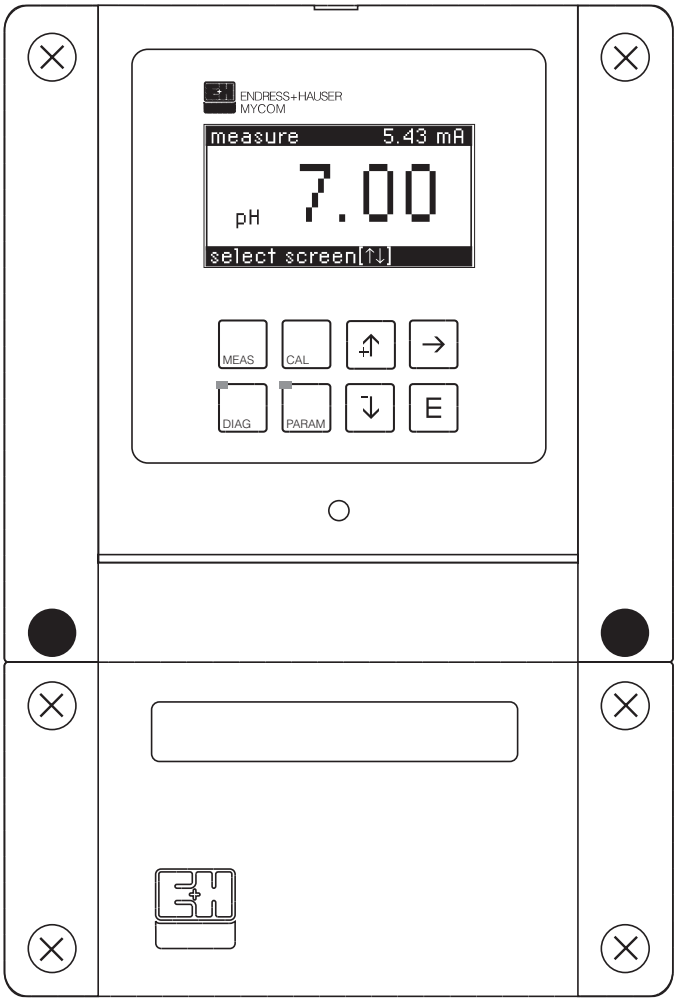
BA 143C/07/en/08.00
Nr. 50077396
Software version 3.00

Mycom
CPM 152
Transmitter/Controller for pH and Redox

Operating Instructions



Endress+Hauser
The Power of Know How

Please familiarise yourself with the instrument before you take any other steps:

General information

Safety

Description

You want to install and start up the instrument.
All the necessary steps can be found in these chapters:

Installation

First Start-up

You want to operate or reconfigure the instrument.
The operating concept is explained in these chapters:

Operation

Instrument configuration

Controller configuration

Calibration

PROFIBUS interface

When you encounter problems or when the instrument requires maintenance, please refer to these chapters:

Diagnostics

Maintenance and service

Please refer to the Mycom menu structure overview on the last pages of these operating instructions.

Table of contents

1 General information

1.1 Symbols used

Warning:

This symbol draws attention to dangers. Failure to follow the instructions may lead to serious injury or damage to property.

Caution:

This symbol draws attention to possible faults due to operator error.

Note:

This symbol draws attention to important items of information.

1.2 Conformity statement

The pH and redox measuring transmitter Mycom CPM 152 has been developed and manufactured in accordance with current European standards and directives.

Note:

A conformity statement can be obtained from Endress+Hauser.

2 Safety

2.1 Intended use

The measuring transmitter Mycom CPM 152 is a microprocessor-based measuring and control instrument used to determine and evaluate the pH value and the redox potential. Since it has been designed to permit extensive programming and the addition of optional plug-in modules, it can be adapted to carry out complicated control assignments and to be incorporated in automatic process control systems.
If the version of the Mycom CPM 152 with explosion protection is chosen, it can be operated in explosive atmospheres as well.

2.2 General safety instructions

Warning:

Operating this instrument in any way other than described in these instructions may compromise the safety and function of the measuring system and is not therefore allowed.

Installation, start-up, operation

The Mycom CPM 152 instrument has been designed and manufactured for safe operation according to the state of the art in engineering and conforms to the relevant regulations and EC directives (see “Technical data”). However, if used improperly or other than for the intended purpose, it may be hazardous, e.g. due to improper connection.

Installation, electrical connection, start-up, operation and maintenance of the measuring system must therefore be performed exclusively by trained specialist personnel properly authorised by the system operator for such work. The specialist personnel must be familiar with these operating instructions and must adhere to the instructions contained therein.

2.3 Safety functions

- **Access codes:**
  Unauthorised access to the calibration and configuration data of the measuring transmitter is effectively prevented by access codes.
- **Alarm functions:**
  The fault contact is activated in case of system faults, temperature sensor failure and serious defects.
  The alarm contact is fail-safe by design, i.e. the alarm is also actuated immediately in case of power failure.
- **Data integrity:**
  The set configuration is maintained even after a power failure.
- **Immunity to interference:**
  This instrument is protected against interference, such as pulse-shaped transients, high frequency and electrostatic discharges in accordance with the current European standards.
  This is, however, only the case for instruments connected as outlined in these operating instructions.

3 Description

3.1 Application areas

The measuring transmitter Mycom CPM 152 is highly suitable for carrying out measuring and control assignments - even in the case of difficult control systems - in the following areas:

- Chemical process engineering
- Pharmaceutical industry
- Food industry
- Water treatment
- Water monitoring
- Effluent treatment
- Sewage treatment plants
- Drinking water

3.2 Measuring system

A typical measuring system consists of:

- a pH combination electrode with or without an integrated temperature sensor Pt 100
- an additional temperature sensor Pt 100 when electrodes without an integrated temperature sensor are being connected.
- an appropriate immersion, flow or retractable assembly with or without a potential matching pin
- a corresponding pH or redox measuring cable
- the Mycom CPM 152 measuring transmitter

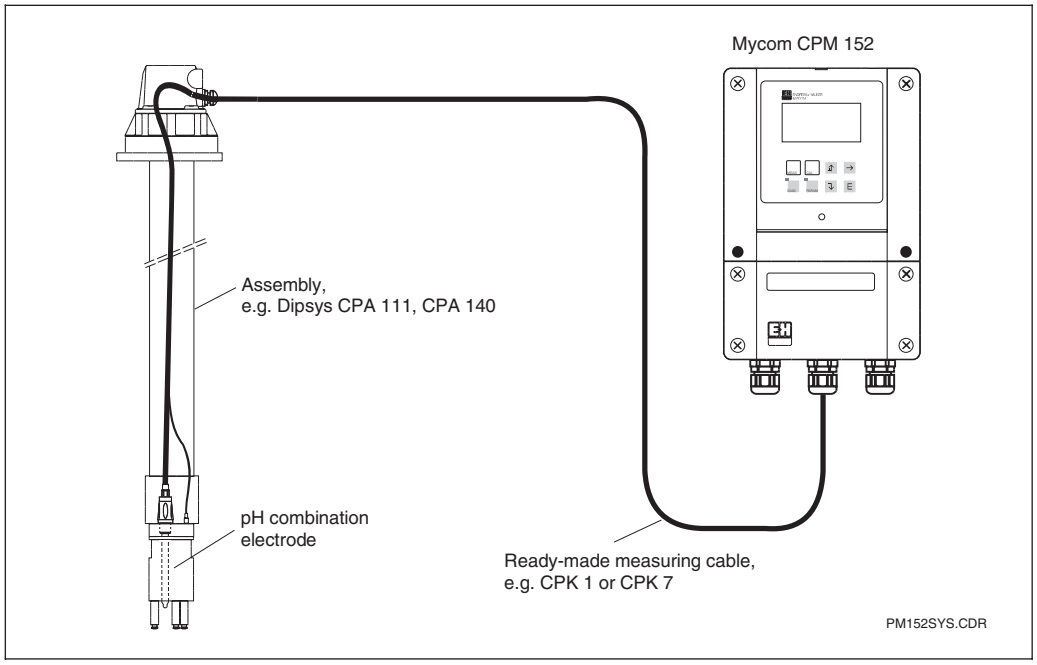


Fig. 3.1 Example of a complete measuring system

3.3 Major features

- Eight-line liquid cristall display
- Plain text menu guidance
- Extensive and clearly structured programming alternatives
- Configuration and calibration are protected by access codes that the user can choose himself
- Modular design with plug-in modules, therefore two measuring inputs, Chemoclean and Autoclean control, two current outputs 0/4 ... 20 mA and up to five contact outputs are possible

Note:

Extension of the instrument by adding new plug-in modules or replacement of individual modules must, however, be carried out exclusively by the manufacturer or the Endress+Hauser service organisation (see the back page of these operating instructions).

3.4 Instrument versions

By means of the order code on the nameplate and the required power supply.
you can identify the instrument version,

pH and redox measuring transmitter Mycom CPM 152

Field housing for wall mounting, ingress protection IP 65
basic version with: 2 signal outputs 0 / 4 ... 20 mA (pH/redox and temperature),
2 output contacts, integrated electrode function monitoring

Equipment and certificate

1-circuit version for non-hazardous areas

A1A Basic version
A1B 3 relays (Chemoclean)
A1C Feedback/hold contact
A1D 3 relays / feedback/hold contact (Autoclean)
A1E PROFIBUS
A1F 3 relays (Chemoclean), PROFIBUS
A1G Feedback/hold contact, PROFIBUS
A1H 3 relays / feedback/hold contact (Autoclean), PROFIBUS

2-circuit version for non-hazardous areas

A2A Basic version
A2B 3 relays (Chemoclean)
A2C Feedback/hold contact
A2D 3 relays / feedback/hold contact (Autoclean)

1-circuit version for Ex areas (CENELEC)

Z1A Basic version, EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1B 3 optocouplers (Chemoclean), EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1C Feedback/hold contact, EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1D 3 optocouplers / feedback/hold contact (Autoclean), EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1E PROFIBUS, EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1F 3 optocouplers (Chemoclean), PROFIBUS, EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1G Feedback/hold contact, PROFIBUS, EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z1H 3 optocouplers / feedback/hold contact (Autoclean), PROFIBUS, EEx em [ia/ib] IIC T4, Atex II (1) 2G

2-circuit version for Ex areas (CENELEC)

Z2A Basic version, EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z2B 3 optocouplers (Chemoclean), EEx em [ia/ib] IIC T4, Atex II (1) 2G
Z2C Feedback/hold contact, EEx em [ia/ib] IIC T4, Atex II (1) 2G

1-circuit version for Ex areas (FM)

F1A Basic version, NI outputs Cl. I Div. 2, Cl. II/III Div. 1, Cl. I Zone 2
F1B 3 optocouplers (Chemoclean), NI outputs Cl. I Div. 2, Cl. II/III Div. 1, Cl. I Zone 2
F1D 3 optocouplers / feedback/hold contact (Autoclean), EEx em [ia/ib] IIC T4, Atex II (1) 2G,
NI outputs Cl. I Div. 2, Cl. II/III Div. 1, Cl. I Zone 2
F1H 3 optocouplers / feedback/hold contact (Autoclean), PROFIBUS,
NI outputs Cl. I Div. 2, Cl. II/III Div. 1, Cl. I Zone 2

2-circuit version for Ex areas (FM)

F2B 3 optocouplers (Chemoclean), NI outputs Cl. I Div. 2, Cl. II/III Div. 1, Cl. I Zone 2

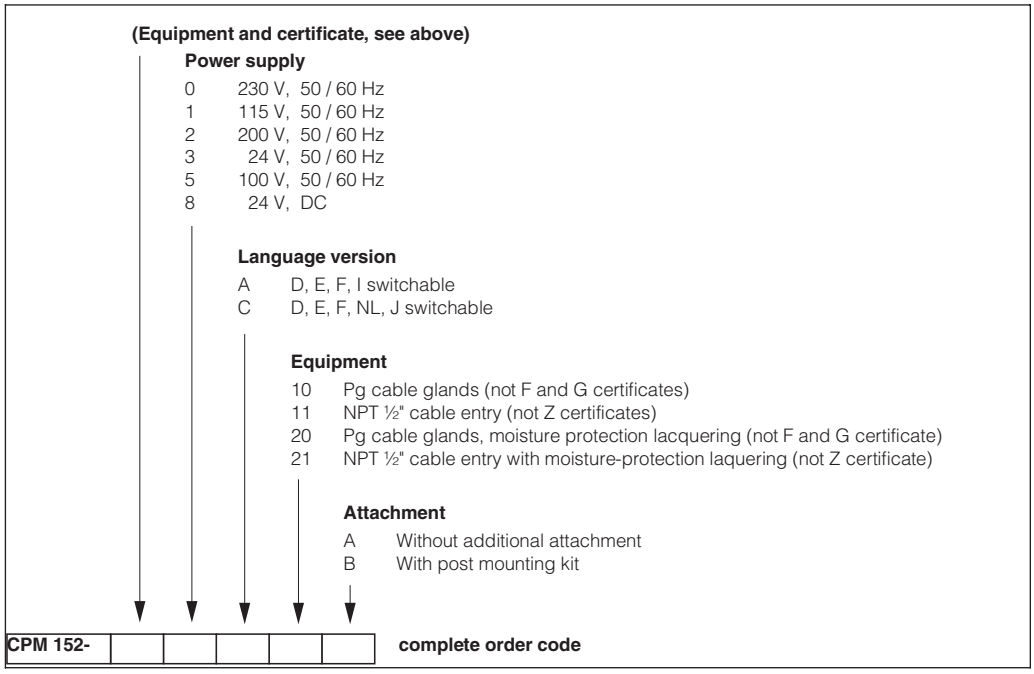
1-circuit version for Ex areas (FM AIS)

G1A Basic version, AIS NI Cl. I-III Div. 1&2, Group A-G
G1B 3 optocouplers (Chemoclean), AIS NI Cl. I-III Div. 1&2, Group A-G
G1D 3 optocouplers / feedback/hold contact (Autoclean), EEx em [ia/ib] IIC T4, Atex II (1) 2G,
AIS NI Cl. I-III Div. 1&2, Group A-G
G1H 3 optocouplers / feedback/hold contact (Autoclean), PROFIBUS,
AIS NI Cl. I-III Div. 1&2, Group A-G

2-circuit version for Ex areas (FM AIS)

G2B 3 optocouplers (Chemoclean), AIS NI Cl. I-III Div. 1&2, Group A-G

▼ (p. t. o.)



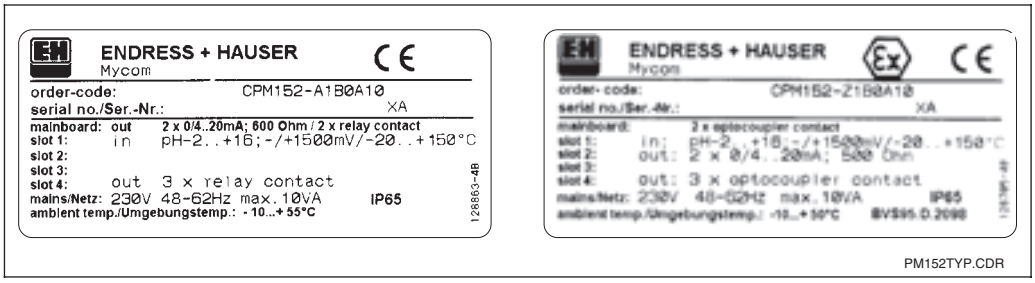


Fig. 3.2 Nameplates of Mycom CPM 152 in non-Ex (left) and Ex version (right)

3.5 Accessories

3.5.1 Attached accessories

- 2 cable glands Pg 13.5 (non-Ex version only)
- Kit for panel and post mounting (mounting version B only)
- 1 measuring point sign with 2 nails
- Operating Instructions
- Certificate of conformity for Ex devices
- Instrument identification card

3.5.2 Buffer solutions for calibration

Technical pH buffer solution (25 °C)

- pH 4.0 red
  Contents: 1000 ml
  Order no. CPY 2-1
- pH 7.0 green
  Contents: 1000 ml
  Order no. CPY 2-3

Technical redox buffer solution (25 °C)

- +225 mV, pH 7.0
  Contents: 100 ml
  Order no. CPY 3-0
- +475 mV, pH 0.0
  Contents: 100 ml
  Order no. CPY 3-1

3.5.3 Mounting accessories

Mounting accessories for the Mycom CPM 152 you will find in chapter 4.3.

4 Installation

4.1 Storage and transport

The packaging material used to store and transport the instrument must provide shock and moisture protection. The original packaging materials offer most effective protection. The ambient conditions also have to meet the requirements (see “Technical data”).

4.2 Unpacking

Inspect for any damaged packaging. The post office or freight carrier must be informed of any damage and the supplier must be notified.

Check that the delivery is complete and corresponds to your order and the shipping documents:

- Quantity delivered
- Instrument version according to the nameplate (see chapter 3.4)
- Accessories (see chapter 3.5.1)
- Operating instructions
- Instrument identification card(s)

Keep the original packaging materials in case the instrument has to be stored or sent anywhere at a later date.

If you have any questions, please contact your supplier or the Endress+Hauser sales agency in your area (see the back of these operating instructions).

4.3 Mounting

Wall installation (mounting versions A and B)

Insert the screws in the attachment holes in the housing and secure the instrument as shown in fig. 4.1.

The holes are covered with plastic caps.

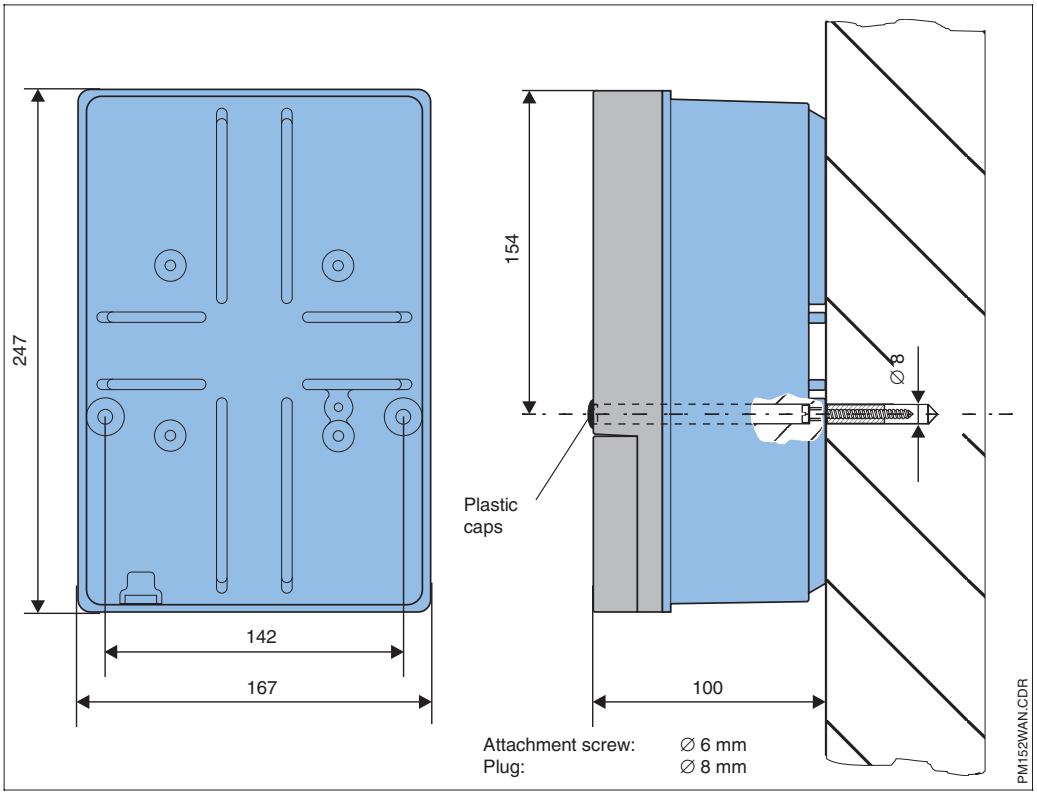
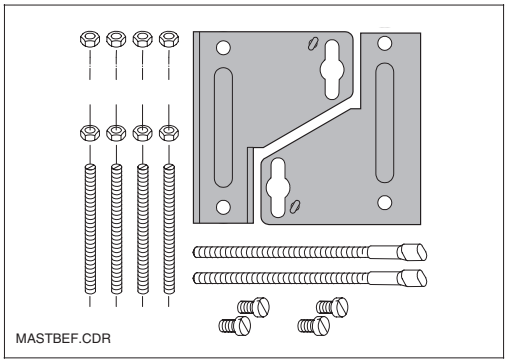


Fig. 4.1 Dimensions for wall installation

Post and panel installation (mounting version B)



Mounting kit for control panel and post installation (order no. 50061357)

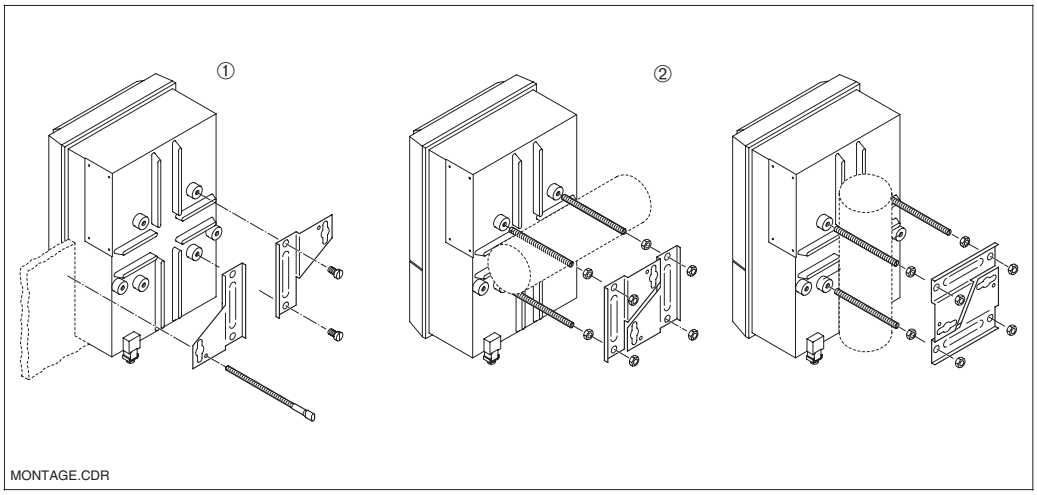
Fig. 4.2

Attach the parts of the mounting kit supplied with the mounting version B to the back of the housing, as shown in fig. 4.3:

Cut-out required: $161^{+0.5}$ x $241^{+0.5}$ mm
Installation depth: 134 mm
Pipe diameter: max. 70 mm

Caution:

Weather protection cover CYY 101 has to be used for installation outdoors (see “Mounting accessories”).



Control panel installation ① and post mounting ② Mycom CPM 152

Fig. 4.3

Mounting accessories

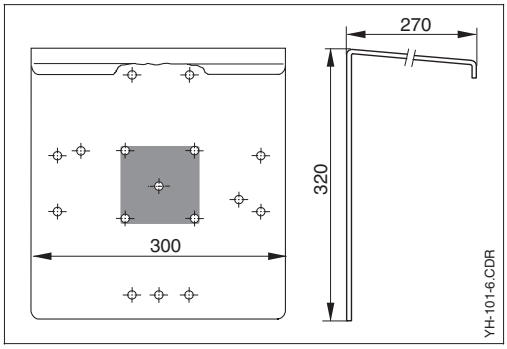
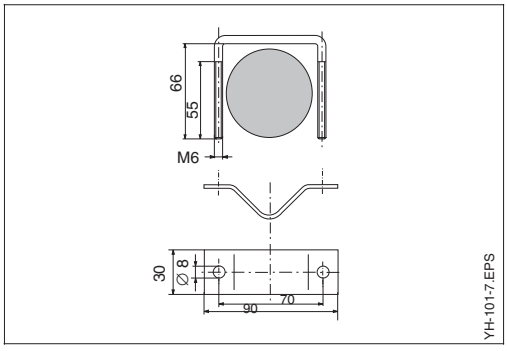


Fig. 4.4 Weather protection cover

- Flat gasket for panel mounting
  Order no. 50064975

- Weather protection cover CYY 101 for operating the Mycom CPM 152 outdoors.
  Material: stainless steel
  Order code CYY101-A
  2 round post attachment kits (see fig. 4.5) are also needed for installation on vertical or horizontal pipes.



Round post attachment kit for weather protection cover CYY 101

Fig. 4.5

- Round post attachment kit for weather protection cover CYY 101. For attachment to vertical or horizontal pipes with a diameter of up to 60 mm.
  Material: stainless steel AISI 304
  Order no. 50062121

4.4 Electrical connection of Mycom CPM 152

Warning:

- Only appropriately trained personnel is allowed to work on the instrument when the system is live and is connected to the mains.
- A mains disconnection device must be installed near the instrument and must be identifed as the mains disconnecting device for the CPM 152 (see EN 61010-1).
- Do not start up the instrument until a protective wire has been connected!
- Before connecting the instrument to the mains, make sure the mains voltage matches the voltage rating on the nameplate!
- When an instrument with explosion protection is being connected, it is vital that the appropriate regulations are observed (see chapter 4.4.2).

Caution:

- All lines conducting signals are to be shielded according to VDE 0165 and run separately from other control lines.

Note:

- Immunity against interference can only be guaranteed if the transmitter is earthed and the screen ground line is kept as short as possible (do not solder an extension onto the screen)!
- The earthing happend with the earth terminal or the inner PE-terminal block
- If the instrument is being installed on a post, grounding the post is also recommended.

Instrument connections

- Undo the four screws in the bottom third of the front of the housing.
- Remove the cover of the connection compartment.
- A connection diagram and information about the specific module connections can be found folded up in the cover.
- Replace the plugs by additional cable glands if required.
- Feed the cable through the cable glands into the connection compartment. Use metal cable gland for pH- / Redox signal line.
- Connect the cables in accordance with the connection diagrams on the following pages.
- Tighten the cable glands securely to make sure the connections are provided with the necessary strain relief.

Warning:

In the non-Ex area, the output contacts can also be connected to the instrument's power supply.

To do this, the thin section provided in the separating wall on the connection compartment lid must be broken out with a pair of pliers.

Now a cable connection between the right and left parts of the connection compartment can be established by attaching the cable carefully and without forming a loop in the cable clip provided.

For this purpose the supply connection has a second terminal »L« resp. »L+«.

4.4.1 Connection of Mycom CPM 152 in non-Ex areas

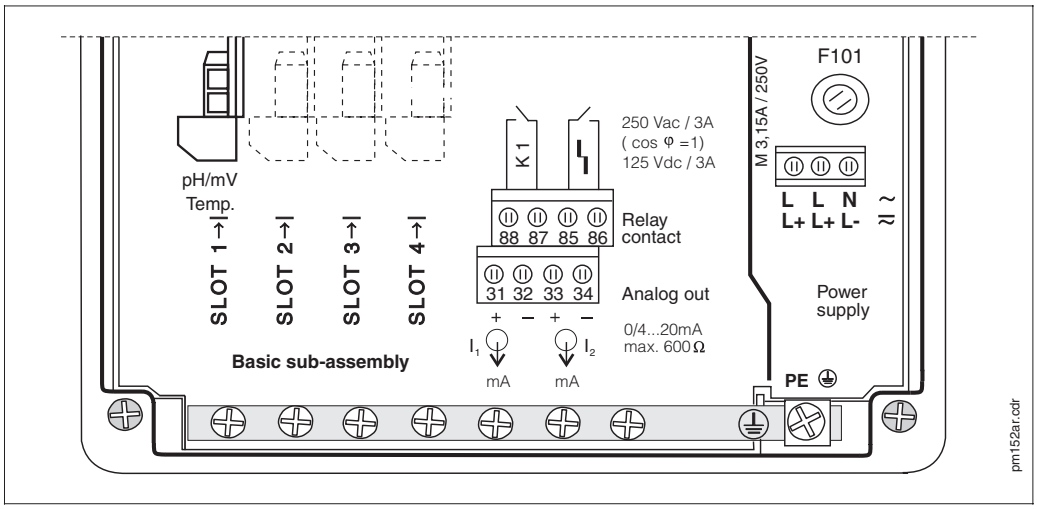


Fig. 4.6 Connection compartment Mycom CPM 152 (non-Ex) (basic equipment)

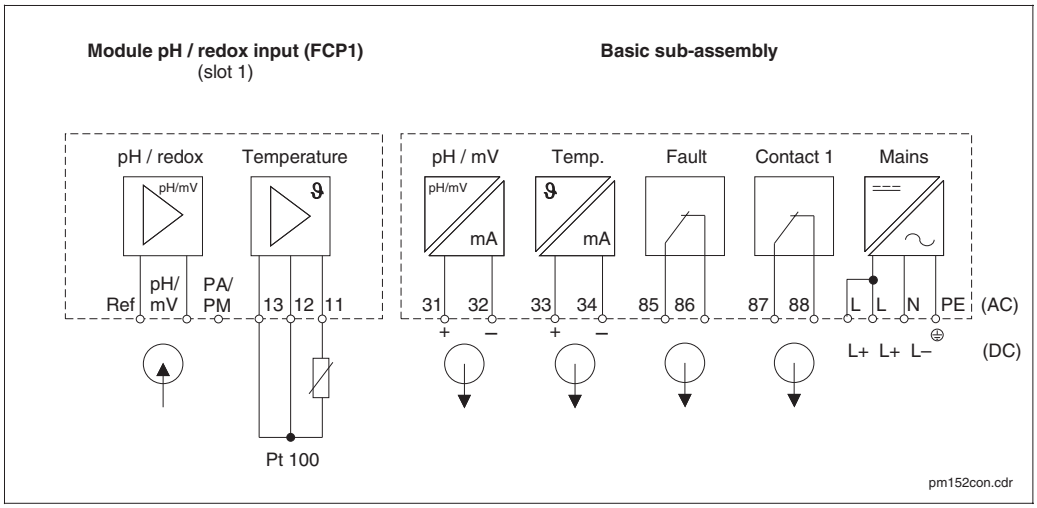
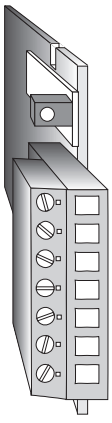


Fig. 4.7 Connection diagram Mycom CPM 152 (non-Ex) (basic equipment)

Module FCP1 (slot 1, basic configuration):



pH/mV	pH/redox input
	not connected
	not connected
Ref.	Reference
PA	Potential matching
13	Pt 100, compensation cable
12	Pt 100, sensor cable
11	Pt 100, sensor cable

Terminal blocks (basic configuration):

Power supply:
L/L+ Mains voltage phase / DC +
L/L+ Mains voltage phase / DC +
N/L- Mains voltage neutral / DC –
PE Mains voltage protective earth

Active current output:
31 Current output (pH/redox signal) plus
32 Current output (pH/redox signal) minus
33 Current output (temp. signal) plus
34 Current output (temp. signal) minus

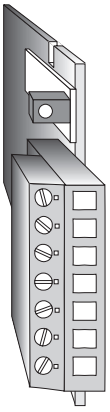
Output contacts:
85/86 Fault contact
87/88 Contact 1

Note:

- The contact situation in case of power failure or when a fault has occurred can be set for “Contact 1” and “Fault contact” via the system configuration.
- All the switching contacts are interference-suppressed with varistors. External loads that are connected may have to be interference-suppressed additionally.

