

# Technical Information

## Liquiline System CA80PH

Colorimetric analyzer for orthophosphate



Integrated controller with up to 2 measuring channels and digital Memosens technology

### Application

The Liquiline System CA80PH is a wet-chemical analyzer for the almost continuous determination of the concentration of orthophosphate in liquid media.

The analyzer is designed for use in the following applications:

- Monitoring and optimization of the treatment efficiency of municipal and industrial wastewater treatment plants
- Monitoring and optimization of aeration basins
- Regulation of precipitant dosage
- Monitoring of cooling water circuits

The "Cabinet, outdoor version" product variant may be set up, mounted and operated outdoors.

### Your benefits

- Easy upgrade to measuring station by connecting up to 4 Memosens sensors
- Cooled version for longer reagent life time
- Two-channel device available
- Digital fieldbuses (e.g. PROFINET, PROFIBUS DP, Modbus TCP, Modbus RS485 and Ethernet IP) and web server
- Simple, tool-free maintenance

## Table of contents

<b>Function and system design</b> . . . . .	<b>4</b>	Fieldbus connection . . . . .	21
Colorimetric measuring principle . . . . .	4	Power consumption . . . . .	21
Phosphorous and phosphate . . . . .	4	Fuse . . . . .	21
Orthophosphate and total phosphorus . . . . .	4	Cable entries . . . . .	21
Photometric determination of orthophosphate . . . . .	5	Cable specification . . . . .	21
Cross-sensitivity . . . . .	5	Heating for dilution water . . . . .	21
Measuring system . . . . .	5	Connecting optional modules . . . . .	21
Reagent cooling module (optional) . . . . .	9	Sensor connection (optional) . . . . .	24
<b>Device architecture</b> . . . . .	<b>10</b>	<b>Performance characteristics</b> . . . . .	<b>24</b>
Function diagram . . . . .	10	Maximum measured error . . . . .	24
Slot and port assignment . . . . .	11	Maximum measurement error for sensor inputs . . . . .	24
 		Maximum measurement error for current inputs and outputs . . . . .	24
<b>Communication and data processing</b> . . . . .	<b>11</b>	LOD (limit of detection, only applies to the blue method) . . . . .	24
 		Repeatability . . . . .	24
<b>Dependability</b> . . . . .	<b>12</b>	Repeatability of sensor inputs . . . . .	24
Reliability thanks to Memosens technology . . . . .	12	Measuring interval . . . . .	24
Ease of maintenance . . . . .	12	Sample requirement . . . . .	24
Self-monitoring functions . . . . .	14	Reagent requirement . . . . .	25
Data security . . . . .	14	Standard requirement . . . . .	25
IT security . . . . .	15	Calibration interval . . . . .	25
 		Cleaning interval . . . . .	25
<b>Input</b> . . . . .	<b>15</b>	Maintenance interval . . . . .	25
Measured variables . . . . .	15	Maintenance effort . . . . .	25
Measuring range . . . . .	15	 	
Types of input . . . . .	15	<b>Mounting</b> . . . . .	<b>25</b>
Input signal . . . . .	15	Mounting location . . . . .	25
Current input, passive . . . . .	15	Installation instructions . . . . .	25
Cable specification (for optional sensors with Memosens technology) . . . . .	16	 	
 		<b>Environment</b> . . . . .	<b>26</b>
<b>Output</b> . . . . .	<b>16</b>	Ambient temperature range . . . . .	26
Output signal . . . . .	16	Storage temperature . . . . .	26
Signal on alarm . . . . .	17	Relative humidity . . . . .	26
Load . . . . .	17	Degree of protection . . . . .	26
Transmission behavior . . . . .	17	Electromagnetic compatibility . . . . .	27
 		Electrical safety . . . . .	27
<b>Current outputs, active</b> . . . . .	<b>17</b>	Pollution degree . . . . .	27
Span . . . . .	17	 	
Signal characteristic . . . . .	17	<b>Process</b> . . . . .	<b>27</b>
Electrical specification . . . . .	17	Sample temperature . . . . .	27
Cable specification . . . . .	17	Consistency of the sample . . . . .	27
 		Sample supply . . . . .	27
<b>Relay outputs</b> . . . . .	<b>17</b>	 	
Electrical specification . . . . .	17	<b>Mechanical construction</b> . . . . .	<b>27</b>
 		Dimensions . . . . .	27
<b>Protocol-specific data</b> . . . . .	<b>18</b>	Weight . . . . .	28
PROFIBUS DP . . . . .	18	Materials . . . . .	28
Modbus RS485 . . . . .	19	Process connection . . . . .	29
Modbus TCP . . . . .	19	Hose entries . . . . .	29
Web server . . . . .	19	Hose specification (self-priming) . . . . .	29
EtherNet/IP . . . . .	19	 	
PROFINET . . . . .	20	<b>Operability</b> . . . . .	<b>29</b>
 		Operation concept . . . . .	29
<b>Power supply</b> . . . . .	<b>21</b>	Display . . . . .	30
Supply voltage . . . . .	21	Remote operation . . . . .	30
		Language packages . . . . .	32

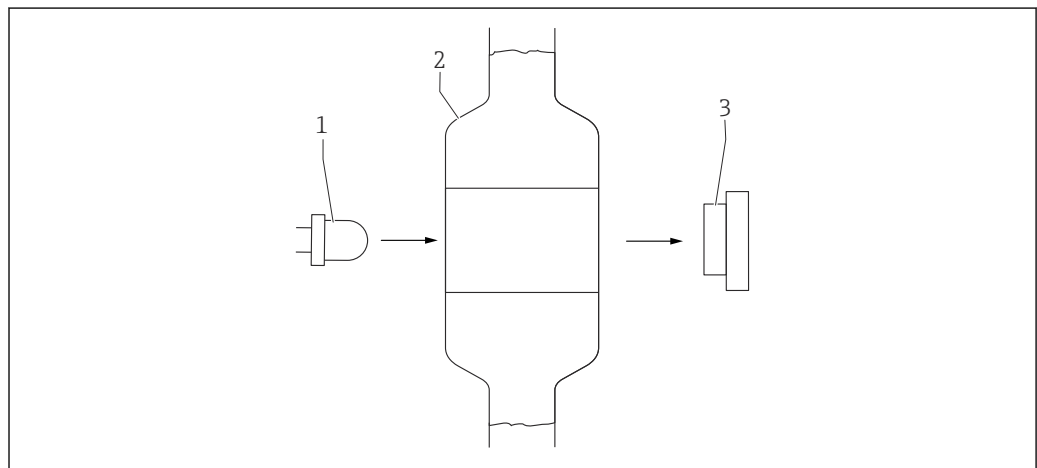
<b>Certificates and approvals</b> . . . . .	<b>32</b>
<b>Order information</b> . . . . .	<b>32</b>
Product page . . . . .	32
Product Configurator . . . . .	32
Scope of delivery . . . . .	33
<b>Accessories</b> . . . . .	<b>33</b>
Device-specific accessories . . . . .	33
Communication-specific accessories . . . . .	38
System components . . . . .	39

## Function and system design

### Colorimetric measuring principle

After sample preparation, some of the permeate is pumped into the mixing/reaction chamber. The specific color reagent is metered exactly in a defined mixture ratio. The chemical reaction causes the characteristic change in the color of the sample. The multispectral photometer determines the level of absorption by the sample at defined wavelengths. The analyzed wavelengths, and their relationships to one another, are parameter-specific.

