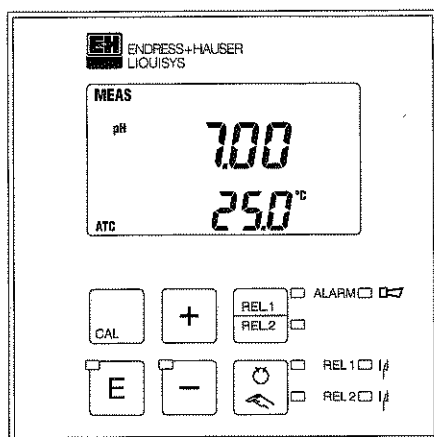
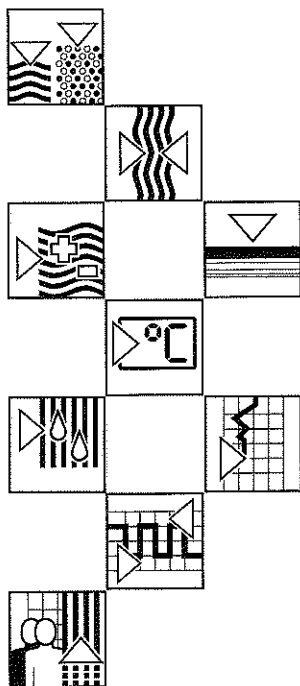


liquisys **CPM 221** **Transmitter/Controller** **for pH and Redox**

Operating Instructions



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



First start-up

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



Operation



Instrument configuration

See the back cover for a fold-out overview of the menu structure.

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



Diagnostics



Maintenance and service

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1 General information

1.1 Symbols used

**Warning!**

This symbol alerts to hazards which may cause serious injuries as well as damage to the instrument, measuring system or other equipment if ignored.

**Caution!**

This symbol alerts to possible malfunction due to operator error.

**Note!**

This symbol indicates important items of information.

1.2 Conformity statement

The pH and redox measuring instrument / controller Liquisys CPM 221 has been developed and manufactured in accordance with the applicable European standards and directives.

**Note:**

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

2 Safety

2.1 Intended use

The measuring transmitter Liquisys CPM 221 is a field-tested and reliable measuring instrument for determining pH values and redox potentials. It is equipped with a current output and two switched outputs for connection to automated process controllers.

2.2 General safety notes



Warning:

- Operation of the device in a manner other than as described in these operating instructions can lead to unsafe and improper functioning of the measuring system.
- The instrument must only be used as a panel-mounted device or in conjunction with the optional field housing.

Installation, start-up, operation

The Liquisys CPM 221 instrument has been designed for safe operation according to the state of the art in engineering and in accordance with the applicable regulations and EC directives; see "Technical data". However, if used improperly or other than for the intended purpose, it may pose a hazard, e.g. due to improper connection.

Installation, electrical connection, start-up, operation and maintenance of the measuring system must therefore be performed exclusively by trained specialists authorised by the system operator. This personnel must have read and understood these operating instructions and must adhere to them.

2.3 Safety devices

- **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:**

Continuous violation of the limit settings or temperature sensor failure will activate an alarm. This condition is indicated by an LED on the control panel and via a switched output. The alarm contact has been designed as a fail-safe switch, i.e. the alarm condition will be immediately signalled in case of a power failure. The alarm contact is also activated by internal errors (see 8.2).

- **Data protection:**

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 operating instructions.

3 Description

3.1 Areas of application

The measuring transmitter Liquisys CPM 221 is suitable for measuring and control tasks in the following areas of application:

- Water treatment and water monitoring
- Effluent treatment
- Neutralisation
- Detoxification in the electroplating industry

3.2 Measuring system

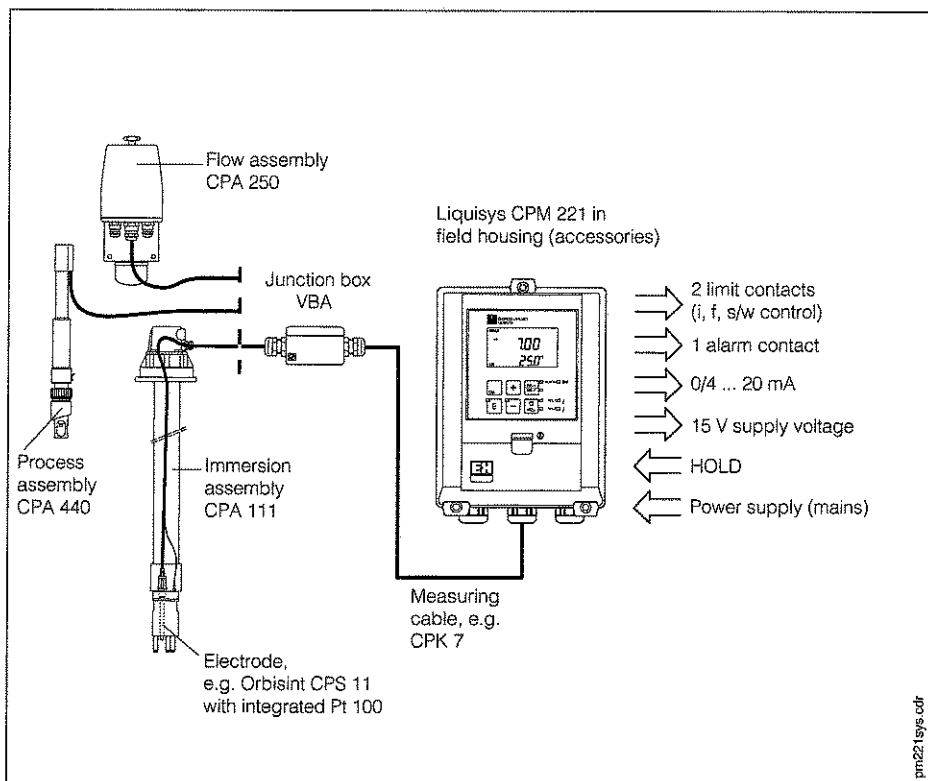


Fig. 3.1 Example of a complete measuring system

A typical measuring system consists of:

- a pH combination electrode with or without integrated temperature sensor Pt 100
- an additional temperature sensor Pt 100 if used with pH electrodes without an integrated temperature sensor
- an appropriate immersion, flow or retractable assembly with or without potential matching pin
- an appropriate pH or redox measuring cable
- the Liquisys CPM 221 measuring transmitter as a panel-mounted instrument or with the field housing (accessories)

3.3 Important features

- Measuring range pH 0 ... 14
- Switching between pH and redox potential measurements
- Easy to read, two-line display
- Simple configuration with only three keys
- Configuration protected by access code
- Fast calibration using the "CAL" key
- Two switched outputs which can be configured as a pulse length controller, pulse frequency controller or limit contactor
- A switched output for alarm signalling in cases of limit violation or temperature sensor failure
- A current output with selectable measurement range, switchable between 0 ... 20 mA or 4 ... 20 mA proportional
- Automatic "hold" function to "freeze" the the current output and the contacts during calibration and configuration
- "Hold" function can be controlled externally via a galvanically separated contact input using an auxiliary voltage

3.4 Instrument variants

Order code

Type
221 Panel-mounted instrument, 96 x 96 x 145 mm, ingress protection IP 54 (front)

Power supply

0	230 V,	50/60 Hz
1	115 V,	50/60 Hz
2	200 V,	50/60 Hz
3	24 V,	50/60 Hz
5	100 V,	50/60 Hz
9	Special version	

Additional features

10	Base version
20	Moisture protection lacquering
99	Special version

CPM 221 - ← complete order code

According to the order code on the nameplate of the instrument, you can identify the device variant and the mains supply type.

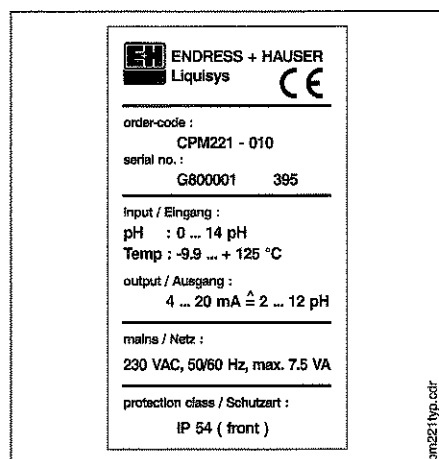


Fig. 3.2 Nameplate of Liquisys CPM 221

3.5 Accessories

Endress+Hauser offers a wide selection of electrodes and assemblies for the Liquisys measuring instrument which are designed for special applications. The following table gives a rough overview

Field housing

Type	Features	Order number
Field housing	For installation of CPM/CLM 221 Dimensions (H x W x D): 204 x 155 x 215 mm Ingress protection IP 65, for wall and post mounting	50054413

Electrodes

Type	Features	Areas of application
Orbisint CPS 11/12/13	Universally applicable, easily cleanable and soiling-resistant thanks to PTFE diaphragm, pressures of up to 6 bar, conductivity > 50 µs/cm	General process engineering
		Industrial waste water
		Detoxification (cyanogen, chromium)
		Neutralisation
Ceratex CPS 31/32/33	Inexpensive electrodes with ceramic diaphragm, long life	Drinking water
		Swimming pools
Ceraliquid CPS 41/42/43	Electrodes with ceramic diaphragm and KCl liquid electrolyte, for use with counterpressure, resistant to pressures of up to 8 bar	Ultrapure water
		Boiler feed water

Please refer to the electrode catalogue (order no. 50071831) for further information on electrodes and measuring cables.

Assemblies

Type	Features	Areas of application
Dipsys CPA 111	Immersion assembly with DN 100 flange, bayonet mounting for fast electrode installation and removal, integration of Chemoclean electrode cleaning system is possible without modification	Open and closed containers and tanks
		Channels
Probit CPA 440	Process assembly for one pH/redox electrode, usable with pressures of up to 6 bar	Pipelines
		Containers and tanks
CPA 250-A	Flow assembly for up to three electrodes, syphon-type design keeps sensors wet even if there is no flow through pipeline	Pipelines

Buffer solutions

Type	Features / contents	Areas of application
CPY 2	pH 4.0 red, contents: 100 ml (order no. CPY 2 - 0) pH 7.0 green, contents: 100 ml (order no. CPY 2 - 2)	pH calibration (reference temperature 25 °C)
CPY 3	+225 mV, pH 7.0, contents: 100 ml (order no. CPY 3 - 0) +475 mV, pH 0.0, contents: 100 ml (order no. CPY 3 - 1)	Redox calibration (measured at 25 °C with PtAg or AgCl measuring chain)



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

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:

- Quantity delivered
- Instrument type and version according to the nameplate (see chapter 3.4)
- Accessories
- Operating instructions
- Identification card(s)

Included in delivery:

- Flat gasket
- Mounting screws
- 3-, 9- and 12-pole terminal blocks
- BNC elbow plug

Save the original packaging in case the device must be stored or shipped at a later time.

