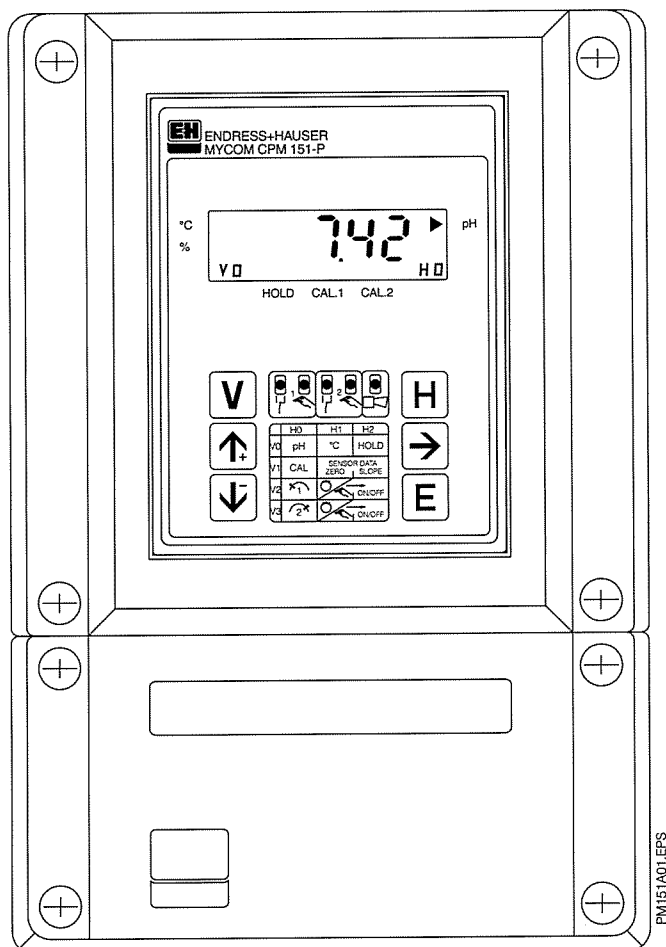
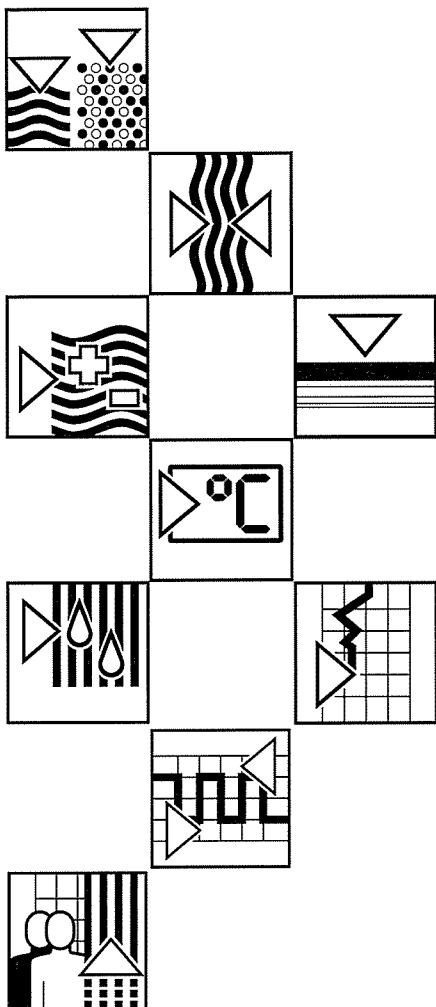


# mycom

## CPM 121-P / 151-P

### pH / temperature transmitter / controller

#### Operating Instructions



Quality made by  
Endress+Hauser



Endress + Hauser

Nothing beats know-how



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



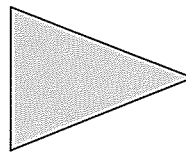
**General information**



**Safety**



**Description**



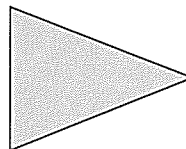
**You wish to install and start up the instrument.  
The required steps are described in these chapters:**



**Installation**



**Start-up**



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



**Operation**



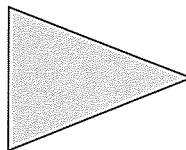
**Calibration**



**Description of operating functions**



**Limit contactor/controller configuration**



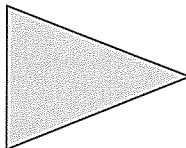
**When you encounter problems or when the instrument requires maintenance, please refer to these chapters for help:**



**Diagnosis**



**Service and maintenance**



## Table of contents

|           |   |           |
|-----------|---|-----------|
| <b>1</b>  | <b>General information</b>                      | <b>2</b>  |
| 1.1       | Symbols used                                    | 2         |
| 1.2       | Conformity statement                            | 2         |
| <b>2</b>  | <b>Safety</b>                                   | <b>3</b>  |
| 2.1       | Intended application                            | 3         |
| 2.2       | General safety notes                            | 3         |
| 2.3       | Safety functions                                | 3         |
| <b>3</b>  | <b>Description</b>                              | <b>4</b>  |
| 3.1       | Areas of application                            | 4         |
| 3.2       | Measuring system                                | 4         |
| 3.3       | Order code                                      | 5         |
| 3.4       | Technical data                                  | 6         |
| <b>4</b>  | <b>Installation</b>                             | <b>8</b>  |
| 4.1       | Storage and transport                           | 8         |
| 4.2       | Unpacking                                       | 8         |
| 4.3       | Mounting  | 8         |
| 4.4       | Mounting accessories                            | 10        |
| 4.5       | Connection                                      | 11        |
| 4.6       | Connection diagram                              | 14        |
| 4.7       | pH electrode connection                         | 15        |
| <b>5</b>  | <b>Start-up</b>                                 | <b>19</b> |
| 5.1       | Measures before first power-up                  | 19        |
| 5.2       | Instrument status after first power-up          | 19        |
| 5.3       | Power failure handling                          | 20        |
| 5.4       | Minimum settings                                | 20        |
| <b>6</b>  | <b>Operation</b>                                | <b>21</b> |
| 6.1       | General notes on operation                      | 21        |
| 6.2       | Key functions                                   | 22        |
| 6.3       | Operating matrix                                | 24        |
| 6.4       | Sensor check system (SCS)                       | 26        |
| <b>7</b>  | <b>Calibration</b>                              | <b>27</b> |
| 7.1       | Preparatory measures                            | 27        |
| 7.2       | Types of calibration                            | 27        |
| 7.3       | MANUAL calibration                              | 28        |
| 7.4       | AUTOMATIC calibration                           | 29        |
| <b>8</b>  | <b>Description of operating functions</b>       | <b>30</b> |
| <b>9</b>  | <b>Limit contactor/controller configuration</b> | <b>41</b> |
| 9.1       | Limit contactor                                 | 41        |
| 9.2       | Controllers                                     | 42        |
| 9.3       | Switching contact configuration                 | 43        |
| 9.4       | Optimisation of controller settings             | 44        |
| 9.5       | Alarm function / fault signalling contact       | 45        |
| 9.6       | Rinse function                                  | 46        |
| <b>10</b> | <b>Diagnosis</b>                                | <b>47</b> |
| 10.1      | Error classes and error numbers                 | 47        |
| 10.2      | Error display and handling                      | 47        |
| 10.3      | Error list                                      | 48        |
| <b>11</b> | <b>Service and maintenance</b>                  | <b>50</b> |
| 11.1      | Cleaning  | 50        |
| 11.2      | Repairs   | 50        |
| 11.3      | Preparation for storage, proper disposal        | 50        |
| 11.4      | Accessories                                     | 51        |
| 11.5      | Index   | 52        |

## 1. General information

### 1.1 Symbols used

**Warning**

This symbol alerts to hazards which may cause irreparable damage.

**Caution**

This symbol alerts to possible malfunction due to operator error.

**Note**

This symbol indicates important items of information.

### 1.2 Conformity statement

The Mycom CPM 121-P / 151-P has been developed and manufactured in accordance with currently valid European standards and directives.

**Note:**

The corresponding certificate of conformity may be requested from Endress+Hauser.

## 2. Safety

### 2.1 Intended application

**Note:**

These installation and operating instructions describe the pH instrument Mycom CPM 121-P / 151-P equipped with all the options.

The Mycom CPM 121-P / 151-P is a microprocessor-based measuring and control instrument used to determine the pH value. State-of-the-art engineering allows the instrument to be adapted to all pH measuring tasks in a simple manner.

The sophisticated controller section permits even complicated processes to be controlled.

Digital interfaces require separate operating instructions from the Mycom family of instruments:

Mycom Serial Interfaces  
BA 090C/07/en

### 2.2 General safety notes

**Warning:**

Operating the instrument in any way other than as described in these instructions may compromise the safety and function of the measuring system and is therefore impermissible.

Connection work and maintenance work under tension may only be carried out by qualified personnel.

If faults cannot be remedied, the instrument must be removed from service and secured to prevent accidental start-up.

### 2.3 Safety functions

- **Access code:** Unauthorised access to the calibration and configuration data of the measuring transmitter is effectively prevented by access codes. The instrument settings can be read at any time without entry of an access code.
- **Alarm function:** System errors, malfunction and continued violation of a limit will result in an alarm signalled by an alarm contact. The alarm signalling contact is fail-safe by design, i.e. an alarm condition will also be signalled in the event of a power failure.
- **Data integrity:** The instrument configuration is retained even after a power failure.
- **Immunity to interference:** This instrument is protected against interference, such as pulse-shaped transients, high frequency and electrostatic discharges, according to the applicable European standards. This is only valid, however, for an instrument connected according to the notes in these installation and operating instructions.

### 3. Description

#### 3.1 Areas of application

Typical areas of application are:

- Water treatment
- Effluent treatment
- Sewage treatment plants
- Chemical industry
- Pharmaceutical industry
- Food industry

#### 3.2 Measuring system

The measuring system consists of:

- a pH combination electrode with or without integrated temperature sensor Pt 100
  - an additional temperature sensor Pt 100 for connection of electrodes without temperature sensor
  - an appropriate process, flow or immersion assembly
  - a pH measuring cable
  - the pH measuring instrument Mycom CPM 151-P in the field housing
- or
- the pH measuring instrument Mycom CPM 121-P in the housing for panel mounting

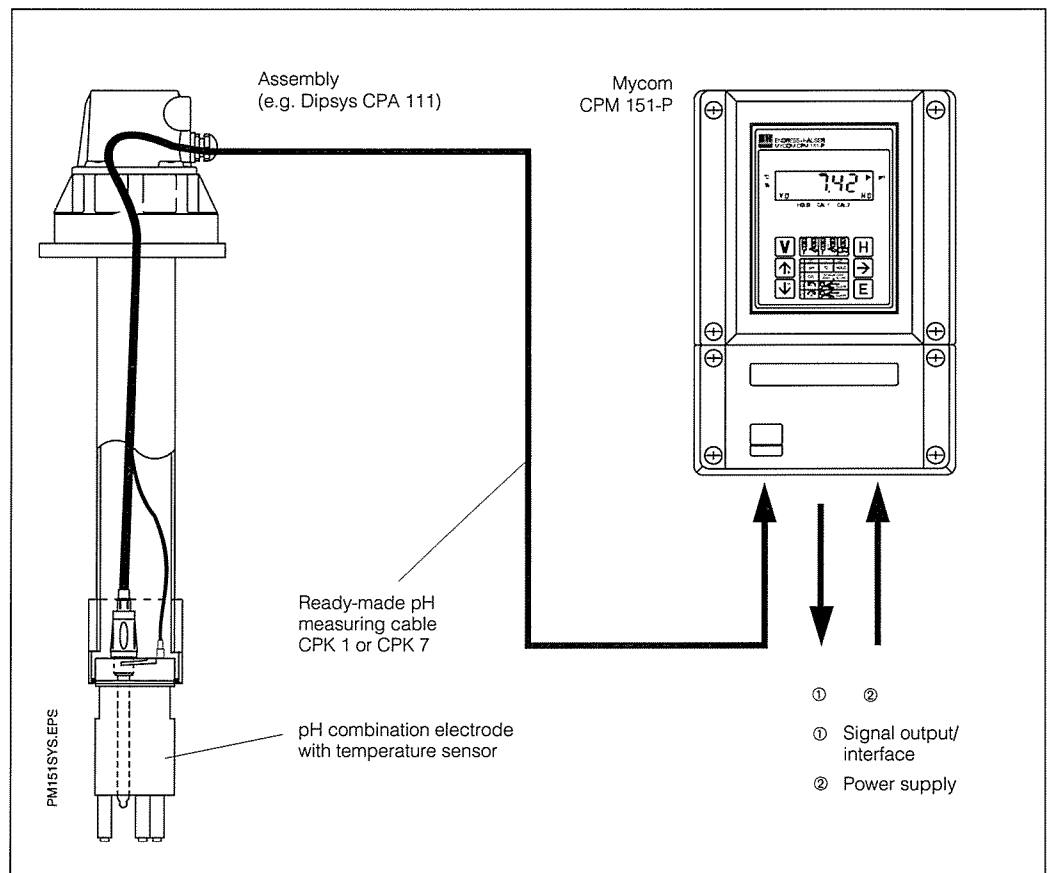


Fig. 3.1: Complete measuring system with Mycom CPM 151-P and an assembly (e.g. Dipsys CPA 111)

### 3.3 Order code

## Mycom CPM 121-P / 151-P

## Types

- 121 housing for panel mounting, 96 x 96 mm, ingress protection IP 54 (front)  
151 field housing, 247 x 167 x 111 mm (H x W x D), ingress protection IP 65

### Parameter

P pH measuring transmitter

## Versions

- 1 with fault signalling contact
- 2 with fault signalling contact and 1 limit / controller
- 3 with fault signalling contact and 2 limits / controller
- 4 with fault signalling contact and three-point step controller
- 9 special version

### Electrode connection

- 0 connection of a combination electrode  
or separate pH and reference electrodes (only for CPM 151)  
1 connection of a pH electrode on BNC connector (only for CPM 121)

## Temperature sensor connection

A Pt 100

## Power supply

- |   |                      |
|---|----------------------|
| 0 | 230 V AC, 50 / 60 Hz |
| 1 | 110 V AC, 50 / 60 Hz |
| 2 | 200 V AC, 50 / 60 Hz |
| 3 | 24 V AC, 50 / 60 Hz  |
| 4 | 48 V AC, 50 / 60 Hz  |
| 5 | 100 V AC, 50 / 60 Hz |
| 6 | 127 V AC, 50 / 60 Hz |
| 7 | 240 V AC, 50 / 60 Hz |
| 8 | 24 V DC              |

## Outputs

- 0 0/4 ... 20 mA for pH value  
1 0/4 ... 20 mA for pH value and temperature  
3 0/4 ... 20 mA for pH value  
with additional RS 232-C interface  
4 0/4 ... 20 mA for pH value  
with additional RS 485 interface  
6 0/4 ... 20 mA for pH value  
with additional RS 485 E+H Rackbus interface  
9 special version

CPM 

|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|
|  |  |  |  |  |  |  |
|--|--|--|--|--|--|--|

 $\Leftarrow$  complete order code

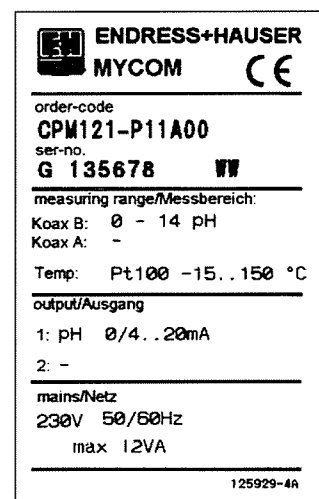


Fig. 3.2: Nameplate of Mycom CPM 121-P

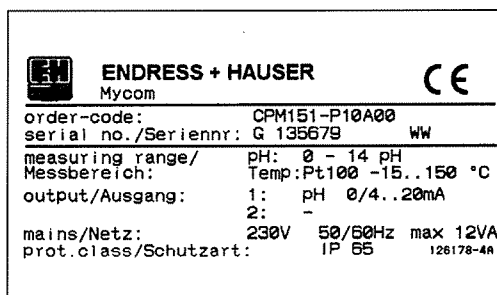


Fig. 3.3:  
Nameplate of  
Mycom CPM 151-P

### 3.4 Technical data

#### Electrical data

##### pH measurement

|  |   |
|--|---|
| Display and measuring range              | −2.00 ... 14.00 pH                                      |
| Measured value resolution                | 0.01 pH   |
| Zero shift range                         | −1.5 ... 9.5 pH   |
| Automatic temperature compensation range | −15 ... +150 °C   |
| Reference temperature                    | +25 °C  |
| Slope adjustment (glass electrode)       | 38 ... 65 mV / pH                                       |
| Temperature sensor                       | Pt 100, 3-wire circuit                                  |
| pH signal input                          | symmetrical high-impedance, $0.5 \times 10^{12} \Omega$ |
| pH signal output current range           | 0 / 4 ... 20 mA   |
| Load                                     | max. 600 $\Omega$                                       |
| pH signal output range                   | adjustable from $\Delta 2$ ... $\Delta 14$ pH           |
| Measured value display                   | LC display, 4 digits, 7 segments, height = 10 mm        |

##### Sensor Check System SCS

|   |                          |
|---|--------------------------|
| Limits for pH electrode fault signalling        |                          |
| pH measuring chain resistance                   | $\leq 2 \text{ M}\Omega$ |
| Terminal capacity                               | $\geq 2 \text{ nF}$      |
| Limits for reference electrode fault signalling |                          |
| Diaphragm resistance                            | 5 ... 30 k $\Omega$      |

##### Temperature measurement

|                                     |  |
|-------------------------------------|--|
| Temperature measuring range         | −15 ... +150 °C                                |
| Temperature signal output (variant) | 0 or 4 ... 20 mA                               |
| Load                                | max. 400 $\Omega$                              |
| Temperature output range            | adjustable from $\Delta 25$ ... $\Delta 165$ K |

##### Limit, controller and alarm functions

|  |   |
|--|---|
| Function   | limit contactor, switchable as pulse-length controller, pulse-frequency controller or three-point step controller |
| Controller characteristics (switchable depending on the version) | P / PI / PID or PD / PT1  |
| Limit contactor / two-point controller                           | 2 contact outputs   |
| Type of function   | MIN or MAX  |
| Setpoints  | −2.00 ... 14.00 pH  |
| Hysteresis for switching contacts                                | 0.1 ... 1.0 pH  |
| Contact delay  | pickup / dropout delay  |
| Delay time   | 0 ... 6000 s  |
| Alarm threshold  | 0.0 ... 16.0 pH   |
| Alarm delay time   | 0 ... 6000 s  |

##### General technical data

|   |  |
|---|--|
| Measured value display                        | LC display, 7 segments, 4 digits, height = 10 mm |
| Indication error of measurement               |  |
| Display (acc. to DIN IEC 746)                 | max. 0.2 %                                       |
| Measured value output (acc. to DIN IEC 746)   | 0.5 %  |
| Status indication                             | LEDs, red and red / green                        |
| Electromagnetic compatibility (EMC)           |  |
| Emmission                                     | corresponds to DIN EN 50081-1, 01.92             |
| Immunity                                      | corresponds to DIN EN 50082-1, 03.93             |
| Ambient temperature, nominal operating range  | −10 ... +55 °C                                   |
| Ambient temperature, limit operating range    | −20 ... +60 °C                                   |
| Ambient temperature for storage and transport | −25 ... +85 °C                                   |
| Relative humidity                             | 10 ... 90 % (non-condensing)                     |



Electrical data ( continued )

|  |   |
|--|---|
| <b>Electrical data and connections</b> |   |
| AC power supply .....                  | 24, 48, 100, 110, 127, 200, 230, 240 V, -15 ... +10 % |
| Frequency .....                        | 50 ... 60 Hz, ± 6 %                                   |
| DC power supply .....                  | 24 V, -20 ... +15 %                                   |
| Power consumption .....                | 12 VA   |
| Contact outputs on CPM 121-P .....     | 2 changeover contacts, 1 floating NO contact          |
| Contact outputs on CPM 151-P .....     | 3 changeover contacts                                 |
| Switching voltage .....                | max. 250 V AC   |
| Switching current .....                | max. 3 A  |
| Switching power .....                  | max. 500 VA   |
| Signal outputs .....                   | 1 or 2 x 0 / 4 ... 20 mA, galvanically separated      |
| Insulation voltage .....               | 650 Vp-p  |
| Auxiliary power supply output .....    | ± 8.5 V, max. 10 mA (R <sub>i</sub> = 400 Ω)          |
| Digital interface (variant) .....      | optionally RS 232-C, RS 485 or E+H Rackbus            |
| Hold input .....                       | ext. floating NO contact                              |
| Input current .....                    | max. 10 mA  |
| Terminals .....                        | terminal block  |
| Max. conductor cross section .....     | 4 mm <sup>2</sup>                                     |

Physical data

|                                  |                                 |
|----------------------------------|---------------------------------|
| <b>CPM 121-P</b>                 |                                 |
| Dimensions .....                 | 96 x 96 x 176,5 mm (HxWxD)      |
| Weight .....                     | 1.1 kg                          |
| Ingress protection (front) ..... | IP 54                           |
| Housing material .....           | polycarbonate                   |
| Front of housing .....           | polyester                       |
| <b>CPM 151-P</b>                 |                                 |
| Dimensions .....                 | 247 x 167 x 111 mm (HxWxD)      |
| Weight .....                     | 3.5 kg                          |
| Ingress protection .....         | IP 65                           |
| Housing material .....           | GD-ALSI (Mg component > 0.05 %) |
| Paintwork .....                  | 2-componenten PU-varnish        |
| Front of housing .....           | polyester, UV-resistant         |

## 4. Installation

### 4.1 Storage and transport

The packaging material used to store or transport the instrument must provide shock and moisture protection. Optimal protection

is provided by the original packaging materials. Conformance with the ambient conditions (see technical data) must be assured.

### 4.2 Unpacking

- Inspect for any damaged packaging! The post office or freight carrier must be informed of any damage. Damaged packaging material must be retained until the matter has been settled.
- Verify that the contents are undamaged! Inform the post office or freight carrier as well as the supplier of any damage.
- Check that the delivery is complete and agrees with the shipping documents and your order (see fig. 3.2/3.3).

The scope of delivery of the Mycom CPM 121-P

(panel-mounted unit) comprises:

- 2 housing fastening elements (order no. 50047795)
- 1 submin D connector (only for instruments equipped with a digital interface) (order no. 50051998)
- Installation and operating instructions
- Instrument identification card(s)

The scope of delivery of the Mycom CPM 151-P comprises:

- 1 housing mounting kit (order no. 50061357)
- 1 measuring point identification label (order no. 50061359)
- Installation and operating instructions
- Instrument identification card(s)

If you have any questions, consult your supplier or the Endress+Hauser sales agency in your area (see back page of these installation and operating instructions for addresses).