Additional module FCP1:

for second pH redox input, identical to module FCP1 in the basic version



pH/mV	pH/redox input
	not connected
	not connected
Ref.	Reference
PA	Potential matching
13	Pt 100, compensation cable
12	Pt 100, sensor cable
11	Pt 100, sensor cable

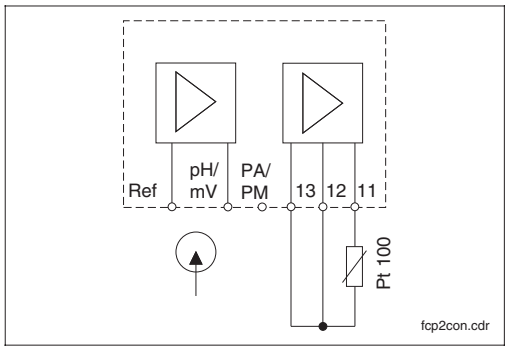


Fig. 4.8 Connection of module FCP1

Additional module FCYK:

with 3 relays for controllers and/or Chemoclean

89/90 Contact 2

91/92 Contact 3

93/94 Contact 4

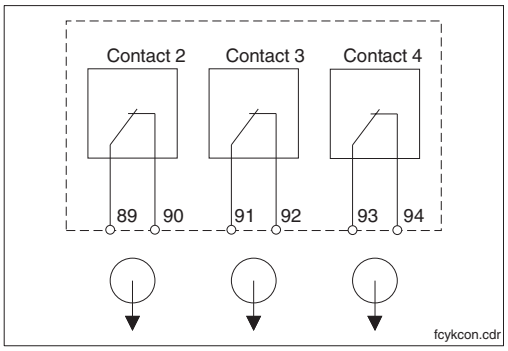


Fig. 4.9 Connection of module FCYK, non-Ex

Additional module FCXI:

with 2 binary input contacts and active analog input (measuring transmitter supply)

21 Analogue current input plus
22 Analogue current input minus

81 Binary input 1 plus
82 Binary input 1 minus

83 Binary input 2 plus
84 Binary input 2 minus

Function of the binary inputs: see chapter 6.8.

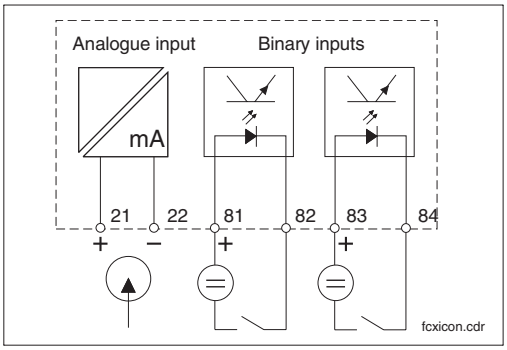


Fig. 4.10 Connection of module FCXI

Technical data

Analogue current input with measuring transmitter supply (for Autoclean system)
- Measuring current range . . . . . 0 ... 22 mA
- Supply voltage . . . . . 20 V at 30 mA

Binary inputs . . . . . Passive, external energy supply necessary
- Power supply:
  - Terminal voltage . . . . . max. 30 V, nom. 12 V
  - Current consumption . . . . . nominal ≈ 2 mA

Isolation voltage . . . . . Galvanically separated 276 V_{eff}

4.4.2 Connection of Mycom CPM 152-Z in Ex areas

General instructions about installation in potentially explosive surroundings

Instruments with the letter Z (standing for "certificate") in their name have been manufactured and tested in accordance with the standardised European regulations (CENELEC) for "Electrical equipment for potentially explosive surroundings". A copy of the conformity certificates issued by the Bergbau-Versuchsstrecke (BVS) is enclosed with this instruction manual.

There are detailed standards covering both production and operation, in Germany including:

- "Decree about electrical equipment in potentially explosive surroundings" (Elex V) Make sure you comply with DIN VDE 0165 in the installation of your instrument! Make sure you comply with Elex V § 9 when your are repairing or modifying electrical equipment!
- "Decree about flammable liquids" (VbF)
- "Equipment Safety Act" (GSG)
- "Explosion guidelines issued by the work safety association of the chemicals industry" (EX-RL)
- "Accident prevention regulations: electrical equipment"

The measuring transmitter Mycom CPM 152-Z is manufactured in accordance with the explosion protection regulations and is allowed to be installed in Zone 1 and 2.

Electrodes (measuring chains) that are suitable for the instrument can also be operated in Zone 1 without a separate approval, because their electrical data mean that they are safe in themselves. Other equipment may only be connected to the Mycom measuring transmitter (with explosion protection) - Z models - if this equipment has an electrical input circuit that is intrinsically safe.

Warning:

Display cover has to be closed during operation under ex conditions.

Note:

Useful information about the installation and operation of electrical equipment in potentially explosive surroundings can be found in the Endress+Hauser brochure GI 003/11/en "Explosion protection of electrical equipment and systems". This brochure can be ordered from the Endress+Hauser sales offices.

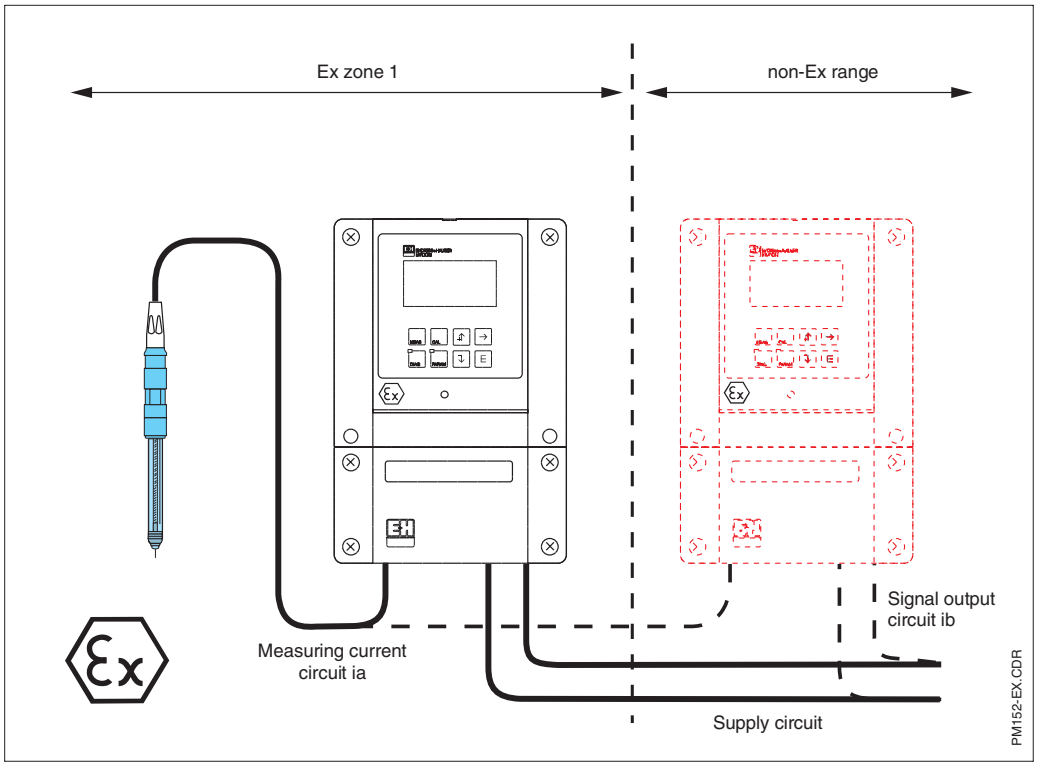


Fig. 4.11 Electrode and measuring transmitter in the explosion area

Connection compartment and connection diagram

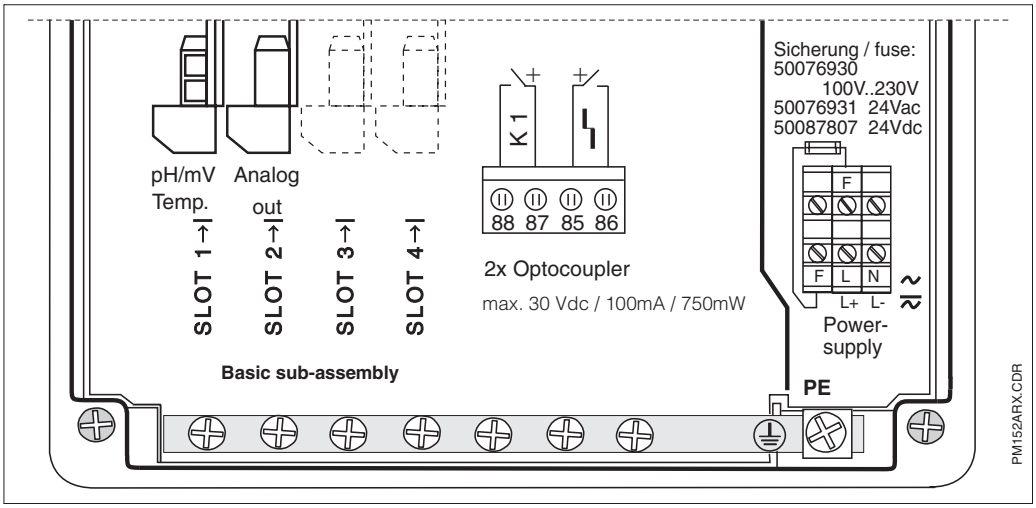


Fig. 4.12 Connection compartment Mycom CPM 152-Z with explosion protection (basic equipment)

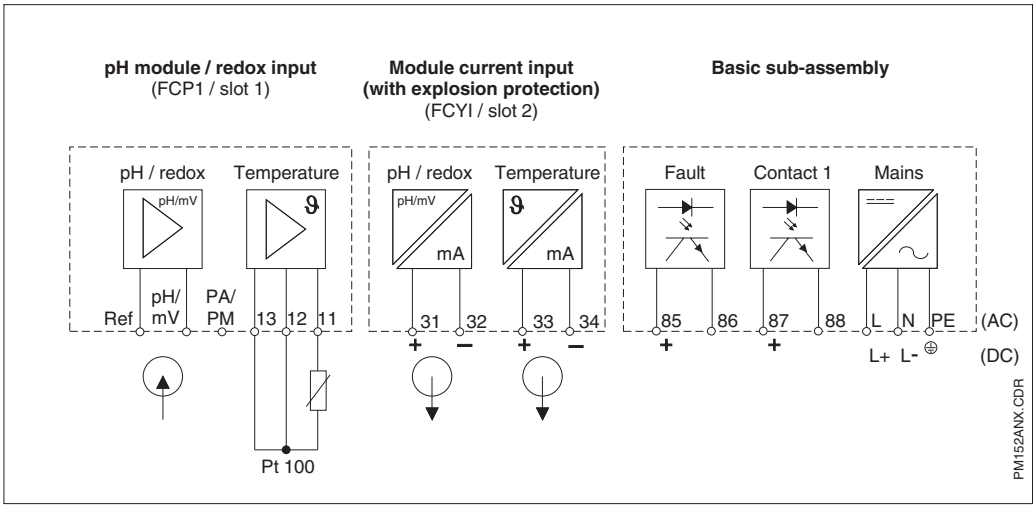
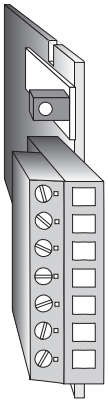


Fig. 4.13 Connection of CPM 152-Z with explosion protection (basic equipment)

Module FCP1 (slot 1, basic configuration):



pH/mV	pH/redox input
	not connected
	not connected
Ref.	Reference
PM	Potential matching
13	Pt 100, compensation cable
12	Pt 100, sensor cable
11	Pt 100, sensor cable

Connection parameters for circuits on terminals pH/mV and 11 to 13:

$C_{a,max}$= 50 nF $L_{a,max}$ = 100 µH

Module FCYI (slot 2, basic configuration):

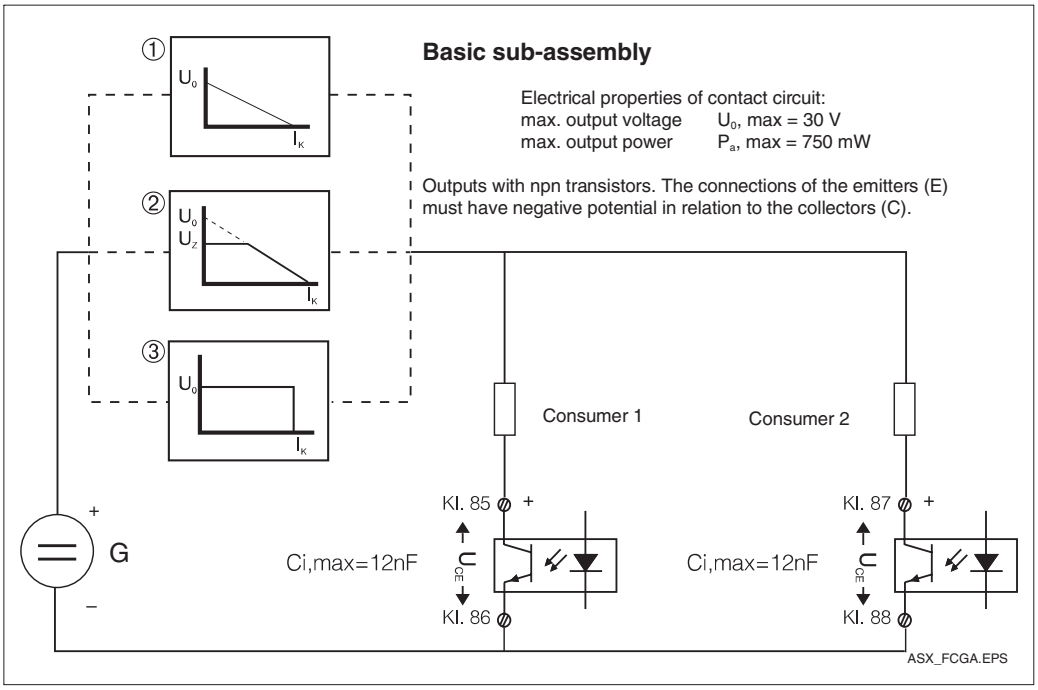
Active current output:
31 Current output 1 (pH/redox) plus
32 Current output 1 (pH/redox) minus
33 Current output 2 (temperature) plus
34 Current output 2 (temperature) minus

Connection parameters for circuits on terminals 31 to 34:
U_{max} = 16.4 V I_{max} = 65 mA
P_{max} = 1.1 W
$C_{a,max}$ = 40 nF $L_{a,max}$ = 100 µH

Terminal blocks (basic configuration):

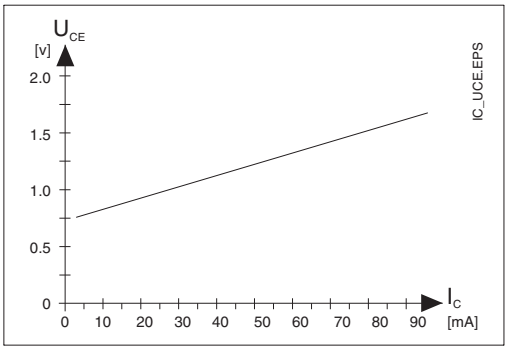
Power supply:
L/L+ Mains voltage phase or DC+
N/L- Mains voltage neutral or DC–
PE Mains voltage protective earth

Output contacts (optocoupler):
85 Fault contact (open collector +)
86 Fault contact (open collector –)
87 Contact 1 (open collector +)
88 Contact 1 (open collector –)



External wiring of optocoupler outputs on basic sub-assembly: only one intrinsically safe contact circuit (ia or ib) with a
① linear
P_a = ¼ ($U_0 \cdot I_K$)
② trapezoidal
1.) $U_Z > 0.5\ U_0$:
P_a = ¼ ($U_0 \cdot I_K$)
2.) $U_Z < 0.5\ U_0$:
$P_a = (U_0 - U_Z) \cdot U_i / R_i$
③ or rectangular
$P_a = U_0 \cdot I_K$
output characteristic of supply G

Fig. 4.14



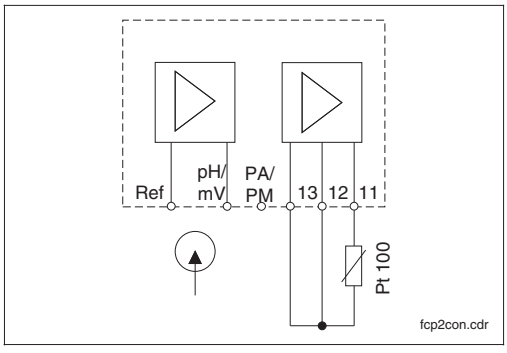
Characteristic of switching transistors on basic sub-assembly and module FCYK while switched-on

Fig. 4.15

Note:

The optocoupler outputs are high-impedance in case of power failure.

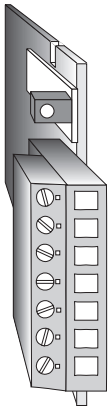
Additional module FCP1:



Connection of module FCP1

Fig. 4.16

For second pH redox input, identical to module FCP1 in the basic version



	pH/mV	pH/redox
17		not connected
16		not connected
Ref.		Reference
PM		Potential matching
13		Pt 100, compensation cable
12		Pt 100, sensor cable
11		Pt 100, sensor cable

Additional module FCYK-Ex:

with 3 optocouplers for controllers and/or Chemoclean

89 Contact 2 plus
90 Contact 2 minus

91 Contact 3 plus
92 Contact 3 minus

93 Contact 4 plus
94 Contact 4 minus

Outputs with npn transistors. The connections of the emitters (E) must have negative potential in relation to the collectors (C).

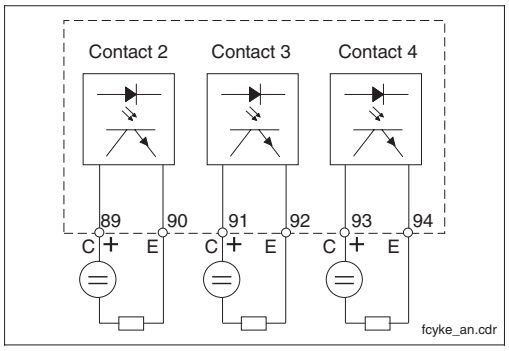


Fig. 4.17 Connection of module FCYK with explosion protection

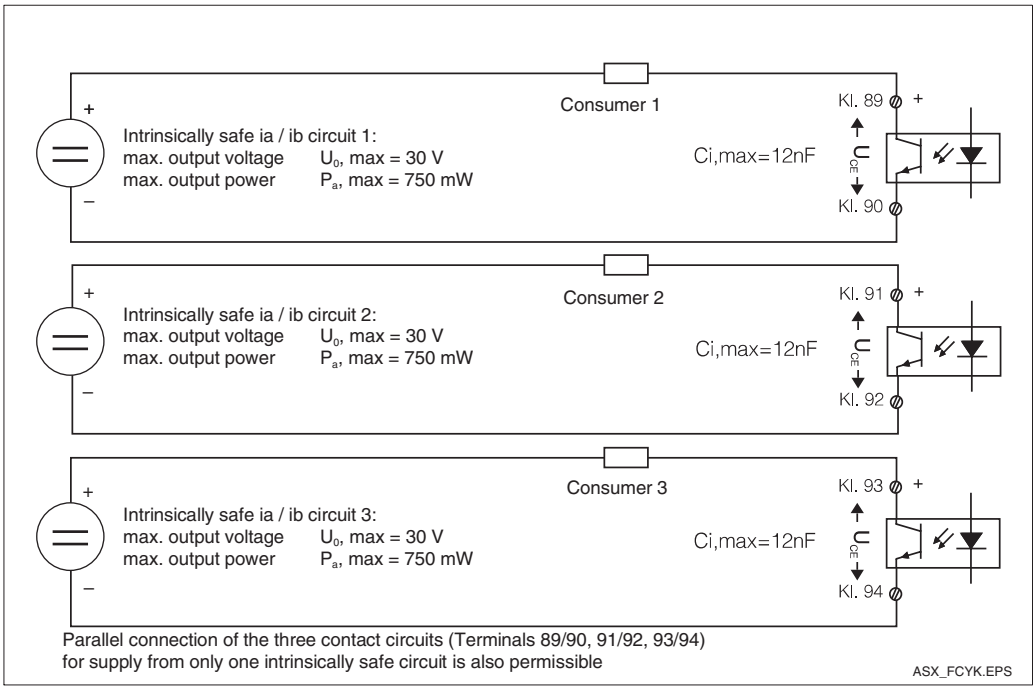


Fig. 4.18 External wiring of output contacts on module FCYK

Additional module FCYP

Digitale interface PROFIBUS-PA:

98 PA –
99 PA +

more information on PROFIBUS-PA is in chapter 10

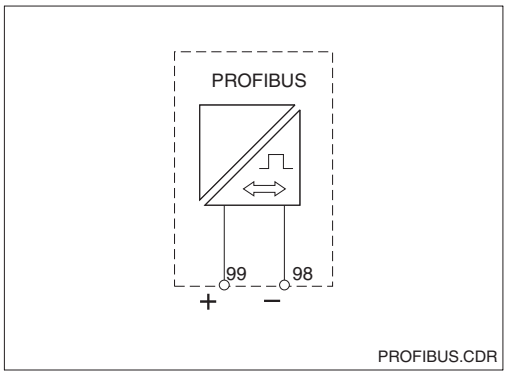


Fig. 4.19 Connection module FCYP

Additional module FCXI:

with 2 binary inputs and active
analogue input (measuring transmitter supply)

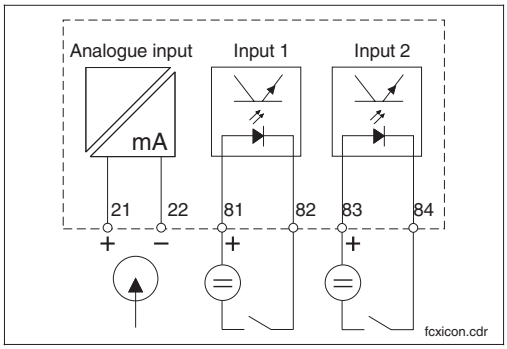


Fig. 4.20 Connection of module FCXI

21 Analogue current input plus
22 Analogue current input minus

81 Binary input 1 plus
82 Binary input 1 minus

83 Binary input 2 plus
84 Binary input 2 minus

Function of the binary inputs: see chapter 6.8.

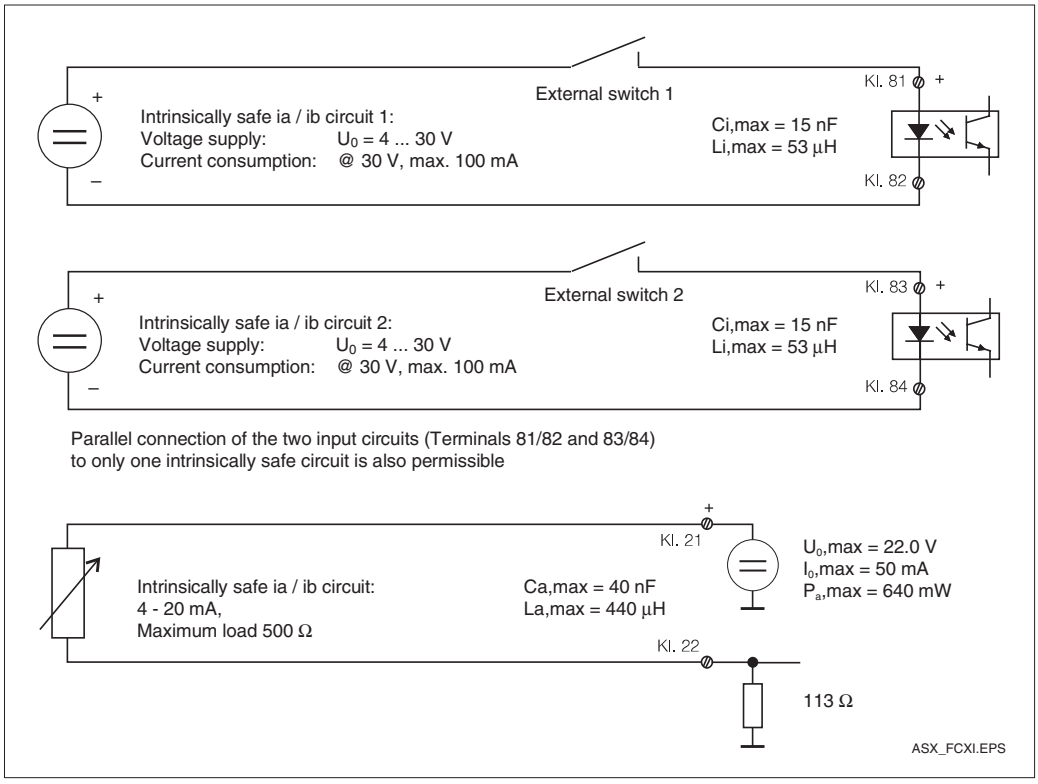


Fig. 4.21 External wiring of the input circuits on module FCXI

4.5 Connection of pH and redox electrodes

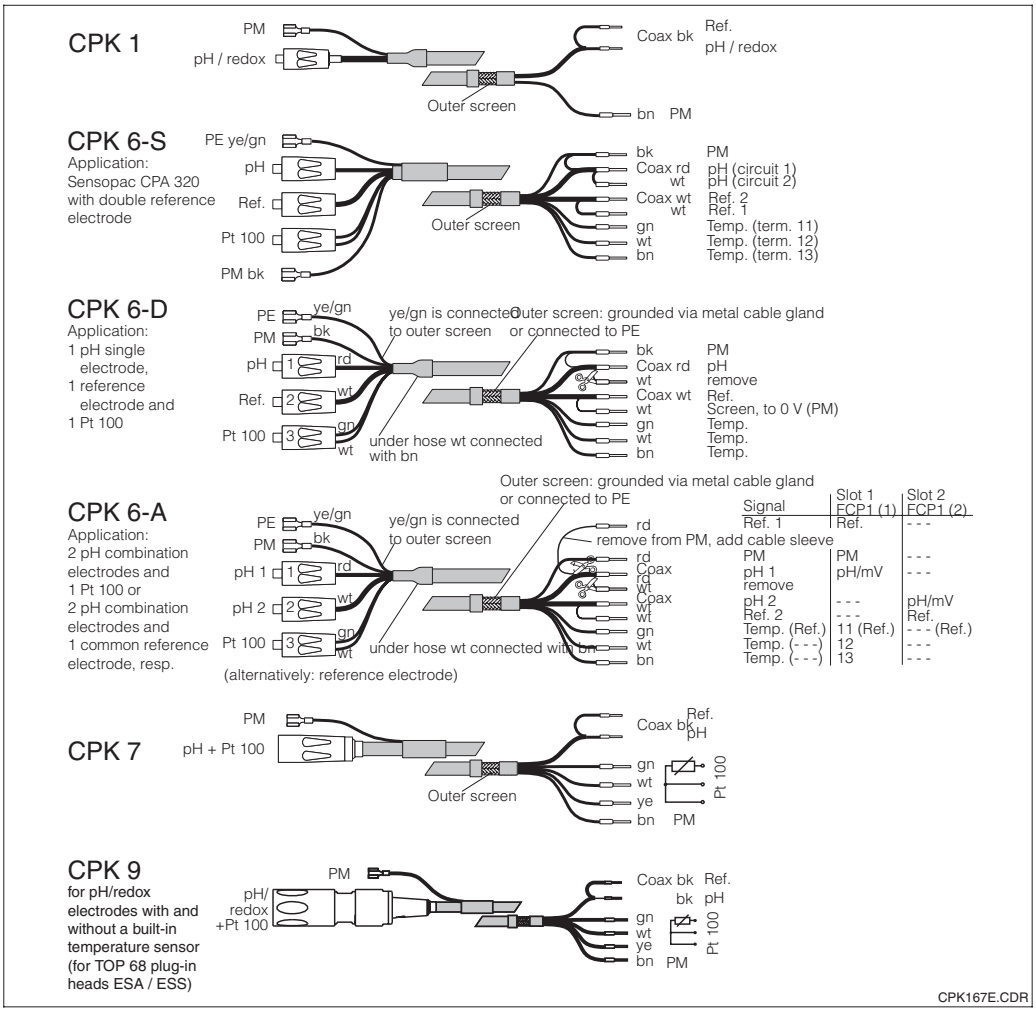


Fig. 4.22 Ready-made measuring cables

4.5.1 Special measuring cables

The pH and redox electrodes are connected via special ready-made multi-wire and shielded measuring cables:

- CPK 1 for electrodes without Pt 100
- CPK 7 for electrodes with Pt 100
- CPK 9 for electrodes withESA/ESS plug-in head (TOP 68)
- CPK 6 for:
  - Sensopac with double reference electrode
  - 1 pH single electrode, 1 reference electrode and 1 Pt 100
  - 2 pH combination electrodes and 1 Pt 100 or 1 common reference electrode, resp.

If you need to extend the measuring cables, use the junction box VBA and non-ready-made cables:

- CYK 71 for CPK 1, CPK 7 and CPK 9
- DMK for CPK 6

(see connection accessories).

Caution:

It is vital to protect plugs and terminals against moisture, because moisture leads to inaccurate measuring results!
For stranded inner wires use wire end sleeves.

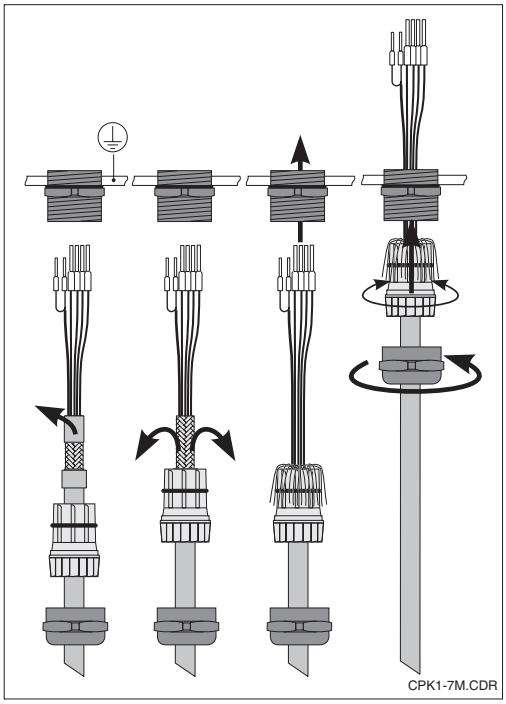


Fig. 4.23 CPK 1 to CPK 9: connection of outer screen to PE using a metal cable gland. The contact originates in the inner cable gland.

4.5.2 Symmetrical or asymmetrical connection of electrodes?

Caution:

The instrument has been configured for symmetrical measurement (with potential matching, PM).

If asymmetrical measurement is required, the configuration has to be changed accordingly (see chapter 7.1.1).

