CM42-MAA101EBE00
BA00382C/07/EN/16.16

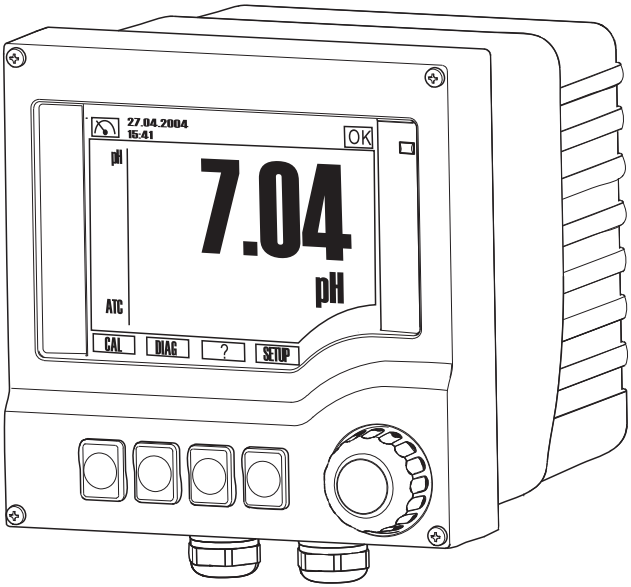
Valid as of:
Firmwareversion 02.02.00

Operating Instructions
Liquiline M CM42

Two-wire transmitter for pH/ORP measurement with Memosens glass sensors

Part 2

HART COMMUNICATION PROTOCOL



Endress+Hauser
People for Process Automation

Table of contents

1 Operation via the fieldbus

The device supports HART communication via current output 1. Here, digital data are transmitted in addition to the current. Most process control systems have HART inputs that can process the data further directly. Process values, the status of the process values and the device status are transmitted.

The device can also be configured via HART. The device driver enables access to the complete Setup and Diagnostics menu with few exceptions.
You have the following options for configuration:
- The process control system directly supports the use of DDs (Device Descriptions) and DTMs (Device Type Managers) or
- you use an additional HART master, e.g. a handheld terminal or FieldCare in conjunction with a modem.

The interface offered by the DDs and DTMs largely corresponds to the menu structure of local operation.
It is not possible to access all the tables and the calibration with DDs or DTMs. In addition, it is not possible to access the logbooks with a handheld terminal.

A detailed description of the commands and features supported by the device is provided in SD01325C under "Document/Manuals/Software" and then "Special Documentation (SD)" on www.endress.com/cm42.

2 Calibration and adjustment

The calibration provides important information on the condition of your sensor and the quality of the pH measurement.

pH glass electrodes
In addition to the slope that has an ideal value of approx. -59 mV/pH at 25 °C, the change in the zero point also provides important information to the user. It is an indicator of the condition of the gel-like layer of the pH glass and could point to a blockage in the reference system. Suitable maintenance would involve cleaning or regenerating the sensor.
To perform a quick test, simply immerse the sensor in a buffer solution with the same pH value as the internal buffer (e.g. pH 7). 0 mV would be an ideal value. The greater the deviation from the ideal value, the poorer the condition of the sensor (±20 mV is still acceptable in most situations).

2.1 Definitions

Calibration (as per DIN 1319):
A calibration is defined as a set of operations that establish the relationship between the measured value or expected value of the output variable and the related true or correct value of the measured variable (input variable) for a measuring system under specified conditions.
A calibration does not alter the performance of the measuring device.

Adjustment
An adjustment corrects the value displayed by a measuring device, in other words the measured/displayed value (the actual value) is corrected so that the reading agrees with the correct, set value.
The value determined during calibration is used to calculate the correct measured value and saved in the sensor.

2.2 Terminology

2.2.1 Zero point and slope

Using a mathematical function, the transmitter converts the input signal of the sensor y (raw measured value) to the measured value x. In many cases, this function is a simple linear of the form $y = a + b \cdot x$.
The linear element "a" is usually equivalent to the zero point and the factor "b" is the slope of the line and is often known as the sensor slope.

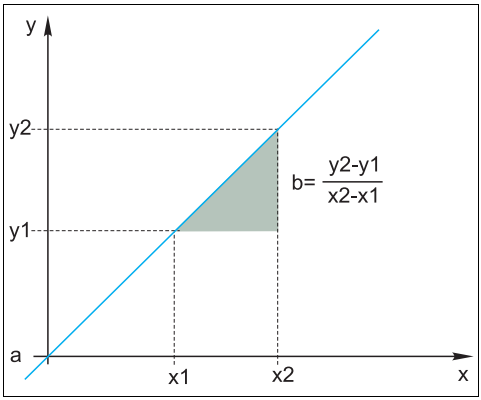


Fig. 1: Linear function

a Zero point
b Slope

The **Nernst equation**, which is used to calculate the pH value, is a typical linear relationship:

$$U_i = U_0 - \frac{2.303\ RT}{F}\ pH$$

pH = -lg(a_{H+}), a_{H+} ... activity of the hydrogen ions
U_i ... raw measured value in mV
U_0 ... zero point (=voltage at pH 7)
R ... universal gas constant (8.3143 J/molK)
T ... temperature [K]
F ... Faraday constant (26.803 Ah/mol)

The slope of the Nernst equation (-2.303RT/F) is known as the **Nernst factor** and has the value -59.16 mV/pH at 25 °C.

2.2.2 Delta slope

The device determines the difference in the slope between the calibration that is currently valid and the last calibration. Depending on the sensor type, this difference is an indicator of the condition of the sensor. The smaller the slope, the less sensitive the measurement, and the accuracy deteriorates particularly in the low measuring range.
Depending on the operating conditions, users can define limit values that represent the still tolerable absolute values of the slope and/or slope differentials. If the limit values are exceeded, maintenance must be performed on the sensor at the very least. The sensor must be replaced if the insensitivity problems persist after maintenance has been carried out.

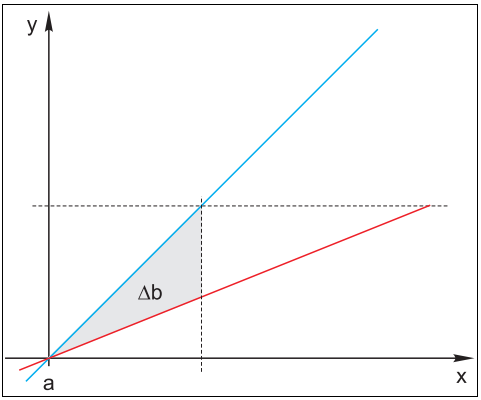


Fig. 2: Delta slope

Blue Last calibration
Red Calibration currently valid
Δb Delta slope

2.2.3 Delta zeropnt.

The device determines the difference between the zero points of the last and second-last calibration. A shift in the zero point does not alter the sensitivity of the measurement. However, if the offset is not corrected this can falsify the measured value.
As with the slope, you can also define and monitor limit values for the offset. If the limit values are exceeded, this means that maintenance must be performed on the sensor.

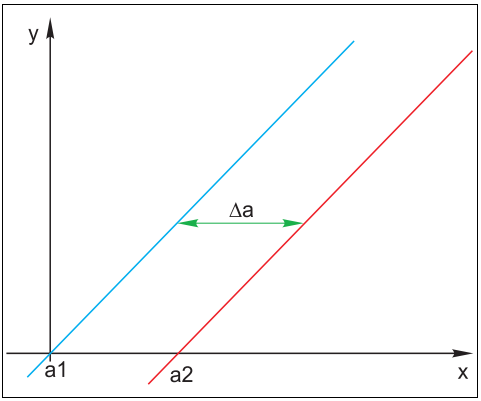


Fig. 3: Delta zeropnt.

a1 Zero point of the second-last calibration
a2 Zero point of the last calibration
Δa Delta zeropnt.

2.3 Notes on the calibration

The following rules apply for all parameters:
- Calibrate in a way that reflects conditions in the process.
  - If the process medium is constantly moving, also move the calibration solution accordingly (e.g. use a magnetic stirrer if calibrating in the laboratory).
  - If your medium is relatively stationary, calibrate in solutions that are also stationary.
- Make sure that the samples are homogeneous for reference measurements, sample calibration etc.
- Use the same menu settings as those in the process to perform the calibration.
  Example: If you automatically compensate for the temperature effect during pH measurement, switch on automatic temperature compensation for the calibration also.

