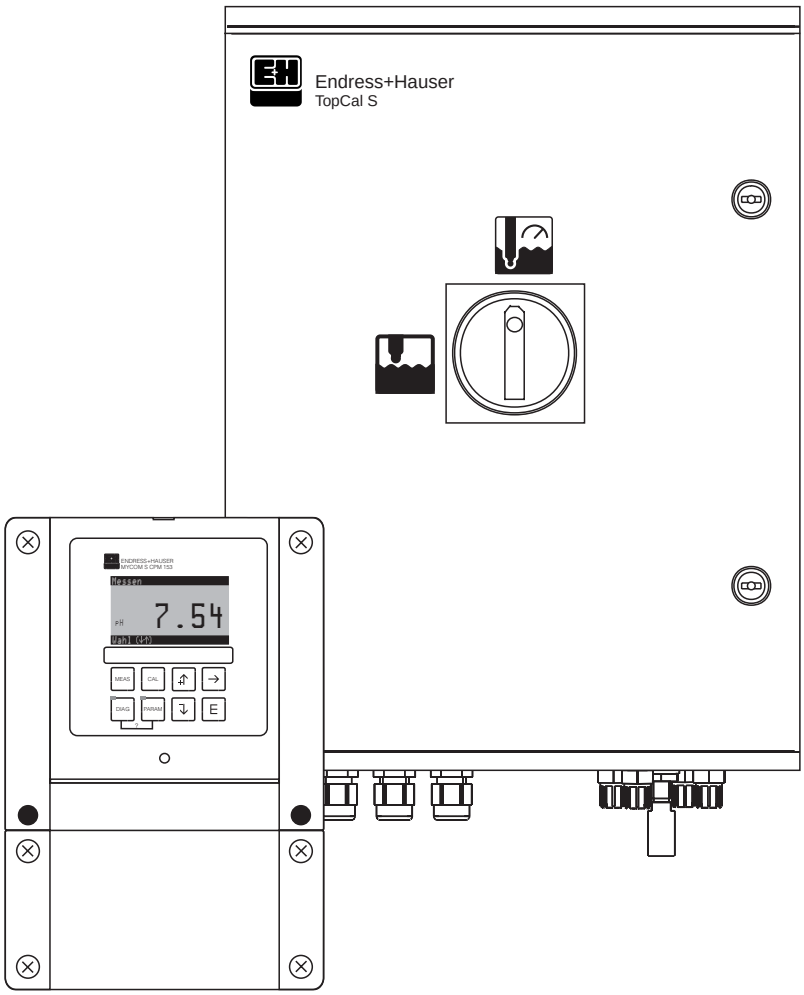
BA 236C/07/en/04.03
51504337
Software version 1.20 or later

TopCal S
CPC 300
Automation of pH/Redox Measurements

Operating Instructions



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ISO 9001

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The Power of Know How

First commissioning ..... page 33

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 completed the settings / calibration.
	"CAL": Calibration key for manual electrode 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).

Change electrode

Remove electrode.
- Move service switch into position.
- Note error message.
- Remove electrode.

Install electrode.
- Service switch must be in position.
- Note error message.
- Install electrode.
- Switch service switch to .
- Note item in display.

Manual operation

- Move assembly.
- Start programme.
- Stop programme.

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1 Safety instructions

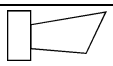
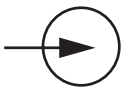
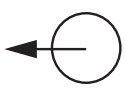
1.1 Safety symbols

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 grounding 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

TopCal S CPC 300 is a fully automatic measuring, cleaning and calibration system for pH and redox measurements. TopCal S CPC 300 consists of the following components:
- Transmitter Mycom S CPM 153
- Control unit CPG 300
- Multihose with assembly hose clip
- Bottles for calibration fluid,
- Communications/Power supply cable CPG 300 / Mycom S CPM 153,
- Hoses CPG 300 for bottles

The system is supplied complete with power supply cables and bottle hoses.
The Ex version of the TopCal S CPC 300 allows operation even in explosive atmospheres. In the Ex version, the CPG 300 is powered via the communication/power supply cable from the Mycom S CPM 153 (see XA 236C/07/en). In the non-Ex version, the CPG 300 and the CPM 153 are connected directly to the power supply.
Aggressive or hot media must not be conveyed via the internal pump. To do this you will have to order a system with control for additional valves.

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, operation

Note the following points:
- If the system is used improperly or other than for its designated use, it may pose a hazard, e.g. due to improper connection.
- Installation, electrical connection, commissioning, 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 instruments have been designed and tested according to the state of the art and left the factory in perfect functioning order. The instruments meet 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/a3) which forms a *component part* of these Operating Instructions. Always follow the installation regulations and the - partly deviating - connection data in the Ex documentation as well. You can find the following symbols on the front page of the additional Ex documentation (according to approval and test centre (Ex Europe, FM USA, CSA Canada).
- The measuring device complies with the general safety requirements in accordance with EN 61010, the EMC requirements of EN 61326, and NAMUR Recommendation NE 21, 1998.

- The manufacturer reserves the right to change the technical data in line with technical progress at any time. You can obtain information on the current version of this 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 compatibility in industrial use according to applicable European directives. 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 devices have to be repaired, please return them *cleaned* to the Endress+Hauser sales centre responsible. You can find the address on the last page of these Operating Instructions. For returns please use the original packaging.
With the instrument, please enclose a completed copy of the "Declaration of Contamination" form particularly when returning assemblies and sensors. You can find this at the end of these Operating Instructions.

2 Identification

2.1 Instrument designation

2.1.1 Nameplate

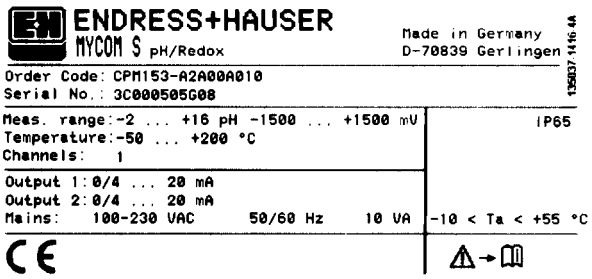


fig. 1: Nameplate example for the transmitter Mycom S CPM 153.

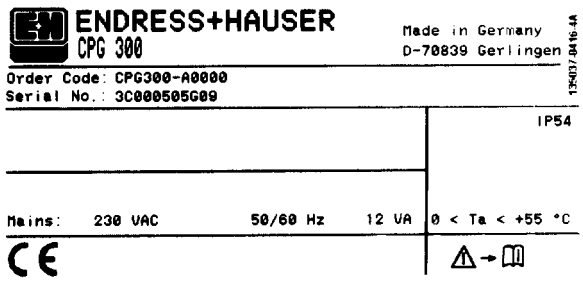


fig. 2: Nameplate example for the control unit CPG 300.

2.1.2 Product structure

Basic equipment:
Control unit CPG 300, transmitter Mycom S with 6 relays and DAT module, multihose (5 m), hose clip, bottle (empty), bottle hoses (2 m), communication/power supply cable Mycom S – CPG 300 (5 m)

	Certificates										
	A	Basic equipment: non-Ex									
	G	With ATEX approval II (1) 2G EEx em ib[ia] IIC T4									
	S	With CSA approval Cl. I, Div. 2, Sensor IS Cl. I Div. 1									
	O	With FM approval Cl. I, Div. 2, with NI input and output circuits, sensor IS Cl. I Div. 1									
	P	With FM approval Cl. I, Div. 2, with NI input and output circuits									
	T	With TIIS approval									
		Control for external valves									
		0	Basic equipment: no additional valves controllable								
		1	Control for 1 external valve, non-Ex								
		2	Control for 1 external valve, Ex								
		3	Control for 2 external valves, non-Ex								
		4	Control for 2 external valves, Ex								
			Measurement inputs Mycom S								
			1	1 measuring circuit for glass electrodes, pH/redox and temperature							
			2	1 measuring circuit for glass electrodes/IsFET sensors, pH/redox and temperature							
				Measurement output Mycom S							
				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						
				D	HART with 2 current outputs 0/4 ... 20 mA, active						
				E	PROFIBUS-PA, without current outputs						
					Power supply						
					0	... 230 V AC					
					1	100 ... 115 V AC (Jumper in CPG 300, universal power supply unit in CPM 153)					
					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	Cable glands NPT ½"			
							3	Cable glands M 20 x 1,5, PROFIBUS-PA M12 plug			
							4	Cable glands NPT 1/2", PROFIBUS-PA M12 plug			
								Length of multihose			
								0	5 m		
								8	10 m		
									Additional equipment		
									0	Without additional equipment	
										Configuration	
										A	with no previous set-up
CPC 300-											Complete order code

2.2 Scope of delivery

The scope of delivery of the cleaning and calibration system TopCal S comprises:
- 1 Transmitter Mycom S CPM 153
- 1 Control unit CPG 300
- 1 Multihose with assembly hose clip
- 1 Bottle for cleaning fluid
- 1 Communications/power supply cable CPG 300 / Mycom S CPM 153,
- 1 Hose CPG 300 for bottle
- 1 Pressure reduction valve
- 1 Water filter
- 1 Operating Instructions 236C/07 (for Ex-systems also the additional Safety Instructions XA 236C/07)
- 1 Instrument identification card
- Accessories (s. chap. 9)

- Check the scope of delivery for completeness using your order and the delivery documents. Make sure the packaging and the contents are undamaged. Inform the supplier about damage to the packaging or the contents. Keep the damaged packaging or the damaged products until the matter has been settled.

2.3 Certificates and approvals

Declaration of Conformity
The product 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 Quick installation guide

1. Ensure that the device is level when installed. Note: the maximum suction height for buffer / cleaner is 2 m.
2. Remove the transport locking device on pneumatic drive (inside of device).
3. Screw on multihose to the bayonet lock, ensuring it is strain-relieved and free of kinks.
4. Connect lines for buffer and cleaner with connections A, B, C.
5. Connect the compressed air supply at the connections I (pump drive) and E (compressed air for rinsing) at 4 - 6 bar.
   Regulate the consistency (5 bar is optimum level) via the reduction valve supplied.
6. Before connecting the rinsing water, the line must be thoroughly flushed. Connect the rinsing water at 3 - 6 bar to connection D (pressurised water for rinsing).
   The rinsing water must be filtered with a 100 µm particle filter.

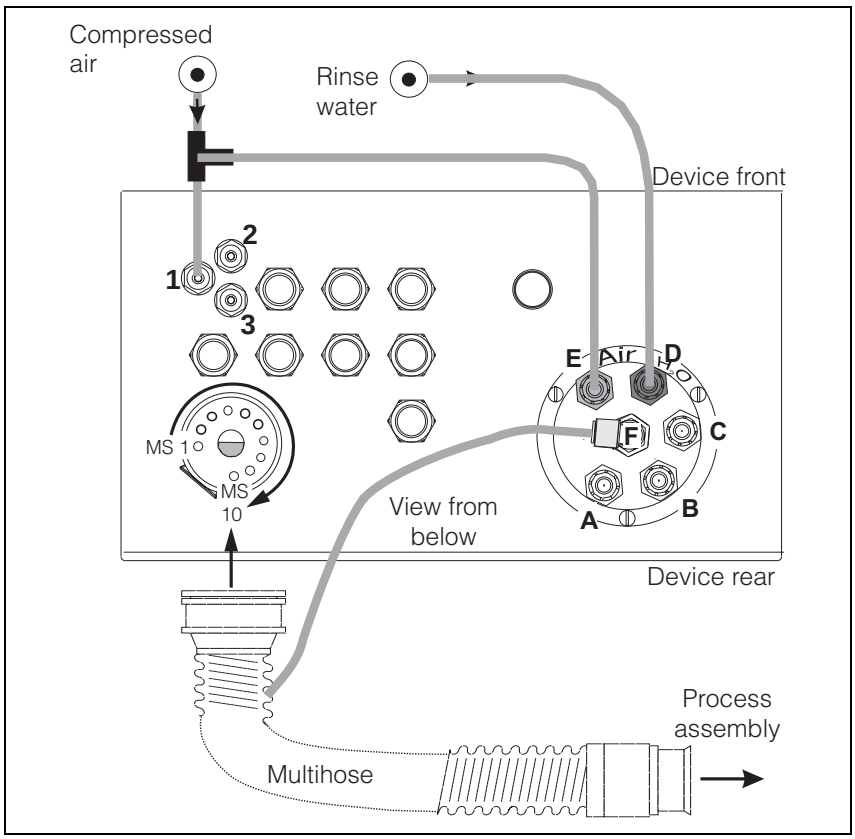


Fig. 3: Connections at the bottom side of the CPG 300 housing

Multihose connections:	Signal
MS1	free
MS2	Assembly in measuring position
MS3	Assembly in maintenance position
MS4	free
MS5	"Measurement" feedback (n/a with inductive feedback)
MS6	"Maintenance" feedback (n/a with inductive feedback)
MS7-MS10	free
Pump connections (exterior)	**Medium**
A	Cleaner (suction)
B	Buffer 1 (suction)
C	Buffer 2 (suction)
D (black)	Pressurised water for rinsing
E (red)	Compressed air for rinsing
F	Output to assembly
Compressed air connections	**Use**
1	Pump drive
2	n/a for non-Ex
3	n/a for non-Ex

Additional valves electrically controlled with non-Ex (switched power supply; for connection, see electrical connection diagrams)

Inspection:

- Check that the compressed air and rinsing water lines are not leaking (inside and outside).
  If you should find leaks, check the *ball check valve*:
  Open the hexagon headed bolt at D or E. The seat of the sealing ball must be clean. The ball must be in position above the spring.
- Check that the hose connection at the black outlet valve (F) is correctly fitted.

Assembly mounting

- *Glass electrode*: Install the assembly at an installation angle of at least 15° in relation to the horizontal and vertical axes (s. fig. 4).
  IsFET-pH-Sensor: If you are using an IsFET-pH-Sensor, you can insert the assembly from vertical to horizontal position.

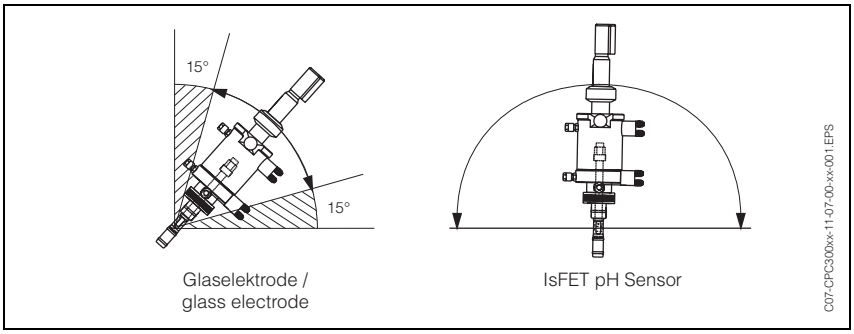


Fig. 4: Left: With glass electrodes, installation angle of at least 15° in relation to the horizontal and vertical axes
right: No limitation with the use of IsFET-Sensor TopHit H CPS 401.

Assembly hosing

- Fit hoses in inlet of the rinsing chambers "from below" and in the outlet "upwards". This prevents excessive air from accumulating in the rinsing chamber (s. fig. 5 left).
- Connect the drive for the
  – measuring position to "2" and for
  – the maintenance position to "3".
- Connect the feedback for
  – the measuring position to "5" and for the
  – maintenance position to "6"
  (s. fig. 5 right).

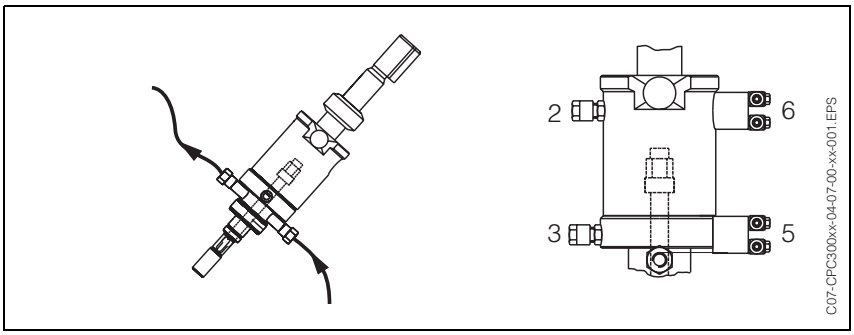


Fig. 5: Left: Inlet of the rinsing chambers "from below"; outlet "upwards".
right: pneumatic connections

Connection of the pneumatic limit switch

- Connect the compressed air lines for the **"Measurement"** position feedback signal at the **lower** limit switch to the indicated connections 1 (= Input) and the 2 (= Output).
- Connect the compressed air lines for the **"Maintenance"** position feedback signal at the **upper** limit switch to the connections indicated by 1 and 2.

For further information please refer to the respective Operating Instructions of the assembly.

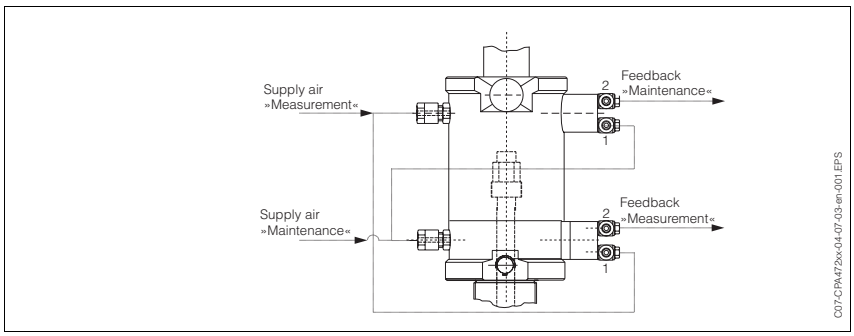


fig. 6: Connection of the pneumatic lines to the CleanFit CPA 47x assembly.
1 = input, 2 = output

Connection of the inductive limit switch

- Disconnect the pneumatic switches from terminals 11 to 14.
- Connect the NAMUR proximity switches to terminals 11- to 14.

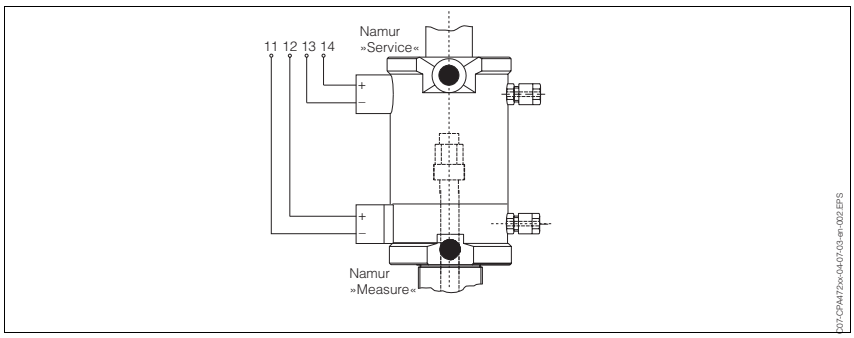


fig. 7: Connection of the inductive limit switches

3.2 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).

3.3 Installation conditions

Always install the transmitter and the control unit so that the cable entries always point downwards.

The components can be installed using the following methods:

Device	Wall mounting	Post/ pipe installation	Panel mounting
Control unit CPG 300	Mounting kit contained in scope of delivery. See fig. 8.	not applicable	not applicable
Mycom S CPM 153, *covered*	Required: 2 screws dia. 6 mm 2 rawl plugs dia. 8 mm	Mounting kit contained in scope of delivery. See fig. 11.	Mounting kit contained in scope of delivery. See fig. 11.
Mycom S CPM 153, *outdoors*	If installed outdoors, weather protection cover CYY102-A required (see Accessories).	Weather protection cover CYY102-A and 2x round post fixtures required (see Accessories).	not usual

Installation instructions
- The transmitter CPM 153 is normally used as a field device.
- The transmitter CPM 153 can be fixed to a vertical or horizontal pipe using the supplied mounting kit. For outdoor installation, a weather protection cover CYY 101 is required. It can be fitted to the field device using all kinds of fixtures (refer to "Accessories").

3.3.1 Installation dimensions

You can find the dimensions and lengths of the devices in the "Technical data" on page 139 ff.

3.4 Installation

3.4.1 Wall mounting

Caution!
- Check that the temperature does not exceed the maximum permitted operating temperature range (–20° ... +60°C). Install the devices in a shady location. Avoid direct sunlight.
- Always mount the devices horizontally so that the cable entries and hose connections point downwards.

Control unit CPG 300

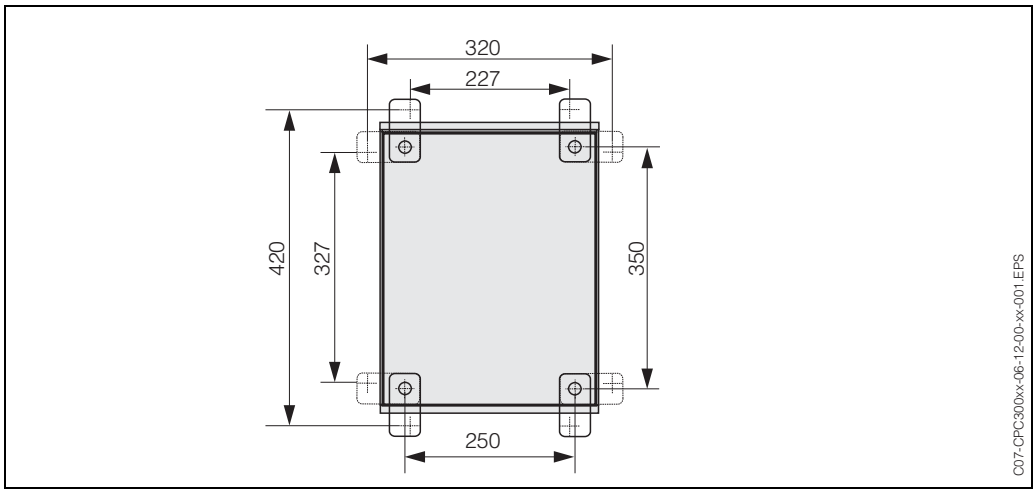


fig. 8: Mounting the control unit CPG 300 using wall mounting kit (contained in scope of delivery)

For the wall mounting of the control unit CPG 300 proceed as follows:

1. Prepare drill holes acc. to fig. 8.
2. Screw the elements of the supplied wall fixing kit to the back panel of the housing (screws contained in the scope of delivery).
3. Fix the housing to the wall.

Transmitter Mycom S CPM 153

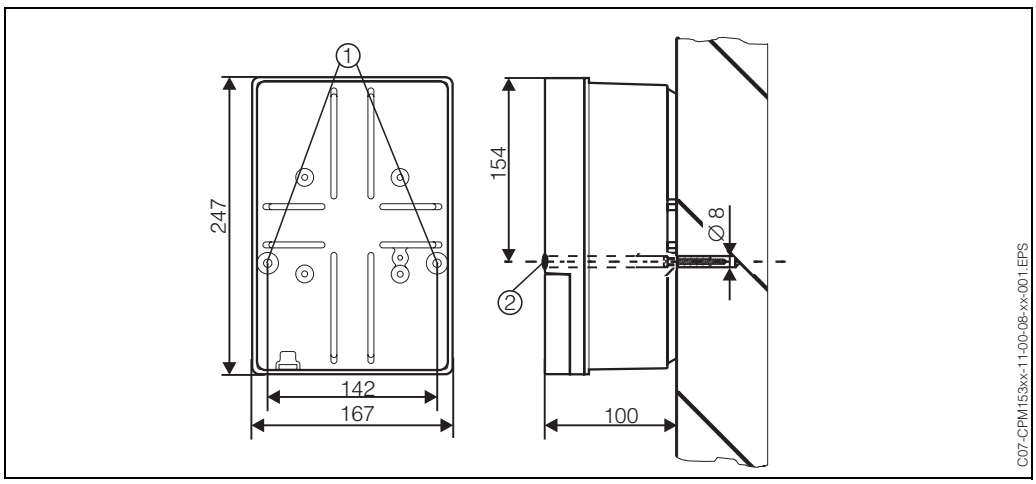


fig. 9: Dimensions for wall mounting: Fixing screw: dia. *6 mm*
Wall plug: dia. 8 mm
1: Fixing drillholes
2: Plastic cover caps

1. Prepare drill holes acc. to fig. 9.
2. Push the two fixing screws from the front through the appropriate fixing bores in the housing.①
   – Fixing screws (M6): max. dia. 6.5 mm
   – Screw head: max. dia. 10.5 mm
3. Mount the transmitter housing on the wall as shown.
4. Cover the drill holes with the plastic cover caps ②.

3.4.2 Post mounting and panel mounting

Transmitter Mycom S CPM 153

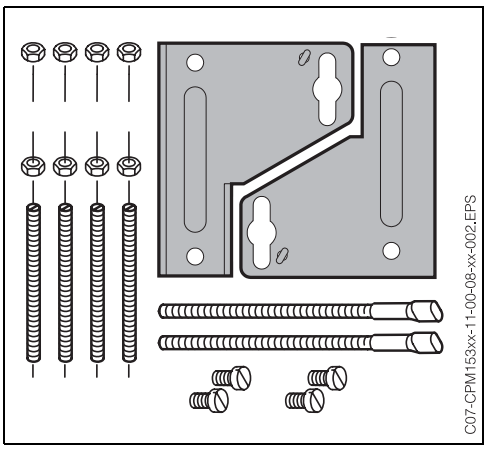


fig. 10: Mounting kit Mycom S CPM 153

Mount the parts of the mounting kit (see accompanying figure) at the back of the housing as depicted in fig. 11.

Required mounting cutout for panel mounting: $161^{+0.5}$ x $241^{+0.5}$ mm.
Installation depth:approx. 134 mm.
Maximum pipe diameter:70 mm.

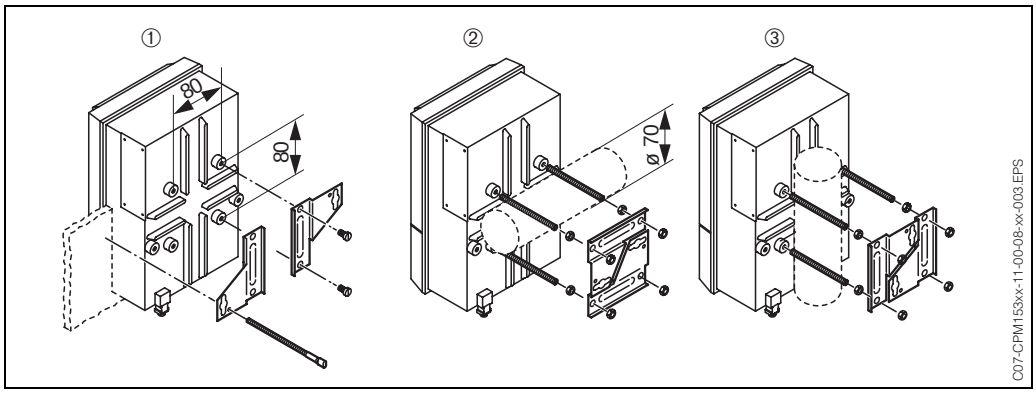


fig. 11: Panel mounting ① and post mounting horizontal ② and vertikal ③ for Mycom S CPM 153

Caution!
Danger of device failure. For outdoor use, the weather protection cover CYY 101 is required (see fig. 12 and accessories).

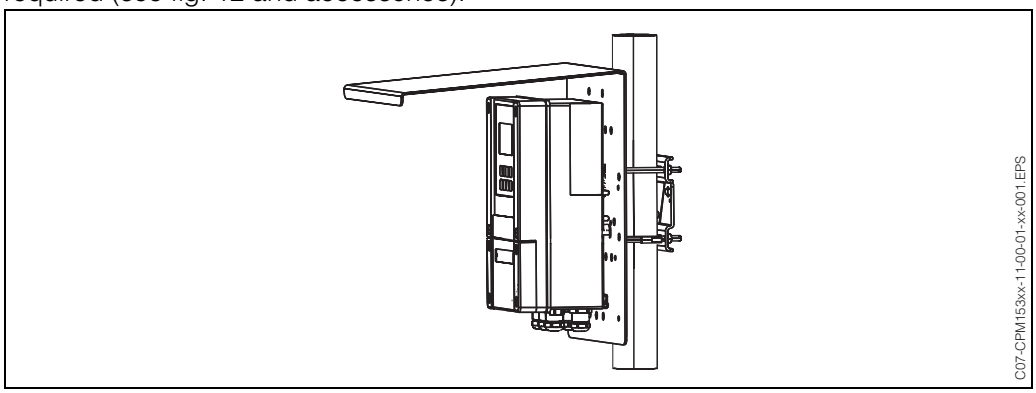


fig. 12: Post mounting for CPM 153 with weather protection cover CYY 101.

3.4.3 Water and compressed air connections

Water	3 ... 6 bar, filtered 100 µm, max. 56 °C (Rinse the line comprehensively before connecting it!)
Compressed air	4 ... 6 bar (optimum 5 bar) filtered 0.5 µm, free from oil and condensate minimum line diameter 10 mm)
Screw unions	bulkhead gland OD 6 / ID 4

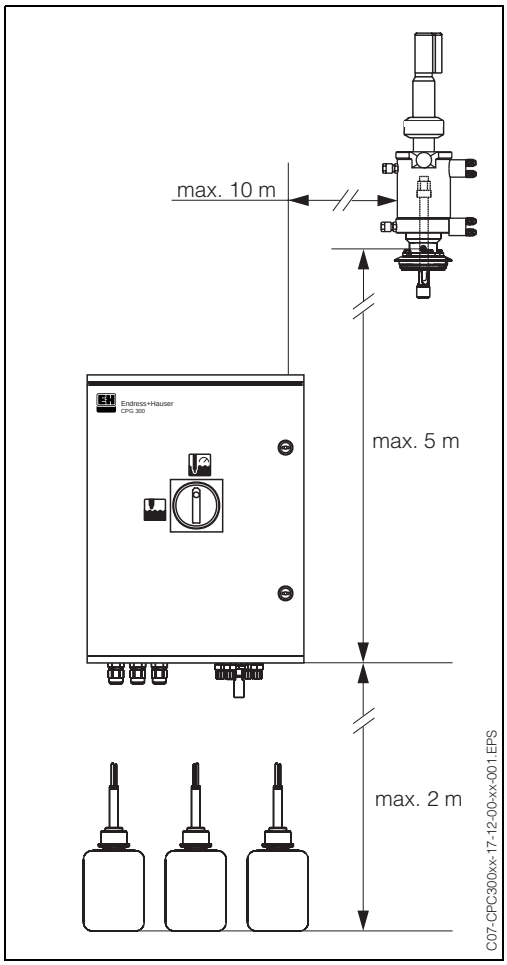


fig. 13: Maximum horizontal and vertical installation distances

Pressure reduction valve

I = Compressed air inlet
O = Compressed air outlet
F = Flow direction behind cover
M = Manometer

✎ Note!
- Please observe the installation direction of the pressure reduction valve.
- Screw in the manometer into the thread on the back.

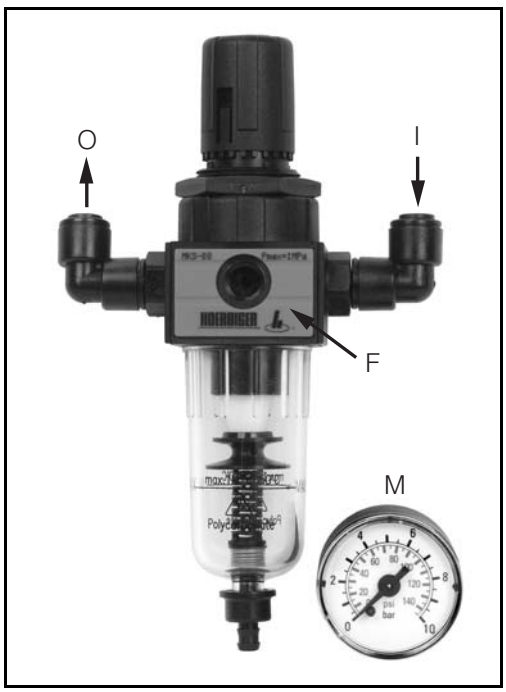


fig. 14: Pressure reduction val ve

3.4.4 Chemical connections

Pump:
(Conveyance of buffer/cleaning agent from CPG 300 to assembly)

✎ Note!
The maximum hose length is 10 m. Of which:

Maximum discharge height	5 m
Maximum horizontal discharge range	10 m
Pressure resistance of internal components	up to 12 bar

Suction of buffer/cleaner from the buffer bottles:

Maximum suction height	2 m

3.5 Installation check

After installing the control unit, transmitter and assembly, carry out the following checks:

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 use, the CYY 101 weather protection cover is required (see "Accessories").
Is the control unit protected against rainfall and direct sunlight?	Avoid direct sunlight.
Is the multihose placed sheltered?	Use protection pipe if necessary.