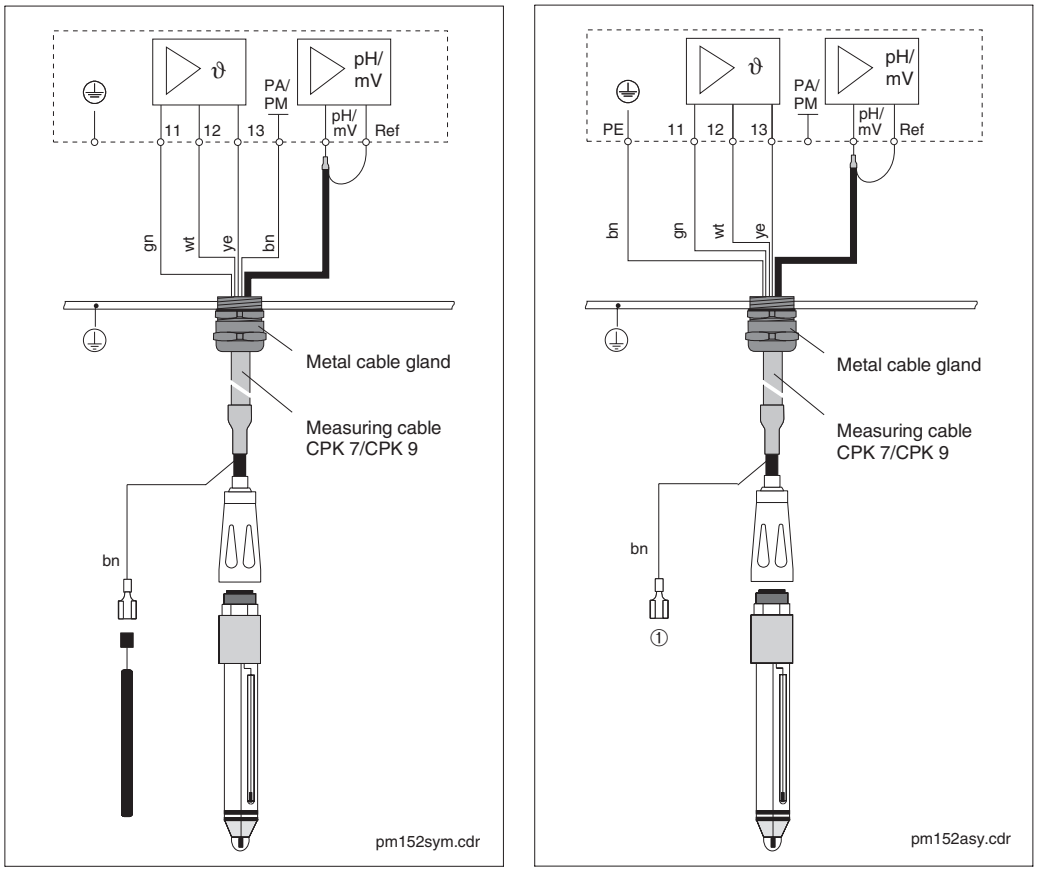


Fig. 4.24 Left: Symmetrical, high-impedance electrode connection

Right: Asymmetrical, high-impedance electrode connection

Symmetrical high-impedance (with PM):

Caution:

If a symmetrical, high-impedance connection is required, the cable for the potential matching pin has to be connected to the terminal PA of the instrument.
The potential matching pin must always be in contact with the medium, i.e. it must also be immersed in the buffer solution during calibration.

Advantage of symmetrical connection:

The reference system of the pH measuring chain is connected to a high-impedance measuring input just like the pH electrode. This eliminates any current leakage.

Measurement is also made less of a problem in difficult ambient conditions (e.g. high flow rates, high-impedance media or partially soiled diaphragm).

Asymmetrical high-impedance (without PM):

If the instrument has an asymmetrical, high-impedance input, pH measuring chains can be connected in conjunction with holders without an additional potential matching pin. If a potential matching pin is already available, connect it to terminal PE.

Disadvantage of asymmetrical connection:

The reference system of the measuring chain is more affected by leakage, possibly leading to measuring errors when operating close to maximum limits (see symmetrical, high-impedance instrument input).

It is not possible to monitor the reference electrode by the SC system (see chapter 7.4) in the case of asymmetrical measurement.

4.5.3 Connection accessories

Extension cables

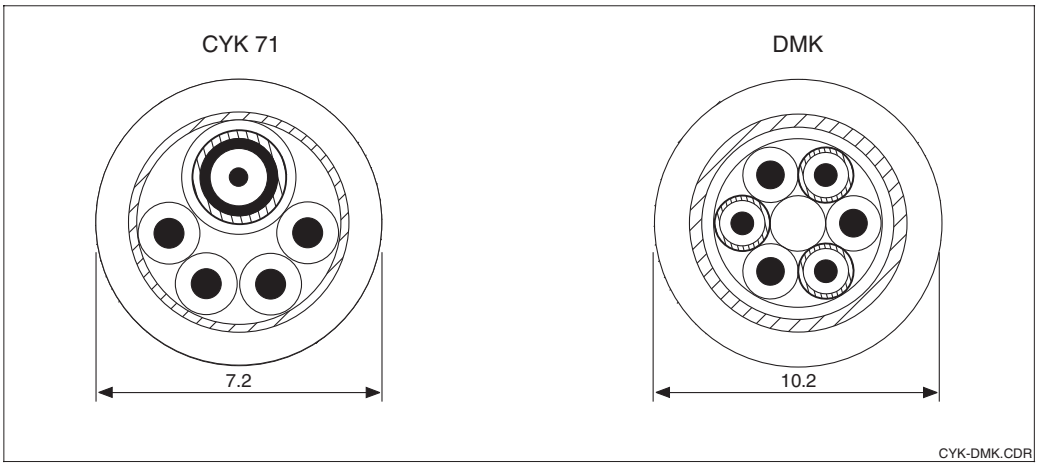


Fig. 4.25 Extension cables: CYK 71 (for CPK 1, 7, 9) and DMK (for CPK 6)

Junction box VBA

This junction box is required for line lengths of more than 20 m between the assembly and the transmitter. It has 4 Pg glands for cable entry and 10 insulated high-impedance screwed terminals for connection of individual wires.
Dimensions: 120 x 120 x 55 mm (L x W x H);
Material: plastic; protection class: IP 65;
Order no.: 50005276

Caution:

The desiccant bag has to be checked and if necessary replaced at certain intervals (determined by the ambient conditions), in order to avoid measuring faults due to moisture bridges on the pH connection line.

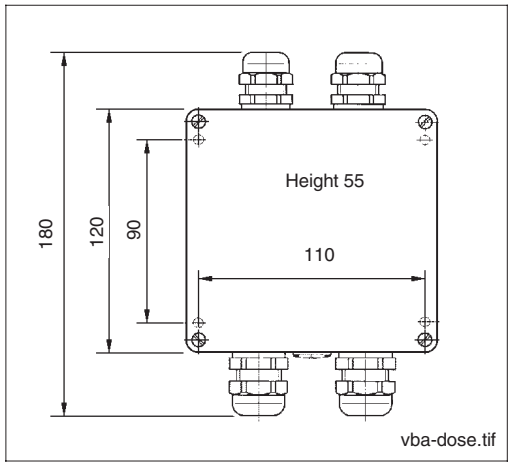


Fig. 4.26 Dimensions junction box VBA

4.6 Removal, packaging and disposal

Repackaging

The instrument must be protected against shock and moisture when it is packaged for later reuse. The original packaging provides the most effective protection.

Disposal

Note:

Electronics scrap is hazardous waste! Make sure you observe the local regulations for its disposal!

5 First Start-up

5.1 Measures before the first power-up

Familiarise yourself with the operation of the measuring transmitter before switching it on for the first time! (chapter 6)

Caution:

Make sure all connections have been established correctly before power-up!

Make sure the pH or redox electrode and the temperature sensor are located in the medium or in a buffer solution. If they are not, implausible readings will be displayed.

For symmetrical electrode connection: make sure that the potential matching pin is always immersed into the medium or the buffer solution together with the electrode.

Warning:

Before power-up, make sure that there is no risk of damage to the system that the instrument is part of; for example, due to valves, pumps etc. that might be activated in an uncontrolled manner.

5.2 The “Set-up guide” menu

The setting data needed for operation are checked in this start-up routine. It is therefore guaranteed automatically that all the required settings are available.

The first question the instrument asks relates to the language in which the displays should appear. The possibilities are shown. If you want “English”, select the second line, so that it is shown inverted and confirm your choice by pressing the “E” (“Enter”) button.
This establishes your choice and the display moves on to the next question. Proceed in the same way with all the other questions (see chapter 6, Operation).

- The start-up procedure can be ended by pressing the keys CAL, DIAG, MEAS and PARAM.
- The start-up routine is repeated every time the instrument is switched on, until the procedure has been completed once and has been actively ended.
- The start-up routine is accessible after this as well, using the menu structure with the advanced code.

Set-up guide / checklist

Question	see chapter	Possible choices	Factory settings	User settings
Language	7.1.4	*Language version A:* Deutsch, English, Français, Italiano *Language version C:* Deutsch, English, Français, Nederlands, Japanese	English	
Contrast of the LCD display	7.1.4	Setting as required	average	
Date	6.4	Enter the date	current date	
Time	6.4	Enter the time	Central European Time, (not summer time)	
Measurement parameter	7.1.1	pH, redox absolute (mV), redox relative (%)	pH	
Type of measurement (only with two-circuitl measurement of pH)	7.1.1	Single circuit measurement channel 1, Single circuit measurement channel 2, redundancy measurement	Redundancy measurement	
Type of electrode 1	7.1.1	Glass electrode pH 7.0; glass electrode pH 4.6; antimony	Glass electr. pH 7.0	
Type of electrode 2 (only with two-circuit measurement of pH)	7.1.1	Glass electrode pH 7.0; glass electrode pH 4.6; antimony	Glass electr. pH 7.0	
Potential matching	7.1.1	without PM (unsymmetrical) with PM (symmetrical high-impedance)	with PM	
Unit for temperature measurement	7.3.2	Celsius [°C], Fahrenheit [°F], Kelvin [K]	Celsius [°C]	
Temperature compensation (only pH meas.)	7.3.1	ATC (automatic) channel 1 / channel 1+2, MTC (manual) Pt 100, MTC (manual)	ATC	
Temperature measurement (only redox meas.)	7.3.2	on, off	On	
Contact function	7.1.3	basic configuration: Fault + maintenance, Fault + contact	Fault + maintenance	
	7.1.3	if equipped with 3 additional contacts: 3 alarms, 2 contacts fault, Chemoclean, contacts 3 alarms, Chemoclean alarms, Chemoclean + holder	3 alarms, 2 contacts	
Alarm contact	7.1.3	N.C. contact, N.O. contact	N.O. contact	
Fault contact	7.1.3	Pulsed contact, continuous contact	Continuous contact	
End of set-up		End, cancel (start again)	End	

6 Operation

6.1 Operating elements

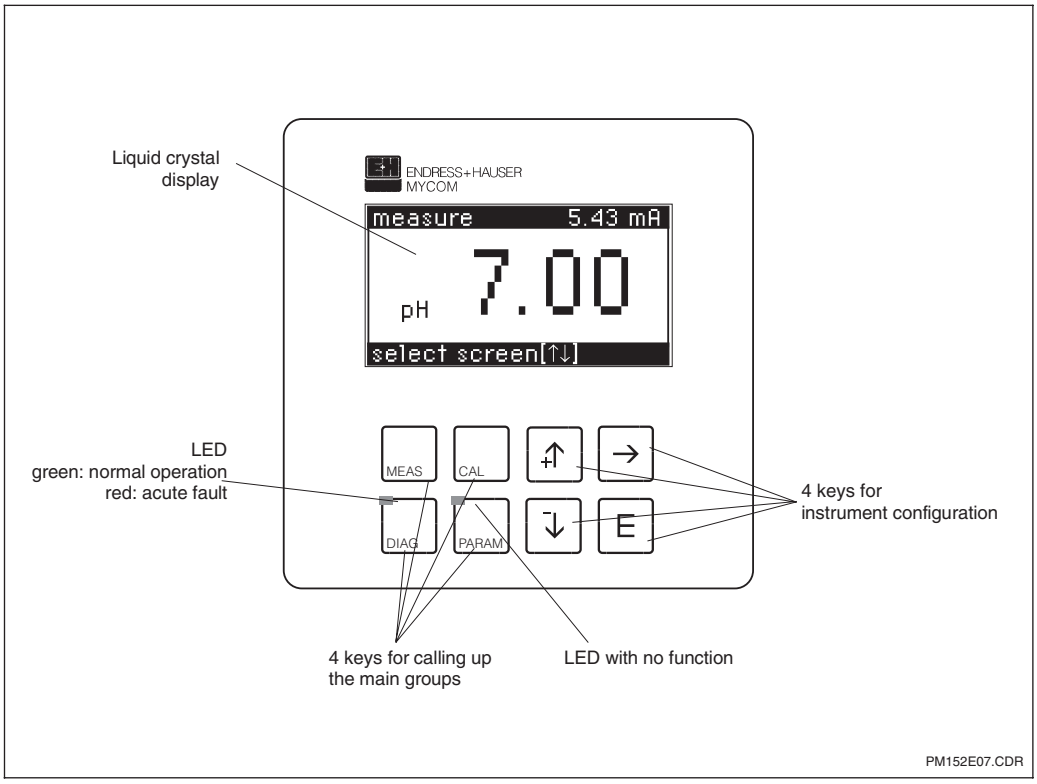


Fig. 6.1 Operating elements Mycom CPM 152

6.2 Display

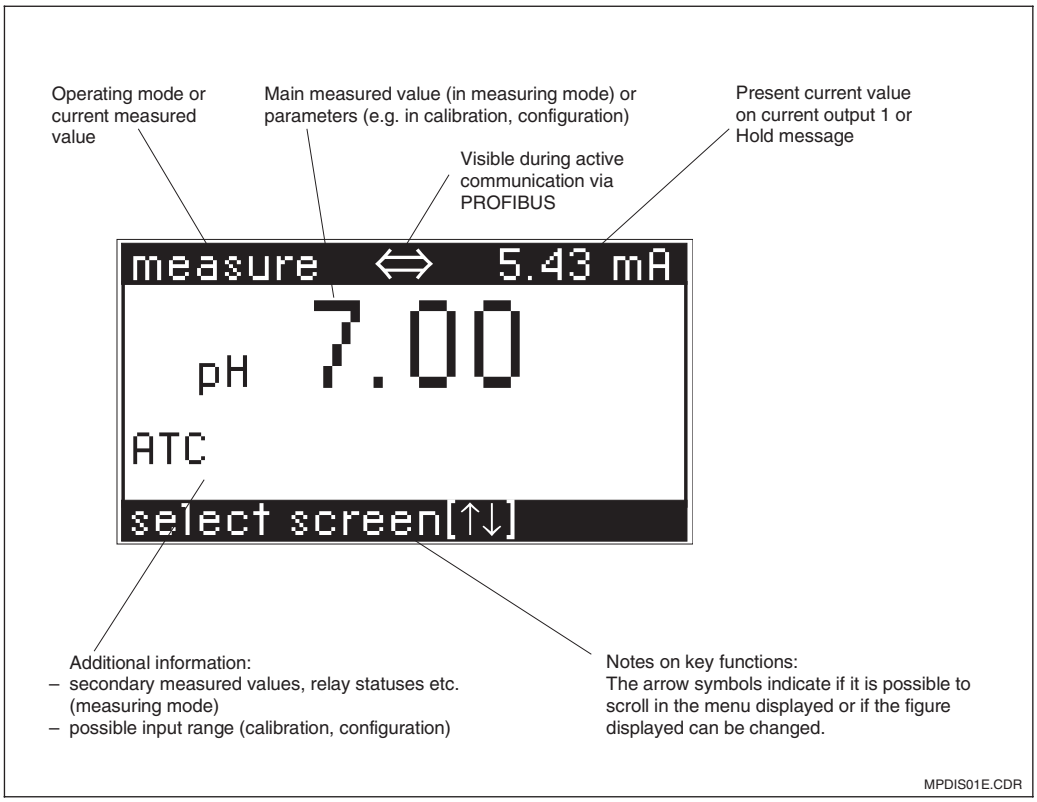


Fig. 6.2 Display Mycom CPM 152

6.3 Key functions

MEAS

Measurement

- Measured value display
- Return to measurement from any position

CAL

Calibration

- Activation of calibration mode
- Calibration menu display

DIAG

Diagnosis

- Calling up fault and maintenance messages
- Calling up information and statistics
- Calling up the service routine with simulation, internal data and the instrument check

The red LED indicates faults

PARAM

Configuration

- Configuration menu display, (setting the instrument for new measurement and control assignments)
- Return to a more general menu

- Increase in the figure that is shown inverted
- Selection of the menu line by moving the inverted bar
- Return to the previous measured value display

- Reduction in the figure that is shown inverted
- Selection of the menu line by moving the inverted bar
- Switching on to the next measured value display

- Selection of editing facility with multi-digit numbers

E

Enter

- Inclusion of a figure or a parameter in the configuration
- Selection of the menu line that is shown inverted

6.4 Operating concept

The functions of the measuring transmitter Mycom CPM 152 are divided into four main groups:

- Measurement
- Calibration
- Diagnosis
- Configuration

These groups are called up by pressing the appropriate keys (see 6.3). Functions relating to one particular subject in the main group are combined in sub-groups, some of which are divided up into further groups.
The sub-groups are displayed as a menu and are selected with the keys ↑ and ↓ (inverted line). The menu may contain more individual points than it is possible to show on one display page. This is indicated by small arrows in the left margin of the window.
Confirm your selection by pressing the E key.

Note:

You can refer to a summary of the Mycom menu structure on the last pages of these operating instructions.

Options are selected and parameters are set in the sub-groups by choosing a menu (see above) or by editing a number.
To do this, you select the digit of the number that is to be edited with the → key and set the required figure by pressing the ↑ and ↓ keys. Repeat this operation for all the other digits in the number. Then confirm by pressing the E key.
The limits for the possible settings are shown in the penultimate line on the display. It is not possible to make settings outside the limits specified there.
When a setting has been confirmed, the procedure is initiated for the next parameter. Once all the parameters in a sub-group have been set, the instrument returns to the menu.
You can reach the general group menu from every position in the sub-group by pressing the “PARAM” key.

Note:

- It is possible to change to a different main group even when you are in the middle of a sub-group. A setting that is not confirmed by pressing the E key first is not, however, stored.
- If there is no input in a sub-group for more than 10 minutes, the instrument automatically changes back to measuring mode (exceptions: set-up guide, simulation and calibration).

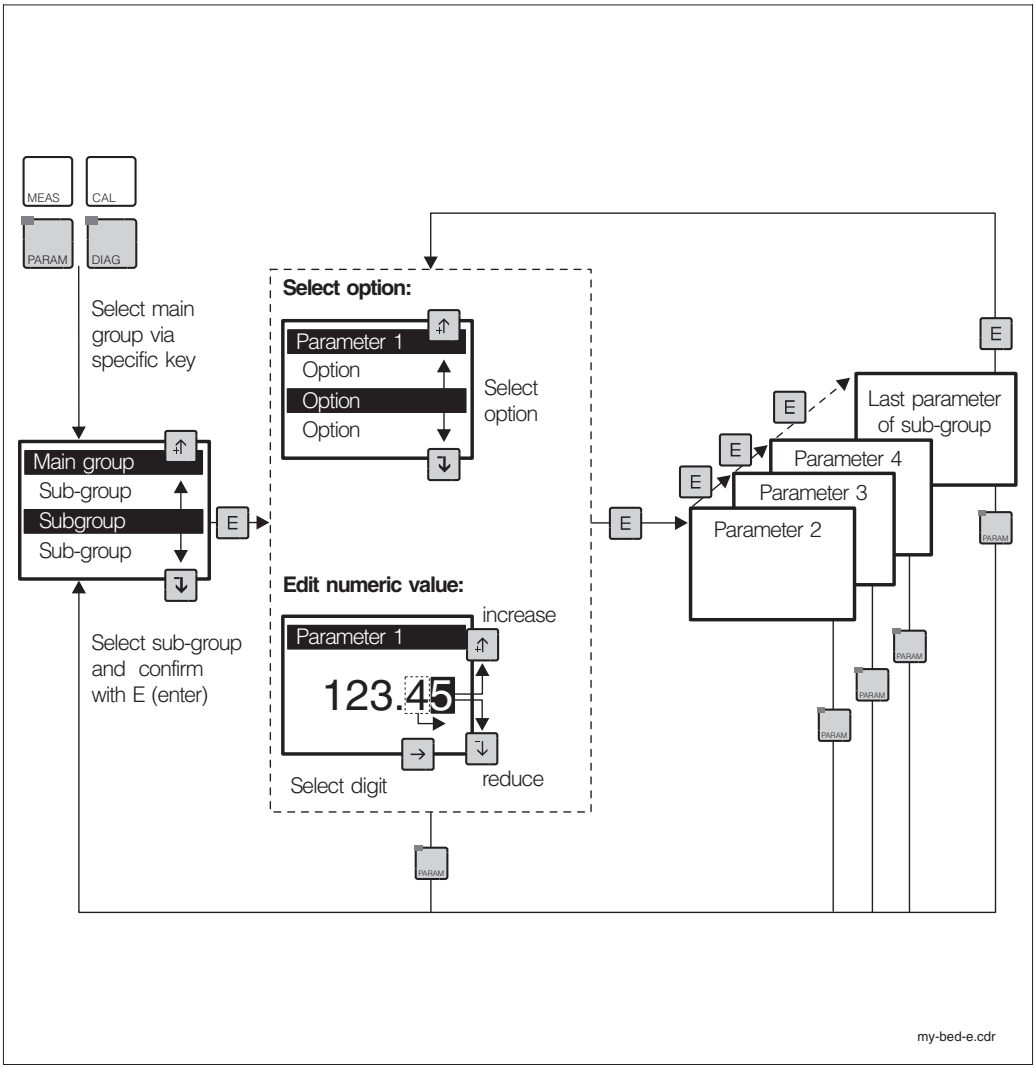


Fig. 6.3 Diagram of the Mycom operating concept

6.5 Different kinds of possible measurement displays

Depending on the nature of the measurement, the measuring transmitter Mycom CPM 152 offers up to six different kinds of possible displays, which can be switched between by pressing the keys ↑ and ↓.

The current pH or redox current output reading is always displayed in the top right-hand line.

Note:

- Contact statuses or set values are only displayed if one or two contacts are configured as limit contactors or controllers.
- TCM1 / TCM2 / TCM3 corresponds to the active table for medium temperature compensation (see 7.3.1)

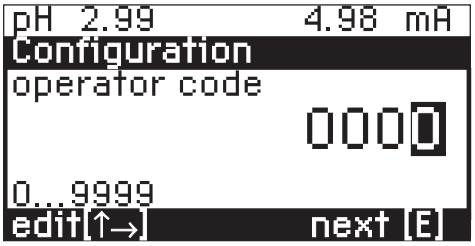
pH		
Single-circuit measurement	1. Main display: Additional info:	pH level channel 1 none
	2. Main display: Additional info:	pH level channel 1 type of temperature compensation (ATC / MTC) medium compensation (TCM1 / TCM2 / TCM3)
	3. Main display: Additional info:	pH level channel 1 type of temperatur compensation (ATC / MTC) MTC temperature if necessary medium compensation (TCM1 / TCM2 / TCM3) measured temperature channel 1 contact statuses if necessary
Redundancy measurement	1. same as pH single-circuit measurement	
	2. same as pH single-circuit measurement	
	3. same as pH single-circuit measurement	
	4. Main display: Additional info:	pH level channel 2 type of temperature compensation (ATC / MTC) MTC temperature if necessary medium compensation (TCM1 / TCM2 / TCM3) measured temperature channel 2 contact statuses if necessary
	5. Main display: Additional info:	difference / pH level type of temperature compensation (ATC / MTC) MTC temperature if necessary medium compensation (TCM1 / TCM2 / TCM3) measured temperature channel 1 contact statuses if necessary

Redox absolute (mV)	
Single-circuit	1. Main display: redox potential channel 1 (large) Additional info: none
	2. Main display: redox potential channel 1 Additional info: none
	3. Main display: redox potential channel 1 Additional info: measured temperature channel 1 if necessary contact statuses if necessary
Redundancy measurement	1. same as redox absolute single-circuit measurement
	2. same as redox absolute single-circuit measurement
	3. same as redox absolute single-circuit measurement
	4. Main display: redox potential channel 2 Additional info: measured temperature channel 1 if necessary contact statuses if necessary
	5. Main display: Difference redox potential value Additional info: measured temperature channel 1 if necessary contact statuses if necessary
Redox relative (%)	
Single-circuit measurement	1. Main display: percentage channel 1 (large) Additional info: none
	2. Main display: percentage channel 1 Additional info: none
	3. Main display: percentage channel 1 Additional info: measured temperature channel 1 if necessary 1 contact statuses if necessary
	4. Main display: percentage channel 1 Additional info: voltage channel 1
Redundancy measurement	1. same as redox relative single-circuit measurement
	2. same as redox relative single-circuit measurement
	3. same as redox relative single-circuit measurement
	4. Main display: percentage channel 2 Additional info: measured temperature channel 1 if necessary contact statuses if necessary
	5. Main display: percentage channel 1 Additional info: voltage channel 1 voltage channel 2
	6. Main display: Difference redox potential value Additional info: measured temperature channel 1 if necessary contact statuses if necessary

6.6 Access codes

Functions can be protected by four-digit access codes to make sure no unintentional or undesirable changes are made to the configuration and calibration data of the measuring transmitter.

The release status of the functions is divided up into **operator and advanced level.** Menus that have not been released are not displayed. If there is no input or the input is incorrect, the code input menu can only be left via the MEAS key.
The access codes are set in the menu configuration / commissioning / system set-up. (see chapter 7.1.2).



MPDIS07E.EPS Fig. 6.4 Code enquiry

Note:

The instrument is supplied unlocked.

Accessible **without code**:

- Measurement displays
- Fault list
- Info list
- Logbook
- Calibration statistics

Accessible **with operator code**:

- Short-cut to relays
- Calibration type selection
- Calibration functions
- Temperature compensation
- Cleaning functions

Accessible **with advanced code**:

- All menus and functions

Caution:

If the codes get lost, unlocking is possible with the default code **"7156"** and a new code can be set on the instrument data / system configuration menu.

6.7 The “short-cut to relays” menu

→ Short-cut to relays

The short-cut to relays menu gives you direct access to the main functions without having to go through the whole of the configuration menu.

Note:

Functions which are not available or not active are not shown in the menu.

Short-cut to relays menu	
Function	Selection
Hold [1]	Hold on / hold off
Limit contact operation mode	Limit contact automatic Limit contact manual
If manual mode selected	Contact on / off **Note:** • The outputs can be set in spite of a possibly activated hold function • The following symbol for manual operation appears in the measured value display:
Controller operation mode	Controller automatic Controller manual
If manual mode selected	Manual modification of the actuating variable **Note:** • When a switch is made to manual operation, the present setting is used as the starting point for the manual setting (smooth switching) • The following symbol for manual operation appears in the measured value display:
Set values	Depending on the configuration (see chapters 8.2/8.3): Input of limit value 1/2 or controller set value
Chemoclean	Automatic on Automatic off Start cleaning
Holder[2]	Service (if holder in Service + Clean measuring position) Cleaning (if holder in Finish service service position)

[1] The hold function does not take effect on activated Chemoclean cleaning cycles.

[2] After “Service” is selected the assembly is brought into service position.
Automatic and external start of cleaning cycles will be disabled.
The assembly can be brought back into measuring position only with “Finish service”.

6.8 Hold and external control inputs

6.8.1 Hold function, "freezing" the outputs

In order to avoid unintentional changes to the current outputs or controller contact positions during configuration or calibration, the present status can be "frozen" or a set current value can be specified.

Warning:

Ongoing Chemoclean cleaning cycles are carried out even if the hold function is activated.

See:

- Chapter 6.7, short cut to relays menu, hold on / off
- Chapter 7.2, current output menu, type of hold: set current value / last measurement
- Chapter 7.5, calibration menu, hold with calibration: yes / no
- Chapter 7.6, Chemoclean menu, Hold with Chemoclean: on / off

6.8.2 External control inputs

Binary input 1: terminals 81 / 82

Binary input 2: terminals 83 / 84

Note:

The binary inputs are only available on instruments with the additional FCXI module and require an additional external power supply (nominal 12 V).

External Hold input:

If no cleaning or assembly functions have been set, both of the binary inputs act as external hold inputs.

Warning:

Ongoing Chemoclean cleaning cycles are carried out despite an external hold signal.

External control in the case of cleaning without retractable assembly (for adjustment see chp. 7.1.3, »relays allocation«)

External control		Effect	
Binary input 1 (81 / 82)	**Binary input 2 (83 / 84)**	**External hold**	**Action**
0	0	off	External controller off. Automatic cleaning program is completed.
0	1	off	External start of a cleaning operation.
1	0	on	External controller prevents a cleaning operation from starting automatically.[1)]
1	1	on	External start of a cleaning operation.

[1)] A cleaning operation that is already in progress is, however, completed.

External control in the case of a connected retractable assembly (for adjustment see chp. 7.1.3, »relays allocation«)

Binary input 1 (81 / 82)	Binary input 2 (83 / 84)	External hold	Action
0	0	off	Move assembly into measuring position
0	1	off	Move assembly into service position
1	0	on	Move assembly into measuring position
1	1	on	Move assembly into service position

External control of clean-function with retractable assembly (for adjustment see chp. 7.1.3, »relays allocation«)

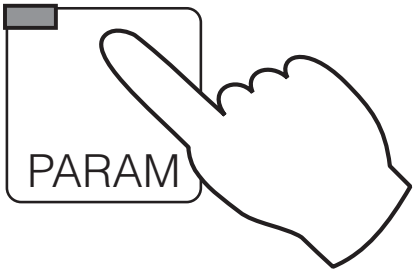
Binary input 1 (81 / 82)	Binary input 2 (83 / 84)	Function
0	0	External controller off. Automatic cleaning program is completed.
1	0	External controller prevents a cleaning operation from starting automatically. [1)]
0	1	Move assembly into service position. External start of a cleaning operation. Assembly remains in service position until the contact is being opened.
1	1	In the service position cleaning can be started via the changeing contact 81/82. While being in the measuring position the function corresponds “0/1"

[1)] However, a cleaning operation that is already in progress is still completed.

Caution:

If the assembly is moved into service position via the menu “Basic operation / assembly”, the external controller will be ignored.

7 Instrument configuration



Note:

- You can refer to a summary of the Mycom menu structure on the last page of these operating instructions.
- Most of the parameter functions are only available with the election »specialist«.