### 4.3 Mounting

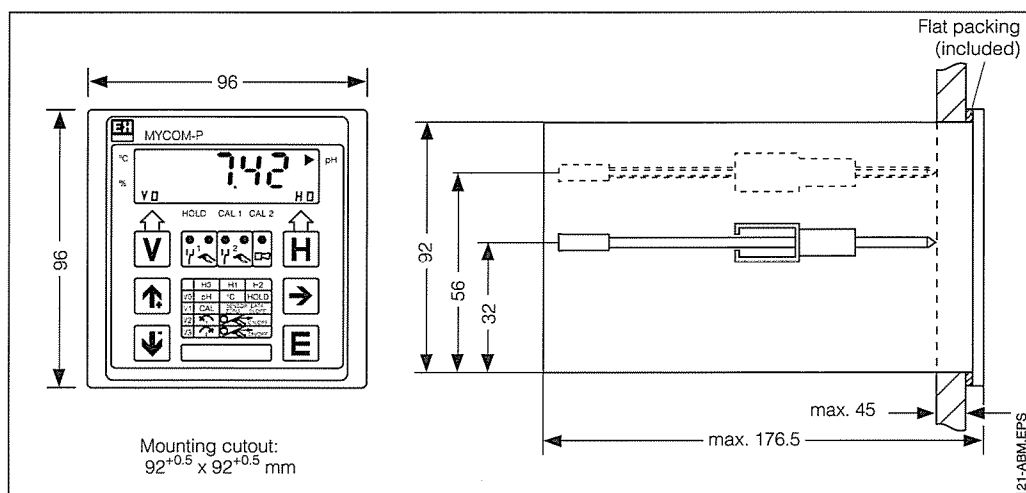
The instrument can be mounted as follows:

- CPM 121-P: panel installation
- CPM 151-P: – panel installation  
– wall installation  
– post installation

#### Panel installation of CPM 121-P

The mounting cutout required according to DIN 43 700 is  $92 \pm 0.5 \times 92 \pm 0.5$  mm.

The instrument is installed using the supplied housing mounting elements. The required installation depth is approx. 180 mm.



## Dimensions of CPM 151-P

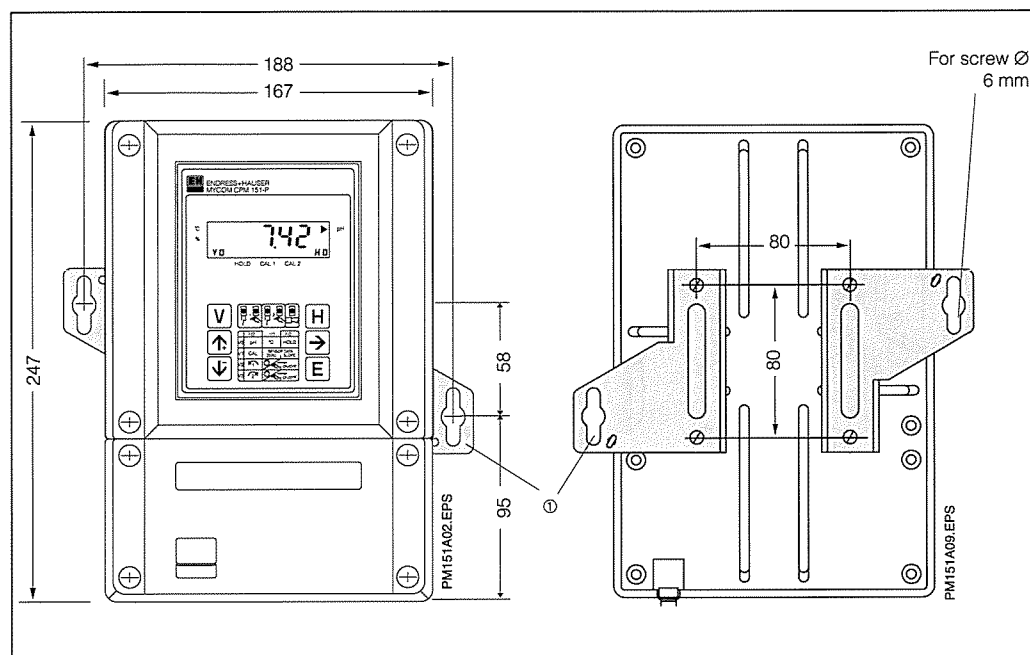


Fig. 4.2 : Dimensions of Mycom CPM 151-P (left)

① Brackets for wall installation

Fig. 4.3: Rear of field housing with mounting brackets installed

**Note:** Mounting brackets and screws for wall installation are included in the housing mounting kit supplied with the instrument.

## Wall installation of CPM 151-P

Install the mounting brackets on the rear of the instrument according to figs. 4.3 and 4.4.

Refer to figs. 4.2 and 4.3 for the housing and mounting dimensions of the field housing.

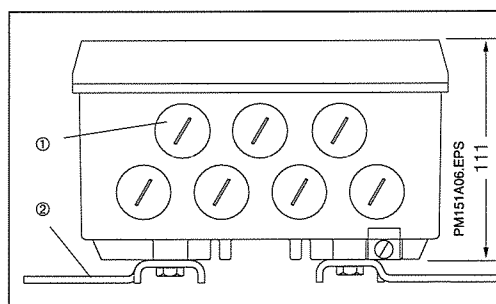


Fig. 4.4: Bottom of field housing with brackets for wall mounting installed

① Screw plugs for Pg 13.5  
② Mounting brackets

## Panel installation of CPM 151-P

The instrument is installed using the supplied housing fastening elements (see fig 4.5). A flat packing (see chapter 11.4) is required to seal the panel cutout.

The cutout required for panel mounting is  $161 \pm 0.5 \times 241 \pm 0.5$  mm (W x H).

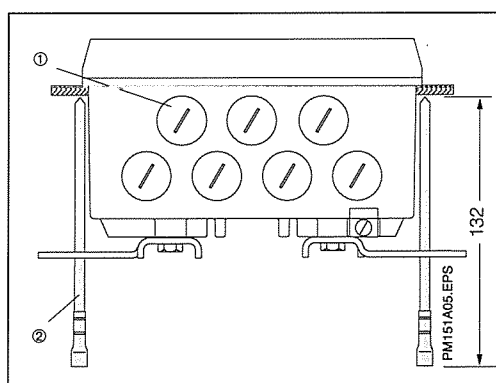


Fig. 4.5: Bottom of field housing with mounting dimensions and tensioning screws for panel mounting installed

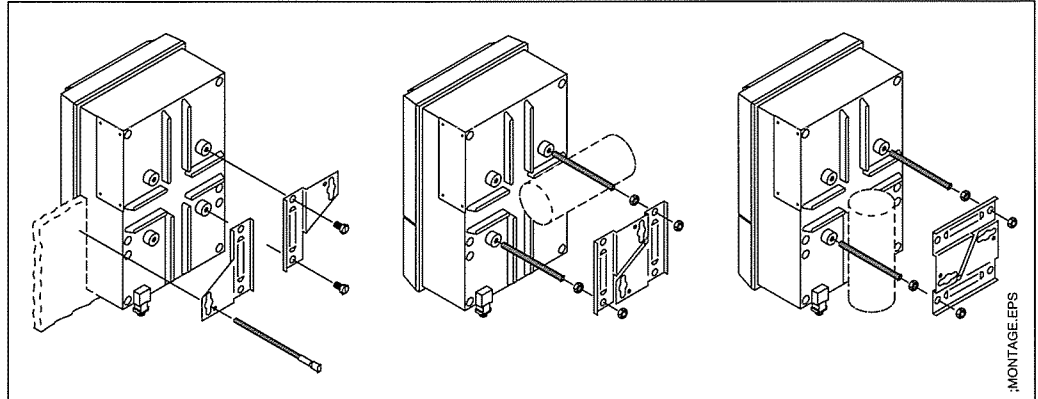
① Screw plugs for Pg 13.5  
② Tensioning screws

#### Post installation of CPM 151-P

The Mycom CPM 151-P (field housing) can be installed on vertical or horizontal tubing with a max. diameter of 70 mm using parts supplied with the housing mounting kit.

These mounting parts are to be installed on the rear of the instrument according to fig. 4.6. Refer to chapter 11.4 regarding other accessories available for the Mycom CPM 151-P

Fig. 4.6: Panel installation and post mounting of Mycom CPM 151-P



#### Caution:

##### Outdoor installation

Long-term, direct exposure of the instrument front to solar radiation is to be avoided.

Install weather protection cover CYY 101 in these cases.

## 4.4 Mounting accessories

#### Weather protection cover CYY 101

Weather protection cover CYY 101 can be attached directly to the upright post of assembly holder CYH 101 by means of two M8 screws (see fig. 4.8, mounting position ①).

Two round post mounting brackets (order no. 50062121) are required to install the weather protection cover on vertical or horizontal tubing or posts with a max. cross section of 60 mm.

Fig. 4.7: Round post mounting for weather protection cover CYY 101 if not installed on assembly holder CYH 101

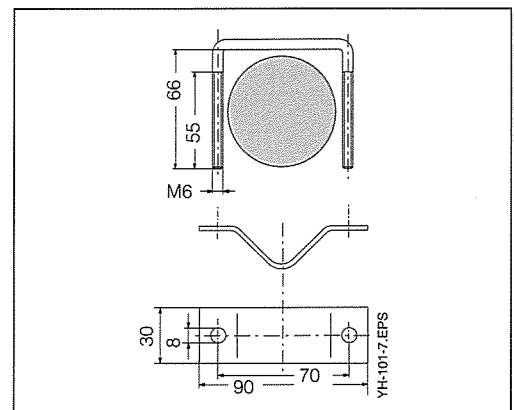


Fig. 4.8: Weather protection cover CYY 101 with dimensions and mounting positions for:

- ① Installation on upright post CYH 101 with two M8 screws
- ② Installation on vertical or horizontal tubing with 2 round post mounting brackets
- ③ Installation of pH meas. transmitter Mycom CPM 151-P
- ④ Wall installation

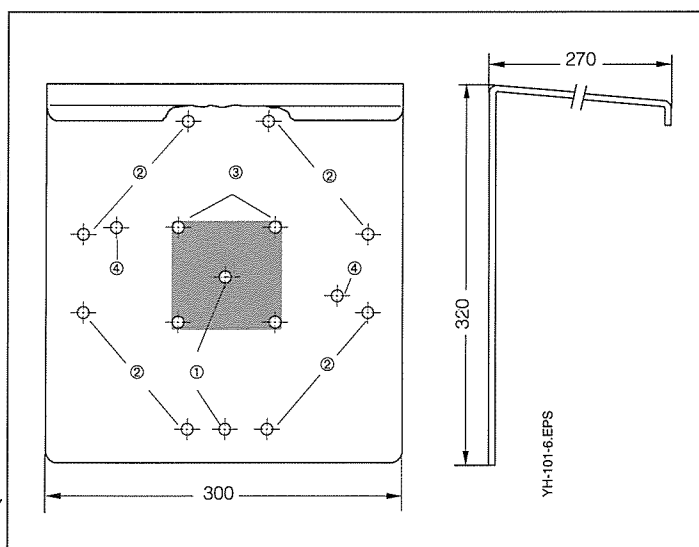
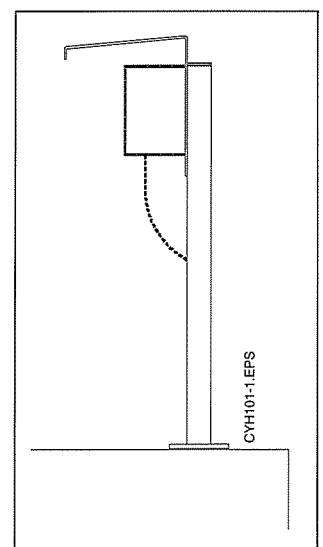


Fig. 4.9 Weather protection cover CYY 101 with Mycom CPM 151-P installed on upright post



**Junction box VBA**

Junction box VBA is required for line lengths of more than 25 m between the assembly and the pH measuring instrument.

It has two Pg 13.5 and Pg 16 glands for cable entry and 10 isolated high-impedance screw terminals for connection of individual wires.

Dimensions: 120 x 120 x 55 mm (H x W x D)

Ingress protection: IP 65

Material: polycarbonate

**Caution:**

To avoid measuring errors caused by humidity bridges on the pH connecting line, please check desiccant bags regularly and replace if necessary (depending on the ambient conditions).

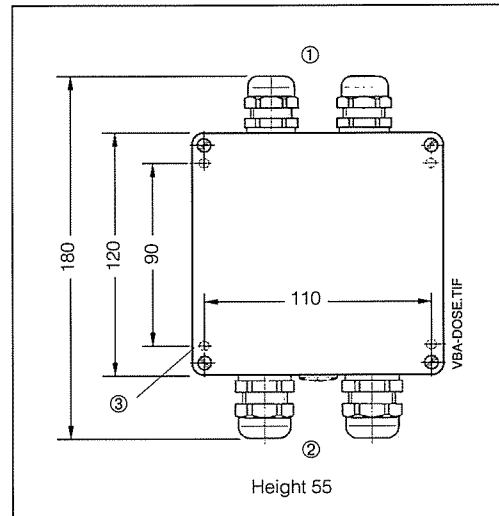


Fig. 4.10: Junction box VBA

- ① 2 Pg 13.5 cable glands
- ② 2 Pg 16 cable glands
- ③ 4 mounting holes, Ø 4.3 mm

**4.5 Connection**

The following connections must be established:

- Mains connection
- Switching contact connection (depending on instrument version)
- pH signal output (0/4 – 20 mA) connection if required
- pH electrode, Pt 100 and potential matching pin (depending on measuring system)

**Warning:**

Work under tension and connection to the mains may only be performed by properly trained personnel.

A mains disconnecting device must be installed close to the instrument and identified as a mains disconnecting device for the CPM 121-P / 151-P (see EN 61010-1).

Before connecting the instrument to the mains, make sure the mains voltage matches the voltage rating on the nameplate.

**Note:**

This instrument has been designed and tested with regard to electromagnetic compatibility.

This is only valid, however, for a properly grounded instrument with a screened measured value output line.

Keep the screen ground line as short as possible (maximum of approx. 30 mm).

Do not solder an extension onto the screen!

This also applies to the connection of junction box VBA.

Ground the upright post when installing the field housing (CPM 151-P) to increase immunity to interference. Running the cable in the post will improve interference suppression.

After installing and connecting the instrument and sensors, the entire measuring system must be checked for proper function.

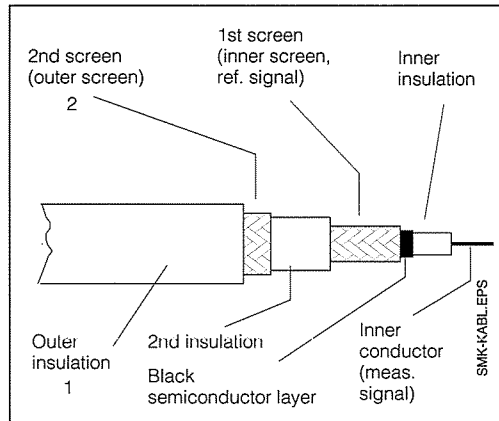


Fig. 4.11: Construction of CPK 1 cable (SMK)

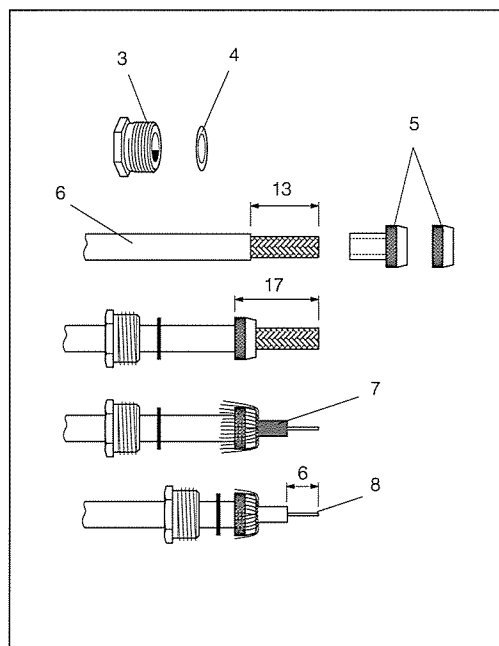


Bild 4.12: preparation of connection cable

### Connection of CPM 121-P

All connections to the instrument are established via the rear panel

- for combined and single pH electrodes using BNC connectors;
- for all sensor and signal lines as well as mains connection and switching contacts using (removable) terminal strips.

Prepare the coaxial cable according to fig. 4.12 for connection of the pH signal line to a BNC elbow plug (see fig. 4.13).

### Preparation of pH connecting cable with BNC connector for CPM 121-P with pH cable CPK 1, CPK 7 or SMK

(see figs. 4.11 and 4.12)

- Strip outer insulation (1) of pH measuring cable approx. 60 mm.
- Fold outer screen (2) back over outer insulation approx. 1 cm.
- Insert cable gland (3) and washer (4) on the cable.
- Remove second insulation (6); length = 13 mm.
- Insert threaded ring (5) for cable diameter of 3 mm or 5 mm over braided screen.
- Fold the braided inner screen back over the threaded ring and cut off excess material.



#### Caution:

Black semiconductor layer (7) must be removed!

- Strip inner insulation approx. 6 mm (8).
- Stranded inner wire: Prepare the connector sleeve included in the connector package

### BNC elbow plug assembly

(see fig. 4.13)

- Loosen screw plug (11) on the BNC elbow plug; unscrew by turning counterclockwise and screw back in 1/2 revolution to prevent the screw from dropping out.
- Carefully push pre-assembled pH cable (12) into connector shell (9) all the way to the noticeable stop.
- Tighten screw plug (11) by turning it clockwise.
- Tighten the cable gland (12)
- pH measuring cable CPK1 or SMK only:

#### Symmetrical high-impedance connection:

Solder 0.75 mm<sup>2</sup> litz (13) to outer screen and wind with insulating tape. Then connect litz (1 cm) to PM / PMC! Clamp **only** the outer insulation of the cable under the strain relief clamp (14) on the rear of the instrument.

#### Asymmetrical connection:

Fold outer screen(15) (approx. 1 cm) over outer insulation and clamp under strain relief clamp (14) on the rear.

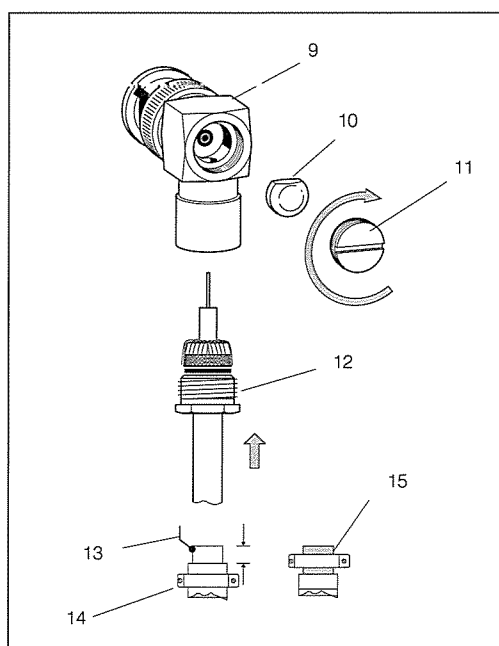


Bild 4.13: Installation of BNC elbow plug

### Connection of CPM 151-P

The electrical cables from the sensors and the signal lines are connected to the terminal strip in the separate connection compartment (see fig. 4.14).

- Replace the screw plugs underneath the instrument with the corresponding number of Pg cable glands.
- Introduce the connecting cables through the Pg cable glands (see fig. 4.14).
- Connect the instrument according to the connection diagram (see fig. 4.15). Signal cables must be spatially separated from mains and power cables.
- Tighten the cable glands.
- Install the cover on the separate terminal connection compartment and tighten the cover screws.