It is advisable to perform the laboratory calibration using the "Memobase Plus" database software (→ "Accessories"). This improves the availability of your measuring points and all the calibration and sensor data records are stored securely in the database.

2.4 Calibration intervals

2.4.1 Specifying the intervals

The service life of a pH glass electrode is limited. This is due, in part, to the deterioration and aging of the pH-sensitive membrane glass. This aging causes the gel-like layer to change and become thicker over time.

Symptoms of aging include:
- Higher membrane resistance
- Slow response
- Decrease in the slope

A change in the reference system (e.g. due to contamination, i.e. unwanted redox reactions at the reference electrode) or electrolyte solution dissolving away in the reference half cell can change the reference potential, which, in turn, causes a zero point shift in the measuring electrode.
To ensure a high level of accuracy, it is important to readjust the pH sensors at set intervals. The calibration interval depends heavily on the area of application of the sensor, as well as the required level of accuracy and reproducibility. The calibration interval can vary between daily and once every few months.

Defining the calibration interval for the process

1. Check the sensor with a buffer solution, e.g. pH 7.
   ↳ Proceed as specified in Step 2 only if the value deviates from the set point. No calibration/adjustment is necessary if the value is within the defined deviation tolerance range (see the Technical Information for the sensor).
2. Calibrate and adjust the sensor.

3. After 24 hours, check again with the buffer solution.
   - If the deviation is within the permitted tolerance range, increase the checking interval by doubling it for example.
   - If the deviation is larger, you must shorten the interval.
4. Continue to proceed as defined in Steps 2 and 3 until you have identified the suitable interval.

Monitoring the calibration

▶ Define the limit values for monitoring the slope and zero point differentials (SETUP/Sensor pH/ORP/Sensor diagnostics/Diagnostic limits).

↳ These limit values depend on the process and must be determined by empirical means.

During calibration a diagnostics message is displayed if the defined warning limits have been exceeded. You then have to service the sensor by cleaning the sensor or reference, or by regenerating the glass membrane.

You have to replace the sensor if warning messages continue to be displayed despite the maintenance measure.

2.4.2 Monitoring the calibration interval

If you have established calibration intervals for your process, you can also have the device monitor them.

Two functions are available to monitor the calibration interval:

1. Calibration timer (SETUP/Sensor pH/ORP/Sensor diagnostics/Diagnostic limits/Calibration timer)

   ↳ You specify the calibration interval and the controller generates a diagnostics message once the set time has elapsed. You then recalibrate the sensor or replace it with a precalibrated sensor.

   The timer is reset with the new calibration.
2. Calibration validity (SETUP/Sensor pH/ORP/Sensor diagnostics/Diagnostic limits/Calibration expired)

   ↳ You set time limits to specify how long a calibration should be regarded as valid. Memosens sensors save all the calibration data. In this way it is easy to see whether the last calibration took place in the specified timeframe and is therefore still valid. This is particularly advantageous when working with precalibrated sensors.

2.5 Types of calibration

2.5.1 pH measurement

The following types of calibration are possible:
- Two-point calibration
  - With calibration buffers
  - Entry of data for the slope, zero point and temperature
- Single-point calibration
  - Entry of a reference value
  - Sample calibration with laboratory comparative value
- Temperature adjustment by entering a reference value

If using a combined sensor (CPS16D/CPS76D/CPS96D) you must calibrate both the pH electrode and the ORP electrode to get reliable rH values, for example.

2.5.2 Measuring the ORP

The following types of calibration are possible:
- Two-point calibration with medium samples (only ORP %)
- Single-point calibration with calibration buffer (only ORP mV)
- Data entry of an offset (only ORP mV)
- Temperature adjustment via reference value

2.6 Two-point calibration

2.6.1 General information

Two-point calibration is the preferred method for pH sensors, particularly in the following applications:
- Municipal and industrial wastewater
- Natural waters and drinking water
- Boiler feedwater and condensates
- Beverages

Calibrating with buffers with pH 7.0 and 4.0 is recommended for most applications.
Alkaline buffer solutions have the disadvantage that carbon dioxide from the air can alter the pH value of the buffer on the long term. If calibrating with alkaline buffers it is best to do so in closed systems, such as flow assemblies or retractable assemblies with a rinse chamber, to minimize the effect of air.

2.6.2 With calibration buffers

pH measurement

You use calibration buffers to perform two-point calibration. The quality buffers supplied by Endress+Hauser are certified and measured in an accredited laboratory. The

accreditation (DAR registration number "DKD-K-52701") confirms that the actual values and the maximum deviations are correct and traceable.

To calibrate the sensor, remove it from the medium and calibrate it in the laboratory. Since Memosens sensors save the data, you can always work with "precalibrated" sensors and do not have to stop monitoring the process to perform a calibration.

Only use calibration buffers once.

Measurement of the ORP in % (2-point cal.)

To obtain useful ORP % values, you must adapt the sensor to your process. This is achieved through two-point calibration. The two calibration points are characteristic of the most important states your medium can assume in the process.
You require two different compositions of your medium that represent the characteristic limits of your process (e.g. 20% and 80% value).
The absolute value in mV is not relevant for the ORP % measurement.

Measuring the ORP in % (data entry)

As an alternative to two-point calibration with medium samples, you can also define the two calibration points via data entry. To do so, use data pairs in mV and % for the two calibration points that represent the most important states of your process medium. Ideally, you will have determined the mV values with a reference measurement.

2.6.3 Entering data for the zero point, slope and temperature(only pH)

You enter the slope, zero point and temperature manually. The function for determining the pH value is calculated from these values. Thus, the data entry returns the same result as two-point calibration.

▶ You must determine the slope, zero point and temperature alternatively.

2.7 Single-point calibration

2.7.1 Numeric input of a reference value (1-point cal.)

pH measurement

Single-point calibration is particularly useful if the deviation of the pH value from a reference value, and not the absolute pH value itself, is of interest to the user. Applications for single-point calibration include:
- Process control
- Quality assurance

Fluctuations in the process value should not exceed ±0.5 pH and the process temperature must remain relatively constant. As the measuring range is limited as a result, it is possible to set the slope to -59 mV/pH (at 25 °C).
Alternatively, you can also use the "sample calibration". Here, you take a sample from the process and determine the pH value in the laboratory. In the case of the laboratory sample, you must make sure that the pH value is determined at the process temperature.

Measuring the ORP in mV

You enter the offset directly with this type of calibration. Use the measured value of a reference measurement, for example, to determine the offset.

2.7.2 Sample calibration (grab sample cal., only pH)

With this type of calibration, you take a sample of the medium and determine its pH value (at process temperature) in the laboratory. You then use this laboratory value to adjust the sensor. This does not change the slope of the calibration function.

2.7.3 With ORP buffers (only measurement of the ORP)

With this type of calibration, you work with calibration buffers, e.g. ORP buffers from Endress+Hauser.
For this purpose, you remove the sensor from the medium and calibrate it in the laboratory. Since Memosens sensors save the data, you can always work with "precalibrated" sensors and do not have to stop monitoring the process for extended periods to perform a calibration.

ℹ Only use calibration buffers once.

2.8 Temperature adjustment

The temperature sensor has to be calibrated at regular intervals to ensure the measured value is not falsified by incorrect temperature measurement.

1. Determine the temperature with a reference measurement.
2. Depending on the result, decide whether you want to align the temperature sensor of the sensor with the reference temperature.

If you do:

3. Go to the "CAL/Temperature" menu.
   ↳ The current offset is displayed. Mode is for information purposes only. You cannot select anything here.
4. Start the adjustment and follow the instructions.
   ↳ The transmitter shows the temperature currently measured by the temperature sensor of the sensor.
5. Enter the temperature of your reference measurement and select "Continue".
   ↳ The new offset is displayed.

6. Confirm acceptance of the new calibration data and finish the adjustment by clicking "OK".
   ↳ The transmitter automatically switches to the measuring mode and the new temperature offset is used.

You can cancel the calibration any time. No new data are then used to adjust the sensor.

2.9 Calibrate

1. Press the soft key for "CAL".
2. Select the type of calibration.
3. Enter the necessary parameters. (The parameters that have to be configured depend on the type of calibration selected.)
4. Start the calibration.
5. Follow the instructions in the menu.
6. Decide whether to use the calibration data captured, or to abort or repeat the calibration.
   ↳ After calibration, the transmitter automatically switches back to the measuring mode and your measuring point is now ready for operation.