4 Wiring

4.1 Quick wiring guide

4.1.1 Wiring diagram Non-Ex

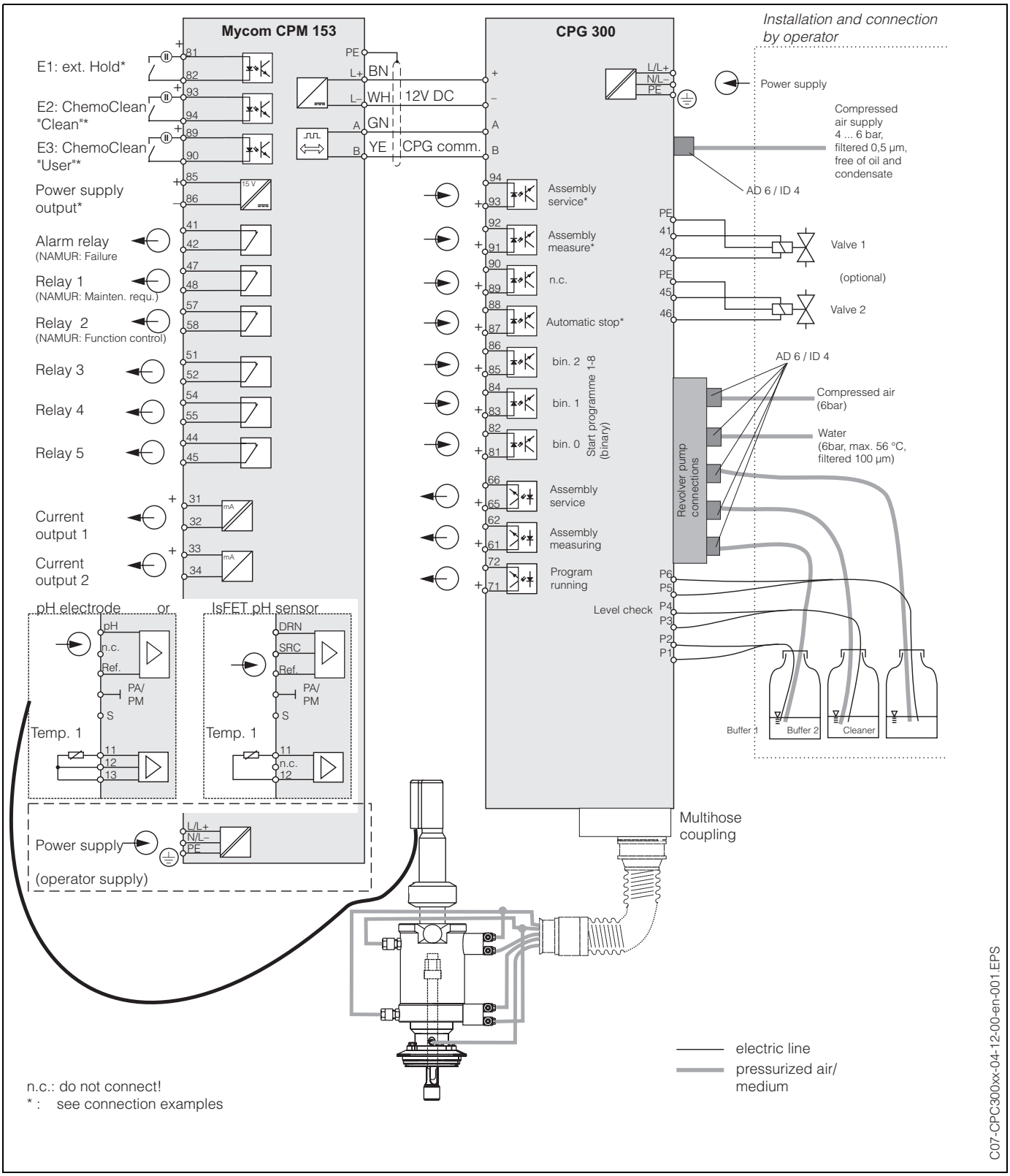


fig. 15: Electrical connection for TopCal S in the non-Ex area

4.1.2 Connection compartment sticker

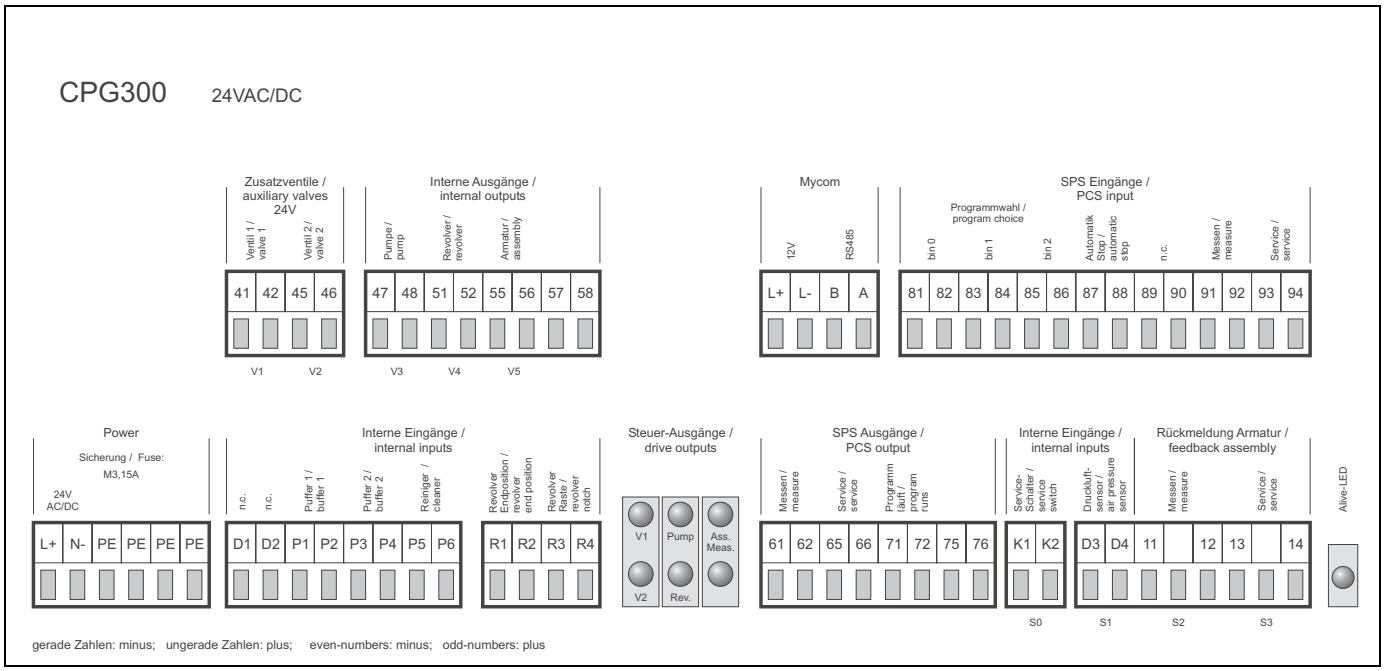


fig. 16: Connection compartment stickers for CPG 300, 24 VAC/DC

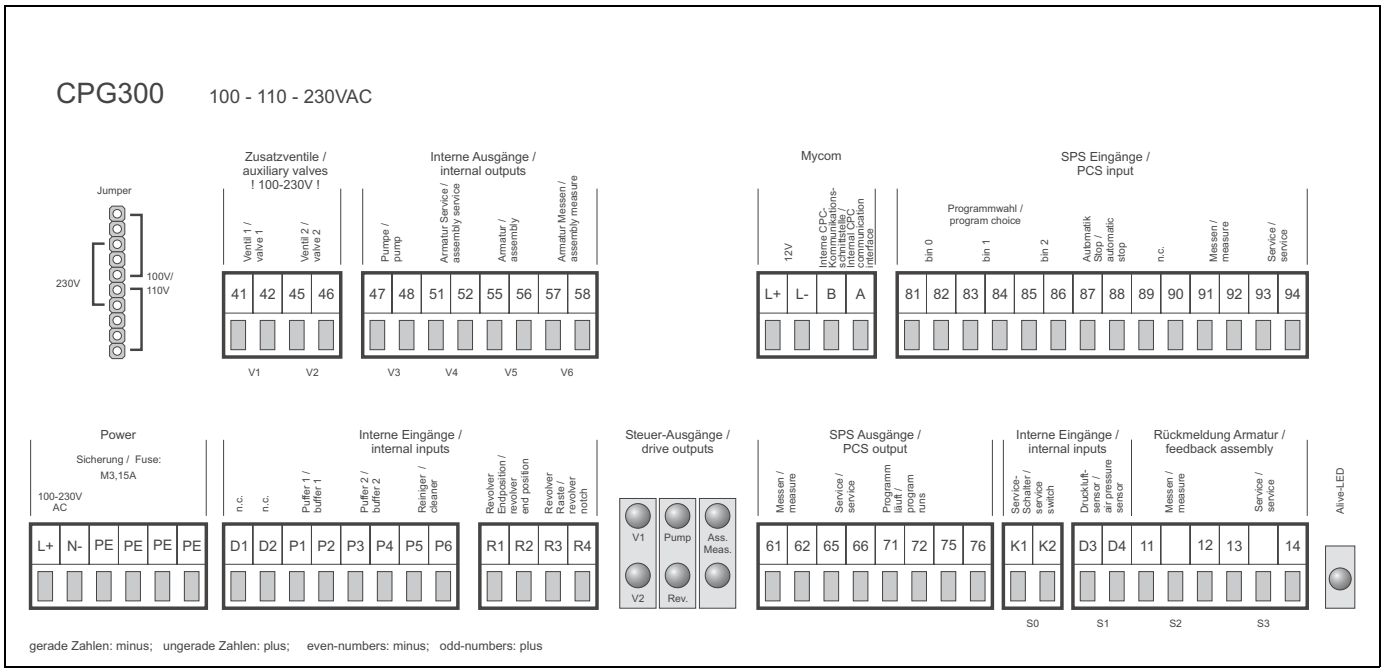


fig. 17: Connection compartment stickers for CPG 300, 100 / 110 / 230 VAC/DC

4.2 Connection of CPG 300

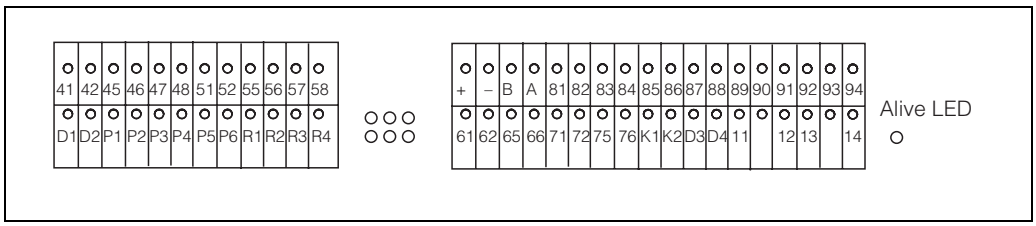


fig. 18: Terminal arrangement CPG 300

Termial	Functional assignment
Outputs:	
41/42	Additional valve 1
45/46	Additional valve 2
47/48	Pump
51/52	Revolver
55/56	Control: Assembly in measurement
57/58	Control: assembly in maintenance
Internal inputs:	
P1/P2	Level check; message that buffer 1 is almost empty
P3/P4	Level check; message that buffer 2 is almost empty
P5/P6	Level check; message that cleaner is almost empty
R1/R2	Move pump to end position
R3/R4	Move pump one slot further

Caution!
- An external power supply is required for the following terminals:
  61/62, 65/66, 71/72
  91/92, 93/94
  87/88
  81/82, 83/84, 85/86
  For these external control inputs you can use the 15 V auxiliary power supply of the Mycom transmitter (terminals 85/86 "CPC supply").
- The power supply (Power: L+/N–) provides the additional valves and the valve block (pump drive, revolver drive, assembly control).

Termial	Functional assignment	
External inputs (from Mycom S + PCS)		
L+/L–	Power supply Mycom S → CPG 300	
A/B	Communication Mycom S → CPG 300	
81/82	ext. Control: cleaning programme (bin. 0)	binary coded (s. p. 74)
83/84	ext. Control: cleaning programme (bin. 1)	
85/86	ext. Control: cleaning programme (bin. 2)	
87/88	Automatic stop	
89/90	n.c.	
91/92	Control: Assembly in measuring position	
93/94	Control: Assembly in maintenance position	
External outputs (assembly status):		
61/62	Assembly in measuring position	
65/66	Assembly in maintenance position	
71/72	Programme running	
75/76	n.c.	
Internal inputs (feedback):		
K1/K2	Control: Mechanical NC contact for service switch	
D3/D4	Monitoring: Has the compressed air failed ?	
11/12	Feedback: Assembly in measuring position	
13/14	Fedback: Assembly in maintenance position	

4.3 Connection of Mycom S

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!
- For connecting the CPM 153 to the CPC 300 use the shielded cable CUS 31. Connect the screen only to the CPM 153 (s. wiring diagram p. 18).
- Connect unused signal wires from input and output lines to the internal PE rail of the CPM 153.

4.3.1 Connection compartment sticker

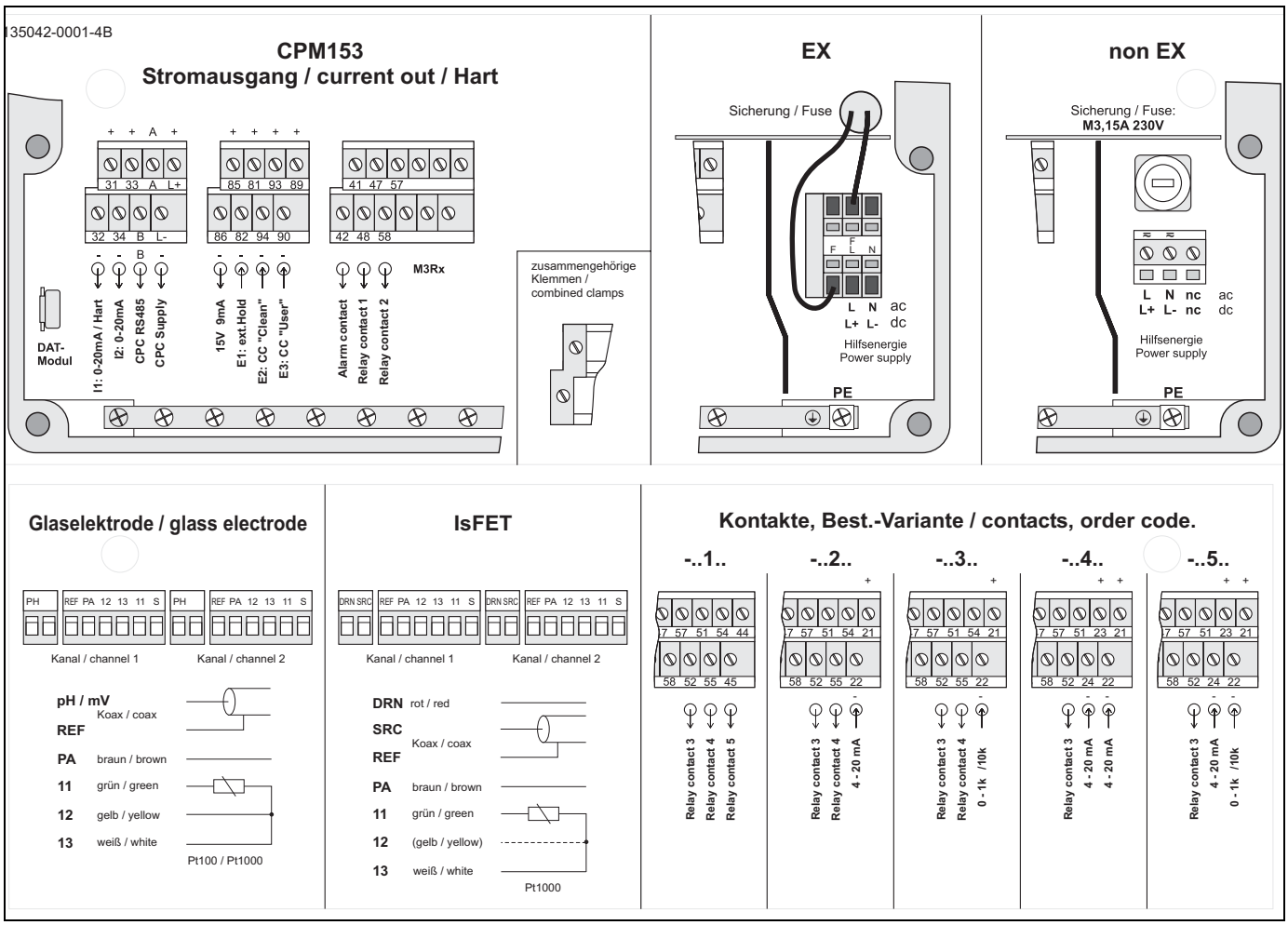


fig. 19: Connection compartment sticker (in the connection compartment of the transmitter)
DRN = Drain
SCR = Source
REF = Reference

4.3.2 Contact assignment Mycom S

In the transmitter Mycom S CPM 153, there are six relays available which you can configure via user menu (see the "PARAM" menu → "Set up 1" → "Contacts" from page 41).

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.
- You can switch the contact type NC / NO via software.

4.3.3 Connecting Mycom S to CPG 300

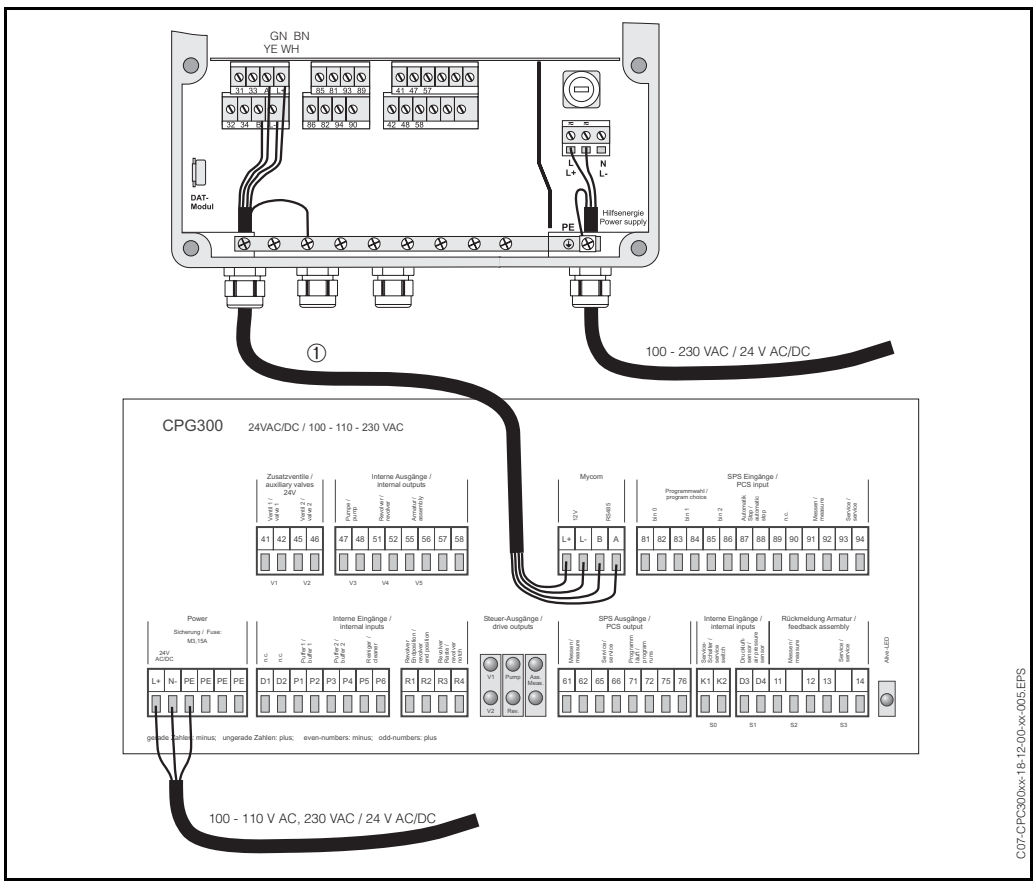


fig. 20: Connection of transmitter Mycom S CPM 153 to control unit CPG 300
① Connection cable

4.4 Sensor connection and measuring cable

4.4.1 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 with standard plug-in head GSA and without Pt 100
- 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

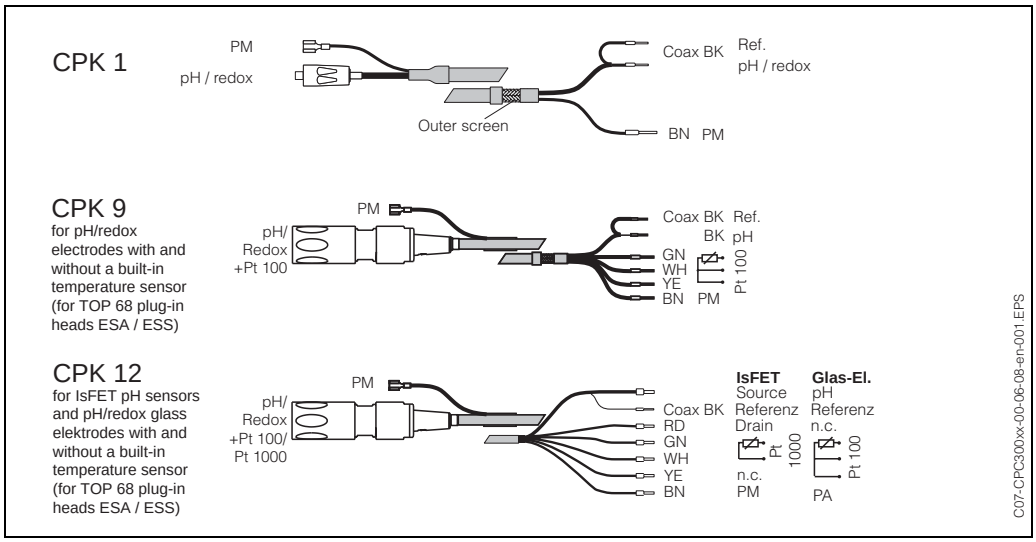


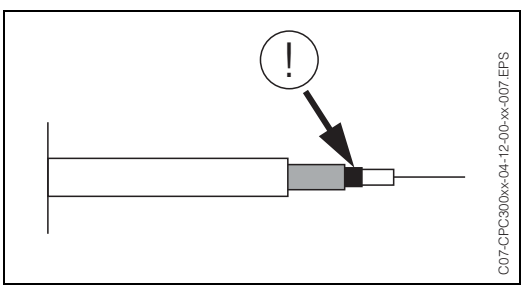
fig. 21: Preterminated special measuring cables to connect pH and redox electrodes.

4.4.2 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!
Remove the black plastic semi-conductor layer (arrow) from the inner coaxial cable. Each cable type has such a layer.



4.4.3 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 471, please proceed as follows:

1. Open housing cover of the CPM 153.
2. On the left side (housing cover) pull off both ends of the red cable to the pH input (s. fig. 22).
3. Remove the "pH" terminal out of the transmitter and replace it by the terminals "DRN" / "SRC".
4. Pin up the jumper included as shown in fig. 23.
5. Change the setting "electrode type" in the Quick Setup menu (p. 35) to "IsFET".

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

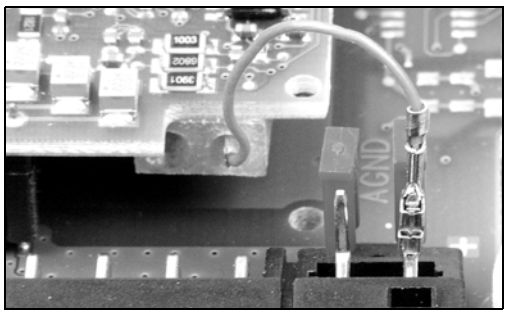


fig. 22: Cable (red) for connection of pH / Redox glass electrodes.

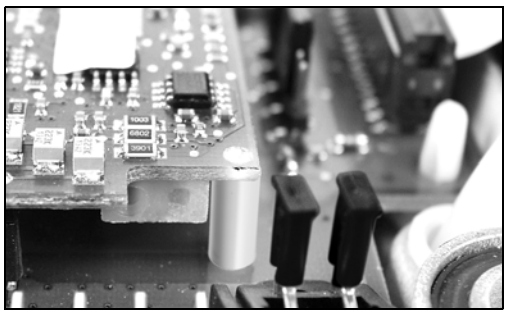


fig. 23: Jumper for connection of IsFET sensor TopHit H CPS 471

4.4.4 Outer screen connection

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

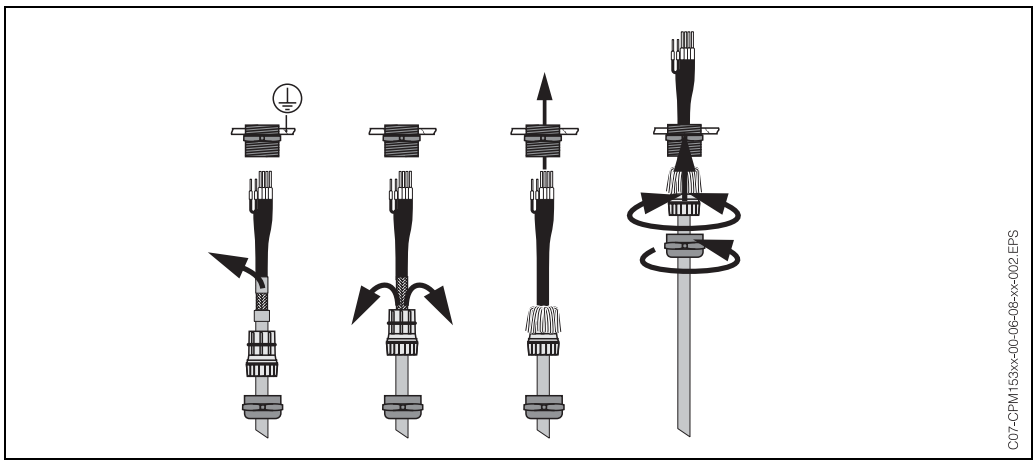


fig. 24: Outer screen connection for CPK 1 to CPK 12 with metal cable gland. The screen contact is within the cable gland.

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 38, Field A6, "Select connection type").

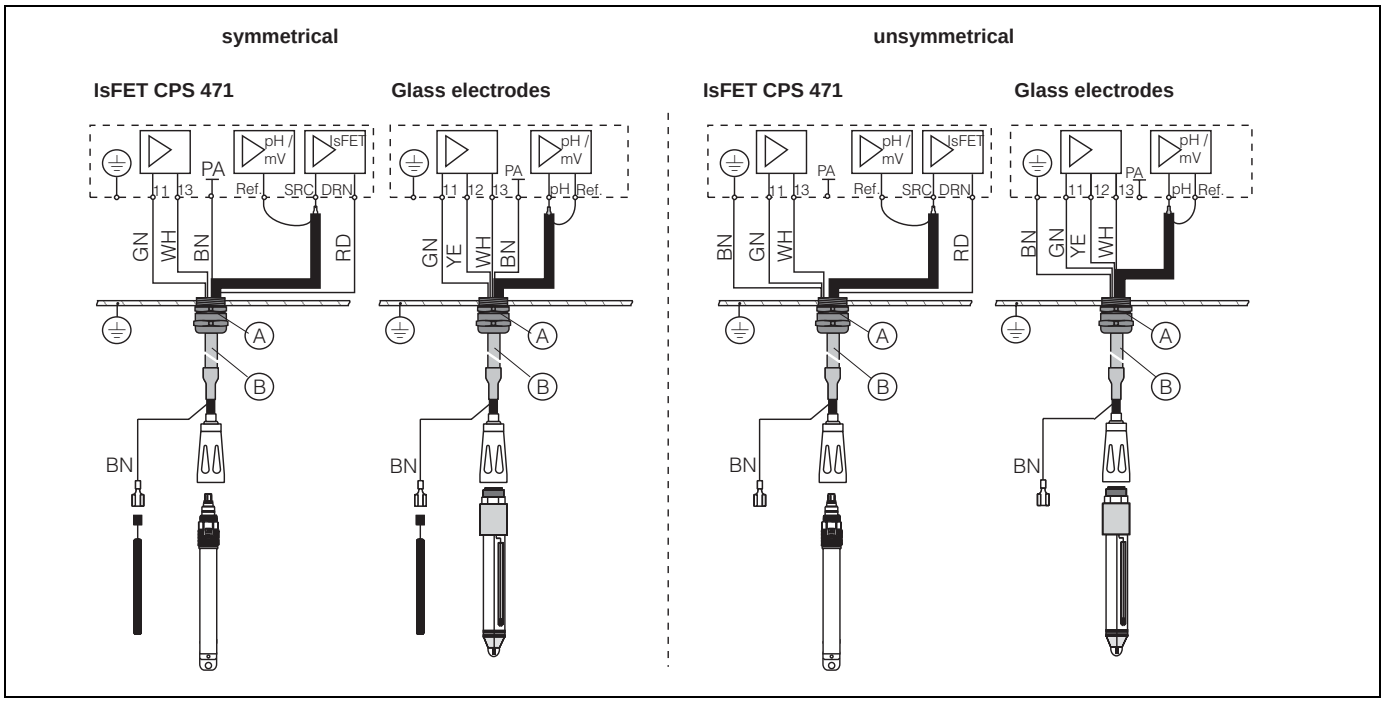


fig. 25: Left:symmetrical electrode connection
Right:unsymmetrical electrode connection

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).
Monitoring of the reference electrode by the SC system (s. page 57) is possible with symmetrical measurement.

Unsymmetrical (without PML)

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

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 57) is *not* possible with unsymmetrical measurement.

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

4.5 Post connection check

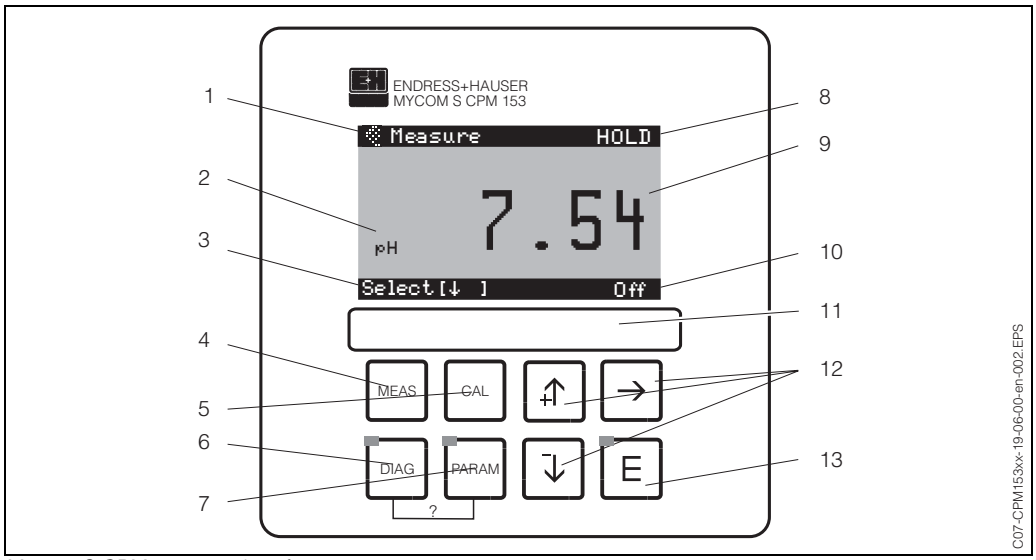
Perform the following checks after completing electrical installation of the measuring device:

Instrument status and specifications	**Remarks**
Is the measuring instrument or the cable damaged externally?	Visual inspection
Electrical connection	**Remarks**
Does the supply voltage match the specifications on the nameplate?	**CPM 153:** 100 V ... 230 V AC long-range 24 V AC / DC **CPG 300:** 110/230 V AC recodeable 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?	
Are all the screw terminals properly tightened?	
For connection with potential matching (PML): Is the PML connected to the measuring medium or the buffer solution?	✎ 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; Hand symbol: sign for manual operation
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; OFFSET, if in pH or redox mode an Offset has been edited
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

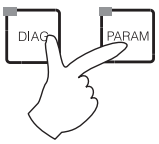
"PARAM" brings you to the Configuration menu of the TopCal S CPC 300.

✎ 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 (s. 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.
Additionally, the field code is displayed, which determines the field selected..

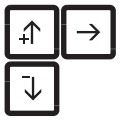
"MEAS" switches to Operation. This displays the measured values. Use the arrow keys to scroll through the different measuring menus.

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

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

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

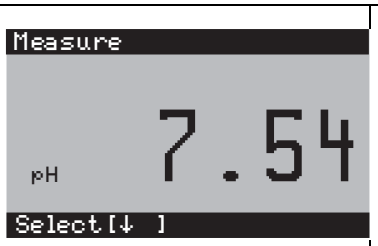
LED (status display):
green: everything OK.
red: an error has occurred.



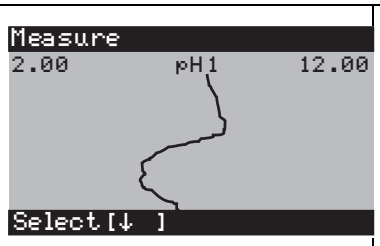
- You can scroll through the menu options with the arrow keys, and then highlight your selection (if there is a choice offered) or
- Increment or decrement numbers by one step with "+" / "-". Move to the next digit with the "right arrow" (editor type 1) or
- "Activate" with the "right arrow" and scroll through the selection with "+" / "-" (editor type 2) (for information on editor types, see page 30).

5.1.3 Open measuring menus

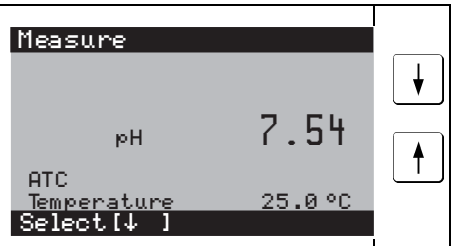
You can choose between the different measuring menus. Use the arrow keys to scroll between the different menus. Switch between the measured value characteristic and the data logger using the ENTER key E.



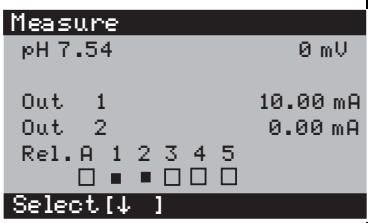
The current measured value is displayed.



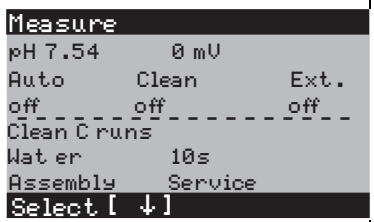
If you have activated the data logger, you can see the current measured value characteristic here (record mode).
If you have activated both data loggers, press the arrow key to switch to the view of the second measured value characteristic.



In this display you can see the measured value, the kind of temperature compensation and the related temperature.



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 = ❒

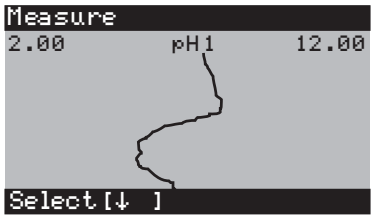
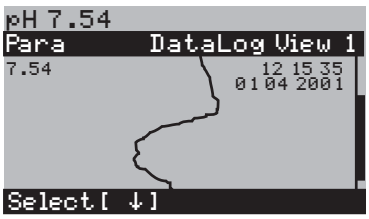


In this display you can see the measuring value, the status of automatic, cleaning and external control as well as the the status of a running cleaning programme.

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 500 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 53). 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" → "DataLog View 1/2" 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 control 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 permits calibration.
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.
In case you have mislaid/forgotten the supplied maintenance code, contact your service office for a universally valid maintenance code.