Based on proportionality the amount of light absorption is a direct indicator of the concentration of the parameter under analysis in the sample. In order to compensate for any interference influences, a reference measurement is performed before the actual measurement. This reference signal is subtracted from the measuring signal. The temperature in the photometer is kept constant to ensure a reproducible reaction that takes place within a short period of time.



A0022399

#### 1 Colorimetric measuring principle

- 1 Multispectral LED unit (for measurement/reference)
- 2 Cuvette - mixing and reaction vessel
- 3 Detector (for measurement/reference)

### Phosphorous and phosphate

Phosphorus usually occurs as phosphate in natural water systems and in wastewater. Phosphates enter the water from:

- Fertilizers leached out of soil
- Biological and industrial waste and wastewater
- Substances added in water treatment (corrosion protection)

Phosphate is usually a limiting nutrient in a water system. Over-enrichment of phosphate (eutrophication) therefore leads to the excessive growth of aquatic plants. When these plants die in the fall, the decay of the additional biomass increases the rate of oxygen consumption. In extreme cases, this may lead to fish kills and decrease the quality of the water system.

### Orthophosphate and total phosphorus

Phosphates are subcategorized into:

- Orthophosphates
- Condensed phosphates
  - Metaphosphates
  - Pyrophosphates
  - Polyphosphates
- Organophosphorus compounds

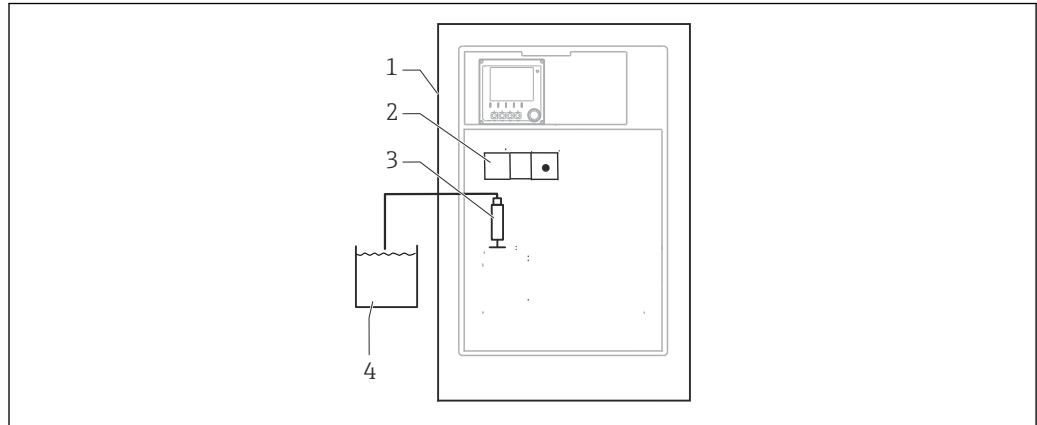
Orthophosphate is always determined if samples are not digested as only orthophosphate can be detected directly by photometric means. This is also known as determination of the "reactive" phosphorus. The measurement results can be indicated in a variety of ways:

- $\text{PO}_4$ , phosphate
- $\text{PO}_4\text{-P}$ , phosphate-phosphorous
- $\text{P}_2\text{O}_5$ , phosphorus pentoxide

Depending on the measuring range, we offer two different methods to determine the phosphorus:

- Molybdenum blue method (2 reagents, versions E1 and E2)
- Molybdate vanadate method (1 reagent, versions E3 and E4)

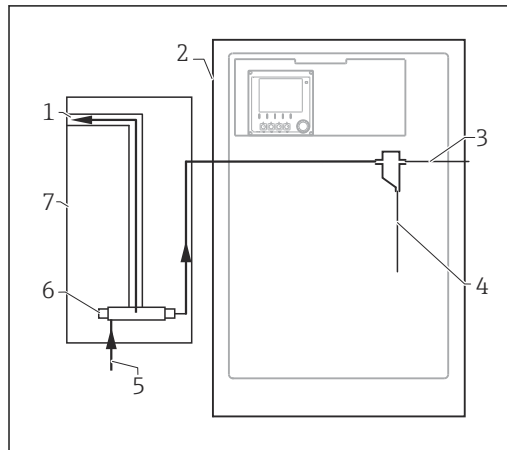
<b>Photometric determination of orthophosphate</b>	<p><b>Molybdenum blue method according to DIN EN ISO 6878</b> (versions E1 and E2)</p> <p>In an acidic solution, orthophosphate ions react with molybdate and antimony ions to form an antimony-phospho-molybdate complex. This complex is reduced to phosphomolybdenum blue with ascorbic acid. Here, the amount of light absorption is directly proportional to the concentration of orthophosphate in the sample.</p> <p><b>Molybdate vanadate method (yellow method)</b> (versions E3 and E4)</p> <p>Vanadate and molybdate ions react with phosphate to form yellow vanadomolybdophosphoric acid. Here, the amount of light absorption is directly proportional to the concentration of orthophosphate in the sample.</p>
<b>Cross-sensitivity</b>	<p>The ions listed were checked with the specified concentrations. A summary effect has not been studied. No cross-sensitivities were observed up to the concentration levels indicated.</p> <p>10 000 mg/l (ppm)    <math>\text{SO}_4^{2-}</math>  1 000 mg/l (ppm)    <math>\text{Cl}^-</math>  500 mg/l (ppm)      <math>\text{Na}^+, \text{K}^+, \text{Ca}^{2+}</math>  50 mg/l (ppm)        <math>\text{CO}_3^{2-}, \text{NO}_3^-, \text{Zn}^{2+}, \text{Cu}^{2+}, \text{Ni}^{2+}, \text{Cr}^{3+}, \text{Co}^{2+}</math>  0.5 mg/l (ppm)      <math>\text{Cr}^{6+}</math> can be eliminated by increasing the level of ascorbic acid added.  Turbidity: sample must be filtered before analysis</p>
<b>Measuring system</b>	<p>A complete measuring system comprises:</p> <ul style="list-style-type: none"> <li>■ Analyzer Liquiline System CA80PH with the configuration ordered</li> <li>■ Reagents, cleaner (CA80PH-**E1/E2 only) and standard solution (to be ordered separately)</li> <li>■ Sample conditioning Liquiline System CAT8x0 (optional)</li> </ul> <p>Microfiltration (Liquiline System CAT810)</p> <ul style="list-style-type: none"> <li>■ Function: pressure pipe sampling and filtration</li> <li>■ Sieve filter, 50 <math>\mu\text{m}</math></li> <li>■ Control via CA80</li> <li>  Optional: time control via integrated timer</li> <li>■ Backflushing, with compressed air or water</li> <li>■ Panel version or integration into analyzer stand</li> <li>■ Application: wastewater treatment plant outlet</li> </ul> <p>Membrane filtration (Liquiline System CAT820), ceramic filter version</p> <ul style="list-style-type: none"> <li>■ Function: sampling and filtration</li> <li>■ Ceramic membrane filter cartridge; pore size 0.1 <math>\mu\text{m}</math> or 0.4 <math>\mu\text{m}</math> or plate filter with holder, pore size 0.04 <math>\mu\text{m}</math></li> <li>■ Communication via Memosens protocol, control via CA80</li> <li>■ Backflushing with compressed air (version with Memosens technology)</li> <li>■ Easy installation with Flexdip CYH112</li> <li>■ Application: aeration, wastewater treatment plant outlet, surface water</li> </ul> <p>Membrane filtration (Liquiline System CAT860)</p> <ul style="list-style-type: none"> <li>■ Function: sampling and filtration</li> <li>■ Ceramic membrane filter candle; pore size 0.1 <math>\mu\text{m}</math> or 0.4 <math>\mu\text{m}</math></li> <li>■ Communication via Memosens protocol, control via CA80</li> <li>■ Automatic backflush function with cleaning solution and compressed air</li> <li>■ Easy installation via Flexdip CYH112</li> <li>■ Application: wastewater treatment plant inlet</li> </ul>