- If calibration is aborted using ESC, or if the calibration is faulty, the system continues to use the original calibration data.
- A calibration error is shown as plain text on the display.
- Any offset set is automatically deleted after accepting the calibration.

3 Diagnostics, troubleshooting

In the DIAG menu you will find information about the device state, in particular detailed error and maintenance messages.
In addition to this, there are various service functions available[1)].

3.1 General troubleshooting

3.1.1 Troubleshooting

The transmitter continuously monitors its own functions.
If an error detected by the device occurs, the red alarm LED lights up and the error number with the related error message appears on the display.

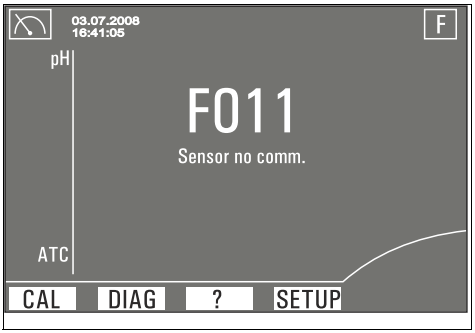


Fig. 4: Error messages (example)

Troubleshooting instructions
A diagnostics message is shown on the display, measured values are implausible or you discover an error.

1. See the Diagnostics menu (DIAG/Errors / Messages) for details on the diagnostics message.
2. Search for the diagnostic message under "Diagnostics information on the local display" (→ 18) in this manual. Use the message number as the search criterion. Ignore the letters indicating the Namur error category.
   ↳ Follow the troubleshooting instructions provided in the last column of the error tables.
3. In the event of implausible measured values, a malfunctioning local display or other errors, refer to "Process errors without messages" (→ 15) or "Device-specific errors" (→ 16).
   ↳ Follow the recommended measures.

1) Depending on the device version

4. Contact the Service Department if you cannot rectify the error yourself. Only cite the error number.

3.1.2 Process errors without messages

Problem	Possible cause	Tests and/or remedial measures
Display values deviate from reference measurement	Incorrect calibration	Repeat the calibration. Where necessary, check and repeat the calibration with the reference device.
	Sensor fouled	Clean the sensor.
	Temperature measurement	Check the temperature measured values of both devices.
	Temperature compensation	Check the settings for temperature compensation and adjustment for both devices.
Measuring chain zero-point cannot be adjusted	Contaminated reference system	Test with new sensor
	Junction clogged	Clean or grind junction
	Asymmetric sensor voltage too high	Clean junction or test with another sensor
No change or subtle change in display	– Sensor fouled – Sensor old – Sensor defective (reference lead)	Clean the sensor.
	Reference has low level of KCl	Check KCl feed (0.8 bar above medium pressure).
Measuring chain slope: – Cannot be adjusted – Too low – No slope	Device input defective	Check device directly.
	– Sensor old – Hair-line crack in glass membrane	Replace sensor.
Constant, incorrect measured value	Sensor not immersing or protection cap not removed	Check installation position, remove protection cap.
	Air pockets in assembly	Check assembly and orientation.
	Ground connection at or in device	Carry out test measurement in isolated vessel, poss. with buffer solution.
	Hair-line crack in glass membrane	Replace sensor.
	Device has impermissible operating status (no reaction to keys being pressed)	Switch device off and then on again.
Incorrect temperature value	Sensor defective	Replace sensor
Measured value fluctuations	Interference on signal output cable	Check cable routing, route cable separately if necessary.
	Interference potential in medium	Eliminate source of interference or ground medium as close as possible to sensor.

Problem	Possible cause	Tests and/or remedial measures
No current output signal	Cable disconnected or short-circuited	Disconnect cable and measure directly at device.
	Output defective	See "Device-specific errors" section.
Fixed current output signal	Current simulation active	Switch off simulation.
Incorrect current output signal	Total load in current loop too high	Measure the voltage directly at the device and compare to diagrams of the power supply and signal voltage (→ Technical data, Part 1).
	EMC (interference coupling)	Check wiring. Determine the reason for the EMC and eliminate it.
No HART communication	Incorrect CPU module	Check nameplate
	▪ HART interface missing ▪ Device not registered in HART server ▪ Load too low (min. 250 Ω required) ▪ Line problems (too long, cross-section too small, not shielded, shield not grounded, cores not twisted) ▪ Several devices configured on same address	For further information see: www.endress.com/hart

3.1.3 Device-specific errors

Problem	Possible cause	Tests and/or remedial measures
Dark display	No supply voltage	Check if supply voltage applied.
	CPU defective	Replace CPU, make sure correct version is used.
Values appear on display but: – Display does not change and / or – Device cannot be operated	Module not wired correctly	Check modules and wiring.
	Impermissible operating system condition	Switch device off and then on again.
Implausible measured values	Sensor module defective	First perform tests and take measures as outlined in "Process-specific errors" section **Test the measuring inputs** 1. Instead of connecting the sensor, connect the Memocheck Sim CYP03D simulator (accessories, → 37). 2. Check whether the value output by the simulator is also displayed by the CM42.

Problem	Possible cause	Tests and/or remedial measures
Current output, current value incorrect	Incorrect adjustment	Check with current simulation switched on, connect mA meter directly to current output .
	Load too large	
	Shunt / short to ground in current loop	
No current output signal	CPU defective	Check with current simulation switched on, connect mA meter directly to current output .

3.1.4 Comunication-related errors

Problem	Possible cause	Tests and/or remedial measures
No communication possible	HART is connected to the wrong current output	Connect HART to current output 1.
	The device reboots	Wait for the device to reboot. HART is available as soon as the measuring screen is displayed.
	Current output defective	Check the output current at output 1 with an external multimeter. If it is not possible to set a current in the range between 3.6 and 21.5 mA, you must replace the module.
No communication possible or communication is unstable	Communication load (resistance) outside the permitted range	Connect HART as shown in the wiring diagrams. Preferably use a 250 Ω resistor.
	The device has been connected to an input of a process control system that is not designed for this purpose (e.g. four-wire instead of two-wire).	Connect HART as shown in the wiring diagrams. An external current source must be provided in the circuit.
	USB HART modem	Alternatively use an RS232 modem. Some programs have problems with USB modems. This has nothing to do with CM42. Use hardware that you know will work.
The control system cannot switch on the burst mode	CM42 does not support the burst mode	Use the device without the burst mode.
The unit of the transmitted device variable does not match the unit on the display	The display and HART are independent of one another	▪ Set the unit of the HART device variables with FieldCare, for instance. ▪ Not all units are available through HART. In such situations, the PCS displays "not defined" or Ω, for example, instead of MΩ. ▪ Use a DD (device description) for your PCS. You can download DDs and DTMs (Device Type Managers) for common PCSs (FieldCare, Pactware, ABB, AMS, PDM, FC475) from the Endress website.

Problem	Possible cause	Tests and/or remedial measures
No communication in a Multidrop network	Incorrect bus addresses	Each device in the Multidrop network must have a unique bus address, preferably in the range from 1 to 15.
	Incorrect connection	All the devices must be connected in parallel.
	The devices in the network do not meet the Multidrop requirements	Do not mix devices with active and passive current outputs. Test whether the network works if you have only connected CM42x devices.
The loop current does not match the value on the display	The loop current has been adjusted by the user	Reset the loop current with FieldCare, for instance. If you do not have a HART tool, reset the device to the factory default settings via the local operation. → Diagnostics/Systemtest/Factory default
HART tag does not match the device designation on the display	PCS uses the short tag instead of the long tag	Set the short tag to the desired value (only possible via HART).
Damping cannot be set for PV	Damping is not supported by all the device variables	-
Not possible to read or write a special parameter or value	Your application	Use device drivers (DD/DTM) where possible. If you are programming your PCS yourself, you can find a complete list of all the supported HART commands, with the associated data content, in the document SD01325C (on the Internet).

3.2 Diagnostic information on local display

The table of diagnostics messages is sorted by the message number. This number cannot be changed. The "Cat." column contains the error category which is assigned at the factory . Document all the changes you make for your measuring point in the diagnose list (→ SETUP/Sensor/Sensor diagnostics/Diagnostics list or SETUP/General settings/Device diagnostics/Diagnostics list).