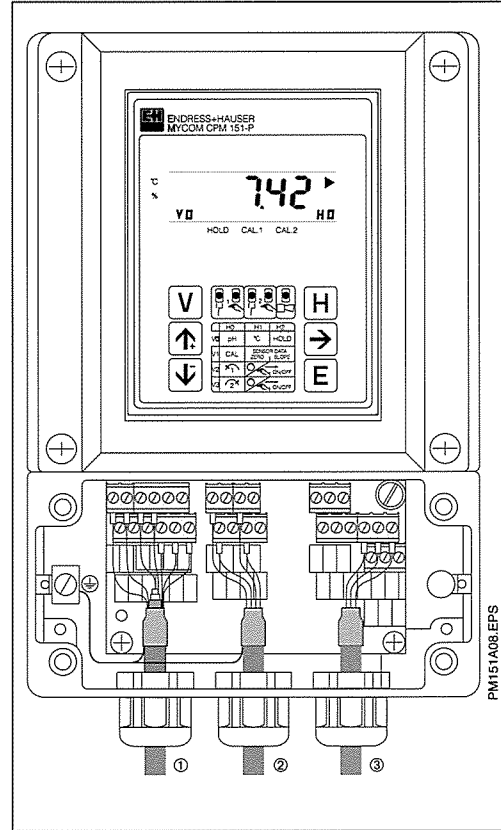


Fig. 4.14: Mycom CPM 151-P with connections in separate terminal connection compartment

- ① Inputs: pH value, temperature
- ② Meas. signal output, interface
- ③ Power supply

| Terminal cross sections          |   |
|----------------------------------|---|
| Cross section:                   | 4.0 mm <sup>2</sup>   |
| Temperature output on CPM 121-P: | 2 terminals with a max. cross section of 2.5 mm <sup>2</sup>  |
| Optionally connectable:          | 1 wire with 2.5 mm <sup>2</sup><br>1 wire with 4.0 mm <sup>2</sup><br>2 litz wires with 1.5 mm <sup>2</sup> each and end sleeves<br>1 litz wire with 2.5 mm <sup>2</sup> and end sleeve |
| Terminal designations:           | acc. to DIN 45140   |

| Line lengths                           |  |
|--|--|
| pH measurement                         |  |
| Max. line length:                      | When using special Endress+Hauser coaxial measuring cable: |
| without SCS (V6 / H0 = OFF)            | 100 m  |
| with SCS (V6 / H0 = ON)                | 20 m   |
| Temperature measurement                |  |
| Sensor connection:                     | 3-wire   |
| Max. line length / line cross section: | 100 m / 0.75 mm <sup>2</sup>                               |

| pH measuring cable lengths available                 | Extension cables |
|--|------------------|
| CPK 1: 5 / 10 / 15 / 20 / 25 / 30 / 140 m            | SMK              |
| CPK 7: 5 / 10 / 15 / 20 / 25 m                       | CYK 7            |
| Use junction box VBA for extension (see chapter 4.4) |                  |

## 4.6 Connection diagram

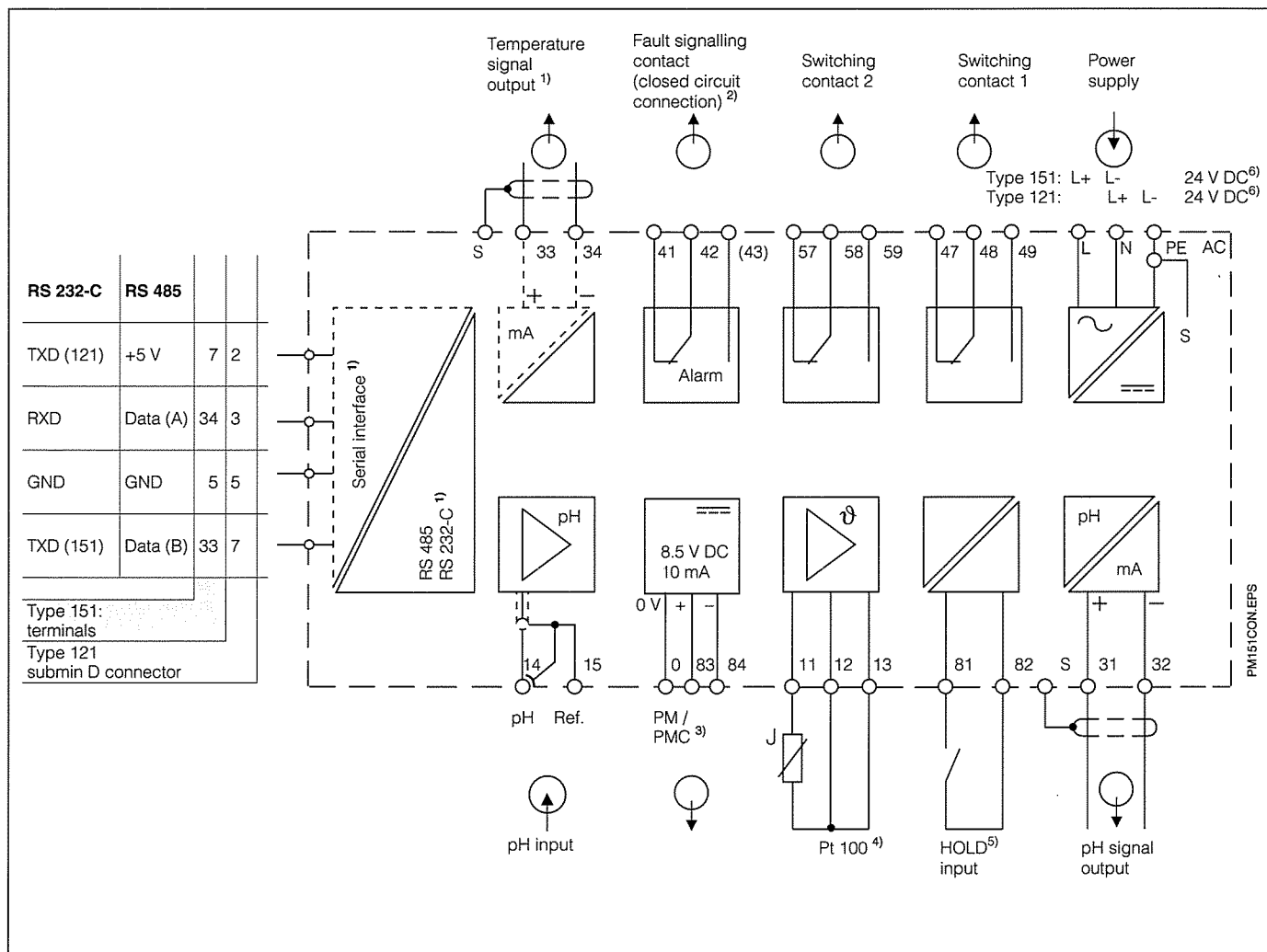


Fig. 4.15: Electrical connection of Mycom CPM 121-P/151-P



**Note:**  
The connection diagram shows the fully equipped unit! Terminal designations in parentheses only apply to the Mycom CPM 151-P!

1) Instrument version optionally with temperature signal output or serial digital interface (terminals 33 und 34) according to order code (see chapter 3).

2) Contact status shown:  
no current or fault present

All switching contacts are interference-suppressed with varistors.  
External loads connected may have to be additionally interference-suppressed.

3) Connection of potential matching pin from assembly (see chapter 4.7)

4) An equivalent resistance is not required if a Pt 100 is not present

5) When operating more than one Mycom, each instrument needs its own potential-free contact

6) 24 V DC: floating or minus pole grounded

### Note:

- For detailed pH electrode connection diagrams see:
- „Symmetrical high-impedance connections“, figs. 4.16, 4.17
- „Asymmetrical high-impedance connections“, fig. 4.18



## 4.7 pH electrode connection

The connection of pH electrodes takes place via multi-core pre-assembled and shielded special measuring cables of types CPK 1, CPK 3 (for laboratory applications) and CPK 7.

**Caution:**

Plugs and terminals must be protected against humidity, otherwise incorrect measurement will result!

Also note the installation and operating instructions for the assembly when installing electrodes.

### Potential matching connection (PM / PMC)

#### Symmetrical high-impedance input

**Caution:**

The potential matching pin of the assembly must be connected to terminal 0 of the instrument (see figs. 4.16 and 4.17).

**Advantage:**

The reference system of the pH measuring chain is connected to a high-impedance input just like the pH electrode. This eliminates any leakage current, rendering measurement under difficult environmental conditions (e.g. high flow rates, high-resistance media or partially soiled diaphragm) less problematic.

**Special requirement:**

The potential matching pin must always contact the medium. Therefore a connection line to PM has to be immersed in the buffer solution during calibration.

#### Asymmetrical high-impedance input

In the case of an asymmetrical high-impedance instrument input, pH measuring chains in conjunction with assemblies can be connected without an additional potential matching pin. Connect the existing potential matching pin to terminal S or PE.

**Disadvantage:**

The reference system of the measuring chain is more affected by leakage, possibly introducing measuring errors in limit operating ranges (see "Symmetrical high-impedance input").

**Note:**

The instrument is configured for symmetrical high-impedance input at the factory.

Switching to asymmetrical high-impedance input is described in chapter 8, matrix position V8 / H3.

**Symmetrical high-impedance  
pH electrode connection on CPM 121-P**  
(0 is selected in matrix field V8 / H3)

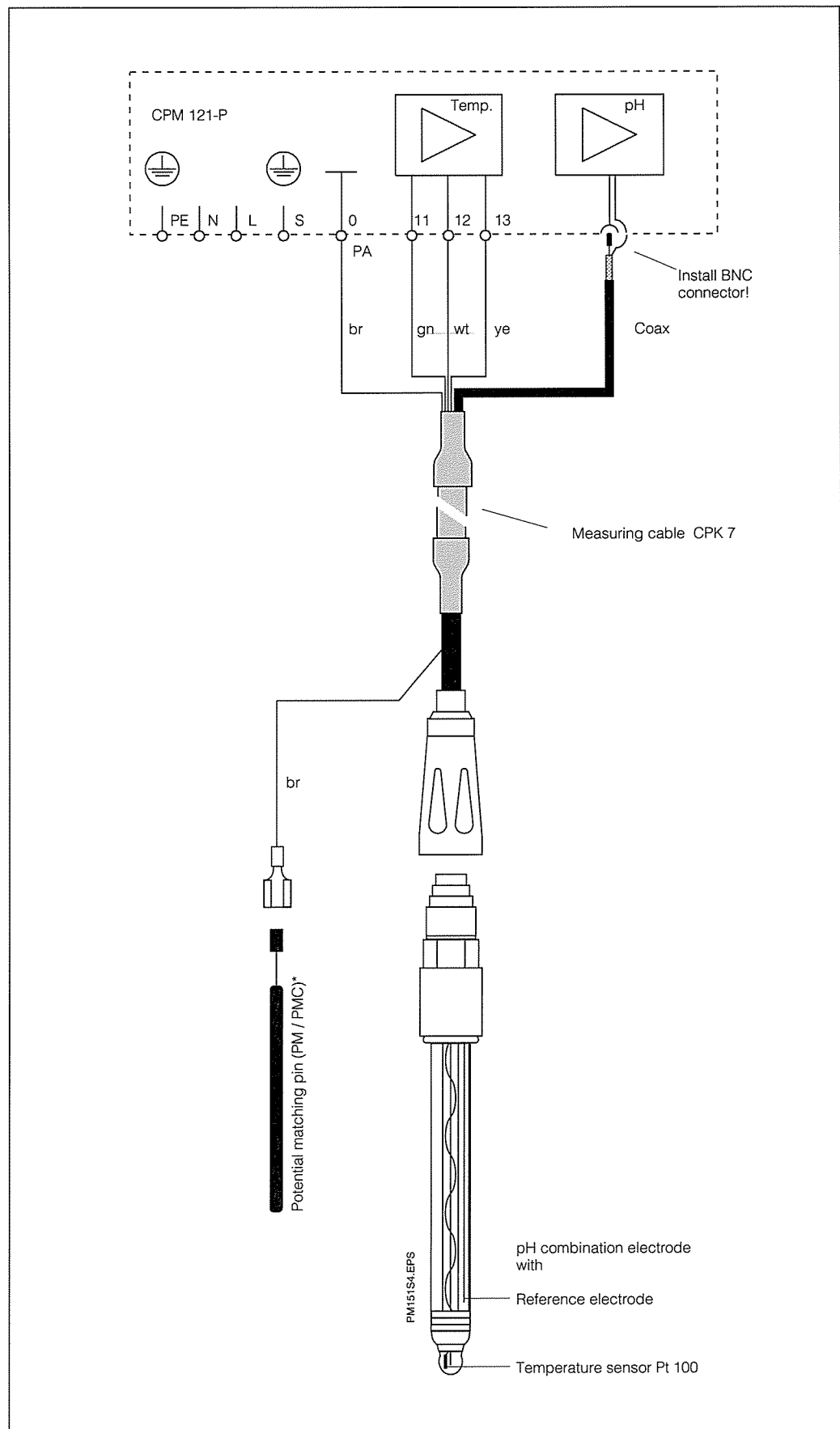


Bild 4.16: pH combination electrode,  
potential matching pin (PM / PMC)\*  
and measuring cable CPK 7

### Symmetrical high-impedance pH electrode connection on CPM 151-P

(0 is selected in matrix field V8 / H3)

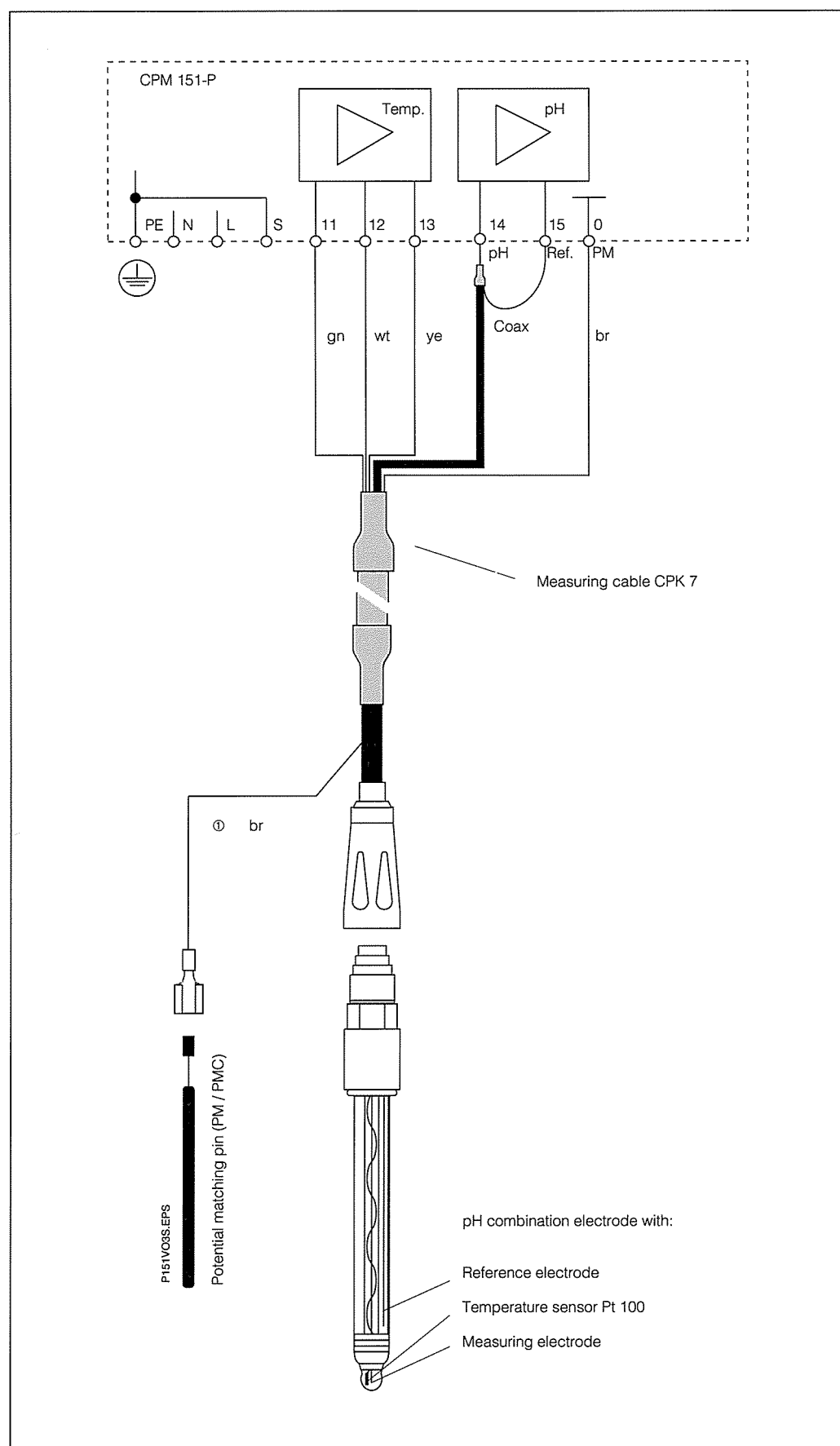
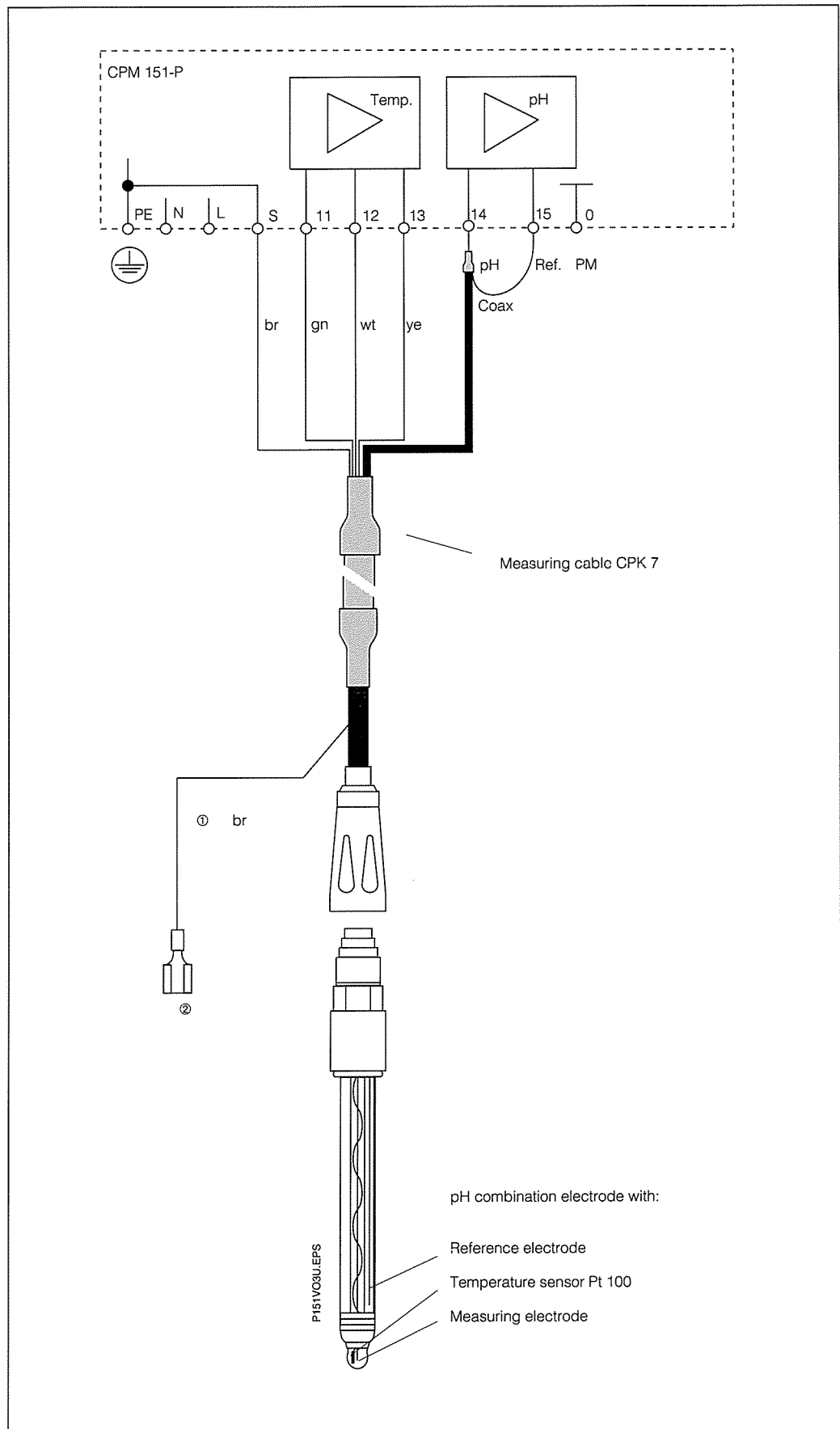
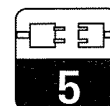


Fig. 4.17: pH combination electrode with temperature sensor Pt 100 and measuring cable CPK 7

① Brown wire connected to outer screen

**Asymmetrical high-impedance  
pH electrode connection on CPM 151-P**  
(1 is selected in matrix field V8 / H3)





## 5. Start-up

### 5.1 Measures before first power-up

Familiarise yourself with the operation of the measuring transmitter before switching it on for the first time.

**Caution:**

- Make sure all connections have been established correctly before power-up!
- Make sure the pH electrode is located in the medium or in a buffer solution since otherwise implausible values will be displayed.
- For measurement with symmetrical high-impedance pH electrode connection: Make sure the potential matching conductor is also connected to the medium or buffer solution.
- Asymmetrical high-impedance pH connection: potential matching connector PM must not be connected to medium.

**Warning:**

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

### 5.2 Instrument status after first power-up

- After power-up, all LCD segments of the the display are briefly activated (approx. 2 s), and all LEDs turn red. Then the unit starts measuring (matrix position V0 / H0).

**The operating and start-up levels are locked.**

**Note:**

The instrument automatically starts up in matrix field V0 / H0 (measurement) following interruptions in operation.

### 5.3 Power failure handling

- In the event of a power failure with a maximum duration of 20 ms, measuring operation continues.
- If there is a power failure with a duration of more than 20 ms, measuring operation is interrupted, but the values entered for the parameters are retained.
- When the operating voltage returns, the unit resumes measuring operation as described in chapter 5.2.

### 5.4 Minimum settings

The possible inputs for all matrix fields are shown in the operating matrix (see chapter 6.3).

Chapter 8 contains a detailed description of the individual matrix fields and also lists the factory settings.

The start-up of the measuring system requires the following minimum settings:

| Field   | Function  |
|---|---|
| <b>Unlocking of start-up level</b><br>(see chapter 6.2) |   |
| <b>Measurement and calibration</b>                      |   |
| V1 / H3   | Definition of temperature compensation:<br>– automatic (ATC)<br><b>or</b><br>– manual (MTC) |
| V1 / H4   | Entry of reference temperature for MTC  |
| V1 / H5   | Definition of calibration type<br>– AUTOMATIC<br><b>or</b><br>– MANUAL                      |
| V1 / H6<br>V1 / H7                                      | Entry of buffer values 1 and 2 for AUTOMATIC  |
| <b>Limit function or control and alarm functions</b>    |   |
| V4 / H0<br>V5 / H0                                      | Definition of controller type for instruments equipped with appropriate options             |
| V4 / H1<br>V5 / H1                                      | Control characteristic for pulse-length, pulse-frequency or three-point step controller     |
| V4 / H8   | Motor operating time for three-point step controller  |
| V7 / H1   | Alarm delay time  |

## 6. Operation

### 6.1 General notes on operation

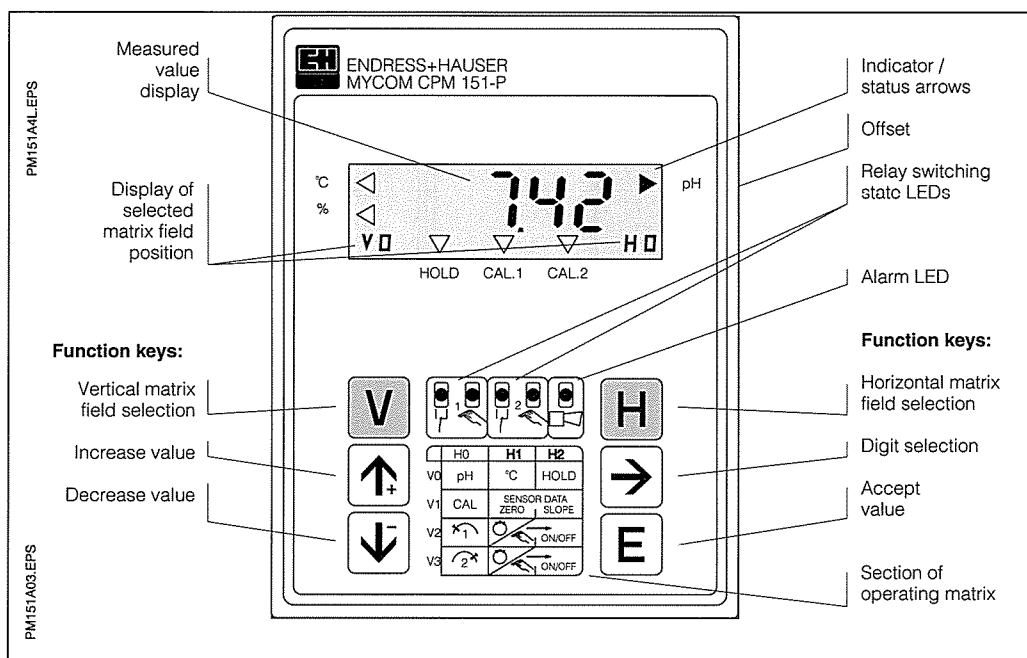


Fig. 6.1: Mycom CPM 121-P/151-P Front view of instrument with display and operating

The operation of the unit is matrix-oriented, i.e. each function of the instrument is assigned one position in a 10 x 10 field matrix (fields V0 / H0 to V9 / H9, see double page 24/25).