A0044814

2 Measuring system with Liquiline System, self-priming

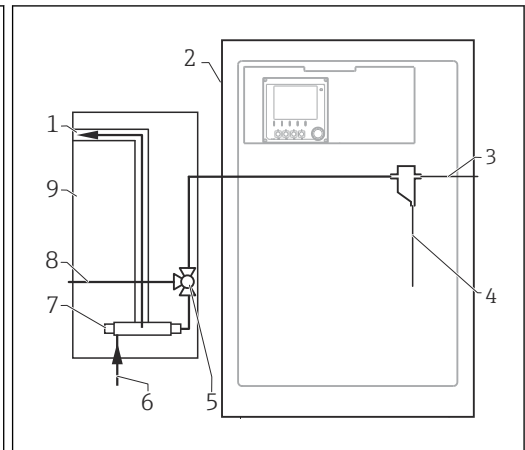
- 1 Liquiline System CA80
- 2 Photometer
- 3 Dosing dispenser
- 4 Particle-free sample



A0044812

3 Measuring system with Liquiline System CAT810

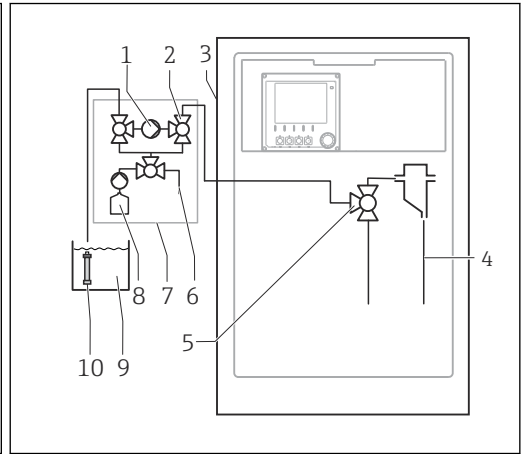
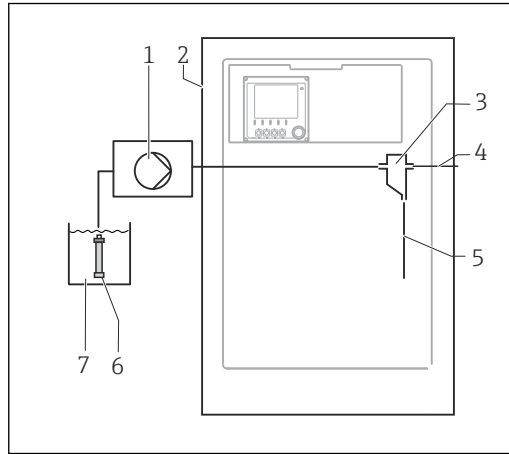
- 1 Overflow
- 2 Liquiline System CA80
- 3 Sample collecting vessel overflow
- 4 Sample
- 5 Pressurized sample
- 6 Filter unit
- 7 Liquiline System CAT810



A0044813

4 Measuring system with Liquiline System CAT810 and cleaning valve

- 1 Overflow
- 2 Liquiline System CA80
- 3 Sample collecting vessel overflow
- 4 Sample
- 5 Cleaning valve
- 6 Pressurized sample
- 7 Filter unit
- 8 Purge connection (compressed air or water)
- 9 Liquiline System CAT810

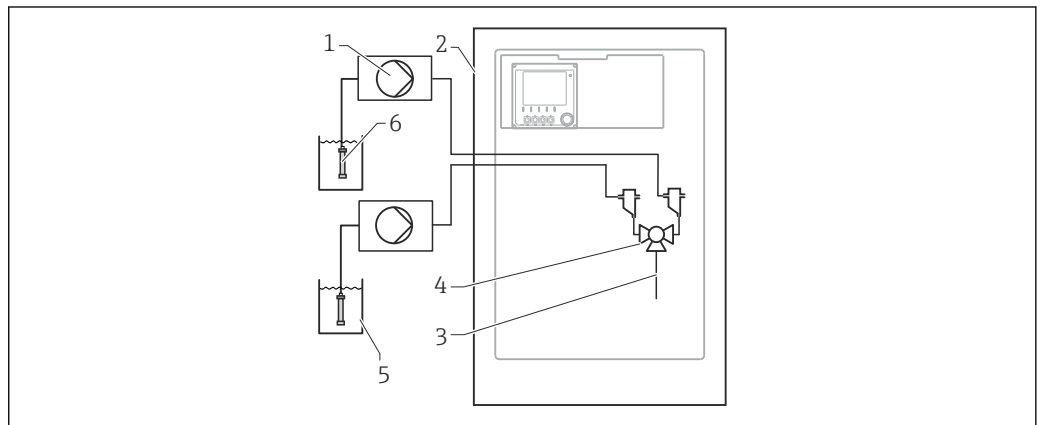


5 Measuring system with Liquiline System CAT820

- 1 Pump
- 2 Liquiline System CA80
- 3 Sample collecting vessel
- 4 Sample collecting vessel overflow
- 5 Sample
- 6 Filter (ceramic)
- 7 Medium