No.	Display text	Cat.	Tests and/or remedial measures
003	Temp. sensor failure	F	– Check wiring
004	Scanning sensor	C	Establishing a connection to the sensor
010	Sensor initialization	C	Wait for the initialization to finish.
011	Sensor no communication	F	– Data processing interrupted due to user interaction with DAT module (F011) – Check the measuring chain with a new sensor – Check the settings for the sensor type used.
012	Sensor failure	F	
013	Wrong sensor type	F	
014	Invalid sensor data	C	
100	Glass impedance alarm	F	– Check glass electrode for breakage and hairline cracks – Check medium temperature – Check electrode plug-in head for moisture and dry if necessary

No.	Display text	Cat.	Tests and/or remedial measures
101	Ref. impedance alarm	F	– Check reference electrode for contamination and damage – Clean reference electrode
102	Glass imp. too low alarm	F	– Impedance of glass membrane too low – Check pH sensor, replace if necessary
103	Ref. imp. too low alarm	F	– Reference impedance too low – Check reference electrode for contamination/clogging – Replace reference or combined electrode
104	Sensor supply bad	F	– Sensor operating voltage fluctuating – Check connection – Replace sensor cable or sensor
106	Glass impedance warning	M	– Check glass electrode for breakage and hairline cracks – Check medium temperature – Check electrode plug-in head for moisture and dry if necessary
107	Ref. impedance warning	M	– Check reference electrode for contamination and damage – Clean reference electrode
111	Glass imp. too low warning	M	– Check glass electrode for breakage and hairline cracks – Check medium temperature – Check electrode plug-in head for moisture and dry if necessary
112	Ref. imp. too low warning	M	– Check reference electrode for contamination and damage – Clean reference electrode
119	Temp offset lower limit	F	– Check the temperature sensor of the sensor – Clean the sensor and recalibrate – Replace sensor
120	Temp offset lower limit	F	
127	Invalid TAG group	F	Use a sensor with a suitable sensor designation or sensor group.
128	Invalid TAG	F	
129	Sensor change aborted	C	Restart the sensor change
130	Calibration active	C	Wait for the calibration to finish.
131	PV not stable	M	– Sensor too old – Cable or connector defective
132	Temperature not stable	M	
134	Zero pnt. too high alarm	M	– Sensor old or defective – Diaphragm blocked – Buffer solutions too old or contaminated
135	Zero pnt. too high warning	M	
136	Zero pnt. too low warning	M	
137	Zero pnt. too low alarm	M	
138	Slope too low alarm	M	
139	Slope too low warning	M	

No.	Display text	Cat.	Tests and/or remedial measures
172	Operating time alarm	M	The operating time for the sensor which you specified has been reached. Replace the sensor to ensure the operability of the measuring point. If a new sensor is used, the counters are reset to the new sensor data.
173	Oper.time >80°C alarm	M	The sensor has reached the operating time under extreme conditions which you specified. Replace the sensor to ensure the operability of the measuring point. If a new sensor is used, the counters are reset to the new sensor data.
174	Oper.time >100°C alarm	M	
175	Oper.time <-300mV alarm	M	
176	Oper.time >300mV alarm	M	
177	Delta slope alarm	M	Sensor aged. Replace the sensor.
178	Delta zero alarm	M	
180	Cal. expired alarm	M	The operated hours counter has reached its limit. Perform a calibration. This resets the counter.
181	No. steril. alarm	M	The number of sterilizations which you specified has been reached. Replace the sensor.
182	Operating time warning	M	The operating time for the sensor which you specified has almost been reached. Prepare to replace the sensor.
183	Oper.time >80°C warn	M	The sensor will soon have reached the operating time under extreme conditions which you specified. Prepare to replace the sensor.
184	Oper.time >100°C warn	M	
185	Oper.time <-300mV warn	M	
186	Oper.time >300mV warn	M	
190	Cal. expired warning	M	The operated hours counter is reaching its limit. Plan a calibration.
191	No. steril. warning	M	The number of sterilizations which you specified will be reached shortly.
203	Wrong transmitter type	F	Use a sensor module that suits the software. (Software version 10... for pH, 13... for conductivity, 20... for oxygen)
215	Simulation active	C	Active corresponding to your settings
218	Current output not available	F	Contact the Service Team!
219	Power supply bad	C	Interference amplitude of power supply too high – Incorrect power supply or unshielded cables used – Connect the device to a clean power supply. – Make sure the cable is grounded correctly. – The error is not rectified until the interference amplitude is gone or if it is in the frequency range for HART communication.
238	Delta slope alarm	C	Sensor aged. Replace the sensor.
239	Delta zero alarm	C	
318	Glass imp. too high alarm	M	Sensor check system warning – Check glass electrode for breakage and hairline cracks – Check medium temperature
319	Ref. imp. too high alarm	M	Sensor check system warning – Check reference electrode for contamination and damage – Clean reference electrode

No.	Display text	Cat.	Tests and/or remedial measures
320	Glass imp. too high warning	M	Sensor check system warning – Check glass electrode for breakage and hairline cracks – Check medium temperature
321	Ref. imp. too high warning	M	Sensor check system warning – Check reference electrode for contamination/clogging – Replace reference or combined electrode
322	Meas. value out of range	S	Process limit value undershot alarm Possible reasons: – Sensor in air – Air cushion in assembly – Sensor defective – Increase the process value – Check the measuring system – Change sensor type
380	Comm. module defect	F	
381	Comm. module incomp	F	
404	Lower limit current output	S	– Measured value outside the specified current range – Check plausibility – Adapt the current output limits (Setup/current output…/Low value (4mA) or Upper value (20mA))
405	Upper limit current output	S	
406	SETUP active	C	End parameter entry
407	DIAG active	C	End query of device and sensor information
408	Calibration aborted	M	Renew calibration solution, repeat calibration
409	Sensor change	C	Sensor change active
501	Device open	M	Close the housing and tighten the screws.
513	Device alarm (|%V%S|)	F	Contact the Service Team! Quote the error number and the text displayed. (|%V%S|) here stands for the text actually displayed.
514	Device warning (|%V%S|)	M	
530	|%V%S| : 20 % remain[1)]	S	The ring memory of the logbook is almost full.
531	|%V%S| : full	S	The ring memory of the logbook is full. From now on, new events will overwrite the oldest entries.
532	Calibration timer expired	M	The counter for the Cal Timer has reached its limit. Perform a calibration. This resets the counter.
802	PCS Alarm	F	Stagnant measured values
810	PV upper limit alarm	F	– Measuring line disconnected – Sensor in air – Air cushion in assembly – Check the measuring chain – Potential matching missing for symmetrical measurement PV = primary value (main value)
811	PV lower limit alarm	F	
812	Temperature out of range	F	
840	PV upper limit warning	M	– Sensor in air – Air cushion in assembly – Check the measuring chain
841	PV lower limit warning	M	

1) Variable text [%V%S]: the relevant logbook is named.

3.3 Diagnostic information via fieldbus

An overview of all the diagnostic messages transmitted over the bus can be found in SD01325C under "Documents" on www.products.endress.com/cm42.

3.4 Adapting the diagnostic information

3.4.1 Classification of diagnostics messages

More detailed information on the current errors displayed is provided in the "DIAG/Errors / Messages" menu. The red LED flashes if a diagnostic message assigned to error category F has occurred. Furthermore, the error category of every diagnostic message is indicated in the status bar of the display by the appropriate error letter.

In accordance with Namur specification NE 107, the diagnostics messages are characterized by:
- Message number
- Error category (letter in front of the message number)
  - **F** = Failure. A malfunction has been detected.
    The cause of the malfunction is to be found in the measuring point.
  - **C** = Function check, no error
    Maintenance work is being performed on the device. Wait until the work has been completed.
  - **S** = Out of specification. The measuring point is being operated outside specifications. Operation is still possible. However, you run the risk of increased wear, shorter operating life or lower accuracy levels. The cause of the problem is to be found outside the measuring point.
  - **M** = Maintenance required. Action must be taken as soon as possible
    The device stills measures correctly. Immediate measures must not be taken. However, proper maintenance efforts would prevent a possible malfunction in the future.
- Message text

If you contact the Service Department, please cite the message number only. Since you can individually change the assignment of an error to an error category, the Service Department cannot use this information.