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

4.3 Mounting

Panel mounting of Liquisys CPM 221

The instrument is fastened using the mounting screws supplied with the instrument (see figure 4.1). The required mounting depth is approx. 175 mm.

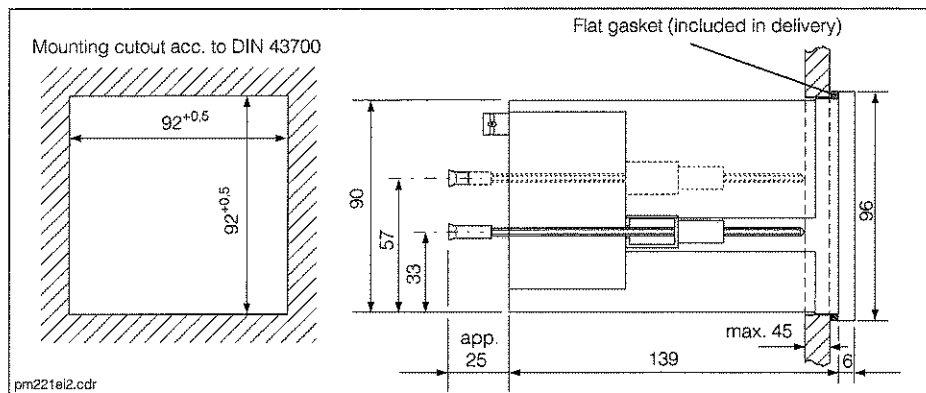


Fig. 4.1 Panel mounting of Liquisys CPM 221

Wall mounting of Liquisys CPM 221 with optional field housing

The brackets and screws for wall mounting are contained in the shipment. Install the brackets onto the rear of the instrument. The dimensions of the mounting holes are shown in figure 4.2.



Warning:

For installation in the field, weather protection cover VH3 is required (see mounting accessories). The protective cover is suitable for wall or post mounting.

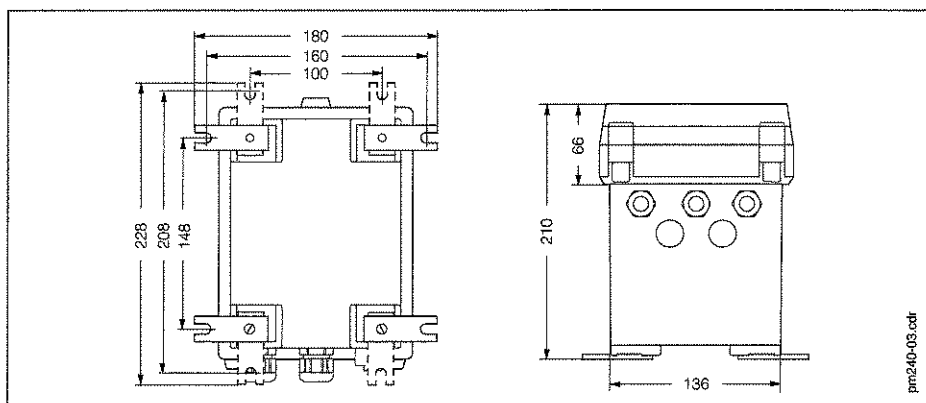


Fig. 4.2 Wall mounting of Liquisys CPM 221 with optional field housing

Post mounting of Liquisys CPM 221 with optional field housing

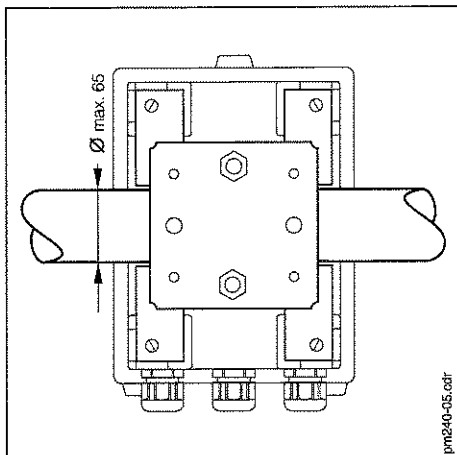


Fig. 4.3 Post mounting of Liquisys CPM 221 with optional field housing

Additional requirements: post mounting kit (see mounting accessories). Install the post mounting kit on the rear of the instrument. Installation is possible on horizontal or vertical pipes. The maximum pipe diameter is 65 mm (see figure 4.3).

Mounting accessories

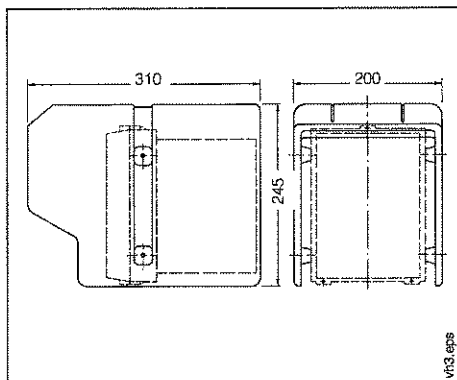


Fig. 4.4 Weather protection cover VH3

Weather protection cover VH3

Weather protection cover for installation on field housing.

Dimensions: 245 x 200 x 310 mm (H x W x D);

Material: plastic;

Order no.: 50003254

Post mounting kit

Retrofit kit for mounting the field housing on horizontal or vertical pipes (max. Ø 65 mm);

Material: galvanised steel;

Order no. 50003244

4.4 Connection



Warning:

- The connection to the mains may only be performed by properly trained personnel.
- Do not perform service work on the instrument while the instrument is energised.
- The instrument must be grounded before start-up!
- A clearly identified mains disconnecting device must be installed close to the instrument.
- Before connecting the instrument to the mains, make sure the mains voltage matches the voltage rating on the nameplate.
- Live components can be touched through the vent slots in the housing and the openings on the rear of the housing. Do not insert tools, wires, etc., in these slots.

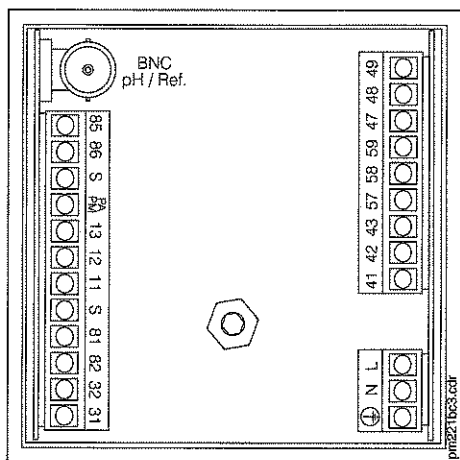


Fig. 4.5 Position and designations of the connections on the rear of the instrument

Instrument connections

Connections are carried out on the rear of the instrument

- for combined pH and single electrodes via a BNC connector,
- for transmitter power supply, temperature sensor, potential matching, switched „hold“ input and current output via the removable 12-pin terminal block,
- for controller relay and alarm contact via the removable 9-pin terminal block,
- for the mains via the removable 3-pin terminal block.

The max. conductor cross section is 2.5 mm².
See figure 4.6 for terminal assignments.

BNC connector (pH redox signal input):

Inner contact: pH / redox signal

Outer contact: reference signal

Connection diagram

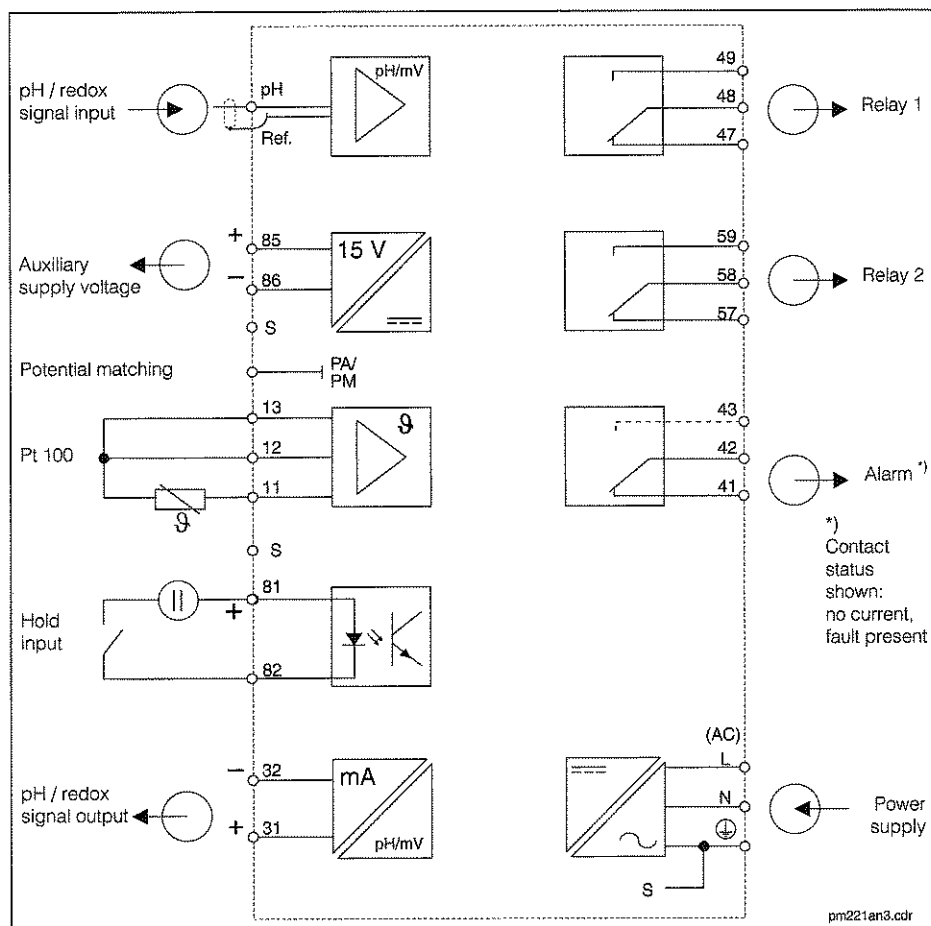


Fig. 4.6 Electrical connection of Liquisys CPM 221

Liquisys CPM 221

Connect the instrument according to figure 4.6.

Liquisys CPM 221 in field housing

Introduce the connecting cables through the glands in the field housing. Connect the instrument according to figure 4.6. Slide the instrument into the housing, exerting a slight pulling force on the cables to pull them out. Tighten the cable glands. Install the front panel and tighten the screws with a hexagon socket wrench.