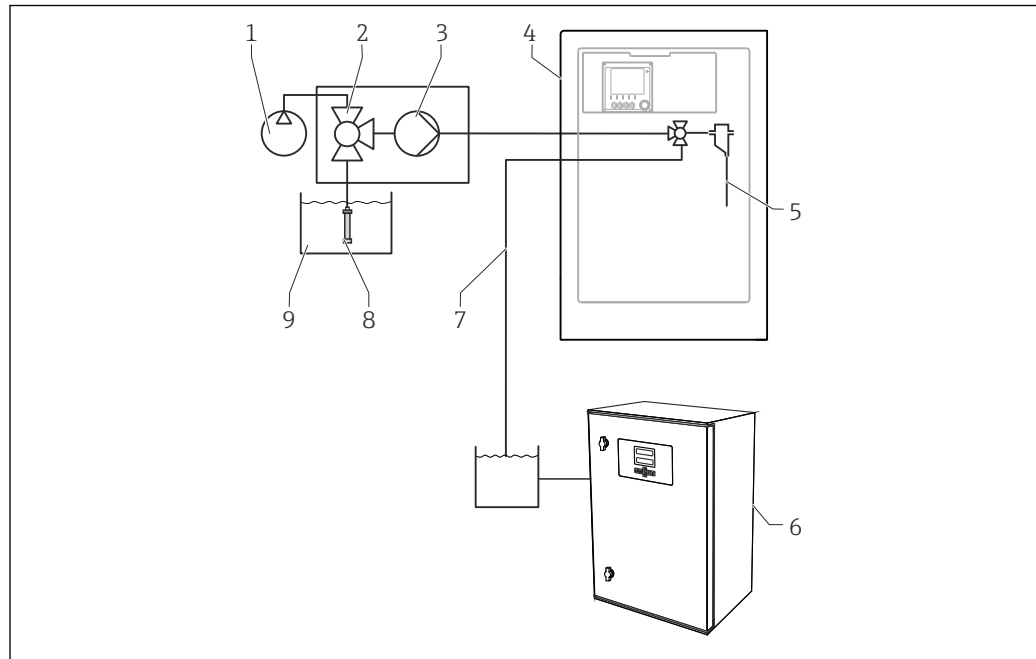
6 Measuring system with Liquiline System CAT860

- 1 Pump
- 2 Valve
- 3 Liquiline System CA80
- 4 Sample
- 5 Valve
- 6 Compressed air
- 7 Liquiline System CAT860
- 8 Cleaning solution
- 9 Medium
- 10 Filter (ceramic)



7 Measuring system with 2x Liquiline System CAT820

- 1 Pump
- 2 Liquiline System CA80
- 3 Sample
- 4 Valve
- 5 Medium
- 6 Filter (ceramic)




A0044808

- 8 *Measuring system with Liquiline System CA80, Liquiline System CAT820 and second analyzer*
- |   |  |   |                                  |
|---|--|---|----------------------------------|
| 1 | <i>Backflushing with compressed air (optional)</i> | 6 | <i>Second analyzer</i>           |
| 2 | <i>Valve (optional)</i>                            | 7 | <i>Sample to second analyzer</i> |
| 3 | <i>Pump</i>  | 8 | <i>Filter (ceramic)</i>          |
| 4 | <i>Liquiline System CA80</i>                       | 9 | <i>Medium</i>                    |
| 5 | <i>Sample</i>                                      |   |                                  |



### Customer-specific solution

Prior to analysis, the sample must be prepared at the customer site so that it is particle-free and homogeneous (representative sample). The sample can either be supplied to an external collecting vessel or pumped directly into the sample collecting vessel of the analyzer. The customer-specific sample preparation system must have its own individual control unit.

 The version of the Liquiline System CA80 as a self-priming device does not have a collecting vessel with level detection. For this reason, a continuous supply of sample must be guaranteed on the process side.

---


### Reagent cooling module (optional)

The analyzer can be fitted with a smart, energy-efficient cooling module for the reagents.

Thanks to the very low rate of reagent consumption and the extended life time, reagents can last for up to 12 weeks depending on the concentration.

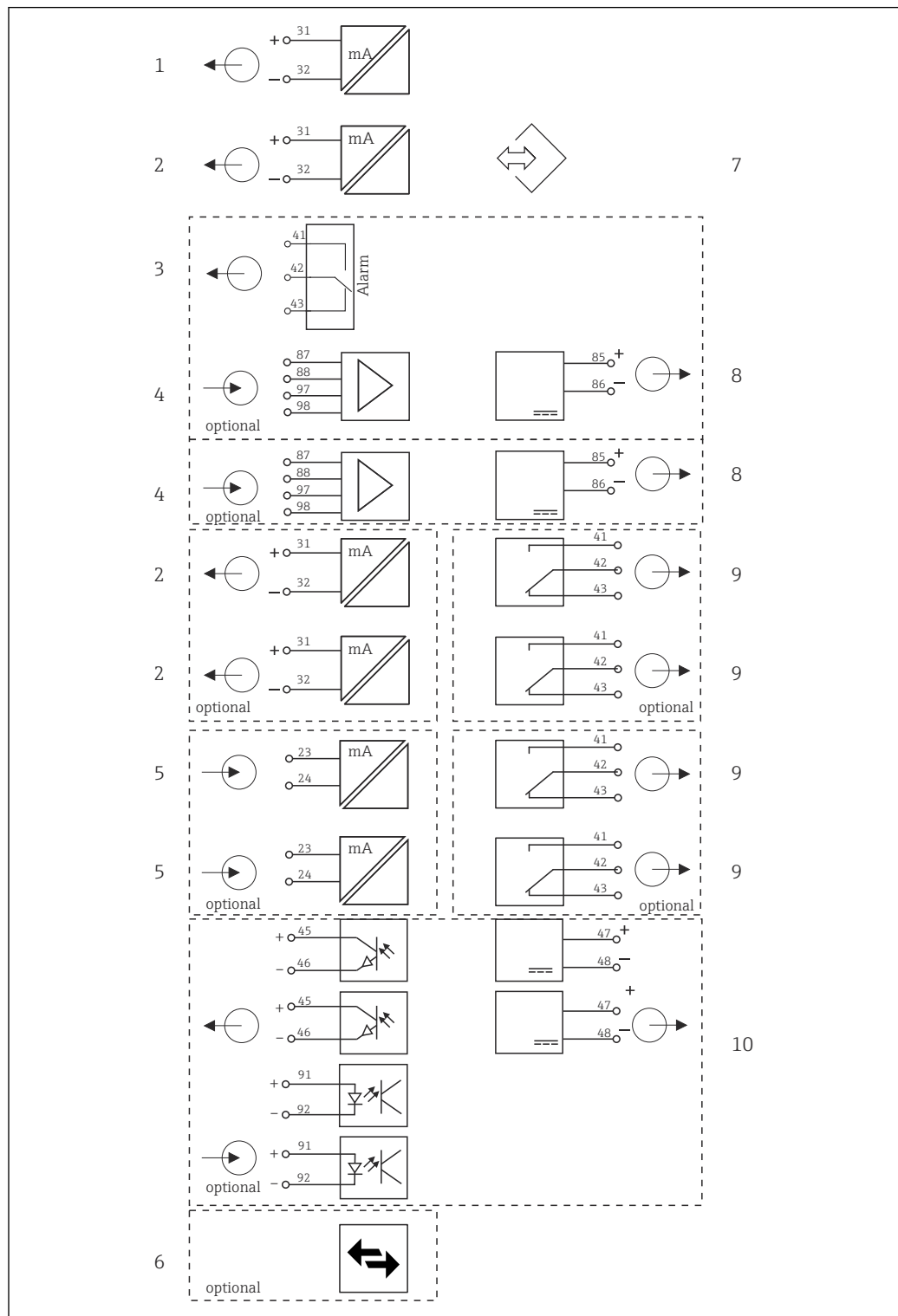
For the molybdenum blue method, the use of the cooling module is recommended for a longer reagent life time.