→ **Set-up guide**	• Guided run through the most important menus	☞ Chapter 5.2
→ **Short-cut to relays**	• Hold on / off, • Manual operation relay, • Controller parameters, • Start Chemoclean	☞ Chapter 6.7
→ **Commissioning**		
→ System set-up	• Measurement, type of electrode • Locking codes • Output relays • General	☞ Chapter 7.1
→ Current output	• Current output parameters • Hold with last value / specified value	☞ Chapter 7.2
→ Temperature	• Temperature compensation autom. / manual • Medium temperature compensation	☞ Chapter 7.3
→ Sensor monitoring	• Delta window • Electrode monitoring on / off • Nature of the action taken with electrode	☞ Chapter 7.4
→ Calibration	• Buffer selection • Limits for false alarms	☞ Chapter 7.5
→ Chemoclean	• Parameters for cleaning functions	☞ Chapter 7.6
→ Relay contacts	• All sub-groups for controller configuration	☞ Chapter 8

Note:

The selection »Relay contacts« or »Chemoclean« only appears if the appropriate options have been set in the commissioning / system set-up menu under »Output relays«.

7.1 System Set-up

→ Commissioning

→ System set-up

→ Parameter ☞ 7.1.1
→ Pass codes ☞ 7.1.2
→ Output relays ☞ 7.1.3
→ General settings ☞ 7.1.4

7.1.1 Parameter

Function	Selection	Default
Operating mode	pH, redox absolute (mV), redox relative (%)	pH
Measurement type (only with two-circuit instrument)	Single circuit measurement channel 1, Single circuit measurement channel 2, redundancy measurement	Redundancy measurement
Electrode type (only with operating mode pH)	Glass electrode pH 7.0 Glass electrode pH 4.6 Antimony	Glass electrode pH 7.0
PM connection, potential matching	Without PM (potential matching) (asymmetrical electrode connection) With PM (potential matching) (symmetrical, high-impedance electrode connection)	with PM
Control parameters for 2nd current output (only with two-circuit instrument)	pH / redox channel 2 Diff. Δ |channel 1 – channel 2| Temperature (channel 1)	Temperature

Note:

When the parameter is changed, all the data are reset to the settings made at the factory (default settings).

7.1.2 Pass codes

Function	Selection	Default
Operator code	0000 ... 9999	0000
Advanced code	0000 ... 9999	0000
Emergency code	–	7156

Note:

Refer to chapter 6.6.

7.1.3 Output relays

Caution:

- Before starting up, check whether the wiring corresponds to the contact configuration selected.
- The output contacts of the non-Ex version show different behaviour in case of power failure (see table »relays allocation« on the next page).
- The optocoupler outputs of the Ex version are high-impedance in the case of power failure.

Function	Selection	Default
For basic configuration (2 output contacts)		
Function for contact 1[1)]	Fault + maintenance Fault + limit / control contact	Fault + maintenance
For configuration with additional module FCYK (5 output contacts)		
Function for contacts 1 ... 4[1)]	3 alarms / 2 contacts fault / clean 3)/ contacts 3 alarms + clean [3)] 2 alarms, clean [3)] + assembly[4)] assembly	3 alarms / 2 contacts
Alarm contacts	N.C., N.O.	N. O.
Type of contact[2)] for fault contact	Pulsed contact (closed for about 1 second) Continuous contact	Continuous contact
Assignment of process warnings (E055-079), if »fault and maintenance« selected	to maintenance contact to no contact	to maintenance contact

[1)] See table »Relays allocation« on the next page
[2)] According to a recommendation made by the measuring and control engineering standards committee (NAMUR)
[3)] With Chemoclean it is possible to activate valves to clean and rinse electrodes
[4)] If the instrument is equiped with the additional module FCXI, automatic cleaning operations with variable cycle times are possible using a pneumatically operated retractable assembly (see chapter 7.6)

Relays allocation for basic configuration		
Selection	»maintenance«	»limit contact / controller«
Fault contact Ter. 85/86	Fault [1]	Fault [1]
Contact 1 Ter. 87/88	Maintenance [2]	Limit / control contact [2]

Output contact of the non-Ex version in case of power failure (configuration of NO/NC, see start-up menu):
[1] active (N. O. contact is closed, N. C. contact is open)
[2] passive (N. O. contact is open, N. C. contact is closed)

Relays allocation for configuration with additional module FCYK				
Selection	»3 alarms / 2 contacts«	»fault / clean / contacts«	»3 alarms + clean«	»2 alarms, clean + assembly« or »assembly«[5]
Fault contact Ter. 85/86	Fault [1]	Fault [1]	Fault [1]	Fault [1]
Contact 1 Ter. 87/88	Maintenance [2]	Limit / control contact 1 [2]	Maintenance [2]	Maintenance [2]
Contact 2 Ter. 89/90	Status [2]	Limit / control contact 2 [2]	Status [2]	Autoclean bit 1 [4]
Contact 3 Ter. 91/92	Limit / control contact 1 [2]	Water [4]	Water [4]	Autoclean bit 2 [4]
Contact 4 Ter. 93/94	Limit / control contact 2 [2]	Cleaning agent [4]	Cleaning agent [4]	Autoclean bit 3 [4]

Output contact of the non-Ex version in case of power failure (configuration of NO/NC, see start-up menu):
[1] active (N. O. contact is closed, N. C. contact is open)
[2] passive (N. O. contact is open, N. C. contact is closed)
[3] remains unchanged
[5] only activatable if additional module FCXI is installed

Note:

The **fault contact** is active in the case of system failure (error codes 1 ... 29).

The preset error current (see chapter 7.2.2) is given out at current output 1 and 2.

The fault contact is specified for all settings.

If it is configured, the **maintenance contact** indicates that there are faults in the instrument or the process, which permit operation to continue but make it necessary to check the measuring system. Depending on the configuration in 7.1.3, the maintenance contact is indicated in the fault codes 30 ... 54 or 30 ... 79.

The **status contact** is active during »hold« and when settings are being made to the instrument (e.g. during calibration).

7.1.4 General settings

Function	Selection	Default
Language	*Language version A (see product structure):* Deutsch, English, Français, Italiano *Language version B (see product structure):* Deutsch, English, Français, Nederlands, Japanese	English
Signal damping[1)] (number of measured values over which measurement is measured; 3 measured values per second)	Number of measurements over which the average is calculated: 0 (= filter off) ... 30	0
Decimal places of the pH display	pH 00.00 pH 00.0	pH 00.00
Temperature unit	Degrees Celsius [°C] Degrees Fahrenheit [°F] Kelvin [K]	Celsius [°C]
Date	Weekday, day, month, year	
Time	Hour, minute	
Tag number (measuring point allocation)	0 ... 9; A ... Z	
Contrast of the display	Setting as required	

1) Signal damping
A continuous signal damping facility in the form of an input filter (average formation) can be switched on to increase the resistance of the measurement to interference. The length of the filter must be adapted to the process on an empirical basis in such a way that short-term interference pulses are suppressed, but that any actual changes in the measured value are recorded.

7.2 Current output

→ Commissioning

→ Current output

→ Current output 1 / 2 ☞ 7.2.2
→ During hold ☞ 7.2.1

7.2.1 Current output during hold

Function	Selection	Default
Current output during hold	Fixed current value Last measured value	Fixed current value
Current value (if a fixed current value has been chosen)	0 ... 22 mA	20 mA

7.2.2 Current output 1 / 2

With single-circuit measurement the configuration is always as follows:
Current output 1: pH / redox
Current output 2: temperature

With two-circuit measurement (see 7.1.1):
Current output 1: pH / redox (channel 1)
Current output 2: pH / redox (channel 2) **or** temperature **or** diff. (channel 1 – channel 2)

Function	Selection	Default
Current loop alarm (Broken line activates fault contact, error message 15 / 16)	active, inactive	inactive
Error current	off (no error current) min. current [1] max. current [2]	off
	Current output 1	
Measuring current range	0 ... 20 mA 4 ... 20 mA	4 ... 20 mA
Damping	1.0 ... 20.0 mA/s	20.0 mA/s
Measuring range lower limit (measured value at 0 / 4 mA)	pH: –2.00 ... +16.00 pH Redox mV: –1500 ... +1500 mV Redox %: –3000 ... +3000 %	0.00 pH –500 mV 0 %
Measuring range upper limit (measured value at 20 mA)[3]	pH: –2.00 ... +16.00 pH Redox mV: –1500 ... +1500 mV Redox %: –3000 ... +3000 %	12.00 pH +500 mV 100 %
	Current output 2	
Measuring current range	0 ... 20 mA 4 ... 20 mA	4 ... 20 mA
Damping	1.0 ... 20.0 mA/s	20.0 mA/s
Measuring range lower limit (measured value at 0 / 4 mA)	Temperature: –20.0 ... +150.0 °C pH 2 [4]: –2.00 ... +16.00 pH Redox mV 2 [4]: –1500 ... +1500 mV Redox % 2 [4]: –3000 ... +3000 % Δ pH [4]: 0.00 ... 18.00 pH Δ mV [4]: 0 ... 3000 mV Δ % [4]: 0 ... 6000 %	0.0 °C 0.00 pH –500 mV 0 % 0.00 pH 0 mV 0 %
Measuring range upper limit (measured value at 20 mA)[3]	Temperature: –20.0 ... +150.0 °C pH[4]: –2.00 ... +16.00 pH Redox abs.[4]: –1500 ... +1500 mV Redox rel.[4]: –3000 ... +3000 % Δ pH [4]: 0.00 ... 18.00 pH Δ mV [4]: 0 ... 3000 mV Δ % [4]: 0 ... 6000 %	150.0 °C 12.00 pH +500 mV 100 % 18.00 pH 1800 mV 1800 %

[1] 0.00 mA for measuring current range 0 ... 20 mA;
2.40 mA for measuring current range 4 ... 20 mA
[2] 22.00 mA
[3] Min. difference between upper and lower limit: Δ 1.8 pH, Δ 400 mV, Δ 10% bzw. Δ 17.1 °C
[4] Only with two-channel measurement

7.3 Temperature compensation and medium temperature compensation

→ Commissioning

→ Temperature ☞ 7.3.4 (for pH)
→ Temperature ☞ 7.3.5 (for Redox)

7.3.1 Temperature influences during pH measurement

There are two essential influences of temperature on pH measurement:

- The slope of a pH measuring chain is temperature-dependent. This change of slope is well-known (Nernst voltage) and can therefore be compensated by the instrument.
- The pH value of the medium to be measured changes with temperature (temperature-dependent dissociation). This change is different for varying media and often unknown. To compensate it, the temperature dependence of the medium must be determined in the laboratory, if required, and stored in the instrument.
- This is necessary, for example, if the pH value of a process with high temperature shall be compared to a laboratory value, which is usually determined at a lower temperature. Entry into Mycom CPM 152 is effected in form of a table.

7.3.2 Temperature compensation of measuring chain

Temperature compensation for the slope of the pH measuring chain can be carried out either automatically via the connected Pt 100 temperature sensor (ATC) or manually by entering a temperature value (MTC). MTC is suitable for constant process temperatures.

7.3.3 Medium temperature compensation

Tables for three different measuring media can be entered in the Mycom CPM 152 for medium temperature compensation. The appropriate table can be selected as the active medium before the process begins.

The compensation consists of up to ten value pairs (temperature and relevant pH level).

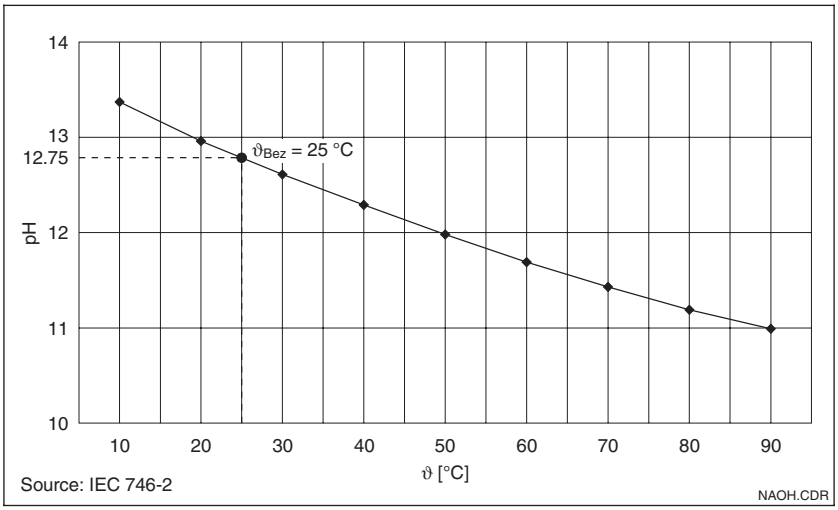
Procedure:

- Take a sample from the process. Its pH value should approximate the set point of the process as well as possible.
- Heat the sample in the laboratory up to the process temperature and determine its pH value.
- During cooling-down, record the pH and temperature value pairs for temperatures prevailing at later measurement (e.g. process temperature and ambient temperature in the laboratory).
- Enter the value pairs into the instrument. As reference temperature, select the temperature for which the set point of the process is defined (e.g. ambient temperature in the laboratory).

Example:

Sodium hydroxide 0.1 mol/l

ϑ [°C]	pH
10	13.37
20	12.96
25	12.75
30	12.61
40	12.29
50	11.98
60	11.69
70	11.43
80	11.19
90	10.99

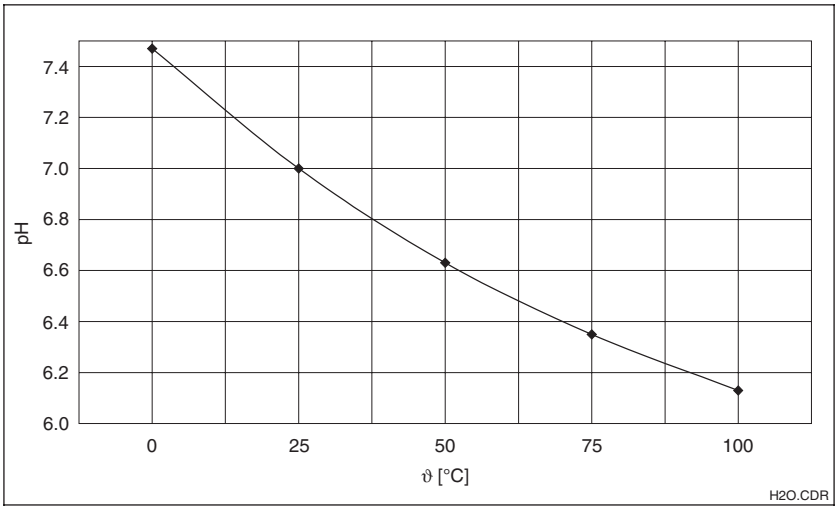


If a reference temperature of 25 °C is entered (e.g. temperature at comparison measurement in the laboratory), then the measured value will always be converted to this temperature, and the corresponding pH value (in this case pH 12.75) will be displayed.

Additional examples:

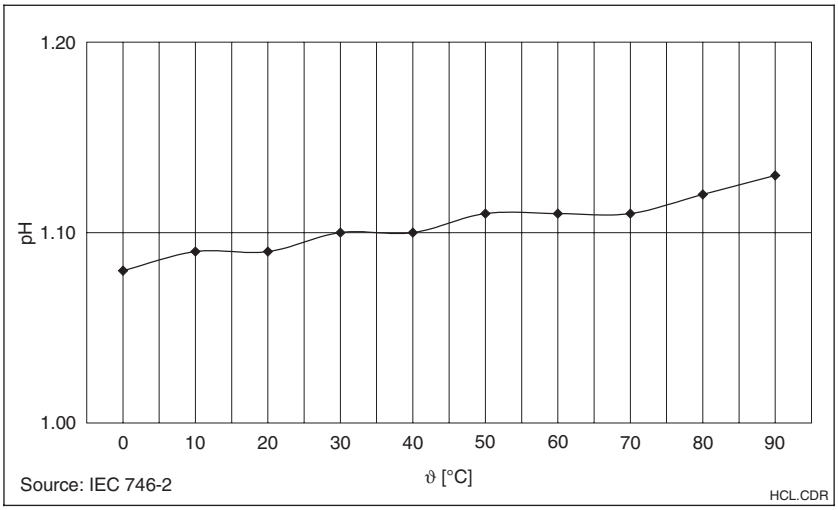
Demineralised water

ϑ [°C]	pH
0	7.47
25	7.00
50	6.63
75	6.35
100	6.13



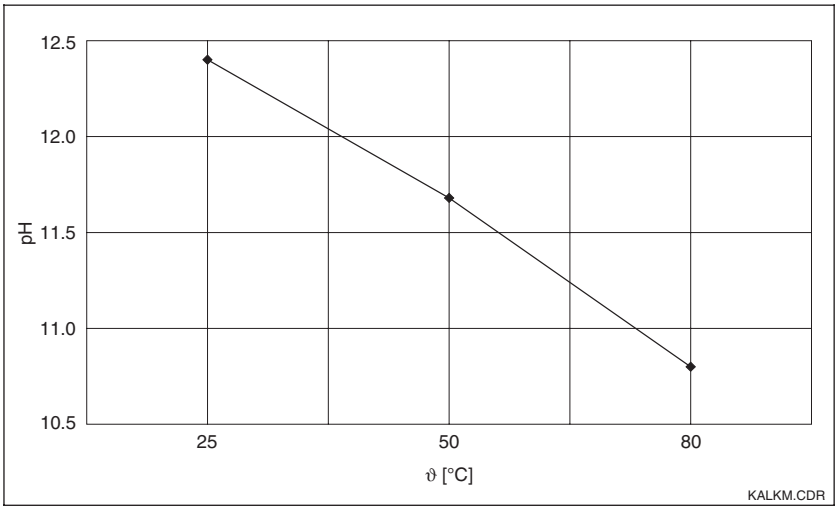
Hydrochloric acid 0.1 mol/l

ϑ [°C]	pH
0	1.08
10	1.09
20	1.09
30	1.10
40	1.10
50	1.11
60	1.11
70	1.11
80	1.12
90	1.13



Milk of lime

ϑ [°C]	pH
25	12.4
50	11.68
80	10.8



Compensation equation:

$$pH_{comp} = pH_{\vartheta} - (pH_{\vartheta tab} - pH_{\vartheta ref})$$

pH_{comp} = compensated pH value
pH_{ϑ} = measured pH value at temperature ϑ
$pH_{\vartheta tab}$ = table value at temperature ϑ
$pH_{\vartheta ref}$ = table value at reference temperature

Note:

With two-circuit measurement, the compensation table is valid for both measuring circuits. The measured or set value of the respective measuring circuit is used as temperature.

7.3.4 Temperature settings pH

Function	Selection	Default
Type of temperature compensation	Automatic (ATC) channel 1 Automatic (ATC) channels 1+2 (with 2-circuit measurement only) Manual (MTC), with Pt 100 = with additional temp. meas. Manual (MTC), = without temp. measurement	Automatic (ATC) channel 1
MTC temperature (if »MTC« is selected)	–20.0 ... 150.0 °C	25.0 °C
Setting offset temperature 1 (with ATC and MTC with Pt 100)	–20.0 ... 150.0 °C	0.0 °C
Setting offset temperature 2 (with ATC 1+2)	–20.0 ... 150.0 °C	0.0 °C
Medium temperature compensation (α value compensation)	yes / no	no
If medium temperature compensation is selected		
Selection of the active medium	Medium 1 / 2 / 3	Medium 1
Data entry (for medium 1 / 2 / 3)		
Number of reference points	2 ... 10	10
Numeric entry[1] of max. 10 value pairs for each medium: temperature –20.0 ... +150.0 °C, pH value –2.00 ... +16.00 pH **Note:** Sequence of temperature values must increase monotonously!		
Reference temperature for medium temperature compensation	–20.0 ... +150.0 °C	25.0 °C

1) Select value with »↑↓« keys.
Press »→« key to access edit mode.
Select digit with »→« key and edit with »↑↓« keys.
Acknowledge edited value with »E« key.
Use »↑↓« keys to select another value or
press »E« key to acknowledge all adjustments made.

7.3.5 Temperature settings redox

Function	Selection	Default
Activation of temp. measurement	On / off	on
Setting of offset temperature (with activated temp. measurement)	Actual temperature value: –20.0 ... 150.0 °C	0.0 °C

7.4 Electrode monitoring »SCS«

→ Commissioning

→ Sensor monitoring

The sensor check system SCS monitors the pH and reference electrode to determine measuring errors and total failure.

The SCS detects:
- pH electrode glass breakage
- Fine short circuits in the pH measuring circuit, including, for example, moisture or dirt bridges at clamping points
- Soiling or blocking of the reference electrode

Two methods are applied to do this:
- Monitoring of high resistance in the pH electrode. If a fault is detected (if the electrode impedance is measured to be < 1 MΩ), the fault message E 008 and the fault contact are activated.
- Monitoring of the reference electrode. If a fault is detected (if the reference electrode impedance is measured to be larger than the set threshold), the maintenance message E 030 and the maintenance contact are activated.

The sensor check system SCS can be switched on or off in the »Sensor monitoring« menu. When the SCS is switched on, it checks automatically whether the pH electrode and/or the reference electrode can be monitored in the current installation (see note below).

Caution:

The maximum line length for measuring cables CPK 71 and DMK is 20 m.
If longer lines are used, the SCS function must be disabled to prevent false alarms.

Note:

Connection symmetrical with PM:
Monitoring of pH electrode and reference electrode.
Connection asymmetrical / without PM:
Monitoring of pH glass electrode only.

Function	Selection	Default
For two-circuit measurement		
Delta window: maintenance required, leads to error message E 035	pH: 0.00 ... 18.00 pH Redox mV: 0 ... 3000 mV Redox %: 0 ... 6000 %	2.00 pH 100 mV 20 %
Delay time until activation of error message	0 ... 600 s	0 s
Delta window: device failure, leads to error message E 019	pH: 0.00 ... 18.00 pH Redox mV: 0 ... 3000 mV Redox %: 0 ... 6000 %	4.00 pH 200 mV 40 %
Delay time until activation of error message	0 ... 600 s	0 s
Activation of SCS	on / off	off
If »on« is selected (only for symmetrical measurement with PM)		
Facility for setting the monitoring threshold for the reference electrode	standard, individual	individual
If »Standard« is selected		
Degree of contamination for SCS monitoring threshold for reference electrode	low (corresponds to 10 kΩ) middle (corresponds to 25 kΩ) high (corresponds to 50 kΩ)	high
If »Individual« is selected		
SCS monitoring threshold for reference electrode 1	0.5 ... 100.0 kΩ	50.0 kΩ
SCS monitoring threshold for reference electrode 2 (for two-circuit measurement only)	0.5 ... 100.0 kΩ	50.0 kΩ

7.5 Preliminary calibration settings

→ Commissioning
→ Calibration

pH → Calibration parameters ☞ 7.5.1
→ General settings ☞ 7.5.2
→ Buffer selection ☞ 7.5.3

Redox → Calibration parameters ☞ 7.5.4
→ General settings ☞ 7.5.5

7.5.1 Calibration parameters (pH)

Function	Selection	Default
Calibration type	numerical calibration manual calibration preset buffer autom. buffer recognition	autom. buffer recognition
Calibrate electrodes (only with 2-circuit instrument, except numerical calibration)	separately together	separately
Temperature compensation for calibration channel 1	Calibrate with ATC calibrate with MTC	with ATC
Temperature compensation for calibration channel 2 (only with 2-circuit instrument)	Calibrate with ATC, temperature sensor 1 Calibrate with ATC, temperature sensor 2 calibrate with MTC	with ATC, temp. sensor 1

7.5.2 General settings (pH)

Function	Selection	Default
Hold during calibration	yes / no	yes
Alarm threshold »electrode slope lower limit«	5.00 ... 59.00 mV / pH	45.00 mV / pH
Alarm threshold »max. deviation of theoretical electrode zero point«	0.05 ... 1.30 pH	1.30 pH
Isothermic compensation in numerical calibration	yes / no	no
if isothermic compensation »yes« is selected		
Isothermal point channel 1	–2.00 ... +16.00 pH	7.00 pH
Isothermal point channel 2 (only with 2-circuit instrument)	–2.00 ... +16.00 pH	7.00 pH

Note:

Entering the isothermal point is not necessary with E+H electrodes. (Isothermal point = point of intersection of two calibration lines, recorded at different temperatures.)

7.5.3 Buffer selection (pH)

Function	Selection	Default
Buffer type	E+H, Ingold; Merck / Riedel; DIN; special buffer type; Japan; Fisher; Beckmann; Cole-Parmer; OMEGA	E+H
If one of the standard buffers is chosen (only relevant for calibration with preset buffer)		
Selection of buffer 1	Different pH values of the selected buffer type	6.98
Selection of buffer 2		4.01
If a special buffer type is chosen		
Number of implementable buffers	2 ... 3	3
– For buffer 1, 2 and if relevant 3 –		
Number of reference points	2 ... 10	10
Buffer table	Numeric entry of max. 10 value pairs (temperature / pH) for each buffer (Intermediate values are determined on a linear basis)	
Selection of buffer 1	Special buffer 1, 2, 3	1
Selection of buffer 2		2

7.5.4 Calibration parameters (Redox)

Function	Selection	Default
Calibration type	with Redox absolute (mV): Data entry absolute Calibration absolute with Redox relative (%) Data entry absolute Data entry relative Calibration absolute Calibration relative 50 % end point	Calibration absolute Calibration relative
Calibrate electrodes (only with 2-circuit instrument, except numerical calibration)	separately together	separately

7.5.5 General settings (Redox)

Function	Selection	Default
Hold during calibration	yes / no	yes
Alarm offset	1 ... 1500 mV	100 mV

7.6 Chemoclean

→ Commissioning

→ Chemoclean

7.6.1 Areas of application

Chemoclean is a system for cleaning electrodes automatically. It requires an instrument with an additional FCYK module (total of 5 output contacts).

An injector (e.g. CYR 10) and an external compressed air supply system are needed for the Chemoclean functions »Cleaning agent« and »Water«.

It is possible to activate a pneumatic retractable holder in combination with the Autoclean CPC 20 control system. Feedback about the holder position is only possible with the additional FCXI module.

7.6.2 Cleaning operation

- The appropriate settings for Chemoclean have to be made first of all on the menu »Instrument data / system configuration / output contacts«:
  - »Fault / clean / contacts« (clean, rinse, two limit / control contacts)
  - »3 alarms, clean« (clean, rinse, maintenance and status contacts)
  - »2 alarms, clean+assembly« (clean, rinse, operate retractable assembly)
  - »assembly« (operate retractable assembly)
- The clean function »Chemoclean« must be set in the »System configuration / output contacts« menu
- »Chemoclean« functions are started via the »short-cut to relays« menu (see chapter 6.7)

Warning:

An external or internal hold command does not have any effect on Chemoclean. Chemoclean has to be switched off whenever any work is carried out on the assembly or the electrode.

Note:

Access to the options »Chemoclean« and »Set-up« is not possible during a cleaning cycle.

When changes are made in the »Set-up« menu, the cleaning cycle starts from the beginning again.

7.6.3 Cleaning programmes

Interval cleaning

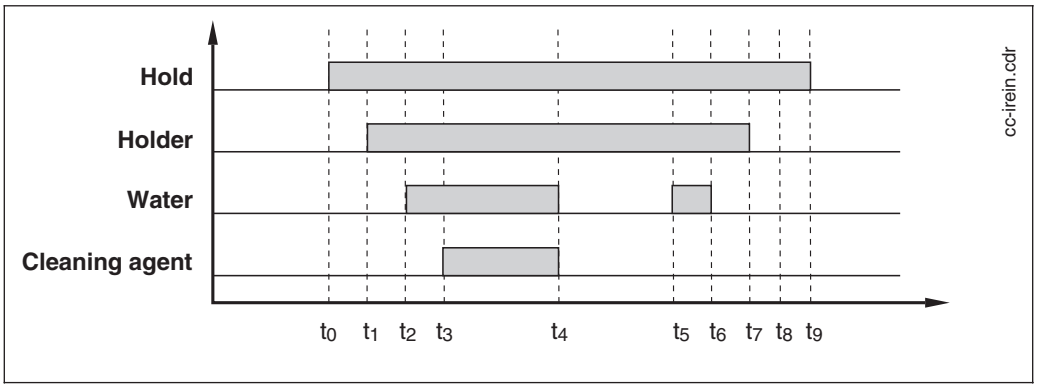


Fig. 7.1 Cleaning cycle with interval cleaning / week programme

A cleaning operation is started when the specified interval time to is over. The system then waits until the interval period is over again before starting the next cleaning operation.

t_0:	Start of the cleaning cycle
t_0 ... t_1	Waiting time (3 seconds)
t_1 ... t_2	Assembly moves to service position
t_2 ... t_3	Pre-rinsing time
t_3 ... t_4	Cleanig time
t_4 ... t_5	Soak time (only with a retrac. assem.)
t_5 ... t_6	Post-rinsing time
t_6 ... t_7	Waiting time (3 seconds)
t_7 ... t_8	Assembly moves to measuring position
t_8 ... t_9	Hold continuation time

Week programme

The cleaning operation is carried out in exactly the same way as when cleaning at intervals.

Interval measurement

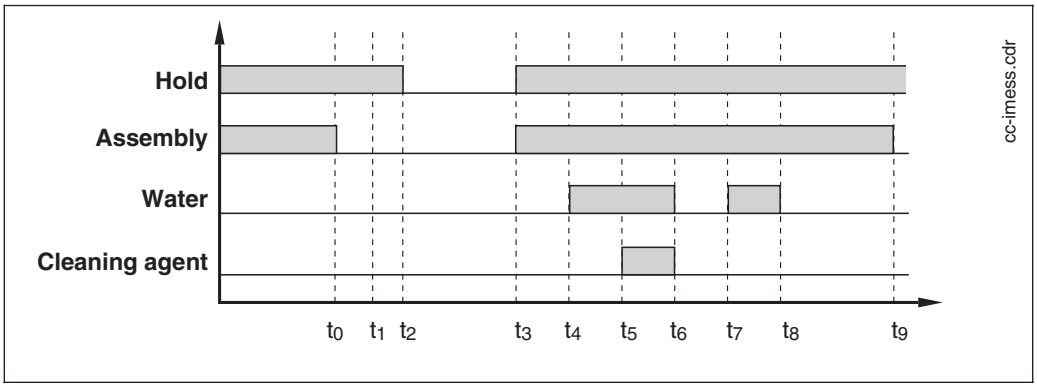


Fig. 7.2 Cleaning cycle with interval measurement

During the waiting period the electrode is located outside the medium and is only moved into measuring position for the duration of the measuring time. Afterwards, the electrode is moved back to service position and is cleaned.

t_0:	Start of measuring
t_0 ... t_1	Assembly moves to meas. position
t_1 ... t_2	Hold continuation time
t_2 ... t_3	Measuring time
t_3 ... t_4	Assembly moves to service position
t_4 ... t_5	Pre-rinsing time
t_5 ... t_6	Cleanig time
t_6 ... t_7	Soak time
t_7 ... t_8	Post-rinsing time
t_8 ... t_9	Dwell time

SCS controlled cleaning

Additionally to one of the three cleaning programs, the cleaning process can be actuated by the SCS fault messages E030 and E031 if the »SCS« electrode monitoring system is switched on (see Chapter 7.4).