Connection of pH and redox electrodes

The connection of pH and redox electrodes takes place via special multi-core, pre-assembled and shielded measuring cables of types CPK 1 to CPK 7 (see section "Special pH / redox measuring cables"). Should it become necessary to extend the measuring cables, use junction box VBA and measuring cable types SMK, PMK or TCK (not assembled; see Connection accessories). Instructions for preparing the measuring cables are included with the cables.



Warning:

Connectors and terminals must be protected against humidity, otherwise faulty measurements will result!

Choice: Symmetrical or asymmetrical?

The pH and redox electrodes can be connected in either a high-impedance symmetrical or asymmetrical configuration. General rule:

- no potential matching connector present – asymmetrical connection (see figure 4.7)
- potential matching connector present – symmetrical connection (see figure 4.8)

However, which arrangement to use may also depend on operating conditions.



Caution:

The instrument is pre-configured for symmetrical measurement. If required, it must be adapted for asymmetrical connection as described in chapter 7.6. The conductor for the potential matching pin must be connected to the terminal "PA / PM" of the instrument for the symmetrical high-impedance connection.

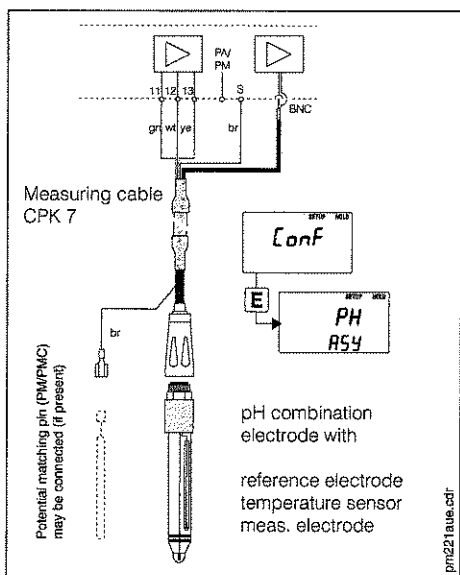


Fig. 4.7 Asymmetrical high-impedance pH electrode connection

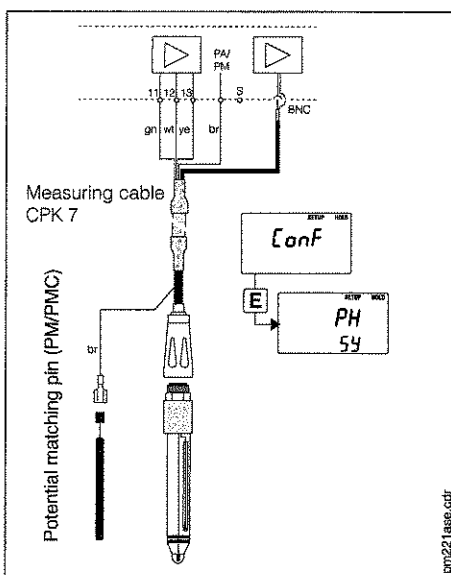


Fig. 4.8 Symmetrical high-impedance pH electrode connection

Special pH / redox measuring cables

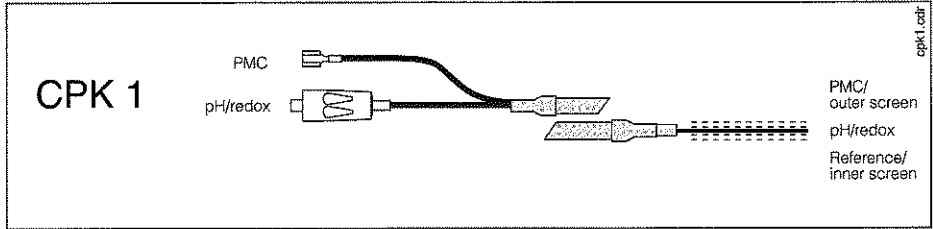


Fig. 4.9 Measuring cable CPK 1

Type: coaxial cable with dual screen, in PVC sheath, Ø 8 mm
Extension: SMK, order no. 50000589

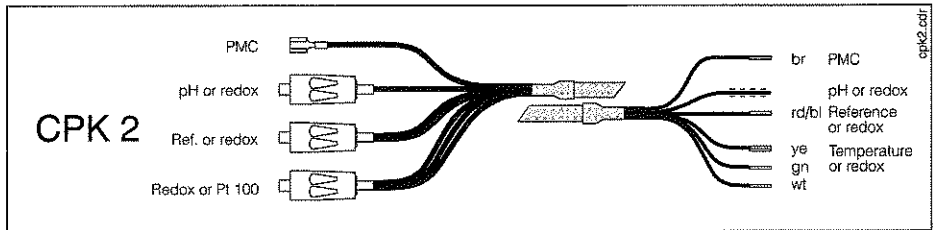


Fig. 4.10 Measuring cable CPK 2

Type: coaxial cable with 6 auxiliary cores and additional outer screen, in PVC sheath, Ø 12 mm
Extension: PMK, order no. 50005277

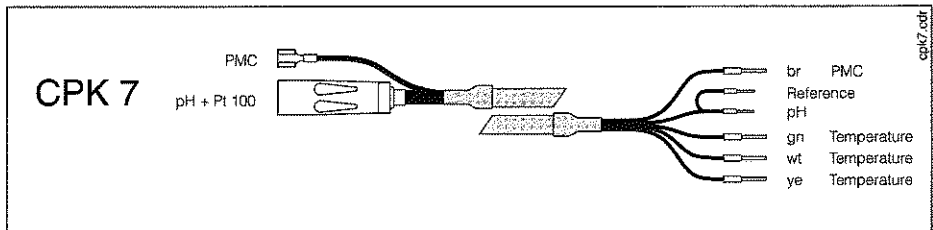


Fig. 4.11 Measuring cable CPK 7

Type: coaxial cable with 3 auxiliary cores and additional outer screen, in PVC sheath, Ø 7 mm
Extension: TCK, order no. 50041101

Cable preparation with cable CPK 1 and screwed BNC plug

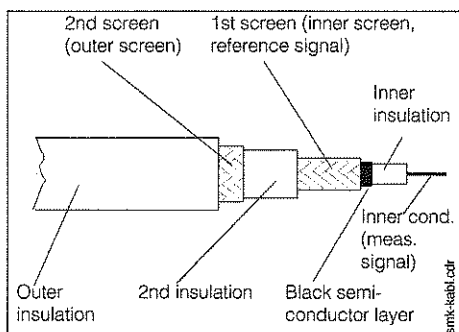


Fig. 4.12 Construction of CPK 1 cable
(CPK 1 = ready-made SMK cable)

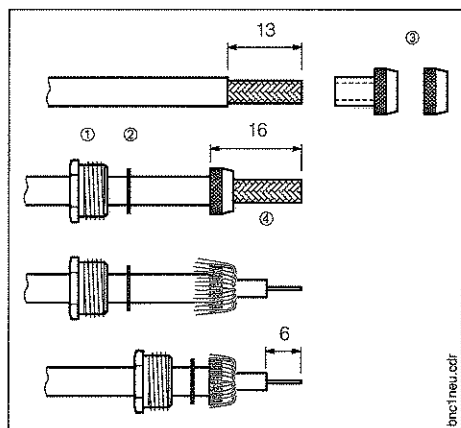


Fig. 4.13 Preparation of pH connecting cable for
installation in BNC elbow plug

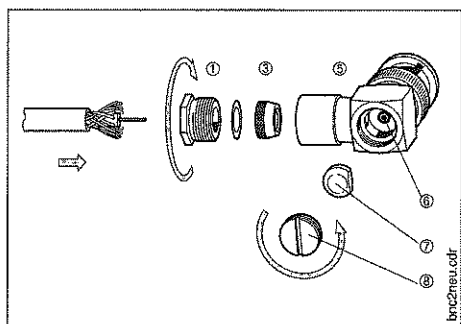


Fig. 4.14 Installation of prepared pH connecting
cable in BNC elbow plug

1: Strip CPK 1 cable approx. 60 mm and fold outer screen over outer insulation.

2: Insert cable gland (①) and washer (②) on cable, remove inner insulation (13 mm), then screw clamping ring (③) onto insulation. Please note: parts ① to ③ are supplied in versions for cable diameters of 3.2 mm and 5 mm.

3: Fold braided inner screen (④) over clamping ring.

4: Remove inner insulation (6 mm).



Caution:

The black semiconductor layer must be removed to the 1st screen (inner screen, reference signal) for connection!

5: Outer screen connection:

- Asymmetrical connection:
Solder 0.75 mm² litz wire (a) onto outer screen and wind with insulation tape. Then connect the litz wire (10 cm) to S.
- Symmetrical high-impedance connection:
Solder 0.75 mm² litz wire (a) onto outer screen and wind with insulation tape. Then connect the litz wire (10 cm) to terminal "PA / PM".

6: Slide BNC plug housing (⑤) over the cable (the inner conductor must be located in clamping notch (⑥) in the plug pin). Tighten cable gland (⑩). Clamp the inner conductor in the clamping notch by inserting clamping piece (⑦) and screwing on plug cover (⑧), thereby establishing the electrical contact between the inner conductor and the plug.

Connection accessories

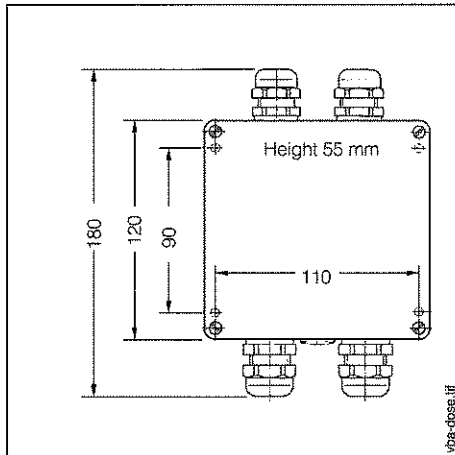


Fig. 4.15 Dimensions of junction box VBA

Junction box VBA

Junction box for connection cables over 20 m long between assembly and pH instrument with 4 Pg cable glands for cable entry and 10 high-impedance insulated screw terminals for single-core connection.

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

Material: plastic; protection class: IP 65

Order no.: 50005276



Caution:

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

4.5 Packaging and disposal

Packaging

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

Disposal



Note:

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

5 First start-up

5.1 Measures before first power-up

**Note:**

Familiarise yourself with the operation of the measuring instrument before switching it on for the first time!