Cooling is by means of a Peltier cooler and does not require maintenance. The cooling unit is controlled automatically via the electronics.

 Due to the reagent life time, the use of a cooling module is recommended at ambient temperatures above 20 °C (68 °F).

## Device architecture

### Function diagram



A0021099

9 Block diagram CA80

1 Current output 1:1

2 Current outputs

3 Alarm relay

4 2 x Memosens input (1 x optional)

5 2 x current input (optional)

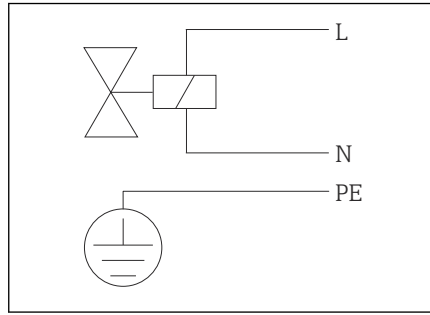
6 Modbus/Ethernet (optional)

7 Service interface

8 Power supply, fixed cable sensors

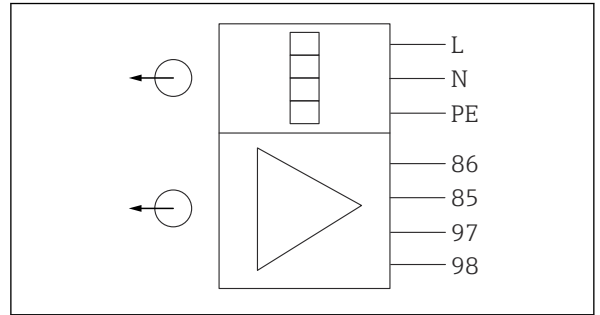
9 2 or 4 x relays (optional)

10 2 digital inputs and outputs (optional)



A0023193

10 Sample preparation block diagram, Liquiline System CAT810 with cleaning valve



A0021102

11 Sample preparation block diagram, Liquiline System CAT820 and CAT860

85, Connection for 24-V power supply

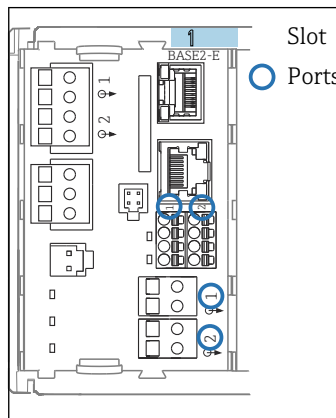
86

97, Communication connection

98

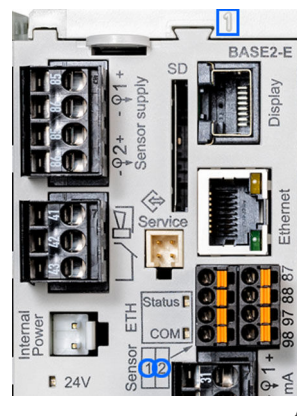
2 x communication via Memosens protocol (1 x optional), hose heating system

## Slot and port assignment



A0044868

12 Slot and port assignment



A0044869

13 Slot and port assignment

```

Analyzer_C8024A05G00
▶ Heartbeat diagnostics
SP1 Analyzer Slot
CH1: 1:1 pH Glass ATC 6.95 pH
CH2: 1:2 Cond e ATC 131.1 µS/cm
Current output 1:1 22.5 mA
Current output 1:2 22.5 mA
Current output 4:1 22.5 mA
Current output 4:2 22.5 mA
    
```

A0040671

14 Slots and ports on the display

\* Analyzer measured value (parameter-specific)

- Inputs are assigned to measuring channels in the ascending order of the slots and ports. In the example above: "CH1: 1:1 pH glass" means: Channel 1 (CH1) is slot 1 (basic module) : Port 1 (input 1), pH glass sensor
- Outputs and relays are named according to their function, e.g. "current output", and are displayed in ascending order with the slot and port numbers
- Display shows SP1: analyzer measuring channel 1 with sampling point SP1 (measured value display is parameter-specific; is not illustrated in the example)

## Communication and data processing

### Communication protocols:

- Fieldbus systems
  - PROFIBUS DP (Profile 3.02)
  - Modbus TCP or RS485
  - PROFINET
  - EtherNet/IP
- Configuration via Ethernet

### Extension module 485DP/485MB and current outputs

For PROFIBUS DP and Modbus RS485 communication protocols: A maximum of 2 current outputs can be used in parallel.

### Ethernet functionality via Base2 module and current outputs

A maximum of 6 current outputs can be used in parallel.