3.4.2 Adapting the diagnostic information

All the diagnostics messages are assigned to specific error categories at the factory. Since other settings might be preferred depending on the application, error categories and the effect errors have on the measuring point can be configured individually. Furthermore, every diagnostic message can be disabled.

Example
The device displays diagnostic message 011 "Sensor no communication". You want to change this message so that no error is shown on the display, for example.

1. Go to SETUP/Sensor pH/ORP/Sensor diagnostics/Diagnostics list or SETUP/General settings/Device diagnostics/Diagnostics list
   ↳ The list of all the diagnostic messages is displayed. Here it does not matter which of the two paths you used to open the list. The list is the same either way.
2. Select diagnostic message 011 and press the navigator button.
   ↳ The details on the diagnostic message and the current message category are displayed.
3. Select the category and decide whether to change the category or deactivate the message.
4. Deactivate the message, for example (Disabled) and press "OK" to confirm your change.
   ↳ The message without the letter of the Namur category is displayed in the diagnostic list. The message is deactivated.

Proceed in a similar fashion if you want to change the category. You then see the change directly in the list.

3.5 Pending diagnostic messages

The Diagnostics menu contains all the information on the device status.
Furthermore, various service functions are available.

The following messages are directly displayed every time you enter the menu:
- "Most important msg."
  Diagnostic message recorded with the highest (most critical) Namur category
- "Past message"
  Diagnostic message whose cause was the most recent to be remedied.

3.6 Diagnostic list

All the diagnostic messages currently pending are listed under DIAG/Errors / Messages.
The Namur category along with the number of the diagnostic message and a message description are displayed.

3.7 Logbooks

The logbook memories are "ring memories". They are filled with data while storage space is available. As soon as the memory is full, each new entry overwrites the oldest entry in the memory.

To ensure data are recorded in the logbooks, you must activate the function in the **SETUP/General settings/Logbooks** menu.
Logbooks cannot be saved to external memories or transferred to other transmitters.
The logbook entries are in chronological order. The most recent entry always appears at the top of the list.

The following logbooks are available:
- Calibration logbook
  - Log of calibrations and adjustments
  - It is possible to call up the following details on every entry: time stamp, calibration method and sensor type used
  - Max. 15 entries
- Event logbook
  - Log of the warnings and error messages
  - It is possible to call up the following details on every entry: time stamp, event (diagnostic message number), description, device status and event state
  - Max. 50 entries
- Parameter logbook
  - Log of changes in the configuration
  - Every modified setting in the SETUP menu is recorded and displayed.
  - Max. 50 entries
- User logbook
  - Log of logins and logouts
  - Each login and logout is recorded and displayed with a time stamp and the user name.
  - The data are only recorded if user administration is enabled.
  - Max. 50 entries
- Audit trail
  - Chronological log of all logbook entries without the data logbook but with the device history (see DIAG/Device information)
  - Here, you can navigate to each individual logbook entry, regardless of the type of logbook, and display the details.
  - Max. 200 entries

You can also define and activate a data logbook:
- SETUP/General settings/Logbooks/Data logbook
- The data logbook consists of the recorded measured values in the scan rate you defined including the associated time stamp.
- Max. 500 entries

3.8 Simulation, Resetting the measuring device

3.8.1 Simulation

You can output a simulated current value at the current output for test purposes.
The symbol for the simulation appears in the status bar of the display when the function is switched on: SIMU

Path: DIAG/Service/Simulation

Function	Display	Info
Current output 1		
Simulation	Options ▪ on ▪ off **Factory setting** off	▪ **on**: The simulation value is output at current output 1. The simulation value continues to be output even if you exit the DIAG menu. If you want to switch back to having the system output the measured value, you have to set the "Simulation" to "Off". ▪ **off**: The measured value, and not the simulation value, is output at current output 1.
Simulation value	3.60 to 21.50 mA **Factory setting** 10.00 mA	
Current output 2		
Simulation	Options ▪ on ▪ off **Factory setting** off	▪ **on**: The simulation value is output at current output 2. The simulation value continues to be output even if you exit the DIAG menu. If you want to switch back to having the system output the measured value, you have to set the "Simulation" to "Off". ▪ **off**: The measured value, and not the simulation value, is output at current output 2.
Simulation value	3.60 to 21.50 mA **Factory setting** 10.00 mA	

3.8.2 Reset and factory settings

Each of the following functions causes the device to be restarted.

NOTICE

Factory default or customer factory default

All user-specific changes in the configuration are lost

- ▶ Make a backup of your configuration on an optional CopyDAT (CY42-C1).
- ▶ Only select "Factory default" or "Customer factory default" if you do not need the modified settings with user-specific changes or have saved them beforehand.

Path: DIAG / Service

Function	Display	Info
Device restart	Options ▪ Abort action ▪ Device restart **Factory setting** Abort action	Restart the device and keep all the settings

Path: DIAG / Service

Function	Display	Info
Factory default	Options ▪ Abort action ▪ Factory default **Factory setting** Abort action	The device is restarted and all the customer-specific settings are reset to the factory default values.
Cust. fact. default	Options ▪ Abort action ▪ Cust. fact. default **Factory setting** Abort action	The device is restarted and all the settings are reset to the original, **optionally** ordered settings

3.9 Change sensor

You can use this function to change a similar sensor without restarting the device.
The device recognizes the type of sensor connected.
Furthermore, it is possible to distinguish between sensors based on their sensor name or sensor group.

1. Select "Proceed sensor change (hold will be active)".

   ↳ The sensor change automatically activates a hold. An error is not output at the control system.

   Depending on whether you assigned, or did not assign, a sensor name or sensor group in the "SETUP/General settings/Sensor check" menu, you also receive information on the sensor expected by the device.

2. Follow the instructions.

3. Change the sensor. Make sure the new sensor matches the required sensor name or group.
   ↳ Once you have connected the new sensor, the message "Initializing sensor" is displayed and afterwards the message "Sensor has valid TAG" (or "Sensor has valid TAG group") appears.

   You can now choose whether you want to use the sensor or repeat the sensor change routine. You can also display the sensor data.

If you have connected a sensor with an invalid sensor name or group, a message is displayed to this effect. The device will not accept this sensor. You can only repeat the sensor change with a valid sensor.

4. Follow the instructions on the display.

- After changing the sensor or aborting the function, the hold is automatically deactivated once the hold delay time has elapsed.
- If you do not manage to change the sensor within 10 minutes, an automatic system abort takes place and the device returns to the measuring mode.
- If you are connecting a different type of sensor, you are prompted to change the projecting version. The change involves a device restart.

3.10 Sensor type change

You can use this function to change a similar sensor without restarting the device.
The device recognizes the type of sensor connected.
Furthermore, it is possible to distinguish between sensors based on their sensor name or sensor group.

1. Select "Proceed sensor change (hold will be active)".

   ↳ The sensor change automatically activates a hold. An error is not output at the control system.

   Depending on whether you assigned, or did not assign, a sensor name or sensor group in the "SETUP/General settings/Sensor check" menu, you also receive information on the sensor expected by the device.

2. Follow the instructions.

3. Change the sensor. Make sure the new sensor matches the required sensor name or group.
   ↳ Once you have connected the new sensor, the message "Initializing sensor" is displayed and afterwards the message "Sensor has valid TAG" (or "Sensor has valid TAG group") appears.

   You can now choose whether you want to use the sensor or repeat the sensor change routine. You can also display the sensor data.

If you have connected a sensor with an invalid sensor name or group, a message is displayed to this effect. The device will not accept this sensor. You can only repeat the sensor change with a valid sensor.

4. Follow the instructions on the display.

- After changing the sensor or aborting the function, the hold is automatically deactivated once the hold delay time has elapsed.
- If you do not manage to change the sensor within 10 minutes, an automatic system abort takes place and the device returns to the measuring mode.
- If you are connecting a different type of sensor, you are prompted to change the projecting version. The change involves a device restart.

3.11 Sensor status

The device displays calculation variables of the calibration function, such as the zero point and slope, and the related quality, i.e. to what extent they deviate from the ideal values.
You also see the sensor operating time.
From the information displayed, you can see whether and when you must schedule maintenance measures for the sensor, whether the sensor has to be calibrated shortly or whether you will have to replace the sensor soon.

You can display the values graphically (as a bar graph) or numerically (selection using soft keys).