Note:

- The total SCS electrode monitoring is only possible in the case of symmetrical measurement with PAL.
- If the SCS fault cannot be eliminated by two cleaning operations, the SCS-controlled cleaning facility is disabled.

7.6.4 Parameterize Chemoclean

Function	Selection	Default
Switching cleaning on / off, set parameters	Chemoclean on, Chemoclean off, Set-up	Chemoclean off
If »set-up« is chosen		
Type of cleaning programme	interval cleaning, interval measurement week programme	interval cleaning
Interval cleaning		
Cleaning cycle: interval time (time between two cleanings)	6 min ... 99 h 59 min 59 s	8 h
Continuation see »Settings for all cleaning programmes«		
Interval measurement		
Dwell time (electrode not in the medium)	0 s ... 99 h 59 min 59 s	0 min
Measurement time (electrode in the medium)	1 min ... 99 h 59 min 59 s	1 min
Continuation see »Settings for all cleaning programmes«		
Week programme		
Week programme parameters	Set-up, cancel	set-up
Week programme	Number of starts (0 ... 12) chosen individually for every day of the week (Mon ... Sun)	0
Day programme	Individual starting time for each start number	0 h
Next day	Editing the next day of the week, discontinuation	next day
Continuation see »Settings for all cleaning programmes«		

Function	Selection	Default
Settings for all cleaning programmes		
Pre-rinsing time	0 ... 999 s	10 s
Cleaning time	0 ... 999 s	5 s
Post-rinsing time	0 ... 999 s	10 s
Repeat rate	0 ... 5 times	0 times
Number of cleaning cycles with cleaning agent	0 ... 9 times	0 times
Hold during Chemoclean	On, off	on
Hold continuation time (to allow the measurement to settle)	0 ... 999 s	10 s
SCS cleaning (starts if error code E030/E031 occurs while SCS is active)	On, off	off
Total interval (if »Measurement at intervals« is selected)	No selection, frequency and total duration of the cleaning cycle plus the dwell and measurement time are displayed	
Total cleaning time (if »Cleaning at intervals«, »Weekly programme« are selected)	No selection, the total duration of a cleaning cycle is displayed	

Note:

If there are discrepancies in the operating mode »week programme« (minimum interval between the operations: 0.1 h or 6 min), the following error message appears: »Interval < 6 min«.

7.6.5 Action when the supply systems fail (mains power / compressed air)

Action when a retractable assembly is connected:

If there is a retractable assembly connected, it always stays in its current position when a failure occurs in the compressed air or power supply system or when there is a fault in the Mycom CPM 152 measuring transmitter (faults E001 - E023).

Failure during a cleaning cycle:

The cleaning operation is repeated when the supply system is working again.
This does not apply to cleaning operations that have been started manually on the »short-cut to relays« menu.

Failure during interval cleaning or measurement in measuring mode:

If it has not been possible to carry out cleaning operations during a supply failure, the last cleaning operation is carried out when the supply system is working again.
Apart from this, the cleaning program is continued as is no failure has occurred.
If the failure occurred while the program was in measuring mode, one minute is measured before any further action is taken, in order to make sure that a stable reading is obtained.

Failure during the week programme in measuring mode:

Cleaning operations during a failure are disregarded and are not carried out afterwards.

8 Controller configuration

The possible controller settings are determined by the equipment incorporated in your instrument as well as by the preliminary settings made in the menu system set-up / output relays« (see chapter 7.1.3).

Note:

For two-circuit instruments, limit value and controller always relate to input 1.

8.1 Types of controller

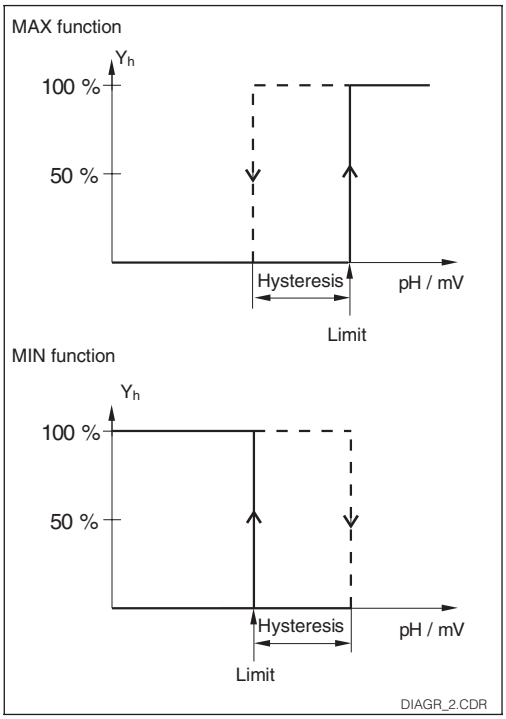


Fig. 8.1 Control curve of a limit contactor

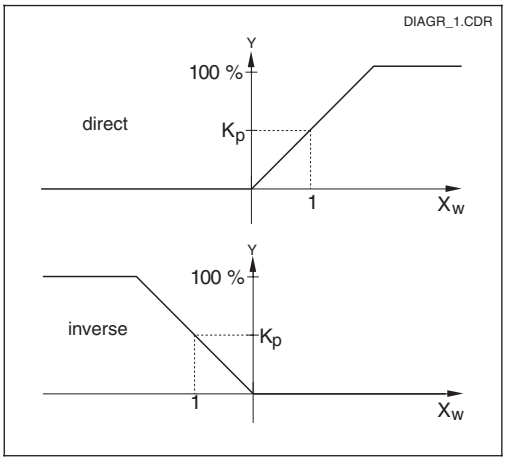


Fig. 8.2 Control curve of a proportional controller with direct and inverse function

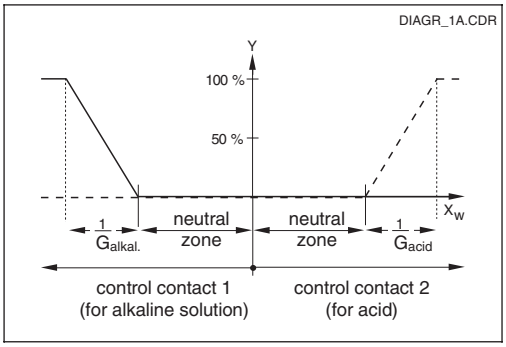


Fig. 8.3 Control curve of a proportionally acting neutralisation controller

The Mycom CPM 152 measuring transmitter has the following controller functions for controlling the pH value:

- Limit contacts
- P, PI, PD, PID controllers
- Neutralisation controllers (P, PI, PD, PID controller for 2 control contacts)
- Two-range P controller
- Three-level step controller

Limit contactor

Depending on the measured value in each case, the contact concerned is either permanently closed or permanently open. Hysteresis and switching function (min./max.) parameters can be set.

PID controllers

There is a choice of conventional P, PI, PD and PID controllers available in the controllers menu for pH/redox controlling with an actuator. Control contact 1 is used to output the actuating signal. Setting of the parameters of the PID controllers is via the values control gain K, integral action time T_n and derivative action time T_v.

Direct controller action:
pos. control deviation X_w ➔ pos. act. signal
Inverse controller action:
neg. control deviation X_w ➔ pos. act. signal
$X_w = X - W$, X = measured value,
W = specified value, Y = actuating signal

Neutralisation controllers

In the neutralisation control process, the pH level of a medium is kept constant by the addition of acid or alkaline solution.
Two separate actuating signals are required for this purpose, one for acid metering and one for alkaline solution metering.
The neutralisation controller is a controller with 2 control contacts that has been specially designed for this assignment.
P, PI, PD and PID are available as possible control structures.
The control gain for alkaline solution and acid can be set separately.
Integral action time T_n and derivative action time T_v are valid for both actuators.
Within the »neutral zone« there is no metering of alkaline solution or acid (Y = 0) for controllers without integral portion (P, PD) and constant metering of alkaline solution or acid ($Y_{new} = Y_{old}$) for controllers with integral portion (PI, PID).

Two-range P controllers

The two-range P controller is the preferred choice for neutralisation in batch processes. In accordance with the processbased titration curve, the control amplification can be set for an inner and an outer pH/redox range. Parameter setting of the controller is via the values $G_{inner\ range}$, $G_{outer\ range}$, X_o and X_u.

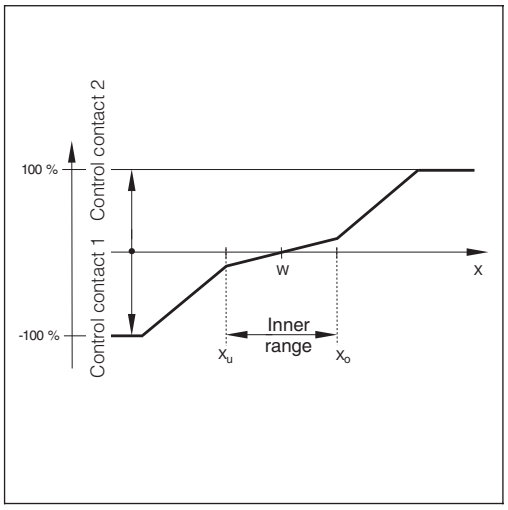


Fig. 8.4 Transmission curve of a P controller with a bent curve

Note:

Positive output values activate control contact 1, negative output values activate control contact 2 on all controllers. The allocation contact/control function has to be set in chp. 7.1.3, »relays allocation«.

Actuating signal outputs

The control contact in question issues a cycled signal, the intensity of which corresponds to the controller output value. According to the nature of the signal cycle, a distinction is made between:

- *Pulse-length modulation:* The length of time the contact concerned remains closed increases as the size of the calculated deviation increases. The period can be set between 0.5 and 99.9 s. Pulse-length-modulated outputs are used to activate solenoid valves.
- *Pulse-frequency modulation:* The switching frequency of the contact concerned increases as the size of the calculated deviation increases. The maximum switching frequency of 1/T can be set between 60 and 180 1/min. The switching time t_{ON} is constant. Pulse-frequency-modulated outputs are used to activate solenoid metering pumps.

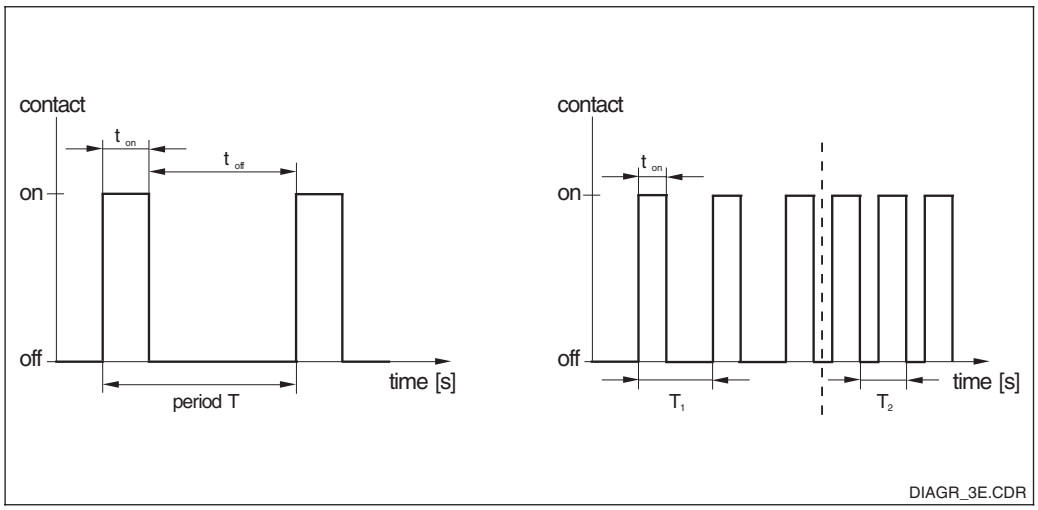


Fig. 8.5 Signal of a pulse-length-modulated control contact (left) and a pulse-frequency-modulated control contact (right)

Three-point step controller

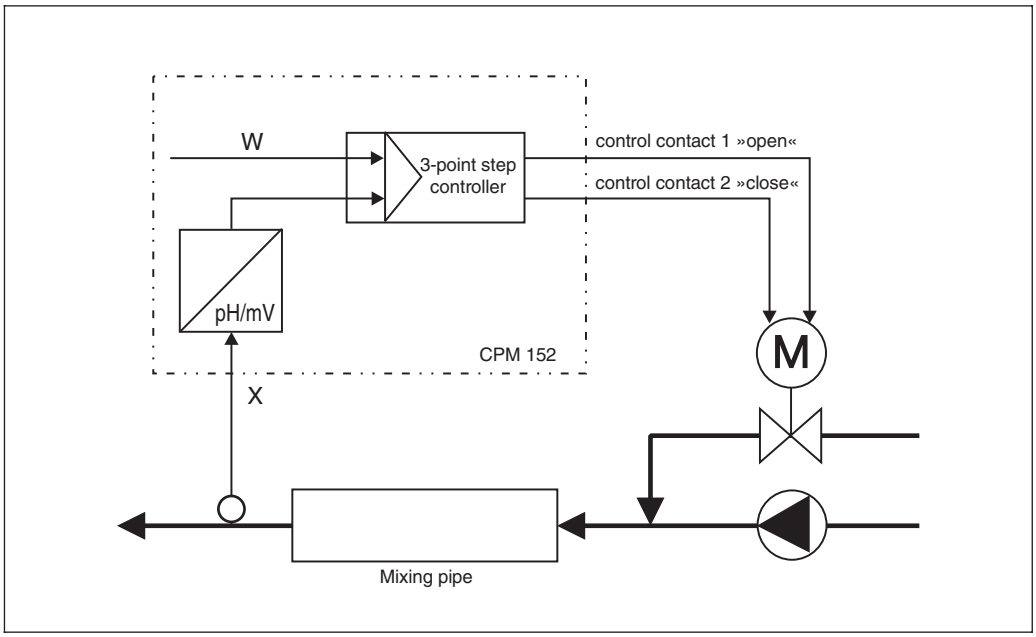


Fig. 8.6 Process control with a three-point step controller

Three-point step controllers are used in connection with integrally acting actuating drives like motor valves and adjustable-lift diaphragm pumps. In combination with these actuating drives, the PD and PDT1 controllers act like PI and PIT1 units. Parameter setting is carried out via the control gain K_P and the integral action time T_n (as is the case with PI controllers). Since three-point step control is carried out without position feedback, the motor running time T_m is required as well, in which the drive goes through the whole of the actuating range.

The adjustable neutral zone makes it possible to suppress unnecessary setting movements in the range of the specified value (Y = 0).
2 control contacts are needed to activate the actuating drives (open / close).
The control contact 1 is activated for positive output values while automatic operation and by pressing the ↑ key while manual operation.
The control contact 2 is activated for negative output values while automatic operation and by pressing the ↓ key while manual operation.

8.2 Instruments with two contacts

→ Commissioning
→ Controllers
→ Limit contactor ☞ 8.2.1
→ Control contact ☞ 8.2.2

8.2.1 Limit contactor (standard equipment)

Note:

The option »limit value + controller« has to be chosen before in the menu »commissioning / system set-up / output relays« (see chapter 7.1.3).

Either a limit contact **or** a controller can be set.
If a controller is supposed to be set and a limit contactor has been set beforehand, the limit contactor has to be switched off (and vice-versa).

Warning:

The type of contact is maintained after an output is switched off and the control contact moves to its home position (e.g. type of contact »N.O.«: control contact open)

Function	Selection	Default
If limit contactor 1 »on« three configuration groups can be selected.	Limit value configuration alarm configuration operating mode	Limit value configuration
If »Limit value configuration« is selected		
Switching limit contact 1 on / off	on, off	off
Limit value	–2.00 ... +16.00 pH	4.00 pH
Hysteresis	0.10 ... 1.00 pH	0.50 pH
Alignment of the limit	min. function max. function	min. function
Pickup delay	0 ... 7200 s	0 s
Dropout delay	0 ... 7200 s	0 s
Contact type	N.C., N.O.	N.O.
If »Alarm configuration« is selected		
Alarm threshold (related to limit value)	0.10 ... 18.00 pH	1.00 pH
Alarm delay	0 ... 6000 s	0 s
If »Operating mode« is selected		
Changing operating mode	automatic limit contact 1, manual limit contact 1	manual

8.2.2 Controller (standard equipment)

Function	Selection	Default
If any controller is set, three configuration groups can be selected.	configuration parameterize operation mode	configuration
If »configuration« is selected		
Control characteristics	P, PI, PD, PID, none	none
Selection of the output	control contact 1 alarm 1 [1)]	contact 1
If »Control contact 1« is selected		
Signal outputs	pulse length, pulse frequency	pulse length
Pulse cycle time (if »Pulse-length controller« is selected)	0.5 ... 99.9 s	10.0 s
Min. cycle time (if »Pulse-length controller« is selected)	0.1 ... 5.0 s	0.3 s
Max. pulse frequency (if »Pulse frequency« is selected)	60 ... 180 1/min	120 1/min
Type of contact	N.C., N.O. relay	N.O.
If »Alarm 1« is selected		
Alarm threshold (related to set point)	0.10 ... 18.00 pH	1.00 pH
Alarm delay	0 ... 6000 s	0 s

[1)] Exceeded setpoint result in error number E 067 and can be signalled at the »maintenance« contact.

Continued on the next page

Function	Selection	Default
If »parameterize« is selected		
P controller		
Control gain	K_p: 0.10 ... 20.00	1.00
Controller output	Min. controller output: 0 ... 50 % Max. controller output: 50 ... 100 %	0 % 100 %
Control effect	Direct, inverse	inverse
PI controller		
Control gain, integral action time	K_p: 0.10 ... 20.00 T_n: 0.1 ... 999.9 min	1.00 10.0 min
Controller output	Min. controller output: 0 ... 50 % Max. controller output: 50 ... 100 %	0 % 100 %
Control effect	Direct, inverse	inverse
PD controller		
Control gain, derivative action time	K_p: 0.10 ... 20.00 T_v: 0.1 ... 999.9 min	1.00 1.0 min
Controller output	Min. controller output: 0 ... 50 % Max. controller output: 50 ... 100 %	0 % 100 %
Control effect	Direct, inverse	inverse
PID controller		
Control gain, integral action time,, derivative action time	K_p: 0.10 ... 20.00 T_n: 0.1 ... 999.9 min T_v: 0.1 ... 999.9 min	1.00 10.0 min 1.0 min
Controller output	Min. controller output: 0 ... 50 % (corresponds to basic load metering) Max. controller output: 50 ... 100 %	0 % 100 %
Control effect	Direct, inverse	inverse
If »operating mode« is selected		
Changing operation mode	Controller automatic Controller manual	manual
Controller output (if »manual« is selected)	0 ... 100 %	0 %
Setpoint (if »automatic« is chosen)	–2.00 ... +16.00 pH	4.00 pH

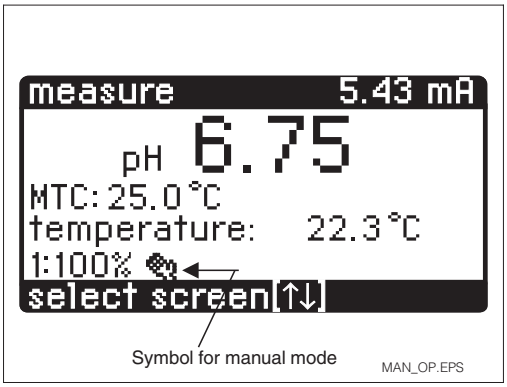


Bild 8.7 The display in operating mode »Manual«

8.3 Instruments with five contacts

→ Commissioning

→ Relay contacts

→ Limit contactor ☞ 8.3.1
→ Control contacts ☞ 8.3.2

Note:

The controllers require either control contact 1 (P, PI, PD, PID) or control contacts 1 and 2 (neutralisation controller, three-point step controller, 2-range P controller).

If limit contactor 1 is selected, it is not possible to set a controller (the relevant menu points cannot be viewed). Access to the control functions is made possible again by switching the limit contactor 1 to »off«. For a combination of limit contactor and controller contact 1 always has to be configurated as a controller and contact 2 as a limit contactor.

8.3.1 Limit contactor (equipment with plug-in module FCYK) – 3 additional contacts

Function	Selection	Default
If limit contactor 1 or / and limit contactor 2 are set three configuration groups can be selected.	Limit value configuration Alarm configuration Operation mode	Limit value configuration
If »configuration« is selected		
Selection of limit contact	Limit contact 1 Limit contact 2	limit contact 1
Switching limit contactor off/on	Off, on	off
Limit value	–2.00 ... +16.00 pH	1: 4.00 pH, 2: 10.00 pH
Hysteresis	0.10 ... 1.00 pH	0.50 pH
Alignment of the limit	Min. function Max. function	1: min. funct. 2: max. funct.
Pickup delay	0 ... 7200 s	0 s
Dropout delay	0 ... 7200 s	0 s
Contact type	N.C., N.O.	N. O.
If »alarm configuration« is selected		
Selection of alarm function	alarm limit contactor 1 [1)] alarm limit contactor 2 [2)]	alarm 1
Alarm threshold (related to limit value)	0.10 ... 18.00 pH	1.00 pH
Alarm delay	0 ... 6000 s	0 s

[1)] Exceeded setpoint result in error number E 067 and can be signalled at the »maintenance« contact.
[2)] Exceeded setpoint result in error number E 068 and can be signalled at the »maintenance« contact.

Continued on the next page

Function	Selection	Default
If »Operation mode« is selected		
Selection of limit contact	Limit contact 1, limit contact 2	limit cont. 1
Changing operating mode	Auto contact 1 / 2 Manual contact 1 / 2	manual contact
Manual operation of limit contactor (If »Manual contact 1 / 2« is selected)	Off, on	off

8.3.2 Controller (equipment with plug-in module FCYK) – 3 additional contacts

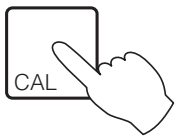
Function	Selection	Default
If a controller is set three configuration groups can be selected.	Configuration Parameterize Operation mode	configuration
If »configuration« is selected		
Selection of type of controller	None, P-, PI-, PD, PID controller, Three-point step contr. (PD, PDT 1), Neutralisation controller, 2-range P controller (the last four options can be selected by scrolling the list)	none
For neutralisation controller: controller type	P, PI, PD, PID controller	P controller
Selection of output	Control contact 1, control contact 2 (not fpr P, PI, PD, PID controller), alarm 1 [1]	control cont. 1
If »Control contact 1« or »Control contact 2« is selected		
Controller characteristics	Pulse-length output Pulse-frequency output 3-point step + (output for positive actuating signals), 3-point step – (output for negative actuating signals)	(depends on controller type)
Pulse cycle time (for »Pulse-length output« or »3-point step +«)	0.5 ... 99.9 s	10.0 s
Min. cycle time (for »Pulse-length output« or »3-point step +«)	0.1 ... 5.0 s	0.3 s
Maximum pulse frequency (if »Pulse-frequency output« is selected)	60 ...180 1/min	120 1/min
Type of contact	N.C., N.O.	N. O.
If »Alarm 1« is selected		
Alarm threshold (related to set point)	0.10 ... 4.00 pH	1.00 pH
Alarm delay	0 ... 6000 s	0 s

[1] Exceeded setpoint result in error number E 067 and can be signalled at the »maintenance« contact.

Continued on the next page

Function	Selection	Default
If »parameterize« is selected		
Parameter setting for the controller characteristics P, PI, PD and PID is carried out as outlined in chapter 8.2.2		
3-point step controller PD or PDT1)		
Control gain, integral action time, motor running time	K_p: 0.10 ... 20.00 T_n: 0.1 ... 999.9 min T_m: 10 ... 999 s	1.00 10.0 min 10.0 s
Neutral zone	0.00 ... 3.00 pH	0.50 pH
Control effect	Direct, inverse	inverse
Neutralisation controller		
Control gain for alkaline solution controller and acid controller	K_p alkal.: 0.10 ... 20.00 K_p acid: 0.10 ... 20.00	1.00 1.00
Integral action time, derivative action time	T_n: 0.1 ... 999.9 min T_v: 0.1 ... 999.9 min	10.0 min 1.0 min
Neutral zone	0.00 ... 3.00 pH	0.50 pH
Controller outputs	Y_h acid: 50 ... 100 % Y_h alkal. sol.: 50 ... 100 %	100 % 100 %
2-range P controller		
Control gain	$K_{p\ inner\ range}$: 0.10 ... 20.00 $K_{p\ outer\ range}$: 0.10 ... 20.00	1.00 1.00
Inner range limits	Upper limit X_U: –2.00 ... +16.00 pH Lower limit X_L: –2.00 ... +16.00 pH	8.00 pH 6.00 pH
Controller outputs	Y_h contact 1: 50 ... 100 % Y_h contact 2: 50 ... 100 %	100 % 100 %
Control effect	Direct, inverse	inverse
If »operation mode« is selected		
Changing the operation mode	Controller automatic Controller manual	manual
if »manual« is chosen		
With 3-point step controllers:	Remain, as long as ↑-key is pressed: open, as long as ↓-key is pressed: close	remain
With neutralization controllers and 2-range P controllers:	Controller output: –100 ... +100 %	0 %
With all other controllers:	Controller output: 0 ... 100 %	0 %
if » automatic« is chosen		
Setpoint	–2.00 ...+16.00 pH	4.00 pH

9 Calibration



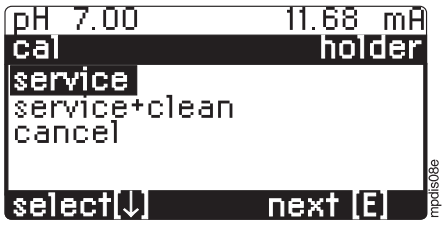
Note:

The preliminary calibration settings are made at the main parameter setting level on the menu “Instrument data / calibration” (see Chapter 7.5).

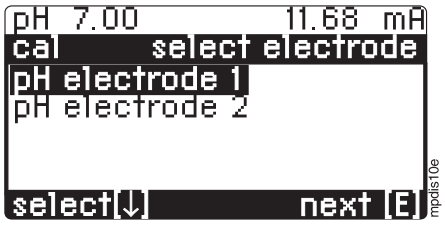
A direct route is taken to the relevant calibration routine in accordance with the type of calibration set on the menu “Instrument data / calibration / calibration parameters” (see Chapter 7.5). The screenshots can therefore deviate from the examples.

Sequence of operations

The code enquiry appears when the CAL key has been pressed.
The whole of the calibration process is accessible with the operator code.



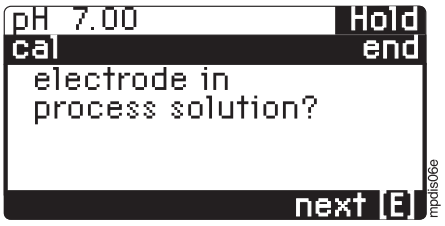
If a retractable assembly is available that is not yet in service position, this operation can be actuated in the “Assembly” window by selecting “Service”.
If the Chemoclean function has been configured, a cleaning operation is also possible.
The assembly and cleaning states are displayed in an information window.



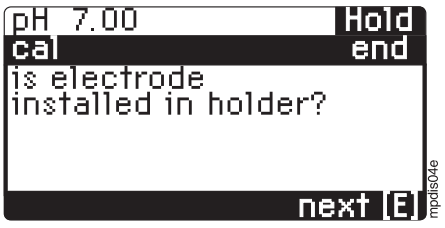
If the electrodes are calibrated individually in two-circuit instruments (preliminary setting on the menu “Instrument data / calibration / calibration parameters”), a specific electrode has to be chosen before the calibration operation starts.

Conclusion of the calibration operation

The calibration operation is concluded by commanding “Store calibration”.



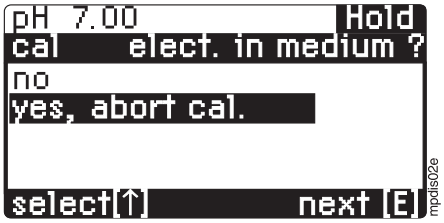
If there is no assembly available, this field appears.



If there is a retractable assembly, these fields appear. If the Chemoclean function has been configured, a cleaning operation is possible as well. The assembly and cleaning states are displayed in an information window.

Interruption of the calibration operation

The calibration operation can be interrupted at any time by pressing the MEAS key.

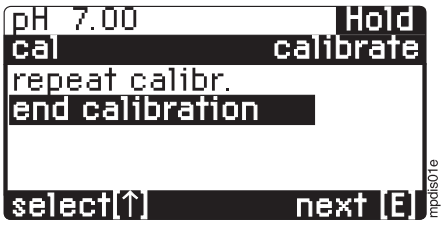


If the interruption is confirmed by “yes, abort calibration”, the system returns to measuring mode.
If “no” is chosen instead, the calibration operation is continued.

Note:

If a retractable assembly is connected, it has to be moved to measuring position via the menu “Basic operation”.

If there is a power failure in the course of the calibration operation, the calibration operation can be repeated or terminated when the power supply has been re-established.



If “End calibration” is chosen, the same fields appear as is the case when the calibration operation has been completed.

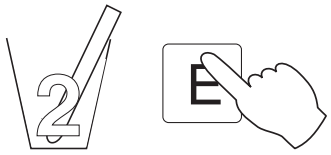
General calibration instructions

Caution:

- Clean electrode before calibration.
- If symmetrical high-impedance electrode connection is chosen, potential matching line has to be in connection with the buffer solution too, e.g. by means of a wire.
- If automatic temperature compensation (ATC) is selected, the relevant temperature sensors must be immersed in the buffer solution too.

Note:

- The fields marked with a black triangle only appear when they are required.
- Confirmation of input and switching to the next field is achieved by pressing the E key.
- When you see these symbols



in the operating table, immerse one or both of the electrodes (as shown on the display in each individual case) in buffer solution 1 or 2. Start calibration with the E key.

- The only way to conclude the calibration operation is with “End of calibration”+ E.

9.1 Calibrate pH

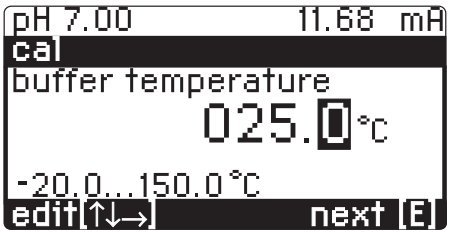
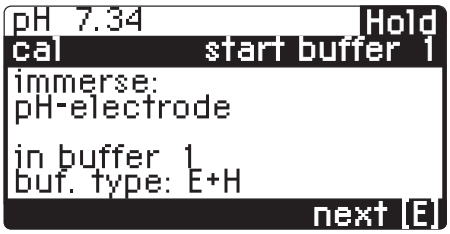
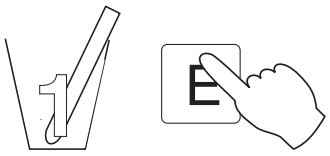
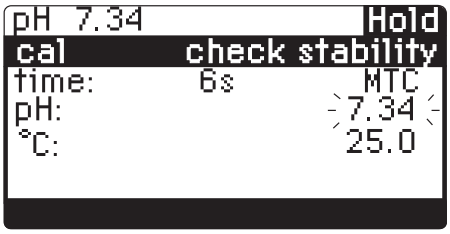
- **Automatic buffer recognition** (☞ 9.1.1)
  Both standard buffers and up to three individually defined buffers can be specified in the “commissioning / calibration / buffer selection” menu (☞ 7.5.3).
  During calibration the instrument identifies the buffer which is being worked with at the time.