**Bus termination on the device**

- Via slide switch at bus module 485DP/485MB
- Displayed via LED "T" on bus module 485DP/485MB

---

## Dependability

### Reliability thanks to Memosens technology

#### MEMOSENS

Memosens makes your measuring point safer and more reliable:

- Non-contact, digital signal transmission enables optimum galvanic isolation
- Completely watertight
- Sensor can be calibrated in a lab, thus increasing the availability of the measuring point in the process
- Intrinsically safe electronics mean operation in hazardous areas is not a problem.
- Predictive maintenance thanks to recording of sensor data, e.g.:
  - Total hours of operation
  - Hours of operation with very high or very low measured values
  - Hours of operation at high temperatures
  - Number of steam sterilizations
  - Sensor condition

### Ease of maintenance

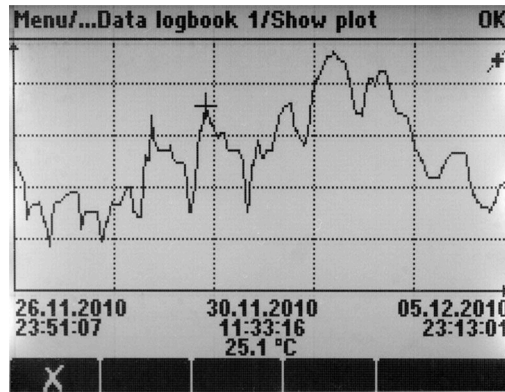
#### Modular design

The modular analyzer can be easily adapted to suit your needs:

- Retrofit extension modules for new or extended range of functions, e.g. current outputs, relays and digital communication
- Upgrade from one channel to two channel analyzer
- Upgrade to cooled analyzer
- Upgrade to measuring station with digital sensors with Memosens technology
- Optional: M12 sensor connector for connecting any kind of Memosens sensor

#### Data storage

- Independent, integrated ring memories (FIFO) or stack memories for recording:
  - An analog value (e.g. flow, pH value, conductivity)
  - Events (e.g. power failure)
- Analyzer data logbook
  - Scan time: automatically adjusted to the measuring interval
  - Max. 2 data logbooks
  - 20 000 entries per logbook
  - Graphic display (load curves) or numerical list
  - Factory setting: enabled for all channels, ring memory (FIFO)
- Data logbooks for digital sensors:
  - Adjustable scan time: 1 to 3600 s (1 h)
  - Max. 8 data logbooks
  - 150,000 entries per logbook
  - Graphic display (load curves) or numerical list
- Calibration logbook: max. 75 entries
- Hardware logbook:
  - Hardware configuration and modifications
  - Max. 125 entries
- Version logbook:
  - Software updates among other things
  - Max. 50 entries
- Event logbook
- Analyzer event logbook
  - Analyzer-specific events
  - Max. 19 500 entries, ring memory or fill-up buffer for recording
- Operations logbook: max. 250 entries
- Diagnostic logbook: max. 250 entries



A0024359

15 Data logbook: graphic representation on the display

### Mathematical functions (virtual process values)

In addition to "real" process values, which are provided by connected physical sensors or analog inputs, mathematical functions can be used to calculate a maximum of 6 "virtual" process values.

#### The "virtual" process values can be:

- Output via a current output or a fieldbus
- Used as a controlled variable
- Assigned as a measured variable to a limit switch
- Used as a measured variable to trigger cleaning
- Displayed in user-defined measuring menus

#### The following mathematical functions are possible:

- Calculation of pH from two conductivity values according to VGB Standard 405, e.g. in boiler feedwater
- Difference between two measured values from different sources, e.g. to monitor membranes
- Differential conductivity, e.g. to monitor the efficiency of ion exchangers
- Degassed conductivity, e.g. for process controls in power plants
- Redundancy to monitor two or three redundant sensors
- rH calculation based on the measured values of a pH and an ORP sensor
- Formula editor as a powerful mathematics tool and for Boolean operations with up to 3 measured values

### FieldCare

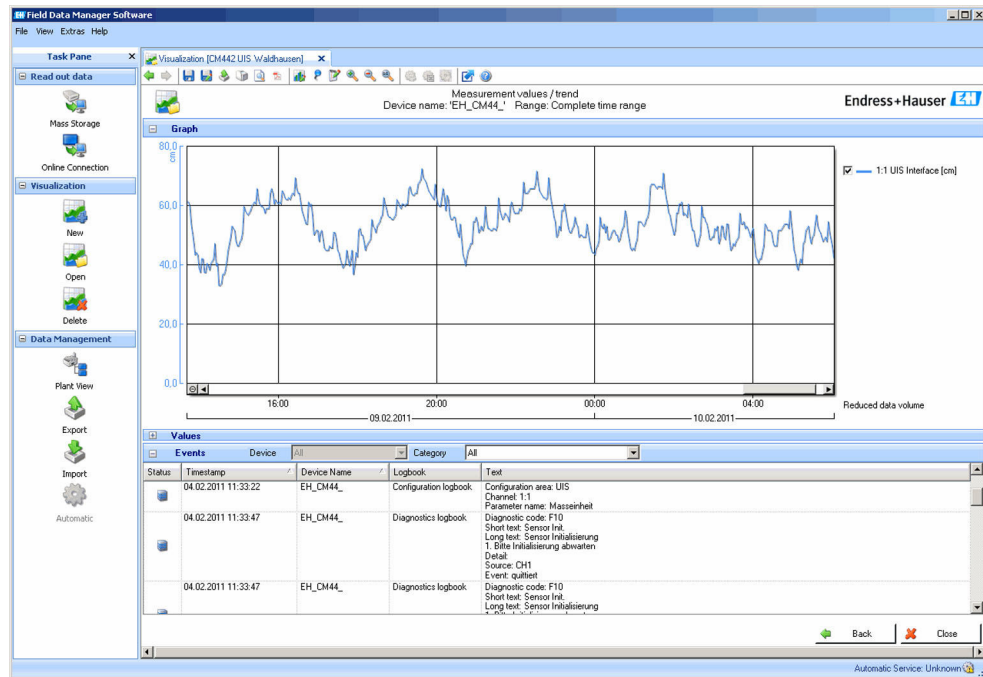
Configuration and asset management software based on FDT/DTM technology

- Complete device configuration when connected via FXA291 and service interface
- Access to a number of configuration parameters and identification, measuring and diagnostic data when connected via HART modem
- Logbooks can be downloaded in CSV format or binary format for "Field Data Manager" software

### Field Data Manager

Visualization software and database for measuring, calibration and configuration data

- SQL database which is protected against manipulation
- Functions to import, save and print out logbooks
- Load curves to display measured values



A0016009

16 Field Data Manager: load curve display

### SD card

The exchangeable storage medium enables:

- Quick and easy software updates and upgrades
- Quick and easy updates and upgrades to measuring parameter lists
- Data storage of internal device memory (e.g. logbooks)
- Transfer of complete configurations to a device with an identical setup (backup function)
- Transfer of configurations without the TAG and bus address to devices with an identical setup (copy function)

Endress+Hauser offers industry-approved SD cards as accessories. These memory cards provide maximum data security and integrity.

Other SD cards can also be used. However, Endress+Hauser does not accept any responsibility for the data security of such cards.

### Self-monitoring functions

#### Electronics

- Current inputs are deactivated in the event of overcurrent and reactivated once the overcurrent stops.
- Board voltages are monitored and the board temperature is also measured.

#### Counter

Counters monitor consumables such as reagents, cleaners or dispensers.