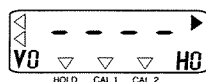
The operating functions are selected via the V (vertical) and H (horizontal) keys. These keys step through the matrix fields, including those which have not been assigned. The key functions are explained in chapter 6.2.

The functions of the matrix are grouped into 3 levels according to their purpose:

- Level 0: **Indication**  
(pH value, temperature, zero point or slope)
- Level 1: **Operation**  
(calibration, hold)  
Code entry: **1111**
- Level 2: **Start-up**  
(current output assignment, damping; controller functions)  
Code entry: **2222**

Without previous code entry, the content of the matrix fields is only displayed.

All matrix fields where the corresponding function has not been activated display:



#### Unlocking the levels

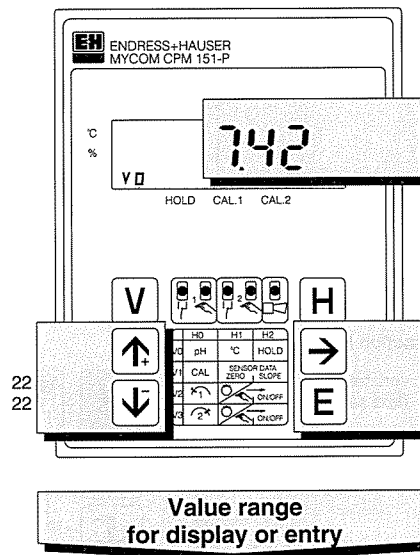
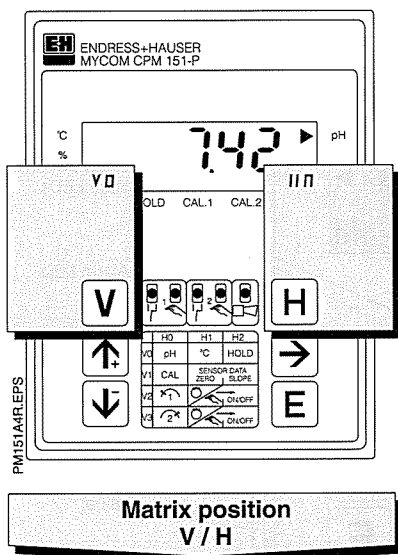
- Select matrix field V0 / H0 and press E key
- The last entered code number is displayed in field V8 / H9
- Unlock level 1 **Operation** by entering **code 1111** or
- level 2 **Start-up** (including level 1 Operation) by entering **code 2222**
- Acknowledge by pressing the E key
- Return to matrix field V0 / H0 (measured value display) by pressing the V and H keys simultaneously

#### Locking levels 1 and 2

Proceed as described above but enter any value **except** 1111 or 2222.

The instrument is automatically locked following interruptions in operation.

## 6.2 Key functions



V key:  
Selection of line:  
matrix fields V0 to V9

With each key stroke the V display  
is increased by one line value.



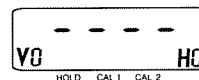
H key:  
Selection of column:  
matrix fields H0 to H9

With each key stroke the H display  
is increased by one column value.

**Example:**  
To collect matrix field  
V1 / H2:

Press V key 1 time  
Press H key 2 times

Display for locked matrix fields:



Display for matrix fields that can be  
changed: digit that can be edited  
flashes.

Use these keys to enter values and  
select functions:



Increase value



Decrease value

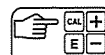


- Select digit:  
This key cycles from 1st digit  
to 2nd digit, 3rd digit, etc.
- Start editing
- Recall after E








Acknowledge value



**Note:**

1. Code 0000 is always displayed in matrix field V8 / H9, when the instrument is started up for the first time or after power failures.
2. Only matrix field V8 / H9 can be selected directly with the „E “ key. All other matrix fields must be accessed by means of individual selection with the „V “ and „H “ keys.
3. **Jumping back** to matrix field **V0 / H0** by pressing the „V “ and „H “ keys at the same time is possible from any matrix field position.

|   |          |  |          |  |                  |   |                  |  |
|---|----------|--|----------|--|------------------|---|------------------|--|
| Basic functions 1                                   | V0<br>H0 | Measurement<br>-2.00 to 14.00 pH   | V0<br>H1 | Temperature display<br>-15.0 to 150.0°C  | 1111<br>V0<br>H2 | HOLD<br>OFF/ON<br>0 = OFF<br>1 = ON   | 2222<br>V0<br>H3 | Toggle<br>0 ... 20 mA /<br>4 ... 20 mA<br>0 = 0 to 20 mA<br>1 = 4 to 20 mA<br>Default: 1 ..... |
|   | V1<br>H0 | 1111<br>Calibration<br>Man. calibration: meas.<br>value display<br>Autom. calibration:<br>buffer value display   | V1<br>H1 | Zero point display<br>Displays pH value at<br>measuring chain voltage<br>of 0 mV   | V1<br>H2         | Slope display<br>Display of measuring<br>chain slope in %, refer-<br>red to theoretical slope   | 2222<br>V1<br>H3 | Toggle MTC/ATC<br>0 = MTC (manual)<br>1 = ATC (automatic)<br>Default: 1 .....                  |
| Limit /contact<br>configuration for<br>controller 1 | V2<br>H0 | 1111<br>Setpoint entry<br>for limit contactor/<br>controller 1<br>-2.00 to 14.00 pH<br>Default: 4.00 ..... pH  | V2<br>H1 | 1111<br>Toggle<br>Auto/Manual<br>0 = manual<br>1 = automatic<br>Default: 1 .....   | V2<br>H2         | 1111<br>Manual OFF/ON<br>Keys   | 2222<br>V2<br>H3 | Pickup delay<br>Limit contactor 1<br>0 to 6000 s<br>Default: 0 .....                           |
|   | V3<br>H0 | 1111<br>Setpoint entry<br>for limit contactor/<br>controller 2<br>-2.00 to 14.00 pH<br>Default: 10.00 ..... pH   | V3<br>H1 | 1111<br>Toggle<br>Auto/Manual<br>0 = manual<br>1 = automatic<br>Default: 1 .....   | V3<br>H2         | 1111<br>Manual OFF/ON<br>Keys   | 2222<br>V3<br>H3 | Pickup delay<br>Limit contactor 2<br>0 to 6000 s<br>Default: 0 .....                           |
| Control parameters 1                                | V4<br>H0 | 2222<br>Controller type<br>0 = off;<br>1 = limit contactor;<br>2 = pulse length;<br>3 = pulse frequency;<br>4 = START rinse funct.<br>Default: 1 ..... | V4<br>H1 | 2222<br>Control<br>characteristic<br>1 = P controller;<br>2 = PI contr.; 3 = PID;<br>4 = PD controller;<br>5 = PT 1 controller<br>Default: 1/4 ..... | V4<br>H2         | 2222<br>Proportional<br>band<br>10 to 500 %<br>Default: 100 .....   | V4<br>H3         | 2222<br>Integral action<br>time<br>0.1 to 999.9 min.<br>Default: 999.9 .....                   |
|   | V5<br>H0 | 2222<br>Controller type<br>0 = off;<br>1 = limit contactor;<br>2 = pulse length;<br>3 = pulse frequency<br>Default: 1 .....                            | V5<br>H1 | 2222<br>Control<br>characteristic<br>1 = P controller;<br>2 = PI controller;<br>3 = PID controller<br>Default: 1 .....                               | V5<br>H2         | 2222<br>Proportional<br>band<br>10 to 500 %<br>Default: 100 .....   | V5<br>H3         | 2222<br>Integral action<br>time<br>0.1 to 999.9 min.<br>Default: 999.9 .....                   |
| Alarm   | V6<br>H0 | 2222<br>SCS electrode<br>OFF/ON<br>0 = OFF<br>1 = ON<br>Default: 0 .....   | V6<br>H1 | 2222<br>SCS reference<br>alarm limit<br>0 to 100<br>0 = OFF<br>Default: 0 .....  |                  |   |                  |  |
|   | V7<br>H0 | 1111<br>Alarm threshold<br>Alarm for setpoint +<br>threshold<br>0.0 to 16.0 pH<br>Default: 1 .....   | V7<br>H1 | 1111<br>Alarm delay<br>0 to 6000 s<br>Default: 30 .....  | V7<br>H2         | 2222<br>Toggle steady/<br>fleeting contact<br>0 = steady contact<br>1 = fleeting contact<br>Default: 0 .....  | V7<br>H3         | 2222<br>Toggle<br>pH value display<br>0 = XX.XX<br>1 = XX.X<br>Default: 0 .....                |
| Interface<br>configuration,<br>unlock / lock        | V8<br>H0 | 2222<br>Parity<br>0 = none<br>1 = odd<br>2 = even<br>Default: 2 .....  | V8<br>H1 | 2222<br>Baud rate<br>selection<br>0 = 4800 Bd<br>1 = 9600 Bd<br>2 = 19200 Bd<br>Default: 1 .....   |                  |   | V8<br>H3         | 2222<br>Toggle<br>pH input<br>0 = symmetrical<br>1 = asymmetrical<br>Default: 0 .....          |
|   | V9<br>H0 | Diagnostic code<br>Error messages<br>E1 to E255  | V9<br>H1 | 2222<br>Service<br>Display and clear auto<br>resets (watchdog<br>triggering due to<br>EMC events)  | V9<br>H2         | Display<br>instrument<br>configuration  | V9<br>H3         | Software version   |

|  |  |  |  |  |   |
|--|--|--|--|--|---|
| 2222<br><b>Rate of rise<br/>mA/s</b><br>V0<br>H4<br>0.2 to 20.0 mA/s<br>Default: 20.0 ..... mA/s             | 2222<br><b>pH at 0/4 mA</b><br>-2.00 to 12.00 pH<br>V0<br>H5<br>Default: 2.00 ..... pH   | 2222<br><b>pH at 20 mA</b><br>0 to 14.00 pH<br>V0<br>H6<br>Default: 12 ..... pH  | 2222<br><b>Temperature<br/>at 0/4 mA</b><br>-15.0 to 125.0 °C<br>V0<br>H7<br>Default: 0 ..... °C               | 2222<br><b>Temperature<br/>at 20 mA</b><br>+10.0 to +150.0 °C<br>V0<br>H8<br>Default: 100.0 ..... °C   | 2222<br><b>Temperature<br/>measurement</b><br>V0<br>H9<br>0 = off<br>1 = on<br>Default: 1 .....   |
| 1111<br><b>MTC temperature<br/>entry</b><br>-15.0 to +150.0 °C<br>V1<br>H4<br>Default: 25 ..... °C           | 2222<br><b>Calibration type</b><br>0 = manual:<br>edit buffer value<br>1 = automatic:<br>pre-defined buffer<br>values are used<br>V1<br>H5<br>Default: 1 ..... | 2222<br><b>Entry of<br/>buffer value 1</b><br>-2.00 to 14.00 pH<br>V1<br>H6<br>Default: 7.00 ..... pH                      | 2222<br><b>Entry of<br/>buffer value 2</b><br>-2.00 to 14.00 pH<br>V1<br>H7<br>Default: 4.01 ..... pH          | 2222<br><b>Toggle electrode<br/>type: glass/<br/>antimony</b><br>0 = glass electrode<br>1 = antimony electrode<br>V1<br>H8<br>Default: 0 ..... | 2222<br><b>HOLD during<br/>cal. / rinse</b><br>V1<br>H9<br>0 = no            no<br>1 = yes        yes<br>2 = yes        no<br>3 = no        yes<br>Default: 1 ..... |
| 2222<br><b>Dropout delay</b><br>Limit contactor 1<br>0 to 6000 s<br>V2<br>H4<br>Default: 0 ..... s           | 2222<br><b>Toggle<br/>MIN/MAX</b><br>0 = MIN<br>1 = MAX<br>V2<br>H5<br>Default: 0 .....  | 2222<br><b>Toggle<br/>NC/NO contact</b><br>0 = NC contact<br>1 = NO contact<br>V2<br>H6<br>Default: 1 .....                | 2222<br><b>Hysteresis</b><br>Limit contactor 1<br>0.1 to 1.0 pH<br>V2<br>H7<br>Default: 0.5 ..... pH           |  |   |
| 2222<br><b>Dropout delay</b><br>Limit contactor 2<br>0 to 6000 s<br>V3<br>H4<br>Default: 0 ..... s           | 2222<br><b>Toggle<br/>MIN/MAX</b><br>0 = MIN<br>1 = MAX<br>V3<br>H5<br>Default: 1 .....  | 2222<br><b>Toggle<br/>NC/NO contact</b><br>0 = NC contact<br>1 = NO contact<br>V3<br>H6<br>Default: 1 .....                | 2222<br><b>Hysteresis</b><br>Limit contactor 2<br>0.1 to 1.0 pH<br>V3<br>H7<br>Default: 0.5 ..... pH           |  |   |
| 2222<br><b>Pulse interval</b><br>0.5 to 99.9 s<br>(only if V4H0 = 2)<br>V4<br>H4<br>Default: 10.0 ..... s    | 2222<br><b>Minimum<br/>ON time</b><br>0.1 to 5.0 s<br>V4<br>H5<br>Default: 0.3 ..... s   | 2222<br><b>Maximum<br/>pulse frequency</b><br>60 to 120 1/min<br>(only if V4H0 = 3)<br>V4<br>H6<br>Default: 60 ..... 1/min |  | 2222<br><b>Motor operating<br/>time</b><br>20 to 99.9 s<br>(3-point step controller<br>only)<br>V4<br>H8<br>Default: 60 ..... s                | 2222<br><b>Neutral zone</b><br>0 to 40 %<br>(3-point step controller<br>only)<br>V4<br>H9<br>Default: 2 ..... %   |
| 2222<br><b>Pulse interval</b><br>0.5 to 99.9 s<br>(only if V4H0 = 2)<br>V5<br>H4<br>Default: 10 ..... s      | 2222<br><b>Minimum<br/>ON time</b><br>0.1 to 5.0 s<br>V5<br>H5<br>Default: 0.3 ..... s   | 2222<br><b>Maximum<br/>pulse frequency</b><br>60 to 120 1/min<br>(only if V4H0 = 3)<br>V5<br>H6<br>Default: 60 ..... 1/min |  |  |   |
|  |  |  | 2222<br><b>Rinse contact:<br/>Entry of rinse time</b><br>0.1 to 10.0 min<br>V6<br>H7<br>Default: 1.0 ..... min | 2222<br><b>Rinse contact:<br/>Entry of interval</b><br>0.5 to 99.9 h<br>V6<br>H8<br>Default: 24 ..... h  | 2222<br><b>Rinse contact:<br/>Entry of settling<br/>time</b><br>0.1 to 10.0 min<br>V6<br>H9<br>Default: 1.0 ..... min   |
|  |  |  |  |  |   |
|  |  |  |  |  |   |
|  |  |  |  |  | 2222<br><b>Unlock/<br/>Lock</b><br>V8<br>H9<br>0000 to 9999<br>Default: 0000 .....  |
| 2222<br><b>Device address</b><br>1 to 32<br>for operation via<br>interface<br>V9<br>H4<br>Default: 1/0 ..... | 2222<br><b>Restore factory<br/>settings (defaults)</b><br>V9<br>H5<br>      | 1111<br><b>Entry of meas.<br/>value offset</b><br>-2.00 to +2.00 pH<br>V9<br>H6<br>Default: 0 ..... pH                     |  | 2222<br><b>Simulation<br/>ON/OFF</b><br>0 = simulation OFF<br>1 = simulation ON<br>V9<br>H8<br>Default: 0 .....                                | 2222<br><b>Output current<br/>simulation</b><br>0.00 to 20.00 mA<br>V9<br>H9<br>Default: 10.0 ..... mA  |

## 6.4 Sensor check system (SCS)

The sensor check system (SCS) monitors the pH measuring circuit for measuring errors and glass electrode failure.

The SCS detects:

- pH electrode glass breakage
- Soiling or blocking of reference system
- Fine short circuits in the pH measuring circuit, including, for example, moisture or dirt bridges in clamping points
- Temperatures exceeding the pH electrode's permissible operating temperature range

The SCS is activated and deactivated using matrix field V6 / H0 (see chapter 8) or via the serial interface.

If the sensor check function is enabled, the sensor check system checks:

- the pH measuring circuit for high resistance. If an error is detected, the fault signalling contact is activated, error E 17 is signalled and warning E 50 for the glass electrode or warning E 51 for the reference electrode is indicated.
- the reference electrode for increased resistance on the diaphragm (see fig. 6.2) if an alarm limit  $\geq 1$  % has been defined in matrix field V6 / H1. If an error is detected, the fault signalling contact is activated and error E 17 and warning E 50 are signalled

The error indication is cleared when the error condition ceases to exist.



### Note:

#### Sensor check system

Reference electrode monitoring is only possible in conjunction with the symmetrical high-impedance input and with the potential matching pin connected.



### Caution:

#### Permissible measuring cable lengths for SCS

- The max. line length for pH measuring cable types CYK, SMK and PMK is approx. 20 m.
- If longer lines are used, the SCS function must be disabled to prevent false alarms.

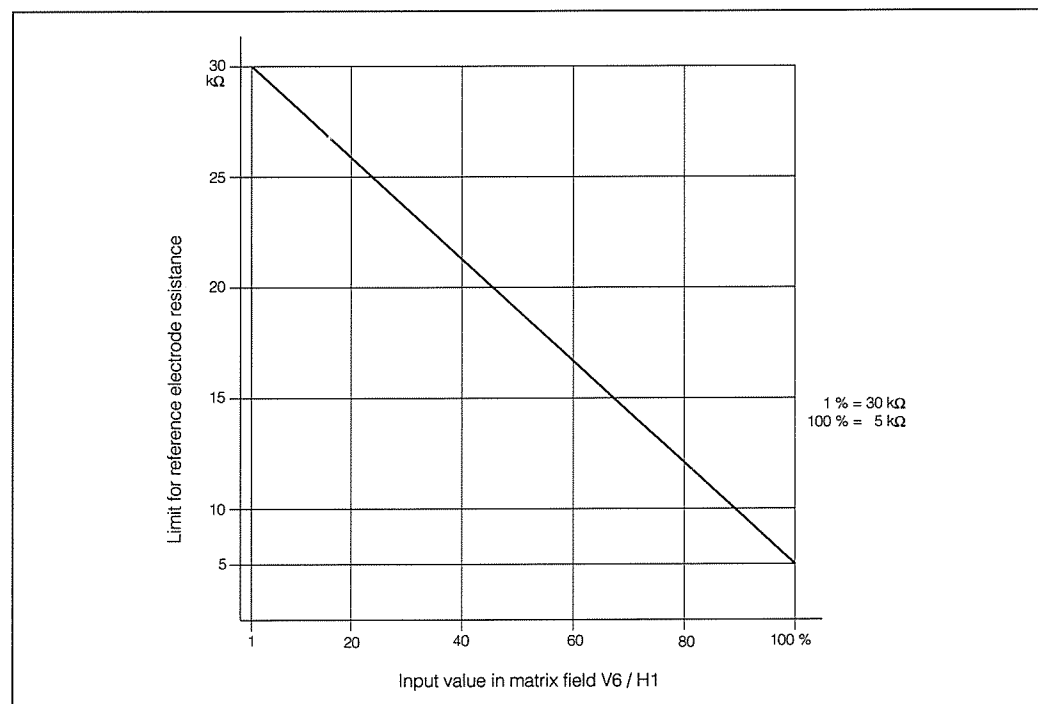


Fig. 6.2: Adjustment range of alarm limit for reference system

## 7. Calibration

Matrix fields V1 / H1  
Level 1 (operation)

### When to calibrate and frequency of calibration

- Mandatory:
  - whenever the measuring system is started up
  - after extended periods of interruption
- Other times:
  - periodically at intervals depending on experience
  - depending on operating conditions (soiling or contamination)

### 7.1 Preparatory measures

- Remove and clean assembly or electrode.
- When working with automatic temperature compensation, the temperature sensor must also be immersed into the buffer solution, or the unit must be switched from automatic to manual temperature compensation (ATC / MTC).
- On units configured for symmetrical high-impedance measurement, the potential matching pin must be immersed in the buffer solution during calibration.

### 7.2 Types of calibration

- **MANUAL** calibration  
If operating mode 0 has been selected in matrix field V1 / H5, the calibration is performed manually by matching the pH display to the buffer value in each case. The current measured value is displayed during calibration.  
  
In the MANual mode of operation, any buffer value between 0 and 14 pH is permissible. The sequence of the two buffer values (value 1 = low , value 2 = high or vice versa) can be selected as desired. The minimum difference between buffer values 1 and 2 must be  $\Delta 2$  pH. Refer to chapter 7.3 for the MANUAL calibration sequence.
- **AUTOMATIC** calibration  
If operating mode 1 has been selected in matrix field V1 / H5, the calibration is performed automatically.  
  
In the AUTOMATIC mode of operation, any buffer value between 0 and 14 pH is permissible. However, the buffer 1 / buffer 2 sequence is fixed. Refer to chapter 7.4 for the AUTOMATIC calibration sequence.
- Calibration via interface  
is possible on units equipped with a serial interface. See chapter 7.5.