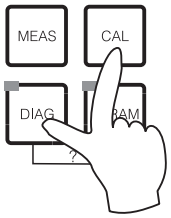
Specialist code

Specialist level (can be protected by the specialist code):
All menus can be accessed and changed.
Factory setting Code = 0000, i.e. the levels are not protected.
In case you have mislaid/forgotten the supplied specialist code, contact your service office for a universally valid specialist code.

To activate the codes (= functions locked) see the item "PARAM"→ "Set up 1" → "Access codes" (s. page 39). 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 reset the code to "0000", all the levels are freely accessible for editing. The code can only be reset via the "specialist" menu.

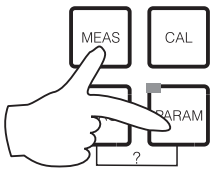
Locking the operation



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



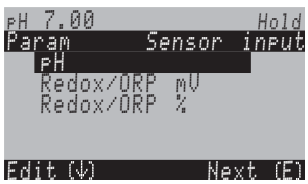
Press the "MEAS" and "PARAM" keys simultaneously to unlock the operation.

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

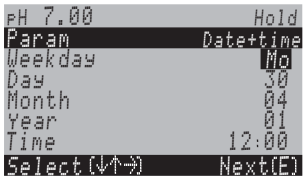
Editor type 1 (E1) *for functions, which can be directly selected from the display. The editing row shows "Edit".*



- 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 settings are active when the instrument is switched on for the first time. The table below lists all the main settings. For all further factory settings, refer to the description of the function groups (from page 38), there the factory setting is printed in **bold**).

Parameter		One-circuit instrument
Select operating mode		pH
Select measuring principle		One-circuit Circuit 1
Select electrode type		Glass electrode 7.0
Select connection type		symmetrical
Select temperature display		°C
Select temperature compensation		ATC K1
Temperature measurement		off
Select temperature sensor		Pt 100
Contact functions		NAMUR
Select current output 1		pH/Redox K1
Select current output 2		Temperature K1
Hold		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
Current output 2:	0/4 mA value: 20 mA value:	Temperature 0.0 °C 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 a transmitter and
- *copy* the complete settings to other CPM 153 transmitters with identical hardware functionality.

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

6 Commissioning

6.1 Installation and function check control

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 that the connection check is carried out (s. chap. 4.5).

6.2 Switching on the device

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

We recommend the following procedure for commissioning:

1. Switch the service switch to the Service position or to "OFF"
2. Connect the Mycom S CPM 153 to the power supply.
3. Wait for initialisation of CPM 153 and CPG 300.
   Function of the green "Alive LED":
   Frequency 2/sec: communication is running
   Frequency 1/sec: communication is loading
   LED lights up constantly: no communication.
   If the LED does not light up, check the power supply at terminal L+/L– (setpoint: 12 volts).
4. If the equipment is being operated for the first time, execute the menu "Quick setup", Chap. 6.4, page 34.
5. Switch the service switch to the Measuring position or to "ON".
6. Determine the number of strokes (page 37).
7. Set the turret and pump control time (page 94).
8. Select a function for the additional valves (page 79).
9. Configure the times of the "Clean" programme (page 80).
10. Start the "Clean" programme and check the entire system for leaks.
    Programme start:
    "PARAM" → Specialist → Manual operation → TopCal → Status messages (Enter) → "Start programme" → "Clean"
11. Now configure the complete system via the menu.

6.2.1 First commissioning

On first switch-on, 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

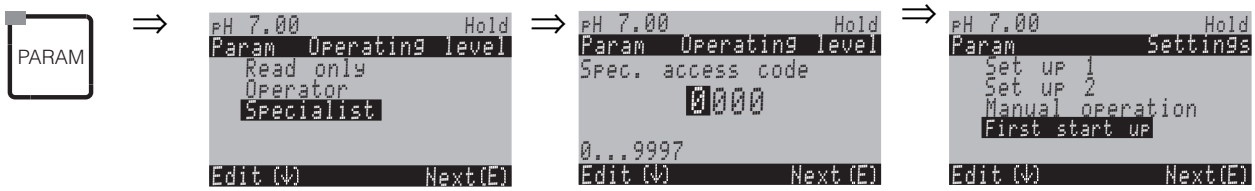
Switch-on behaviour
A closed control loop is created once the measuring system is switched on. During this time (approx. 5-8 minutes), the measured value adjusts to the real value. This settling behaviour occurs each time the liquid film between the pH-sensitive semiconductor and the reference lead is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

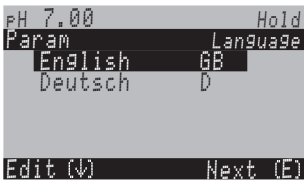
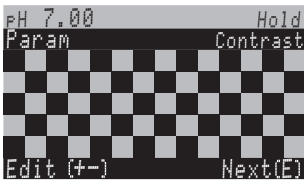
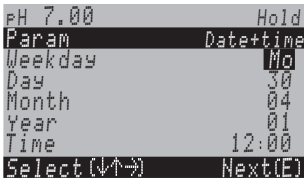
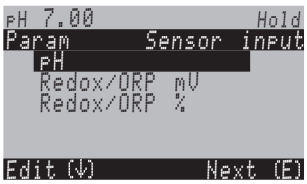
Sensitivity to light
Like all semiconductor elements, the IsFET chip is sensitive to light (measured value fluctuations). However only intense direct illumination impinges on the measuring value. For this reason, avoid direct exposure to sunlight during calibration. Normal ambient light does not affect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

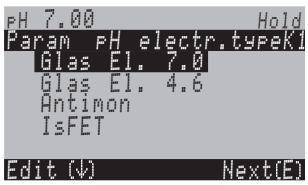
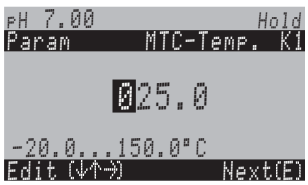
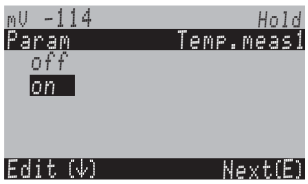
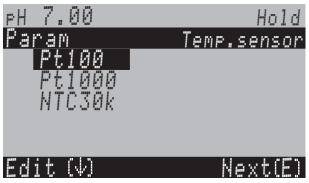
6.4 Quick Setup

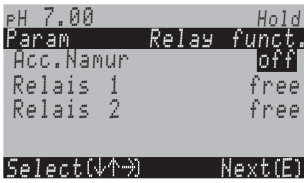
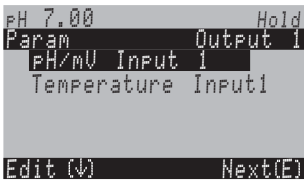
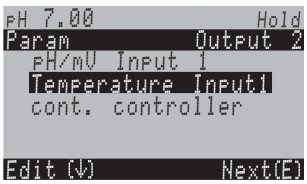
In this menu, configure the most important transmitter functions required for measurement.

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 the operating mode changes, all the user settings are automatically reset.** • Here it is sensible to use the DAT module to save your settings.

CODE	Display	CHOICE (default = bold)	INFO
T7		**Glass el. 7.0** Glass el.4.6 Antimony IsFET	**Select electrode type** (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.
T9		**solution ground** no solution ground	**Select connection type** *solution ground* = with potential matching (PML) *no solution ground* = without PML
T10		**°C** °F	**Select temperature display**
T11		**ATC** MTC MTC+Temp	**Select temperature compensation** *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** (only with pH and selection of MTC or MTC+Temp. in Field T11)
T13		**off** on **Pt 100** Pt 1000 NTC 30k	**Temperature measurement** (only for redox)
T17		**Pt 100** Pt 1000 NTC 30	**Select temperatur sensor**

CODE	Display	CHOICE (default = bold)	INFO
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 22). Selection: free / Controller / LC / CCW / CCC *free*: no function *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 77)
T19		**pH/Redox K1** Temperature K1	**Select current output 1** Selection of the parameter, which shall be output on the current output.
T20		pH/Redox K1 **Temperature K1** contiuous controller	**Select current output 2** Selection of the parameter, which should be output at the current output. *contiuous controller*: Control of a controlling actuator via the current output See also Controller menu page 55.
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		**end** restart	**Exit Quick Setup?** *restart* = Run through settings in Fields T1-T22 *end* = Save the settings in Fields T1-T22 and exit Quick Setup.

6.4.1 Determine stroke number

So that you can correctly convey your media, buffers, cleaners, water etc. using the pump of the CPG 300, you must determine the stroke rate which is necessary to fill the complete system (up to the rinse chamber of the assembly).

To enter the menu, proceed as follows:

Keep pressing "E" until the rinse chamber of the assembly is filled with cleaner, buffer or water.
You can use this number (which is displayed) as the number of strokes used to convey cleaner / buffer in a cleaning programme (entry in field NAAA5, page 80).

Note!
This function is only available with TopCal CPC 300.

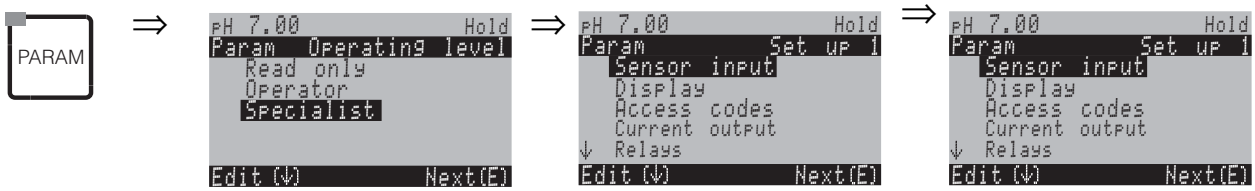
6.5 Description of functions

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 signal attenuation, you have already made all the settings in the menu at the first commissioning in Quick Setup (s. page 34). You can change the selected values in this menu.

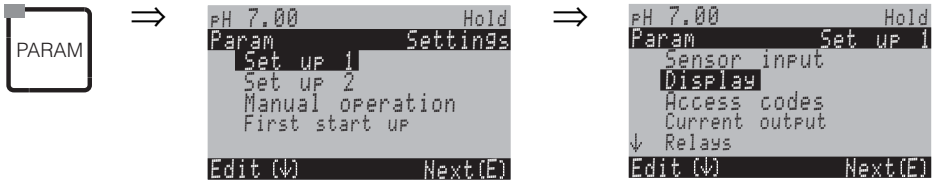
For the first entry to the parameter setting, you have to insert your specialist code (s. page 29, s. page 39). To enter the menu, proceed as follows:

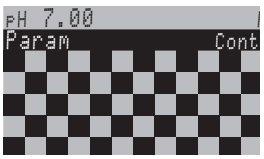


CODE	CHOICE (default = bold)	INFO
A1	**pH** Redox mV Redox %	**Operating mode selection** If the operating mode changes, the user settings are automatically reset.
A4	**Glass el. 7.0** Glass el. 4.6 Antimony IsFET	**Select electrode type 1** (only pH) ✎ Note! • In the event of a change from glass or 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.
A6	**symmetrical** unsymmetrical	**Select connection type** *symmetrical* = with potential matching (PML) *unsymmetrical* = without PML ✎ Note! For further information, see page 38.
A7	pH/Redox: **00 s** Temperature: **00 s** (00...30s)	**Set measured value attenuation** The mean value over the set time is displayed. There is no attenuation for the 00s value.

6.5.2 Set up 1 – Display

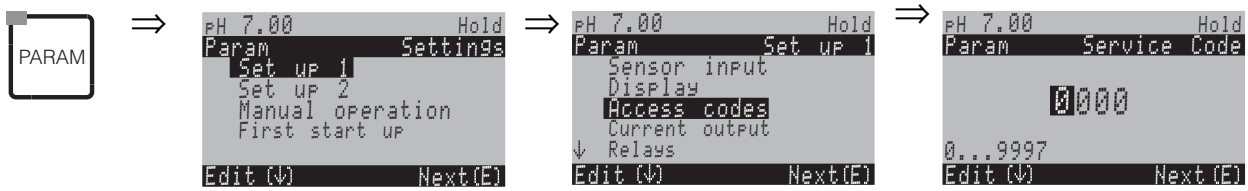
To enter the menu, proceed as follows:



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** Enter the complete date and time here.
B4	pH **00.00** pH 00.0	**Select no. of decimal places** (only for pH measuring type)
B5	**°C** °F	**Select temperature unit**
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:

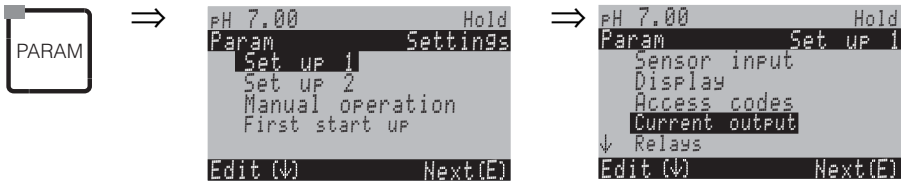


CODE	CHOICE (default = bold)	INFO
D1	**0000** (0 ... 9997)	**Enter maintenance code** In the range 0000 ... 9997, the code can be freely selected. 0000 = no Security Locking.
D2	**0000** (0 ... 9997)	**Enter specialist code** In the range 0000 ... 9997, the code can be freely selected. 0000 = no Security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

Note!
Danger of misuse. Make sure that the codes you enter and the universal code (s. page 40) 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 always 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** Temperature contiuous controller	**Selecting the measured values,** which should be output at the current output. Selection possibilities related to the instrument variant and the selected output (see selection table above). ✎ Note! Danger of data loss. If you change the assignment for the current output from "contiuous controller" to a different function **after** you have configured the controllers, the **complete** controller settings (s. page 55) 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 ... 20 mA **4 ... 20 mA**	**Current range selection** ✎ Note! If you change the current range after editing the table, the table will be reset.
EA4	!!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)
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 range of the measured value is –2 ... +16 pH. The minimum distance from the upper to the lower measured value limit is 2 pH units. (Exmp.: 0/4 mA: pH 7 and 20 mA: pH 9)
EAA6	Linear characteristic active.	**Note in display:** The linear characteristic is activated after confirmation by pressing "E". Cancel by pressing "PARAM".
EAB1	**01** (1 ... 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 rows to be deleted, delete them with → and confirm this with "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 "contiuous controller" can only be assigned to the current output 2.

Current output1 (Terminals 31 +, 32 –)	**Current output2** (Terminals 33 +, 34 –)
pH/redox Temperature	pH/redox Temperature contiuous controller

- 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):

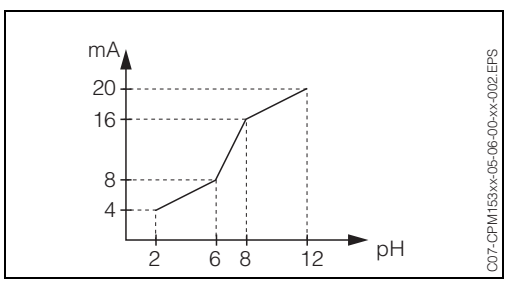
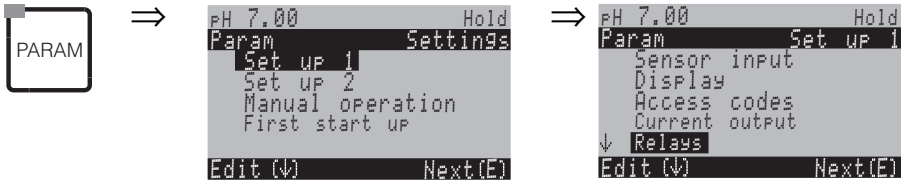


fig. 26: Example of characteristic enter using a table

6.5.5 Set up 1 – Relays

To enter the menu, proceed as follows:



CODE	CHOICE (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 with Chap. 4.3.2). 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 77). The limit value/controller contacts are configured in the menu "PARAM" → "Set up 2" → "Controller settings". ✎ 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 55) is reset to the default values. • If you change the relay assignment for the controller, you must use the controller menu (s. page 55) 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 (s. page 22) are free.

CODE	CHOICE (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	**Steady contact** Wiping contact	**Contact type: Fault signalling contact** (only, when NAMUR funcion = off) *Steady contact* = active for as long as an error is present. *Wiping contact* = active for 1 second when an alarm signal occurs
F6	ChemoClean is always a 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. Here, you enter the temperature value manually, which is used to adjust the slope of the electrode to the medium temperature.

MTC+Temp.: The pH value is corrected with the manually entered temperature (see MTC). On the display however, the value which appears is what the temperature sensor measures in the medium.

Medium temperature compensation
Tables for Medium 1...3:
For medium temperature compensation, tables can be created in the 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 wish 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 temperature using customer-specific tables (see below).
	Temperature:			
		GAA1	**ATC K1** MTC MTC+Temp.	**Select temperature compensation** ATC = automatic temperature compensation with a temp. sensor circuit MTC = manual temp. comp. (with fixed temperature, entered in Field GAA2) MTC+Temp. = as MTC. On the display however, the value which appears is that of the temperature sensor connected to the temperature input of the transmitter.
		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 30 none	**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.
	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

CODE	CHOICE (default = bold)	INFO
Select table:		
GBA1	Medium 1 Medium 2 Medium 3 **off**	**Select medium** Select a medium. *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 rows to be deleted, delete them with → and confirm this with "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 reference 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 112) 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 112 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 112.

To enter the menu, proceed as follows:.

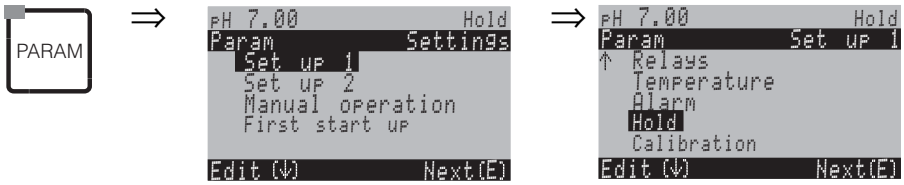
CODE	CHOICE (default = bold)	INFO
H1	Min (2.4 mA) **Max (22 mA)** off	**Select error current** Set the error current at which an error message is active.
H2	!!Caution!! Current output 0...20 mA and error current = 2.4 mA is dangerous.	**Note in display:** Error current is in the measuring current range. If, in Field EA3, 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	**0000 s** (0 ... 2000 s or min)	**Alarm delay entry** Delay between error occurrence and alarm trigger.
	No. E025 A **on** I **on** CC **on**	**Error/contact assignment** Each error can be assigned individually: *No.* = error number E025 (only display) *A* = Assignment to the alarm relay (activate/ deactivate) This error triggers an alarm. *I* = This error triggers an error current *CC* = ChemoClean®. This error triggers cleaning.
H6	Function: off Time input: 0002s (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** CPC **on**	**Selection: automatic hold active when:** CAL = Calibration DIAG = Service/Diagnosis PARAM = Parameter entry menu *CPC on*: If CPC 300 programmememe runs, Hold is active. If CPC Hold "off" is selected, no Hold will be set from the CPC 300.
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 and 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
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, the "Hold" indicator flashes in the display.
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.

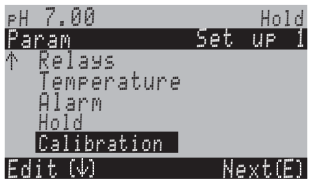
6.5.9 Set up 1 – Calibration

Operating mode pH

To enter the menu, proceed as follows:

PARAM ⇒

⇒



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.
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.

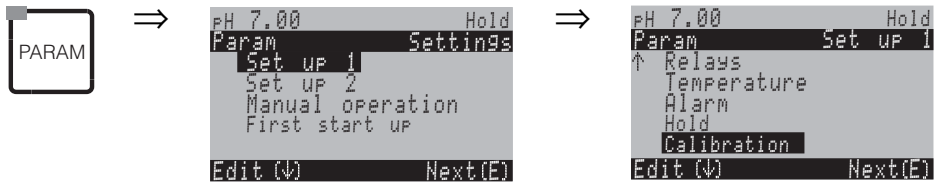
CODE	CHOICE (default = bold)	INFO
JA2	DIN 19267 Ingold **E+H** NBS / DIN 19266 Special buffer	**Select buffer type** (only fixed buffer, auto. buffer recognition) *Special buffer* = The special buffer tables for definition using Fields JB1 to JB6 are used. ✎ Note! You can find the buffer tables for the buffers offered in the Appendix (s. page 160).
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
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".

CODE	CHOICE (default = bold)		INFO
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.
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.

CODE	CHOICE (default = bold)	INFO
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 a calibration must take place. *Time*: Display of the remaining time to an error message (count down).
Autocal. TopCal:		
JE1	**Fixed buffer** Auto. buffer recognition	**Calibration parameters** Sets the calibration type undertaken when the "CAL" key is pressed: *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.
JE2	DIN 19267 Ingold **E+H** NBS / DIN 19266 Special buffer	**Select buffer type** (only fixed buffer, auto. buffer recognition) The following are available: DIN 19267, Ingold, E+H, NBS / DIN 19266, special buffer. *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 160).
JE3	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)
JE4	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)
JE5	**Buffer while Cal:** **off** on Intervall **15s**	**Deliver buffer while calibrating** During calibration you can continue to deliver buffer in a defined intervall.

Operating mode Redox

To enter the menu, proceed as follows:

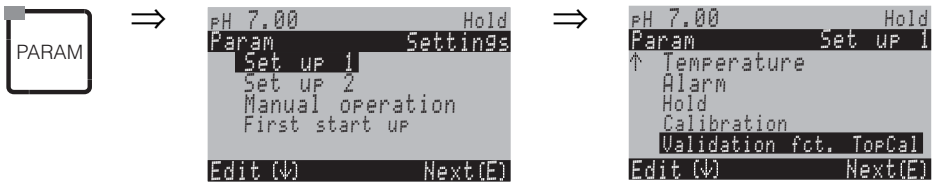


CODE	CHOICE (default = bold)	INFO
J1	**Offset** Manual calibration Cal. settings Calibration timer Calibration TopCal	**Calibration menu selection** *Offset*: Entry of a fixed value by which the mV value is displaced. *Manual calibration:* Initial settings for the function of the CAL key. *Cal. settings:* 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.
Autocal. TopCal:		
JF1	**0450 mV** (-1500...1500mV)	**Specification of calibration solution used with TopCal.**

6.5.10 Set up 1 - Validation function TopCal

To enter the menu, proceed as follows:

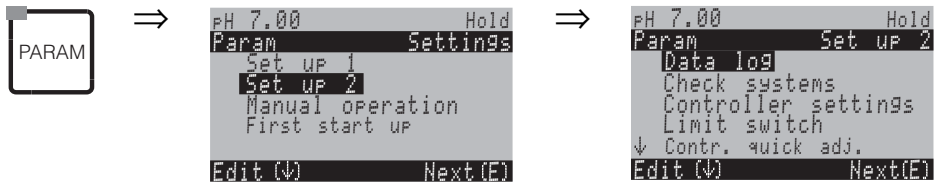


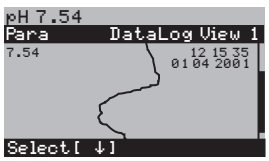
CODE	CHOICE (default = bold)	INFO
Validation function TopCal:		
V1	Function: **off** on Service: 0.50 pH	**Validation alarm** Select the deviation between setpoint and actual pH value at which an alarm is triggered.
V2	Table: Val. P1 Val. P2 Val. P1/2 Val+Cal Destination: Userprog. 1 Userprog. 2 Userprog. 3 no prg.	**Validation programme** Select a table for the validation and a user programme.

6.5.11 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.

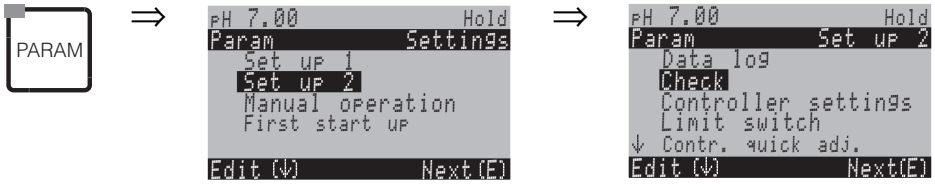
To enter the menu, proceed as follows:



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**

6.5.12 Set up 2 – Check systems

To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)	INFO
L1	SCS: **off** SCS Ref.: **off**	**Select SCS (= Sensor Check System) mode:** *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.

6.5.13 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 34 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 36, or Field F1, page 43) and/or
- Current output **2** must be defined as an contiuous controller if you want to control the actuator via a 20 mA interface
  (Field T20, page 36, or Field EA1, page 41).

Note!
- *Danger of data loss.* If you assign the relays which are used by the controller with another function (Field F1, page 43), the **complete** controller settings is reset to the default values.
- If you change the relay assignment for the controller in the Contacts menu (Field F1, page 43), 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.

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, contiuous 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. 27) 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. 27). 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.

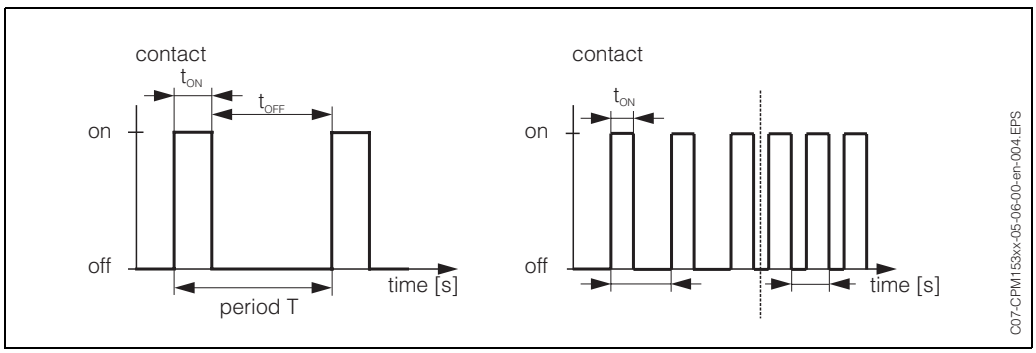


fig. 27: left: pulse-width modulation (PWM)
Right: pulse-frequency modulation (PFM)

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. 28).

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

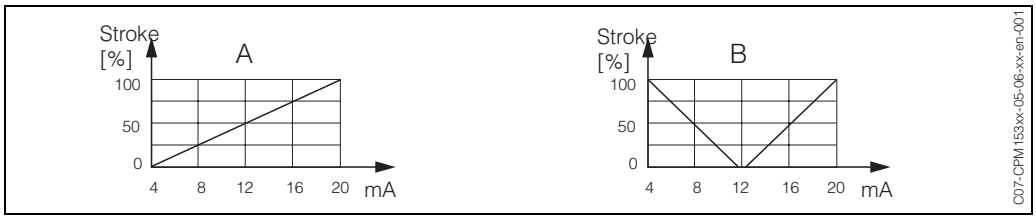


fig. 28: A: Stroke diagram for a control valve
B: Stroke diagram for two contrarotating control valves ("split range")

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

Selection aid for online processes

Process	Path	Dosing actuators	Required hardware equipment for control: Circuits	Relay	Current inputs	Current outputs
1-sided control	not looking-ahead	1 PWM	1	1	–	–
		1 PFM	1	1	–	–
		1 three-PS / 1 PWM/PFM — without signal	1	2	–	–
		analogue	1	–	–	1

C07-CPC300xx-16-12-00-en-002.EPS

Selection aid for online processes

Process	Path	Dosing actuators	Required hardware equipment for control: Circuits	Relay	Current inputs	Current outputs
2-sided control	not looking-ahead	2 PWM	1	2	–	–
		2 PFM	1	2	–	–
		1 three-PS / 1 PWM/PFM — without signal	1	3	–	–
		current output	1	–	–	1

C07-CPC300xx-16-12-00-en-001.EPS

Selection aid for batch processes

Process	Dosing actuators	Required hardware equipment for control: Circuits	Relay	Current inputs	Current outputs
1-sided control	1 PWM	1	1	–	–
	1 PFM	1	1	–	–
	1 three-PS / 1 PWM/PFM — without signal	1	2	–	–
	current output	1	–	–	1
2-sided control	2 PWM	1	2	–	–
	2 PFM	1	2	–	–
	1 three-PS / 1 PWM/PFM — without signal	1	3	–	–
	current output	1	–	–	1

C07-CPC300xx-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. 29. 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.

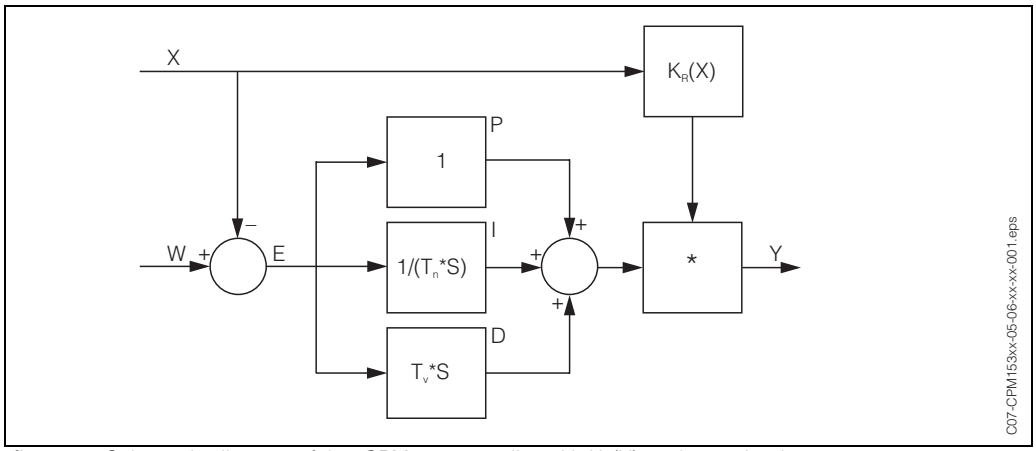


fig. 29: Schematic diagram of the CPM 153controller with $K_R(X)$ as the total gain

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).

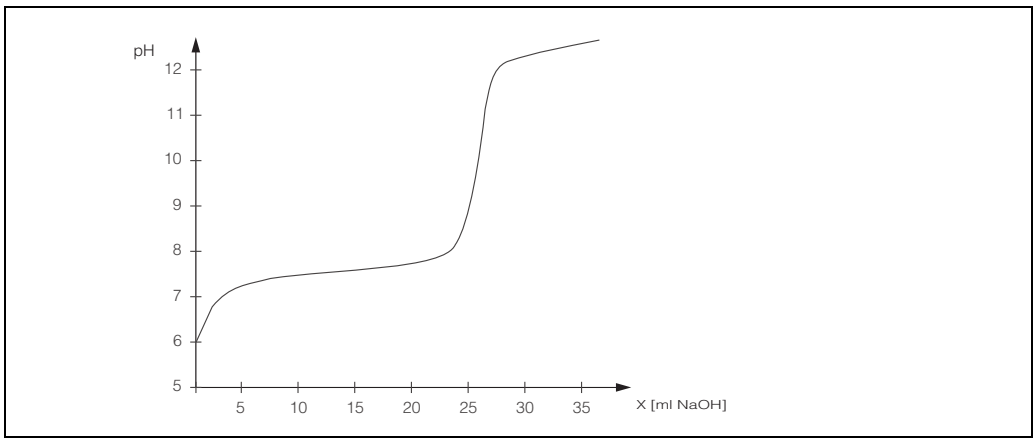


fig. 30: Schematic titration curve of a weak acid with a strong alkali.

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).

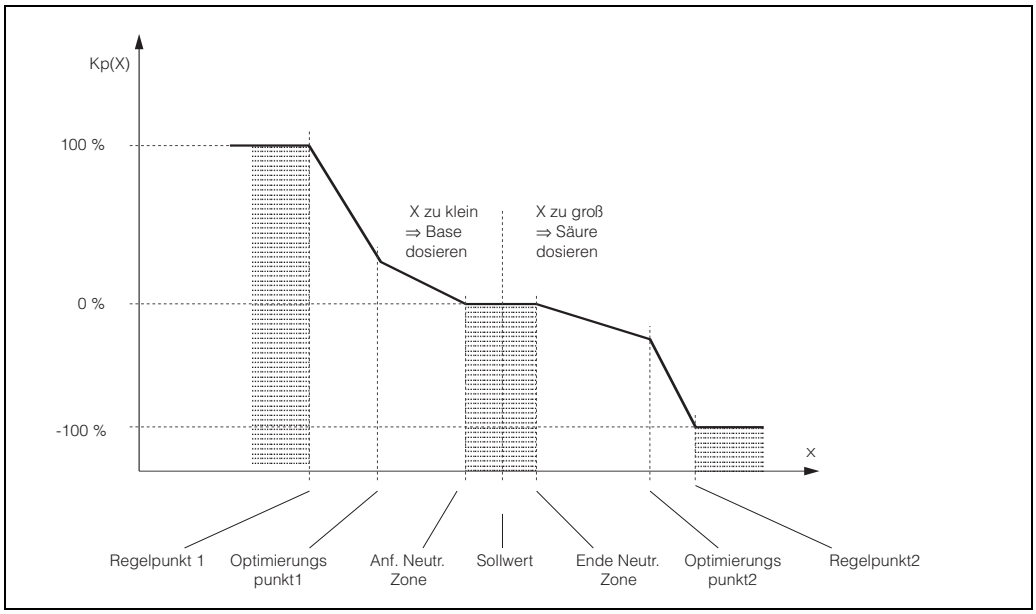


fig. 31: Diagram to describe the most important corner points for control

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.

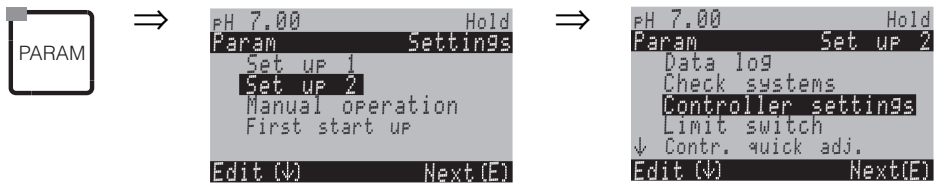
Points of the characteristic:
For *constant control gain* ("linear characteristic"), you require:
Set point W,
Neutral zone
– Two-sided: "Start of the neutral zone" and "End of neutral zone"
– One-sided: only one of the two points
For *range-dependent modulation gain* ("segmented curve"), you require 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. Curve:

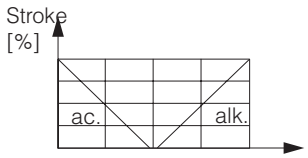
In the user settings (see below) you switch directly to an active measuring menu and can check the settings made and change them if necessary.