#### Photometer

- Automatic temperature monitoring
- Active monitoring of communication between the photometer module and the analyzer electronics

#### Sample preparation (optional)

- Active monitoring of communication between sample preparation with Memosens communication and the analyzer
- Counter for consumables, such as hoses of the peristaltic pump

#### Sample collecting vessel (optional)

Active monitoring of liquid level in the sample collecting vessel to ensure the supply of liquid to the analyzer

Leak sensor in the housing

### Data security

All settings, logbooks etc. are stored in a non-volatile memory to ensure that the data are retained even in the event of a disruption to the power supply.

**IT security**

We only provide a warranty if the device is installed and used as described in the Operating Instructions. The device is equipped with security mechanisms to protect it against any inadvertent changes to the device settings.

IT security measures in line with operators' security standards and designed to provide additional protection for the device and device data transfer must be implemented by the operators themselves.

## Input

**Measured variables** PO<sub>4</sub>, PO<sub>4</sub>-P, P<sub>2</sub>O<sub>5</sub> [mg/l, ppm]

**Measuring range**

CA80PH-**E1:	0 to 2.5 mg/l PO <sub>4</sub> -P (blue method)
CA80PH-**E2:	0.05 to 10 mg/l PO <sub>4</sub> -P (blue method)
CA80PH-**E3:	0.5 to 20 mg/l PO <sub>4</sub> -P (yellow method)
CA80PH-**E4:	0.5 to 50 mg/l PO <sub>4</sub> -P (yellow method)

*Only CA80PH-\*E2 (with dilution function)*

Measuring range to be configured [mg/l (ppm) PO <sub>4</sub> -P]	Dilution factor <sup>1)</sup>	Effective measuring range [mg/l (ppm) PO <sub>4</sub> -P]
0.05 to 10	1	0.05 to 10 <sup>2)</sup>
0.05 to 10	5	0.25 to 50
0.05 to 10	10	0.5 to 100
0.05 to 10	50	2.5 to 500

- 1) User configurable
- 2) Dilution function disabled

*Only CA80PH-\*E4 (with dilution function)*

Measuring range to be configured [mg/l (ppm) PO <sub>4</sub> -P]	Dilution factor <sup>1)</sup>	Effective measuring range [mg/l (ppm) PO <sub>4</sub> -P]
0.5 to 50	1	0.5 to 50 <sup>2)</sup>
0.5 to 50	5	2.5 to 250
0.5 to 50	10	5 to 500
0.5 to 50	20	10 to 1000

- 1) User configurable
- 2) Dilution function disabled

**Types of input**

- 1 or 2 measuring channels (analyzer main parameter)
- 1 to 4 digital sensor inputs for sensors with Memosens protocol (optional)
- Analog current inputs (optional)
- Binary inputs (optional)

**Input signal**

Depending on version  
2 x 0/4 to 20 mA (optional), passive, potentially isolated

**Current input, passive**

**Span**  
> 0 to 20 mA

**Signal characteristic**  
Linear

**Internal resistance**  
Non-linear

**Test voltage**  
500 V

**Cable specification**  
(for optional sensors with  
Memosens technology)

**Cable type**  
Memosens data cable CYK10 or sensor fixed cable, each with cable end sleeves or M12 round-pin connector (optional)

**Cable length**  
Max. 100 m (330 ft)

## Output

**Output signal**

Depending on version:

- 2 x 0/4 to 20 mA, active, potentially isolated (standard version)
- 4 x 0/4 to 20 mA, active, potentially isolated (version with 2 additional analog outputs)
- 6 x 0/4 to 20 mA, active, potentially isolated (version with 4 additional analog outputs)
- Binary outputs

PROFIBUS DP/RS485	
Signal encoding	EIA/TIA-485, PROFIBUS DP-compliant acc. to IEC 61158
Data transmission rate	9.6 kBd, 19.2 kBd, 45.45kBd, 93.75 kBd, 187.5 kBd, 500 kBd, 1.5 MBd, 6 MBd, 12 MBd
Galvanic isolation	Yes
Connectors	Spring terminal (max. 1.5 mm), bridged internally (T-function), optional M12
Bus termination	Internal slide switch with LED display

Modbus RS485	
Signal encoding	EIA/TIA-485
Data transmission rate	2,400, 4,800, 9,600, 19,200, 38,400, 57,600 and 115,200 baud
Galvanic isolation	Yes
Bus termination	Internal slide switch with LED display

Web server and Modbus TCP	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	10 / 100 MBd
Galvanic isolation	Yes
Connection	RJ45, M12 optional
IP address	DHCP or configuration using menu

EtherNet/IP	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	10 / 100 MBd
Galvanic isolation	Yes
Connection	RJ45, M12 optional (D-encoded)
IP address	DHCP (default) or configuration via menu



PROFINET	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	100 MBd
Galvanic isolation	Yes
Connection	RJ45
Name of station	Via DCP protocol using the configuration tool (e.g. Siemens PRONETA)
IP address	Via DCP protocol using the configuration tool (e.g. Siemens PRONETA)

<b>Signal on alarm</b>	Adjustable, as per NAMUR Recommendation NE 43 <ul style="list-style-type: none"> <li>■ In measuring range 0 to 20 mA: Failure current from 0 to 23 mA</li> <li>■ In measuring range 4 to 20 mA: Failure current from 2.4 to 23 mA</li> <li>■ Factory setting for failure current for both measuring ranges: 21.5 mA</li> </ul>
------------------------	--

<b>Load</b>	Max. 500 Ω
-------------	------------

<b>Transmission behavior</b>	Linear
------------------------------	--------

## Current outputs, active

<b>Span</b>	0 to 23 mA
-------------	------------

<b>Signal characteristic</b>	Linear
------------------------------	--------

<b>Electrical specification</b>	<b>Output voltage</b> Max. 24 V  <b>Test voltage</b> 500 V
---------------------------------	--

<b>Cable specification</b>	<b>Cable type</b> Recommended: shielded cable  <b>Cable specification</b> Max. 2.5 mm <sup>2</sup> (14 AWG)
----------------------------	---

## Relay outputs

<b>Electrical specification</b>	<b>Relay types</b> <ul style="list-style-type: none"> <li>■ 1 single-pin changeover contact (alarm relay)</li> <li>■ 2 or 4 single-pin changeover contacts (optional with extension modules)</li> </ul> <b>Maximum load</b> <ul style="list-style-type: none"> <li>■ Alarm relay: 0.5 A</li> <li>■ All other relays: 2.0 A</li> </ul>
---------------------------------	---

**Relay switching capacity***Base module (Alarm relay)*

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	700,000
	0.5 A	450,000
115 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	1,000,000
	0.5 A	650,000
24 V DC, L/R = 0 to 1 ms	0.1 A	500,000
	0.5 A	350,000