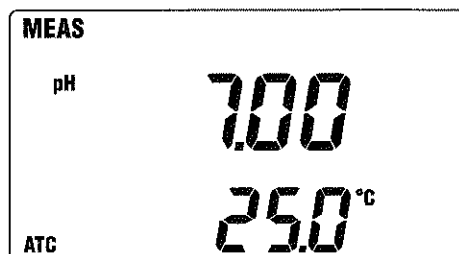
**Caution:**

Before power-up, check that all connections have been properly made!
Make sure that the pH electrode is in the medium to be measured or a buffer solution. This ensures that a plausible value will be displayed.
In the case of configurations with potential matching, make sure that the pin contacts the medium or buffer solution.

**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 Power-up, factory settings



After power-up, the instrument performs a self-test and then starts up in the measuring mode. If the display is similar to figure 5.1, the instrument is functioning properly.

The measured values shown on the display may be different.

Now the instrument can be configured and calibrated.

Fig. 5.1 Display after power-up and completion of self-test

The following factory settings are active when the instrument is powered up for the first time:

Type of measurement	pH measurement, symmetrical
pH electrode characteristic offset	0 pH
Temperature compensation	automatic
Limit for controller 1	pH 4.00 (redox: -500 mV or 10.0%)
Limit for controller 2	pH 10.00 (redox: +500 mV or 90%)
Controller type 1	Limit contactor, minimum contact (activated when value drops below limit 1)
Controller type 2	Limit contactor, maximum contact (activated when limit 2 is exceeded)
Current output 0 / 4 ... 20 mA	4 ... 20 mA
pH value for 4 mA signal current	pH 2
pH value for 20 mA signal current	pH 12



Note:

Refer to chapters 7.1 to 7.7 for all other factory settings.

5.3 First configuration and calibration

The measuring transmitter Liquisys CPM 221 is pre-configured as a pH measuring instrument. If it is to be operated as a redox instrument, its configuration must be changed as described in chapter 7.6 before the first calibration.

Then calibrate the measuring instrument as described in chapter 7.7.

Make any additional changes to the instrument settings as needed for your particular application.

The following table will help you locate the corresponding chapter in this manual.

Chapters relevant to the configuration and calibration of the measuring transmitter	
Electrode connection (symmetrical / asymmetrical)	☞ chapter 7.6
Configuration for pH measurement / redox measurement	☞ chapter 7.6
Calibration of measuring transmitter	☞ chapter 7.7
Selection of temperature compensation	☞ chapter 7.2
Controller configuration	☞ chapter 7.4
Limit contactor configuration	☞ chapter 7.3
Current output configuration	☞ chapter 7.5
Alarm delay setting	☞ chapter 7.6

5.4 Test

If the instrument proceeds into measurement mode after power-up and completing the self-test, it is working properly.

In order to check the alarm function as well as any connected alarm signalling device, the current supply can be interrupted for a moment. All configuration data will be maintained.

The controller relays can be operated manually for function checks, maintenance work, etc. See chapter 6.6, Auto / manual mode of operation.

6 Operation

6.1 Operator interface

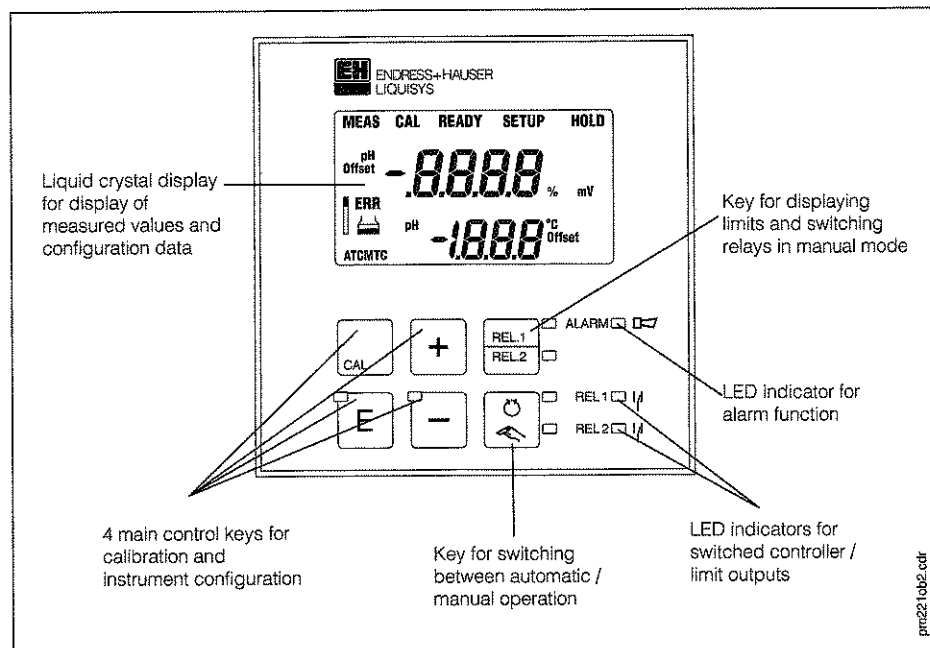








Fig. 6.1 Operating elements of Liquisys CPM 221

6.2 Display elements

LED indicators

- ☐ REL.1 ☐ Indication for relay controlled in "manual" mode (red LED).
- ☐ REL.2 ☐
- ☐  ☐ Indication for "auto" (green LED) or "manual" (yellow LED) mode.
- ☐  ☐

- REL.1 ☐  Indicates the status of relays 1 and 2.
- REL.2 ☐  LED green: measured value is within permissible limits, relay is inactive.
- REL.2 ☐  LED red: measured value is outside of permissible limits, relay is active.

- ☐  Alarm indication for continuous limit violation, temperature sensor failure, AD converter overflow or system errors.

Liquid crystal display

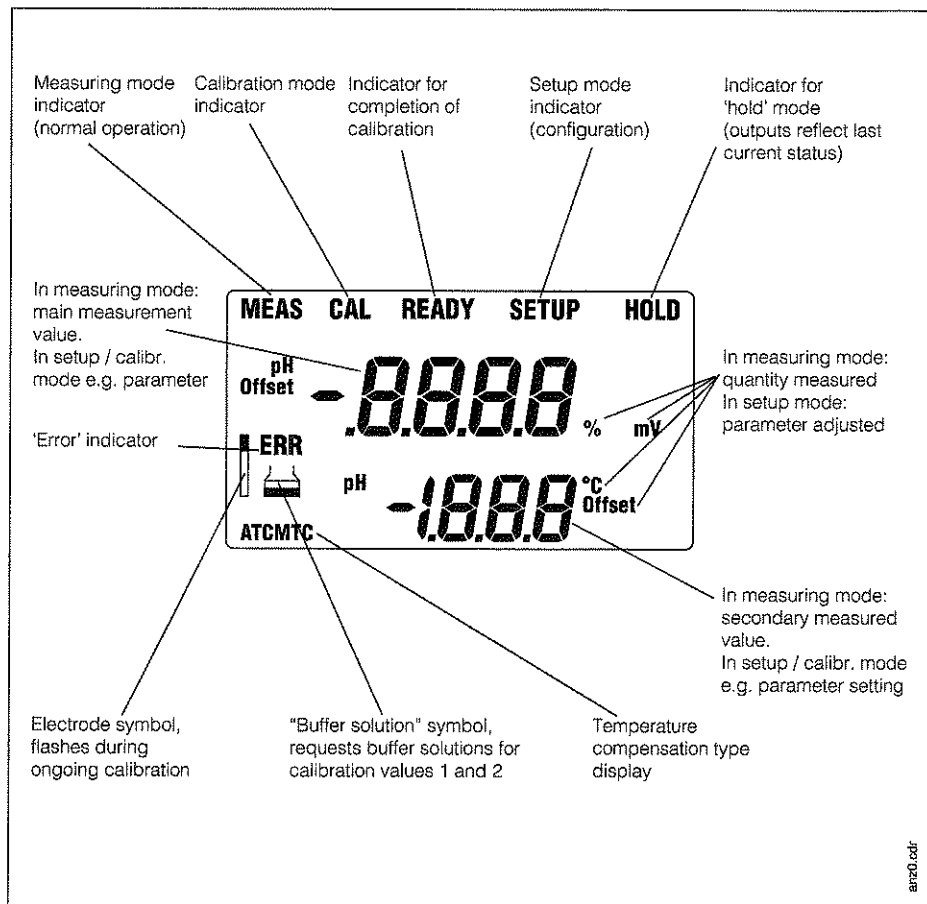


Fig. 6.2 Liquid crystal display of Liquisys CPM 221

6.3 Key functions



Quick calibration

After pressing the CAL key and entering the calibration code (11), the instrument shows the display for the first calibration step. The CAL key is further used for controlling the entire calibration.



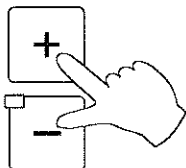
Setup

After pressing the E key and entering the setup code (22), the instrument switches to the setup mode. The E key is further used for:

- selecting the individual functions in setup mode
- saving the data entered in setup mode
- starting calibration



In measuring mode: Relay operation in "manual" mode.
In setup mode: Setting of parameters and numerical values (the setting speed increases when the key is held down).



Note:

Push both keys simultaneously to return to the measuring mode.



- Displays the limits set for the relays in "auto" mode,
- switches between relay 1 and relay 2 in "manual" mode.



- Toggles the relays between the "auto" and "manual" modes.