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 1-s. alkali** batch 1-s. acid batch 2-sided inline 1-s. alkali inline 1-s. acid inline 2-sided	**Select the process type,** which describes your process. *1-s. = 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** 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. *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).

CODE	CHOICE (default = bold)		INFO
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**
MA3	+Relay –Relay Motor run time Xsd	**n.c.** **n.c.** 060.0s 04.0%	**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. *Xsd*: Maximum differential gap between valve and position feedback. If the difference is greater than the edited value, it will be compensated by position changes. ✎ Note! If you cannot select a relay here, use the "Contacts" menu to make relays available for the controller function.
MA4	Relay: max. pulse frequency	**n.c.** 1/min.	**Relay selection** (for pulse frequency) *Relay:* Relay selection *max. pulse frequency*: Input of the maximum pulse frequency. (Pulses with a higher frequency are not forwarded to the relay). (Maximum setting: 120 1/min)
MA5	Relay: Period: t_E min:	**n.c.** **000.0 s** **000.0 s**	**Relay selection** (for pulse length) *Relay:* Relay selection *Period:* Period length T in seconds (Range 0.5 ... 999.9 s) *t_E min*: Minimum switch-on period. (Shorter pulses are not forwarded to the relay and treat therefore the actuators with care).
MA6	Current output 2 0 ... 20 mA **4 ... 20 mA**		**Current output 2** (for current output) Selection of the current range, which should be output at the current output.
MA7	y=0% 0/4 mA 20 mA		**Current output** Assign the current value which corresponds to 100 % dosing medium provision.

CODE	CHOICE (default = bold)		INFO
Actuators: With selection "two-sided" in field M1:			
MB1	Dosing via: 1 output **2 outputs**		**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.
1 Output:			
MBA1	via current output 2: 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	100 % acid 0/4 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. 32) in the "split range" method.  C07-CPM153xx-05-06-00-en-005 *fig. 32: Two-sided control over one current output*
2 outputs:			
MBB1	Acid: Alkali:	**I length** 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 –Relay Motor run time Xsd	**n.c.** **n.c.** 060.0s 04.0%	**Acid dosing: Relay selection** (for three-point step controller) *Description see above*
MBB3	pulse frequency Relay: max. pulse frequency	**n.c.** 120/min.	**Acid dosing: Relay selection** (for pulse frequency) *Description see above*
MBB4	pulse length Relay: Period: t_E min:	**n.c.** **000.0 s** **000.0 s**	**Acid dosing: Relay selection** (for pulse length) *Description see above*

CODE		CHOICE (default = bold)		INFO
MBB5		+Relay –Relay Motor run time Xsd	**n.c.** **n.c.** 060.0s 04.0%	**Alkali dosing: Relay selection** (for three-point step controller) *Description see above*
MBB6		Relay: max. pulse frequency	**n.c.** 1/min.	**Alkali dosing: Relay selection** (for pulse frequency) *Description see above*
MBB7		Relay: Period: t_E min:	**n.c.** **000.0 s** **000.0 s**	**Alkali dosing: Relay selection** (for pulse length) *Description see above*
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 St.ntr. zone End ntr. zone K_R 1 K_R 2	07.00pH 06.50pH 07.50pH 01.00pH 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 St.ntr. zone End ntr. zone O.pnt. X1 O. pnt.Y1 O.pnt. X2 O. pnt.Y2 Ctrl.pnt.1 Ctrl.pnt. 2	07.00pH 06.50pH 07.50pH 05.00pH 00.20pH 09.00pH -00.20pH 02.00pH 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 n; 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 **auto** Set: **07.00pH** act.: **07.00pH** y: **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.

6.5.14 Set up 2 – Limit switch

The transmitter CPM 153 has several possibilities for assigning a relay contact. The limit contactor can be assigned to a switch-on and switch-off point, as well as a pickup and dropout delay. In addition, an error message can be generated when an alarm threshold is set. You can trigger cleaning in connection with this error message (see Error/Contact Assignment, page 48). These functions can be used both for pH/redox and temperature measurement.

To illustrate the contact states of any relay or fault signalling contact, refer to fig. 33:

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 alarm 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 *Switch-on point < switch-off point* similar to *Switch-on point > switch-off point* function.

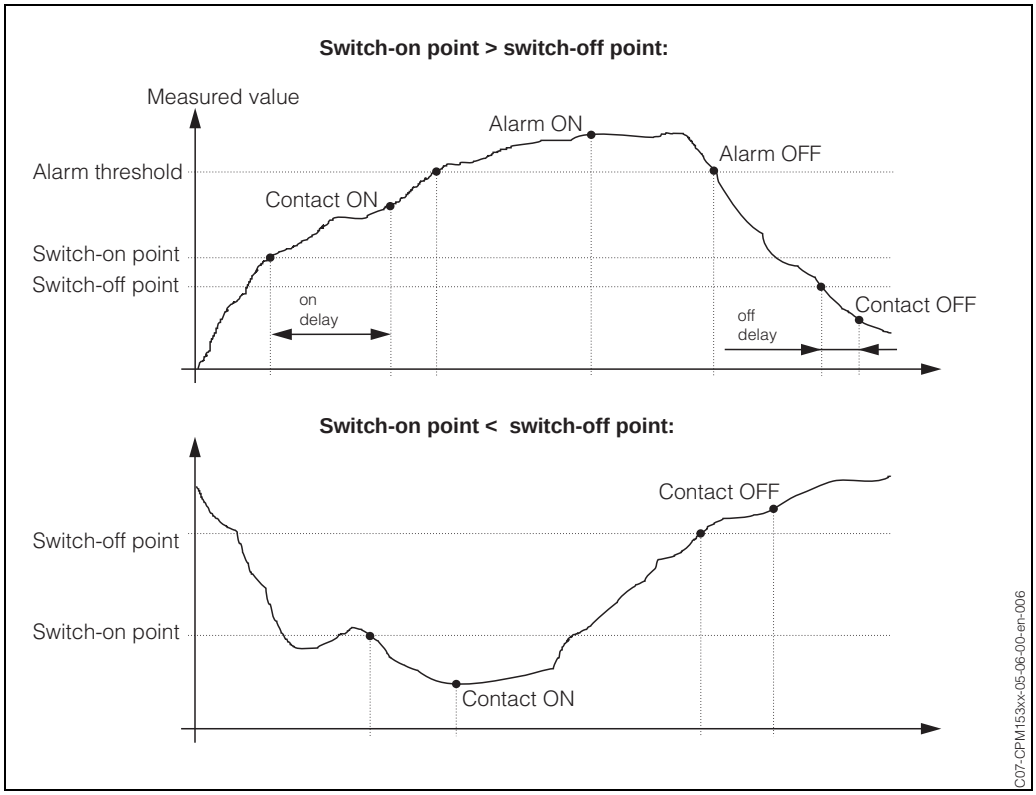
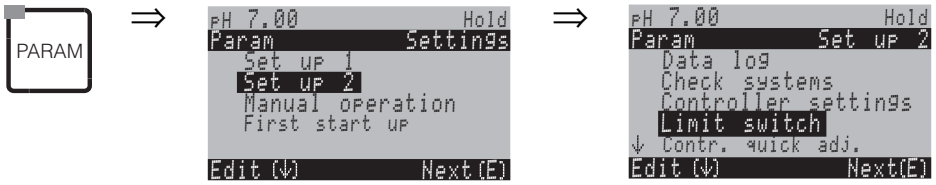


fig. 33: Diagram of the relationship between switch-on and switch-off points and on and off delay

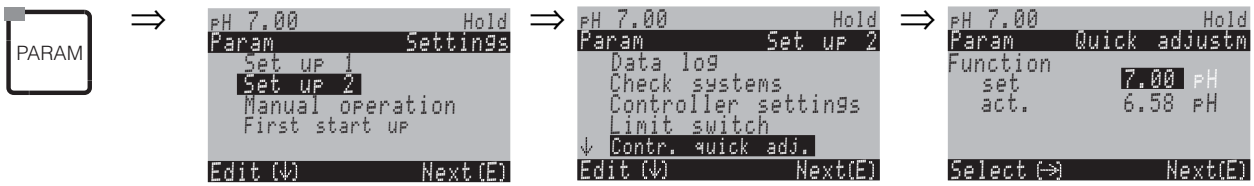
To enter the menu, proceed as follows:



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 (pH/redox, temperature) *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.

6.5.15 Set up 2 - Controller quick adjustment

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



6.5.16 Set up 2 – TopCal S

The cleaning and calibration processes and cleaning/calibration control are set in this menu:

Setting up the programme
For configuration, select the appropriate cleaning/calibration programme for your measuring point from the stored programmes in the instrument.You can freely adapt the cleaning or calibration programmes to your requirements or deactivate them as necessary (e.g. the programme steps water, cleaner, buffer solution, additional valve control, number of repeats and step sequence). Moreover, it is possible to configure specially adapted user programmes.

You can choose between the following functions:
- *Automatic*: Freely programmeable weekly programme, separately for every week day with freely selectable interval lengths.
- *Cleaning:* Selection of cleaning programmes.
- *User programme:* Selection and configuration of customer-specific cleaning programme
- *Power failure programme:* In the event of a failure of the power supply or the communication, the system is automatically cleaned or calibrated.
- *External control:* Programmes can be started via an external process control system.

Selecting the programme
You have a choice of *eight* cleaning and calibration programmes in total (see function overview).
- Programmes Clean, Clean C, Clean S, Clean CS, Clean Int: Permanently assigned to one function. The cleaning times or repeat cycles are freely selectable.
- Programmes User 1/2/3: User-definable (user programmes). A simple way of programming is to copy predefined programmes to user programmes and adapt them.

Triggering the programme
The programmes can be triggered automatically at preset intervals, manually or in the event of an error message. Almost any error message can be programmed to start a programme.

Activating the programme
Switch on the trigger to activate the selected programme.

Aborting the programme
A programme (Clean, Clean C, Clean S, Clean CS) is completed once it is started (safety concept). During this time, no other programmes can be started.
The service switch at the front door of the CPG 300 is of highest priority. Switching to "Service!" interrupts even running programmes.
The programme Clean Int. can be interrupted by a steady signal at the digital input "Automatic stop". Therefore, the assembly must be in "Measure" position. If there is no signal at the binary input, the programme Clean Int. is continued.

Connecting the external cleaning trigger
For electrical connection of the binary coding have a look at the table "terminal arrangement CPC 300" (s. page 20).

Note!

- Refer to the annex for a wiring example of an external cleaning trigger (→ Seite 159).
- Select the control for one or two external additional valves for your device under Order Code item **"External valve control"**.
- The "Sterilisation" and "Sealing water" functions are **only** released on devices fitted with a control function for additional external valves.
- You can freely use additional external valves as required in the freely definable user programmes. For example, for superheated steam, a second cleaner, cooling air, organic cleaner etc.
- What is sealing water?
  In processes with fibrous or adhesive media, assemblies with ball valves are fitted to block the medium, e.g. Probfit CPA 463 or Cleanfit P CPA 477. To keep the rinse chamber free of medium, the sealing water valve opens automatically before the assembly emerges from the process. The counterpressure in the rinse chamber caused by the sealing water prevents the ingress of medium into the chamber. The sealing water pressure must then be greater than the pressure of the medium.

Function overview of cleaning and calibration programmes

Function → Pro-gramme ↓	Cleaning	Calibration	Sterilisa-tion	Sealing water*	Steril. and seal. wat.	Control via binary contacts		
						bin. 0	bin. 1	bin. 2
						Term. 81/82	Term. 83/84	Term. 85/86
Clean (= cleaning)	✓	–	–	Control for 1 valve required	–	1	0	0
Clean C (= cleaning + calibration)	✓	✓	–	Control for 1 valve required	–	0	1	0
Clean S (= cleaning + sterilisation)	✓	–	Control for 1 valve required	–	Control for 2 valves required	0	0	1
Clean CS (= cleaning + calibration + sterilisation	✓	✓	Control for 1 valve required	–	Control for 2 valves required	1	1	0
Clean Int (= cleaning interval)	✓	–	–	Control for 1 valve required	Control for 2 valves required	Programme cannot be started externally.		
User 1 (selectable)	✓	✓	Up to 2 additional external vales can be used as requirede.g. for superheated steam, organic cleaner, 2nd cleaner, cooling air. Device control for 1 or 2 valves is required.			1	0	1
User 2 (selectable)	✓	✓				0	1	1
User 3 (selectable)	✓	✓				1	1	1

Note!
- "1" = Apply a voltage of 10 ... 40 V (duration approx. 400 mS) to contact bin 0 (terminals 81/82). For non-Ex instruments this auxiliary energy can be taken from the 15 V auxiliary power supply of the Mycom S CPM 153.
- "0" = 0 V

Standard programme flow

Clean			Clean Int.			Clean C			Clean S			Clean CS		
01	Assembly Service		01	Assembly Service		01	Assembly Service		01	Assembly Service		01	Assembly Service	
02	Water	30s	02	Water	30s	02	Water	30s	02	Hot air	1200 s	02	Water	30s
03	Cleaner	15x	03	Cleaner	15x	03	Cleaner	15x	03	Wait	600s	03	Cleaner	15x
04	Wait	30s	04	Wait	30s	04	Wait	30s	04	Repeat sterilis.	0x	04	Wait	30s
05	Water	30s	05	Water	30s	05	Water	30s	05	Assembly Meas.		05	Water	30s
06	Air	20s	07	Repeat Clean.	0x	06	Air	20s	06	---------- --------		06	Air	20s
07	Repeat Clean.	0x	08	Assembly Meas.		07	Repeat Clean.	0x	07	Prog. time:_____		07	Repeat Clean.	0x
08	Assembly Meas.		09	---------- --------		08	Cal. buffer 1	15x	08			08	Cal. buffer 1	15x
09	---------- --------		10	Prog. time:_____		09	Water	30s	09			09	Water	30s
10	Prog. time:_____		11	Meas. time	10s	10	Air	20s	10			10	Air	20s
11			12	Integral action time	10s	11	Cal. buffer 2	15x	11			11	Cal. buffer 2	15x
12			13			12	Water	30s	12			12	Water	30s
13			14			13	Air	20s	13			13	Air	20s
14			15			14	Assembly Meas.		14			14	Hot air	1200s
15			16			15	---------- --------		15			15	Wait	600s
16			17			16	Prog. time:_____		16			16	Repeat sterilis.	0x
17			18			17			17			17	Assembly Meas.	
18			19			18			18			18	---------- --------	
19			20			19			19			19	Prog. time:_____	

Optional programmes

User 1 - User 3	Redox			Val. P1			Val. P2			Val. P1/2		
01	01	Assembly Service		01	Assembly Service		01	Assembly Service		01	Assembly Service	
02	02	Water	30s	02	Water	30s	02	Water	30s	02	Water	30s
03	03	Cleaner	15x	03	Cleaner	15x	03	Cleaner	15x	03	Cleaner	15x
04	04	Wait	30s	04	Wait	30s	04	Wait	30s	04	Wait	30s
05	05	Water	30s	05	Water	30s	05	Water	30s	05	Water	30s
06	06	Air	20s	06	Air	20s	06	Air	20s	06	Air	20s
07	07	Repeat Clean.	0x	07	Back to 1	^	07	Back to 1	0x	07	Back to 1	0x
08	08	Cal. buffer 1	15x	08	Buffer 1	15x	08	Buffer 2	15x	08	Buffer 1	15x
09	09	Water	30s	09	Val. Buffer 1		09	Val. Buffer 2		09	Val. Buffer 1	
10	10	Air	20s	10	Water	30s	10	Water	30s	10	Water	30s
11	11	Assembly Meas.	15x	11	Air	20s	11	Air	20s	11	Air	20s
12	12	---------- ----------	30s	12	Assembly Meas.		12	Assembly Meas.		12	Buffer 2	
13	13	Prog. time:_____	20s	13	_____	354s	13	_____	354s	13	Val. Buffer 2	
14	14			14	Prog.time		14	Prog.time		14	Water	30s
15	15			15			15			15	Air	20s
16	16			16			16			16	Assembly Meas.	
17	17			17			17			17		
18 (up to 25 programme steps possible)	18			18			18			18	Prog.time	354s
19	19			19			19			19		

Programmes in Redox operating mode

In Redox operating mode, calibration is not possible with the calibration programmes Clean C and Clean CS. Instead, you can use the programme "Redox Cal." in User programme 1.
The Redox Cal. programme sequence corresponds to the programme sequence of Clean C with the exception of steps 11 to 13.

Validation TopCal

If the function is active, the programmes Val. P1, Val P2, Val P1/P2 can be transferred into the user programmes.

General pump behaviour

- To prevent the pump from drying during periods of infrequent use, the pump is turned once to zero position every six hours.
- Before every programme start, the pump turns to the specified zero position. This ensures that the pump starting position is clearly defined, even in the event of the pump having to be turned by hand.
- If an IsFET-pH-Sensor is used, the rinsing chamber is automatically rinsed every day with clean water. This prevents the sensor from drying up, or from standing too long in the same liquid.

Hold behaviour TopCal S

- Hold is active when the assembly moves into the maintenance position.
- When hold is active, no new automatic programmes are started.
  It can be started externally or via local operation as required.
- You can deactivate the TopCal S as hold source
  (PARAM → Basic settings → Hold → TopCal Hold *off*)

Operating sequence:

When first configuring, the following settings must be made:

1. Automatic operating mode:
- Here you enter the programme sequence.
- If you are only using the set programmes 1 to 5, you can enter all the settings (e.g. conveyor periods, repeat cycles).
- You create the user-defined programmes 6 to 8 in the item "User programmes". After editing, configuration and release, these are available to be used and can be integrated into the automatic.

2. Cleaning cycle / Measuring cycle:
The cleaning cycle "Clean Int" is integrated into the automatic and is configured there (see example below in fig. 34).
It cannot be started externally.

3. External start signals:
- You can start each programme directly via a 3 bit signal (Coding s. page 74).
- To control the programmes using an external start signal, you also enter the settings of the set programme (e.g. conveyance times, repeat cycles) *in the* "Automatic" operating mode.
- You create the user-defined programmes 6 to 8 in the item "User programmes". After editing, configuration and release, these are available to be used.

Automatic
Each day of a week can be programmemed individually.
"Clean Int": Cleaning is carried out at set intervals.
("Cleaning cycle": measuring time >> cleaning + dwell time;
"Measuring cycle": measuring time << cleaning + dwell time)
"User": User-defined cleaning programmes (create in Programme Editor).

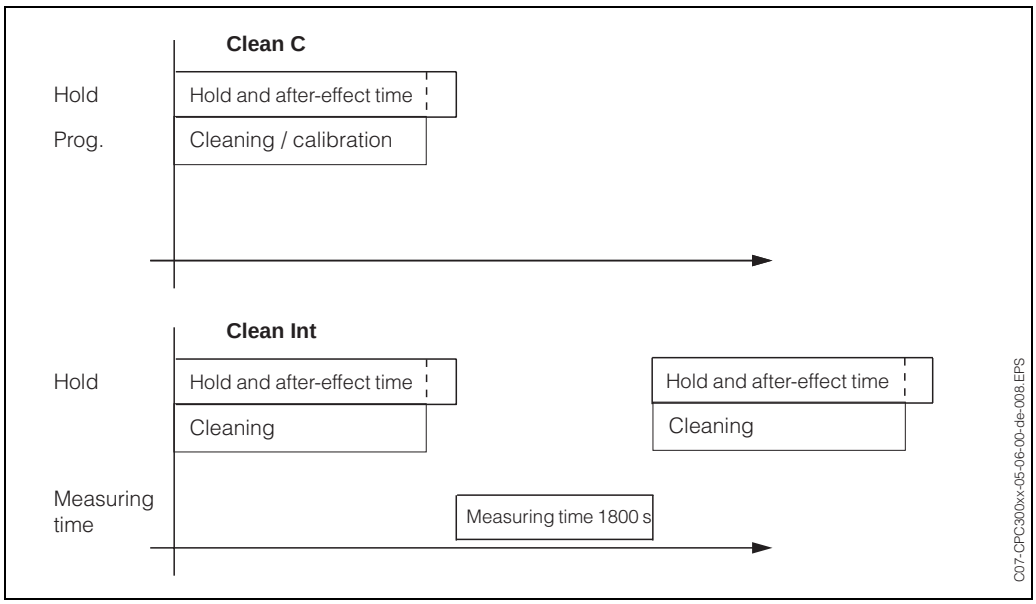
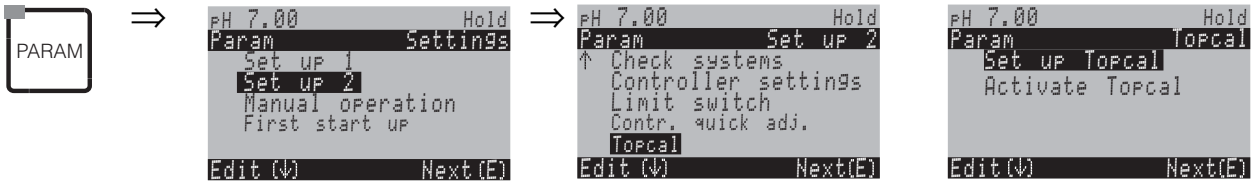


fig. 34: Example for the programme sequence of "Clean C" and "Clean Int".

To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)		INFO
N1	**Set up Topcal** Activate Topcal		**Selection** *Configuration* = create/edit a TopCal S programme *Activation* = Switch on/off TopCal S functions
Set up TopCal:			
NA1	Automatic Cleaning Ext. Control	**off** **off** **off**	**Note in display:** Displays the current system status
NA2	Valve V1 Valve V2	------ ------	**Assignment of additional valves (if available)** You can assign different functions to the additional valves: Sterilisation, Sealing water or user-defined (user programme). *Sealing water*: If you have activated the sealing water function, you can use it with every assembly move (see user programme, field NAD1). ✎ Note! • Fields NA2 to NA4 can only be edited if all the functions in field NA1 are switched off and the option to control additional valves is available. • If you change the function of the additional valves, sterilisation or sealing water is no longer available in the set programmes accordingly. • If you have changed the valves function, you have to check the assignment in the user programmes.
NA3	**Valve 1** (0...9; A...Z)		**Enter valve name 1** Enter 8 character name for valve 1.
NA4	**Valve 2** (0...9; A...Z)		**Enter valve name 2** Enter 8 character name for valve 2.
NA5	Automatic Cleaning Emergency programme User programme		**Select function of the cleaning system**
Automatic:			
NAA1	Monday Tuesday ..... Sunday	1 2 ... 0	**Weekday selection menu** Select cleaning day. The number of cleaning triggers for the day is shown after each day.
NAA2	Edit day? Copy day?		**Select day function** *Edit day*: You can edit the function for this day. *Copy day*: The selected day is copied to the day selected in the field below.

CODE	CHOICE (default = bold)		INFO
Edit day:			
NAAA1	01 Clean 18:22 18:23 02 Clean S: 05:00 05:10 03 Clean Int.: 18:22 18:54 **no progr.**		**View/edit day programme** You can see the complete daily programme or "No Progr.". You can overwrite the option and also the already set programmes by making 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. 81)
NAAA2	01 Water 02 Cleaner 03 Water 04 Rep. cleaning	**0 s** **30 s** **30 s** **0x**	**Select programme blocks** The times for individual programme steps can be individually adjusted here. Select a block for editing by pressing "E". *Rep. cleaning*: Number of repeats Note! Leave this selection by pressing "PARAM".
NAAA3	Sealing water	**on**	**Sealing water:** Switch on or off Note! • You can insert this programme step in the first line of the day programme only. • You can select this function only if the valve has been defined in field NA2.
NAAA4	**0010 s** (0 ... 9999 s)		**Air / superheated steam / wait / water:** Enter the time during which the valve remains open to allow the conveyance of air, superheated steam, etc.
NAAA5	**02** (0 ... 99)		**Buffer 1 / buffer 2 / cleaner :** Enter number of strokes required to convey buffer/ cleaner. Note! Please note that you must ascertain the required stroke rate of *your system* in advance. You find information on this in the chapter Commissioning (page 32) or in the "DIAG" menu (page 94).
NAAA6	Repeat x number of times **00** (0 ... 10)		**Repeat cleaning** How often should the previous step (cleaner or water) by repeated?
Copy day:			
09	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. • Leave this selection by pressing "PARAM".

CODE	CHOICE (default = bold)	INFO
Cleaning:		
NAB1	**no progr.** Clean Clean C Clean CS	**Select a programme** to be started in the case of soiling or blocking of the electrode.
Power failure programme:		
NAC1	The power failure programme is only possible in Automatic mode.	**Note in display (no entry)**
NAC2	Clean Clean C Clean CS	**Select a programme** which will be launched if the power supply or the communication fails.
User programme: *(Programme editor)*		
NAD1	**User prog. 1** User prog. 2 User prog. 3	**Select user programme (only TopCal S)** With TopCal S, you have *three* user programmes available. (With ChemoClean there is *one* user programme available.)
NAD2	**Edit** Insert programme Configure Enable Disable Rename	**Select edit function** *Insert programme*: An installed programme (e.g. *Clean*) can be inserted into the user programme. Note! • After a programme is disabled, it can be reenabled at any time. • Leave this item by pressing "PARAM". • If you edited a programme **for the first time**, you have to configure it at least once so that you can enable/ ChemoCleandisable it.
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!)

CODE	CHOICE (default = bold)		INFO
Change/insert:			
NA DA3	**Sealing water** **Assembly meas.** Assembly Service Cleaner Water Wait ...	**off**	**Select function** Selection for TopCal S: Sealing water, assembly measuring, assembly service, cleaner, water, wait, back to, air, Cal. buffer 1, Cal. buffer 2, buffer 1, buffer 2, Hold on, Hold off. Selection for ChemoClean: Water, cleaner, valve 1 open, valve 1 closed, valve 2 open, valve 2 closed, Hold on, Hold off, wait, back to. *Back to* : You can create a programme loop with this function (for repeats). Enter the line where you want to go back. *Hold on/off*: With "assembly service" a Hold is set. You can set a Hold with te function "Hold on" individually. ✎ Note! If you use a IsFET sensor please pay attention to the special features for measurement with glass-free IsFET sensors (s. page 33).
Move to:			
NA DA4	(Displays blocks as list) 01 Water 02 +Cleaner 03 Wait		**Select rows** You move the function selected in Field NADA1 to the highlighted position. ✎ Note! This overwrites the highlighted function.
Insert template:			
NADB1	User prog. = ? **no prog.** Clean Clean S		**Select the template** you want to copy to the user programme.
Configure:			
NADC 1	Sealing water 01 Water 02 Cleaner 03 Wait ...	off	**Configuring the selected programme blocks** Select the line which you want to configure. *Sealing water:* If you activate the sealing water function, in this programme sealing water will be delivered to the rinse chamber of the assembly with every assembly move. 1 second before moving the assembly to the maintenance position the sealing water transport starts. *Cleaner* / *Water* / *Cal. buffer 1, 2* / B*uffer 1, 2*: Edit number of strokes of the medium transport. *Wait*: Enter waiting time. *back to*: Enter number of repeating the programme loop. *Compressed air:* Enter the duration of required air flow.
Enable programme:			
NADD 1	Programme is enables		**Note in display (no entry):** The created/edit programme is enabled.
NADD 2	**User prog.** (0...9; A...Z)		**Change name** 9-character name for your user programme, freely selectable.

CODE		CHOICE (default = bold)		INFO
	Disable programme			
	NADE1	Do you want to disable the programme?		**Query** Pressing "E" (= Continue) disables the programme. Pressing "PARAM" (= Cancel) takes you back without disabling the programme.
	NADE2	The programme was disabled.		**Note in display (no entry)**
	Rename programme:			
	NADF1	**User prog.** (0...9; A...Z)		**Change name** 9-character name for your user programme, freely selectable.
Activate TopCal S:				
NB1		Automatic Cleaning Power failure progr. User programme	**off** **off** **off** **off**	**Select control levels** Activation of functions for TopCal S, through which a programme is started.
NB2		Automatic Cleaning Power failure progr. User programme	**off** **off** **off** **off**	**Note in display (no entry):** System status

6.5.17 Set up 2 – ChemoClean

ChemoClean® is used in a manual system (without TopCal S) to automatically clean pH/ redox electrodes in suspended or flow assemblies with a spray system. Water and cleaner is conveyed to the electrode by means of an injector (e.g. CYR 10).

Use with TopCal S

ChemoClean® is a standard function in the Mycom S and can be used in conjunction with the TopCal S. The two contacts in the Mycom S can be started
- via a binary input in the Mycom S either
- externally, in a weekly pattern (Automatic) or
- in manual operation.

The two contacts can be flexibly adapted to individual cleaning sequences with a user-defined programme.

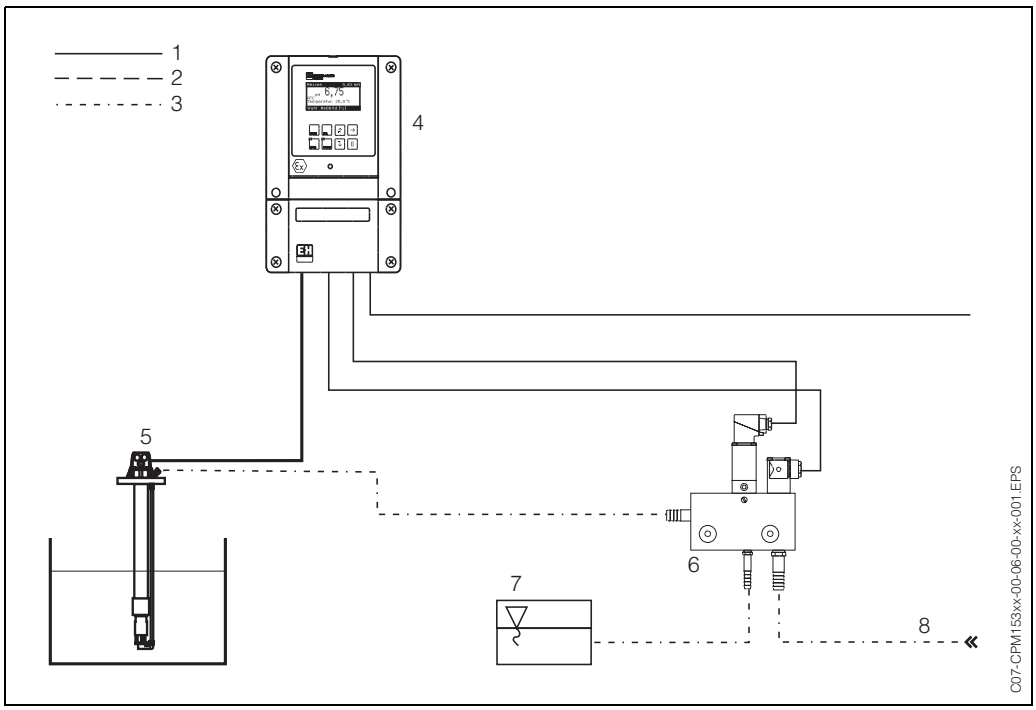


fig. 35: Depiction of the ChemoClean function in combination with Mycom S CPM 153
1: Electric line
2: Pressurised air
3: Water/cleaning fluid
4: CPM 153 transmitter
5: Immersion assembly
6: Injector CYR 10
7: Cleaning fluid
8: Motive water

Operation:

1. In the menu "Set up 1" → "Contacts" (Field F1, s. page 41), the function ChemoClean® must be switched on and the appropriate contacts connected to the injector (see connection example on page 142).
2. The cleaning processes are configured in this menu. Here, the automatic or event-controlled cleaning can be adapted to the process conditions.
   One or more of the following controls are possible:
   – Automatic (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 input. For this, external control must be activated in Field O1, "Select Control Levels": Ext. control "on")
   – Cleaning: 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")

Automatic:
"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 (s. fig. 36). This programme cannot be started directly via the binary inputs.
- "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.

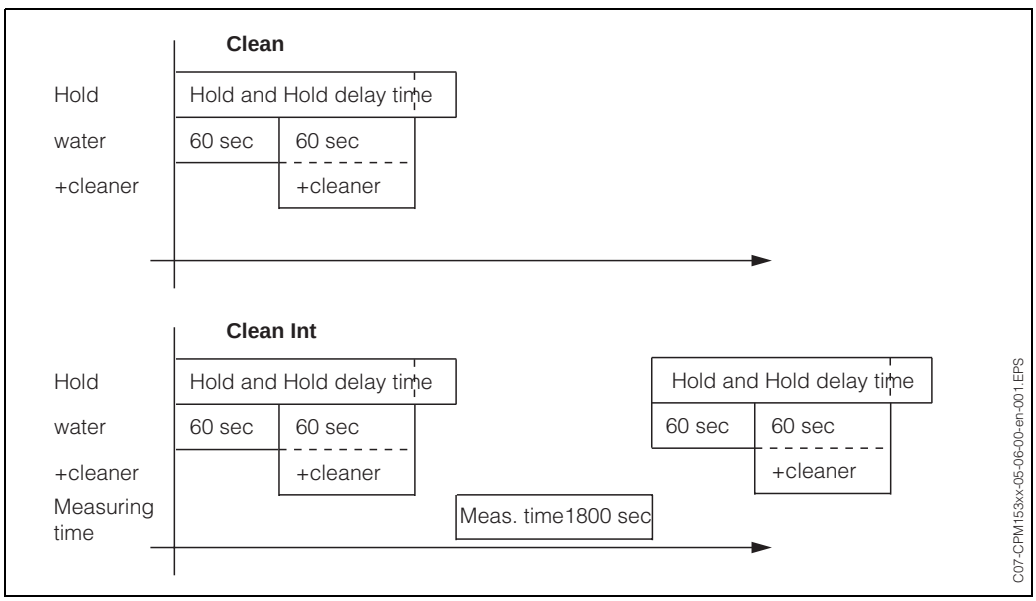


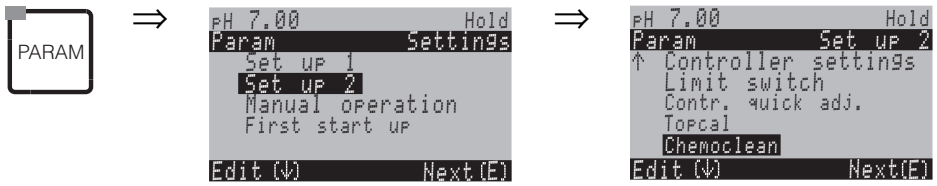
fig. 36: Graphic representation of the above cleaning example

Required settings according to the example
(bold: to be set 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	**0s**	03 Water	**0s**
18:00	18:02	04 Rep. Clean.	**0x**	Meas. time	**1800s**
Clean Int					
18:20	24:00				

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

To enter the menu, proceed as follows:



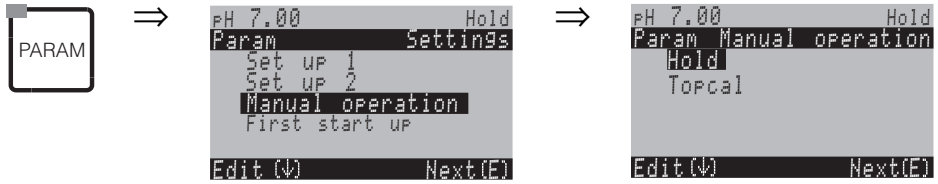
CODE	CHOICE (default = bold)		INFO
O1	Automatic Cleaning trigger Ext. Control	**off** **off** **off**	**Select control levels** Select the function which will trigger ChemoClean cleaning.
O2	Automatic Cleaning trigger Ext. Control	**off** **off** **off**	**Note in display:** Displays the current system status.
O3	**Automatic** User prog.		**Select the configuration menu** *Automatic*: Select only with "weekly programme on" *User programme*: Here you create customer-specific programmes using the Programme Editor (see Programme Editor, p. 81).
Automatic:			
OA1	**Monday** Tuesday ..... Sunday	**0** 0 ... 0	**Weekday selection menu** Select cleaning day. The number of cleaning triggers for the day is shown after each day.
OA2	**Edit day?** Copy day?		**Select day function** *Edit day*: You edit the cleaning sequence for this day. *Copy day*: The day selected in OA1 is copied to the day selected in the field below.