#### Note: Calibration and measurement

- If the yellow protective cap is not used for the storage of the pH electrode, the electrode must be kept in a KCl solution (e.g., 3 molar) or in buffer solution 7.
- Calibrate in the acid range if possible; alkaline buffer solutions are unstable because they absorb CO<sub>2</sub> from the ambient air, which causes inaccuracies, e.g. buffer 1 = pH 7, buffer 2 = pH 4



#### Note:

For further information about maintenance of pH and redox electrodes and a selection of usable electrode cleaning agents see:

- „Short operating instructions for pH and redox electrodes“ (enclosed with pH and redox electrodes)
- Installation and operating instructions for assembly in question

### 7.3 MANUAL calibration

Matrix field V1 / H0 ; level 1

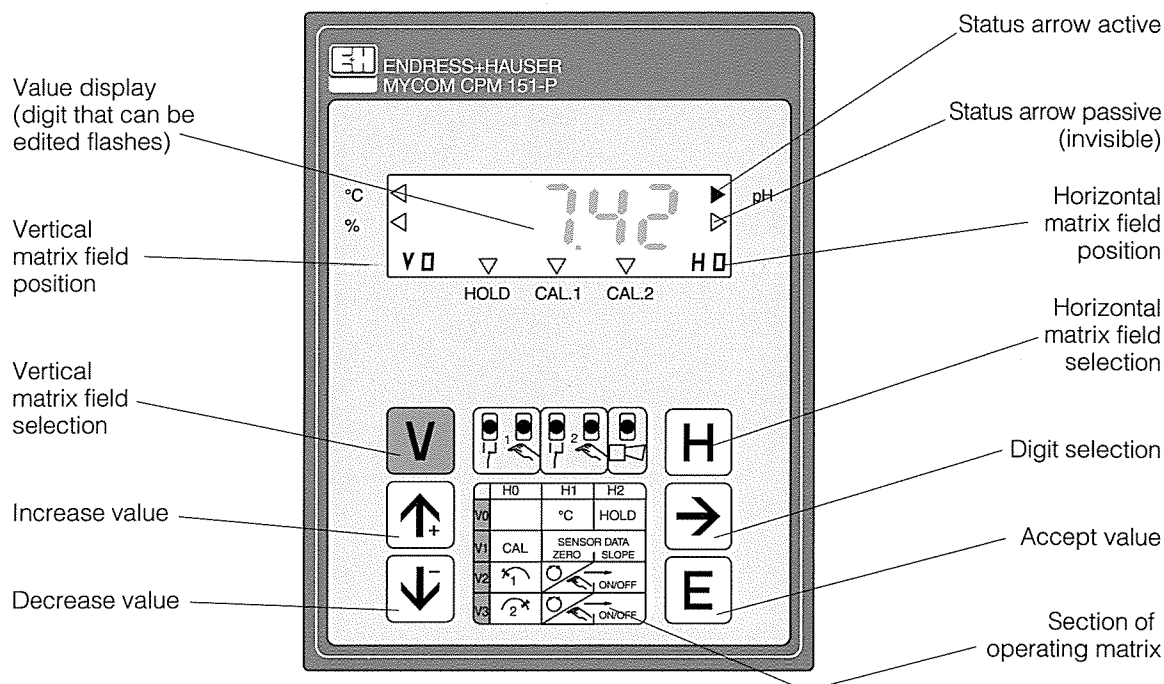
**Field V1 / H5 set to 0**

| Function  | Matrix field / command         | Display value                         | Instrument display | Note  |
|---|--------------------------------|---------------------------------------|--------------------|---|
| Unlock MANual calibration <sup>1)</sup>   | V8 / H9:<br>1111<br>and E      | 1111                                  |                    | Unlock level 1;<br>then go to<br>V1 / H0                              |
| Activation of calibration function  | V1 / H0<br>and<br>E            | Current pH<br>value measured,<br>e.g. |                    | Calibration function is selected                                      |
| <b>Place sensor in buffer solution 1!</b>   |                                |                                       |                    |   |
| Calibration with buffer solution 1  | →                              | Current pH<br>value measured,<br>e.g. |                    | Buffer 1  |
| Edit buffer value 1   | →, ↑, ↓                        | Buffer value 1                        |                    |   |
| Confirm display value   | E                              | Current pH<br>value measured,<br>e.g. |                    | Alarm? If not,<br>continue with<br>buffer 2                           |
| <b>End calibration in case of one-point calibration (press V and H simultaneously)<br/>Place sensor in buffer solution 2!</b> |                                |                                       |                    |   |
| Calibration with buffer solution 2  | →                              | Current pH<br>value measured,<br>e.g. |                    | Possibly abort<br>with V and H  |
| Edit buffer value 2   | →, ↑, ↓                        | Buffer value 2                        |                    |   |
| Confirm display value   | E                              | Current pH<br>value measured,<br>e.g. |                    | Alarm?  |
| Repeat calibration,<br>i.e. restart<br>calibration<br><b>either</b> with buffer 1<br><b>or</b> with buffer 2                  | E<br>→                         | Current pH<br>value measured,<br>e.g. | <br><br>or         | Buffer 1  |
| Measure   | V and H<br>at the<br>same time | Current pH<br>value measured,<br>e.g. |                    |   |
| Lock calibration menu<br>(if necessary)   | V8 / H9:<br>e.g. 1112<br>and E |                                       |                    | To lock:<br>enter any<br>number                                       |
| Abort calibration routine   | V and H<br>at the<br>same time | Current pH<br>value measured,<br>e.g. |                    | Previous cali-<br>bration values<br>are retained                      |
| Error inquiry   | V9 / H0                        | Error code<br>display, e.g.           |                    | Multiple errors<br>are possible;<br>display errors<br>with ↑ / ↓ keys |

**Note:**

- <sup>1)</sup> To unlock level 1, enter code **1111**  
 To unlock levels 1 **and** 2, enter code **2222**  
 Levels 1 and 2 stay unlocked until they are locked again by a power failure or by entering any number **except 1111 or 2222**.

## Instrument front panel



### Unlock

Operation: 1111  
Start-up and maintenance: 2222

### Lock

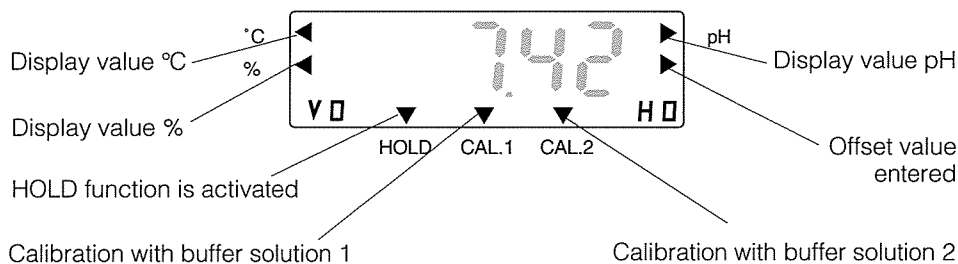
enter any number (except unlock code)

### Shortcuts

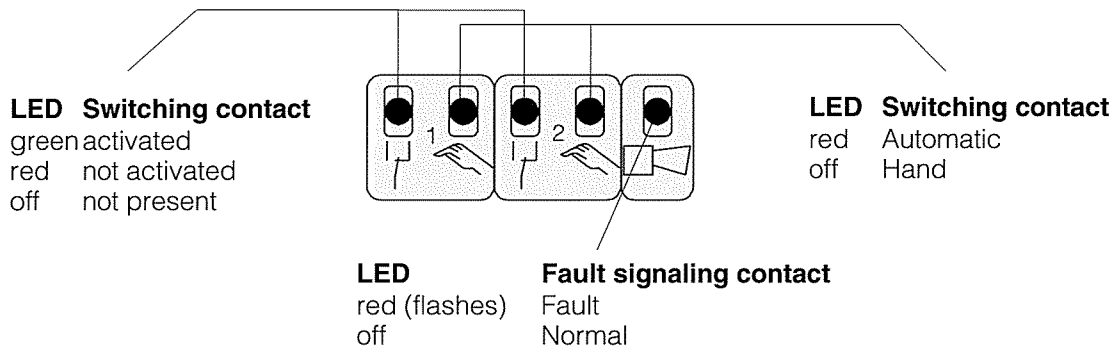
Measurement: Press V + H at the same time

Access unlock/lock field from measurement mode: Press E key

## Status display







## LED display



**Warning!**  
Please read your manual before operating.



|   |                  |   |                  |  |                  |  |                  |   |
|---|------------------|---|------------------|--|------------------|--|------------------|---|
| Basic functions 1                                   | V0<br>H0         | <b>Measurement</b><br>-2.00 to 14.00 pH   | V0<br>H1         | <b>Temperature display</b><br>-15.0 to 150.0°C   | 1111<br>V0<br>H2 | <b>HOLD OFF/ON</b><br>0 = OFF<br>1 = ON  | 2222<br>V0<br>H3 | <b>Toggle</b><br>0 ... 20 mA /<br>4 ... 20 mA<br>0 = 0 to 20 mA<br>1 = 4 to 20 mA<br>Default: 1 ..... |
|   |                  |   |                  |  |                  |  |                  |   |
| Basic functions 2                                   | 1111<br>V1<br>H0 | <b>Calibration</b><br>Man. calibration: meas.<br>value display<br>Autom. calibration:<br>buffer value display   | V1<br>H1         | <b>Zero point display</b><br>Displays pH value at<br>measuring chain voltage<br>of 0 mV  | V1<br>H2         | <b>Slope display</b><br>Display of measuring<br>chain slope in %, refer-<br>red to theoretical slope   | 2222<br>V1<br>H3 | <b>Toggle MTC/ATC</b><br>0 = MTC (manual)<br>1 = ATC (automatic)<br>Default: 1 .....                  |
|   |                  |   |                  |  |                  |  |                  |   |
| Limit /contact<br>configuration for<br>controller 1 | 1111<br>V2<br>H0 | <b>Setpoint entry</b><br>for limit contactor/<br>controller 1<br>-2.00 to 14.00 pH<br>Default: 4.00 ..... pH  | 1111<br>V2<br>H1 | <b>Toggle Auto/Manual</b><br>0 = manual<br>1 = automatic<br>Default: 1 .....   | 1111<br>V2<br>H2 | <b>Manual OFF/ON</b><br>Keys   | 2222<br>V2<br>H3 | <b>Pickup delay</b><br>Limit contactor 1<br>0 to 6000 s<br>Default: 0 ..... s                         |
|   |                  |   |                  |  |                  |  |                  |   |
| Limit/contact<br>configuration<br>for controller 2  | 1111<br>V3<br>H0 | <b>Setpoint entry</b><br>for limit contactor/<br>controller 2<br>-2.00 to 14.00 pH<br>Default: 10.00 ..... pH   | 1111<br>V3<br>H1 | <b>Toggle Auto/Manual</b><br>0 = manual<br>1 = automatic<br>Default: 1 .....   | 1111<br>V3<br>H2 | <b>Manual OFF/ON</b><br>Keys   | 2222<br>V3<br>H3 | <b>Pickup delay</b><br>Limit contactor 2<br>0 to 6000 s<br>Default: 0 ..... s                         |
|   |                  |   |                  |  |                  |  |                  |   |
| Control parameters 1                                | 2222<br>V4<br>H0 | <b>Controller type</b><br>0 = off;<br>1 = limit contactor;<br>2 = pulse length;<br>3 = pulse frequency;<br>4 = START rinse funct.<br>Default: 1 ..... | 2222<br>V4<br>H1 | <b>Control characteristic</b><br>1 = P controller;<br>2 = PI contr.; 3 = PID;<br>4 = PD controller;<br>5 = PT 1 controller<br>Default: 1/4 ..... | 2222<br>V4<br>H2 | <b>Proportional band</b><br>10 to 500 %<br>Default: 100 ..... %  | 2222<br>V4<br>H3 | <b>Integral action time</b><br>0.1 to 999.9 min.<br>Default: 999.9 ..... min                          |
|   |                  |   |                  |  |                  |  |                  |   |
| Control parameters 2                                | 2222<br>V5<br>H0 | <b>Controller type</b><br>0 = off;<br>1 = limit contactor;<br>2 = pulse length;<br>3 = pulse frequency<br>Default: 1 .....                            | 2222<br>V5<br>H1 | <b>Control characteristic</b><br>1 = P controller;<br>2 = PI controller;<br>3 = PID controller<br>Default: 1 .....                               | 2222<br>V5<br>H2 | <b>Proportional band</b><br>10 to 500 %<br>Default: 100 ..... %  | 2222<br>V5<br>H3 | <b>Integral action time</b><br>0.1 to 999.9 min.<br>Default: 999.9 ..... min                          |
|   |                  |   |                  |  |                  |  |                  |   |
| Sensor check system                                 | 2222<br>V6<br>H0 | <b>SCS electrode OFF/ON</b><br>0 = OFF<br>1 = ON<br>Default: 0 .....  | 2222<br>V6<br>H1 | <b>SCS reference alarm limit</b><br>0 to 100<br>0 = OFF<br>Default: 0 .....  |                  |  |                  |   |
|   |                  |   |                  |  |                  |  |                  |   |
| Alarm   | 1111<br>V7<br>H0 | <b>Alarm threshold</b><br>Alarm for setpoint +<br>threshold<br>0.0 to 16.0 pH<br>Default: 1 ..... pH  | 1111<br>V7<br>H1 | <b>Alarm delay</b><br>0 to 6000 s<br>Default: 30 ..... s   | 2222<br>V7<br>H2 | <b>Toggle steady/<br/>fleeting contact</b><br>0 = steady contact<br>1 = fleeting contact<br>Default: 0 .....   | 2222<br>V7<br>H3 | <b>Toggle pH value display</b><br>0 = XX.XX<br>1 = XX.X<br>Default: 0 .....                           |
|   |                  |   |                  |  |                  |  |                  |   |
| Interface<br>configuration,<br>unlock / lock        | 2222<br>V8<br>H0 | <b>Parity</b><br>0 = none<br>1 = odd<br>2 = even<br>Default: 2 .....  | 2222<br>V8<br>H1 | <b>Baud rate selection</b><br>0 = 4800 Bd<br>1 = 9600 Bd<br>2 = 19200 Bd<br>Default: 1 .....   |                  |  | 2222<br>V8<br>H3 | <b>Toggle pH input</b><br>0 = symmetrical<br>1 = asymmetrical<br>Default: 0 .....                     |
|   |                  |   |                  |  |                  |  |                  |   |
| Service and<br>simulation                           | V9<br>H0         | <b>Diagnostic code</b><br>Error messages<br>E1 to E255  | 2222<br>V9<br>H1 | <b>Service</b><br>Display and clear auto<br>resets (watchdog<br>triggering due to<br>EMC events)   | V9<br>H2         | <b>Display instrument<br/>configuration</b>  | V9<br>H3         | <b>Software version</b>   |
|   |                  |   |                  |  |                  |  |                  |   |

■ Indication

■ Operation (code 1111)

□ Start-Up (code 2222)



|  |  |  |  |  |   |
|--|--|--|--|--|---|
| 2222<br><b>Rate of rise<br/>mA/s</b><br>V0<br>H4<br>0.2 to 20.0 mA/s<br>Default: 20.0 ..... mA/s             | 2222<br><b>pH at 0/4 mA</b><br>V0<br>H5<br>-2.00 to 12.00 pH<br>Default: 2.00 ..... pH   | 2222<br><b>pH at 20 mA</b><br>V0<br>H6<br>0 to 14.00 pH<br>Default: 12 ..... pH  | 2222<br><b>Temperature<br/>at 0/4 mA</b><br>V0<br>H7<br>-15.0 to 125.0 °C<br>Default: 0 ..... °C               | 2222<br><b>Temperature<br/>at 20 mA</b><br>V0<br>H8<br>+10.0 to +150.0 °C<br>Default: 100.0 ..... °C   | 2222<br><b>Temperature<br/>measurement</b><br>V0<br>H9<br>0 = off<br>1 = on<br>Default: 1 .....   |
| 1111<br><b>MTC temperature<br/>entry</b><br>V1<br>H4<br>-15.0 to +150.0 °C<br>Default: 25 ..... °C           | 2222<br><b>Calibration type</b><br>V1<br>H5<br>0 = manual:<br>edit buffer value<br>1 = automatic:<br>pre-defined buffer<br>values are used<br>Default: 1 ..... | 2222<br><b>Entry of<br/>buffer value 1</b><br>V1<br>H6<br>-2.00 to 14.00 pH<br>Default: 7.00 ..... pH                      | 2222<br><b>Entry of<br/>buffer value 2</b><br>V1<br>H7<br>-2.00 to 14.00 pH<br>Default: 4.01 ..... pH          | 2222<br><b>Toggle electrode<br/>type: glass/<br/>antimony</b><br>V1<br>H8<br>0 = glass electrode<br>1 = antimony electrode<br>Default: 0 ..... | 2222<br><b>HOLD during<br/>cal. / rinse</b><br>V1<br>H9<br>0 = no            no<br>1 = yes        yes<br>2 = yes        no<br>3 = no        yes<br>Default: 1 ..... |
| 2222<br><b>Dropout delay</b><br>Limit contactor 1<br>V2<br>H4<br>0 to 6000 s<br>Default: 0 ..... s           | 2222<br><b>Toggle<br/>MIN/MAX</b><br>V2<br>H5<br>0 = MIN<br>1 = MAX<br>Default: 0 .....  | 2222<br><b>Toggle<br/>NC/NO contact</b><br>V2<br>H6<br>0 = NC contact<br>1 = NO contact<br>Default: 1 .....                | 2222<br><b>Hysteresis</b><br>Limit contactor 1<br>V2<br>H7<br>0.1 to 1.0 pH<br>Default: 0.5 ..... pH           |  |   |
| 2222<br><b>Dropout delay</b><br>Limit contactor 2<br>V3<br>H4<br>0 to 6000 s<br>Default: 0 ..... s           | 2222<br><b>Toggle<br/>MIN/MAX</b><br>V3<br>H5<br>0 = MIN<br>1 = MAX<br>Default: 1 .....  | 2222<br><b>Toggle<br/>NC/NO contact</b><br>V3<br>H6<br>0 = NC contact<br>1 = NO contact<br>Default: 1 .....                | 2222<br><b>Hysteresis</b><br>Limit contactor 2<br>V3<br>H7<br>0.1 to 1.0 pH<br>Default: 0.5 ..... pH           |  |   |
| 2222<br><b>Pulse interval</b><br>0.5 to 99.9 s<br>(only if V4H0 = 2)<br>V4<br>H4<br>Default: 10.0 ..... s    | 2222<br><b>Minimum<br/>ON time</b><br>V4<br>H5<br>0.1 to 5.0 s<br>Default: 0.3 ..... s   | 2222<br><b>Maximum<br/>pulse frequency</b><br>V4<br>H6<br>60 to 120 1/min<br>(only if V4H0 = 3)<br>Default: 60 ..... 1/min |  | 2222<br><b>Motor operating<br/>time</b><br>V4<br>H8<br>20 to 99.9 s<br>(3-point step controller<br>only)<br>Default: 60 ..... s                | 2222<br><b>Neutral zone</b><br>V4<br>H9<br>0 to 40 %<br>(3-point step controller<br>only)<br>Default: 2 ..... %   |
| 2222<br><b>Pulse interval</b><br>0.5 to 99.9 s<br>(only if V4H0 = 2)<br>V5<br>H4<br>Default: 10 ..... s      | 2222<br><b>Minimum<br/>ON time</b><br>V5<br>H5<br>0.1 to 5.0 s<br>Default: 0.3 ..... s   | 2222<br><b>Maximum<br/>pulse frequency</b><br>V5<br>H6<br>60 to 120 1/min<br>(only if V4H0 = 3)<br>Default: 60 ..... 1/min |  |  |   |
|  |  |  | 2222<br><b>Rinse contact:<br/>Entry of rinse time</b><br>V6<br>H7<br>0.1 to 10.0 min<br>Default: 1.0 ..... min | 2222<br><b>Rinse contact:<br/>Entry of interval</b><br>V6<br>H8<br>0.5 to 99.9 h<br>Default: 24 ..... h  | 2222<br><b>Rinse contact:<br/>Entry of settling<br/>time</b><br>V6<br>H9<br>0.1 to 10.0 min<br>Default: 1.0 ..... min   |
|  |  |  |  |  |   |
|  |  |  |  |  |   |
|  |  |  |  |  | Unlock/<br>Lock<br>V8<br>H9<br>0000 to 9999<br>Default: 0000 .....  |
| 2222<br><b>Device address</b><br>V9<br>H4<br>1 to 32<br>for operation via<br>interface<br>Default: 1/0 ..... | 2222<br><b>Restore factory<br/>settings (defaults)</b><br>V9<br>H5<br>   | 1111<br><b>Entry of meas.<br/>value offset</b><br>V9<br>H6<br>-2.00 to +2.00 pH<br>Default: 0 ..... pH                     |  | 2222<br><b>Simulation<br/>ON/OFF</b><br>V9<br>H8<br>0 = simulation OFF<br>1 = simulation ON<br>Default: 0 .....                                | 2222<br><b>Output current<br/>simulation</b><br>V9<br>H9<br>0.00 to 20.00 mA<br>Default: 10.0 ..... mA  |

Calibration

- Note:
- Clean electrodes thoroughly before calibration
  - Immerse PM connection in buffer solution
  - Rinse electrode with water after each calibration step

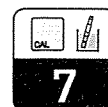
| Automatic calibration sequence |         |                              |                                     |
|--------------------------------|---------|------------------------------|-------------------------------------|
| Step                           | Matrix  | Command                      | Meaning                             |
| 1                              | V8 / H9 | 1111                         | Unlock                              |
| 2                              | V1 / H0 | E                            | Calibration selected                |
| 3                              | V1 / H0 | →                            | Automatic calibration with buffer 1 |
| 4                              | V1 / H0 | →                            | Automatic calibration with buffer 2 |
| 5                              | V1 / H0 | Press V + H at the same time | Measurement                         |
| 6                              | V8 / H9 |                              | Lock                                |
|                                |         |                              |                                     |

| Manual calibration sequence |         |                              |                           |
|-----------------------------|---------|------------------------------|---------------------------|
| Step                        | Matrix  | Command                      | Meaning                   |
| 1                           | V8 / H9 | 1111                         | Unlock                    |
| 2                           | V1 / H0 | E                            | Calibration selected      |
| 3                           | V1 / H0 | →                            | Calibration with buffer 1 |
| 4                           | V1 / H0 | → ↑ ↓                        | Edit buffer value 1       |
| 5                           | V1 / H0 | E                            | Accept buffer value       |
| 6                           | V1 / H0 | →                            | Calibration with buffer 2 |
| 7                           | V1 / H0 | → ↑ ↓                        | Edit buffer value 2       |
| 8                           | V1 / H0 | E                            | Accept buffer value       |
| 9                           | V1 / H0 | Press V + H at the same time | Measurement               |
| 10                          | V8 / H9 |                              | Lock                      |

Refer to chapter 7.4 of operating instructions for details.

Refer to chapter 7.3 of operating instructions for details.