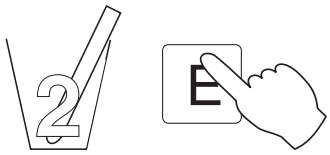
Note:

Automatic buffer recognition is not possible with antimony electrodes.

- **Preset buffers** (☞ 9.1.2)
  Two buffer solutions are determined in the “commissioning / calibration / buffer selection” menu (☞ 7.5.3).
  Besides standard buffers individual buffers can be defined.
- **Manual calibration** (☞ 9.1.3)
  Manual calibration is carried out by matching the pH display to the relevant buffer value and the current measured value is shown in each case.
- **Numerical calibration** (☞ 9.1.4)
  Electrode zero point and slope value are entered manually.

9.1.1 Automatic buffer recognition (pH)

Display	Description
	Only if “Calibration with MTC” has been selected in the previous field: Enter the value for manual temperature compensation. Selection band: – 20.0 ... 150.0 °C Press the E key.
 	
	Calibration is being carried out now. The instrument is waiting until the pH measurement has stabilised and will then store the measured value and move on to the starting field for the 2nd buffer.
	If the measured value is not stable after 300 seconds a display appears with the option of discontinuing the calibration operation. Press the E key to stop the calibration here and to return to the “Type of calibration” menu.

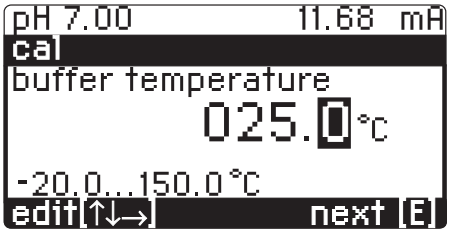
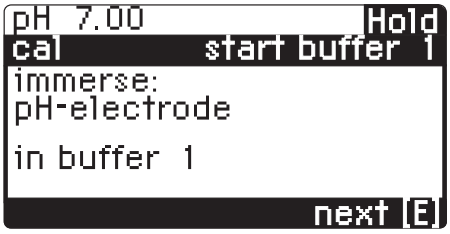
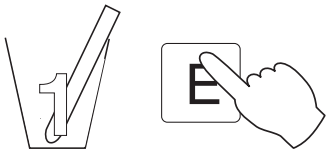
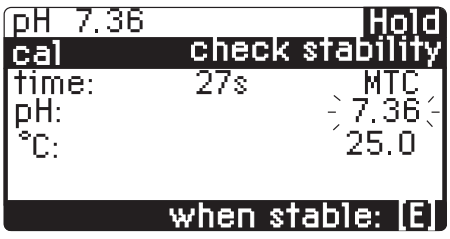
Display	Description
pH 7.00 Hold cal start buffer 2 immerse: pH-electrode in buffer 2 buf. type: E+H next [E]	
pH 4.21 Hold cal check stability time: 15s MTC pH: 4.21 °C: 25.0	Calibration is being carried out now. The instrument is waiting until the pH measurement has stabilised and will then store the measured value and move on to the calibration information.
	If the measured value is not stable after 300 seconds a display appears with the option of discontinuing the calibration operation. Press the E key to stop the calibration here and to return to the “Type of calibration” menu.
pH 4.21 Hold cal info identified buffers: buffer pH 6.98 buffer pH 4.01 buf. type: E+H next [E]	Display of the buffers identified.
pH 4.21 Hold cal info electr. 1 zeropoint pH7.00 o.k. slope 5.00mV/pH out of range next [E]	Calibration information. If the electrode zero point and slope figures are outside the tolerance limits you will be informed about this on the display. If the pH values of the buffer solutions used are too close together, you will be informed about this on the display. Repeat the calibration operation with suitable buffers.
pH 7.00 Hold cal info electr. 1 zeropoint pH7.00 o.k. slope 59.25mV/pH o.k. next [E]	Display with plausible calibration values.
pH 7.00 Hold cal end store calibr. repeat calibr. discard calibr. select[↓] next [E]	Final menu. You can: • store the calibration • repeat the calibration • discard the calibration and return to measuring mode Make your choice and press E.

9.1.2 Preset buffers (pH)

The same procedure as with calibration with automatic buffer identification (see chapter 9.1.1) is followed in the case of calibration with preset buffers. One difference is, however, that the buffers specified during instrument configuration in the “Calibration” menu have to be used. To avoid mistakes, the correct type of buffer (pH value and manufacturer) is displayed during calibration.

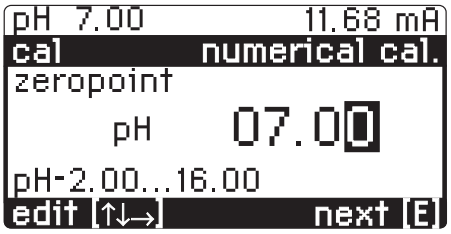
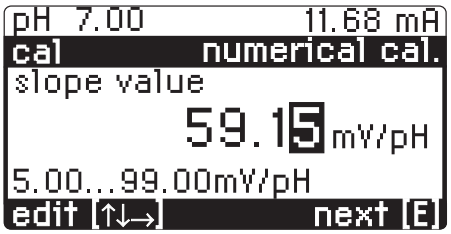
Single-point calibration is also possible.
If you want to choose this, press the “CAL” key when the 2nd buffer is requested.

9.1.3 Manual buffer (pH)

Display	Description
	Enter the value for manual temperature compensation. Selection band: – 20.0 ... 150.0 °C. Press the E key. (Only if “Calibration with MTC” was selected.)
 	
	Wait until the pH measurement has stabilised. Press the E key to store the measurement.

Display	Description
pH 7.36 Hold cal enter buffer 1 temperature: 25.0°C pH 07.00 pH-2.00...16.00 edit[↑↓→] next [E]	The pH value measured with the old calibration data is displayed. Correct the display by entering the temperature-correct pH value of the buffer you are currently using. Press the E key. If you are calibrating two temperature sensors the instrument will ask you to repeat the input before moving on to the next step.
pH 7.00 Hold cal start buffer 1 immerse: pH-electrode in buffer 2 1-pt [Cal] next [E]	  If single-point calibration is chosen: move on to the calibration information by pressing “CAL”.
pH 4.21 Hold cal check stability time: 27s MTC pH: 4.21 °C: 25.0 when stable: [E]	Wait until the pH measurement has stabilised. Press the E key to store the measurement.
pH 4.21 Hold cal enter buffer 2 temperature: 25.0°C pH 04.00 pH-2.00...16.00 edit [↑↓→] next [E]	The pH value measured with the old calibration data is displayed. Correct the display by entering the te,mperature-correct pH value of the buffer you are currently using. Press the E key. When calibrating with two temperature sensors, the instrument will ask you to repeat the input before moving on to the next step.
pH 7.00 Hold cal info electr. 1 zeropoint pH7.00 o.k. slope 59.25mV/pH o.k. next [E]	Calibration information If the electrode zero point and slope figures are outside the tolerance limits you will be informed about this on the display. Press the E key to store the new values. (For two measuring circuits there is a 2nd information display.)
pH 7.00 Hold cal end store calibr. repeat calibr. discard calibr. select[↓] next [E]	Final menu. You can: • store the calibration • re peat the calibration • dis card the calibration and return to measuring mode Make your choice and press E.

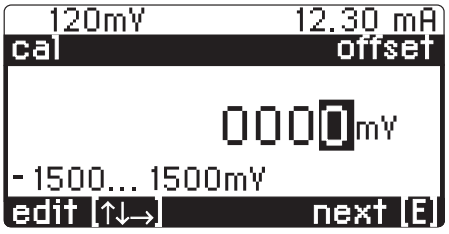
9.1.4 Numerical calibration (pH)

Display	Description
	Enter the pH value for the electrode zero point. Press the E key.
	Enter the electrode slope value in mV / pH. Press the E key. **Note:** The slope value relates to the set reference temperature.

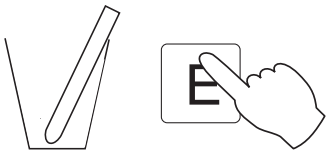
9.2 Calibrate redox absolute (mV)

- **Data entry** (☞ 9.2.1)
  Entry of electrode offset in mV
- **Calibration absolute** (☞ 9.2.2)
  The electrode offset is calculated out of the difference between the actual measured value and the known buffer value.

9.2.1 Data entry absolute (numerical calibration / mV)

Display	Description
	Enter the mV value for the electrode offset. Press the E key. The value entered takes effect immediately. (Maximum offset: 400 mV)

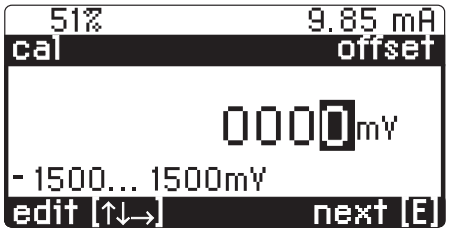
9.2.2 Calibration absolute (mV)

Display	Description
221mV Hold cal start buffer immerse: electrode in buffer set next [E]	
221mV Hold cal. check stability time: 27s mV: 120 when stable: [E]	The redox value measured with the old calibration data is displayed. Wait until the measurement has stabilised. Press the E key to store the measurement.
221mV Hold cal input buffertype 0225 mV - 1500... 1500mV edit [↑↓→] next [E]	Enter the redox value for the buffer used.
221mV Hold cal info offset 4mV o.k. next [E]	Calibration information. If there is a calibration fault you will be informed by a display. Press the E key.
221mV Hold cal end store calibr. repeat calibr. discard calibr. select [↓] next [E]	Final menu. You can: • sto re the calibration • repe at the calibration • disc ard the calibration and return to measuring mode Make your choice and press E.

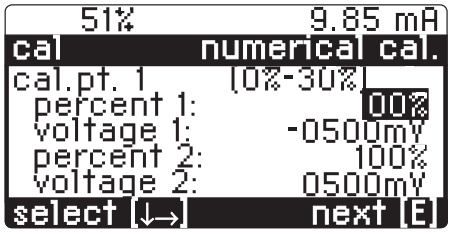
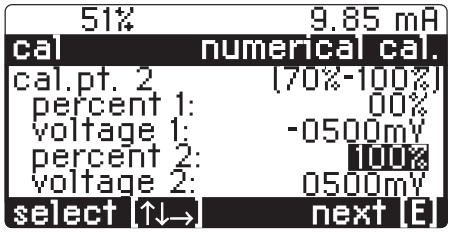
9.3 Calibrate redox relative (%)

- **Data entry absolute** (☞ 9.3.1)
  Entry of electrode offset in mV.
- **Data entry relative** (☞ 9.3.2)
  Entry of two % calibration points and to each of them the according mV value.
- **Calibration absolute** (☞ 9.3.3)
  The electrode offset is calculated out of the difference between the actual measured value and the known buffer value.
- **Calibration relative** (☞ 9.3.4)
  One detoxified and one unchanged sample serve as buffers.
- **50% end point calibration** (☞ 9.3.5)
  The experimentally determined 50% end point is used.

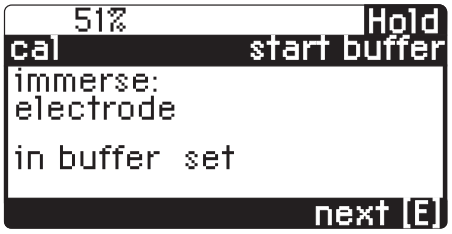
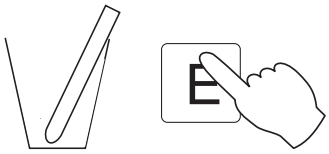
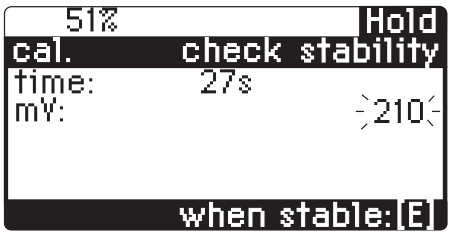
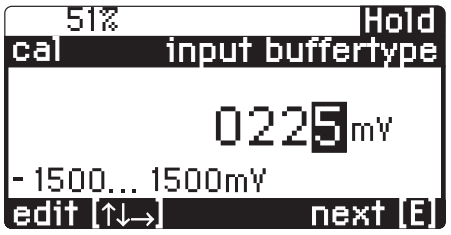
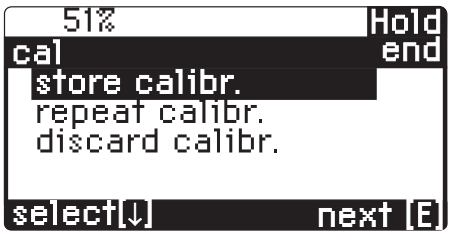
9.3.1 Data entry absolute (%)

Display	Description
	Enter the mV value for the electrode offset. Press the E key. The value entered takes effect immediately.

9.3.2 Data entry relative (%)

Display	Description
	Form two pairs of relative and absolute redox values by entering appropriate figures: Select line with "↑↓" keys. Press "→" if you want to edit the selected figure using the "↑↓" keys. Confirm each edited value by pressing "E". Pressing the "E" key once more confirms the whole new settings. The input will take effect immediately.
	

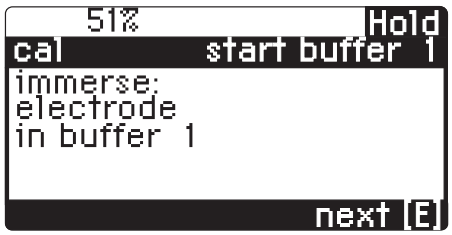
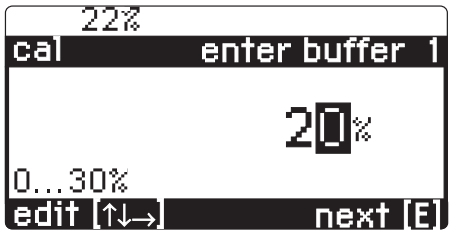
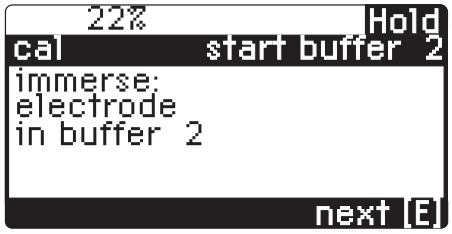
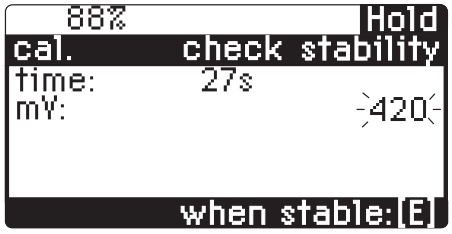
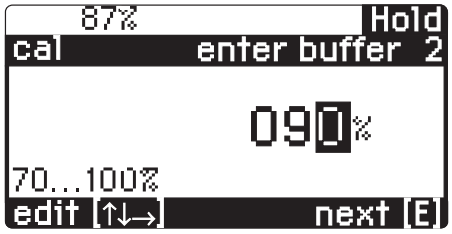
9.3.3 Calibration absolute (%)

Display	Description
	
	The redox value measured with the old calibration data is displayed. Wait until the measurement has stabilised. Press the E key to store the measurement.
	Enter the absolute redox value of the buffer in mV.
	Calibration information. If there is a calibration fault you will be informed by a display. Press the E key.
	Final menu. You can: • store the calibration • repeat the calibration • discard the calibration and return to measuring mode Make your choice and press E.

9.3.4 Calibration relative (%)

A sample of the medium is filled in two containers for calibration purposes. The contents of the first container are detoxified and serve as buffer 1.

The contents of the second container are left unchanged and serve as buffer 2.

Display	Description
	 Detoxified sample 
	Wait until the redox measurement has stabilised. Press the E key to store the measurement.
	Enter the relevant redox value of buffer 1 (detoxified sample) in percent.
	 Unchanged sample 
	The redox value measured with the old calibration data is displayed. Wait until the measurement has stabilised. Press the E key to store the measurement.
	Enter the relative redox value of buffer 2 in per cent.

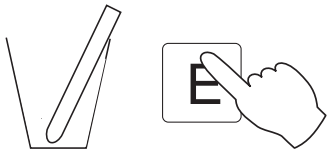
Continued on the next page

Display	Description
51% Hold cal info voltage range too small! measured values will not be stored next [E]	If there is a calibration fault you will be informed by a display. Press the E key to return to the start menu.
51% Hold cal end store calibr. repeat calibr. discard calibr. select[↓] next [E]	Final menu. You can: • store the calibration • repeat the calibration • discard the calibration and return to measuring mode Make your choice and press E.

9.3.5 50 % end point (%)

Note:

The 50% end point must be known (e.g. by titration of the toxic solution)

Display	Description
51% Hold cal start buffer immerse: electrode in buffer set next [E]	
51% Hold cal. check stability time: 27s mV: 210 when stable:[E]	Wait until the redox measurement has stabilised. Press the E key to store the measurement.
51% Hold cal info electr. 1 0% voltage -482mV o.k. 100% voltage. 507mV o.k. next [E]	Information about the voltage range of the calibration curve.
51% Hold cal end store calibr. repeat calibr. discard calibr. select[↓] next [E]	Final menu. You can: • store the calibration • repeat the calibration • discard the calibration and return to measuring mode Make your choice and press E.

10 PROFIBUS interface

10.1 FCYP module

In the simplest case, a complete measuring point consists of the Mycom CPM 152 with the FCYP module (see chapter 4, fig. 4.12), a bus coupler, a PLC or a PC with the operating program Commuwin II and a PROFIBUS-PA terminating resistor.

The maximum number of transmitters in one bus segment is determined by their current consumption, the power of the bus coupler and the required bus length (refer to TI 260F/00/en for details).
Normally, up to 32 Mycom CPM 152 units can be operated in one bus segment in the case of non-Ex applications.

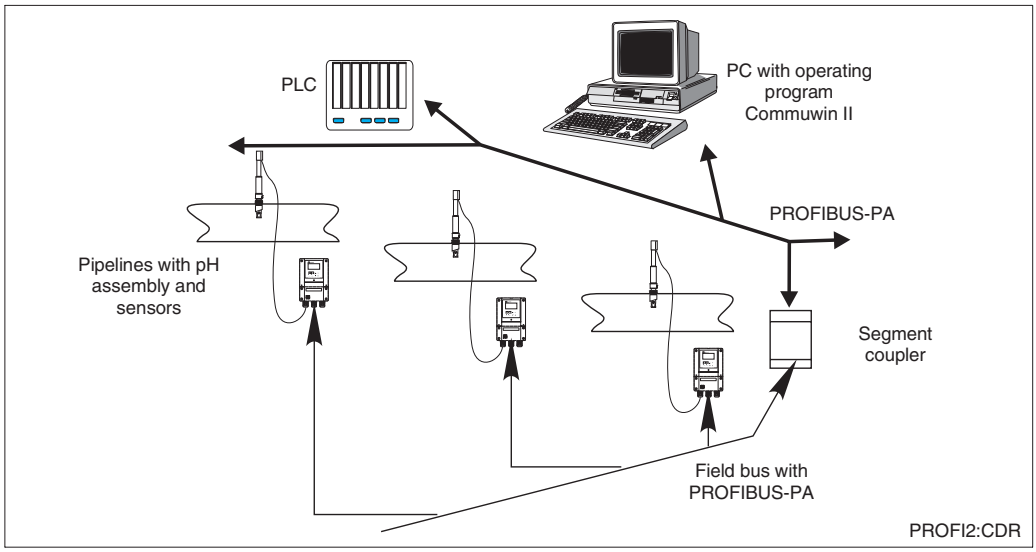


Fig. 10.1 Measuring system based on PROFIBUS-PA protocol with Mycom CPM 152

10.2 Bus cable

Shielded, twisted-pair cable should preferably be used for new installations (e.g., Belden 3097A, Siemens 6xV 1830-5AH10 cable). The FISCO model (explosion protection) prescribes the following specifications:

- Loop impedance (DC): 15 ... 150 Ω/km
  Inductance per unit length: 0.4 ... 1 mH/km
  Capacitance p. unit length: 80 ... 200 nF/km

Please refer to TI 260F/00/en Project planning notes for PROFIBUS-PA and the PROFIBUS-PA specification for information on setup and grounding of the network.

Cable connection

The bus line also carries the auxiliary energy for the plug-in PROFIBUS card and is connected as follows:

- Thread the cable through the cable entry fitting.
- Connect the bus cable to the terminals (see fig. 10.192).
  Terminal 99 PA+
  Terminal 98 PA-
  (Polarity reversal does not affect operation.)
- Attach the screen to the internal ground terminal.
- Connect the external ground terminal to the potential matching line if required.

Caution:

Multiple grounding of the protective screen in explosion protection applications is only permissible in special cases.

10.3 Bus address

Each device is assigned a unique bus address:

⇒ Set address (1 ... 126) with switches 1-7
⇒ Switch 8 set to OFF:
Address set with DIL switches 1-7 is valid.
⇒ Switch 8 set to ON:
The address set in the field or via the interface is valid.

Setting of PROFIBUS address (menu selection):

- Param
- Advanced
- Commissioning
- System set-up

General ⇒ PROFIBUS address (default 126)

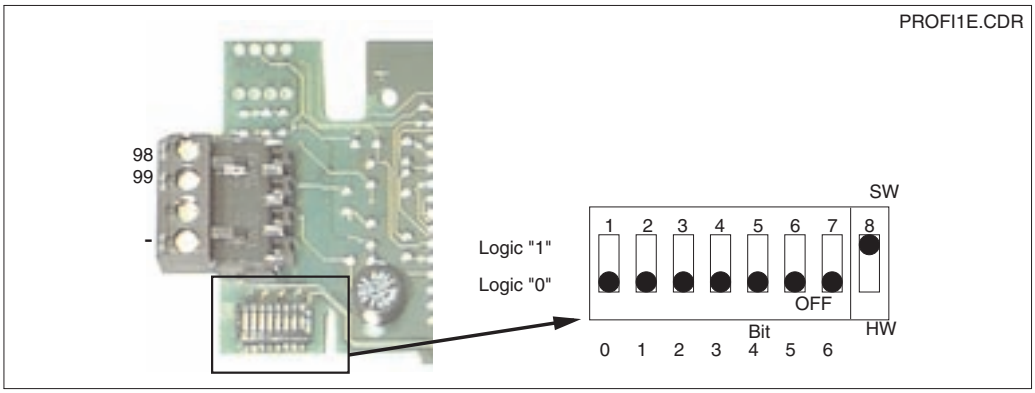
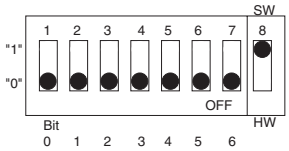


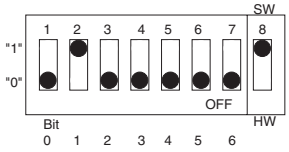
Fig. 10.2 Section of PROFIBUS card in Mycom showing address setting 126 (factory setting)

Addressing examples

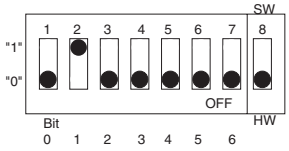
Factory setting:
Software addressing (SW)
(default: 126_d)
(Hardware setting will be ignored)



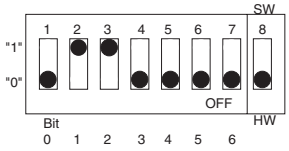
Software addressing
(default: 126_d)
(Hardware setting will be ignored)



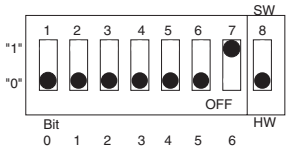
Hardware addressing (HW)
address: 2_d



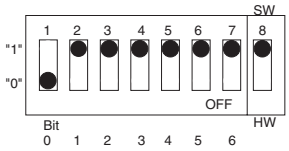
Hardware addressing
address: 6_d



Hardware addressing
address: 64_d



Software addressing
address: 126_d
(default after switching from HW to SW)



10.4 Remote-controlled operation with Commuwin II (acyclical service)

PROFIBUS-PA devices can be operated via the Commuwin II operating program (starting with software version 1.5). A PC with PROFIBUS-DP interface is necessary. Operation with Commuwin II is described in the BA 124F operating instructions. Settings are made via the operating matrix (see fig. 10.3) or graphical user interface (see fig. 10.4). The necessary files are available on CD.

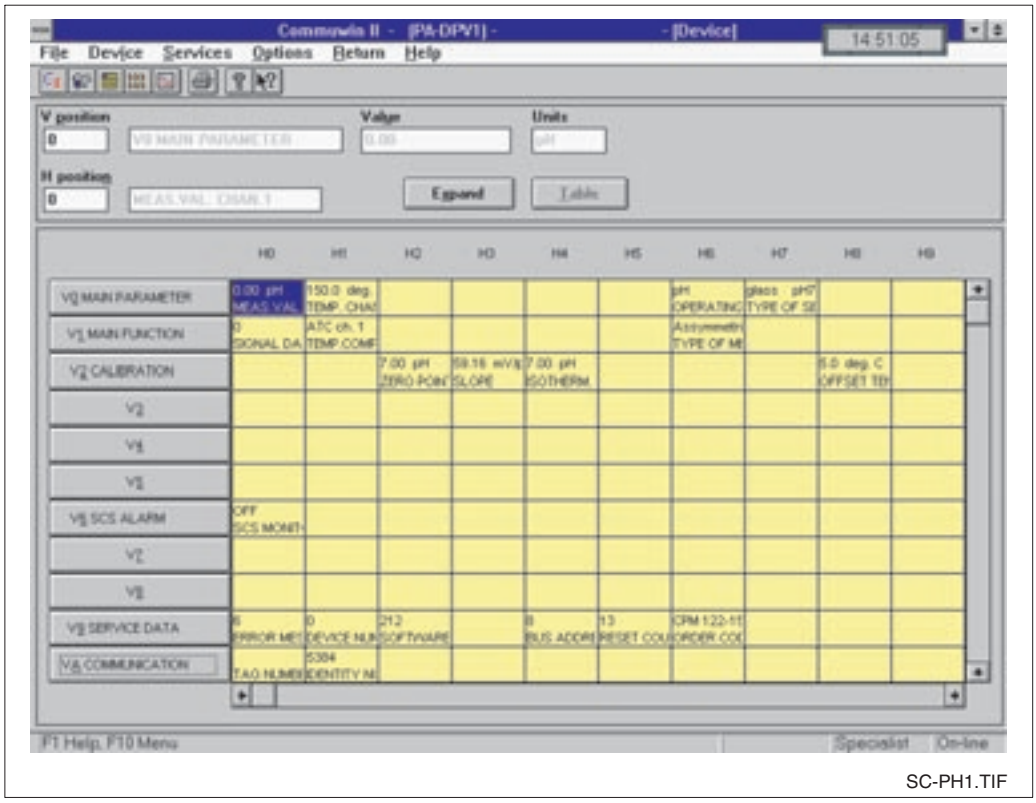


Fig. 10.3 Instrument data (commissioning) menu displayed in Commuwin II

Note:

During active communication via PROFIBUS an double arrow is visible in the upper line of the instrument display.

Establishing the connection

Remote control requires installation of the PROFIBUS-PA server, and the PC must be equipped with a PROFIBUS-PA interface:

- The connection to Commuwin II is established via the PROFIBUS-PA server.
- The device list contains all devices connected to the segments selected.
- The appropriate settings are made in the Commissioning menu.
- PROFIBUS-PA profile parameters can also be displayed and set via the graphical user interface.

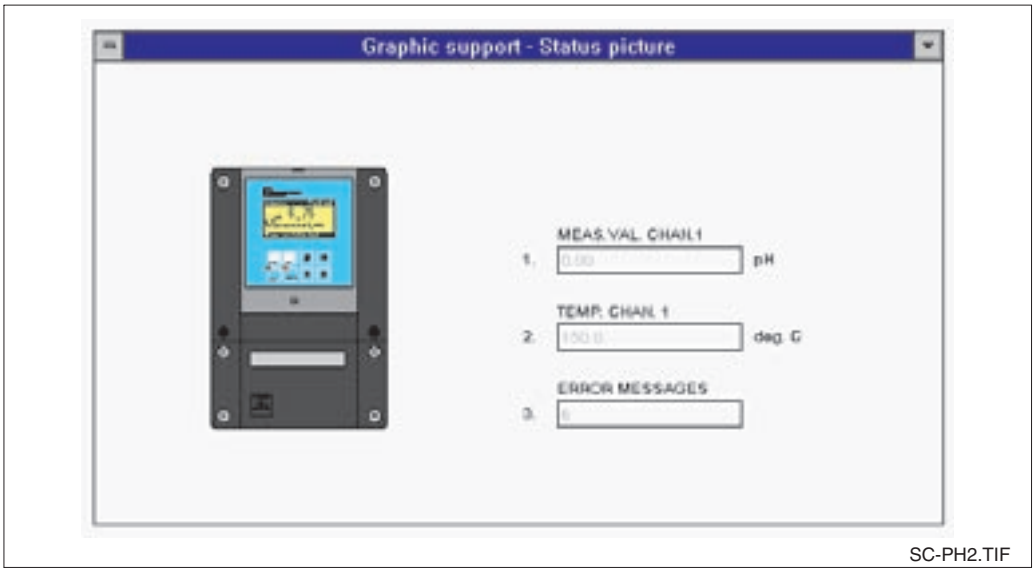


Fig. 10.4 Graphical operation of Commuwin II

10.5 PROFIBUS-PA parameters

Parameter	Matrix VH	Index (Slot = 1)	Datentyp	Read	Write	Data
Composite List Directory	-	1	Octet String	yes		24
DEVICE_ID	V99H0	25	Octet String	yes		16
Actual Error	90	42	Unsigned 16	yes		2
Device Bus Address	94	44	Integer 8	yes		1
Device and Software Number	93	48	Unsigned 16	yes		2
Measuring value pH/Redox	00	108	Float	yes		4
Temp. value	01	109	Float	yes		4
Operating mode	06	110	Unsigned 8	yes		1
Electrode type	07	111	Unsigned 8	yes		1
Input damping	10	112	Unsigned 8	yes	yes	1
ATC/MTC settings	11	113	Unsigned 8	yes	yes	1
MTC temperature	13	114	Float	yes	yes	4
with/without PM	16	115	Unsigned 8	yes		1
Temperature measurement on/off	17	116	Unsigned 8	yes	yes	1
Input zero point	22	117	Float	yes		4
Input slope	23	118	Float	yes		4
Input isotherm point	24	119	Float	yes		4
Display temperature offset	28	120	Float	yes		4
SCS on/off	60	121	Unsigned 8	yes	yes	1
SCS checking art	61	122	Unsigned 8	yes	yes	1
SCS reference threshold	62	123	Unsigned 8	yes	yes	1
SCS reference el. resistance	63	124	Float	yes	yes	4
Device number	91	125	Unsigned 32	yes		4
Softwareversion	92	126	Unsigned 16	yes		2
Reset counter	95	127	Unsigned 8	yes		1
SAP code	96	128	Octet String	yes		18
Meas. point description	A0	129	Octet String	yes	yes	32
PNO-ident-nomber	A1	130	Unsigned 16	yes		2

10.6 System integration via PLC (cyclical service)

The Mycom CPM 152 transmitter makes the measured values (OUT) available cyclically using the PROFIBUS-PA protocol. Other PROFIBUS-PA parameters are made available using the acyclical service.