CODE	CHOICE (default = bold)		INFO
	Edit day:		
OAA1	Clean 18:22 18:23 **no progr.**		**View/edit day programme** You can see the complete daily programme or "No Progr.". You can overwrite the option and also the already set programmes by making 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. 81)
OAA2	01 Water 02 +Cleaner 03 Water 04 Rep. cleaning	0 s 30 s 30 s 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 is conveyed in addition to water. *Rep. cleaning*: Number of repetitions of the previous steps 01 ... 03 ✎ Note! • If you change a programme block, the change is effective for all other cleaning sequences. • Leave this selection by pressing "PARAM".
OAA3	**0010 s** (0 ... 9999 s)		**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) by repeated?
	Copy day:		
09	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.

✎ Note!
User prog.: *To edit the user programmes, refer to the **programme editor** on page 81 (Fields OB to OBE1).*

6.5.18 Manual operation

To enter the menu, proceed as follows:



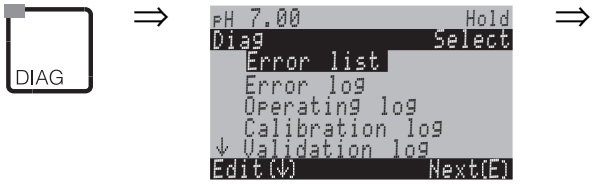
CODE	CHOICE (default = bold)		INFO
R1	HOLD TopCal S ChemoClean		**Select manual operation** ✎ Note! • Leave the manual operation menu by pressing "PARAM", "DIAG" or "MEAS". • The settings are only active in this menu. Nothing is saved when you leave.
TopCal S:			
RA1	Automatic Cleaning trigger Ext. Control	off off off	**Note in display (no entry):** System status
RA2	Move assembly Prog. Start Prog. stop		**Selection** You can move the assembly manually or start/stop a programme.
Move assembly:			
RAA1	Ass. Service Ass. measurement		**Select position,** into which the assembly should move.
RAA2	Automatic Cleaning trigger Ext. Control	off off off	**Note in display (no entry):** System status
Prog. start:			
RAB1	no prog. Clean Clean S ...		**Select programme** If a programme is already running and you start another one, this is only started after the previous programme has finished.
RAB2	Automatic Cleaning trigger Ext. Control Clean running Water Cleaner	off off off 10 s 2x	**Note in display (no entry):** System status: Displays the running programme with the remain time for water, cleaner, etc.
Prog. stop:			
RAC1	Automatic Cleaning trigger Ext. Control	off off off	**Note in display (no entry):** System status The current programme is stopped.

CODE	CHOICE (default = bold)		INFO
ChemoClean:			
RB1	Automatic Cleaning trigger Ext. Control	off off off	**Note in display (no entry):** System status
RB2	**No Prog.** Clean		**ChemoClean cleaning** Start / Abort. Here, each external programme start is suppressed. Once a programme is started it cannot be stopped. ✎ Note! Leave this menu 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. When you activate the Hold, a stylised hand is shown in the left top of the display as a sign for manual operation. ✎ Note! If the controller function lies on current output 2, it follows the instructions of the defined "controller hold" (s. page 49).

✎ Note!
Any *external* programme start is suppressed in the fields RA2 to RAC1.

6.5.19 Diagnosis

To enter the menu, proceed as follows:



CODE	CHOICE (default = bold)	INFO
U	**Error list** Error log Operation log Calibration log Validation log Service	*Error list*: Displays the current active errors. (Complete error list with description s. page 112) *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. You can use the right arrow key to obtain further details on this calibration. *Validation log*: Lists the last 30 TopCal validations. ✎ Note! • Use the arrow keys to scroll through the lists. • Leave the lists by pressing "E".
Service:		
Y	**Factory reset** Simulation Instrument check DAT download Set up 2 Instrument version TopCal S ChemoClean Reset count	**Select service diagnosis** *Factory reset*: Different data groups can be reset to the factory settings. *Simulation*: The transmitter behaviour can be simulated after entering of different parameters. *Instrument check*: The instrument functions (display, keys, etc.) can be tested individually. *Reset*: Device reset ("warm start") *DAT download*: Copy data into/out of the DAT module. *Set up 2*: Instrument reset (="warm start"), IsFET values and SCS values *Instrument version*: Device internal data e.g. serial number can be queried. *TopCal S*: Inspecting programmes, inputs, mechanics, pump and revolver control times. *ChemoClean* (only, if the complete ChemoClean function is activated): inspecting programmes, inputs, mechanics. *Reset count*: reset counter, write access

CODE	CHOICE (default = bold)		INFO
Factory reset:			
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.
Service data / logbooks:			
YAA1	**0000**		**Service code entry required** Note! For service access code, see Field D1, p. 40.
YAA2			**Note in display:** Incorrect service code entry (back to the last field)
Simulations:			
YB1	Simulation: Output:1 Output:2	**off** 12.00 mA 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: Measured value: Temperature:	**off** pH 07.00 025.00°C	**Adapt simulation (measured value/ temperature)** *Simulation off*: The frozen values from the last measurement are used for the simulation. *Simulation on*: The values (measured value/temperature) can be changed.
YB3	Simulation: Failure contact: Contact 1: Contact 2: ...	**off** off off 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.

CODE	CHOICE (default = bold)	INFO
Instrument check		
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".
DAT download:		
YD1	**Save to DAT** Read from DAT Delete 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**
Delete 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.
YD5	in process	**Copy** The data from the DAT module are copied to the EEPROM of the transmitter. ✎ Note! After the "Read from DAT" copying procedure, a reset is triggered automatically (similar to the warm start on a computer, see below).

CODE	CHOICE (default = bold)		INFO
Set up 2			
YA1	**Reset** IsFET SCS values		**Select function** IsFET is available only, if function is activated.
Reset:			
YAB1			**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.
IsFET:			
YAC1	Ref. K1: Leak. curr. K1:	**0000mV** 0.00µA	**View current IsFET sensor data** *Leak. curr.* = Leakgae current
SCS values:			
YAD1	Glass 1: Reference 1: Glass 2: Reference 2:	---- MΩ ---- kΩ ---- MΩ ---- kΩ	**View current Sensor Check System (SCS) values**
Instrument version:			
YF1	SW Version: HW Version: Serial No.: Card ID:	1.2 1 12345678 1AB	**Controller data** Open controller data and the hardware version.
YF2	SW Version: HW Version: Serial No.: Card ID:	1.2 1 12345678 1AB	**Basic module data**
YF3	SW Version: HW Version: Serial No.: Card ID:	1.2 1 12345678 1AB	**Transmitter 1 data** Open transmitter data (1).
YF5	SW Version: HW Version: Serial No.: Card ID:	1.2 1 12345678 1AB	**DC-DC converter** (only for two-circuit)) Module for power supply of transmitter 2
YF6	SW Version: HW Version: Serial No.: Card ID:	1.2 1 12345678 1AB	**Relay data**
YF7	12345678901234		**Serial number for Mycom S** 14 digit number consisting of 0 ... 9 and A ... Z (readable only)
YF8	CPM153-A2B00A010		**Order Code** 15 digit number consisting of 0 ... 9 and A ... Z

CODE	CHOICE (default = bold)		INFO
YF9	SW Version: HW Version: Serial No.: Card ID:	1.2 1 12345678 A1B	**Data for CPC 300**
YF10	12345678901234		**Serial number for CPC 300** 14 digit number consisting of 0 ... 9 and A ... Z (readable only)
YF11	CPC 300-A2B00A010		**Order Code for TopCal S CPC 300** 15 digit number consisting of 0 ... 9 and A ... Z
TopCal S:			
YG1	Automatic. Cleaning trigger Ext. Control	off off off	**Note in display (no entry):** System status
YG2	**Ext. inputs** Mechanics Pump control time Revolver control time		**TopCal S diagnosis**
External inputs:			
	Start Auto stop Wait trigger Ass. measurem. Ass. Service	**no prog.** off off off off	**Note in display (no entry):** Status of the external digital inputs.
Mechanics:			
YGB1	**Assembly** Cleaner ... Sealing water		**Select valve test:** Assembly, cleaner, buffer 1, buffer 2, water, compressed air, revolver, pump, superheated steam, sealing water. Highlight and select by pressing "E". *Cleaner, water*: To ascertain the number of strokes required to complete fill your system, keep pressing "E" until the assembly rinse chamber is filled with cleaner or buffer. You can use this number (which is display) as the number of strokes used to convey cleaner/water in a cleaning programme (entry in field NAAA5, page 80).
YGB2	**Assembly ↑ service** End function TopCal S ready		**Note in display (no entry):** Valve status
Pump control time:			
YGC1	Medium suction **02 s** (0 ... 99s)		**Pump** Enter the time until the pump executes the next step (e.g. conveying the medium)
YGC2	Convey the medium **02 s** (0 ... 99s)		**Pump** Enter the time until the pump executes the next step (e.B. medium suction)

CODE	CHOICE (default = bold)		INFO
	Revolver control time		
YGD1	"Rotate" time period **02 s** (0 ... 99s)		**Revolver** Enter the time during which the revolver should rotate. Can be optimally adjusted depending on the supply pressure.
YGD2	"Back" time period **02 s** (0 ... 99s)		**Revolver** Enter the time during which the revolver should rotate. Can be optimally adjusted depending on the supply pressure.
	ChemoClean (only, if the complete ChemoClean function is activated):		
YH1	Automatic. Cleaning Ext. Control	off off off	**Note in display (no entry):** System status
YH2	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.
YH3	Ext. Inputs Hardware		**Selection ChemoClean check**
	Ext. Inputs:		
YHA1	Start AutoStop Wait-Trigger Measuring Service	Userprog on on on on	**Info field:** status of external digital inputs
	Hardware:		
YHB1	Water Cleaner Water and cleaner		**Selection hardware** Select a function which shall be tested.
YHB2	Automatic. Cleaning Ext. Control	off off off	**Note in display (no entry):** System status
	Factory functions:		
YI1	**0**		**Reset counter** (only triggered by watchdog) Can be reset via Set Default → service data.
YI2	**0**		**Write access** You can recall the number of write access to the EEPROM.

Note!
Any *external* programme start is suppressed in the fields YG2 to YGD2.

6.5.20 Calibration

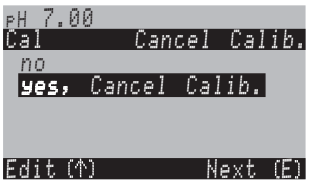
Note!
The defaults for on-site calibration are made in the menu
"PARAM" → "Set up 1" → "Calibration" (s. page 47 for pH / page 51 for Redox).

The calibration can be protected with the maintenance and the specialist codes (compare with page 40).

Procedure:

1. Move assembly to service position.
2. Remove electrode.
3. Clean electrode before calibration.

Note!
- Note the necessary preparatory work for calibration (page 106, pH and page 108 redox)
- For measurements with PML (potential matching), the PA line must be immersed in the buffer solution.
- If automatic temperature compensation is selected for calibration (ATC), the corresponding temperature sensor must also be immersed in the buffer solution.
- The instrument switches automatically to Hold (factory setting) whenever it is calibrated.
- Cancel calibration by pressing the "MEAS" key.

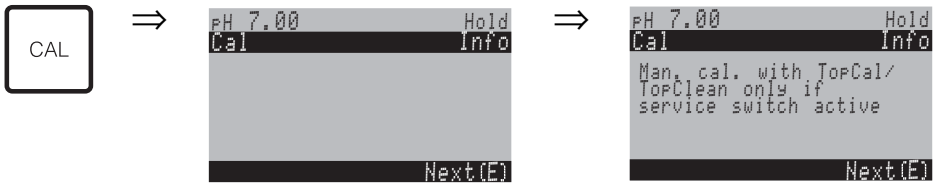


- If you confirm this with "yes, cancel cal.", you return to the measurement mode.
- If you select "no", calibration is continued.

The following section describes the calibration procedures for:

pH calibration	→	"Manual data entry" (s. page 97)
	→	"Manual calibration with buffer" (s. page 95)
	→	"Calibration with fixed buffer" (s. page 98)
	→	"Calibration with automatic buffer recognition" (s. page 98)
Redox absolute calibration	→	"Absolute data entry" (s. page 99)
	→	"Absolute calibration" (s. page 100)
Redox relative calibration	→	"Absolute data entry" (s. page 100)
	→	"Relative data entry" (s. page 102)
	→	"Absolute calibration" (s. page 101)
	→	"Relative calibration" (s. page 103)
	→	"50% turnover point" (s. page 104)

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 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 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,** (only if "Calibrate with MTC" is selected)
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 51 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.

CODE	CHOICE (default = bold)	INFO
CA	Calibration with manual buffer	**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,** where zero point and slope have been detected.
CAB2	**025.0 °C** (–20.0 ... +150.0 °C)	**Enter buffer temperature** (only when "Calibration with MTC" is selected) Confirm by pressing E
CAB3	Immerse: pH electrode in buffer 1	**Handling instructions** Immerse the electrode in buffer 1. Confirm by pressing E
CAB4	Temperature 1: 25.0 °C **07.00** (pH –2.00 ... +16.00)	**Enter pH value of buffer 1**
CAB5	Time: 10 s **MTC** pH 1: 7.00 mV 1: 0 °C: 25.0	**Checks the stability of the calibration (buffer 1)** 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	Invalid calibration value	**Note in display:** If an error is present (e.g. incorrect buffer used), this message is displayed.
CAB7	Immerse: pH electrode in buffer 1	**Handling instructions** Immerse the electrode in buffer 2. Confirm by pressing E
CAB8	Temperature 1: 25.0 °C **07.00** (pH –2.00 ... +16.00)	**Enter pH value of buffer 2** (only with manual buffer)
CAB9	Time: 10 s **MTC** pH 1: 7.00 mV 1: 0 °C: 25.0	**Checks the stability of the calibration (buffer 2)** 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
CAB10	Invalid calibration value	**Note in display:** If an error is present (e.g. incorrect buffer used), this message is displayed.
CAB11	Zero point 07.00 Good Slope 59.00 Good	**Note in display:** Info on electrode. Data on the zero point, slope and calibration quality.

CODE	CHOICE (default = bold)	INFO
CAB12	Electrode status good	**Note in display:** Electrode status: 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.
CAB13	**Accept** Reject Recalibrate	**End of calibration** *Accept*: Pressing E accepts the new calibration data. *Reject*: The data is not accepted, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
CAB14	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
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** 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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
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
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. 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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
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
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** 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.

CODE	CHOICE (default = bold)	INFO
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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
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
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 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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
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
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** 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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
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
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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
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
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 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, a recalibration won't be started. *Recalibrate*: The data is rejected and a new calibration will be started.
CCE8	Electrode in medium?	**Note in display:** If the electrode is back in the medium, so that measurement can take place?

7 Maintenance

Maintenance of a measuring point with TopCal S comprises:

- Compliance with safety instructions concerning:
  - Personal safety see below
  - Ex equipment see below
  - System and process see below
- Cleaning and monitoring of the sensor Chap. 7.2
- Sensor calibration Chap. 7.3
- Maintenance of cables and connections Chap. 7.4
- Maintenance of assembly Chap. 7.5
- Maintenance of the TopCal S control unit CPG 300 Chap. 7.6

The transmitter 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 (s. page 91).

Personal safety instructions

Warning!
- If you have to remove the electrode, assembly or parts of the assembly during maintenance, pay attention to the process-side hazards caused by pressure, temperature and contamination.
  Wear protective equipment appropriate to the possible dangers.
- The CPG 300 and process retractable assembly work with compressed air and motive water. Switch off the air and water inflow, before working on screw unions, valves or pressure switches.
- The non-Ex versions of the CPM 153 and CPG 300 work primarily with mains voltage. De-energise the devices before you open them. Check that there is no voltage and secure the switch(es) against switch-on. These measures are not necessary with the 24 VDC/AC version.
- If work is essential under mains 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.

Safety instructions for system and process

Note!
- Remember that any maintenance work on the device, cabling, assembly or sensors may have impacts on process control or the process itself.
- All measures which influence current outputs, relay contacts or communication should be discussed with a superior beforehand.

7.1 Operation of the service switch

The service switch is located on the door of the CPG 300 housing. There are two possible switch positions:

Maintenance:
(horizontal switch setting)
- The electrode moves into the rinse chamber.
- "Hold" is active for the outputs.

Measurement:
(vertical switch setting)
After moving from the maintenance position, a query appears asking whether the programme should be launched or the electrode should be moved into the process without cleaning/calibration.
Only those programmes are offered which have already been edited.

Note!
The service switch always has priority. This means that any programme running is interrupted as soon as you operate the service switch.

7.2 Sensor cleaning and monitoring

Sensor cleaning is a component of the TopCal S system. Usually, additional or external cleaning of the sensor is unnecessary. However, before monitoring the sensor, advance external cleaning may be necessary.

7.2.1 External cleaning of the sensor

Warning!
- Protect hands, eyes and clothing from the cleaning agents.
- You must fulfil the necessary protection measures if the sensor is taken directly out of a toxic or an aggressive process.
- Switch the service switch to "Maintenance" to keep the assembly safely in the maintenance position.

The selection of cleaning agent depends on the type of soiling. The most frequent soiling and the associated cleaning agents are listed in the table below:

Type of soiling	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 cleaning agents.	
Calciferous deposits, metal hydroxide deposits, heavy biological deposits	3% HCl
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

Caution!
Only convey diluted acids (max. 3%) directly via the pump. Make sure that the wetted materials of the pump are resistant to the acids used. Technical acids contain aggressive gases which may impair the working life of the components.

Due to the danger of pump damage, the following media have to be conveyed via external additional valves and the rinse block CPR 40:
- Technical acids (e.g. technical hydrochloric acid)
- Concentrated acids (phosphoric acid, nitric acid, sulfuric acid, hydrochloric acid)
- acetone, ketones, aromatic solutizing agents
- organic solvents
- hot media.

To do this you will have to order a system with control for additional valves (see Ordering Information).

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.

7.2.2 Inspecting the sensor

Check for air bubbles in the pH electrode:
air bubbles indicate incorrect installation. Therefore check the installation position:

- Permitted: 15° to 165° to the horizontal.
- Horizontal installation or installation with the plug-in head pointing downward are not permitted (except when using a CPS 401 IsFET pH sensor).

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 (PML pin connected, but still unsymmetrical operating mode ("without PML") selected. See functional description, Field A6 on p. 38.
- Shunt in measuring cable (e. g. through humidity) between reference line and grounded screen or PA line.
- Measuring instrument defective (shunt in reference input or entire input amplifier downstream of PE).

Removing diaphragm blockages:
Blocked reference system diaphragms can be mechanically cleaned (only sensors with ceramic diaphragms does not apply to teflon diaphragms or open ring electrodes):
- Use a small key file.
- Only file in one direction.

7.3 Manual calibration

Sensor calibration is a component of the TopCal S system. Usually, additional or external calibration of the sensor is *unnecessary*.

If calibration is to be carried out outside of the assembly (e. g. for test purposes), the operating mode of the pH input should be noted. With preselection "with PML" (= symmetrical connection), the PM lines of the CPM 153 must also be immersed in the calibration solution.

Note!
The assembly must be moved into the service position with the service switch, before manually calibrating.

7.4 Maintenance of cables, connections and power supply lines

Weekly checks (recommended timeframe):
Check the tightness of:
- Compressed air hoses and connections
- Motive water hoses and connections and
- Hoses and connections of buffer and cleaner tanks.

Check
- The multihose connections of the CPG 300 and assembly for tightness.

Monthly checks (recommended timeframe):
- Check sensor plug-in head for tightness and humidity (if the assembly is located in a humid environment or outdoors).
- 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!
- Check cable glands for tightness.

Six-monthly checks (recommended timeframe):
- CPM 153: 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).
- Check sensor plug-in head for tightness and humidity (if the assembly is located in a dry environment).

7.5 Maintenance of the process assembly

Weekly checks (recommended timeframe):
- Check the upper section of the assembly for compressed air tightness and mechanical damage.
- Check the process connection for tightness against the process and mechanical damage.
- Check the compressed air lines and connections for tightness and mechanical damage.

Annual checks (recommended timeframe):
- External cleaning if necessary. To replace seals, the assembly must be clean, dry and, if necessary, decontaminated.
- With inductive feedback: test and, if necessary, set switching distance
- Replacement of the seals not in contact with the medium (recommended: as necessary, at least once a year)
- Replacement of seals in contact with the medium (at least once a year, no further recommendations possible, as extremely dependent on process, material and level of assembly use)
- End test after completion of maintenance work:
  – Assembly moves to measuring and service position?
  – Maintenance and measuring feedback signals available? (Check using the CPM 153 status messages)
  – Process connection and compressed air connections tight?
  – Does the meter display plausible values?

Replacement of the sealing elements is dependent on the type of assembly. Instructions for replacement is contained in the appropriate service kit. You can find the necessary service kit in the operating instructions of your assembly.

7.6 Maintenance of the control unit CPG 300

Weekly checks (recommended timeframe):
- Check the inside of the compressed air connections for tightness:
  – Pneumatic valves
  – Pump drive
  – Pressure switch.
- Check level of buffer and cleaning solutions. Top up if necessary.
- Check the multihose connections of the CPG 300 and assembly for tightness.

Annual checks (recommended timeframe):
- Retighten the terminals in the cabinet.
- Also check that the interior and the PCBs are clean, dry and free of corrosion.
  – If not: check the seals, screw unions and pumps for leaks and breaks).
- Test of the level measurement for buffer and cleaner bottles.
- Replacement of pump sealing elements. Use the sealing kit in the spare parts list on page 128. The sealing kit contains the appropriate instructions.

Note!
- If there is frequent calibration or cleaning, it may be necessary to replace the pump seals more often.
- After maintenance work on the pump, check the conveyed volume by taking measurements at the outlet.

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. 112: Error number list → List of all occurring error numbers.
Chap. 8.1.2, p. 118: Process-specific error → e.g. temperature value is incorrect.
Chap. 8.1.3, p. 123: Device-specific error → e.g. display is dark.

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

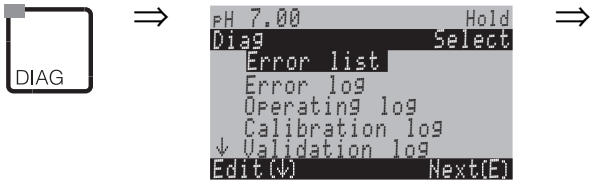
Warning!
Danger to life.
- De-energise the instrument before you open it. Check that there is no voltage and secure the switch(es) against switch-on.
- If work is required under voltage, this may only be carried out by an electrician, but a second person must be present for safety reasons.
- Switch contacts 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 correct functioning, accuracy and reliability after corrective maintenance.

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 there is also data on whether the factory setting (= Fact.) of this error triggers
- an alarm,
- an error current or
- cleaning.

To enter the error list, proceed as follows:



Note!
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.						
E005	Failure	Unknown CPG code	TopCal S is not recognised. TopCal S is not compatibel to Mycom S software.	yes		no		–	–
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	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
E012	Failure	CPG communication failure	Check TopCal S connecting cable.	yes		no		no	
E013	Failure	Assembly has not reached service position	Check assembly position and feedback signals, compressed air present? Check pneumatic lines to the assembly. Assembly blocked mechanically? For non-Ex: power supply present?	yes		no		no	
E014	Failure	Assembly has not r eached measuring position		yes		no		no	
E015	Failure	Revolver does not turn	Check pneumatic drive. Compressed air pressure too low. Feedback defective.	yes		no		no	
E016	Failure	Revolver end position code defective	Check limit switch and connection. Compressed air pressure too high.	yes		no		no	
E017	Failure	Data error in CPC 300 EEPROM	Switch instrument off and on. If necessary corrective maintenance at factory.	yes		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		–	–
E024	Failure	CPG programme interrupted	Control input 87/88 switched: Ext. control criteria.	yes		no		no	
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		–	–

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
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		–	
E050	Maintenance	Cleaner almost empty	if empty: fill; if not empty: Check level sensors	yes		no		no	
E051	Maintenance	Buffer 1 almost empty		yes		no		no	
E052	Maintenance	Buffer 2 almost empty		yes		no		no	
E053	Failure	Failure three-point step controller	reserved	yes		no		no	
E054	Maintenance	Dosage time alarm	Dosage time exceeded at total dosage. Dosage interrupted, dosing agent empty or process too inconsistant.	yes		no		no	
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	

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

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
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	
E086	Maintenance	Delta limit buffer 1 exceeded	Calibrate sensors.	no		no		no	
E087	Maintenance	Delta limit buffer 2 exceeded		no		no		no	
E090	Function check	CPG service switch active	Check on CPG if service was actually carried out.	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		–	
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		–	

Error no.	NAMUR class	Error message	Possible causes / measures	Alarm contact		Error current		Automatic cleaning start	
				Fact	User	Fact	User	Fact	User
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 keypad (Keys "CAL" + "DIAG" simultaneously = security locking)	Press "MEAS" and "PARAM" simultaneously to unlock.	
No automatic calibration possible, as measuring chain zero point not settable	Reference system poisoned	Test with new electrode.	pH/mV electrode
	Diaphragm blocked	Clean or grind diaphragm.	HCl 3%, file (only file in one direction)
	Measuring line broken	pH input on instrument short-circuit ⇒ Display pH7	Reterminate or use new cable
	Unsymmetrical sensor voltage too high	Clean diaphragm or test with different electrode.	HCl 3%, file (only file in one direction)
	Potential matching (PA/PM) Mycom ⇔ Incorrect medium	asymm.: no PA or PA on PE symm.: PA connection needed	Connection s. chap. 4
No or slow display change	Electrode soiled	Clean electrode.	s. chap. 7.2
	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		
No automatic calibration possible as measuring chain slope not adjustableslope too small	Connection not at high impedance (humidity, dirt)	Test cable, connector and junction boxes.	pH simulator
	Instrument input defective	Directly test instrument.	pH simulator
	Electrode aged	Replace electrode.	pH electrode
No automatic calibration possible as measuring chain slope not adjustable/no slope	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.	

Error	Possible cause	Remedial action	Equipment needed, spare parts
Permanent, incorrect measured value	Electrode not immersing 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 glass membrane	Replace electrode.	pH electrode
	Instrument in impermissible operating status (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 s. page 18
	Measuring cable defective	Check cable.	Ohmmeter
	Incorrect sensor type selected	Set sensor type on instrument (Field 141).	Check temperature sensor with Ohmmeter.
	Sensor defecitve	Check sensor	
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	Possibly earth with / at PA pin (connect PA to PE).	Problem mainly occurs in plastic lines
	Device unsymmetrical and PAL connected	possibly earth with / at PA pin (connect PA to PE)	
	Electrode soiled or with deposits	Clean electrode (see Chap. 8.8.1).	Highly polluted media: Use spray cleaning.
Measured values fluctuate	Interference in measuring cable	Connect cable screening as per wiring diagram.	Wiring diagram s. page 18
	Faults 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 PA pin in assembly to device terminal PA/PM.	Possibly earth medium by connecting PA to PE

Error	Possible cause	Remedial action	Equipment needed, spare parts
Controller / limit contact does not work	Controller switched off	Activate controller s. 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 pickup 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 value, 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	Replace controller module	See spare parts list in Chap. 8.3
Fixed current output signal	Current simulation active	Switch off simulation .	See DIAG / Service / Simulation
	Processor system inactive	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
Feedforward control does not work	No current input available	Basic equipment is: Additional module M3R-3 with 3 relays	Use module M3R-2 o. -1 See spare parts list Chap. 8.3
Feedback input does not work	No resistance input available	Basic equipment is: Additional module M3R-3 with 3 relays	Use module M3R-2 o. -1 See spare parts list in Chap. 8.3

Error	Possible cause	Remedial action	Equipment needed, spare parts
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, s. chap. 9
CPG 300 does not work (non-Ex version)	No supply voltage	Check connection	
	Fuse defective	Check, if necessary, replace	
	Switch to "Maintenance"	Turn switch to "Measure".	
CPG 300 does not work (Ex version)	Power supply from CPM 153 defective.	Measure, CPG 300 terminals L+/L–	DVM 20 V DC
Pump does not reach zero position	– Air pressure too high, pump "overrides" correct position – Upper micro switch is not closed in the zero position – Wrong wiring of the switch – Screw at revolver is missing or in a wrong position	– Reference value: 5 bar, fine adjustment with needle valve; step speed 0.5 sec – Replace micro switch – Kl. R1/R2: zero position 0 V, otherwise 3,2 V, switch is a NO contact – Replace screw, possibly re-adjust position	
Revolver does not turn	– Air pressure too low – Wrong wiring of the switch – The metal lamina at the switch is defective – pneumatic valve 4 does not open	– Reference value: 5 bar, fine adjustment with needle valve; step speed 0.5 sec – Kl. R3/R4: in motion 0 V, otherwise 3,2 V, switch is a NO contact, as wiping contact – check, possibly replace – Does yellow LED shine (in the lower mid)? Power supply connected?	
Assembly permanently proceeds	Pneumatic hoses to assembly connected in a wrong way	Check pneumatic hoses.	
Assembly proceeds several times without correct feedback	– Pneumatic connections interchanged – Feedback connected not correctly – Feedback switch is wrongly adjusted – Assembly has been proceeded manually. Feedback signal therfore is undefined.	– fig. 5, page 12: Hose 2 "measuring" to valve 5 in front, hose 3 "maintenance" to valve 5 in the back. – fig. 5, page 12: Hose 2 "measuring" to multi hose MS5 (Kl. 11/12), hose 6 "maintenance" to multi hose MS6 (Kl. 13/14) – Feedback switch under pressure: opened: Kl. 11/12-13/14 = 14 V closed: Kl. 11/12-13/14 = 0 V – Position change via menu manual operation	

Error	Possible cause	Remedial action	Equipment needed, spare parts
No buffer or cleaner conveyance	– Tank empty – Line blocked – Pump defective – Multihose defective	Check error messages Test functions in manual operation	Indicator LEDs CPG 300 (s. fig. 16 / fig. 17, page 19): *V1*: Additional valve 1 active *V2*: Additional valve 2 active *Pump*: Pump stroke check *Rev*: Pump reverse *Meas*: Assembly in measurement mode *Alive*: LED flashes irregularly, if function o.k. Pressure switch feedback (Pos.No. 440, p. 128) type"NC": no pressure = closed with pressure = open.
Pressurised air or cleaning agent are not conveyed	– Pressure in line is low – Line is blocked – Ball in the ball valve is not in the *upper* position	Check line Open ball valve (Pos. D, E in fig. 3, page 11), check ball: it must be above spring and distance piece	
Assembly stays in "Service" position	– No compressed air – Switch to "Maintenance" – Incorrect position feedback signal	Check error messages Test functions in manual operation. Disconnect pressure switch and check with Ohmmeter.	
Assembly stays in "Measurement" position			

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 fig. 37 (p. 127)
	Device fuse defective (Ex device)	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 device view on page 127
	Operating system in impermissible state	Switch instrument off and on	Possibly EMC problem: if problem persists, have installation checked by E+H Service
Instrument gets hots	Incorrect mains voltage or too high	Compare mains voltage and nameplate rating	
	Power unit defective	Replace power unit	All 6 red LEDs on the M3G module must be lit
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 PA 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, bushing using the device view on page 127
Current output, Current value incorrect	Calibration incorrect: – Load too high – Shunt / short-circuit to frame in current circuit	Test with integrated current simulation, connect mA meter directly to current output	If simulation value incorrect: new module M3Cx-x required. If simulation value correct: check current circuit for load and shunts
	Incorrect operating mode	Check, whether 0–20 mA or 4–20 mA is selected	

Error	Possible cause	Tests and / or remedial action	Equipment, spare parts, personnel
No current output signal	Jumper incorrectly set	Change coding	See Chap. 8.4.2
	Current output stage defective (Module: M3CH-x)	Test with integrated current simulation, connect mA meter directly to current output	If test negative: Replace module M3CH-x (Check variants, see spare parts list in Chap. 8.3)
	Instrument with PROFIBUS® interface	PROFIBUS® instruments do not have a current output	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 48).
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 112, editing errors on page 48). 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 "Set up 1" menu → "Contacts", you can define the contacts as NC contacts or NO contacts (s. page 41). In the case of a power failure, the contacts will act according to the setting you make.