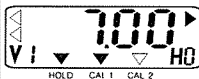
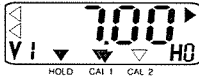
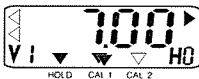
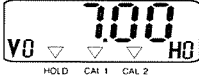
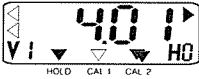
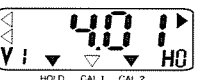

| Error list (matrix field V9/H0) |  |                 |  |
|---------------------------------|--|-----------------|--|
| E. No.                          | Meaning  | E. No.          | Meaning  |
| <b>System errors</b>            |  | <b>Warnings</b> |  |
| 1                               | Data exchange error in processor                                       | 30              | Current output simulation enabled  |
| 2                               | Internal configuration error   | 31              | Parameter range for current output 1 too small   |
| <b>Disturbances</b>             |  | 32              | Parameter limits for current output 1 interchanged (falling assignment)                            |
| 10                              | Limit or setpoint exceeded for longer period than delay setting        | 34              | Temperature range for current output 2 too small   |
| 12                              | pH parameter below lower limit of measuring range                      | 35              | Temperature range limits for current output 2 interchanged   |
| 13                              | pH measuring range exceeded  | 36              | Minimum ON time for pulse-length controller or three-point step controller excessive, controller 1 |
| 17                              | SCS error  | 37              | Minimum ON time for pulse-length controller or three-point step controller excessive, controller 2 |
| 19                              | Temperature below lower limit of measuring range                       | 41              | Outside permissible slope range  |
| 20                              | Temperature measuring range exceeded                                   | 42              | Outside permissible asymmetry range  |
| 22                              | Below permissible minimum value for 0/4 mA current range (output 1)    | 43              | Measured value unstable during calibration   |
| 23                              | Permissible maximum value for 20 mA current range exceeded (output 1)  | 44              | pH difference between buffers is too small   |
| 25                              | Permissible minimum value for 0/4 mA current range exceeded (output 2) | 45              | Buffer difference too small  |
| 26                              | Permissible maximum value for 20 mA current range exceeded (output 2)  | 48              | ATC but temperature measurement disabled   |
|                                 |  | 50              | SCS error, glass electrode   |
|                                 |  | 51              | SCS error, reference electrode   |



## 7.4 AUTOMATIC calibration

Matrix field V1 / H0 ; level 1

**Field V1 / H5 set to 1**

| Function   | Matrix field / command    | Display value                     | Instrument display  | Note   |
|--|---------------------------|-----------------------------------|---|--|
| Unlock AUTOMATIC calibration <sup>1)</sup>   | V8 / H9:<br>1111<br>and E | 1111                              |   | Unlock level 1;<br>then go to<br>V1 / H0                       |
| Activation of calibration function   | V1 / H0<br>and E          | Buffer value 1<br>(field V1 / H6) |    | Calibration function is selected                               |
| <b>Place sensor in buffer solution 1!</b>  |                           |                                   |   |  |
| Start calibration with buffer solution 1<br><br>CAL.1 arrow flashes until measured value is stable   | →                         | Buffer value 1                    |    | Max. meas. period 300 s;<br>check for perm. electr. parameters |
| <b>Meas. value stable: end calibration in case of one-point calibration (with V0 / H0) or continue calibration with buffer 2</b><br><b>Alarm LED flashes (error code 43) if meas. value does not stabilise – then:</b> |                           |                                   |   |  |
| Repeat calibration   | →                         | Buffer value 1                    |   | Max. perm. fluctuation of meas. value:<br>0.01 pH / 5 s        |
| End of calibration (return to V0 / H0)<br><br><b>or</b>  | V and H at the same time  | Current pH value measured, e.g.   |  | 1-point calibration: buffer value 1 accepted                   |
| <b>Place sensor in buffer solution 2!</b>  |                           |                                   |   |  |
| Start calibration with buffer solution 2<br><br>CAL.2 arrow flashes until measured value is stable   | →                         | Buffer value 2                    |  | Automatic check for permissible zero and slope values          |
|  |                           | Current pH value measured, e.g.   |  | Alarm?   |
| <b>Alarm LED flashes if meas. value does not stabilise (error code 43) – then:</b>   |                           |                                   |   |  |
| Repeat calibration<br><br><b>or</b>  | →                         | Buffer value 2                    |  | Max. perm. fluctuation of meas. value:<br>0.01 pH / 5 s        |
| End of calibration (return to V0 / H0)   | V and H at the same time  |                                   |   | Possible during entire calibration sequence                    |

Calibration with buffer 2

### Note:



Status / indicator arrow invisible



Status / indicator arrow visible







Status / indicator arrow flashes

## 8. Description of operating functions

| Matrix pos.<br>V / H | Description of function   | Parameter settings |      |
|----------------------|---|--------------------|------|
|                      |   | Fact.              | User |
| 0 / 0                | <b>Measurement</b><br>Display of temperature-compensated pH value $\pm$ offset value.<br>Display range:<br>-2.00 ... 14.00 pH<br><br>Use the ENTER key to jump directly to field V8 / H9 (Unlock / Lock).   |                    |      |
| 0 / 1                | <b>Temperature display</b><br>Display of temperature in °C<br>-15.0 ... +150.0 °C<br><br>Temperatures above 150 °C trigger error message 20<br>Temperatures below -15 °C trigger error message 19   |                    |      |
| 0 / 2                | <b>HOLD OFF / ON</b><br>Activation of HOLD function.<br>0 = OFF<br>1 = ON<br><br>If value 1 (ON) is entered, both current outputs are frozen to their current value.<br>In the case of the pulse-length and pulse-frequency controllers, any I and D components are set to 0. The state of an three-point step controller is maintained. With automatic operation, all contacts are set to the normal condition. Any alarm period accumulated or rinse interval time is reset to 0. | 0                  |      |
| 0 / 3                | <b>Toggle 0 ... 20 mA / 4 ... 20 mA</b><br>Switches the lower current output limit to 0 or 4 mA.<br>0 = 0 ... 20 mA<br>1 = 4 ... 20 mA<br><br>This setting affects both current outputs.  | 1                  |      |
| 0 / 4                | <b>Rate of rise mA / s (damping)</b><br>Sets the current rate of rise of the current output for the measured value.<br>0.2 ... 20.0 mA / s<br><br>This setting does not affect the temperature output.  | 20.0               |      |
| 0 / 5                | <b>pH at 0 / 4 mA</b><br>Entry of pH value for 0 or 4 mA in steps of 0.01.<br>- 2.00 ... 12.00 pH<br><br>If the minimum difference between the upper and lower current values is less than 2 pH, error message 31 is issued.  | 2.00               |      |
| 0 / 6                | <b>pH at 20 mA</b><br>Entry of pH value for 20 mA in steps of 0.01.<br>0.00 ... 14.00 pH<br><br>If the minimum difference between the upper and lower current values is less than 2 pH, error message 31 is issued.   | 12.00              |      |


| Matrix pos.<br>V / H  | Description of function  | Parameter settings |      |
|---|--|--------------------|------|
|   |  | Fact.              | User |
| <b>Matrix fields V0 / H7 and V0 / H8:</b><br>Temperature output parameters can only be set on instruments equipped with a temperature output (see chapter 3.3, Order code). |  |                    |      |
| 0 / 7   | <b>Temperature at 0 / 4 mA</b><br>Entry of temperature value for 0 or 4 mA of the 2nd current output<br>-15.0 ... +125.0 °C<br><br>The minimum difference to the value at 20 mA is 25.0 K; if below, error message 34 is issued. | 0                  |      |
| 0 / 8   | <b>Temperature at 20 mA</b><br>Entry of temperature value for 20 mA of the 2nd current output.<br>10.0 ... 150.0 °C<br><br>The minimum difference to the value at 0/4 mA is 25.0 K; if below, error message 34 is issued.        | 100                |      |
| 0 / 9   | <b>Temperature measurement</b><br>0 = OFF<br>1 = ON<br><br>If temperature measurement is disabled, ATC (automatic temperature compensation) must also be switched off in field V1 / H3; otherwise error message 48 is issued.    | 1                  |      |

| Matrix pos.<br>V / H | Description of function   | Parameter settings |      |
|----------------------|---|--------------------|------|
|                      |   | Fact.              | User |
| 1 / 0                | <b>Calibration</b><br>See separate descriptions:<br>MANual calibration (chapter 7.3)<br>AUTOMATIC calibration (chapter 7.4)   |                    |      |
| 1 / 1                | <b>Zero point display</b><br>Display of pH value for 0 volt signal from measuring chain (recalculated with each calibration).<br>-1.00 ... +9.50 pH   | 7.00               |      |
| 1 / 2                | <b>Slope display</b><br>Display of current electrode slope as a percentage of theoretical slope (59.16 mV / pH at 25 °C)<br>Antimony electrode<br>43.0 ... 110 %<br>Glass electrode<br>65.0 ... 110.0 %   | 100                |      |
| 1 / 3                | <b>Toggle MTC / ATC</b><br>Switches the temperature compensation type<br>0 = MTC (manual)<br>1 = ATC (automatic)<br><br>– If set to 0 (MTC), the temperature is based on the value selected in field V1 / H4.<br>– If set to 1 (ATC), temperature is based on the value measured by the temperature sensor and displayed in field V0 / H1.  | 1                  |      |
| 1 / 4                | <b>Entry of MTC temperature</b><br>Entry of reference temperature for manual temperature compensation (field V1 / H3 set to 0 = MTC)<br>-15.0 ... +150.0 °C   | 25                 |      |
| 1 / 5                | <b>Toggle AUTOMATIC / MANUAL calibration</b><br>Selects the calibration type<br>0 = manual<br>1 = automatic<br><br>– A setting of 0 means manual calibration, i.e. the pH display is manually adjusted to the value of the buffer solution (the current pH measuring value is displayed).<br>– If set to 1 (automatic), the buffer values stored in fields V1 / H6 and V1 / H7 are used as setpoints during calibration. Only the selected buffer values are displayed.   | 1                  |      |
| 1 / 6                | <b>Entry of buffer value 1</b><br>Entry of 1st buffer value for the automatic calibration procedure<br>-2.00 ... 14.00 pH<br><br> <b>Note:</b> <ul style="list-style-type: none"> <li>For maximum accuracy, the calibration must always be performed at the same temperature!<br/>If the difference between buffer values 1 and 2 is less than 2 pH, error message 44 is displayed.</li> <li>If the contents of the current field are changed via an interface while a calibration procedure takes place in V1 / H0, the change takes effect only after completion of the calibration and after restarting a calibration procedure.</li> </ul> | 7.00               |      |



| Matrix pos.<br>V / H | Description of function  | Parameter settings |      |
|----------------------|--|--------------------|------|
|                      |  | Fact.              | User |
| 1 / 7                | <b>Entry of buffer value 2</b><br>Entry of 2nd buffer value for automatic calibration.<br>-2.00 ... 14.00 pH<br><br> <b>Note:</b><br>If the contents of the current field are changed via an interface while a calibration procedure takes place in V1 / H0, the change takes effect only after completion of the calibration and after restarting a calibration procedure.   | 4.01               |      |
| 1 / 8                | <b>Toggle glass electrode / antimony electrode</b><br>Selects the electrode type:<br>0 = glass electrode<br>1 = antimony electrode<br><br> <b>Note:</b> <ul style="list-style-type: none"> <li>Whenever this parameter is changed, the factory settings (defaults) for zero (field V1 / H1) and slope (field V1 / H2) are restored. Recalibration to the actual electrode values is therefore mandatory!</li> <li>The sensor check system SCS is disabled when this field is set to 1 (antimony electrode).</li> </ul>  | 0                  |      |
| 1 / 9                | <b>Automatic HOLD during calibration / rinse</b><br>0 = no HOLD (calibration)      /      no HOLD (rinse)<br>1 = HOLD (calibration)          /      HOLD (rinse)<br>2 = HOLD (calibration)          /      no HOLD (rinse)<br>3 = no HOLD (calibration)      /      HOLD (rinse)<br><br>– When set to 1 (HOLD), the HOLD function is automatically activated when the calibration is started with the „ → “ key (see V0 / H2), and automatically deactivated after calibration.<br>– When set to 1 (HOLD during rinse), the HOLD function is automatically activated during the rinse and settling periods when the rinse function is enabled.<br>HOLD is automatically deactivated during the interval wait period.<br><br> <b>Note:</b><br>If the contents of this field are changed via an interface, the change takes effect only after completion of the calibration and after restarting a calibration procedure. | 1                  |      |



| Matrix pos.<br>V / H  | Description of function   | Parameter settings                             |      |
|---|---|--|------|
|   |   | Fact.  | User |
| Values in parentheses apply to limit / contact configuration of controller 2. |   |  |      |
| 2 / 0<br>(3 / 0)  | <b>Setpoint entry</b> controller 1 (controller 2)<br>Entry of setpoint for controller 1 (controller 2)<br>-2.00 ... 14.00 pH  | 4.00 /<br>(10.00)                              |      |
| 2 / 1<br>(3 / 1)  | <b>Toggle AUTO / MANUAL</b> controller 1 (controller 2)<br>0 = manual<br>1 = automatic<br><br>When set to 0 (MANUAL mode), the manual mode LED is on (red, see chapter 6.1, fig. 6.1).<br>The contacts can then be actuated manually in field V2 / H2.<br>The contacts drop out when this field is set to AUTO.<br>The I and D components of the controller are reset to 0.   | 1  |      |
| 2 / 2<br>(3 / 2)  | <b>Manual OFF / ON</b> controller 1 (controller 2)<br>If field V2 / H1 is set to 0 = MANUAL, contact 1 (2) can be activated in this field by pressing the ↑+ key.<br>Effect of pressing and holding down key:<br>Limit contactor: steady contact<br>Pulse-length controller: steady contact<br>Pulse-frequency controller: max. frequency<br>3-point-step controller only:<br>↓- switches contact 2   |  |      |
| 2 / 3<br>(3 / 3)  | <b>Pickup delay</b> controller 1 (controller 2)<br>Entry of pickup delay for contact 1 or contact 2 of limit contactor in seconds.<br>0 ... 6000 s  | 0  |      |
| 2 / 4<br>(3 / 4)  | <b>Dropout delay</b> controller 1 (controller 2)<br>Entry of dropout delay for contact 1 or contact 2 of limit contactor in seconds.<br>0 ... 6000 s  | 0  |      |
| 2 / 5<br>(3 / 5)  | <b>Toggle MIN / MAX</b> controller 1 (controller 2)<br>Determines the function of contact 1 or contact 2.<br>0 = MIN<br>1 = MAX<br><br>Meaning of setting 0 = MIN:<br>The contact is enabled when the value drops below the setpoint.<br>Meaning of setting 1 = MAX:<br>The contact is enabled when the value exceeds the setpoint.   | Contr. 1<br>0 = MIN<br><br>Contr. 2<br>1 = MAX |      |
| 2 / 6<br>(3 / 6)  | <b>Toggle NC / NO contact</b> controller 1 (controller 2)<br>Defines contact 1 or contact 2 as a normally closed (NC) or normally open (NO) contact.<br>0 = normally closed contact<br>1 = normally open contact  | 1  |      |
| 2 / 7<br>(3 / 7)  | <b>Hysteresis</b> controller 1 (controller 2)<br>Defines the hysteresis for limit contactor 1 or 2 in pH values<br>0.1 ... 1.0 pH<br><br>Effect of MAX contact function:<br>The contact is activated when the setpoint is exceeded and deactivated when the value drops below setpoint minus hysteresis.<br>Effect of MIN contact function:<br>The contact is activated when the value drops below the setpoint and deactivated when the measured value exceeds setpoint plus hysteresis. | 0.5  |      |

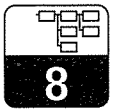


| Matrix pos.<br>V/H  | Description of function  | Parameter settings         |      |
|---|--|----------------------------|------|
|   |  | Fact.                      | User |
| Values in parentheses apply to limit / contact configuration of controller 2. |  |                            |      |
| 4 / 0<br>(5 / 0)  | <b>Controller type</b><br>Determines the controller type for controller 1 (controller 2)<br>0 = controller off<br>1 = limit contacter<br>2 = pulse-length controller<br>3 = pulse-frequency controller<br>4 = START rinse function<br>This field is not existing for version 4 (three-point step controller)                   | 1                          |      |
| 4/0   |  <b>Note on rinse function:</b><br>Setting this field to 4 (START rinse function) immediately starts the rinse function (see chapter 9.6).  |                            |      |
| 4 / 1<br>(5 / 1)  | <b>Control characteristic</b><br>Defines the control characteristic for controller 1 (controller 2)<br>1 = P controller<br>2 = PI controller<br>3 = PID controller<br><br>Control characteristic settings for controller 1 when configured as a three-point step controller:<br>4 = PD controller<br>5 = PT1 controller        | 1<br><br><br><br><br><br>4 |      |
| 4 / 2<br>(5 / 2)  | <b>Proportional band xp</b> controller 1 (controller 2)<br>Defines the proportional band xp in %.<br>10 ... 500 %  | 100                        |      |
| 4 / 3<br>(5 / 3)  | <b>Integral action time</b> controller 1 (controller 2)<br>Determines the integral action time in minutes for controller characteristics PI, PID or PD, PT1 of three-point step controller.<br>0.1 ... 999.9 min   | 999.9                      |      |
| 4 / 4<br>(5 / 4)  | <b>Pulse interval</b> controller 1 (controller 2)<br>Determines the pulse interval in seconds for pulse-length and three-point step controllers.<br>0.5 ... 99.9 s   | 10.0                       |      |
| 4 / 5<br>(5 / 5)  | <b>Minimum ON time</b> controller 1 (controller 2)<br>Determines the minimum on time in seconds for pulse-length and three-point step controllers.<br>0.1 ... 20.0 s<br><br><b>Please note:</b><br>If the minimum on time is greater than 30 % of the pulse interval defined in V4 / H4 (V5 / H4), error message 36 is issued. | 0.3                        |      |
| 4 / 6<br>(5 / 6)  | <b>Maximum pulse frequency</b> controller 1 (controller 2)<br>Determines the maximum pulse frequency in 1 per minute for the pulse-frequency controller.<br>60 ... 120 1/min   | 60                         |      |
| 4 / 8   | <b>Motor operating time</b> controller 1<br>Determines the motor operating time for the 3-point step controller in seconds.<br>10 ... 999 s  | 60                         |      |
| 4 / 9   | <b>Neutral zone</b> controller 1<br>Defines a neutral zone around the setpoint (as a percentage of the measuring range) to suppress minimal changes when working with the 3-point step controller.<br>0 ... 40 %   | 2                          |      |



| Matrix pos.<br>V / H | Description of function  | Parameter settings |      |
|----------------------|--|--------------------|------|
|                      |  | Fact.              | User |
| 6 / 0                | <b>Sensor check system OFF / ON</b><br>0 = OFF<br>1 = ON<br><br>In the case of an error, error message 17 and warning E 50 are signalled (see chapter 10.3).<br>When field V1 / H8 is set to 1 („Antimony electrode“), the sensor check system SCS is automatically set to OFF and cannot be enabled.  | 0                  |      |
| 6 / 1                | <b>Reference electrode SCS alarm limit</b><br>Determines an alarm limit used to monitor the internal resistance of the reference electrode.<br>Error messages E 17 and E 51 are signalled when this limit is exceeded.<br>0 ... 100 %<br>0 = OFF<br>1 ... 100 % $\hat{=}$ 30 k $\Omega$ ... 5 K $\Omega$ (function see fig. 6.2)<br>When 1 is selected in field V1 / H8 („Antimony electrode“) or field V8 / H3 is set to „asymmetrical pH input“ the SCS reference electrode monitor is disabled. | 0                  |      |
| 6 / 7                | <b>Rinse contact: entry of rinse time</b><br>Entry of rinse time for the rinse function in minutes.<br>0.1 ... 10.0 min<br><br>This field is irrelevant if the rinse function is switched off.   | 1.0                |      |
| 6 / 8                | <b>Rinse contact: entry of interval</b><br>Entry of time interval for the rinse function in hours<br>0.5 ... 99.9 h<br><br>This field is irrelevant if the rinse function is switched off.   | 24.0               |      |
| 6 / 9                | <b>Rinse contact: entry of settling time</b><br>Entry of the settling time for the rinse function in minutes.<br>0.1 ... 10.0 min<br><br>The settling time is the time following rinse contact switch-off during which the automatic HOLD function remains active.<br>This field is irrelevant if the rinse function is switched off.  | 1.0                |      |

| Matrix pos.<br>V / H | Description of function   | Parameter settings |      |
|----------------------|---|--------------------|------|
|                      |   | Fact.              | User |
| 7 / 0                | <b>Alarm threshold</b><br>Determines the threshold in pH values where an alarm condition starts if a limit is exceeded.<br>0.0 ... 16.0 pH<br><br><b>Example:</b><br>Limit 9.0 pH, MAX function of contact, alarm threshold 1.5 pH; an alarm condition exists starting at 10.5 pH.<br><br> <b>Note:</b><br>The fields 7/0 to 7/2 are only accessible when at least 1 limit contactor/controller is active.   | 1.0                |      |
| 7 / 1                | <b>Alarm delay</b><br>Determination of the delay period in seconds after which, following violation of the alarm threshold, an alarm condition exists (see V7 / H0).<br>0 ... 6000 s<br><br>Alarm conditions are signalled via the alarm LED and the fault signalling contact (see chapter 9.5).<br>– If the alarm situation ceases before expiration of the delay period, the timer is reset to 0.<br>– When the HOLD function is enabled in field V0 / H2, the timer is also reset to 0.  | 30                 |      |
| 7 / 2                | <b>Toggle steady / fleeting contact</b><br>Defines the alarm contact as a steady or a fleeting contact.<br>0 = steady contact<br>1 = fleeting contact<br><br>If defined as a fleeting contact, the closing time is 1 s.   | 0                  |      |
| 7 / 3                | <b>Toggle pH measured value display</b><br>Determines the display format in field V0 / H0 (measurement)<br>0 = display with two decimal points: XX.XX<br>1 = display with one decimal point: XX.X<br><br> <b>Note:</b> <ul style="list-style-type: none"> <li>• If set to three digits, the display value is rounded off, i.e. values &lt; X.X5 pH are rounded down, other values are rounded up.</li> <li>• This setting does not affect the display format of the serial interface.</li> </ul> | 0                  |      |

| Matrix pos.<br>V / H | Description of function  | Parameter settings |      |
|----------------------|--|--------------------|------|
|                      |  | Fact.              | User |
| 8 / 0                | <b>Parity</b><br>Determines the parity bit for the RS interface.<br>0 = none<br>1 = odd<br>2 = even  | 2                  |      |
| 8 / 1                | <b>Baud rate setting</b><br>For RS 232-C, the transfer rate can be switched between 4800 and 9600 baud.<br>0 = 4800 baud (only available for RS 232-C)<br>1 = 9600 baud (available for RS 232-C and RS 485)<br>2 = 19200 baud and RACKBUS protocol (only available for RS 485)<br><br>When set to „0“ or „1“, the RS standard protocol is used for transmission and the parity can be set in field V8 / H0.<br>When set to „2“ (19200 baud), the RACKBUS protocol is used for data transfer, and the parity is forced to „even“ („2“ in field V8/H0).  | 1                  |      |
| 8 / 3                | <b>Toggle pH input</b><br>Configures the pH input:<br>0 = symmetrical<br>1 = asymmetrical<br><br>When set to „asymmetrical“, the sensor check system (SCS) for the reference electrode is automatically disabled.<br><br> <b>Note:</b><br>In the „asymmetrical“ mode, a potential matching pin must not be connected.   | 0                  |      |
| 8 / 9                | <b>Unlock / Lock</b><br>Entry of access code<br>0000 ... 9999<br><br><b>Level 0</b> (indication): code entry not required, fields are „read only“.<br><b>Level 1</b> (operation): enter code <b>1111</b> to access.<br><b>Level 2</b> (start-up): enter code <b>2222</b> to access.<br><br> <b>Note:</b> <ul style="list-style-type: none"> <li>Field V8 / H9 can be accessed directly from field V0 / H0 by pressing the E key.</li> <li>Levels 1 and 2 are locked by entering any number except <b>1111</b> or <b>2222</b>.</li> <li>Locking affects only the keyboard, not the interface.</li> </ul> | 0000               |      |