6.4 Operating concept

Operating modes

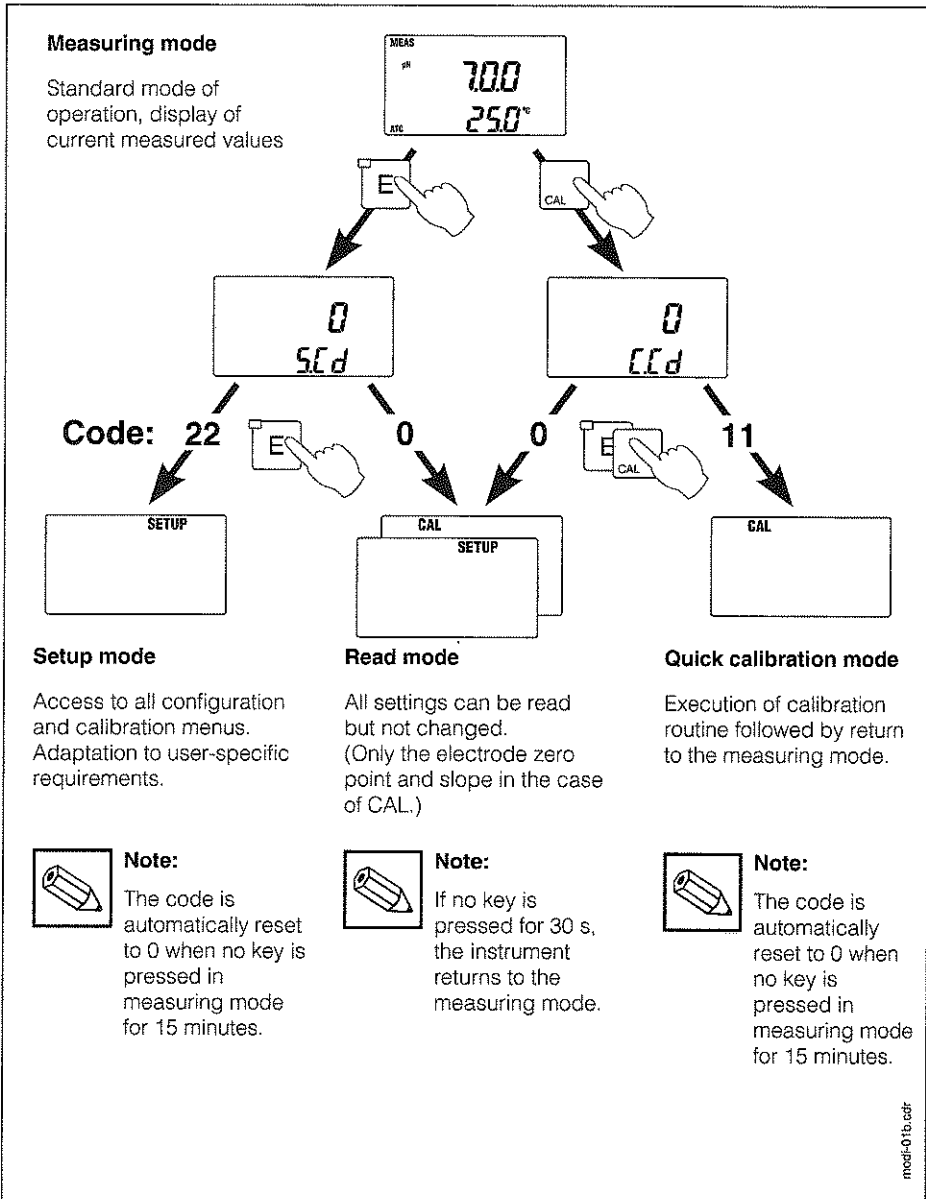


Fig. 6.3 Description of the four operating modes

Menu structure

The configuration and calibration functions are arranged in a menu structure by function groups.



Note:

See the fold-out back page of these operating instructions for an overview of the Liquisys menu structure.

- The function groups are selected in the setup mode with the '+' and '-' keys.
- The 'E' key is used to move from one function to the next within a function group.
- The '+' and '-' keys are used for option selection and editing.
Selections must be confirmed by pressing the 'E' key.
- Pressing the '+' and '-' keys at the same time terminates programming and accepts the changes made.



Note:

If a change is made but not confirmed by pressing the 'E' key, the previous setting is retained.

Changes outside the permissible adjusting range are rejected.

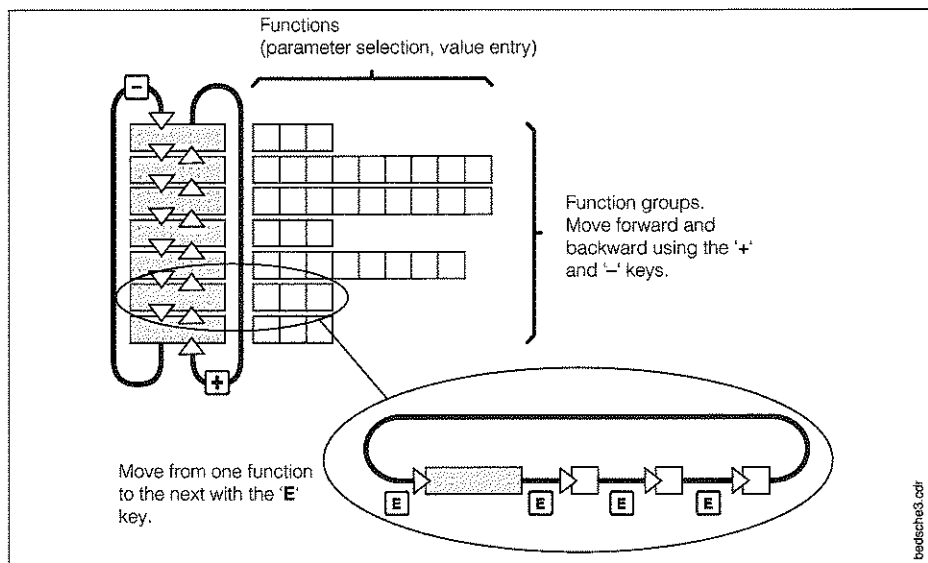


Fig. 6.4 Schematic representation of Liquisys menu structure

Hold function: "freezes" the outputs

The current output is „frozen“ in the setup mode and during quick calibration, i.e. the last current value is constantly output. The display shows the „HOLD“ message. During automatic operation, all contacts will go to their normal positions. Any alarm delay accumulated will be reset to '0'. This function can also be activated externally via a contact input (see chapter 4.4, „Connection“).


Note:

If the hold function is to remain active even after a power failure, the hold contact input is to be used.

6.5 Operation example

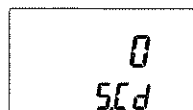

Note:

Please refer to menu structure on fold-out back page.

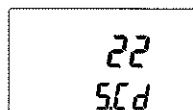
Supposing the limit value for controller output 2 were to be set to 12 pH as the switching point using the min. function, you would proceed as follows:



Select the "SetupCode" field (S.Cd = Setup Code).



Enter code 22 to access the configuration mode.



Confirm the code.

The instrument is now in setup mode, and the first function group is selected ("OFS" = Offset). The hold function is active.



Select the "setpoint 2" function group (SP 2 = setpoint 2).





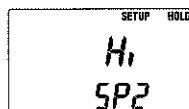
Select the „setpoint entry" function.



Change the setting, e.g. from 10 pH to 12 pH.



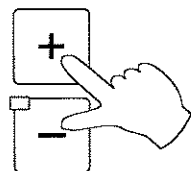
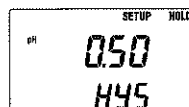
Confirm the entry.
The instrument advances to the next function.



Change the factory setting of
"Hi" (upper limit = Max Function) to
"Lo" (lower limit = Min Function).



Confirm the setting.
The instrument advances to the next function
(HYS = hysteresis setting).

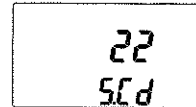


Return to the measuring mode by pressing
the '+' and '-' keys at the same time.
The hold function is deactivated.

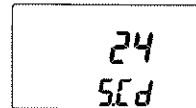




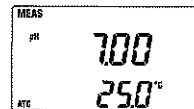
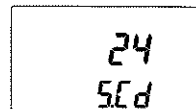
Select the „Setup Code“ field.



Change the code
(to any number) to block the access to the configuration function.



Confirm the (blocking) code entry.
The instrument returns to the measuring mode.



6.6 Auto / manual mode of operation



Automatic operation

In this mode of operation, the relays are controlled by the measuring transmitter.



- ☐ The limit settings can also be displayed in the measuring mode with the relay shift key.
- ☐ When this key is pressed, limit 1 is displayed for 2 seconds, then limit 2 for another 2 seconds. Then the display reverts to the current measured value.



Switching to manual operation

The instrument is switched to the manual mode by pressing the Auto / Manual key.
In this mode, the relays are switched manually.
Press the "REL. 1 / REL. 2" key to toggle between the relays.

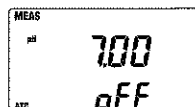


Note:

- The manual mode must be enabled by entering setup code "22".
- The current operating mode setting is retained even in the event of a power failure.
- The manual mode has precedence over an external hold request.

Relay operation

Depending on the controller type selected, the relays can be controlled with the '+' and '-' keys. The current status or value is shown on the second display line.



Limit contactor:

The limit contactor is switched on with the '+' key and switched off with the '-' key. The relay status remains in effect until changed.



Pulse length controller:

The keys change the duty cycle (and thus the ON period) from 0 ... 100% of the preset period, e.g. to manually control a solenoid valve.

The ON time is increased with '+' and decreased with '-'.



Note:

The minimum relay ON time is 100 ms.



Pulse frequency controller:

The keys change the pulse frequency from 0 to the maximum frequency entered in the controller configuration (see chapter 7.4). This controller type can be used, for example, to manually control a solenoid-operated dosing pump.

The frequency is increased with '+' and decreased with '-'.

7 Instrument configuration

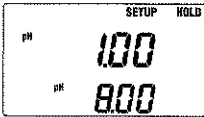
7.1 Offset adjustment *OFS*

This function group is used to change the offset and thus shift the electrode characteristic (pH only). The setting range is approx. ± 2 pH at 25 °C.

The current measured value is displayed.


Note:

This function group is not displayed during redox operation.

Field	Selection / range	Display	Info
Sets the offset value in pH. The measured value is displayed. (OFS = offset)	± 2 pH relative to measured value displayed Default: 0 pH		The offset value is not reset during calibration.


Note:

When an offset has been entered, this is indicated by the "Offset" display element in the measuring mode.





7.2 Selection of temperature compensation *Set °C*

This function group is used to select the temperature compensation and to calibrate the Pt 100 sensor.



Note:

This function group is not displayed during redox operation.

Field	Selection / range	Display	Info
Switches the automatic temperature compensation ATC on or off (pH measurement only). (on ATC = ATC switched on) (oFF ATC = ATC switched off)	on ATC oFF ATC Default: on		
Entry of a process temperature value for manual temperature compensation. (P.°C = process temperature)	-9.9 ... 125 °C Default: 25 °C		MTC operation. Not displayed for ATC operation
Entry of a calibration temperature value for manual temperature compensation. (C.°C = calibration temperature)	-9.9 ... 125 °C Default: 25 °C		MTC operation. Not displayed for ATC operation
Adapts the Pt100 signal by an offset value (when using various quality classes). The actual measured value is shown on the second display line.	-5 ... +5 °C relative to absolute value (ATC only) Default: 0 °C		Not displayed for MTC operation



Note:

When switching between manual and automatic temperature compensation (on Atc / oFF Atc), the temperature offset is reset to the default value (0 °C).

7.3 Limit contactor configuration SP 1, SP 2



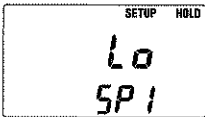

These function groups are used to configure the limit parameters.




Programming for limits 1 and 2 is identical; therefore both function groups are covered by this description.



Note:

If the controller function is disabled in the "Controller" function group, the "Setpoint 1" and "Setpoint 2" function groups are not displayed.