8.2.4 Assembly behaviour

Problem	Behaviour CPM 153	Behaviour CPG 300	Assembly behaviour
CPM 153 voltage failure during measurement	No function		
CPM 153 voltage failure during maintenance	No function		
CPG 300 voltage failure during measurement	Error message E012	All valves closed	Can be pushed out of the process.
CPG 300 voltage failure during maintenance	Error message E012	All valves closed	Stays in service position
Air failure during measurement	Error message		Can be pushed out of the process.
Air failure during maintenance	Error message E027		Stays in service position
Air failure during autoclean	Error message E027		Stays in service position
Water failure during measurement	Error message E028		
Water failure during maintenance	Error message E028		
Buffer 1 / 2 empty			
Cleaner empty			
Pump does not convey			

8.3 CPM 153 spare parts

For your own safety, always use genuine spare parts. Only genuine spare parts ensure correct functioning, accuracy and reliability after corrective maintenance. You receive all spare parts in the form with a unique code, optimally adapted packaging including ESD protection for modules and a set of instructions.

CPM 153: Module /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
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
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 CPM 153 Installation and removal of parts

Please observe the safety instructions in Chap. 8.3.
The position designations relate to the spare parts list on page 126.

8.4.1 Device view CPM 153

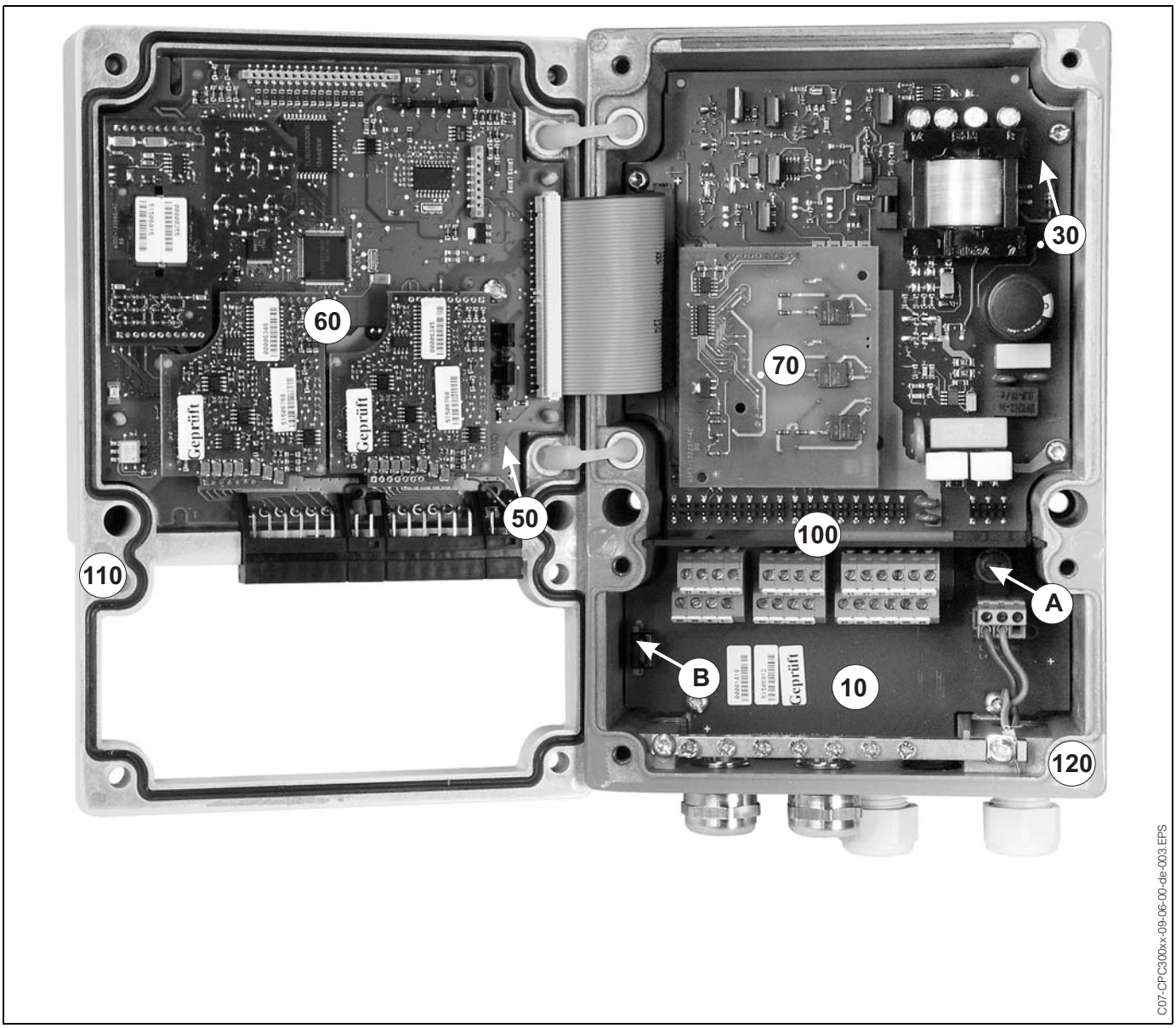


fig. 37: Interior view of the transmitter Mycom S
Remarks:
A: The figure shows the non-Ex fuse.
B: Slot for DAT memory module
10: Terminal module
30: Supply module
50: Controller module
60: pH input module
70: Relay module
80: Terminal set pH input
100: Partition plate (not shown in figure)
110: Housing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

8.4.2 Codings

Current outputs active or passive:
in the device versions CPM 153-xxxA/-xxxB (2 current outputs) the current outputs can be operated as either 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!

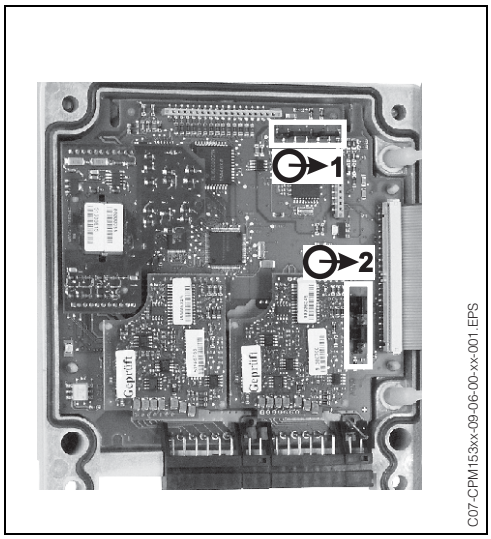


fig. 38: Coding of the current outputs (Interior view of the CPM 153 housing upper section)

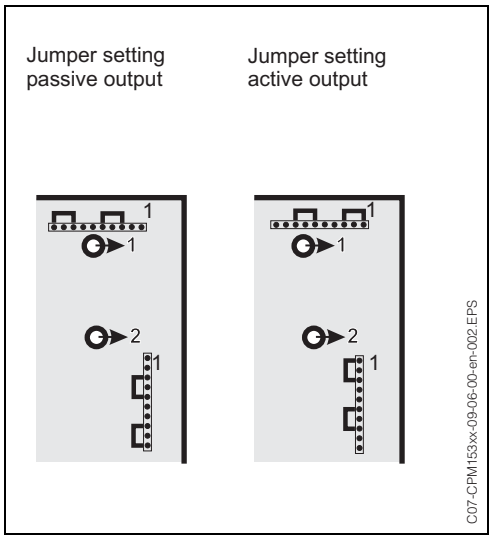


fig. 39: Active/passive coding of the current outputs

8.5 CPG 300 Spare parts

For your own safety, always use genuine spare parts. Only genuine spare parts ensure correct functioning, accuracy and reliability after corrective maintenance. You receive all spare parts in the form with a unique code, optimally adapted packaging including ESD protection for modules and a set of instructions.

Spare parts CPG 300

Pos No.	Kit name	Contents / Use	Order number
300	Electronics module CPG 300 Ex	tested, complete module. Power supply for Ex using the CPM 153. With the 110/230 VAC version, the voltage can be selected with jumpers.	51507432
310	Electronics module CPG 300 110/230 VAC non-Ex		51507433
320	Electronics module CPG 300 24 VDC/AC non-Ex		51507434
330	Terminal strip set Ex and non-Ex	All required plug-in terminal strips	51507436
340	Complete pump (consisting of positions 360, 370, 380)	Completely installed pump	51507437
350	Pump drive revolver with installation plates	Pneum. drive for revolver with installation plates for drive and pump	51507438

Pos No.	Kit name	Contents / Use	Order number
360	Pump drive piston	Pneum. drive for conveyor pumps	51507439
370	Hydraulic cylinder	Conveyor cylinder for buffer and cleaner	51507440
380	Pump connection unit with end position switches	Pump lower section with connections for buffer, cleaner; air and water; end position switch for revolver	51507441
390	Pump sealing kit	All seals required for the pump	51507442
400	Complete conveyance pressure monitor	Pressure switch and nozzles with 2 hose connections	51507443
410	Multihose CPG 300 5 m	4 hoses in protective hose with pneumatic multiplug	51507461
420	Multihose CPG 300 10 m		51508786
430	Multihose connection	Pneumatic multiplug in housing installation version.	51507446
440	Assembly feedback pressure switch	Pressure switch, NO contact	51507447
450	Pneumatic pressure switch	Pressure switch	51507448
460	Non-Ex valve	Electrically-operated valve (coil)	51507449
470	Ex valve (piezo valve)	Valve with piezo precontrol	51507450
480	Pneumatics module CPG 300 (non-Ex) with 3 valves	Module with basic section, valves, pressure switch, mufflers	51507457
490	Pneumatics module CPG 300 (non-Ex) with 3 piezo valves	Module with basic section, valves, pressure switch, mufflers	51507451
500	Pneumatics module CPG 300 (non-Ex) with 5 piezo valves	Module with basic section, valves, pressure switch, mufflers	51507456
510	Complete level probe	Screw-in section for tank, suction hose, level probe, cable	51507458
520	Kit of pneumatic / hydraulic small parts	Hoses ID 4/ 6 mm, hose adapters, 4/6 adapter , T-sections, hose connections, Schott connections, non-return valves, screws, spring	51507459
	Kit replacement pump	Pump inspected	51511676
	Kit hosing	Hoses ID4/6 mm, hose connections, throttle for revolver PVDF	51510981
	Pressure reduction kit	Pressure reduction valve, filter	51505755
	Water filter kit	Water filter 100 µm	51511336

8.6 CPG 300 Installation and removal of parts

Please observe the safety instructions in Chap. 8.5.
The position designations relate to the spare parts list on Chap. 8.5.

8.6.1 Device view CPG 300

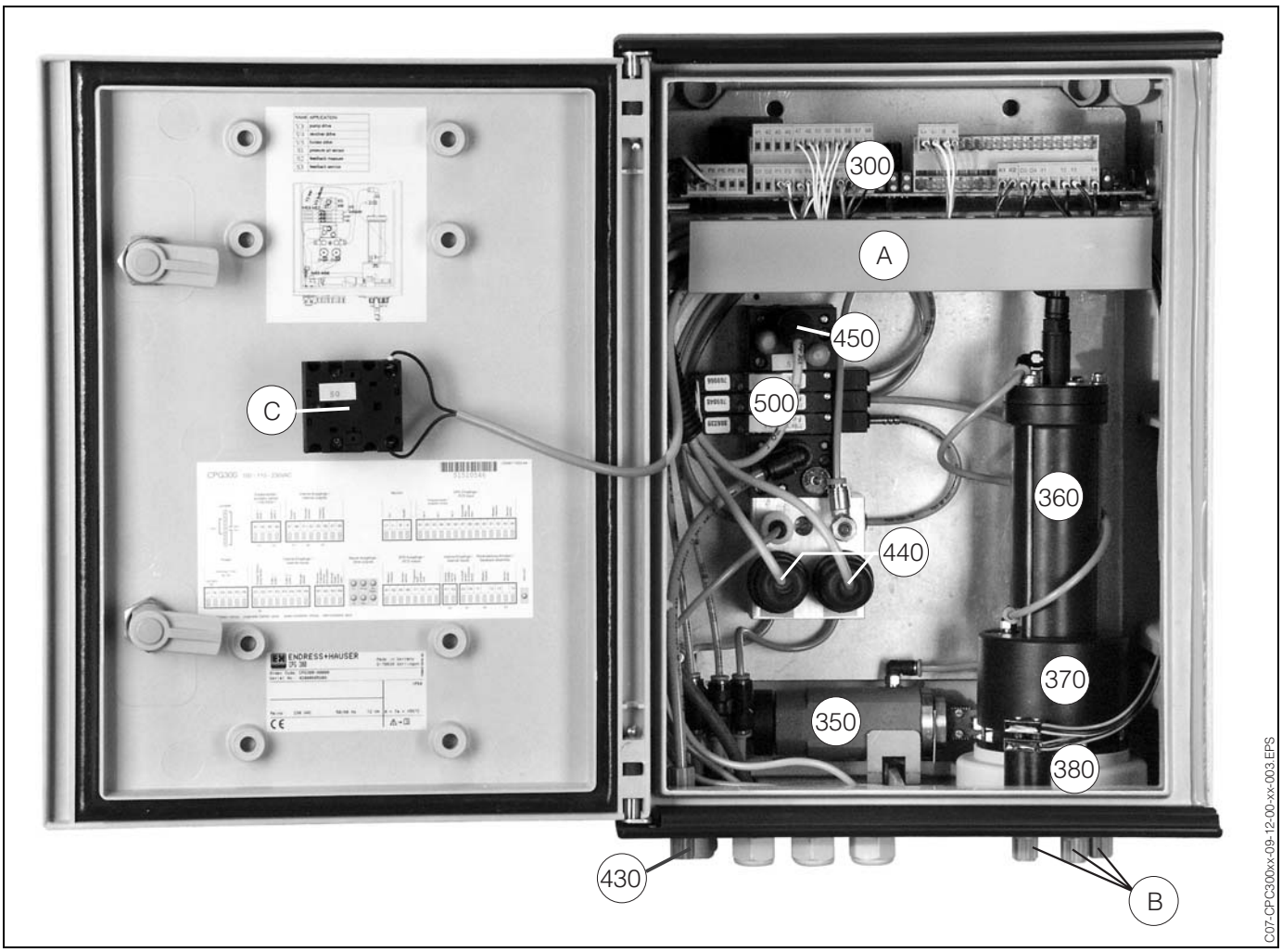


fig. 40: Complete view of CPG 300 housing
300: Electronics module with terminals
350: Revolver drive
360: Pump drive
370: Pump
380: Connection unit
430: Multihose connector
440: Pneumatic feedback
450: Pressure switch
500: Valve block with valves
A: Cable channel
B: Pump connections, hydraulic
C: Service switch

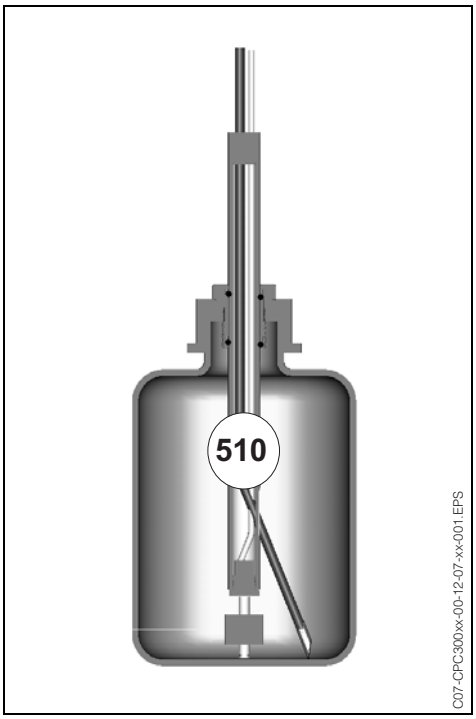


fig. 41: Detailed view: level measurement with drive in the buffer/cleaner bottles

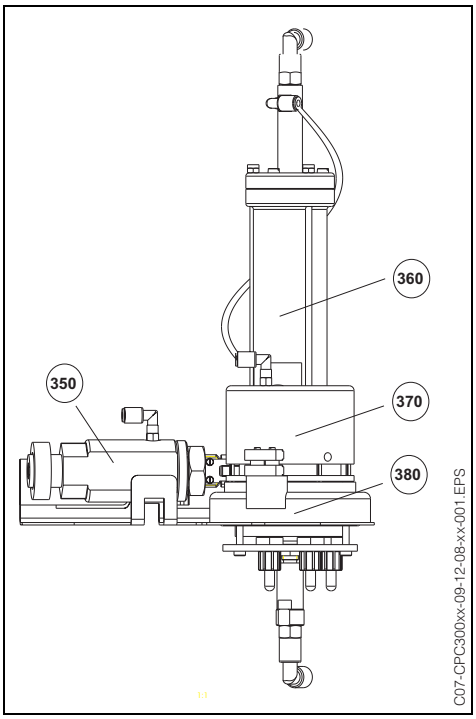


fig. 42: Detailed view: individual parts of the pump
350: Revolver drive
360: Pump drive
370: Pump
380: Connection unit

The numbers in the diagram are the position designations in the spare parts list.

8.7 Detailed plans of CPG 300

You can follow the signals using the detailed plans and check the internal wiring.

8.7.1 Terminal wiring diagram CPG 300

Please refer to Chap. 4.2.

8.7.2 Pneumatics and hydraulics CPG 300 non-Ex

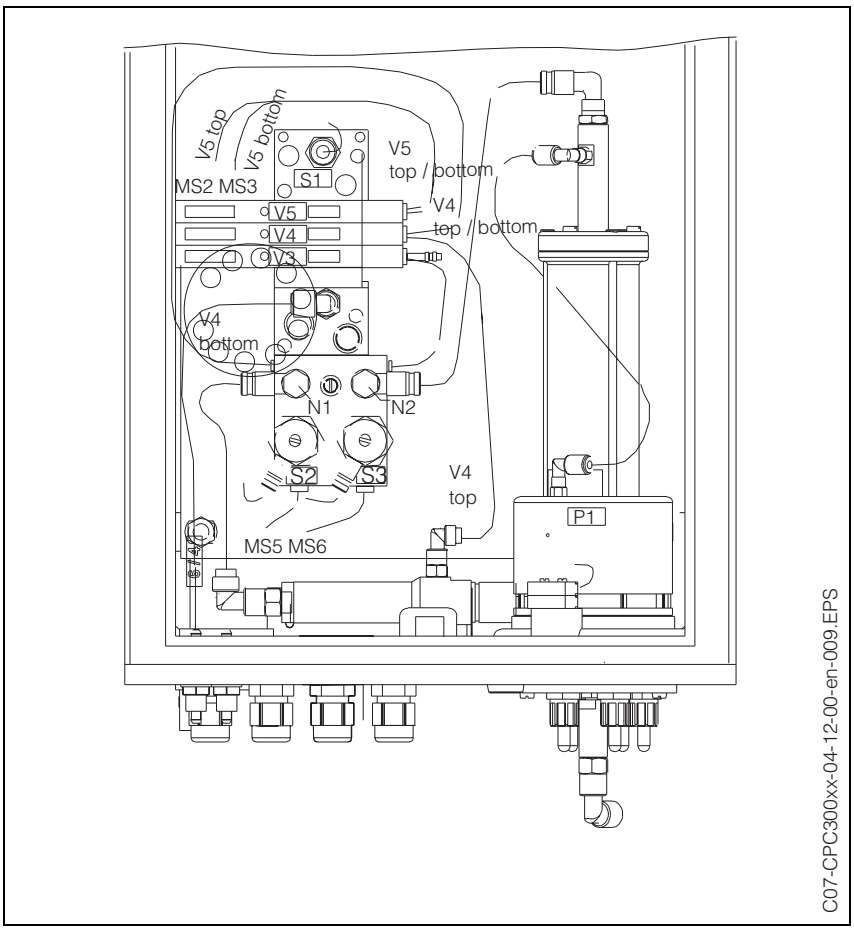


Fig. 43: Pneumatics and hydraulics plans for CPG 300 non-Ex

Multihose:

Connection	Signal
MS1	free
MS2	Assembly in measuring position
MS3	Assembly in maintenance position
MS4	free
MS5	"Measurement" feedback (n/a with inductive feedback)
MS6	"Maintenance" feedback (n/a with inductive feedback)
MS7	free
MS8	free
MS9	free
MS10	free

Valves (controlled electrically)

Name	Use
V3	Pump drive
V4	Revolver drive
V5	Assembly control

Pressure switch

Name	Use
S1	Compressed air monitoring
S2	Feedback "Measurement" (not used with inductive feedback)
S3	Feedback "Maintenance" (not used with inductive feedback)
S4	Conveyance pressure monitoring

Needle valves	
N1	Preadjusted throttle for revolver control time.
N2	Fine adjustment for pump control time Close the valve and open it ¼ revolution.

8.8 Replacing the device fuses

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

Fuse CPM 153:
- Position of the fuse holder: "A" in fig. 37.
- Use only a 5 x 20 mm fine-wire fuse with 3.15 mA, medium slow-blow. All other fuses are not permitted.

Fuse CPG 300
- Position of the fuse holder: "A" in fig. 40.
- Use only a 5 x 20 mm fine-wire fuse with 3.15 mA, medium slow-blow. All other fuses are not permitted.

8.9 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.

Apart from the mechanical components, the CPG 300 also contains electronic components. For disposal purposes, separate the device into electronics, plastic (housing) and metal rubbish.

The assembly may be contaminated by the medium. Therefore, when disposing of it, the plant disposal or safety officer must be consulted.

9 Accessories

Offline configuration with Parawin

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

DAT module

The DAT module is a memory device (EEPROM) which can be easily plugged into the connection compartment of the transmitter. Using the DAT module, you can
- *save* complete settings, logbooks and the data 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
CleanFit CPA 471 / 472 / 473 / 474 / 475	Retractable assembly for manual or pneumatic operation. Cleaning and calibrating the electrode is possible under process conditions. CPA 475: 3A approval, application pending with 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	• Process systems in general (471, 472, 473 / 474) • Food, pharmaceutical applications (475) • Biotechnology (475)

pH/redox electrodes

Type	Properties	Applications
OrbiSint 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, 50054649	• General process engineering • Industrial wastewater • Detoxification (cyanide, chrome) • Neutralisation
CeraLiquid 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, 50059346	• General process engineering • Ultra-pure water • Boiler feed water • Detoxification (cyanide)
CeraGel 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, 51505837	• General process engineering • Food processing • Water treatment
TopHit CPS 471	Rupture-proof pH sensor based on IsFET technology. Short response time, very high resistance to alternating temperature cycles, sterilisable, almost no acid or alkaline errors Technical Information TI 283C/07/en, 51506685	• General process engineering • Food, pharmaceutical applications • Water treatment • Biotechnology

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 NT/95/98/2000 operating system).

Connection accessories

- *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.
- *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.
  Technical Information for all cable types and junction boxes: TI 118C/07/en, Order No.: 50068526

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: 5000 ml; Order No.: CPY2-A pH 7.0, green, contents: 5000 ml; Order No.: CPY2-B 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 5000 ml; Order No.: CPY3-6 +475 mV, pH 0.0, contents: 5000 ml; Order No.: CPY3-7	Redox calibration (measured at 25 °C with PtAg or AgCl measuring chain)

Flat gasket

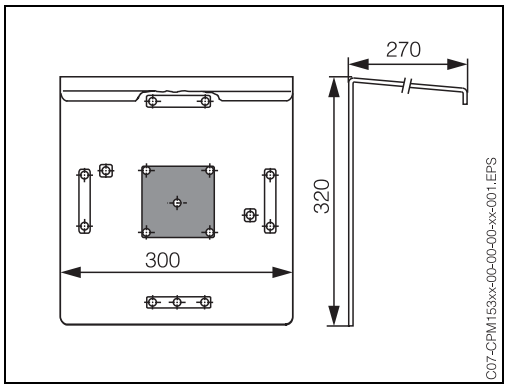
Flat gasket for sealing the front panel mounting of the CPM 153. Order No.: 50064975

Weather protection cover CYY 101

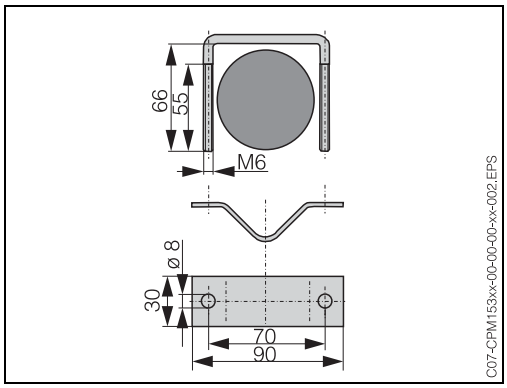
For installing the transmitter outdoors.

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

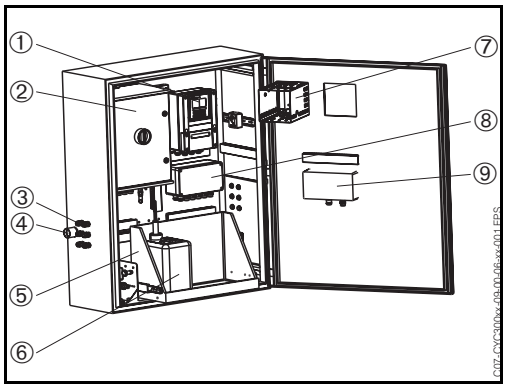


Round post fixture for CYY 101

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

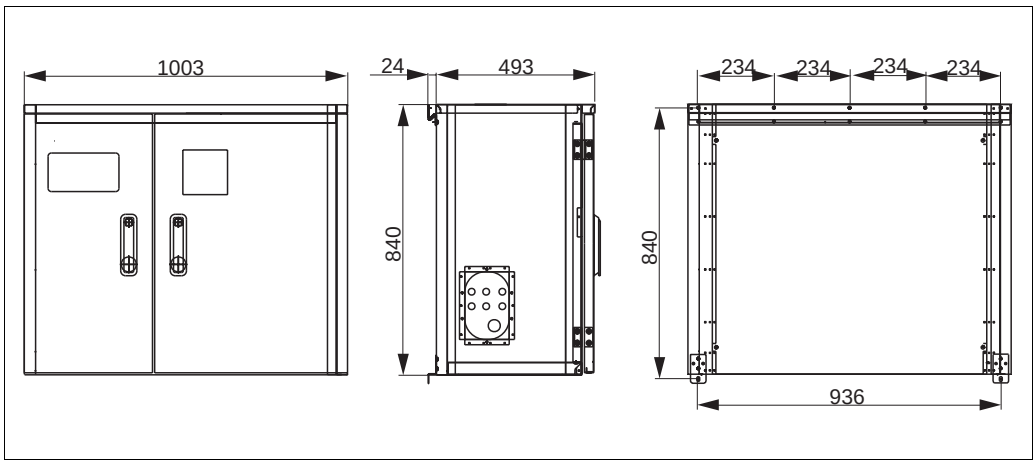
Housing CYC 300

Housing for TopCal S CPC 300, with rack for buffer and cleaner solutions. Operating panel with alarm LED and lock for programme start and assembly drive. Window for Mycom S or MemoGraph S. For Ex and Non-Ex applications. Material: plastic or stainless steel.

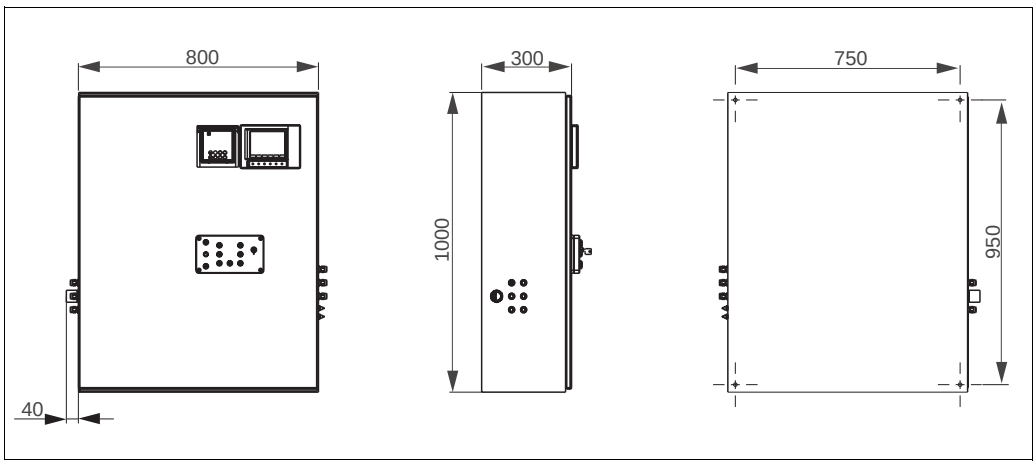


1 Mycom S CPM 153
2 TopCal S CPC 300
3 Pg cable glands
4 Multihose gland
5 Rack
6 Buffer and cleaner solutions
7 MemoGraph S
8 Programme control unit
9 Operating panel
(Order operating panel separately: Order No.: 51512891)

Housing CYC 300



Dimensions housing CYC 300, stainless steel version



Dimensions of housing CYC 300, plastic version

Product structure Housing CYC 300

	Certificates							
	A	no approval						
	G	with ATEX approval II (1) 2G EEx em ib[ia] IIC						
	O	with FM approval Cl. I, Div. 2, with NI input and output circuits, sensor IS Cl. I Div. 1						
	P	with FM approval Cl. I, Div. 2, with NI input and output circuits						
	S	with CSA approval Cl. I, Div. 2, with NI input and output circuits, sensor IS Cl. I Div. 1						
	T	with TIIS approval						
		Power supply						
		1	230 V AC					
		2	110-115 V AC					
		3	24 V AC / DC					
			Materials					
			A	Plastic				
			G	Stainless steel 1.4301 (AISI 304)				
				Heating				
				1	no electrical heating			
				2	with electrical heating			
					Data recording			
					A	no MemoGraph S		
					B	with MemoGraph S		
						Allocation		
						1	empty housing, CPC 300 not mounted	
						2	order item of associated CPC	
							Options	
							1	Basic version
CYC 300-								complete order code

10 Technical data

10.1 Input

Mycom S CPM 153:

Measured variables	pH, redox, temperature	
pH (glass / IsFET)	Measuring range	–2.00 ... +16.00
	Measured value resolution	pH 0.01
	Zero point offset range	pH –2 ... +16
	Range of automatic temperature compensation	–50 ... +150 °C
	Reference temperature	25 °C (settable with medium temperature compensation)
	Slope adjustment	5 ... 99 mV / pH
	Input resistance under nominal operating conditions	$> 1 \cdot 10^{12}\ \Omega$
	Input current under nominal operating conditions	$< 1.6 \cdot 10^{-12}$ A
Redox	Measuring range	–1500 ... +1500 mV –300 ... +300%
	Measured value resolution	0.1 mV
	Zero point offset range	+200 ... –200 mV
	Assignment with % display	adjustable, Δ for 100% = Δ 150 ... Δ 2000 mV
	Electrode offset	±120 mV
	Input resistance under nominal operating conditions	$> 1 \cdot 10^{12}\ \Omega$
	Input current under nominal operating conditions	$< 1.6 \cdot 10^{-12}$ A
Temperature	Temperature sensor	Pt 100 (three-wire circuit) Pt 1000 NTC 30k
	Measuring range (can also be displayed in °F)	–50 ... +150 °C (NTC: –20 ... 100 °C)
	Measured value resolution	0.1 K
	Temperature offset	± 5K
Digital inputs	Input voltage	10 ... 40 V
	Internal resistance	R_i = 5 kΩ

CPG 300:

Digital inputs	Input voltage	10 .. 40 V
	Internal resistance	R_i = 5 kΩ

10.2 Output parameters

Mycom S CPM 153:

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, adjustable	pH: pH 1.8 ... 18 Redox: 300 ... 3000 mV Temperature: 17 ... 170 °C
	active current output (only non-Ex): Load	max. 600 Ω
	passive current output: Supply 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 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%
	Alarm 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	0.5 ... 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 the power supply • Current output 2 and the CPC 300.	
	The remaining circuits are galvanically isolated from each other.	

CPG 300:

Digital outputs	Optoelectronic coupler, max. switching voltage	30 V
	Max. switching current	100 mA
	Max. switching power	3 W
Control for external valves	☝Caution! *Device damage possible*. Each output has its own fuse.	
	Switched power supply.	
	Max. switching current	I_{max} = 3 A
	Max. switching power	P_{max} = 750 VA

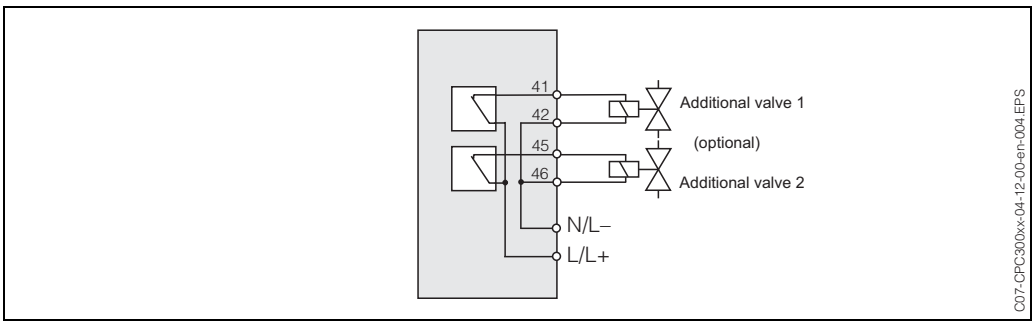


fig. 44: Switched power supply to control additional external valves

Electrical connection data

Mycom S CPM 153:

Power supply	100 ... 230 V AC +10/–15% 24 V AC/DC +20/–15%
Frequency	47 ... 64 Hz
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

CPG 300:

Power supply	100 / 110 / 230 VAC +10/–15% 24 V AC/DC +20/–15%
Frequency	47 ... 64 Hz
Power consumption	max. 12 VA
Separation voltage between galvanically isolated circuits	276 V_{rms}
Terminals, max. cable cross-sectional area	3 x 2.5 mm^2

Warning!
Please observe the partly deviating data for Ex instruments. They are listed in the additional Safety instructions for electrical equipment in hazardous areas XA 233C/07/en and XA 236C/07/en.

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] output	max. 0.2% of current range end value	
Repeatability[1]	max. 0.1% of measuring range	

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

10.4 Ambient conditions

Ambient temperature	0 ... +55 °C
Ambient temperature limit	–20 ... +60 °C
Storage and transport temperature	–30 ... +80 °C
Relative humidity	10 ... 95%, non-condensing
Ingress protection	CPM 153: IP 65 CPG 300: IP 54
Electromagnetic compatibility	Interference emission to EN 61326: 1997 / A1:1998; Class B resource (Housing sector) Interference immunity to EN 61326: 1997 / A1:1998; Appendix A (Industrial sector)
Safety requirements	Complies with general safety requirements acc. to EN 61010. Complies with NAMUR Recommendations NE 21.