	Command	Type	Function
Module 1	OUT	Read	Current measured value of process variable in pH or mV and the corresponding status - Status = 80 $_{Hex}$, devices OK - Status = 0C $_{Hex,}$ warning or alarm active. The information is transferred byte-by-byte in 5 bytes, with the last byte containing the status information.
Module 2	OUT	Read	Current measured value of process variable in pH or mV and the corresponding status - Status = 80 $_{Hex}$, devices OK - Status = 0C $_{Hex,}$ warning or alarm active. The information is transferred byte-by-byte in 5 bytes, with the last byte containing the status information.

Two so-called modules are available for the data exchange with the PLC:

- Module 1: main measured value
- Module 2: temperature value measured

Data format for module 1 and module 2

Byte	Daten	Datenformat
1	Measured value	IEEE 754-floating point number (pH or mV)
2	Measured value	
3	Measured value	
4	Measured value	
5	Device status	80_{Hex} = device o.k. $0C_{Hex}$ = error (alarm condition)
6	Measured value	IEEE 754-floating point number (°C)
7	Measured value	
8	Measured value	
9	Measured value	
10	Device status	80_{Hex} = device o.k. $0C_{Hex}$ = error (alarm condition)

IEEE 754 floating point number

D15	D14	D13	D12	D11	D10	D9	D8	D7	D6	D5	D4	D3	D2	D1	D0
VZ	Exponent (E)								Fraction (F)						
	2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}
Fraction (F)															
2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}	2^{-16}	2^{-17}	2^{-18}	2^{-19}	2^{-20}	2^{-21}	2^{-22}	2^{-23}

10.7 Device master file / type file

The device master data is required to use the PROFIBUS. This data must be provided in the Siemens TYP file format. The data must be loaded into the communication partner (Siemens operating system COMET 200 or COM PROFIBUS) before the bus system is started up. The data is stored in the following locations:

- All *.200 files are stored in the type file directory, e.g. ***\TYPDAT5X
- All *.GSD files are stored in the device master file directory, e.g. ***\GSD
- All *.BMP files are stored in the bitmap directory, e.g. ***\BITMAPS

The meaning of the individual device parameters is desribed in the PROFIBUS-PA specification.

The device master files are also provided for other SPS produtcs:

- E+H Diskette with PROFIBUS-PA device files (order no. 943157-0000)
- Internet: http://www.endress.com
  . . . . http://www.profibus.com

11 Diagnostics

11.1 Error messages

11.1.1 Error statuses

A distinction is made between two different error statuses:

- active – the error is acute
- inactive – the error is no longer acute.

When there is an active error, the LED in the Diag key lights up red; if there is no active error, the LED is green.

Errors are divided up into four error categories on a priority basis:

Category	Error number	Effect
Failure	E001 ... E029	• Failure contact active • Error current at current output 1 and 2 (as specified, see chapter 7.7.2.2) • DIAG-LED red
Maintenance	E030 ... E054	• Maintenance contact active if this was set in the menu “System configuration/Output contact” • DIAG-LED red
Fault in process	E055 ... E079	• Maintenance contact active if set and assignment of process warnings to maintenance selected • DIAG-LED red
Warning	E080 ... E116	• DIAG-LED red

11.1.2 Error list and error logbook

Error list

The instrument controls up to 30 active errors in a list. The error with the highest priority is included at the top of the list. When the list is full, the error with the lowest priority is deleted. The type of error is displayed in plaintext, while the error number as well as the date and time it occurred are also shown.

You can scroll forwards and backwards from entry to entry in the list by pressing the ↓ and ↑ keys.
The user cannot either change or delete the entries in the error list. The entry is deleted automatically when a fault is no longer acute.

Error logbook

If you press the E key, you switch from the error list to the error logbook. The error logbook records every occasion on which an error message is activated and deactivated in chronological order in a list with up to 50 entries, indicating the time and date. You can scroll forwards and backwards from entry to entry in the list by pressing the ↓ und ↑ keys. The user cannot either change or delete entries in the error list. When the capacity of the list has been exhausted, the oldest entry is deleted. If the E key is pressed again, you return to the “Diagnostics” menu.

Note:

Only the ten most recent entries in the error logbook are saved if there is a power cut.

11.1.3 Error table

No.	Display	Remedy
Failure		
E001	ERROR occured on internal data (red DIAG-LED endures even after the error has become inactive)	Return the instrument to your Endress+Hauser sales agency to be repaired or request service assistance.
E002	Data ERROR in EEPROM	
E003	Invalid module configuration	Check slot configuration
E004	Module configuration changed	To set new slot configuration select “factory reset/hardware config” in service menu (see 10.4.3)
E005	Unknown module card-ID	Check slot configuration
E006	Checksum error in EEPROM	Correct the checksum with the function »Service«. If successless, change EEPROM.
E007	Transmitter defective	When temperature measurement is correct, check sensor and connections. When temperature measurement is not correct, change the transmitter.
E008	SCS glass broken	Check the pH electrode for glass breakage; check electrode plug-in head for moisture and dry it if necessary; check medium temperature. (Maximum cable length for SCS is 20 m).
E009	SCS glass broken, electrode 2	
E010	Temperature sensor defective	Check temperature measurement and connections; check instrument and measuring cable with temperature simulator if necessary
E011	Temperature sensor 2 defective	
E013	Collecting error assembly	Check retractable assembly (compressed air, mechanical blockage)
E015	Current loop 1 open	Check connections lines and any connected instruments
E016	Current loop 2 open	
E019	Delta threshold overflow	Check delta window settings (see 7.4)
E020	Voltage input range under limit	Repeat calibration and replace buffer solutions; if necessary replace the electrode and check instrument and measuring cable with a simulator
E021	Voltage input range 2 under limit	
E022	Voltage input range over limit	
E023	Voltage input range 2 over limit	
Maintenance		
E030	SCS fault reference electrode	Check the reference electrode for glass breakage and dirt; clean the reference electrode; check the temperature of the medium
E031	SCS fault reference electrode 2	
E032	Out of the set slope range	Repeat calibration and replace buffer solutions; if necessary replace the electrode and check instrument and measuring cable with simulator
E033	Out of the set asymmetry range	
E034	Out of the set offset range	

Fault in process		
No.	Display	Remedy
E055	Display range measured value under limit	Check measurement, control and connection; if necessary, check instrument and measuring cable with simulator
E056	Display range measured value 2 under limit	
E057	Display range measured value over limit	
E058	Display range measured value 2 over limit	
E059	Temperature range under limit	
E060	Temperature range 2 under limit	
E061	Temperature range over limit	
E062	Temperature range 2 over limit	
E063	Current limited 0/4 mA output 1	Check the configuration in the “Current outputs” menu; check measurement, control and connections; if necessary check instrument and measuring cable with simulator
E064	Current limited 20 mA output 1	
E065	Current limited 0/4 mA output 2	
E066	Current limited 20 mA output 2	
E067	Limit or setpoint 1 exceeded	
E068	Limit or setpoint 1 exceeded	
E072	Loss in compressed air pressure (only with CPC 20)	Check compressed air supply
Warning		
E080	Range for current output 1 too small	Increase the range in the “Current outputs” menu
E081	Range for current output 2 too small	

11.2 Information list / logbook

11.2.1 Information list

Two information windows are displayed in succession in the menu point “Information list”. In window 1 you will find the last time the instrument was started up, its name and the number of control contacts. You can move on to window 2, the “logbook”, by pressing the E key.

11.2.2 Logbook

Window 2 contains a list of the last 30 times the instrument has been operated, including the date and time. The latest occurrence is shown at the top of the list. When the list is full, the last entry is deleted in each case.

The entries cover:

- all changes to the configuration
- all simulations (in general)

It is not possible to delete or change entries in the logbook.

11.3 Calibration statistics / calibration history

You can tell when pH electrodes are beginning to age when they start deviating from the calibrated zero point increasingly fast and when there is a deterioration in slope. A chronological record of the calibration data is therefore advisable, so that the current quality of an electrode can be determined.

The measuring transmitter Mycom CPM 152 includes two automatic record-keeping facilities to simplify the assessment of electrode aging in the menu points "Diagnostics – calibration statistics" and "– calibration history".

Caution:

Not only the calibration statistics but also the calibration history are deleted completely when the operating mode is changed or when the instrument is reset to factory settings!

11.3.1 Calibration statistics

The results of the last five calibrations are stored in the calibration statistics in chronological order. The nature of the entries depends on the operating mode chosen (pH, redox absolute or redox relative).

In the pH operating mode, the electrode zero point and slope and the relevant calibration date are displayed in two successive windows.

The windows for the values of the second electrode are then displayed in the case of two-circuit measurement.

You can always move on to the next window by pressing the E key.

In the redox absolute and redox relative operating modes, only one window is needed per electrode to display the electrode offset and the relevant calibration date.

11.3.2 Calibration history

The following information is recorded for the last five calibrations in the calibration history:

- Type of calibration
- Date and time
- Buffer and duration of the measurement (except in the case of the data input calibration)

You can scroll forwards and backwards between entries by pressing the ↑ and ↓ keys. In the case of two-curcuit measurement, you can move on to the window for the calibration history of the second electrode by pressing the E key.

Note:

Faulty calibrations are not included in the calibration history.
The buffer value at 25 °C is entered in the calibration types specified buffers and calibration with automatic buffer identification.

11.4 Service

Press the DIAG key and choose “Service” → “Specialist”.
Following you will be offered a choice of the following groups:

- Simulation
- Internal data
- Factory reset
- Instrument check
- Special functions

Note:

The value displayed for the current output and/or the contact status displayed is immediately set in the “Simulation” menu. If the value in the window is changed, the current output and/or the contact status is changed at the same time.
The simulation facility is deactivated by leaving the window.

11.4.1 Simulation

Function	Selection
Setting the present current value on current output 1	0.00 ... 22.00 mA
Setting the present current value on current output 2	0.00 ... 22.00 mA
Setting the current contact statuses (the number of contacts displayed depends on the instrument equipment and configuration)	Selection of the contacts with the ↑ and ↓ keys. Opening and closing of the contact selected with the → key.
Simulation of measured pH value [1)]	–2.00 ...16.00 pH / ±1500 mV / ±3000 %
Temperature simulation [1)]	–20.0 ... 150.0 °C

[1)] Current and contact outputs change according to the set configuration.

11.4.2 Internal data

Function	Selection
Display of the device number	No selection
Display of the software version	No selection
Display of the hardware configuration in several consecutive windows: slot allocation, module, installation date, module serial number	No selection
Order code	Alphanumeric input with the characters 0 ... 9 and a ... Z
Reset counter	No selection

11.4.3 Factory reset

Function		Selection
Default (Reset options)		Cancel (no reset), set config (store modified module assignment), Only configuration data, Only calibration data, All data, Service data
	set config	After pressing the E key the hardware equipment is checked and the modified slot assignment is stored.
	Only configuration data reset	All configuration data are reset to the factory setting if confirmed by pressing the E key. **Caution:** **All previous instrument configuration data are lost!**
	Only calibration data reset	All calibration data are reset to the factory setting if confirmed by pressing the E key. **Caution:** **All previous calibration data are lost!**
	All data reset	Configuration and calibration data are reset to the factory setting if confirmed by pressing the E key. **Caution:** **All previous configuration and calibration data are lost!**
	Service data, logbook, reset counter, message logbook	Functions for authorized service personnel only. Service Code necessary.

Caution:

If calibration data are reset, the measuring system must be re-calibrated.

11.4.4 Instrument check

Function		Description
Type of test		Selection: keyboard, display, RAM, EPROM, EEPROM
	Keyboard	Graphic presentation of the keyboard layout. Press all the keys in succession. If the key is working an acknowledgement appears in the relevant field of the display. You return to selection type of test afterwards by pressing the E key.
	Display	A chessboard pattern and its inversion are shown alternately. Check the display to see if any dots are missing. You return to selection type of test by pressing the E key.
	RAM	Internal test. At the end of the testing time the result is displayed. You return to “Selection type of test” by pressing the E key.
	EPROM	
	EEPROM	

12 Maintenance and service

12.1 Cleaning

For cleaning of keys and housing we recommend commercial, non-abrasive cleaning agents.

Warning:

We do not guarantee resistance to concentrated mineral acids or lyes, benzyl alcohol, methylene chloride and high-pressure steam.

12.2 Exchange of defective fuse

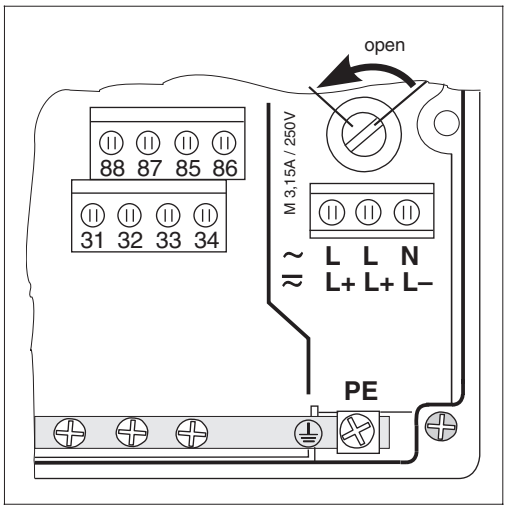


Fig. 12.1 Position of fuse holder in non-Ex version

Non-Ex version:

Before starting the instrument has to be voltage free. Open fuse holder using a screwdriver (see Fig. 12.1) and replace with a type M 3.15A / 250V fuse.

Ex-version:

Replacement of the fuse module must be done by authorised service personnel only.

Order-no.:

50076930	100 V ... 230 VAC
50076931	24 VAC
50087807	24 VDC

12.3 Repairs

All repair work must be done directly by the manufacturer or by the Endress+Hauser service organisation.
A list of the Endress+Hauser service representatives can be found on the back of these operating instructions.

13 Appendix

13.1 Technical data

13.1.1 General technical data

General specifications

Manufacturer	Endress+Hauser
Product designation	Mycom CPM 152

pH measurement

Measuring range	pH –2.00 ... +16.00
Measured value resolution	pH 0.01
Deviation of indication[1], measured value	max. 0.2 % of measuring range
Reproducibility[1]	max. 0.1 % of measuring range
Zero-point shift range	pH –2.00 ... +16.00
Automatic temperature compensation range	–20 ... +150 °C
Reference temperature	25 °C
Slope adjustment	5 ... 99 mV/pH
pH signal input	
Input resistance at nominal operating conditions	$> 1 \times 10^{12}\ \Omega$
Input current at nominal operating conditions	$< 1.6 \times 10^{-12}$ A
pH signal output	
Current range (active)	0 / 4 ... 20 mA
Measurement deviation[1]	max. 0.2 % of current range maximum
Load	max. 600 Ω (Ex: max. 500 Ω)
Transmission range	adjustable, Δ 1.8 ... Δ 18 pH

Redox measurement

Measuring range	–1500 ... +1500 mV / –3000 ... + 3000 %
Measured value resolution	1 mV / 1 %
Deviation of indication[1], measured value	max. 0.2 % of measuring range
Reproducibility[1]	max. 0.1 % of measuring range
Assignment for % display	adjustable, Δ for 100 % = 150 ... 2000 mV
Electrode offset	±200 mV
Redox signal input	
Input resistance at nominal operating conditions	$> 1 \times 10^{12}\ \Omega$
Input current at nominal operating conditions	$< 1.6 \times 10^{-12}$ A
Redox signal output	
Current range (active)	0 / 4 ... 20 mA
Measurement deviation[1]	max. 0.2 % of current range maximum
Load	max. 600 Ω (Ex: max. 500 Ω)
Transmission range	adjustable, Δ 300 ... Δ 3000 mV

Temperature measurement

Temperature sensor	Pt 100 (three-wire connection)
Measuring range (can also be displayed in °F and K)	–20 ... +150 °C
Measured value resolution	0.1 °C
Deviation of indication[1], measured value	max. 0.5 % of measuring range
Reproducibility[1]	max. 0.1 % of measuring range
Temperature signal output	
Current range (active)	0 / 4 ... 20 mA
Measurement deviation[1]	max. 0.2 % of current range maximum
Load	max. 600 Ω (Ex: max. 500 Ω)
Transmission range	adjustable, Δ 17 ... Δ 170 °C

Limit, controller and alarm functions

Function (adjustable)	limit contactor, pulse-length controller, pulse-frequency controller, three-point step controller, neutralisation controller, P controller with a bend of the characteristic
Controller response (adjustable)	P / PI / PID or PD / PDT1
Limit contactor / two-point controller	2 contact outputs, up to 3 optional outputs for cleaning functions
Function type	MIN or MAX
Setpoint range	pH –2.00 ... 16.00
Hysteresis for switching contacts	
pH	pH 0.1 ... 1.0
Redox absolute	10 ... 100 mV
Redox relative	1 ... 100 %
Pickup / dropout delay	0 ... 7200 s
Alarm threshold	
pH	pH 0.1 ... 18
Redox absolute	10 ... 3000 mV
Redox relative	1 ... 3000 %
Alarm delay	0 ... 6000 s

Electrical data and connections

AC power supply	24 / 100 / 115 / 200 / 230 V +10 / –15 %
Frequency	47 ... 64 Hz
DC power supply	24 V +20 / –15 %
Power consumption	max. 10 VA
Contact outputs	2 floating contacts (Ex: 2 optocouplers), switchable, NO or NC contact function, 3 additional contacts optional
Switching current	max. 3 A (Ex: ≤ 100 mA)
Switching voltage	max. 250 V AC / 125 V DC (Ex: ≤ 30 V)
Switching power	max. 750 VA (Ex: ≤ 750 mW)
Signal outputs	2 × 0 / 4 ... 20 mA, isolated from other circuits but not from each other
Separation voltage	276 V_{rms}
Terminals, max. cross-section	2.5 mm^2

General technical data

Measured value display	illuminated LC display with 128 × 64 dot matrix
Electromagnetic compatibility (EMC)	interference emission and interference immunity acc. to EN 61326-1:1997
Nominal operating conditions	
Ambient temperature	–10 ... +55 °C (Ex: –10 ... +50 °C)
Relative humidity	10 ... 95 %, non-condensing
Limit operating conditions	
Ambient temperature	–20 ... +60 °C (Ex: –10 ... +50 °C)
Storage and transport temperature	–30 ... +80 °C (Ex: –25 ... +75 °C)
Ex approval	EEx em [ia/ib] IIC T4
Ex test certificates	BVS 95.D.2098, SEA 96.1 10489

Physical data

Dimensions (H × W × D)	247 × 167 × 111 mm
Weight	max. 6 kg
Ingress protection	IP 65
Materials	
Housing	diecast AlSi 12 (Mg content 0.05 %), plastic-coated
Front	polyester, UV-resistant

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

Subject to modifications.

13.1.2 Technical data of PROFIBUS-PA

Output parameters

Output signal	digital communication signal, PROFIBUS-PA
PA function	slave
Response time Slave	approx. 20 ms
PLC	approx. 600 ms at approx. 30 instruments
Alarm signal	PROFIBUS-PA: signal status bit is set, last valid measured value is retained
Integration time	0 ... 99 s, default 0 s
Bus termination resistor	none, separate PROFIBUS-PA terminating resistor
Physical layer	IEC 1158-2
Integrated overvoltage protection	25 V AC / 250 A

Display and user interface

Remote control	via PC using operating program Commuwin II
Communication point	PROFIBUS-PA

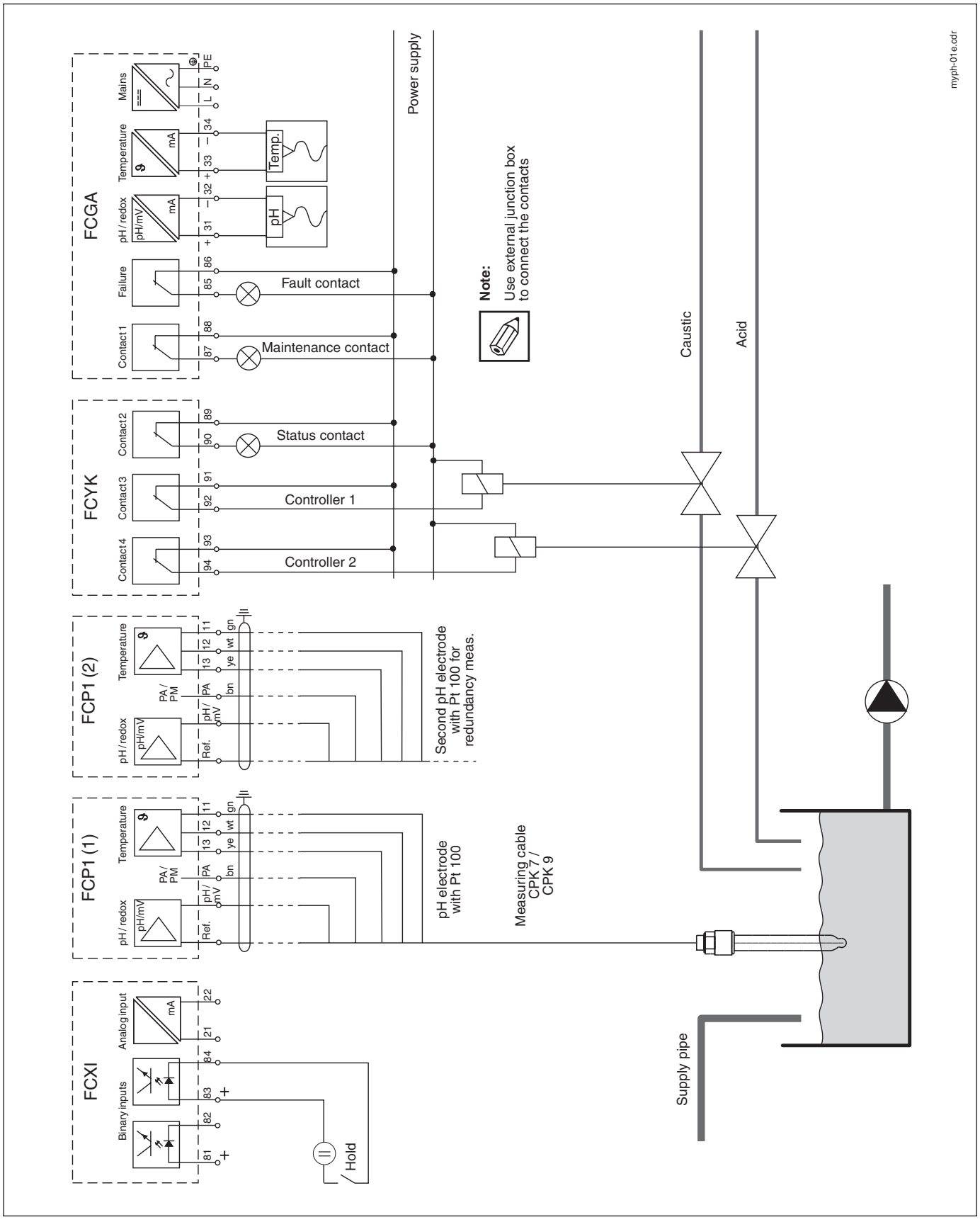
Power supply

Bus supply	9 ... 32 V DC
Current consumption	11 ± 1 mA
Inrush current	corresponds to Table 4, IEC 1158-2

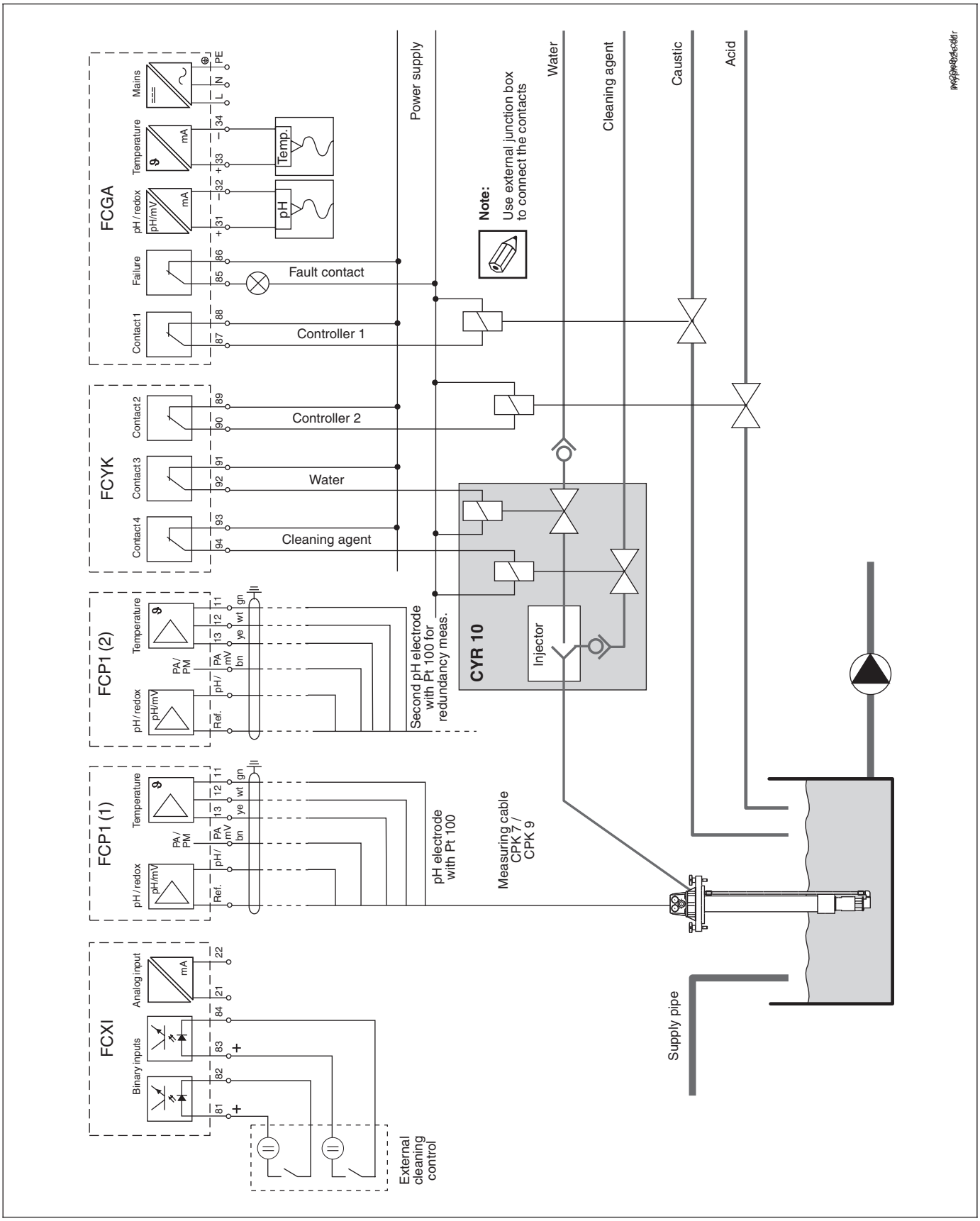
Subject to modifications.