Field	Selection / range	Display	Info
Entry of limit for controller 1/2 in pH / mV / % (SP1 = setpoint 1 = limit 1) (SP2 = setpoint 2 = limit 2)	0 ... 14 pH -1000 ... 1000mV 0 ... 100.0 % Default: limit 1: 4.00 pH / -500 mV / 10.0 % limit 2: 10.00 pH / +500 mV / 90.0 %	 	
Determines the contact function (Lo = MIN contact, activated when value drops below limit) (Hi = MAX contact, activated when limit is exceeded) (SP 1 / 2 = setpoint 1 / 2)	Lo Hi Defaults: Setpoint 1: Lo Setpoint 2: Hi	 	All combina- tions of the two contacts, Lo/Lo, Lo/Hi, Hi/Lo and Hi/Hi, can be selected

Field	Selection / range	Display	Info
<p>Determines the hysteresis for limit contactor 1 / 2 in pH / mV / %.</p> <p>MAX function: the contact is activated when the limit is exceeded and deactivated when the value drops below the limit minus hysteresis.</p> <p>MIN function: the contact is activated when the value drops below the limit and deactivated when the value exceeds the limit plus hysteresis.</p> <p>(HYS = hysteresis)</p>	<p>0.1 ... 1 pH 10 ... 100 mV 1 ... 10.0%</p> <p>Default: pH: 0.5 pH mV: 50 mV %: 5.0 %</p>		
<p>Sets the pickup delay for contact 1 / 2 when used as a limit contactor (On.d = On delay = pickup delay)</p>	<p>0 ... 2000 s</p> <p>Default: 0 s</p>		
<p>Sets the dropout delay for contact 1 / 2 when used as a limit contactor (OF.d = Off delay = dropout delay)</p>	<p>0 ... 2000 s</p> <p>Default: 0 s</p>		

7.4 Controller configuration *Entr*

This function group is used for controller configuration. These settings affect both controllers.

General notes on setting the controllers

The relays of the Liquisys CPM 221 measuring transmitter can be configured to function as a limit contactor or as a proportional controller.

- Limit contactor:
The relay in question is either picked up or dropped out continuously.
- Proportional controller:
The relay in question outputs a pulsed signal that increases in intensity the more the measured value deviates from the setpoint, until the signal reaches the maximum intensity.

Two types of proportional controllers can be distinguished by the signal pulse they output:

- **Pulse length controller:**
Far from the setpoint, the relay is picked up for a longer time. Close to the setpoint, the relay is picked up for a shorter time. The period can be set. Pulse controllers serve to control solenoid valves.
- **Pulse frequency controller:**
Far from the setpoint, the pulse frequency is higher. Near the setpoint, the frequency is lower. The maximum frequency can be set. Pulse frequency controllers serve to control solenoid-operated dosing pumps.



Note:

When setting the pulse length controller, the period can be adjusted from 0.5...20 s. The minimum relay ON time is 100 ms.
When setting the pulse frequency controller, the maximum frequency is 120 $\frac{1}{\text{min}}$.

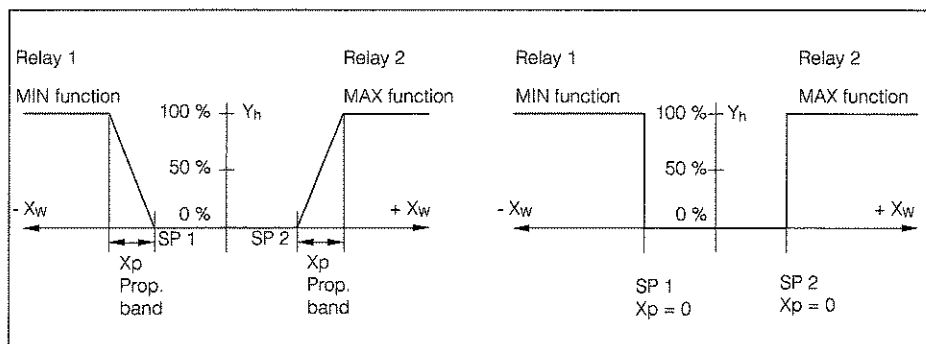


Fig. 7.1 Control characteristics of a proportional controller (left) and a limit contactor (right)

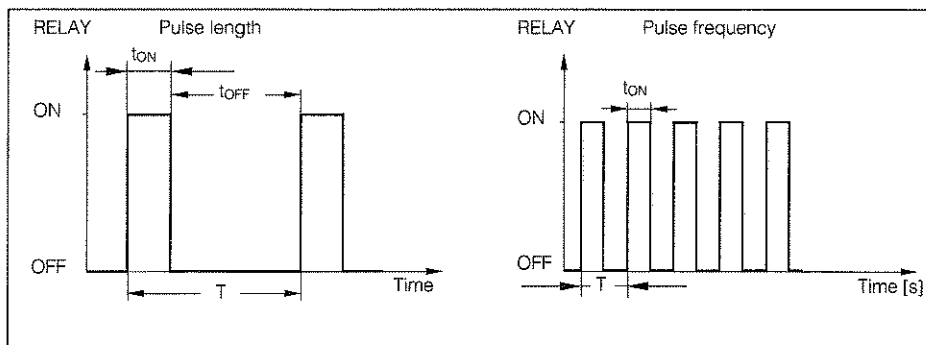

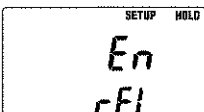

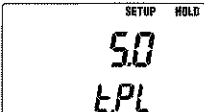








Fig. 7.2 Control characteristics of a pulse length controller (left) and pulse frequency controller (right)

Field	Selection / range	Display	Info
<p>Determines the controller type for controller / limit contactor 1 / 2</p> <p>(tYP = controller type) (oFF = controller off) (L.Ct = limit contactor) (PLC = pulse length controller) (PFC = pulse frequency controller)</p>	<p>oFF L.Ct PLC PFC</p> <p>Default: L.Ct</p>		<p>If oFF is selected, the following functions are not shown.</p>
<p>Toggles between normally closed and normally open function</p> <p>(rEL = relay function) (dEEn = deenergized, normally closed contact) (En = energized, normally open contact)</p>	<p>dEEn En</p> <p>Default: dEEn</p>		<p>If L.Ct is selected, the following functions are not shown.</p>
<p>Determines proportional band Xp for controller 1 / 2 in pH / mV / %</p> <p>(PrP = proportional band)</p>	<p>10 ... 500 % of MR</p> <p>Default: 100 %</p>		<p>See above</p>
<p>Determines the period (in %) or max. frequency (in 1/min), depending on the controller type</p> <p>(t.PL = period length) (F.PF = max. frequency)</p>	<p>(Period for pulse length controller 0.5 ... 20 s) Default: 10 s</p> <p>(Max. frequency for pulse frequency controller 60 ... 120 1/min) Default: 60 1/min</p>	 	<p>See above</p>

7.5 Current output measuring range selection *ring*

This function group is used to determine the measuring range for the current output.

Field	Selection / range	Display	Info
<p>Toggles the lower limit of the current output between 0 and 4 mA</p> <p>(out = current output)</p>	<p>0 – 20 4 – 20</p> <p>Default: 4 – 20 mA</p>		
<p>Entry of pH or redox value for 0 or 4 mA (depending on setting for lower limit).</p> <p>Caution! Fixed settings for redox-%:</p> <p>0 % = 0 / 4 mA 100 % = 20 mA (r. 0 = value for 0 mA at 0-20 mA) (r. 4 = value for 4 mA at 4-20 mA)</p>	<p>pH measurement: 0 ... 14</p> <p>Default: 2 pH</p> <p>Redox-mV measurement: -1000 ... +1000 mV</p> <p>Default: -1000 mV</p>	 	<p>The difference to the value at 20 mA must be at least 1 pH or +/- 50 mV.</p>
<p>Entry of pH or redox value for 20 mA.</p> <p>Caution! Fixed settings for redox-%:</p> <p>0 % = 0 / 4 mA 100 % = 20 mA</p> <p>(r.20 = value for 20 mA)</p>	<p>pH measurement: 0 ... 14 pH</p> <p>Default: 12 pH</p> <p>Redox-mV measurement: -1000...+1000 mV</p> <p>Default: +1000 mV</p>	 	<p>The difference to the value at 0 / 4 mA must be at least 1 pH or +/- 50 mV.</p>



Note:

Falling assignments are possible (e.g. 4 mA → 12 pH, 20 mA → 6 pH); the pH difference must be at least Δ1 pH.

If the value falls outside of the display range of -2 ... 16 pH, the message 'UR' (Underrange) or 'OR' (Overrange) appears.


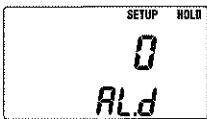

7.6 General instrument configuration *Conf*



This function group is used for general instrument configuration settings.



Warning:

All user settings are lost if the instrument is reset to the factory default settings!
This includes the settings in the other function groups!

Field	Selection / range	Display	Info
Configuration of measuring transmitter for pH, redox-% or redox-mV measurement. Sets the pH input to symmetrical or asymmetrical. (PH = pH transmitter) (OrP = redox-% transmitter) (OrP+mV = redox-mV transm.) (SY = symmetrical) (ASY = asymmetrical)	PH + SY PH + ASY OrP + % + SY OrP + % + ASY OrP + mV + SY OrP + mV + ASY Default: PH + SY		
Determines the alarm delay between the violation of a limit and the activation of the alarm relay. (Al.d = alarm delay)	0 ... 2000 s Default: 0 s		
Defines the alarm relay as a steady or fleeting contact. (StdY = steady contact) (FLEt = fleeting contact) AL.C = alarm contact)	StdY FLEt Default: StdY		Closing time for "fleeting contact" is 1 s.

Field	Selection / range	Display	Info
<p>Sets the electrode type to glass or antimony.</p> <p>This field is not available in the redox mode.</p> <p>(GLAS = glass electrode) (AntY = antimony electrode) (EL = electrode)</p>	<p>GLAS</p> <p>AntY</p> <p>Default: GLAS</p>		<p>After each change, the factory calibration data for zero and slope are restored.</p> <p>Recalibration is mandatory!</p>
<p>Use this function to restore the factory settings for all functions.</p> <p>(no = do not restore) (YES = restore) (dEF = default = factory settings)</p>	<p>no</p> <p>YES</p> <p>Default: no</p>		<p>Warning: All user settings will be overwritten by the factory defaults!</p>

7.7 Calibration of measuring transmitter *CAL PH*

This function group is used to calibrate the measuring transmitter. The correct calibration routine appears depending on whether the instrument is configured as a pH or redox measuring transmitter.