10.5 Process conditions

Temperature range media conveyed	0 ... +50 °C
Additional pressure media	Aggressive or hot media which are conveyed via additional valves (optional) must not be conveyed by the pump of the CPC 300 system. Use the rinse block CPR 40 for that.

10.6 Mechanical data

Design / dimensions

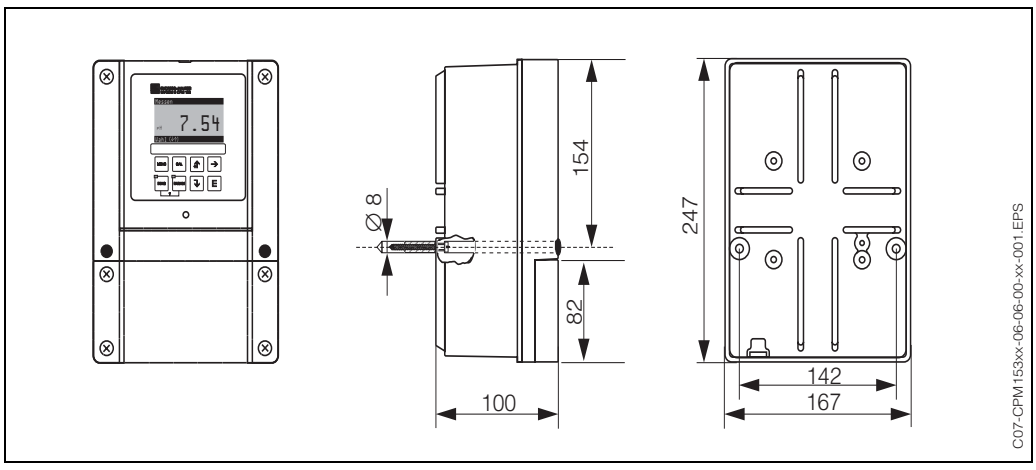


fig. 45: Dimensions of transmitter Mycom S CPM 153.

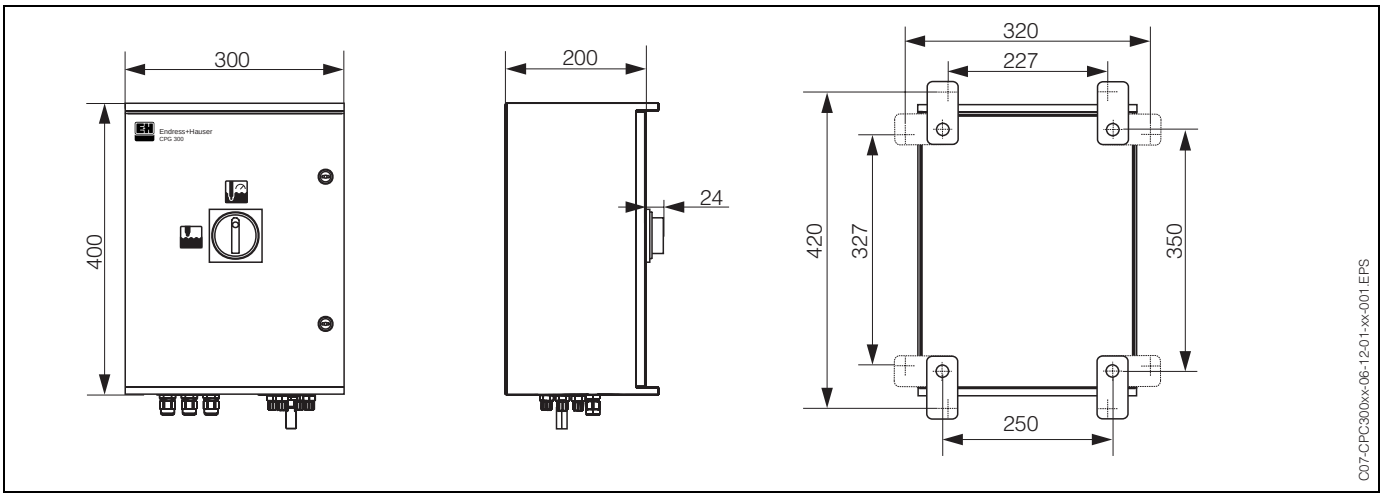


fig. 46: Dimensions of control unit CPG 300

Dimensions bottles	5 litre bottles (19 x 25 x 15 cm) Required installation height: 35 cm	

Weight	CPG 300: approx. 20 kg		CPM 153: max. 6 kg
Materials	Mycom S	Housing	GD-AlSi 12 (Mg content 0.05%), plastic-coated
		Front	Polyester, UV-resistant
	CPG 300	Housing	Ex and non-Ex: Polyester GF
		Hoses	PU, PTFE (in contact with medium)
		Pump	PVC, Viton® , PP, PVDF, POM (in contact with medium)
	Bottles		HDPE

Caution!
Only convey diluted acids (max. 3%) directly via the pump. Make sure that the wetted materials of the pump are resistant to the acids used. Technical acids contain aggressive gases which may impair the working life of the components.

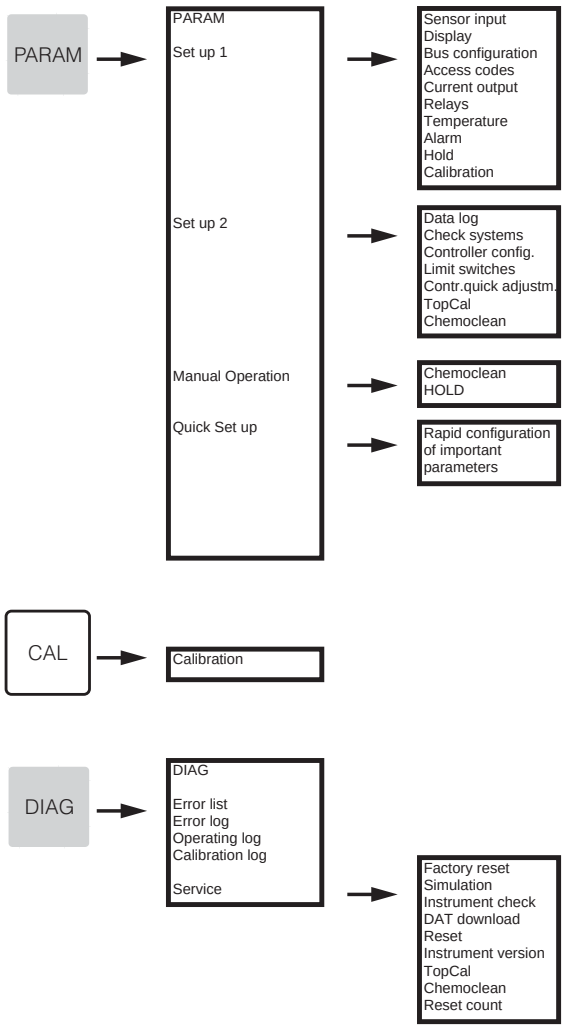
Due to the danger of pump damage, the following media have to be conveyed via external additional valves and the rinse block CPR 40:
- Technical acids (e.g. technical hydrochloric acid)
- Concentrated acids (phosphoric acid, nitric acid, sulfuric acid, hydrochloric acid)
- acetone, ketones, aromatic solutizing agents
- organic solvents
- hot media.

To do this you will have to order a system with control for additional valves (see Ordering Information).

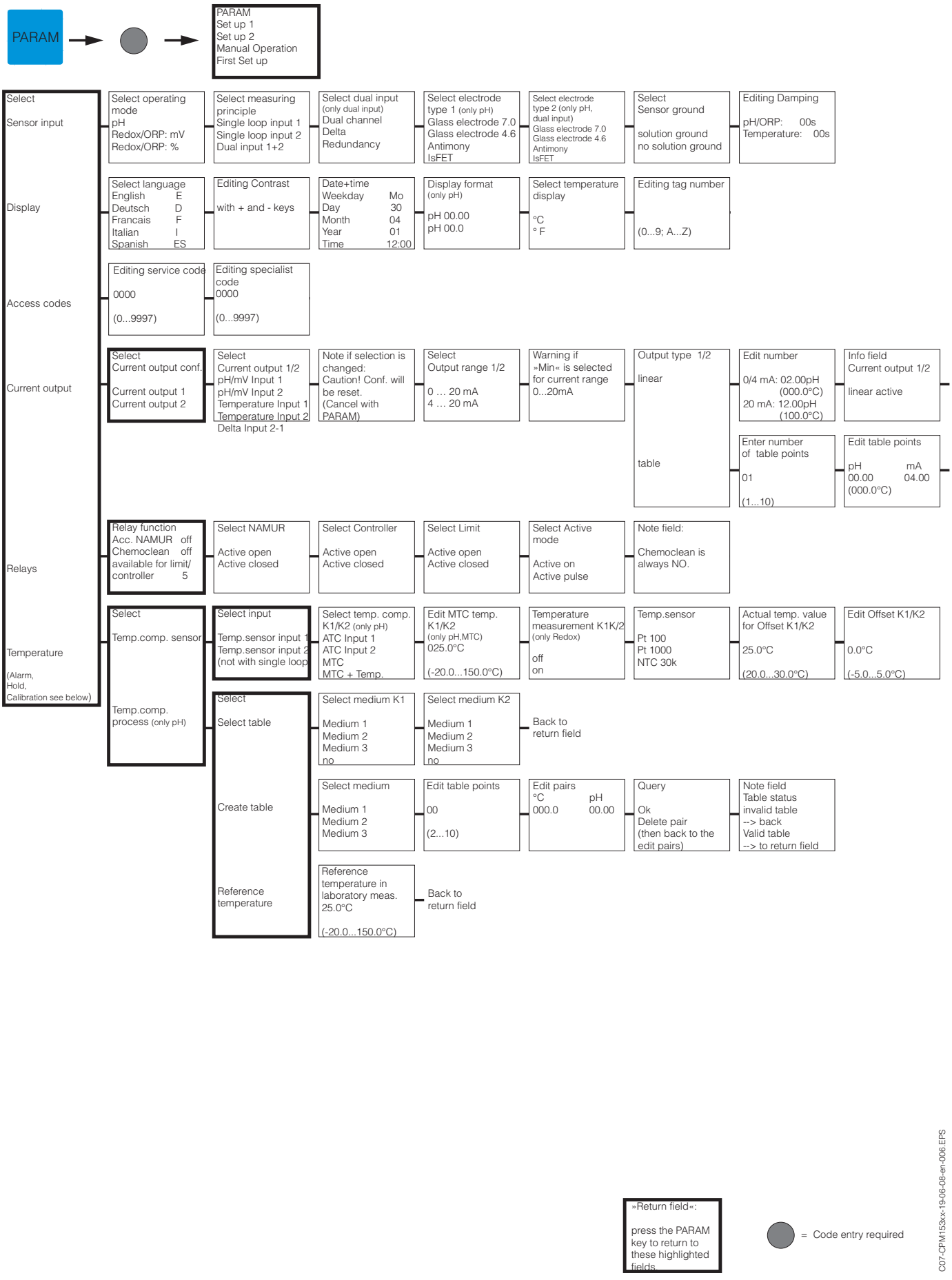
11 Appendix

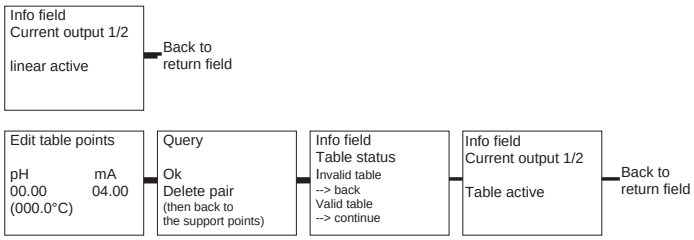
11.1 Operating matrix

The basic structure of the operating menu is shown below.

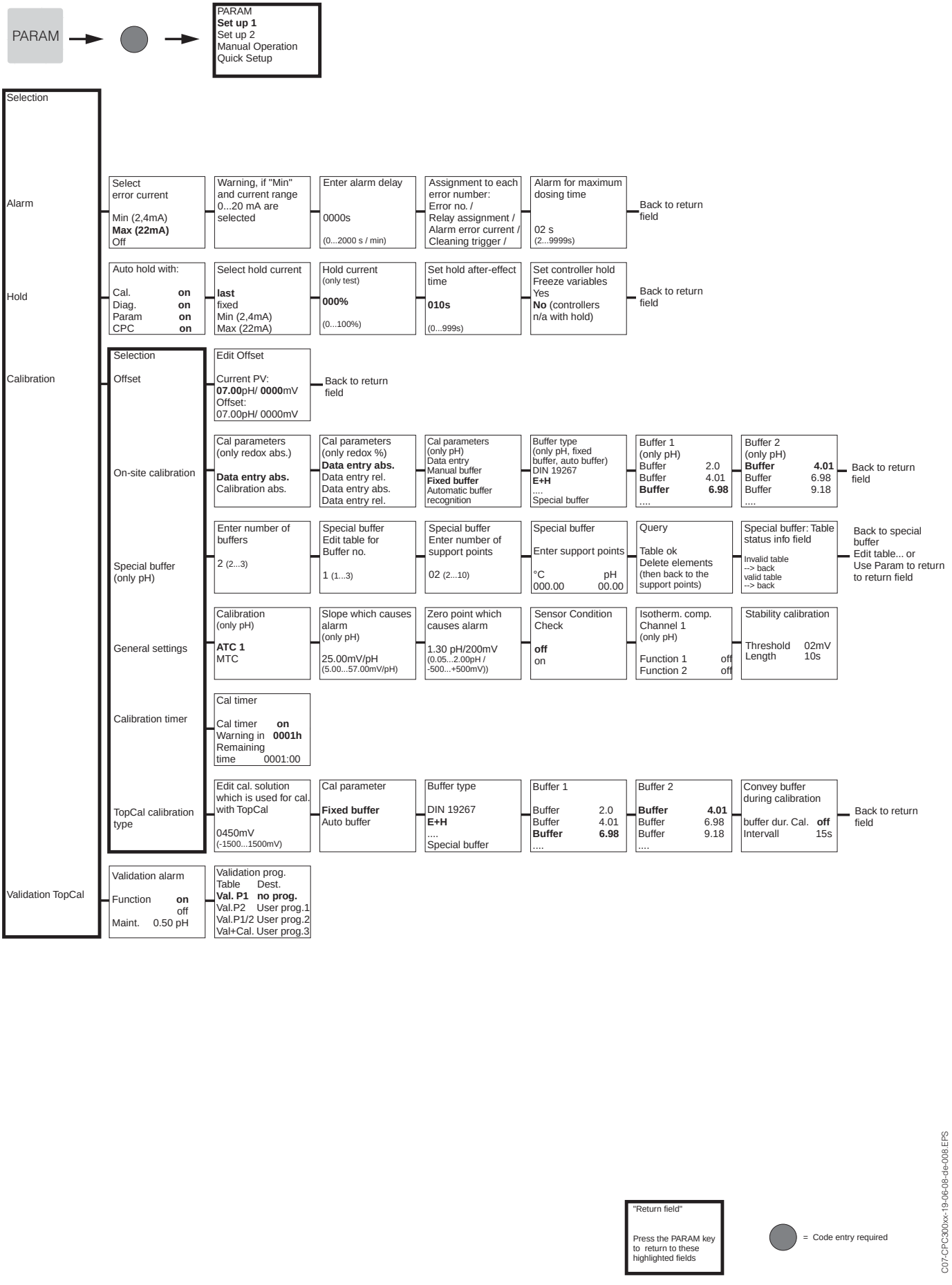


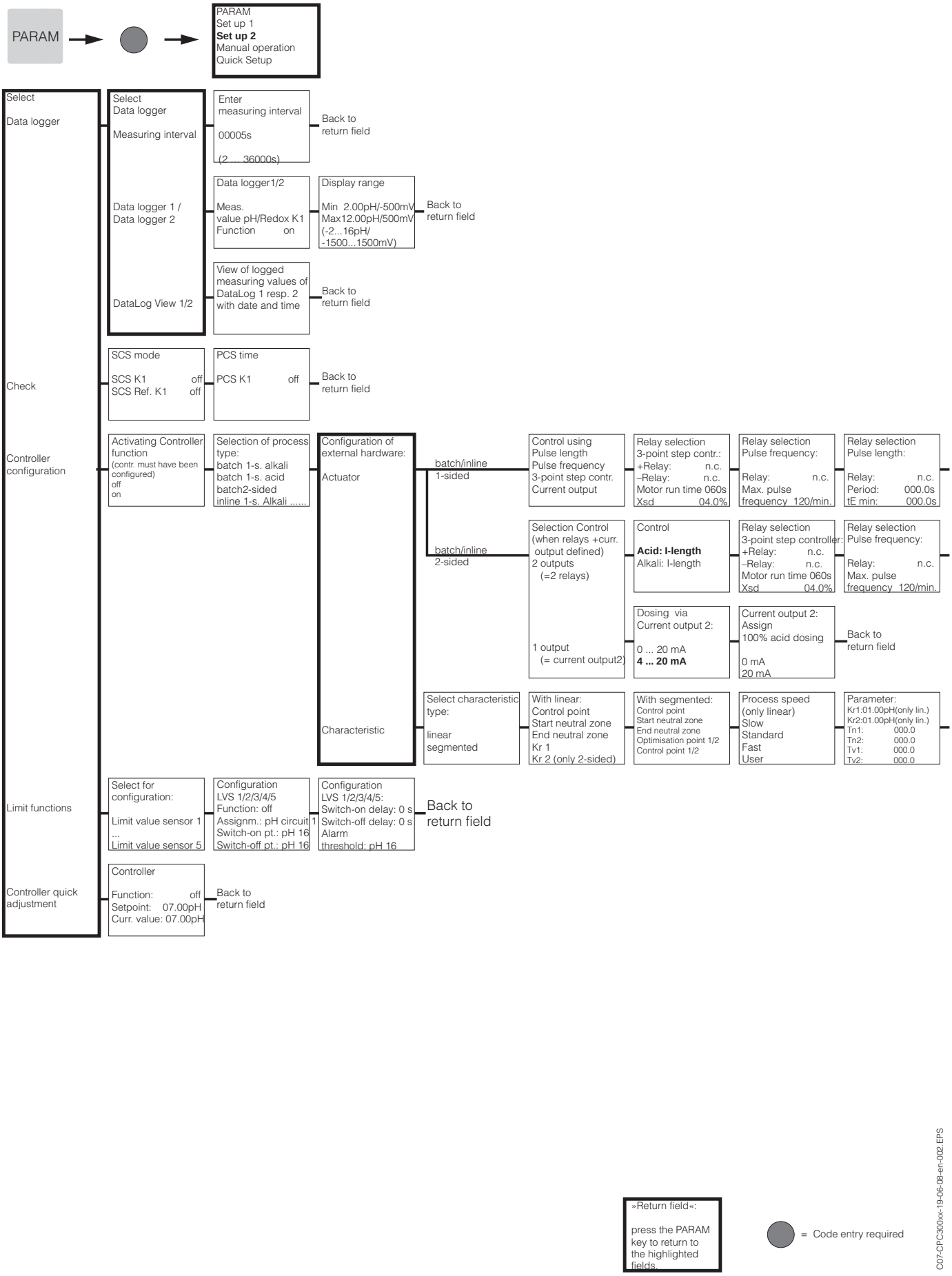
C07-CPC300xx-19-06-08-en-005.EPS

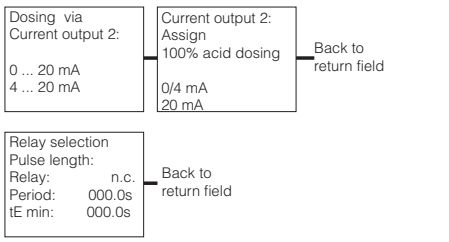

PARAM
PARAM
Set up 1
Set up 2
Manual Operation
First Set up
Select
Sensor input
Select operating mode
pH
Redox/ORP: mV
Redox/ORP: %
Select measuring principle
Single loop input 1
Single loop input 2
Dual input 1+2
Select dual input
(only dual input)
Dual channel
Delta
Redundancy
Select electrode type 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 E
Deutsch D
Francais F
Italian I
Spanish ES
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)
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
Output type 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
Chemoclean off
available for limit/ controller 5
Select NAMUR
Active open
Active closed
Select Controller
Active open
Active closed
Select Limit
Active open
Active closed
Select Active mode
Active on
Active pulse
Note field:
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
Create table
Reference temperature
Select medium K1
Medium 1
Medium 2
Medium 3
no
Select medium K2
Medium 1
Medium 2
Medium 3
no
Back to return field
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 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

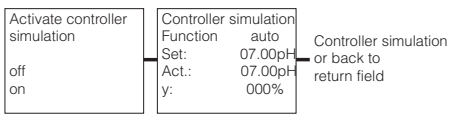


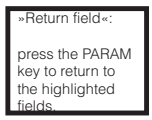
C07-CPM153xx-19-06-08-en-007.EPS

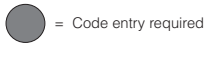

PARAM
PARAM
Set up 1
Set up 2
Manual Operation
Quick Setup
Selection
Alarm
Select error current
Min (2,4mA)
Max (22mA)
Off
Warning, if "Min" and current range 0...20 mA are selected
Enter alarm delay
0000s
(0...2000 s / min)
Assignment to each error number:
Error no. /
Relay assignment /
Alarm error current /
Cleaning trigger /
Alarm for maximum dosing time
02 s
(2...9999s)
Back to return field
Hold
Auto hold with:
Cal. **on**
Diag. **on**
Param **on**
CPC **on**
Select hold current
last
fixed
Min (2,4mA)
Max (22mA)
Hold current
(only test)
000%
(0...100%)
Set hold after-effect time
010s
(0...999s)
Set controller hold
Freeze variables
Yes
No (controllers n/a with hold)
Back to return field
Calibration
Selection
Offset
Edit Offset
Current PV:
07.00pH/ **0000**mV
Offset:
07.00pH/ 0000mV
Back to return field
On-site calibration
Cal parameters (only redox abs.)
Data entry abs.
Calibration abs.
Cal parameters (only redox %)
Data entry abs.
Data entry rel.
Data entry abs.
Data entry rel.
Cal parameters (only pH)
Data entry
Manual buffer
Fixed buffer
Automatic buffer recognition
Buffer type (only pH, fixed buffer, auto buffer)
DIN 19267
E+H
....
Special buffer
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
Special buffer (only pH)
Enter number of buffers
2 (2...3)
Special buffer
Edit table for Buffer no.
1 (1...3)
Special buffer
Enter number of support points
02 (2...10)
Special buffer
Enter support points
°C pH
000.00 00.00
Query
Table ok
Delete elements
(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
Use Param to return to return field
General settings
Calibration (only pH)
ATC 1
MTC
Slope which causes alarm (only pH)
25.00mV/pH
(5.00...57.00mV/pH)
Zero point which causes alarm
1.30 pH/200mV
(0.05...2.00pH / -500...+500mV))
Sensor Condition Check
off
on
Isotherm. comp. Channel 1 (only pH)
Function 1 off
Function 2 off
Stability calibration
Threshold 02mV
Length 10s
Calibration timer
Cal timer
Cal timer **on**
Warning in **0001h**
Remaining time 0001:00
TopCal calibration type
Edit cal. solution which is used for cal. with TopCal
0450mV
(-1500...1500mV)
Cal parameter
Fixed buffer
Auto buffer
Buffer type
DIN 19267
E+H
....
Special buffer
Buffer 1
Buffer 2.0
Buffer 4.01
Buffer 6.98
....
Buffer 2
Buffer 4.01
Buffer 6.98
Buffer 9.18
....
Convey buffer during calibration
buffer dur. Cal. **off**
Intervall 15s
Back to return field
Validation TopCal
Validation alarm
Function **on**
off
Maint. 0.50 pH
Validation prog.
Table Dest.
Val. P1 no prog.
Val.P2 User prog.1
Val.P1/2 User prog.2
Val+Cal. User prog.3
"Return field"
Press the PARAM key to return to these highlighted fields
= Code entry required
C07-CPC300xx-19-06-08-de-008.EPS


PARAM
PARAM
Set up 1
Set up 2
Manual operation
Quick Setup
Select
Data logger
Limit functions
Controller quick adjustment
Check
Controller configuration
Select
Data logger
Measuring interval
Data logger 1 /
Data logger 2
DataLog View 1/2
Enter
measuring interval
00005s
(2 ... 36000s)
Back to return field
Data logger1/2
Meas.
value pH/Redox K1
Function on
Display range
Min 2.00pH/-500mV
Max12.00pH/500mV
(-2...16pH/
-1500...1500mV)
Back to return field
View of logged measuring values of DataLog 1 resp. 2 with date and time
Back to return field
SCS mode
SCS K1 off
SCS Ref. K1 off
PCS time
PCS K1 off
Back to return field
Activating Controller function
(contr. must have been configured)
off
on
Selection of process type:
batch 1-s. alkali
batch 1-s. acid
batch2-sided
inline 1-s. Alkali .....
Configuration of external hardware:
Actuator
Characteristic
batch/inline 1-sided
batch/inline 2-sided
Control using
Pulse length
Pulse frequency
3-point step contr.
Current output
Relay selection
3-point step contr.:
+Relay: n.c.
–Relay: n.c.
Motor run time 060s
Xsd 04.0%
Relay selection
Pulse frequency:
Relay: n.c.
Max. pulse frequency 120/min.
Relay selection
Pulse length:
Relay: n.c.
Period: 000.0s
tE min: 000.0s
Selection Control
(when relays +curr. output defined)
2 outputs
(=2 relays)
1 output
(= current output2)
Control
Acid: I-length
Alkali: I-length
Relay selection
3-point step controller:
+Relay: n.c.
–Relay: n.c.
Motor run time 060s
Xsd 04.0%
Relay selection
Pulse frequency:
Relay: n.c.
Max. pulse frequency 120/min.
Dosing via Current output 2:
0 ... 20 mA
4 ... 20 mA
Current output 2:
Assign
100% acid dosing
0 mA
20 mA
Back to return field
Select characteristic type:
linear
segmented
With linear:
Control point
Start neutral zone
End neutral zone
Kr 1
Kr 2 (only 2-sided)
With segmented:
Control point
Start neutral zone
End neutral zone
Optimisation point 1/2
Control point 1/2
Process speed
(only linear)
Slow
Standard
Fast
User
Parameter:
Kr1:01.00pH(only lin.)
Kr2:01.00pH(only lin.)
Tn1: 000.0
Tn2: 000.0
Tv1: 000.0
Tv2: 000.0
Select for configuration:
Limit value sensor 1
...
Limit value sensor 5
Configuration
LVS 1/2/3/4/5
Function: off
Assignm.: pH circuit 1
Switch-on pt.: pH 16
Switch-off pt.: pH 16
Configuration
LVS 1/2/3/4/5:
Switch-on delay: 0 s
Switch-off delay: 0 s
Alarm
threshold: pH 16
Back to return field
Controller
Function: off
Setpoint: 07.00pH
Curr. value: 07.00pH
Back to return field
»Return field«:
press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPC300xx-19-06-08-en-002.EPS