13.2 Connection examples

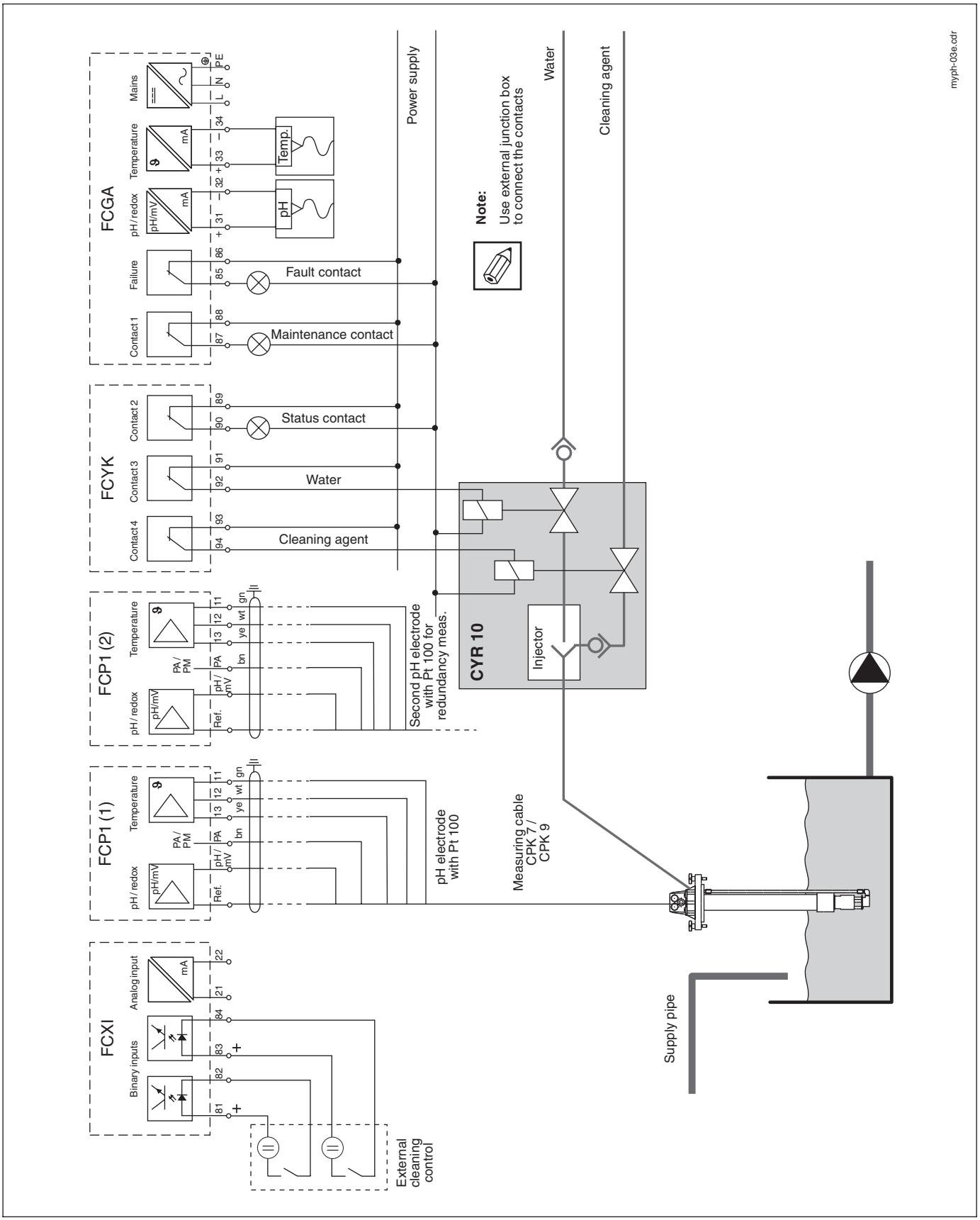
13.2.1 pH controller, 3 contacts (non-Ex)



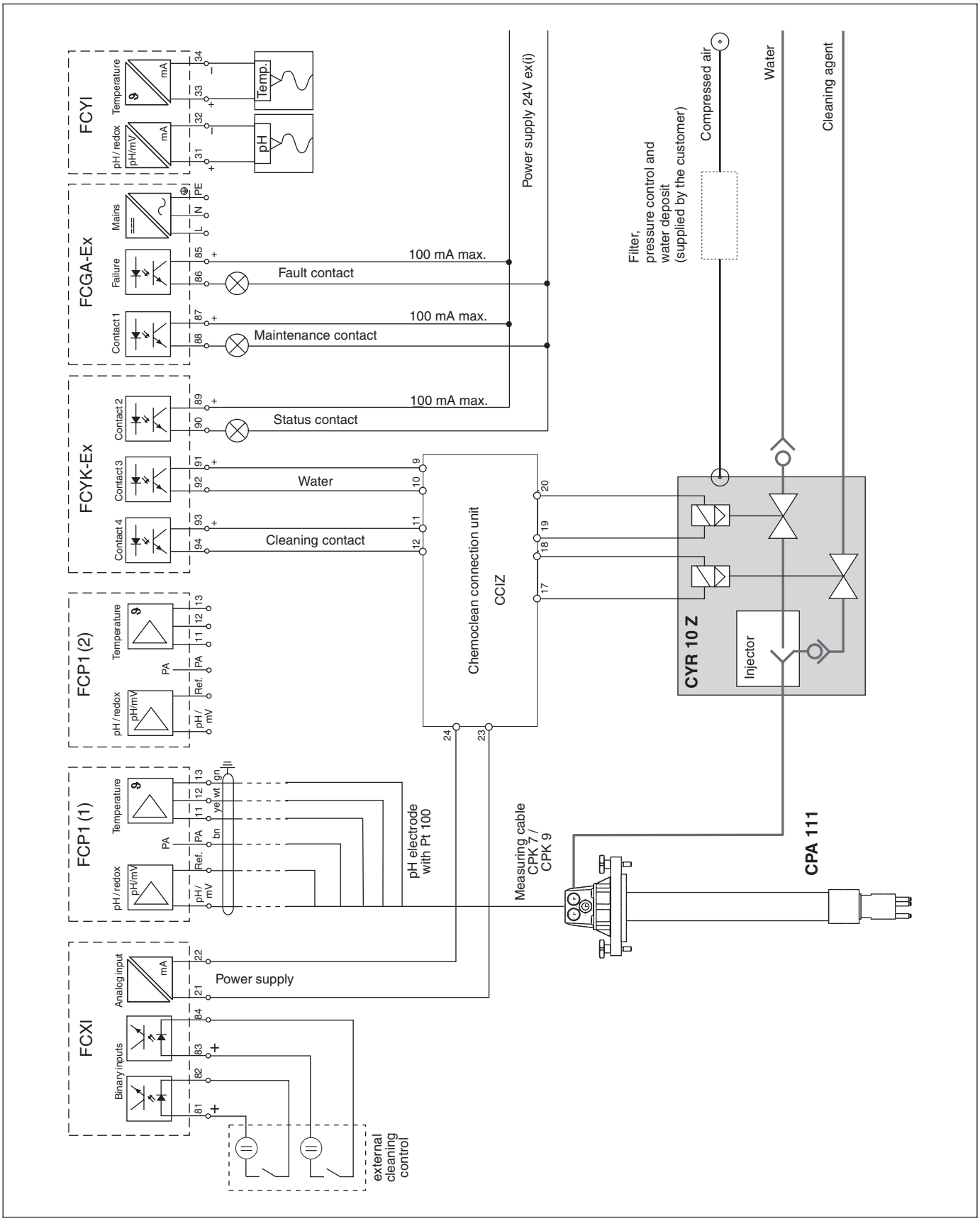
13.2.2 pH controller, Chemoclean CYR 10 (non-Ex)



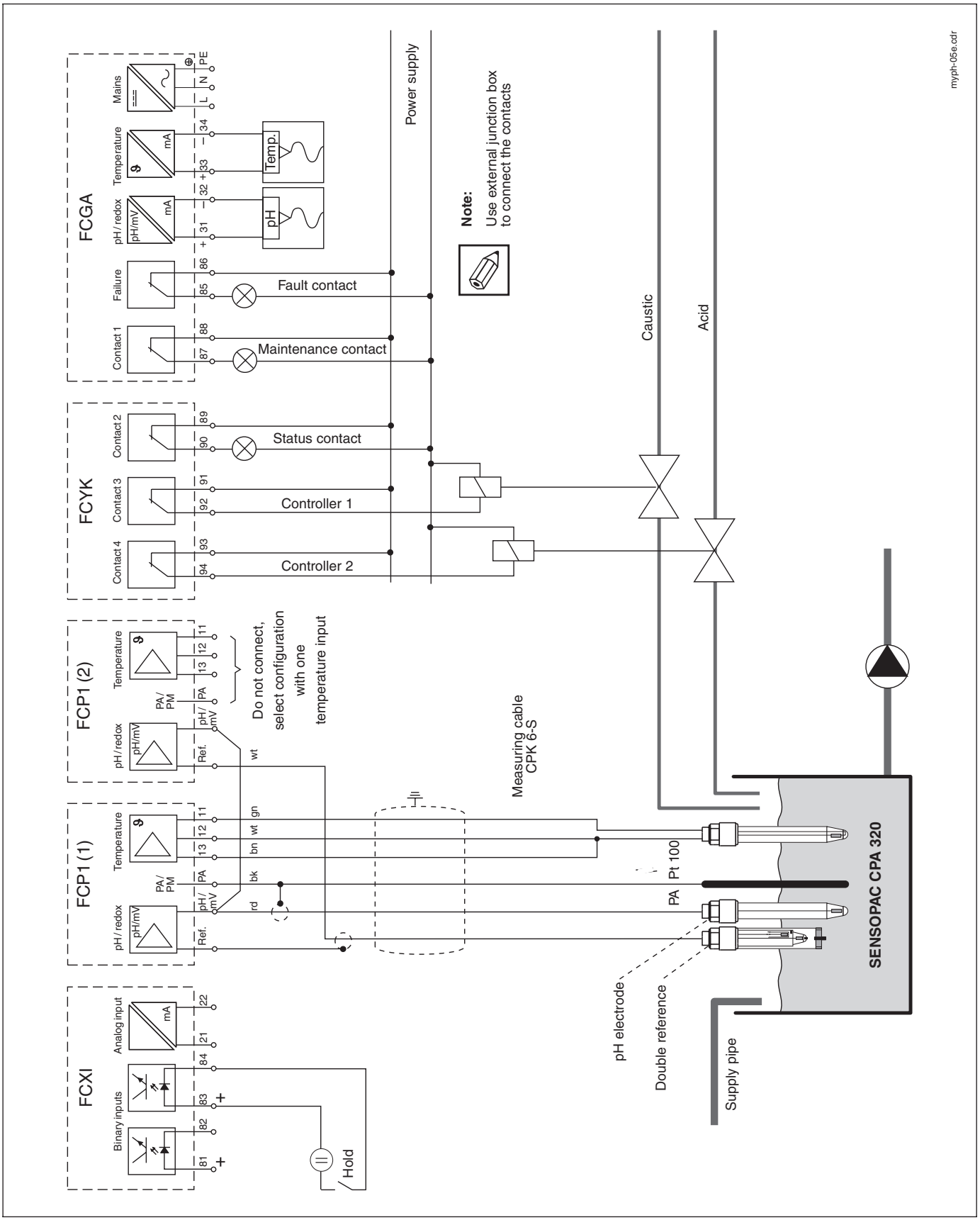
13.2.3 3 contacts, Chemoclean CYR 10 (non-Ex)



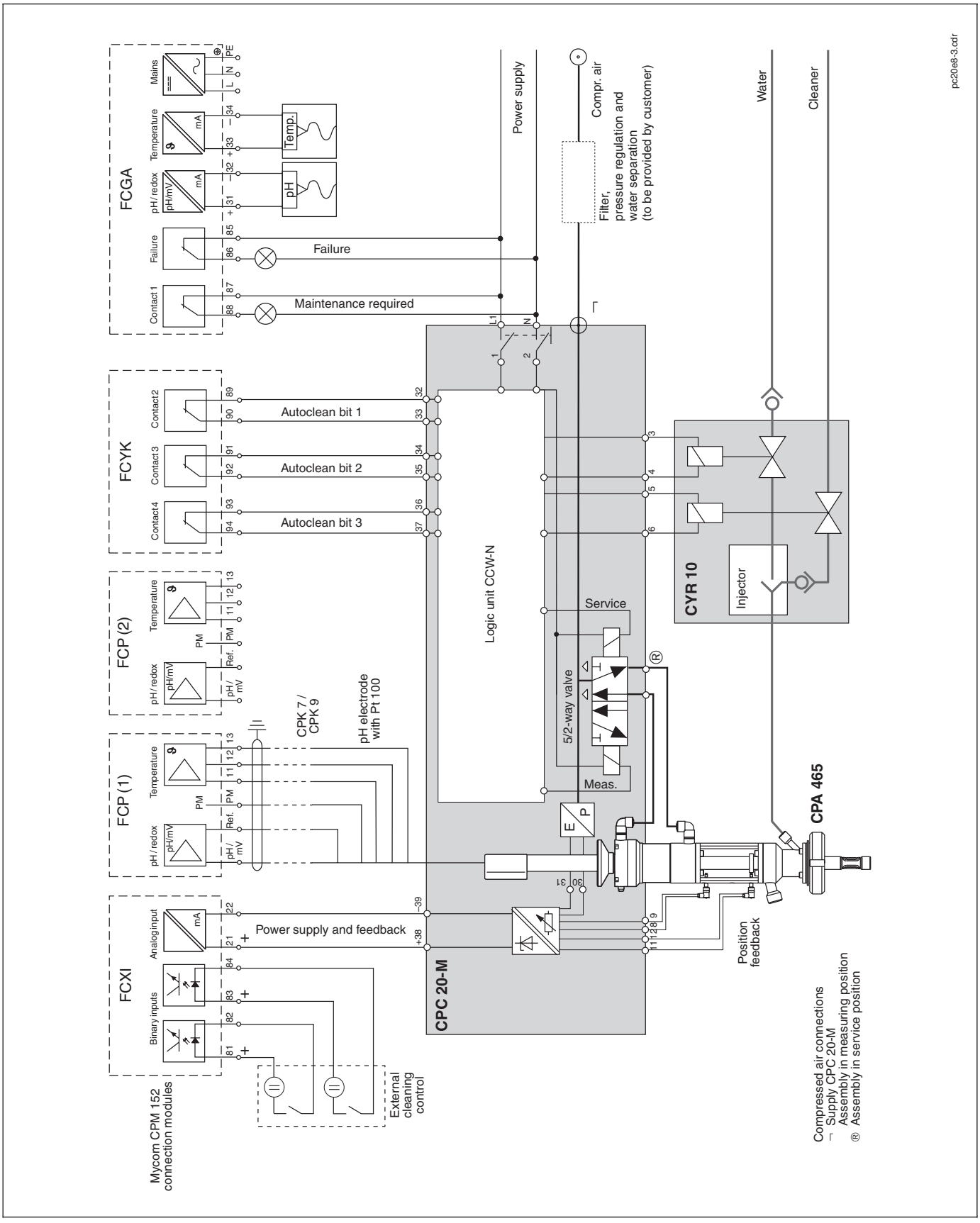
13.2.4 Chemoclean CYR 10 Z with power adapter (Ex)



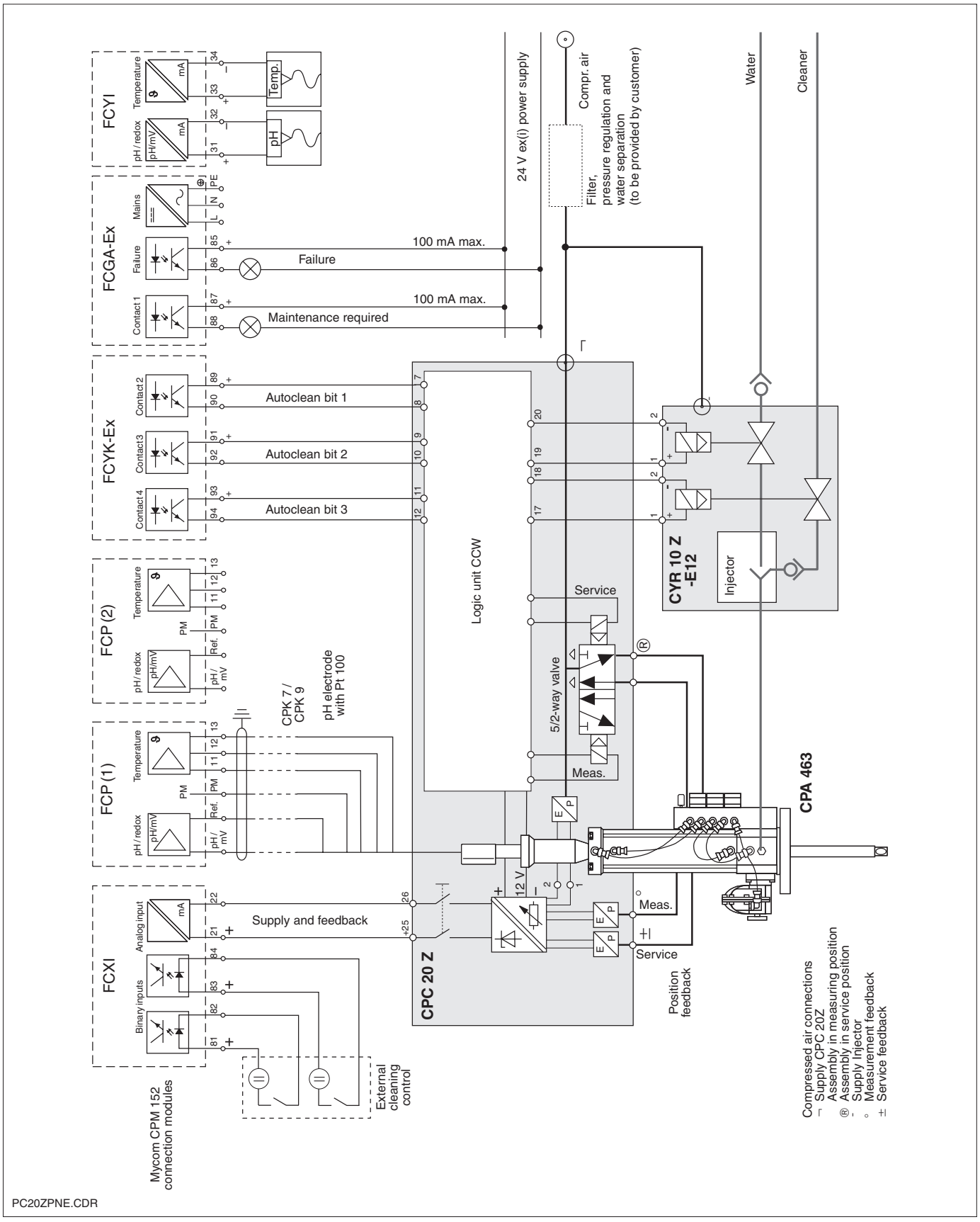
13.2.5 Sensopac CPA 320, pH controller, 3 contacts (non-Ex)



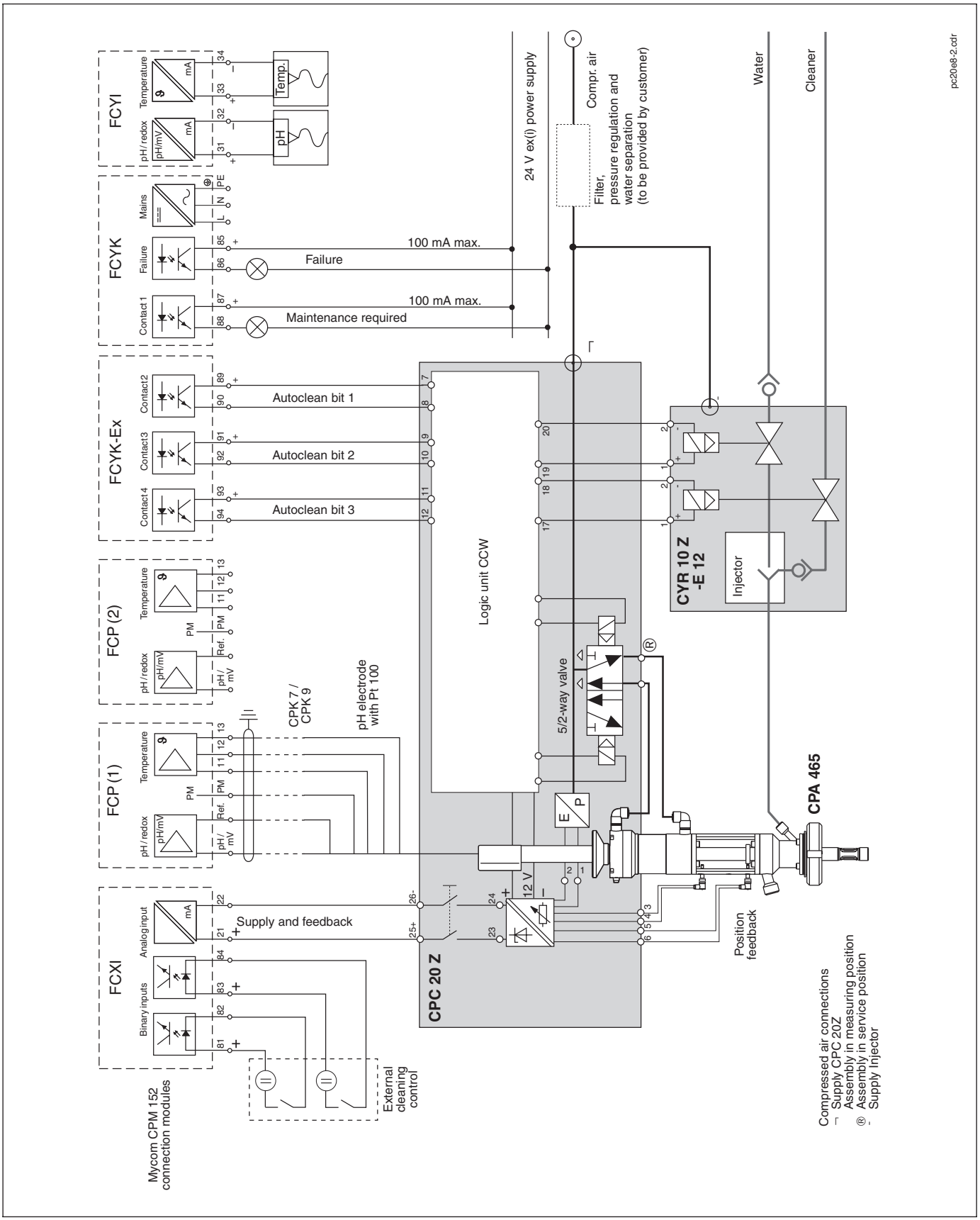
13.2.6 Autoclean CPC 20-M (non-Ex), inductive feedback



13.2.7 Autoclean CPC 20 Z-M (Ex), pneumatic feedback

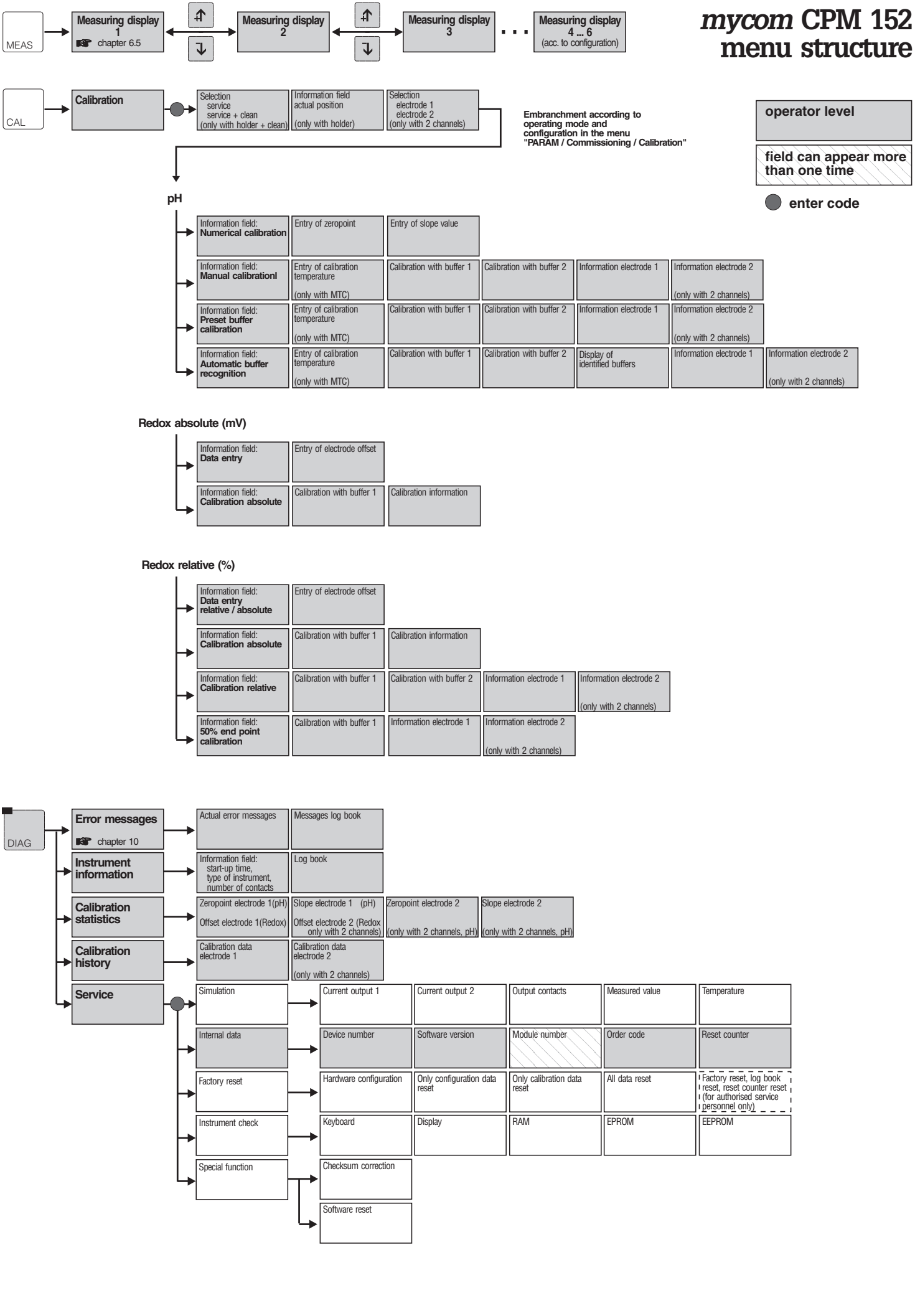


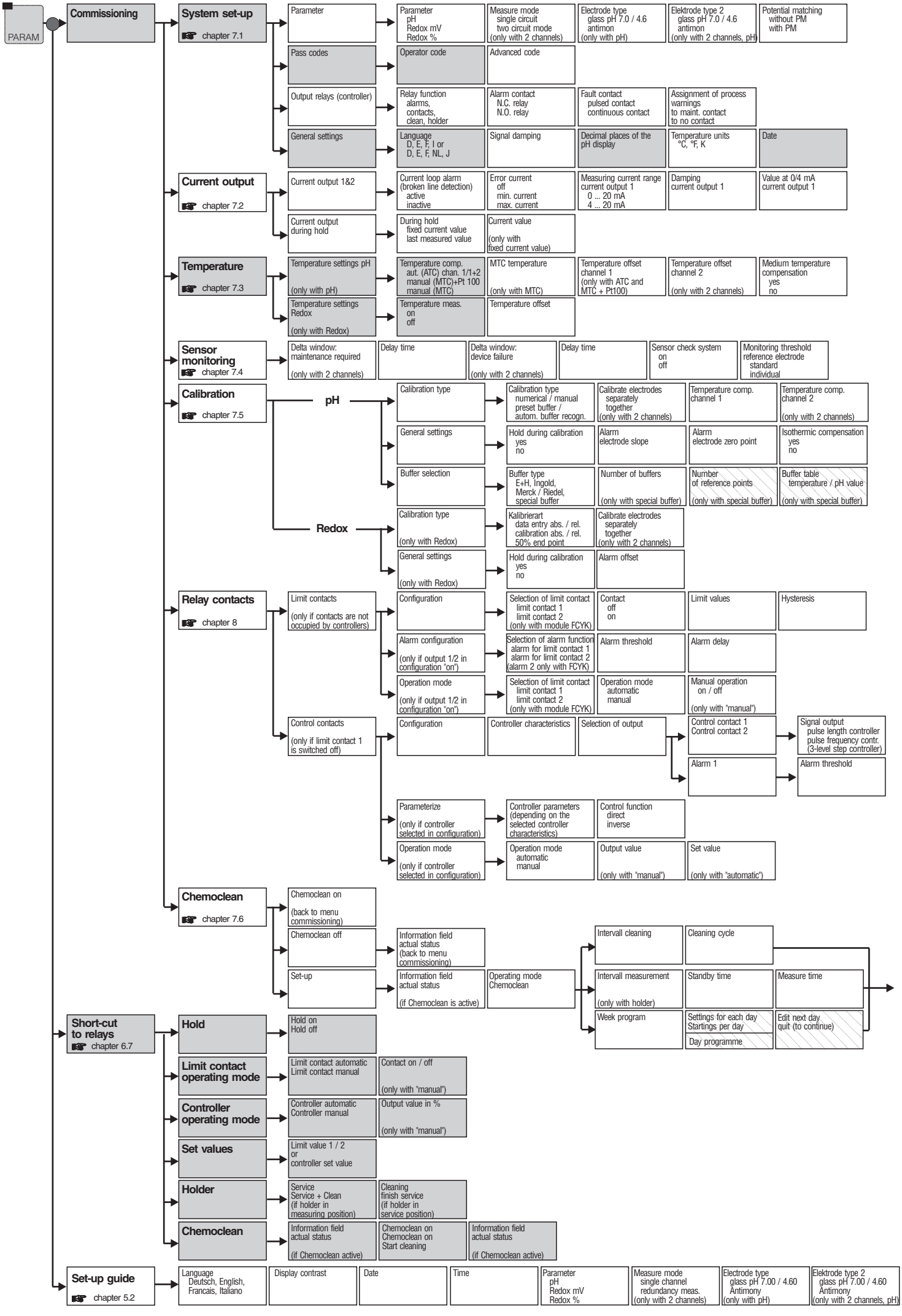
13.2.8 Autoclean CPC 20 Z-M (Ex)



13.3 Index

mycom CPM 152 menu structure

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chapter 7.1
Parameter
Parameter
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Redox %
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single circuit
two circuit mode
(only with 2 channels)
Electrode type
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antimon
(only with pH)
Elektrode type 2
glass pH 7.0 / 4.6
antimon
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Potential matching
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Output relays (controller)
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contacts,
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MTC + Pt100)
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together
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no
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Alarm
electrode zero point
Isothermic compensation
yes
no
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Merck / Riedel,
special buffer
Number of buffers
(only with special buffer)
Number
of reference points
(only with special buffer)
Buffer table
temperature / pH value
(only with special buffer)
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(only with Redox)
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calibration abs. / rel.
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Calibrate electrodes
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together
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occupied by controllers)
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(only with module FCYK)
Contact
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on
Limit values
Hysteresis
Alarm configuration
(only if output 1/2 in
configuration "on")
Selection of alarm function
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alarm for limit contact 2
(alarm 2 only with FCYK)
Alarm threshold
Alarm delay
Operation mode
(only if output 1/2 in
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Selection of limit contact
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(only with module FCYK)
Operation mode
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(only with "manual")
Control contacts
(only if limit contact 1
is switched off)
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Selection of output
Control contact 1
Control contact 2
Signal output
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Operating mode
Chemoclean
Intervall cleaning
Cleaning cycle
Intervall measurement
(only with holder)
Standby time
Measure time
Week program
Settings for each day
Startings per day
Day programme
Edit next day
quit (to continue)
Short-cut
to relays
chapter 6.7
Hold
Hold on
Hold off
Limit contact
operating mode
Limit contact automatic
Limit contact manual
Contact on / off
(only with "manual")
Controller
operating mode
Controller automatic
Controller manual
Output value in %
(only with "manual")
Set values
Limit value 1 / 2
or
controller set value
Holder
Service
Service + Clean
(if holder in
measuring position)
Cleaning
finish service
(if holder in
service position)
Chemoclean
Information field
actual status
(if Chemoclean active)
Chemoclean on
Chemoclean on
Start cleaning
Information field
actual status
(if Chemoclean active)
Set-up guide
chapter 5.2
Language
Deutsch, English,
Francais, Italiano
Display contrast
Date
Time
Parameter
pH
Redox mV
Redox %
Measure mode
single channel
redundancy meas.
(only with 2 channels)
Electrode type
glass pH 7.00 / 4.60
Antimony
(only with pH)
Elektrode type 2
glass pH 7.00 / 4.60
Antimony
(only with 2 channels, pH)

mycom CPM 152 menu structure

Current output 2
temperature, pH/Redox 2,
difference ΔpH
(only with 2 channels)

operator level

field can appear more than one time

enter code

Time	tag number (measuring point description)	Profibus address (only FCYP)	Display contrast	
Value at 20 mA current output 1	Measuring current range current output 2 0 ... 20 mA 4 ... 20 mA	Damping current output 2	Value at 0 / 4 mA current output 2	Value at 20 mA current output 2

Selection of active medium (1, 2, 3) (only with medium temperature comp.)	Number of reference points (only with medium temperature comp.)	Value pairs temperature / pH value (only with medium temperature comp.)	Reference temperature (only with medium temperature comp.)

Degree of contamination low / middle / high (only with standard)	Monitoring threshold in kΩ (only with individual)

pH isothermal point channel 1	pH isothermal point channel 2 (only with 2 channels)
Selection buffer 1	Selection buffer 2

Min. function Max. function	Pickup delay	Dropout delay	Contact type N.C. relay N.O. relay

Pulse cycle time (for pulse length contr.)	Minimum cycle time (for pulse length contr.)	Max. pulse frequency (for pulse frequency controller)	Control contact N.C. relay N.O. relay
Alarm delay			

Pre-rinse time	Cleaning time	Post-rinse time	Repeat rate	Cycles without cleaning agent	Hold during Chemoclean	Hold delay (only with hold during Chemoclean)	SCS cleaning (only with SCS on)	Display of intervall time or total cleaning time

Potential matching without PM with PM	Temperature units °C, °F, K	Temperature comp. ATC MTC (only with pH)	Temperature meas. on off (only with Redox)	Contact function alarms, contacts, clean, holder	Alarm contact N.C. relay N.O. relay	Fault contact pulsed contact continuous contact	End of set-up end cancel

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