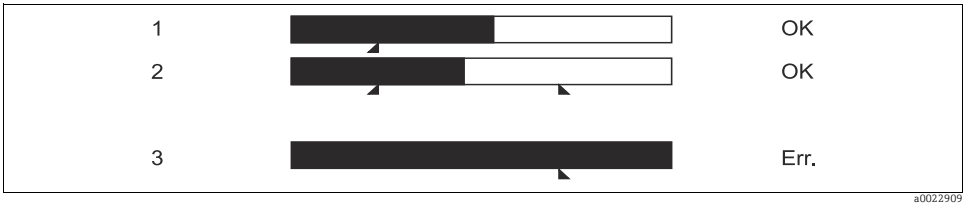


Abb. 5: Graphic display of the sensor status (example)

1 Calibration date, e.g. slope: value is within an acceptable range
2 Calibration date, e.g. zero point: value is within an acceptable range
3 Operating time: specified duration exceeded: error is displayed

You can set warning and alarm limits in the "SETUP/Sensor pH/ORP/Sensor diagnostics" menu.

3.12 Output state

The current value and the output variable are displayed for each current output.
You can select the output variable to be displayed in the "SETUP/Current output" menu.

The current output range is displayed for information purposes only. It is fixed at 4 to 20 mA.

3.13 Device information

Information in the following categories is displayed:
- Identification
  Information on the device identifier, e.g. serial number, order code, device version and bus address
- CPU
  Identification of the installed CPU module, e.g. serial number, order code, hardware and firmware versions
- Sensor module
  Identification of the installed sensor module, e.g. serial number, order code, hardware and firmware version
- Current output
  Identification of the current output, e.g. serial number, order code, hardware and firmware version
- Display
  Identification of the installed display module, e.g. serial number, order code, hardware and firmware version
- Device history
  "Hardware logbook"
  All the hardware and software changes made to the device can be read out with a time stamp and with detailed information on every entry.
  – Max. 10 entries concerning changes to the software version
  – Max. 25 entries concerning changes to the hardware, e.g. sensor change, module replacement etc.

3.14 Sensor information

Information is displayed in the following categories depending on which sensor type is connected:
- Identification
  Information on the sensor identification, e.g. serial number, order code, software and hardware version, sensor name and sensor group
- Specification
  Application limits for main value and temperature
- Calibration
  Calibration data of the last calibration, e.g. calibration method, calibration values and serial number of the transmitter used for the calibration

- Operating time
  Sensor operation, e.g. total operating time and operation under extreme conditions
- Max. operating values
  Maximum and minimum measured values

3.15 Firmware history

Date	Version	Changes in the firmware	Documentation: edition
05/2014	02.01.00	Improvement ▪ Support for new bus module FBPA3, FBPA1 is no longer supported ▪ Refactored bus drivers (DTM/DD) with full operation ▪ Revised menus ▪ Revised sensor information ▪ Possible to change sensor type without DAT ▪ Sensor status: all status values and operating hours values are displayed numerically	BA00381C/07/XX/15.14 BA00382C/07/XX/15.14
04/2012	Package 07 to 13	Extension ▪ Support for pH/ORP combined sensors Improvement ▪ Enhanced user administration ▪ Damping can be set for up to 600 s ▪ Alarm and warning signal possible at both current outputs ▪ Current output allows negative measuring range slope (lower limit > upper limit) ▪ Choice of measured variables modified ▪ Modified configuration of diagnostics messages ▪ Modified diagnostics messages	BA00381C/07/XX/14.12 BA00382C/07/XX/14.12
11/2010	Package 06	Extension ▪ Support for Korean Improvement ▪ Sensor state display ▪ Sensor check	BA00381C/07/XX/13.10 BA00382C/07/XX/13.10
11/2009	Package 05	Extension ▪ Manual hold also in the "Basic" software version Improvement ▪ Two-point calibration for special buffers corrected ▪ Improved table entry	BA00381C/07/XX/03.10 BA00382C/07/XX/03.10
10/2008	10.05.00	Extension ▪ User administration upgraded ▪ Monitoring functions ▪ DAT functionalities: Upgrade, update, saving user settings by DAT ▪ Redesign of measuring menus ▪ HART protocol 6	BA00381C/07/XX/08.08 BA00382C/07/XX/08.08.
02/2008	10.04.05	Improvement ▪ 3.6 mA functionality	BA00381C/07/XX/02.08 BA00382C/07/XX/02.08
05/2007	10.04.05	Extension ▪ Memobase functions	BA00381C/07/XX/05.07 BA00382C/07/XX/05.07

Date	Version	Changes in the firmware	Documentation: edition
06/2006	10.04.00	Extension ▪ Advanced functionality: – Medium compensation pH – Memosens limit contactor ▪ ORP %	BA00381C/07/XX/10.06 BA00382C/07/XX/10.06
04/2006	10.03.00	Extension ▪ Advanced functionality: – Pfaudler electrodes – Predictive maintenance: PCS, SCC, calibration timer ▪ Software update via DAT modules ▪ Date and time format selectable ▪ Language extension ▪ Diagnosis table, advanced diagnosis codes	BA00381C/07/XX/05.06 BA00382C/07/XX/05.06
09/2005	10.02.00	Extension ▪ PROFIBUS Profile 3.0 ▪ Upload / Download mode ▪ Extension of the Memosens data	BA00381C/07/XX/11.05 BA00382C/07/XX/11.05
07/2005	10.01.00	Improvement ▪ Correction of the Memosens functionality ▪ Extended error codes ▪ Additional types of calibration ▪ Improvement of the update behavior	BA00381C/07/XX/08.05 BA00382C/07/XX/08.05
06/2005	10.00.00	Original firmware	BA00381C/07/XX/05.05 BA00382C/07/XX/05.05

4 Maintenance

Only clean the front of the housing with commercially available cleaning agents.

The front is resistant to the following as per DIN 42 115:
- Ethanol (short periods)
- Diluted acids (max. 2% HCl)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaners

NOTICE

Prohibited cleaning agents

Danger of damaging the housing surface or housing sealing.
- ▶ Never use concentrated mineral acids or bases for cleaning purposes.
- ▶ Never use organic cleaners such as acetone, benzyl alcohol, methanol, methylene chloride, xylene or concentrated glycerol cleaner.
- ▶ Never use high-pressure steam for cleaning purposes.