| Matrix pos.<br>V/H | Description of function   | Parameter settings                |      |
|--------------------|---|-----------------------------------|------|
|                    |   | Fact.                             | User |
| 9 / 0              | <b>Diagnostic code</b><br>Displays the current diagnostic code according to chapter 10.<br>E- - - ... E256<br><br><ul style="list-style-type: none"> <li>– The error with the highest priority (chapter 10.1), i.e. the error with the lowest number, is displayed.</li> <li>– Additional error messages can be displayed by pressing the ↑+ or ↓- key.</li> <li>– Error numbers are automatically cancelled when the corresponding error condition ceases to exist.</li> </ul>   |                                   |      |
| 9 / 1              | <b>Service</b><br>Displays the number of automatic resets.<br>0 ... 255<br><br>The error can be reset to 0 with the „↑+“, „↓-“ and E keys.<br>Restoring the default values in field V9 / H5 does not reset this counter.  |                                   |      |
| 9 / 2              | <b>Display instrument configuration</b><br>Displays the current instrument configuration<br>0 ... 9999<br><br>1st digit: 0<br>2nd digit: 0<br>3rd digit: 0 = no contact<br>1 = with fault signalling contact<br>2 = with fault sign. contact and 1 controller<br>3 = with fault sign. contact and 2 controllers<br>4 = with fault signalling contact and three-point step controller<br>9 = special version<br><br>4th digit: 0 = no second current output<br>1 = second current output<br>3 = RS 232-C with E+H Conducta protocol<br>4 = RS 485 with E+H Conducta protocol<br>6 = RS 485 with E+H Rackbus protocol |                                   |      |
| 9 / 3              | <b>Software version</b><br>Displays the software version of the instrument according to the Endress+Hauser Conducta standard.<br>0.00 ... 99.99   |                                   |      |
| 9 / 4              | <b>Device address</b><br>Sets the device address for operation via the RS interface.<br>1 ... 32: RS 232-C<br>0 ... 63: RS 485  | 1<br>(Standard)<br>0<br>(Rackbus) |      |

| Matrix pos.<br>V/H | Description of function   | Parameter settings |      |
|--------------------|---|--------------------|------|
|                    |   | Fact.              | User |
| 9 / 5              | <b>Preset values (defaults)</b><br>Press the E key to restore the default (factory) parameter settings as specified for each field.<br><br><ul style="list-style-type: none"> <li>– When this field is selected, the display shows „SEtd“.</li> <li>– The display flashes when the E key is pressed.</li> <li>– When the defaults have been restored, „End“ is displayed.</li> </ul>  <b>Warning:</b><br>This function overwrites all parameter settings made by the user. The display fields V1 / H1 and V1 / H2 and field V8 / H9 (Unlock / Lock) are not affected.<br><br>This function is not accessible via the interfaces. |                    |      |
| 9 / 6              | <b>Entry of measured value offset</b><br>–2.00 ... +2.00 pH<br><br><ul style="list-style-type: none"> <li>– The value entered here is added to the calibrated and temperature-compensated measured value and affects the display, the current output and the controllers / limit contactors.</li> <li>– If an offset has been entered, the „measured value offset“ indicator arrow appears on the display.</li> <li>– The offset is automatically cancelled during calibration and when the sensor type (glass / antimony electrode) is changed.</li> </ul>   | 0.00               |      |
| 9 / 8              | <b>Simulation ON / OFF</b><br>This field is used to disable and enable the output current simulation function.<br>0 = simulation OFF<br>1 = simulation ON<br><br>When set to 0, the simulation function is disabled.<br>When set to 1, the current value determined in field V9 / H9 is output on both current outputs.<br><br> <b>Note:</b><br>When finished simulating the output current defined in field V9 / H9 (see below), the simulation must be set to 0 (i.e. OFF) again.  | 0                  |      |
| 9 / 9              | <b>Output current simulation</b><br>Entry of a current value independent of the measurement that is to be output on both outputs when field V9 / H8 is set to 1 = „Simulation ON“.<br>0.00 ... 20.00 mA<br><br>Any new value entered here takes effect as soon as the E key is pressed.   | 10.00              |      |

## 9. Limit contacter/controller configuration

### 9.1 Limit contacter

#### Limit contacter function

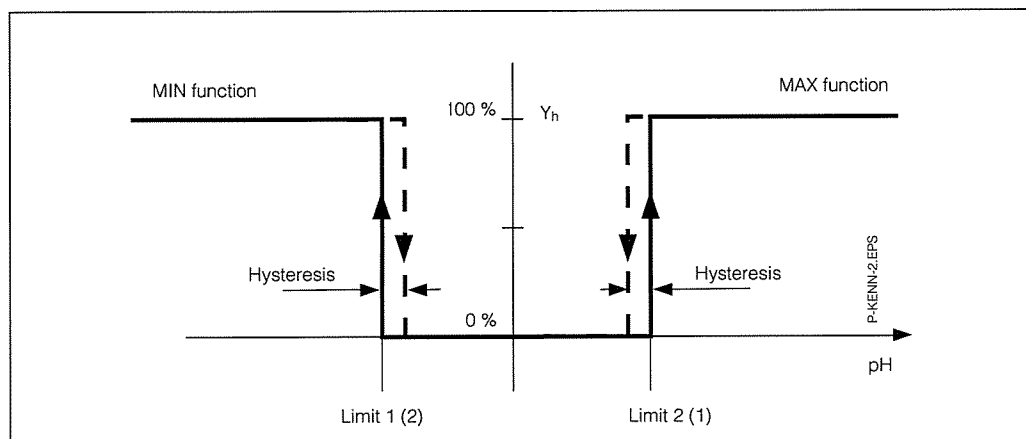


Fig. 9.1: Characteristic curve of limit contacter function

#### Limit contacter settings

| Sequence of parameter settings |   | Matrix position     |                     | See                |
|--------------------------------|---|---------------------|---------------------|--------------------|
|                                |   | V / H<br>(contr. 1) | V / H<br>(contr. 2) |                    |
| 1.                             | Controller type<br>Entry value = 1                  | 4 / 0               | 5 / 0               | Page 35            |
| 2.                             | Contact pickup<br>or<br>dropout delay               | 2 / 3<br>2 / 4      | 3 / 3<br>3 / 4      | Page 34            |
| 3.                             | Switching function<br>MIN / MAX                     | 2 / 5               | 3 / 5               | Pages 34<br>and 43 |
| 4.                             | Relay contact<br>closed or open circuit<br>function | 2 / 6               | 3 / 6               |                    |
| 5.                             | Hysteresis  | 2 / 7               | 3 / 7               | Page 34            |
| 6.                             | Setpoint  | 2 / 0               | 3 / 0               | Page 34            |

## 9.2 Controllers

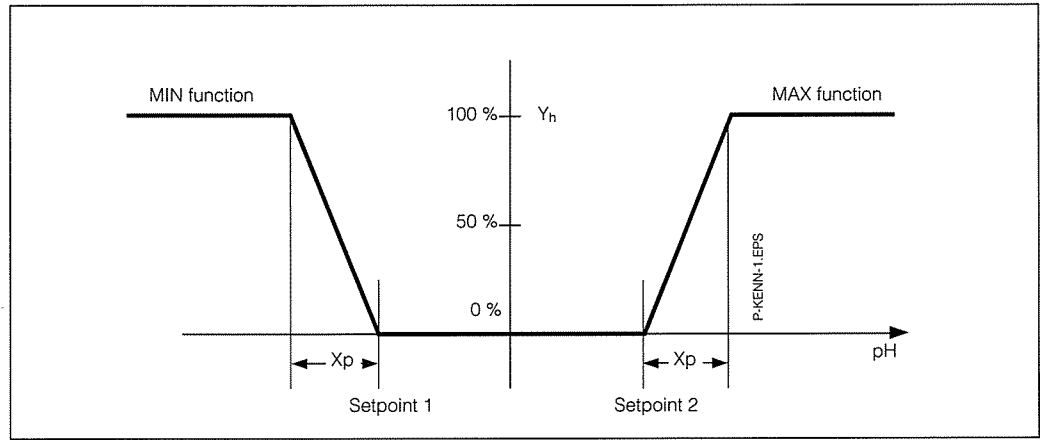


Fig. 9.2: Control characteristic of P controller

$X_p$  = proportional band  
 $Y_h$  = output signal control range

### Two-point control function

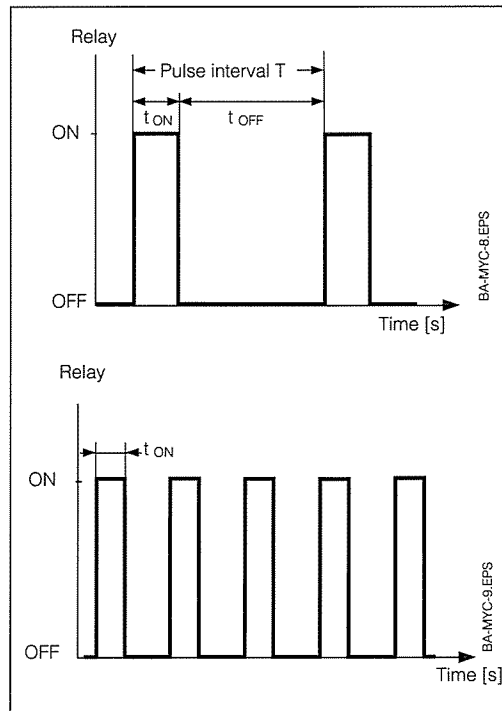


Fig. 9.3: Relay output of pulse-length controller

Fig. 9.4: Relay output of pulse-frequency controller

$$\text{Pulse frequency} = \frac{\text{no. of pulses}}{s}$$

| Sequence of parameter settings |  | Matrix position     |                     |
|--------------------------------|--|---------------------|---------------------|
|                                |  | V / H<br>(contr. 1) | V / H<br>(contr. 2) |
| 1.                             | Controller type<br>Entry value:<br>2 or 3  | 4 / 0               | 5 / 0               |
| 2.                             | Pulse-length controller<br>(see fig. 9.3):<br>pulse interval T min.<br>ON time $t_{ON}$<br><b>or</b><br>pulse-frequency controller<br>(see fig. 9.4):<br>(e.g., metering pump control)<br>– max. pulse frequency | 4 / 4<br>4 / 5      | 5 / 4<br>5 / 5      |
| 3.                             | Controller characteristic<br>P, PI, PID  | 4 / 1               | 5 / 1               |
| 4.                             | Integral action time<br>– for PI, PID  | 4 / 3               | 5 / 3               |

### Three-point step controller

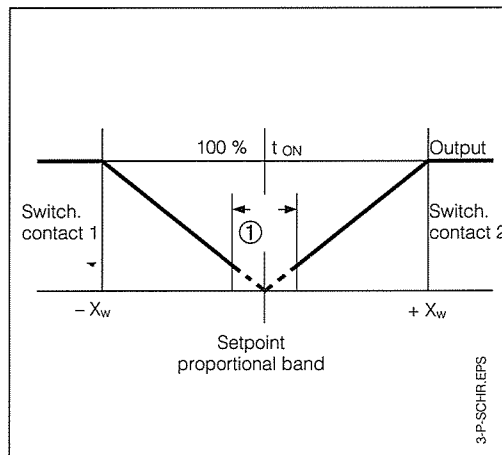


Fig. 9.5: P transfer characteristic of three-point step controller

$$\text{Relative ON time} = \frac{t_{ON}}{T} \cdot 100 \%$$

① Neutral zone  
 +  $X_w$  = meas. value > setpoint  
 –  $X_w$  = meas. value < setpoint

|   |                   |                                  |       |
|---|-------------------|----------------------------------|-------|
| 5.  | Proportional band | 4 / 2                            | 5 / 2 |
|   |                   | <b>Matrix position<br/>V / H</b> |       |
| <b>Motor actuator adaptation</b>            |                   |                                  |       |
| Motor operating time                        |                   | 4 / 8                            |       |
| Neutral zone                                |                   | 4 / 9                            |       |
| Pulse interval                              |                   | 4 / 4                            |       |
| Min. ON time                                |                   | 4 / 5                            |       |
| <b>Settings for controller optimisation</b> |                   |                                  |       |
| Control characteristic<br>PD / PT1          |                   | 4 / 1                            |       |
| Proportional band                           |                   | 4 / 2                            |       |
| Integral action time                        |                   | 4 / 3                            |       |



9.3 Switching contact configuration

The following table shows all the operating states for the limit contacter function of the unit. The measured or display value (actual value) fluctuates between approx. 0 % (> setpoint 1) and approx. 100 % (< setpoint 2).

Different switching contact positions (0 = OFF, 1 = ON) will result depending on the switching function (MIN / MAX) and the operating mode (closed / open circuit) of the output contact.

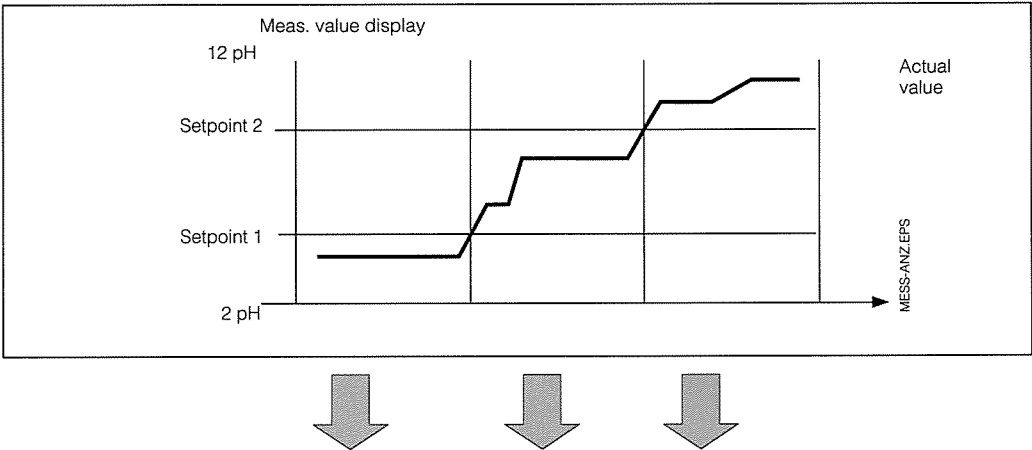


Fig. 9.6: Status diagram for automatic operation of Mycom CPM 151-P with limit contacter function

|                          |                           | Switching contacts |       |       |       |       |       | Contact at power failure |
|--------------------------|---------------------------|--------------------|-------|-------|-------|-------|-------|--------------------------|
| Function V2 / H5 V3 / H5 | Principle V2 / H6 V3 / H6 | LED                | Cont. | LED   | Cont. | LED   | Cont. |                          |
| Setpoint MIN             | Closed circuit            | red                | OFF   | green | ON    | green | ON    | OFF                      |
|                          | Open circuit              | red                | ON    | green | OFF   | green | OFF   | OFF                      |
| Setpoint MAX             | Closed circuit            | green              | ON    | green | ON    | red   | OFF   | OFF                      |
|                          | Open circuit              | green              | OFF   | green | OFF   | red   | ON    | OFF                      |

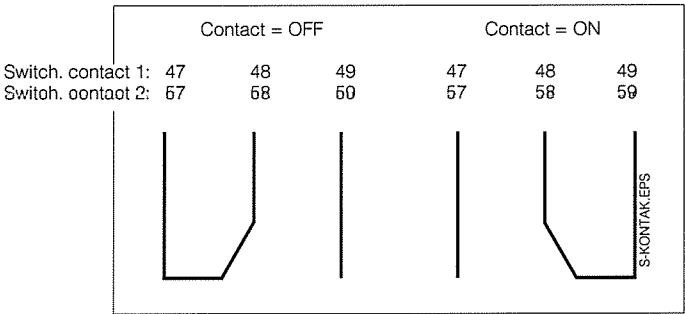
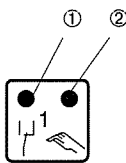


Fig. 9.7: Contact positions for switching contacts 1 and 2 with terminal assignments (according to fig. 4.15, chapter 4.6)

LED function



① Red / green switching status LED:  
green = idle position = OFF  
red = working position = ON

② Red manual / automatic LED:  
Automatic operation: LED OFF  
Manual operation: LED ON

## 9.4 Optimisation of controller settings

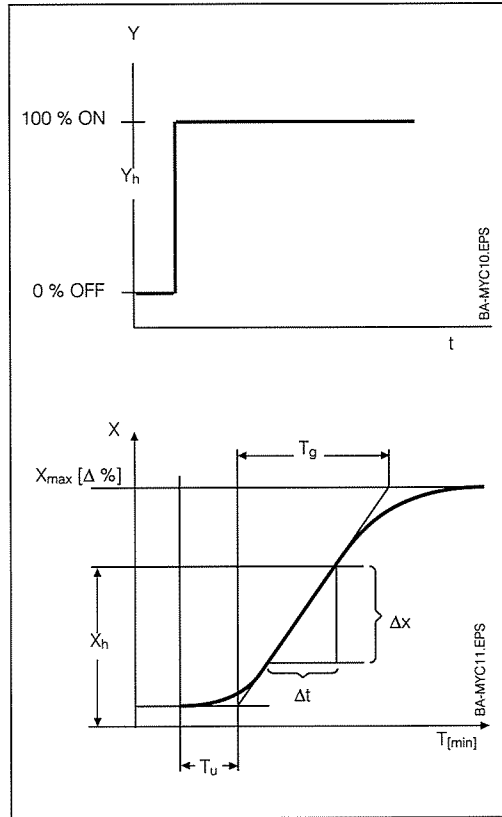


Fig. 9.8: Step response of process

- Step response of process (fig. 9.8)

$Y$  = manip. variable [0 ... 100 %]  
 $Y_h$  = control range  
 $T_u$  = delay time [s]  
 $T_g$  = recovery time [s]  
 $X_{max}$  = maximum process value  
 $X_h$  = setpoint adjustment range

- Max. rate of rise of controlled variable

$$V_{max} = \frac{\Delta x}{\Delta t} \quad \left[ \frac{\Delta \text{pH}}{\text{s}} \right]$$

- Pulse interval  $T \leq 0.25 T_u$   
The following relationship results from the step response according to fig. 9.8:

$$K = \frac{V_{max}}{X_h} \cdot T_u \cdot 100 \%$$

### Recommended settings

Refer to the table below regarding the recommended settings for the PI, PID or PD / PT 1 controllers.

| Control characteristic | Settings                    |                            |
|------------------------|-----------------------------|----------------------------|
|                        | Proportional band $X_p$ [%] | Int. action time $T_n$ [s] |
| P                      | 1.0 K                       | -                          |
| PI                     | 2.6 K                       | 6.0 $T_u$                  |
| PID                    | 1.7 K                       | 2.0 $T_u$                  |
| PD / PT1               | 0.5 K                       | 2.5 $T_u$                  |

PD and PT1 controllers in conjunction with motor actuators have the same effect as PI controllers.

The PT1 controller operates like a PD controller. However, in the event of fast changes of the actual value it replaces high manipulated variable peaks with a small value which fades out over time constant  $T_1$ .

The derivative time for the formation of the D component is computed according to the integral action time.

It is:  $T_D = 0.4 T_n$

In the example below, the settings for  $X_p$  and  $T_n$  are determined based on the step response of the process.

### Example for determination of controller settings

The controller is operated in manual mode to activate the actuator (metering process).

The following values are measured:

$$\Delta x = 4 \text{ pH}$$

$$\Delta t = 90 \text{ s}$$

$$T_u = 70 \text{ s}$$

The setpoint adjusting range of the controller is:

$$X_h = 14 \text{ pH}$$

This is used in the following calculations:

$$K = \frac{\Delta x}{X_h \cdot \Delta t} \cdot T_u \cdot 100 \%$$

$$K = \frac{4}{14 \cdot 90} \cdot 70 \cdot 100 \% = 22 \%$$

This results in the following settings for the different controller variants:

| Control characteristic | Settings                    |                                  |
|------------------------|-----------------------------|----------------------------------|
|                        | Proportional band $X_p$ [%] | Integral action time $T_n$ [min] |
| P                      | 22                          | —                                |
| PI                     | 57                          | 7.0                              |
| PID                    | 37                          | 2.3                              |
| PD / PT1               | 11                          | 2.9                              |

## 9.5 Alarm function / fault signalling contact

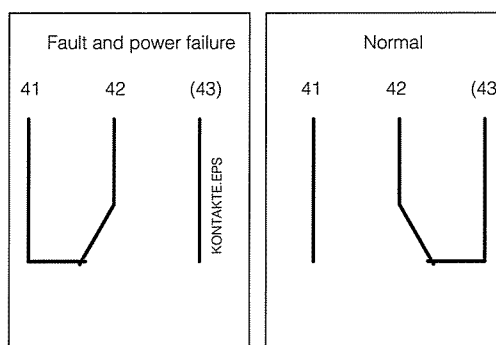
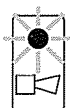
| Sequence of parameter settings           | Matrix position V / H |
|--|-----------------------|
| 1. Setpoint controller 1<br>controller 2 | 2 / 0<br>3 / 0        |
| 2. Alarm threshold                       | 7 / 0                 |
| 3. Alarm delay                           | 7 / 1                 |
| 4. Steady or<br>fleeting contact         | 7 / 2                 |

### Fault signalling contact

| Operating condition | LED     | Contact 41/42 |
|---------------------|---------|---------------|
| Normal              | —       | OFF           |
| Power failure       | —       | ON            |
| Fault               | flashes | ON            |

### Alarm condition

- Alarm LED flashes red
- Fault signalling contact ON
- Error number in matrix field V9 / H0 (see error list in chapter 10.3)



(contact 43 on CPM 151-P only)

Fig. 9.9: Contact positions of fault signalling contact with terminal assignments (according to fig. 4.15, chapter 4.6)

## 9.6 Rinse function

On instrument variants equipped with limit contactor and controller functions, contact 1 can be configured as a rinse contact. Contact 1 is then no longer available as a control / limit contactor contact.

| Sequence of parameter settings |  | Matrix position V / H |
|--------------------------------|--|-----------------------|
| 1.                             | Cleaning time                          | 6 / 7                 |
| 2.                             | Interval                               | 6 / 8                 |
| 3.                             | Settling time                          | 6 / 9                 |
| 4.                             | rinse function = 4<br>START<br>OFF = 0 | 4 / 0                 |

The next interval timer is started immediately. The cleaning time and settling time are not added to the interval period.

If the automatic HOLD function is enabled, it is activated during the cleaning and settling periods.

| Operating condition | Rinse contact |       |
|---------------------|---------------|-------|
|                     | LED           | Cont. |
| Interval            | –             | OFF   |
| Cleaning time       | red           | ON    |
| Settling time       | green         | OFF   |



### Caution:

The first cleaning cycle starts immediately after activation of the rinse function in matrix field V4 / H0 (controller type).



### Note:

The rinse function cannot be switched to manual mode.