Caution:

If the calibration is aborted after the first of two values (return to the measuring mode) or if the calibration is faulty, the calibration data will continue to be used. A calibration error is indicated by an "ERR" and a flashing electrode symbol on the display. Repeat the calibration!



Note:

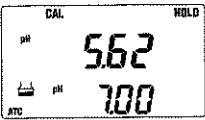

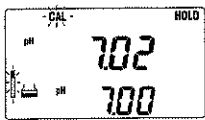


Calibration errors can have two causes:

- The measured value signal is unstable.
- Buffer solution used up: Replace the buffer solution with a fresh one.
- Electrode too old or damaged: A log with the data for the zero point and slope in mV/pH kept by the user continuously for each calibration provides information on electrode ageing.

If the slope of a glass electrode is below 38 mV/pH or if the slope of an antimony electrode is below 25 mV/pH, the electrode must be checked and replaced if necessary.

pH calibration

During the calibration with manual temperature compensation, the instrument automatically switches from the preset process to the calibration temperature. The instrument switches back to the process temperature upon leaving the "Calibration" function group (refer to chapter 7.2 for setting the two temperature values).

Description	Display	Info
Calibration with buffer 1		
The +/- keys can be used to adjust the buffer value. The value is shown on the lower display line.		The previously set buffer value is reused for the next calibration.
Place the electrode in the buffer. When working with ATC, the temperature sensor must also be immersed in the buffer solution.		In the case of symmetrical high-impedance measurement, a connection between the potential matching connector and the buffer must also be established, e.g. with a wire.
Start the calibration by pressing the 'E' or 'CAL' key. The electrode symbol and 'CAL' start flashing on the display.		
The value is accepted as soon as it is stable or confirmed by pressing the 'E' or 'CAL' key. Repeat the procedure with the other buffer solution to calibrate value 2.		A calibration error produces the „ERR" message. Repeat the calibration or exit the function group in this case.
Calibration with buffer 2 (like buffer 1)		
After completing the calibration, the values for electrode slope and zero point are displayed. To display these values without calibration, select the Calibration function group with the code „0".	 <p>Defaults: 59.1 mV/pH 7.00 pH (glass) 1.00 pH (antimony)</p>	The values for the slope in mV / pH and the zero point in pH (referred to 25°C) are determined anew during each calibration. In the case of the quick calibration, the instrument immediately switches to the measuring mode after calibration.

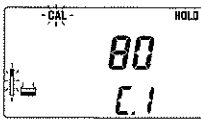
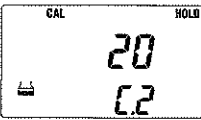
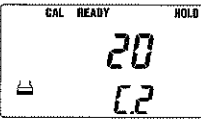
Redox - % calibration

For calibration, medium samples are placed in two containers. The contents of the first container is detoxified. The contents of the second container remains unchanged.



Note:

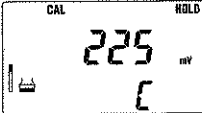
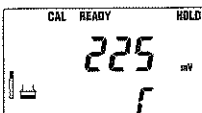
The calibration range is ± 1000 mV, the minimum difference 60 mV.

Description	Display	Info
<p>The "toxic" sample is used to set a relative value of 80 %.</p> <p>The "non-toxic" sample is used to set a relative value of 20 %.</p> <p>Default values: 0% = -1000 mV 100 % = +1000 mV</p>		<p>Potential matching is required for symmetrical measurement. (C.1 = 80% calibration value) (C.2 = 20% calibration value)</p>
<p>Start the calibration by pressing the 'E' or 'CAL' key. The electrode symbol and 'CAL' start flashing on the display.</p>		<p>The % value to be calibrated is displayed.</p>
<p>The value is accepted as soon as it is stable or confirmed by pressing the 'E' or 'CAL' key. Repeat the procedure with the "toxic" sample to calibrate value 2.</p>		<p>A calibration error produces the „ERR" message. Repeat the calibration or exit the function group in this case.</p>
<p>The completion of calibration is indicated by the display element "READY".</p>		<p>In the case of the quick calibration, the instrument automatically returns to the measuring mode.</p>

Redox - mV calibration

The measuring instrument has a calibrated mV display range. An absolute mV value is set with a single buffer solution (adaptation of measuring chain offset). A buffer solution chosen by the user, preferably for 225 or 475 mV, is used.

The maximum permissible calibration offset is ± 200 mV.

Description	Display	Info
Place the electrode in the selected buffer solution. The '+' and '-' keys can be used to set the exact mV value. Accept with 'E'. Default: mV factory calibration value		Potential matching is required for symmetrical measurement. (C = calibration value.) In the case of the quick calibration, the instrument automatically returns to the measuring mode.
The completion of calibration is indicated by the display element "READY".		In the case of the quick calibration, the instrument automatically returns to the measuring mode.



Caution:

Only one buffer solution is required for calibration in the redox - mV operating mode. Any attempt to use two buffer solutions during calibration will inevitably result in faulty calibration data!

8 Diagnostics

**Warning:**

Alarm signalling devices must have an independent power supply to permit alarm signalling in the event of a power failure!

8.1 Alarm

An alarm condition exists when the measured value

- exceeds the upper limit or
 - stays below the lower limit
- for a period which exceeds the alarm delay setting.

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed

8.2 Errors

Editing error

If values outside of the permissible value range are entered when editing a configuration setting, the "ERR" symbol on the display flashes briefly.

Temperature error

A temperature error is signalled when

- the temperature sensor cable is defective, or
- when a temperature is measured that lies outside the measuring or ATC range.

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed
- Symbol "ERR" is displayed
- Symbol "ATC" flashes on the display

**Note:**

Temperature error monitoring only takes place when the temperature measurement is enabled.

System errors

Internal communication errors lead to the display of a system error. The message "Err." and a one-digit error code flash on the main parameter display field.

- 1: EEPROM error
- 2: Internal communication error

Effect:

- Alarm LED is on
- Alarm contact (41 / 42) is closed
- Hold function is activated

If the system error cannot be eliminated by switching the power supply to the instrument off and back on, the instrument must be sent to the competent Endress+Hauser sales agency for servicing.

Error message in the event of AD converter overflow

Effect:

- Symbol "ERR" is displayed
- Alarm LED is on
- Alarm contact (41 / 42) is closed

To eliminate the error, check calibration, offset setting and measuring input wiring.

8.3 Possible faults in measuring mode and remedy

Cause	Analysis / remedy
Measuring chain zeropoint cannot be adjusted	
Reference system poisoned or diaphragm blocked	Connect another combination electrode or reference electrode; possibly clean or grind down diaphragm.
Measuring line open	In the case of a short circuit at the BNC input socket or the instrument input terminals, the zero point (pH 7) should be adjustable. The symmetrical measurement also requires a potential matching connection.
Electrode asymmetry voltage excessive	When the input terminals are short-circuited, the zero point should be adjustable. Clean the diaphragm or connect a new electrode.
Grounding error, e.g. potential matching despite asymmetrical connection, or no potential matching in case of symmetrical measurement	Check connection type and setting (symmetrical/asymmetrical). Perform measurement in a plastic container.
No slope	
Hairline crack in the spherical glass cap at the tip of the pH glass electrode	Replace electrode.
Shunt or short circuit in the measuring line or terminals	Check measuring line and terminals and replace if necessary.
Moisture in cable or electrode connector	Replace measuring cable or connector. Drying the cable is not sufficient!
No change in display value or creeping display, slope adjustment impossible	
Electrode glass membrane extremely soiled or grease deposition	Connect another electrode; possibly clean or grind down diaphragm.
Creeping display due to ageing of glass electrode membrane	Try with another electrode or check slope with pH simulator.
Insulation damaged on / in assembly connection head or in measuring line	If possible, connect electrode directly to pH instrument or check with pH simulator.
Measuring amplifier resistance too low	Check with pH simulator.

Cause	Analysis / remedy
Stable but incorrect display value	
Measuring chain not immersed in medium or air cushion (foam) in flow assembly	Check calibration with buffer solution.
Short to ground in or on instrument	Zero can be adjusted when measuring buffer solution, but immediately drifts in a grounded medium. Test: immerse ground line in buffer solution.
Glass electrode broken; invisible hairline crack?	Replace electrode.
Measured values fluctuate	
Measuring cable subject to interference	Use measuring cable with dual screen (e.g. CPK 1 or CPK 2); possibly change line routing.
Diaphragm blocked	Clean diaphragm or use new electrode.
Electrode broken	Check electrode for visible damage; possibly replace electrode.
Unwanted potential in medium	Asymmetrical input: connect medium to protective earth (PE). Use symmetrical high-impedance input and connect potential matching pin.
Glass electrode broken; invisible hairline crack?	Replace electrode.
No potential matching with symmetrical high-impedance connection	Check connection of potential matching pin; connect if necessary.
Alarm message cannot be cleared	
Continuous violation of limit or temperature sensor defective	Check temperature sensor, electrode and connections. The alarm message cannot be cleared on the instrument! The alarm message is cleared automatically as soon as the cause of the alarm condition ceases to exist.

9 Maintenance and service

9.1 Cleaning

Use a soft cloth and soap solution to clean the front of the field housing and the membrane keyboard.

**Caution:**

Even if the instrument becomes very dirty (e.g. from paint or varnish) do not use aggressive cleaning agents such as thinner or acetone!

9.2 Repair

Replacing a blown fuse

Disconnect the instrument from the power source. Loosen the screw on the rear of the instrument and pull the plug-in unit out of the housing halfway. The fuse is located on the right board between the transformer and the rear of the instrument.

Further repairs

All further repairs may only be carried out directly by the manufacturer or through the Endress+Hauser service organisation. An overview of the Endress+Hauser service network can be found on the back cover of these operating instructions.