5 Repair

5.1 Spare parts

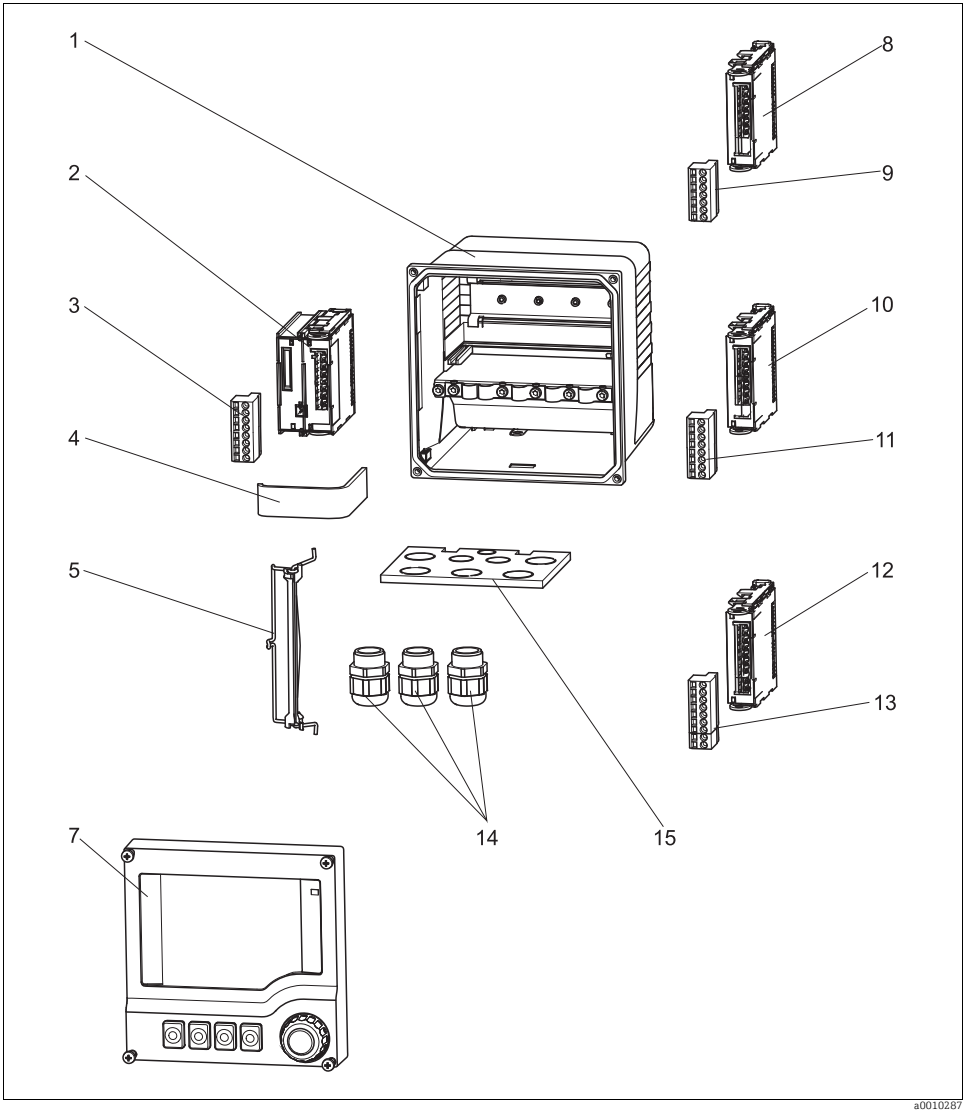


Fig. 6: Exploded view
Please refer to the following table for item names and order numbers for spare parts.

Item	Kit CM42	Order number
1	Housing base, polyester, NPT ½" ▪ Base ▪ Plate NPT ½" (item 15) ▪ Cable mounting rail cpl. SS ▪ 3 threaded joints NPT ½" (item 14)	71001362
2	CPU module, curr. outp. + HART, non-Ex ▪ FMIH1 insertion module (FC2W1+FBIH1), nonEx ▪ Terminal strip (item 3)	51518002
3	Terminal set, CPU module, curr. outp. + HART	51517481
4	Ribbon cable for plastic housing ▪ 1 cable, conf. 40xAWG28 EX, 90 mm (3.5") crimp	51517503
5	Hinge for plastic housing ▪ Hinge cpl. CM42 KS ▪ 2 special screws K40x10 Torx self-form.	51517500
7	Top housing section, plastic, with display ▪ Display, keys, navigator, screws and cover plate ▪ Hinge (item 5) ▪ Ribbon cable (item 4)	71249341
8	Inp. module conductivity, conductive measurement, non-Ex ▪ FSLC1, insertion module, cond. conductivity, non-Ex ▪ Terminal strip (item 9)	51518005
8	Inp. module conductivity, inductive measurement, non-Ex ▪ FSLI1, insertion module, ind. conductivity, non-Ex ▪ Terminal strip (item 9)	51518006
9	Inp. module terminal set, conductivity, conductive measurement	51517489
9	Inp. module terminal set, conductivity, inductive measurement	51517490
10	Inp. module digital/Memosens, non-Ex ▪ FSDG1, insertion module, 1 channel, 1 SWU, non-Ex ▪ Terminal strip (item 11)	51518007
11	Inp. module terminal set, digital/Memosens	51517491
12	Inp. module pH/ORP/temperature, non-Ex ▪ FSPH1, insertion module, pH/mV, non-Ex ▪ Terminal strip (item 13)	51518004
13	Inp. module terminal set, pH/ORP/temperature	51517487
14, 15	Threaded joints, NPT ½" ▪ 1 set of threaded joints ▪ Thread base plate (item 15)	51517505
No graphic	Terminal set, 5 pcs. each for all modules, 7 types	51517498
No graphic	10 set of cable clamps+screws ▪ 10 EMC cable clamps D6 (0.24") ▪ 10 EMC cable clamps D4 (0.16") ▪ 10 cheese head screws M4x8 A2	51517499

Item	Kit CM42	Order number
No graphic	Connection jack for external Historom/CDI	51517507

5.2 Replacing modules

5.2.1 Replacement instructions

You change modules if you must replace defective modules or if you want to change the hardware configuration of your device.

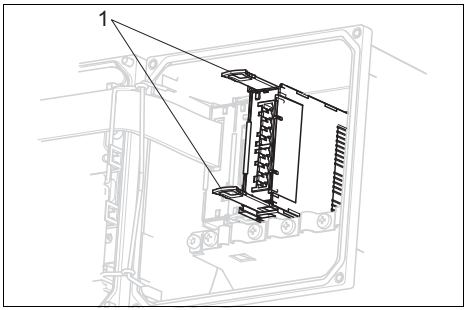


Fig. 7: Removing module

1 Removal aids

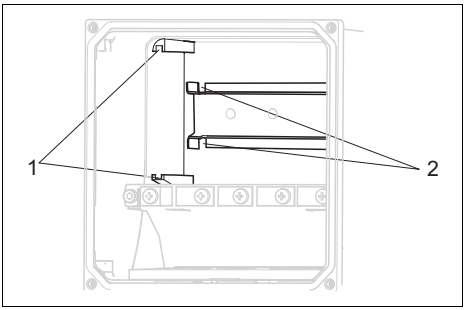


Fig. 8: Housing guides

1 Guides on housing wall
2 Guides in DIN rail

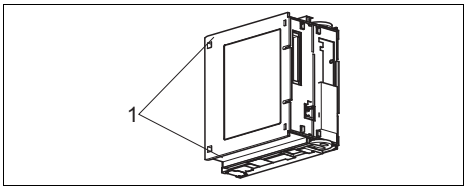


Fig. 9: Module, left side (cable connections = front)

1 Guides (CPU module) to fit into the guides in housing

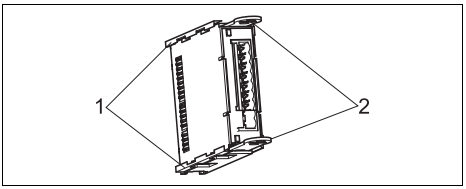


Fig. 10: Module, right side (cable connection = front)

1 Guides (input module) to fit into the right-hand guides in the CPU module
2 Removal aids

1. Disconnect the transmitter from the power supply and open the housing.
2. Remove the cable connections from the module you want to replace.
3. Pull out the two removal aids on the module until the stop (→ 7).
   ↳ The module can now be easily removed from the DIN rail.
4. Slide the new module into the guides (→ 8, → 9, → 10).

5. Push the two removal aids on the module in the direction of the DIN rail until the stop. This locks the module onto the DIN rail.
6. Connect the cables in accordance with the wiring diagram (see "Wiring").
7. Connect the sensor, close the housing, and check that the entire measuring system is working correctly.

5.2.2 Hardware and software required to change a parameter

To change the measured variable, you might require another input module.
The table lists the order numbers.

Changing the measured variable to:						
pH Analog	**pH/ORP Memosens**	**pH ISFET Memosens**	**Conductive conductivity Analog**	**Inductive conductivity Analog**	**Conductivity Memosens**	**Oxygen Memosens**
51518004	-	-	51518005	51518006	-	-

5.3 Return

The product must be returned if it is in need of repair or a factory calibration, or if the wrong product was ordered or delivered. Legal specifications require Endress+Hauser as an ISO-certified company, to follow certain procedures when handling products that are in contact with the medium.

To ensure your device is returned in a safe, professional and swift manner,
check the website for information about the return procedure and basic conditions:
www.services.endress.com/return-material

5.4 Disposal

The device contains electronic components and must therefore be disposed of in accordance with regulations on the disposal of electronic waste.
Please observe local regulations.

6 Accessories

The most important accessories available at the time this document went to print are listed below. Contact your sales center or the service department for accessories that are not listed here.