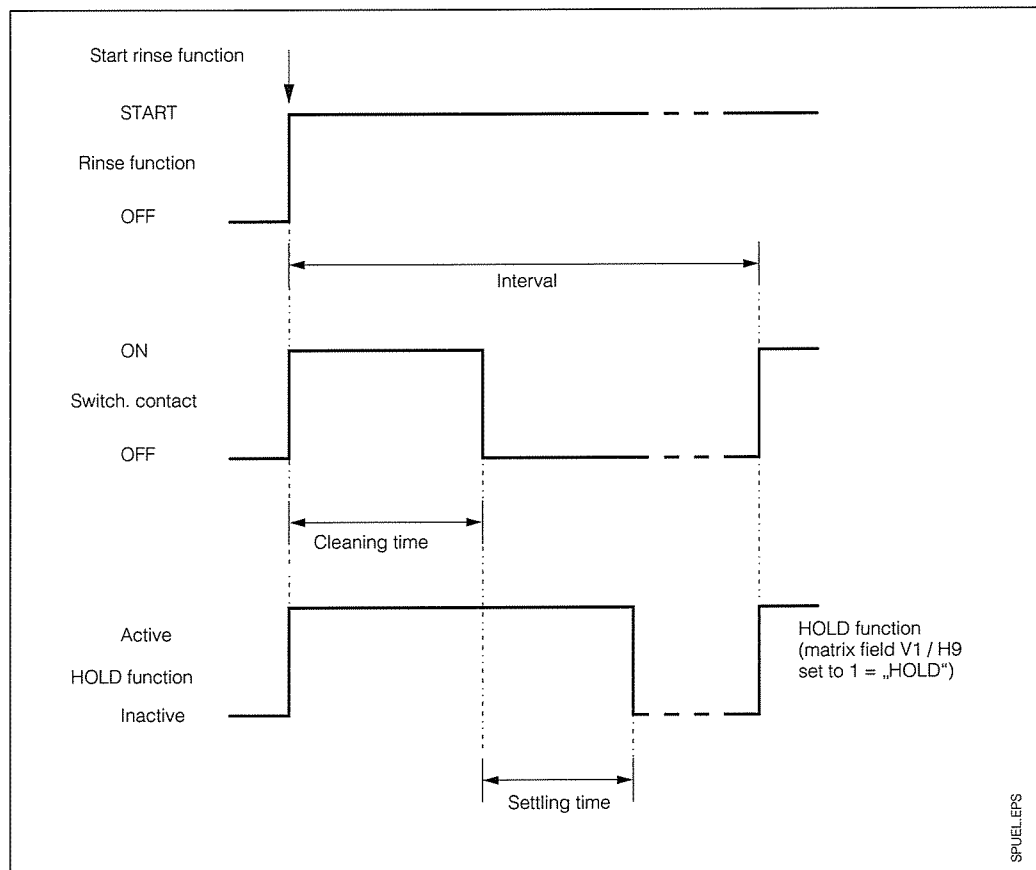


Fig. 9.10: Diagram of rinse function sequence

## 10. Diagnosis

### 10.1 Error classes and error numbers

Errors are grouped into three classes:

| Error class  | Priority   | Error no.  |
|--------------|------------|------------|
| No error     |            | ----       |
| System error | 1 = high   | 1 ... 9    |
| Disturbance  | 2 = medium | 10 ... 29  |
| Warning      | 3 = low    | 30 ... 255 |

#### System errors

are error conditions where proper operation of the entire measuring system is no longer guaranteed (e.g., parameter storage EEPROM cannot be read correctly).

These errors require servicing (repair of instrument at factory or replacement) since they cannot be cleared.

#### Disturbances

are error conditions where

- a) the process parameter to be measured and possibly to be controlled lies outside the limits (process error),

or

- b) display and / or current output lie outside the specified accuracy range,

or

- c) the measuring transmitter connections receive incorrect signals.

These errors are cancelled as soon as the error condition ceases to exist.

#### Warnings

are error conditions where

- a) an operator error must be corrected,

or

- b) maintenance will be required shortly.

These errors are cancelled as soon as the error condition ceases to exist.



#### Caution:

If a warning is ignored, a disturbance may result.

### 10.2 Error display and handling

Each of the errors described below is entered in an error list which is sorted by the error number in ascending order (see chapter 10.3).

Multiple occurrences of an error are signalled only once.

Any occurrence of an error activates the alarm LED (flashes at intervals of one second). System errors and disturbances also activate the alarm contact (which may be defined as a steady or a fleeting contact).

When field V9 / H0 is selected, the display shows the number of the error with the lowest number which has occurred in the format „E001“ to „E255“.

The error list can be searched for other errors which have occurred using these keys:



ascending

and



descending

Disturbances and warnings are deleted from the error list as soon as the error condition ceases to exist. If the error list is empty, „E- - -“ is displayed.

### 10.3 Error list

| Error no. (display)  | Meaning  | Refers to field V / H | Measures for maintenance / troubleshooting   |
|----------------------|--|-----------------------|--|
| <b>System errors</b> |  |                       |  |
| 1                    | Data exchange error in processor                                       |                       | Return instrument to your Endress+Hauser sales agency for repair or request service.   |
| 2                    | Internal configuration error   |                       | Return instrument to your Endress+Hauser sales agency for repair or request service.   |
| <b>Disturbances</b>  |  |                       |  |
| 10                   | Limit or setpoint exceeded for longer period than delay setting        | 7 / 1                 | Alarm delay timeout. Check actuator, controller function and control parameters.   |
| 12                   | pH parameter below lower limit of measuring range                      | 0 / 0                 | Check pH measurement, control and connections; check instrument and measuring cable with pH simulator if necessary.              |
| 13                   | pH measuring range exceeded  | 0 / 0                 | Check pH measurement, control and connections; check instrument and measuring cable with pH simulator if necessary.              |
| 17                   | SCS error  | 6 / 0                 | Check pH electrode for glass breakage; check electrode plug-in head for moisture and dry if necessary; check medium temperature. |
| 19                   | Temperature below lower limit of measuring range                       | 0 / 1                 | Check temperature measurement and connections; check instrument and measuring cable with temperature simulator if necessary.     |
| 20                   | Temperature measuring range exceeded                                   | 0 / 1                 | Check temperature measurement and connections; check instrument and measuring cable with temperature simulator if necessary.     |
| 22                   | Below permissible minimum value for 0/4 mA current range (output 1)    | 0 / 5                 | Check 0 / 4 mA measuring range assignment and change if necessary. Check measurement and control.                                |
| 23                   | Permissible maximum value for 20 mA current range exceeded (output 1)  | 0 / 6                 | Check 20 mA measuring range assignment and change if necessary. Check measurement and control.                                   |
| 25                   | Permissible minimum value for 0/4 mA current range exceeded (output 2) | 0 / 7                 | Check 0 / 4 mA measuring range assignment and change if necessary. Check measurement.  |
| 26                   | Permissible maximum value for 20 mA current range exceeded (output 2)  | 0 / 8                 | Check 20 mA measuring range assignment and change if necessary. Check measurement.   |
| 30                   | Current output simulation enabled                                      | 9 / 8                 | Set simulation to OFF.   |

| Error no. (display) | Meaning  | Refers to field V / H | Measures for maintenance / troubleshooting   |
|---------------------|--|-----------------------|--|
| <b>Warnings</b>     |  |                       |  |
| 31                  | Parameter range for current output 1 too small   | 0 / 5<br>0 / 6        | Increase difference (min. $\Delta 2$ pH), e.g., 3 to 5 pH.   |
| 32                  | Parameter limits for current output 1 interchanged (falling assignment)                            | 0 / 5<br>0 / 6        | Interchange values, i.e. value of V0 / H5 must be smaller than value of V0 / H6, e.g. 2 to 10 pH.  |
| 34                  | Temperature range for current output 2 too small   | 0 / 7<br>0 / 8        | Increase difference (min. $\Delta 25$ K)   |
| 35                  | Temperature range limits for current output 2 interchanged   | 0 / 7<br>0 / 8        | Correct range limits   |
| 36                  | Minimum ON time for pulse-length controller or three-point step controller excessive, controller 1 | 4 / 4<br>4 / 5        | Decrease value<br>Permissible: 0.1 to 5.0 s  |
| 37                  | Minimum ON time for pulse-length controller or three-point step controller excessive, controller 2 | 5 / 4<br>5 / 5        | Decrease value<br>Permissible: 0.1 to 5.0 s  |
| 41                  | Outside permissible slope range  | 1 / 0                 | Repeat calibration, renew buffer solutions, change electrode if necessary, and check instrument and measuring cable with simulator.<br>Permissible slope ranges for<br>– glass electrode: 75 ... 110 %<br>– antimony electrode: 43 ... 110 % |
| 42                  | Outside permissible asymmetry range  | 1 / 0                 | Repeat calibration, renew buffer solutions, change electrode if necessary, and check instrument and measuring cable with simulator.  |
| 43                  | Measured value unstable during calibration   | 1 / 0                 | Check electrical connection (potential matching?), check instrument and measuring cable with pH simulator if necessary.  |
| 44                  | pH difference between buffers is too small   | 1 / 6<br>1 / 7        | Select two buffers with a difference of pH values $> 2$ pH.  |
| 45                  | Buffer difference too small  | 1 / 0                 | Select two buffers with a difference of pH values $> 2$ pH:<br>check buffer solutions and renew if necessary.  |
| 48                  | ATC but temperature measurement disabled   | 0 / 9<br>1 / 3        | Check settings:<br>switch off ATC or switch on temperature measurement.  |
| 50                  | SCS error, glass electrode   | 6 / 0                 | Check electrodes for glass breakage; check electrode plug-in head for moisture and dry if necessary; check medium temperature.   |
| 51                  | SCS error, reference electrode   | 6 / 1                 | Check electrodes for blocking; check electrode plug-in head for moisture and dry if necessary; check medium temperature.   |

## 11. Service and maintenance

### 11.1 Cleaning

Use commercial cleansers to clean the instrument front panel.

The front panel is resistant (test method DIN 42 115) to:

- Alcohol
- Diluted acids
- Diluted bases
- Ester
- Hydrocarbons
- Ketones
- Household cleansers


**Note:**

- We do not guarantee resistance to concentrated mineral acids or concentrated lyes, benzyl alcohol, methylene chloride and high-pressure steam with temperatures above 100 °C.

### 11.2 Repairs

Repair work must only be carried out directly by the manufacturer or by the Endress+Hauser service organization. See the back cover of these operating instructions for an overview of the Endress+Hauser service network.

### 11.3 Preparation for storage, proper disposal

**Packaging**

Packaging must provide shock and moisture protection. Optimal protection is provided by the original packaging materials.


**Note:**

Electronic components to be disposed of are considered special waste!  
Please observe local regulations for disposal!



## 11.4 Accessories

The following accessories may be ordered separately for the Mycom:

- Weather protection cover CYY 101  
Weather protection cover for installation on the Mycom CPM 151 - P  
Dimensions: 320 x 300 x 270 mm (L x W x D)  
Material: stainless steel 1.4301  
(order no. CYY 101)
- Assembly holder CYH 101  
This suspension assembly holder with an upright post for pendulous suspension of pH assemblies:  
(order no. CYH 101-A)
- Round post mounting kit CYY 101  
for installation of weather protection cover and Mycom on horizontal or vertical tubing (max. Ø 60 mm)  
Material: stainless steel 1.4301  
(order no. 50062121)
- Mounting post CYY 102  
Post of square tube (1.4301) to install instruments directly or via weather protection cover CYY 101 height of post: 1.50 m.  
Material: hot-dip galvanised steel  
(order no. CYY 102-A)
- Junction box VBA  
Junction box for connecting line lengths above 25 m between the assembly and pH instrument; with 4 Pg cable glands (2 x Pg 13.5 and 2 x Pg 16) for cable entry and 10 isolated high-impedance screw terminals for connection of individual wires  
Dimensions: 120 x 120 x 55 mm (H x W x D)  
Material: polycarbonate  
Ingress protection: IP 65  
(order no. 50005276)
- Flat packing  
To seal panel cutout for panel installation of Mycom CPM 151-P  
(order no. 50064975)
- Cable CPK 1  
Length: min. 5 m, max. 40 m  
special coaxial pH connecting cable with electrode connector, with dual screen, in PVC sheath  
Cable diameter: 7 mm  
Temperature range: -25 °C to +85 °C  
(order no. CPK 1-05/10/15/20/25/30/40)
- Cable SMK  
Extension for CPK 1  
(order no. 50000598)

- Cable CPK 7  
Length: min. 5 m, max. 25 m  
special pH cable for electrodes with integrated temperature sensor Pt 100, with dual screen, in PVC sheath, fitted with an electrode connector and connector for potential matching pin  
Cable diameter: 7 mm  
Temperature range: -25 °C to +85 °C  
(order no. CPK 7-05/10/15/10/25)
- Cable CYK 7  
Extension for CPK 7  
(order-no. 50041101)
- pH simulator P 191  
(order no. CPP 1)
- Pt 100 simulator T 198  
(order no. 50001418)

### Supplementary documentation

- ☐ Operating instructions  
Mycom Interfaces  
BA 078C/07/en
- ☐ Operating instructions  
Mycom Rackbus Interfaces  
BA 090C/07/en
- ☐ Technical Information  
Universal suspension assembly holder  
CYH 101  
TI 092C/07/en

## 11.5 Index

### A

|  |        |
|--|--------|
| Accessories                            | 51     |
| Alarm delay                            | 37     |
| Alarm function                         | 45     |
| Alarm threshold                        | 37     |
| Areas of application                   | 4      |
| Assembly holder CYH 101                | 51     |
| Assembly holder CYH 101-A              | 51     |
| Asymmetrical high-impedance connection | 18     |
| Asymmetrical high-impedance input      | 15     |
| Auto resets                            | 39     |
| AUTOMATIC                              | 29     |
| AUTOMATIC calibration                  | 29, 32 |
| Automatic HOLD during calibration      | 33     |

### B

|                   |    |
|-------------------|----|
| Baud rate         | 38 |
| Baud rate setting | 38 |

### C

|                             |                 |
|-----------------------------|-----------------|
| Cables                      | 51              |
| Calibration                 | 27 - 29, 32     |
| Calibration and measurement | 27              |
| Cleaning                    | 50              |
| Code 1111 (operation)       | 21, 38          |
| Code 2222 (start-up)        | 21, 38          |
| Complete measuring system   | 4               |
| Conformity statement        | 2               |
| Connection                  | 11              |
| Connection diagram          | 14              |
| Connection of CPM 121-P     | 12              |
| Connection of CPM 151-P     | 14              |
| Contact positions, switch.  |                 |
| contacts 1 and 2            | 43              |
| Control characteristic      | 35, 42, 44 - 45 |
| Controller pulse interval   | 42              |
| Controller type             | 24, 35          |
| Controllers                 | 42, 44 - 45     |
| CPK 1                       | 15, 51          |
| CPK 7                       | 15 - 18, 51     |

### D

|                                    |         |
|------------------------------------|---------|
| Description of instrument          | 4 - 7   |
| Description of operating functions | 30 - 40 |
| Device address                     | 39      |
| Diagnosis                          | 47 - 49 |
| Diagnostic code                    | 39      |
| Dimensions of Mycom CPM 121        | 8       |
| Dimensions of Mycom CPM 151-P      | 9       |
| Display for editable matrix fields | 22      |
| Display for locked matrix fields   | 22      |
| Disturbance                        | 47      |
| Dropout delay                      | 34      |

### E

|                                 |                  |
|---------------------------------|------------------|
| Electrical connection           | 13 - 14, 16 - 18 |
| Electrical data                 | 6                |
| Entry of buffer value 1         | 32               |
| Entry of buffer value 2         | 33               |
| Entry of MTC temperature        | 32               |
| Error classes and error numbers | 47               |
| Error display and handling      | 47               |
| Error handling                  | 47 - 48          |
| Error list                      | 48               |

### F

|                                     |    |
|-------------------------------------|----|
| Fault signalling contact            | 45 |
| Flat packing for panel installation | 51 |

### G

|                            |    |
|----------------------------|----|
| General information        | 2  |
| General notes on operation | 21 |
| General safety notes       | 3  |

### H

|               |        |
|---------------|--------|
| HOLD ON / OFF | 30     |
| Hysteresis    | 34, 41 |

### I

|  |                 |
|--|-----------------|
| Installation                           | 8 - 18          |
| Instrument connections                 | 13              |
| Instrument status after first power-up | 19              |
| Integral action time                   | 35, 42, 44 - 45 |

### J

|                  |        |
|------------------|--------|
| Junction box VBA | 11, 51 |
|------------------|--------|

### K

|               |    |
|---------------|----|
| Key functions | 22 |
|---------------|----|

### L

|  |         |
|--|---------|
| Level 0 (indication)                       | 21, 38  |
| Level 1 (operation)                        | 21, 38  |
| Level 2 (start-up)                         | 21, 38  |
| Levels                                     | 21      |
| Limit contactor                            | 41      |
| Limit contactor / controller configuration | 41 - 46 |
| Limit contactor function                   | 41, 43  |
| Limit contactor setting sequence           | 41      |
| Limit contactor settings                   | 41      |

**M**

|  |         |
|--|---------|
| MANUAL . . . . .                         | 28      |
| MANUAL calibration . . . . .             | 28, 32  |
| Manual OFF / ON . . . . .                | 34      |
| Matrix field . . . . .                   | 21      |
| Matrix field(s) . . . . .                | 22      |
| Matrix fields . . . . .                  | 21, 38  |
| Max. rate of rise . . . . .              | 44      |
| Maximum pulse frequency . . . . .        | 35      |
| Measured value display . . . . .         | 21      |
| Measurement . . . . .                    | 30      |
| Measures before first power-up . . . . . | 19      |
| Measuring cable . . . . .                | 16 - 18 |
| Measuring system . . . . .               | 4       |
| Meßkabel . . . . .                       | 16      |
| Minimum ON time . . . . .                | 35      |
| Minimum settings . . . . .               | 20      |
| Motor operating time . . . . .           | 35      |
| Mounting . . . . .                       | 8       |
| Mounting accessories . . . . .           | 10      |
| Mounting brackets . . . . .              | 9       |
| Mycom . . . . .                          | 4 - 5   |
| Mycom Interfaces . . . . .               | 51      |
| Mycom Rackbus Interfaces . . . . .       | 51      |

**N**

|                                    |    |
|------------------------------------|----|
| Nameplate of CPM 121 - P . . . . . | 5  |
| Nameplate of CPM 151 - P . . . . . | 5  |
| Neutral zone . . . . .             | 35 |

**O**

|   |                      |
|---|----------------------|
| Operating functions . . . . .                 | 21, 30 - 32, 35 - 40 |
| Operation . . . . .                           | 21 - 26, 29, 36 - 40 |
| Description of operating functions . . . . .  | 37                   |
| Optimisation of controller settings . . . . . | 44                   |
| Order code . . . . .                          | 5                    |
| Output current simulation . . . . .           | 40                   |

**P**

|   |            |
|---|------------|
| P controller . . . . .                                | 42         |
| Panel installation . . . . .                          | 8 - 9      |
| Parameter setting sequence . . . . .                  | 42         |
| Parity . . . . .                                      | 38         |
| Pg 16 . . . . .                                       | 11         |
| Pg cable gland . . . . .                              | 11         |
| pH at 0 / 4 mA . . . . .                              | 30         |
| pH at 20 mA . . . . .                                 | 30         |
| pH combination electrode . . . . .                    | 4, 16 - 18 |
| pH electrode connection . . . . .                     | 15         |
| pH measuring cable . . . . .                          | 4          |
| Physical data . . . . .                               | 7          |
| Pickup delay . . . . .                                | 34         |
| Post mounting . . . . .                               | 10         |
| Post mounting kit . . . . .                           | 10, 51     |
| Potential matching connection<br>(PM / PMC) . . . . . | 15         |
| Potential matching pin (PM / PMC) . . . . .           | 16 - 17    |
| Power failure handling . . . . .                      | 20         |
| Preparation of pH connecting cable . . . . .          | 12         |
| Preparatory measures . . . . .                        | 27         |
| Preset values (defaults) . . . . .                    | 40         |
| Priority . . . . .                                    | 47         |
| Process step response . . . . .                       | 44         |
| Proportional band . . . . .                           | 35, 42     |
| Pulse interval . . . . .                              | 35, 42, 44 |
| Pulse-frequency controller . . . . .                  | 42         |
| Pulse-length controller . . . . .                     | 42         |

**R**

|   |    |
|---|----|
| Rate of rise mA / s . . . . .                 | 30 |
| Rate of rise of controlled variable . . . . . | 44 |
| Repairs . . . . .                             | 50 |
| Rinse contact . . . . .                       | 36 |
| Rinse function . . . . .                      | 46 |

## S

|  |         |
|--|---------|
| Safety                                 | 3       |
| Safety regulations                     | 3       |
| Selection of matrix field columns      | 22      |
| Selection of matrix field rows         | 22      |
| Sensor check system (SCS)              | 26      |
| Sensor check system OFF / ON           | 36      |
| Sequence of parameter settings         | 46      |
| Service and maintenance                | 50 - 51 |
| Setpoint entry                         | 34      |
| Settings                               | 46      |
| Simulation ON / OFF                    | 40      |
| Slope display                          | 32      |
| SMK                                    | 51      |
| SMK cable                              | 12      |
| Software version                       | 39      |
| Start-up                               | 19 - 20 |
| Status / indicator arrows              | 29      |
| Status diagram for automatic operation | 43      |
| Step response of process               | 44      |
| Storage and transport                  | 8       |
| Supplementary documentation            | 51      |
| Switching contact configuration        | 43      |
| Switching contacts                     | 43      |
| Symbols used                           | 2       |
| Symmetrical high-impedance connection  | 16 - 17 |
| Symmetrical high-impedance input       | 15      |
| System errors                          | 47      |

## T

|                                       |             |
|---------------------------------------|-------------|
| Table of contents                     | 1           |
| Technical data                        | 6           |
| Temperature at 0 / 4 mA               | 31          |
| Temperature at 20 mA                  | 31          |
| Temperature display                   | 30          |
| Temperature measurement               | 13          |
| Temperature sensor Pt 100             | 14, 17 - 18 |
| Terminals                             | 13          |
| Three-point step controller           | 42          |
| Toggle 0 ... 20 mA / 4 ... 20 mA      | 30          |
| Toggle AUTO / MANUAL                  | 34          |
| Toggle AUTOMatic / MANual calibration | 32          |
| Toggle MIN / MAX                      | 34          |
| Toggle MTC / ATC                      | 32          |
| Toggle NC / NO contact                | 34          |
| Toggle steady / fleeting contact      | 3 /         |
| Two-point control function            | 42          |

## U

|  |    |
|--|----|
| Universal suspension assembly holder CYH 101 | 51 |
| Unlock / lock                                | 38 |
| Unpacking                                    | 8  |
| Upright post VM3                             | 51 |

## V

|                                  |    |
|----------------------------------|----|
| Value entry / function selection | 22 |
|----------------------------------|----|

## W

|                                  |            |
|----------------------------------|------------|
| Wall installation                | 9          |
| Warnings                         | 47         |
| Weather protection cover CYY 101 | 10, 12, 51 |

## Z

|                    |    |
|--------------------|----|
| Zero point display | 32 |
|--------------------|----|







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