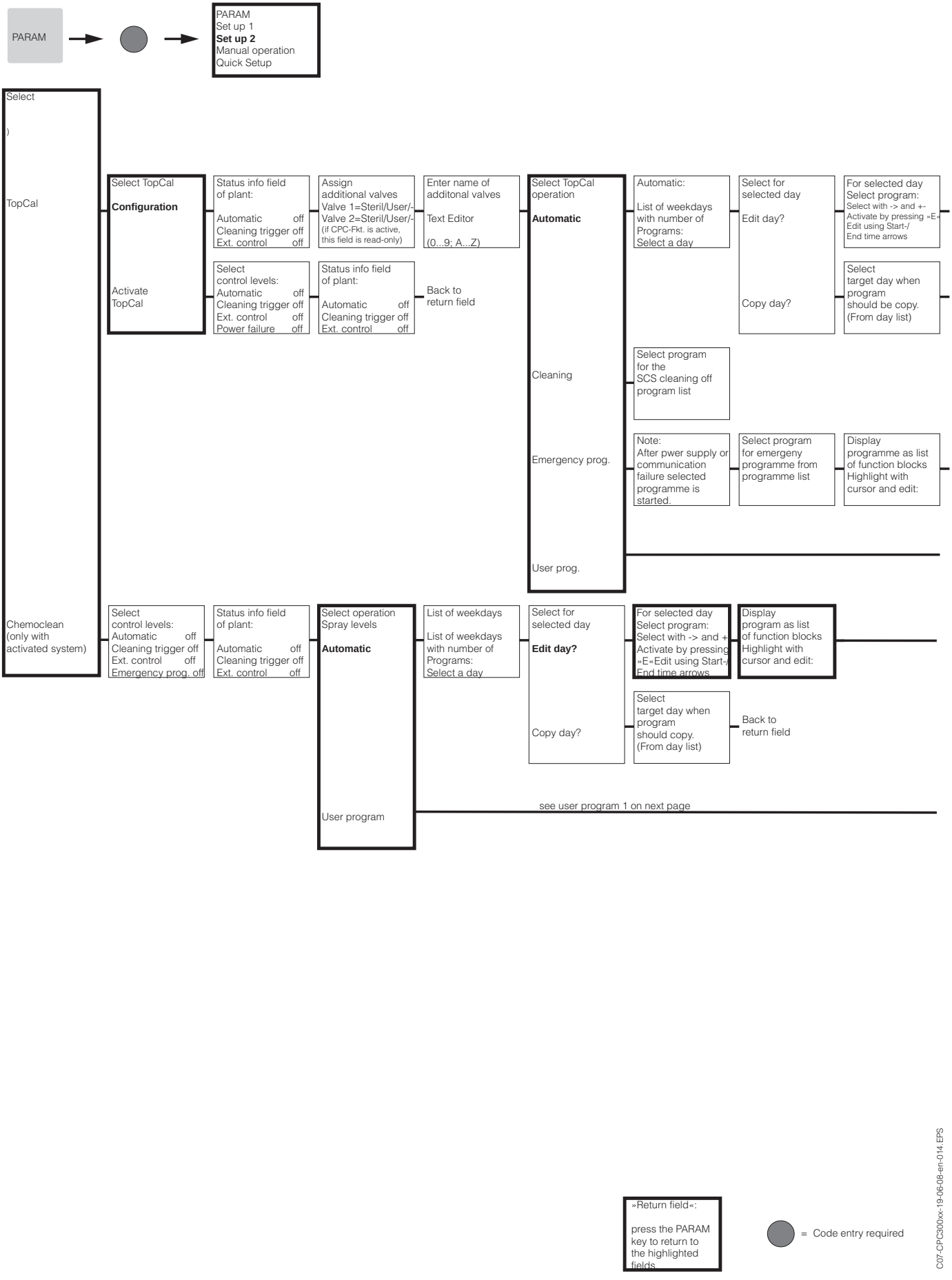


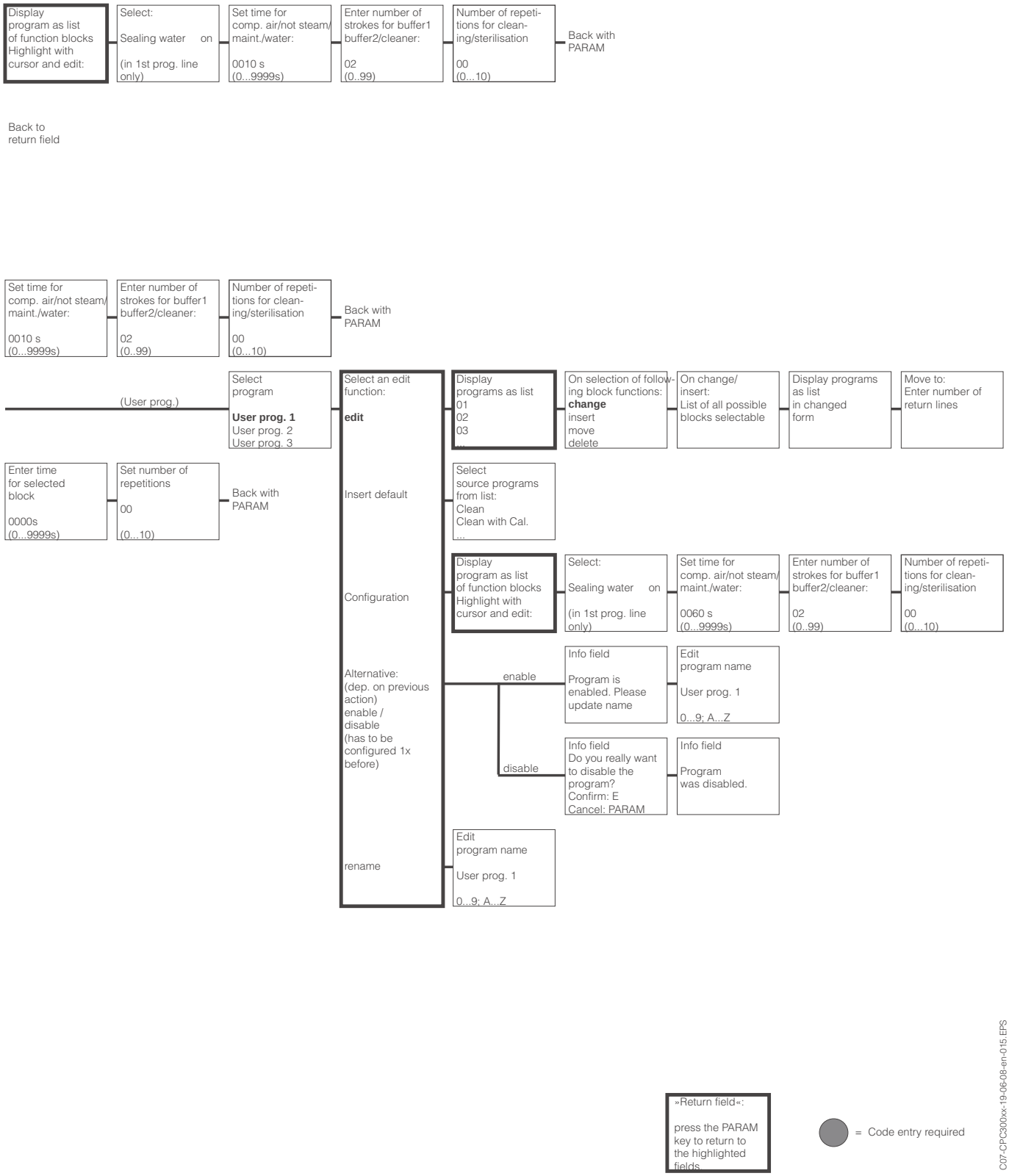


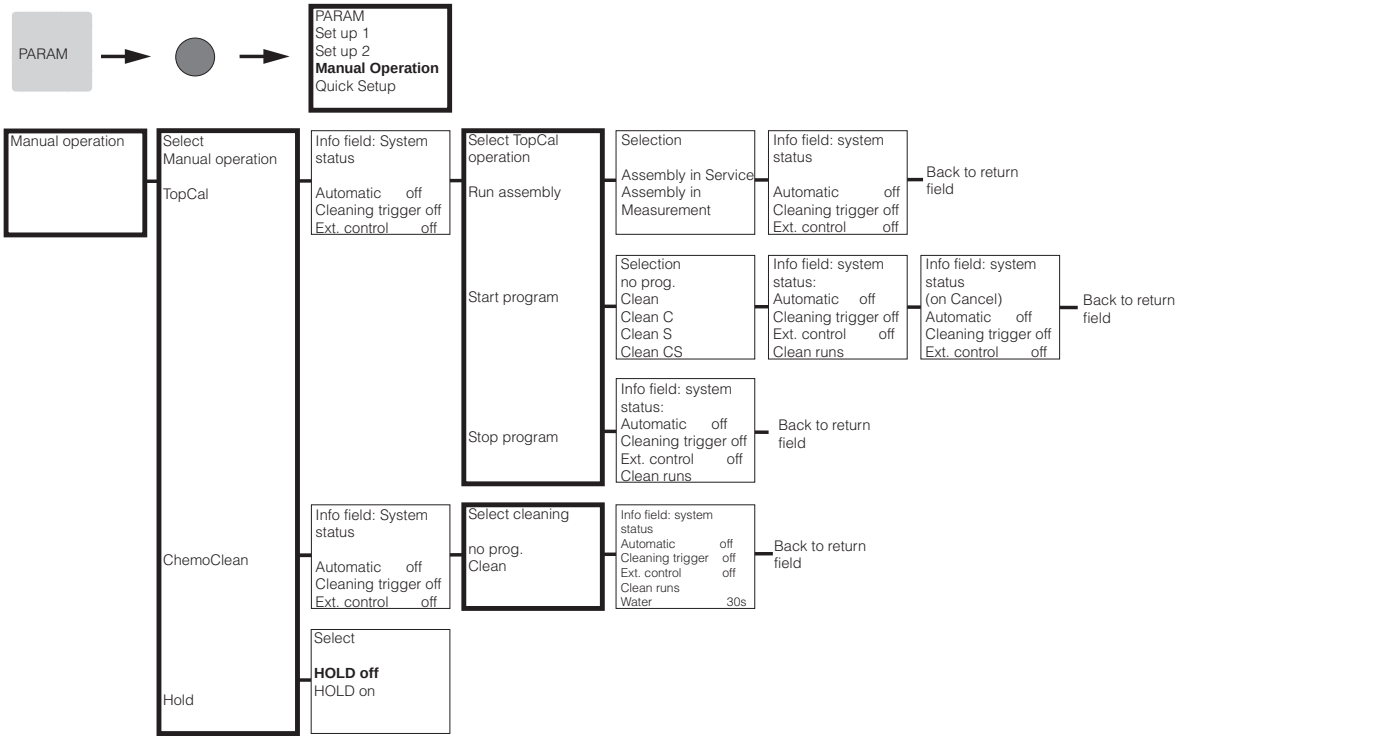


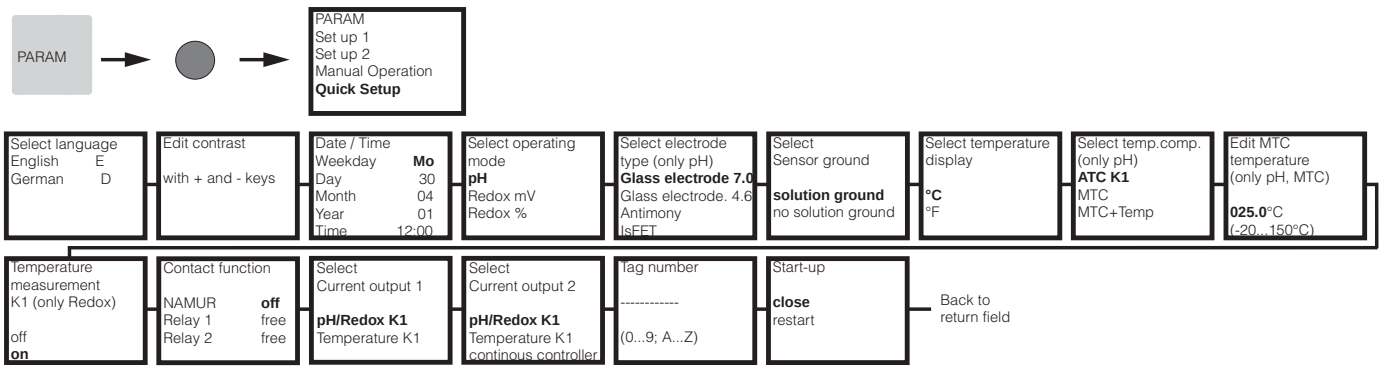


C07-CPC300xx-19-06-08-en-003.EPS


PARAM
PARAM
Set up 1
Set up 2
Manual operation
Quick Setup
Select
)
TopCal
Select TopCal
Configuration
Activate
TopCal
Status info field
of plant:
Automatic off
Cleaning trigger off
Ext. control off
Assign
additional valves
Valve 1=Steril/User/-
Valve 2=Steril/User/-
(if CPC-Fkt. is active,
this field is read-only)
Enter name of
additonal valves
Text Editor
(0...9; A...Z)
Select
control levels:
Automatic off
Cleaning trigger off
Ext. control off
Power failure off
Status info field
of plant:
Automatic off
Cleaning trigger off
Ext. control off
Back to
return field
Select TopCal
operation
Automatic
Cleaning
Emergency prog.
User prog.
Automatic:
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
Select
target day when
program
should be copy.
(From day list)
Select program
for the
SCS cleaning off
program list
Note:
After pwer supply or
communication
failure selected
programme is
started.
Select program
for emergeny
programme from
programme list
Display
programme as list
of function blocks
Highlight with
cursor and edit:
Chemoclean
(only with
activated system)
Select
control levels:
Automatic off
Cleaning trigger off
Ext. control off
Emergency prog. 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
Select
target day when
program
should copy.
(From day list)
Back to
return field
Display
program as list
of function blocks
Highlight with
cursor and edit:
see user program 1 on next page
»Return field«:
press the PARAM
key to return to
the highlighted
fields
= Code entry required
C07-CPC300xx-19-06-08-en-014.EPS


Display program as list of function blocks Highlight with cursor and edit:
Select: Sealing water on (in 1st prog. line only)
Set time for comp. air/not steam/ maint./water: 0010 s (0...9999s)
Enter number of strokes for buffer1 buffer2/cleaner: 02 (0..99)
Number of repetitions for cleaning/sterilisation 00 (0...10)
Back with PARAM
Back to return field
Set time for comp. air/not steam/ maint./water: 0010 s (0...9999s)
Enter number of strokes for buffer1 buffer2/cleaner: 02 (0..99)
Number of repetitions for cleaning/sterilisation 00 (0...10)
Back with PARAM
(User prog.)
Select program User prog. 1 User prog. 2 User prog. 3
Select an edit function: edit
Display programs as list 01 02 03 ...
On selection of following block functions: change insert move delete
On change/ insert: List of all possible blocks selectable
Display programs as list in changed form
Move to: Enter number of return lines
Enter time for selected block 0000s (0...9999s)
Set number of repetitions 00 (0...10)
Back with PARAM
Insert default
Select source programs from list: Clean Clean with Cal. ...
Configuration
Display program as list of function blocks Highlight with cursor and edit:
Select: Sealing water on (in 1st prog. line only)
Set time for comp. air/not steam/ maint./water: 0060 s (0...9999s)
Enter number of strokes for buffer1 buffer2/cleaner: 02 (0..99)
Number of repetitions for cleaning/sterilisation 00 (0...10)
Alternative: (dep. on previous action) enable / disable (has to be configured 1x before)
enable
Info field Program is enabled. Please update name
Edit program name User prog. 1 0...9; A...Z
disable
Info field Do you really want to disable the program? Confirm: E Cancel: PARAM
Info field Program was disabled.
rename
Edit program name User prog. 1 0...9; A...Z
»Return field«: press the PARAM key to return to the highlighted fields
= Code entry required
C07-CPC300xx-19-06-08-en-015.EPS



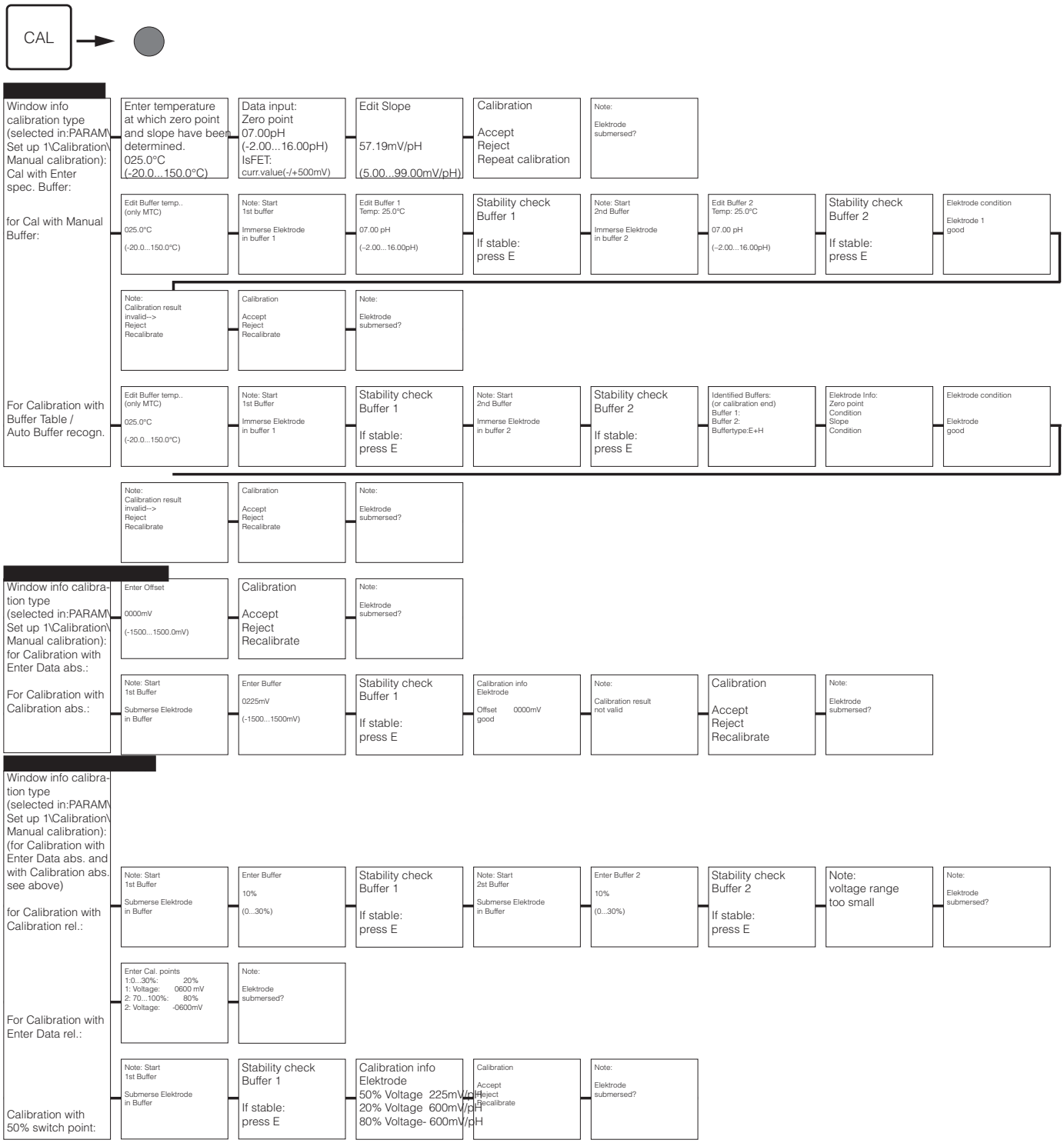


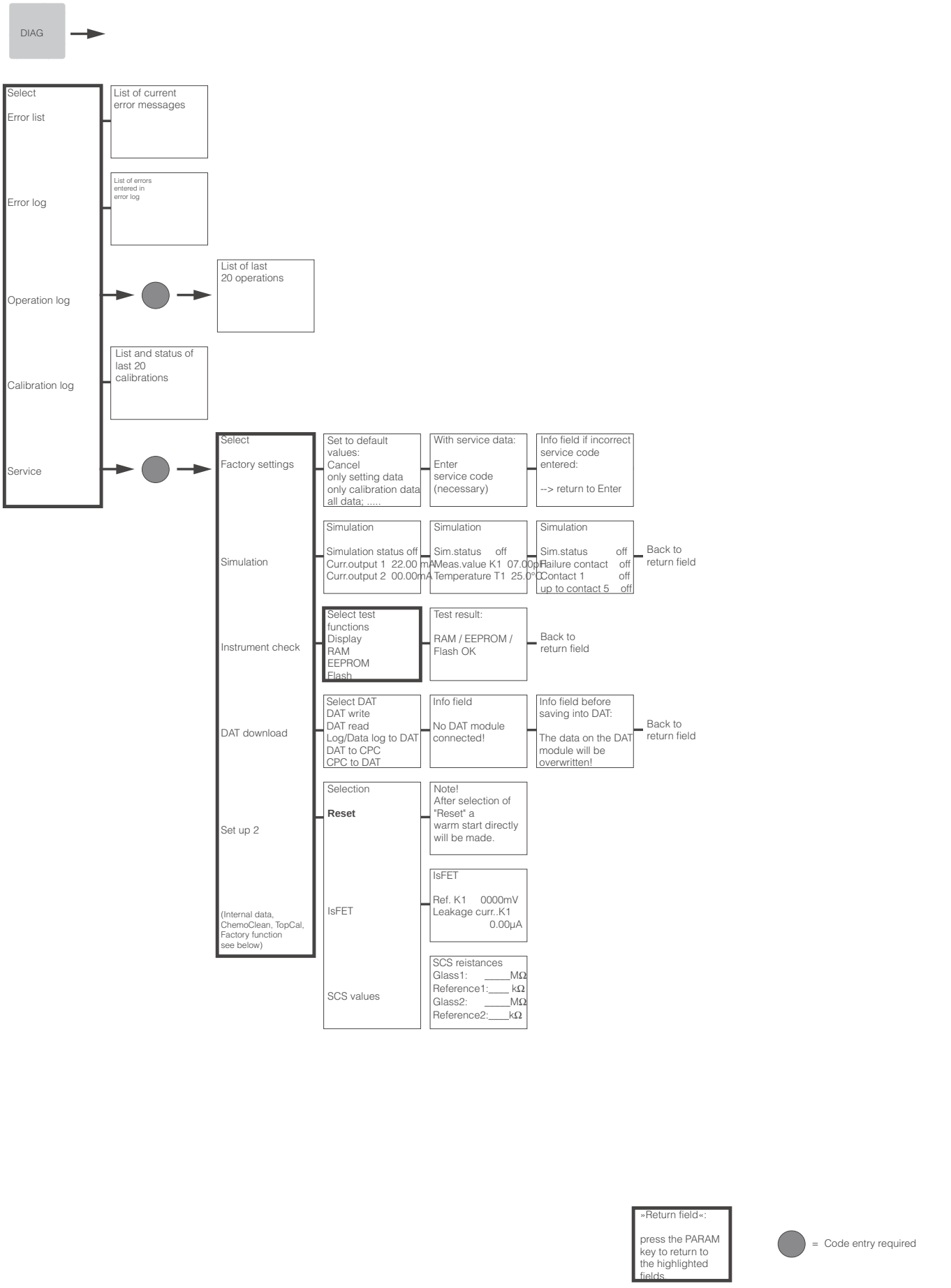
C07-CPC300xx-19-06-08-de-011.EPS

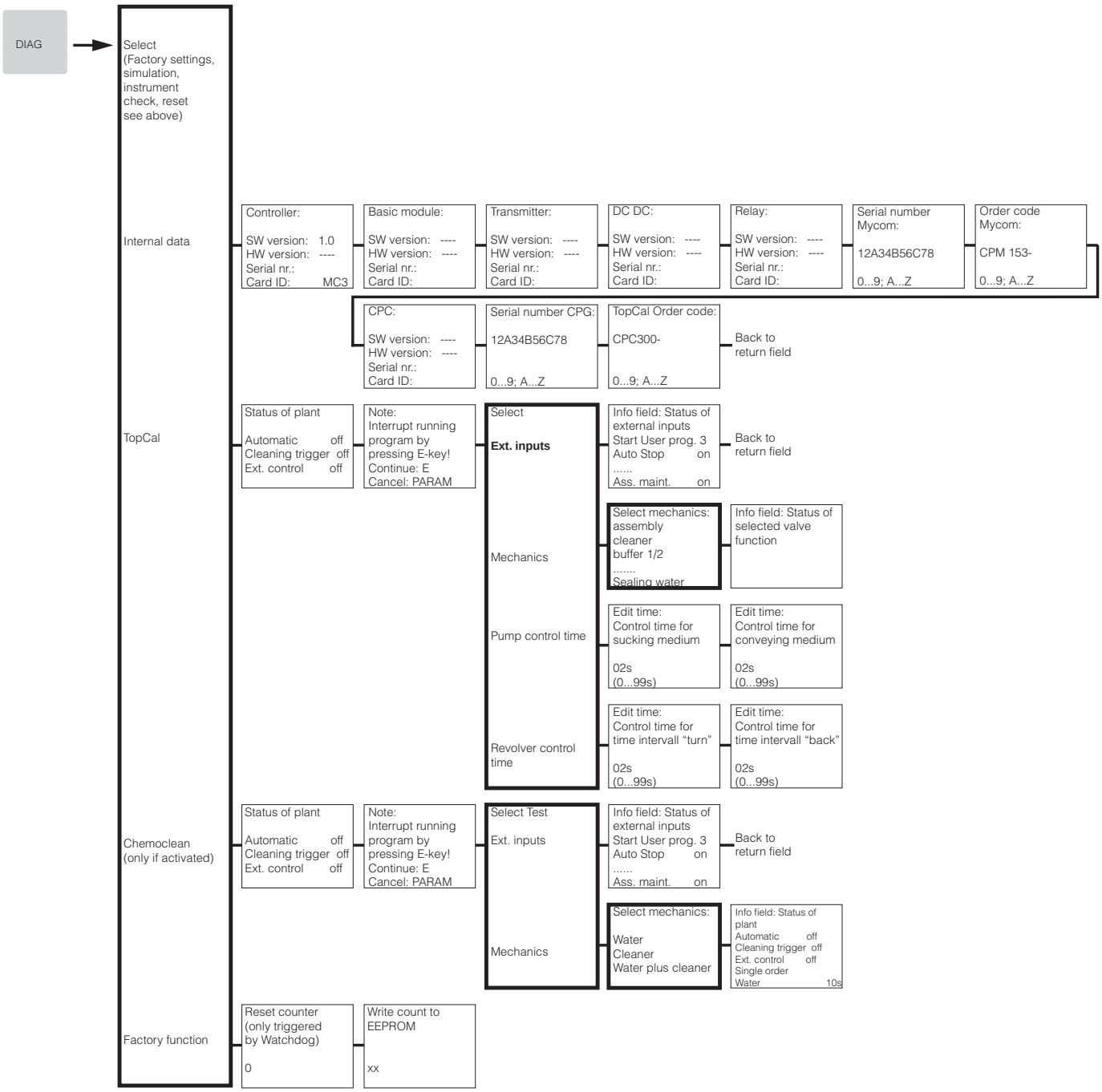
"Return field"

Press the PARAM key to return to these highlighted fields.

= Code entry required

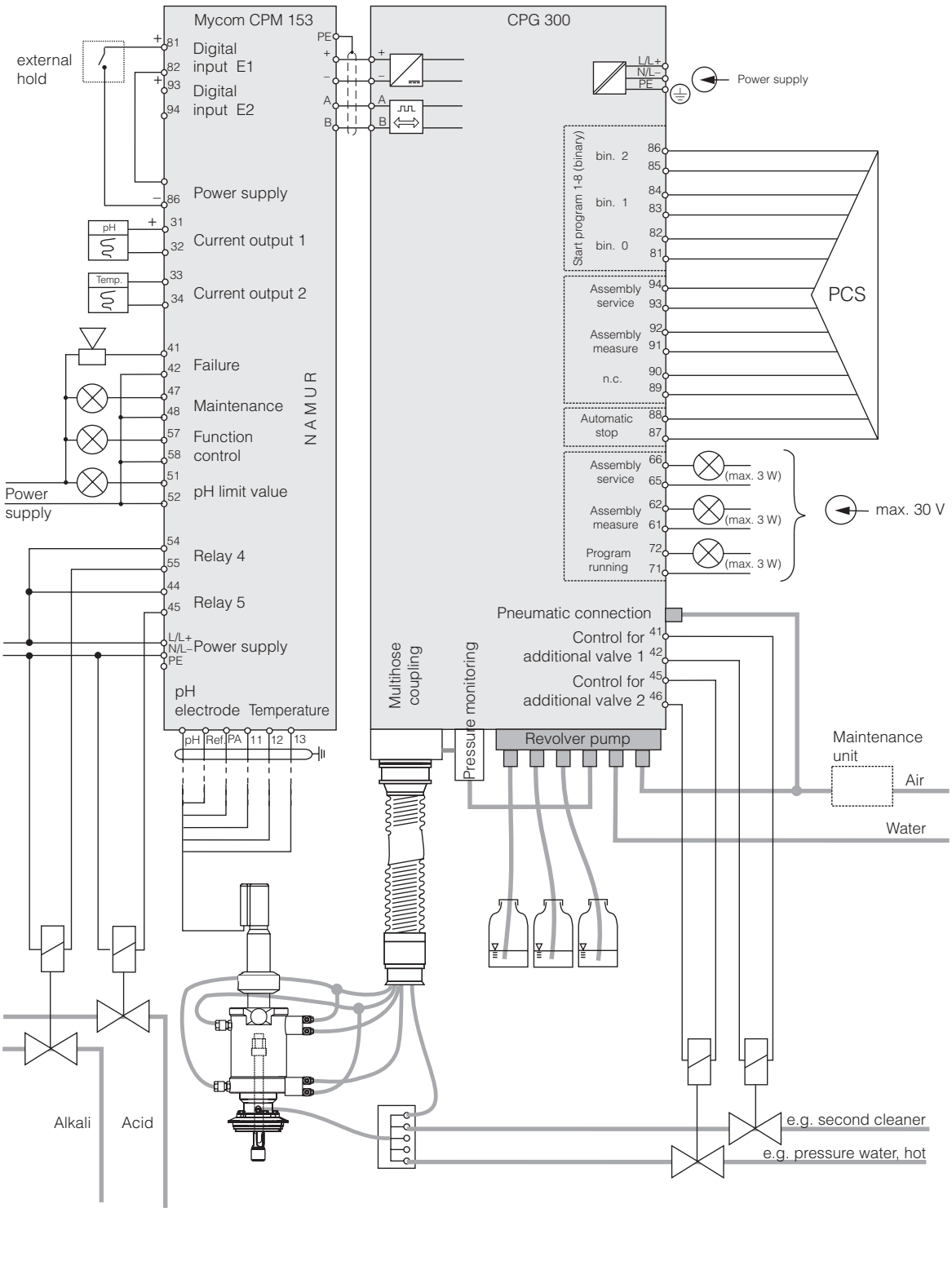

CAL
Window info calibration type (selected in:PARAM\ Set up 1\Calibration\ Manual calibration): Cal with Enter spec. Buffer:
Enter temperature at which zero point and slope have been determined. 025.0°C (-20.0...150.0°C)
Data input: Zero point 07.00pH (-2.00...16.00pH) IsFET: curr.value(-/+500mV)
Edit Slope
57.19mV/pH
(5.00...99.00mV/pH)
Calibration
Accept
Reject
Repeat calibration
Note:
Elektrode submersed?
for Cal with Manual Buffer:
Edit Buffer temp.. (only MTC)
025.0°C
(-20.0...150.0°C)
Note: Start 1st buffer
Immerse Elektrode 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 Elektrode 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
Elektrode condition
Elektrode 1 good
Note: Calibration result invalid--> Reject Recalibrate
Calibration
Accept
Reject
Recalibrate
Note:
Elektrode 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 Elektrode in buffer 1
Stability check Buffer 1
If stable: press E
Note: Start 2nd Buffer
Immerse Elektrode in buffer 2
Stability check Buffer 2
If stable: press E
Identified Buffers: (or calibration end) Buffer 1: Buffer 2: Buffertype:E+H
Elektrode Info: Zero point Condition Slope Condition
Elektrode condition
Elektrode good
Note: Calibration result invalid--> Reject Recalibrate
Calibration
Accept
Reject
Recalibrate
Note:
Elektrode submersed?
Window info calibration type (selected in:PARAM\ Set up 1\Calibration\ Manual calibration): for Calibration with Enter Data abs.:
Enter Offset
0000mV
(-1500...1500.0mV)
Calibration
Accept
Reject
Recalibrate
Note:
Elektrode submersed?
For Calibration with Calibration abs.:
Note: Start 1st Buffer
Submerse Elektrode in Buffer
Enter Buffer
0225mV
(-1500...1500mV)
Stability check Buffer 1
If stable: press E
Calibration info Elektrode
Offset 0000mV
good
Note:
Calibration result not valid
Calibration
Accept
Reject
Recalibrate
Note:
Elektrode submersed?
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 Elektrode in Buffer
Enter Buffer
10%
(0...30%)
Stability check Buffer 1
If stable: press E
Note: Start 2st Buffer
Submerse Elektrode in Buffer
Enter Buffer 2
10%
(0...30%)
Stability check Buffer 2
If stable: press E
Note: voltage range too small
Note:
Elektrode submersed?
For Calibration with Enter Data rel.:
Enter Cal. points
1:0...30%: 20%
1: Voltage: 0600 mV
2: 70...100%: 80%
2: Voltage: -0600mV
Note:
Elektrode submersed?
Calibration with 50% switch point:
Note: Start 1st Buffer
Submerse Elektrode in Buffer
Stability check Buffer 1
If stable: press E
Calibration info Elektrode
50% Voltage 225mV/pH
20% Voltage 600mV/pH
80% Voltage- 600mV/pH
Calibration
Accept
Reject
Recalibrate
Note:
Elektrode submersed?
If you press the MEAS key, a message will appear asking if you want to abort the calibration.
= Code entry required
C07-CPC300xx-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 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
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
DAT to CPC
CPC 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
Selection
Reset
Note!
After selection of "Reset" a warm start directly will be made.
IsFET
IsFET
Ref. K1 0000mV
Leakage curr..K1 0.00µA
(Internal data, ChemoClean, TopCal, Factory function see below)
SCS values
SCS reistances
Glass1: _____MΩ
Reference1:____ kΩ
Glass2: _____MΩ
Reference2:____kΩ
»Return field«:
press the PARAM key to return to the highlighted fields
= Code entry required
C07-CPC300xx-19-06-08-en-012.EPS


DIAG
Select (Factory settings, simulation, instrument check, reset see above)
Internal data
Controller: SW version: 1.0 HW version: ---- Serial nr.: Card ID: MC3
Basic module: SW version: ---- HW version: ---- Serial nr.: Card ID:
Transmitter: SW version: ---- HW version: ---- Serial nr.: Card ID:
DC DC: SW version: ---- HW version: ---- Serial nr.: Card ID:
Relay: SW version: ---- HW version: ---- Serial nr.: Card ID:
Serial number Mycom: 12A34B56C78 0...9; A...Z
Order code Mycom: CPM 153- 0...9; A...Z
CPC: SW version: ---- HW version: ---- Serial nr.: Card ID:
Serial number CPG: 12A34B56C78 0...9; A...Z
TopCal Order code: CPC300- 0...9; A...Z
Back to return field
TopCal
Status of plant Automatic off Cleaning trigger off Ext. control off
Note: Interrupt running program by pressing E-key! Continue: E Cancel: PARAM
Select
Ext. inputs
Info field: Status of external inputs Start User prog. 3 Auto Stop on ..... Ass. maint. on
Back to return field
Mechanics
Select mechanics: assembly cleaner buffer 1/2 ..... Sealing water
Info field: Status of selected valve function
Pump control time
Edit time: Control time for sucking medium 02s (0...99s)
Edit time: Control time for conveying medium 02s (0...99s)
Revolver control time
Edit time: Control time for time intervall "turn" 02s (0...99s)
Edit time: Control time for time intervall "back" 02s (0...99s)
Chemoclean (only if activated)
Status of plant Automatic off Cleaning trigger off Ext. control off
Note: Interrupt running program by pressing E-key! Continue: E Cancel: PARAM
Select Test
Ext. inputs
Info field: Status of external inputs Start User prog. 3 Auto Stop on ..... Ass. maint. on
Back to return field
Mechanics
Select mechanics: Water Cleaner Water plus cleaner
Info field: Status of plant Automatic off Cleaning trigger off Ext. control off Single order Water 10s
Factory function
Reset counter (only triggered by Watchdog) 0
Write count to EEPROM xx
»Return field«: press the PARAM key to return to the highlighted fields.
= Code entry required
C07-CPC300xx-19-06-08-en-013.EPS

11.2 Connection example

Non-Ex, double-sided neutralisation, pH limit value, NAMUR pin assignment, pH and temperature at current outputs, two additional valves, external control using PCS, assembly status display



11.3 Wiring example for external cleaning trigger

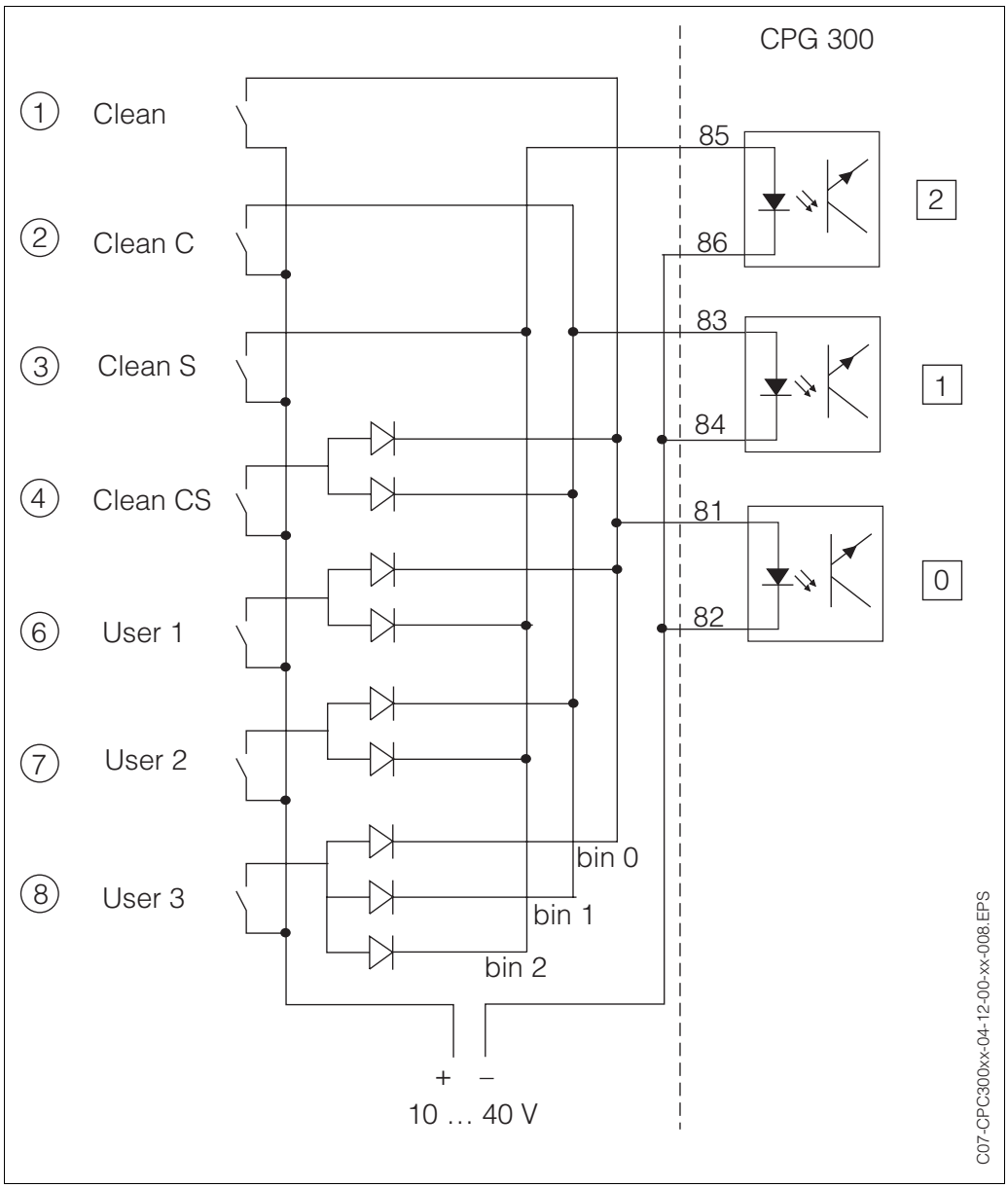


fig. 47: Wiring diagram for the external control of the cleaning programmes
①to ⑧: Buttons to start the cleaning programmes
81 to 86: Terminals for programme start
0 / 1 / 2: binary inputs of the control unit CPG 300
10 ... 40 V for e.g. taken from auxiliary power supply of Mycom S CPM 153, terminals 85/85 (15 V)
Diodes 1N4007
3 mA per optocoupler input

11.4 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 employees 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 to health ☐ biologically 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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