6.1 Installation kits

Post mount for
- 1 Mounting plate
- 2 Threaded rods M5x75 mm A2
- 2 Hexagonal nuts M5 A2, DIN 934
- 2 Spring washers A2 DIN127, form B5 (M5)
- 2 Washers A 5.3, DIN125 A2
- Order No. 51518263

Panel installation kit for panel cutout 138x138 mm (5.43x5.43 inch)
- 1 Panel installation seal
- 2 Tensioning screws M6x150 mm
- 4 Hexagonal nuts M6, DIN934 A2
- 4 Spring washers, A2 DIN127, form B6
- 4 Washers A6.4, DIN125 A2
- Order No. 51518173

6.2 Weather protection

Weather protection cover
- Order No. 51517382

6.3 Firmware update and upgrade

CY42 DAT module
- Function upgrade, update and memory module
- Ordering as per order structure

	Version	
	C1	CopyDAT, for saving the configuration and transferring it to other devices
	F1	FunctionDAT for extending the function to 2 current outputs
	F2	FunctionDAT for extending the function to advanced software
	S1	SystemDAT, for software update, language catalog extension
CY42-		Complete order code

6.4 Data management

Memobase Plus CYZ71D
- Software for central data and sensor management
- Windows XP, SP3 or Windows 7, SP1 (32 and 64-bit) or Windows 10 (32 and 64-bit)
- www.endress.com/cyz71d

6.5 Measured value simulation

Memocheck Sim CYP03D
- Reference for plant qualification
- Verification of data transmission
- Order according to product structure, Configurator: www.endress.com/cyp03d
- Technical Information, TI00481C

6.6 Communication-specific accessories

Commubox FXA191
- Intrinsically safe HART communication with FieldCare via the RS232C interface
- Converts HART signals on RS 232C interface
- Technical Information TI00237F

Commubox FXA195 HART
- Intrinsically safe HART communication with FieldCare via the USB interface
- Technical Information TI00404F

Commubox FXA291
- Connects the CDI interface of measuring devices with the USB interface of the computer or laptop
- Technical Information TI00405C

WirelessHART Adapter SWA70
- Wireless connection of measuring devices
- Easily integrated, offers data protection and transmission safety, can be operated in parallel with other wireless networks, and requires little wiring effort
- Technical Information TI00061S

Fieldgate FXA320
- Gateway for the remote interrogation of 4-20 mA measuring devices via a Web browser
- Technical Information TI00025S

Fieldgate FXA520
- Gateway for the remote diagnostics and configuration of connected HART devices
- Technical Information TI00051S

Field Xpert SFX100
- Compact, flexible and robust industry handheld terminal for remote configuration and for obtaining measured values via the HART current output
- Operating Instructions BA00060S

7 Technical data

7.1 Input

7.1.1 Measured variables

→ Documentation of the connected sensor

7.1.2 Measuring range

→ Documentation of the connected sensor

7.1.3 Cable specification

CYK10, CYK20 with Memosens — Max. cable length 100 m (330 ft)

7.2 Output

7.2.1 Output signal

2x 4 to 20 mA, passive, potentially isolated from one another

HART

Signal encoding	FSK ± 0.5 mA via current signal
Data transmission rate	1200 Baud
Galvanic isolation	Yes
Load (communication resistor)	250 Ω

7.2.2 Signal on alarm

3.6 to 21.5 mA (4.0 mA fixed for HART Multidrop mode)

7.2.3 Load

Max. load with supply voltage of 24 V: 500 Ω
Max. load with supply voltage of 30 V: 750 Ω

7.2.4 Current output, passive

Span

3.6 to 21.5 mA

Signal characteristics

Linear / table

Cable specification

Cable type: shielded cable, Ø 2.5 mm (14 AWG)

7.3 Protocol-specific data

Manufacturer name:	Endress+Hauser
Model name:	Liquiline pHORP
Manufacturer ID code:	11_h
Device type code:	$11A0_h$
HART protocol revision:	7
Device revision:	1
Number of device variables:	7
Physical layers supported:	FSK
Physical device category:	Transmitter, non-DC-isolated bus device

7.4 Electrical connection

7.4.1 Supply voltage and signal voltage

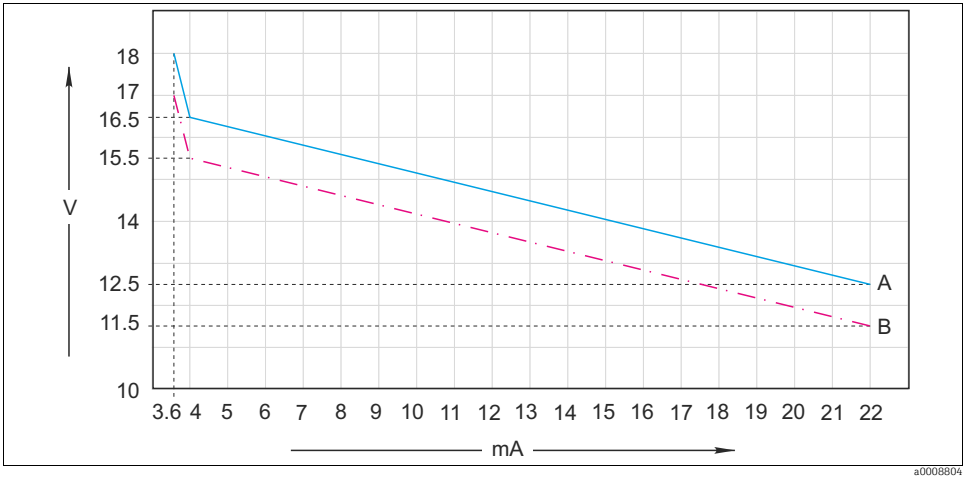


Fig. 11: Minimum supply voltage at the transmitter depending on the output current

A With HART communication
B Without HART communication

7.4.2 Certified cable glands

Cable gland	Clamping area, permitted cable diameter
M16 x 1.5 mm	3 to 6 mm (0.12 to 0.24")
M20 x 1.5 mm	5 to 9 mm (0.20 to 0.35")
M20 x 1.5 mm	6 to 12 mm (0.24 to 0.47")
NPT 3/8"	3 to 6 mm (0.12 to 0.24")
NPT 1/2"	5 to 9 mm (0.20 to 0.35")
NPT 1/2"	6 to 12 mm (0.24 to 0.47")
G3/8	3 to 6 mm (0.12 to 0.24")
G1/2	5 to 9 mm (0.20 to 0.35")
G1/2	9 to 12 mm (0.35 to 0.47")
Dummy plug M16	-
Dummy plug M20	-

NOTICE

Housing not sealed correctly, lack of strain relief

Dust can enter, cables can become loose, IP protection no longer guaranteed

- Make sure that cable glands cannot become loose and that the seals are installed close to the housing.
- Once you have routed the cables through the glands, tighten the cable glands and the associated nuts with a torque of 2 Nm to ensure the cables are secure.
- Pay attention to strain relief for the cables. Route the cables so that they are securely in place.
- Make sure that the cable entries and glands are leak-tight.

7.4.3 Cable cross-section

Max. cable cross-section: 2.5 mm^2 (h 14 AWG), GND 4 mm^2 (h 12 AWG)

7.5 Performance characteristics

7.5.1 Current output response time

t_{90} = max. 500 ms for an increase from 4 to 20 mA

7.5.2 Measured value resolution

→ Documentation of the connected sensor

7.5.3 Maximum measured error

→ Documentation of the connected sensor

Current outputs, additional	25 µA

7.5.4 Memosens maximum measured error

With digital data transmission, the measured value supplied by the sensor is relayed exactly at the sensor input. The accuracy depends solely on the connected sensor and the quality of the sensor adjustment.

7.5.5 Tolerance of current outputs

Current outputs, additional	25 µA

7.5.6 Repeatability

→ Documentation of the connected sensor

7.6 Environment

7.6.1 Ambient temperature range

−30 to 70 °C (−20 to 160 °F)

7.6.2 Storage temperature

−40 to 80 °C (−40 to 175 °F)

7.6.3 Electromagnetic compatibility

Interference emission and interference immunity to EN 61326-1: 2006, Category B (residential environments)

7.6.4 Degree of protection

IP66 / IP 67 / NEMA 4X

7.6.5 Relative humidity

10 to 95%, not condensing

7.6.6 Pollution degree

The product is suitable for pollution degree 3.

7.7 Mechanical construction

7.7.1 Weight

1.5 kg (3.3 lbs)

7.7.2 Material

Housing	PC-FR (polycarbonate, flame-retardant)
Housing seals	Foamed silicone, EPDM
Module housing	PC (polycarbonate)
Soft keys,	TPE
Cable mounting rail	Stainless steel 1.4301 (AISI 304)
Display panel	PC-FR (polycarbonate, flame-retardant)
Cable glands	PA (polyamide) V0 as per UL94
Dummy plugs M16 and M20	PA (polyamide) V0 as per UL94

Index

W

Z

www.addresses.endress.com

Endress+Hauser

People for Process Automation