10 Appendix

10.1 Technical data

pH measurement

Measuring range (MR)	pH 0 ... 14
Display range	-2 ... +16 pH with indication of MR violation (upper / lower limit)
Measured value resolution	pH 0.01
Deviation of indication ¹⁾	max. 0.5 % of MR
Reproducibility ¹⁾	max. 0.2 % of MR
Reference temperature	+25 °C
pH offset range	±2 pH
Slope adjustment	
Glass	38.0 ... 65.0 mV / pH (nominal value 59.16 mV / pH)
Antimony	25.0 ... 65.0 mV / pH (nominal value 59.16 mV / pH)
pH signal input	
Input resistance for nominal operating conditions	> 1 x 10 ¹² Ω
pH signal output	
Current range	0 / 4 ... 20 mA
Measurement deviation ¹⁾	max. 0.75 % of MR
Load	max. 500 Ω
Output range	adjustable, minimum Δ 1 pH

Redox measurement

Display and measuring range	-1000 ... +1000 mV / 0 ... 100%
Measured value resolution	1 mV / 0.1 %
Deviation of indication ¹⁾	max. 0.5 % of MR
Reproducibility ¹⁾	max. 0.2 % of MR
Redox offset range	±120 mV
Redox signal input	
Input resistance for nominal operating conditions	> 1 x 10 ¹² Ω
Redox signal output	
Current range	0 / 4 ... 20 mA
Measurement deviation ¹⁾	max. 0.75 % of MR
Load	max. 500 Ω
Output range	
absolute (mV)	adjustable, minimum Δ 50 mV
relative (%)	fixed, 0 ... 100 %

Temperature measurement

Temperature sensor	Pt 100 (3-wire connection)
Measuring range / ATC range	-9.9 ... +125 °C
Measured value resolution	0.1 °C
Deviation of indication ¹⁾	max. 1.0 % of MR

¹⁾ Acc. to DIN IEC 746 part 1, for nominal operating conditions

Limit, controller and alarm functions**Limit contactor**

Pickup / dropout delay 0 ... 2000 s

Controller

Function (adjustable) pulse length / pulse frequency controller

Controller characteristic proportional

Proportional band 0 ... 500 % of upper range value

Adjustable period with pulse length controller 0.5 ... 20 s

Adjustable frequency with pulse frequency controller 60 ... 120 ¹/min

Hysteresis for switched contacts

pH / redox mV / redox % 0.1 ... 1 pH / 10 ... 100 mV / 1 ... 10.0 %

Alarm

Function (switchable) steady contact / fleeting contact

Alarm delay 0 ... 2000 s

Electrical data and connections

Voltage supply AC 24 / 100 / 115 / 200 / 230 V AC, +10 / -15 %

Frequency 48 ... 62 Hz

Current consumption max. 7.5 VA

Auxiliary voltage output

Output voltage 15 V +/- 0.6 V

Output current max. 10 mA

Contact outputs potential-free changeover contacts

Switching current

With ohmic load ($\cos \varphi = 1$) max. 5 A

With inductive load ($\cos \varphi = 0.4$) max. 3 A

Switching voltage max. 250 V AC, 30 V DC

Switching power

With ohmic load ($\cos \varphi = 1$) max. 1250 VA AC, 150 W DC

With inductive load ($\cos \varphi = 0.4$) max. 500 VA AC, 90 W DC

Signal output 0 / 4 ... 20 mA, galvanically separated

Isolation voltage, signal output max. 2500 V_{RMS}

pH / redox input BNC socket

Terminals plug-in terminal blocks, 3, 9 and 12 poles

Conductor cross section max. 2.5 mm²

Mains fuse fine wire fuse, medium, 250 V / 1 A

General technical data

Measured value display LC display, two lines, 4 and 3 1/2 digits, with status symbols

Electromagnetic compatibility (EMC)

Emission according to EN 50081-1

Immunity according to EN 50082-1

Nominal operating conditions

Ambient temperature 0 ... +50 °C

Relative humidity 10 ... 95 %, non-condensing

Voltage supply, AC 24 / 100 / 115 / 200 / 230 V AC +10 / -15 %

Frequency 48 ... 62 Hz

Limit operating conditions

Ambient temperature -10 ... +60 °C

Temperature for storage and transport -25 ... +65 °C

Physical data
Dimensions

Housing for panel mounting (H x W x D)	96 x 96 x 145 mm
Installation depth	approx. 175 mm
Field housing (H x W x D)	204 x 155 x 215 mm

Weight

Liquisys CPM 221 (housing for panel mounting)	max. 0.7 kg
Liquisys CPM 221 with field housing	max. 2.3 kg

Protection class

Liquisys CPM 221 (housing for panel mounting)	IP 54 (front) / IP 30 (housing)
Field housing	IP 65

Materials

Housing	polycarbonate
Front membrane	polyester, UV-resistant
Field housing	polycarbonate

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Display	Abbreviation for	Meaning	Page
ALC	alarm contact	Alarm contact	37
ALd	alarm delay	Alarm delay	37
AntY	antimony electrode	Antimony electrode	38
ASY	asymmetric	Asymmetrical electrode connection	37
Atc	automatic temperature compensation	Automatic temperature compensation	31
CLC	calibration °C	Calibration temperature	31
CL1	cal 1	Redox sample 1	40
CL2	cal 2	Redox sample 2	40
CL	calibration	Function group 'Calibration'	38
CLd	calibration code	Calibration code	24
Ctrl	controller	Function group 'Controller'	33
Conf	configuration	Function group 'Configuration'	37
dEEn	deenergized	Normally closed contact	35
dEF	default	Factory settings	38
EL	electrode	Electrode	38
En	energized	Normally open contact	35
FLEt	fleeting contact	Fleeting contact	37
FPF	frequency	Max. frequency	35
GLAS	glass electrode	Glass electrode	38
H₁	high	Upper limit	32

Display	Abbreviation for	Meaning	Page
HYS	hysteresis	Hysteresis	33
LCT	limit contactor	Limit contactor	35
Lo	low	Lower limit	32
no	no	Do not restore defaults	38
OFd	off delay	Dropout delay	33
off	off (controller / ATC)	Controller / ATC off	29, 31, 35
OFs	offset	Offset	30
on	on	Controller / ATC on	29, 31
OnD	on delay	Pickup delay	33
Or	over range	Display range exceeded	36
OrP	oxygen redox potential	Redox potential	37
out	current output	Current output	36
PFC	pulse frequency controller	Pulse frequency controller	35
PLC	pulse length controller	Pulse length controller	35
PtC	process °C	Process temperature	31
PH	pH	pH	37
PrP	proportional	Proportional band	35
r.0	range 0 mA	Value at 0 mA (0...20 mA)	36
r.4	range 4 mA	Value at 4 mA (4...20 mA)	36
r.20	range 20 mA	Value at 20 mA (0/4...20 mA)	36

Display	Abbreviation for	Meaning	Page
rEL	relay	Relay function	35
rng	range	Function group 'Measuring range'	36
SCd	setup code	Setup code	24
SEt °C	set temperature °C	Function group 'Temperature compensation'	31
SP 1	setpoint 1	Limit 1	32
SP2	setpoint 2	Limit 2	32
Stdy	steady	Steady contact	37
SY	symmetrical	Symmetrical electrode connection	37
tPL	period length (t)	Period	35
tYP	type	Controller type	35
Ur	under range	Value below display range	36
YES	yes	Restore defaults	38

Appendix

liquisys CPM 221 Menu structure

The display screens shown in this overview are examples and may be different during operation.

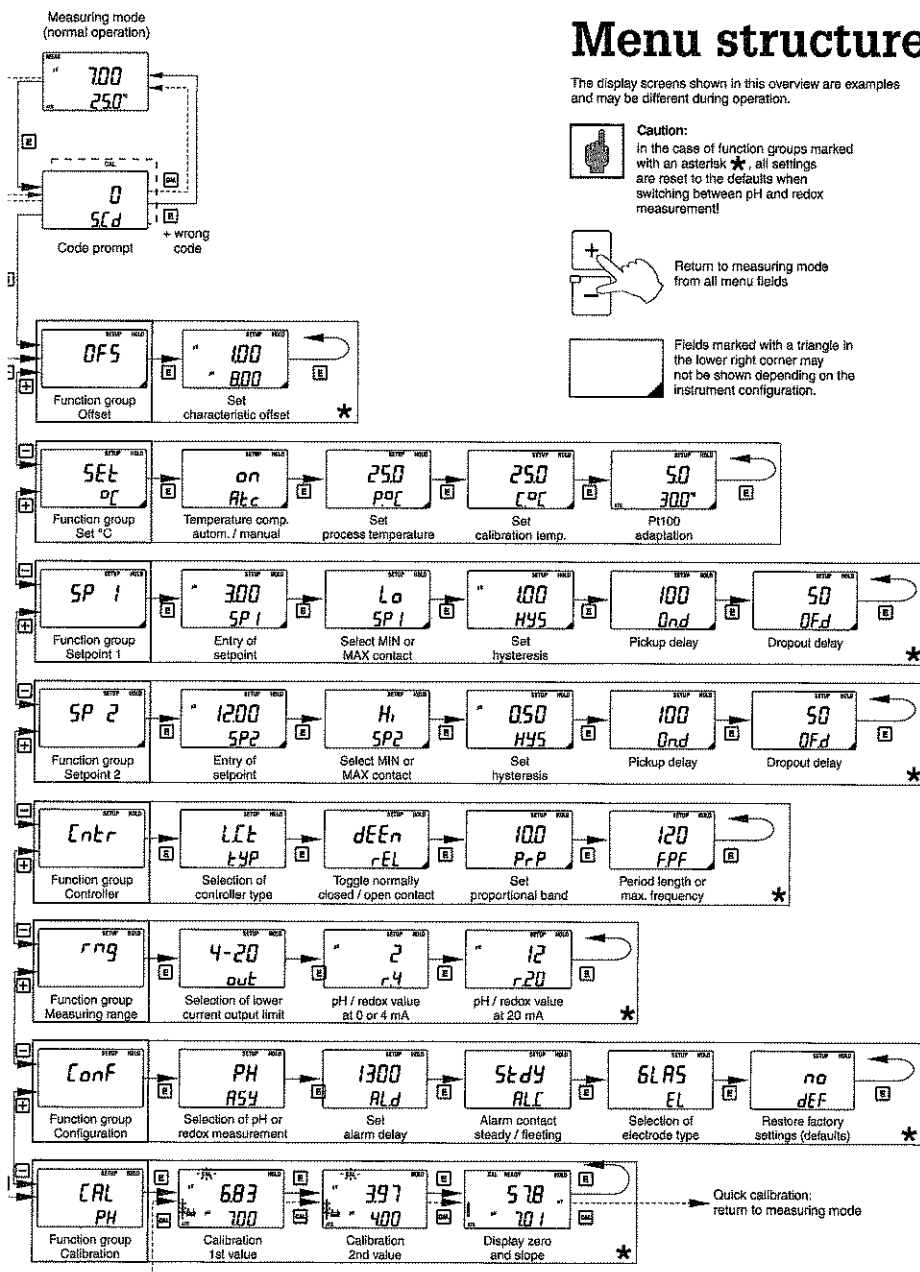


Caution:
In the case of function groups marked with an asterisk *****, all settings are reset to the defaults when switching between pH and redox measurement!



Return to measuring mode from all menu fields

Fields marked with a triangle in the lower right corner may not be shown depending on the instrument configuration.



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50077388

BA 140C/07/en/12.96
 Printed in Germany

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