*Extension module*

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	700,000
	0.5 A	450,000
	2 A	120,000
115 V AC, $\cos\Phi = 0.8$ to 1	0.1 A	1,000,000
	0.5 A	650,000
	2 A	170,000
24 V DC, L/R = 0 to 1 ms	0.1 A	500,000
	0.5 A	350,000
	2 A	150,000

## Minimum load (typical)

- Min. 100 mA at 5 V DC
- Min. 1 mA at 24 V DC
- Min. 5 mA at 24 V AC
- Min. 1 mA at 230 V AC

**Protocol-specific data****PROFIBUS DP**

Manufacturer ID	11 <sub>h</sub>
Device type	155E <sub>h</sub>
Profile version	3.02
Device database files (GSD files)	<a href="http://www.endress.com/profibus">www.endress.com/profibus</a> Device Integration Manager DIM
Output variables	16 AI blocks, 8 DI blocks
Input variables	4 AO blocks, 8 DO blocks
Supported features	<ul style="list-style-type: none"> <li>▪ 1 MSCYO connection (cyclical communication, master class 1 to slave)</li> <li>▪ 1 MSAC1 connection (acyclical communication, master class 1 to slave)</li> <li>▪ 2 MSAC2 connections (acyclical communication, master class 2 to slave)</li> <li>▪ Device lock: The device can be locked using the hardware or software.</li> <li>▪ Addressing using DIL switches or software</li> <li>▪ GSD, PDM DD, DTM</li> </ul>

<b>Modbus RS485</b>	Protocol	RTU/ASCII
	Function codes	03, 04, 06, 08, 16, 23
	Broadcast support for function codes	06, 16, 23
	Output data	16 measured values (value, unit, status), 8 digital values (value, status)
	Input data	4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information
	Supported features	Address can be configured using switch or software

<b>Modbus TCP</b>	TCP port	502
	TCP connections	3
	Protocol	TCP
	Function codes	03, 04, 06, 08, 16, 23
	Broadcast support for function codes	06, 16, 23
	Output data	16 measured values (value, unit, status), 8 digital values (value, status)
	Input data	4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information
	Supported features	Address can be configured using DHCP or software

**Web server** The web server enables full access to the device configuration, measured values, diagnostic messages, logbooks and service data via standard WiFi/WLAN/LAN/GSM or 3G routers with a user-defined IP address.

TCP port	80
Supported features	<ul style="list-style-type: none"> <li>▪ Remote-controlled device configuration(1 session)</li> <li>▪ Save/restore device configuration (via SD card)</li> <li>▪ Logbook export (file formats: CSV, FDM)</li> <li>▪ Access to web server via DTM or Internet Explorer</li> <li>▪ Login</li> <li>▪ Web server can be switched off</li> </ul>

<b>EtherNet/IP</b>	Log	EtherNet/IP		
	ODVA certification	Yes		
	Device profile	Generic device (product type: 0x2B)		
	Manufacturer ID	0x049E <sub>h</sub>		
	Device type ID	0x109F		
	Polarity	Auto-MIDI-X		
	Connections	CIP	12	
		I/O	6	
		Explicit message	6	
		Multicast	3 consumers	
	Minimum RPI	100 ms (default)		
	Maximum RPI	10000 ms		
	System integration	EtherNet/IP	EDS	
Rockwell		Add-on-Profile Level 3, Faceplate for Factory Talk SE		

IO data	Input (T → O)	Device status and diagnostic message with highest priority  Measured values: <ul style="list-style-type: none"> <li>▪ 16 AI (analog input) + Status + Unit</li> <li>▪ 8 DI (discrete input) + Status</li> </ul>
	Output (O → T)	Actuating values: <ul style="list-style-type: none"> <li>▪ 4 AO (analog output) + status + unit</li> <li>▪ 8 DO (discrete output) + Status</li> </ul>

**PROFINET**

Protocol	"Application layer protocol for decentral device periphery and distributed automation", PNIO Version 2.34
Communication type	100 MBit/s
Conformance Class	Conformance Class B
Netload Class	Netload Class II
Baud rate	Automatic 100 Mbps with full-duplex detection
Cycle times	From 32 ms
Device profile	Application interface identifier 0xF600 Generic device
PROFINET interface	1 port, Realtime Class 1 (RT_CLASS_1)
Manufacturer ID	0x11 <sub>h</sub>
Device type ID	0x859F <sub>h</sub>
Device description files (GSD)	Information and files under: <ul style="list-style-type: none"> <li>▪ <a href="http://www.endress.com">www.endress.com</a> On the product page for the device: Documents/Software → Device drivers</li> <li>▪ <a href="http://www.profibus.com">www.profibus.com</a> On the website under Products/Product Finder</li> </ul>
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	<ul style="list-style-type: none"> <li>▪ 1 x AR (IO Controller AR)</li> <li>▪ 1 x AR (IO-Supervisor Device AR connection allowed)</li> <li>▪ 1 x Input CR (Communication Relation)</li> <li>▪ 1 x Output CR (Communication Relation)</li> <li>▪ 1 x Alarm CR (Communication Relation)</li> </ul>
Configuration options for measuring device	<ul style="list-style-type: none"> <li>▪ Web browser</li> <li>▪ Manufacturer-specific software (FieldCare, DeviceCare)</li> <li>▪ Device master file (GSD), can be read out via the integrated web server of the measuring device</li> </ul>
Configuration of the device name	DCP protocol
Supported functions	<ul style="list-style-type: none"> <li>▪ Identification &amp; maintenance Simple device identification via: <ul style="list-style-type: none"> <li>▪ Process control system</li> <li>▪ Nameplate</li> </ul> </li> <li>▪ Measured value status The process variables are communicated with a measured value status</li> <li>▪ Blinking feature (FLASH_ONCE) via the local display for simple device identification and assignment</li> <li>▪ Device operation via operating tools (e.g. FieldCare, DeviceCare)</li> </ul>
System integration	For information on system integration, see the Operating Instructions <ul style="list-style-type: none"> <li>▪ Cyclic data transmission</li> <li>▪ Overview and description of the modules</li> <li>▪ Status coding</li> <li>▪ Startup configuration</li> <li>▪ Factory setting</li> </ul>

## Power supply

<b>Supply voltage</b>	<ul style="list-style-type: none"> <li>▪ 100 to 120 V AC / 200 to 240 V AC or 24 V DC (not available for "Outdoor" version)</li> <li>▪ 50 or 60 Hz</li> </ul>
<b>Fieldbus connection</b>	Supply voltage: not applicable
<b>Power consumption</b>	<p><b>All versions except "Outdoor" version</b></p> <p>130 VA + 660 VA per hose heater, max. 1450 VA (version with cooling system)</p> <p>24-V version: max. 105 W</p> <p><b>"Outdoor" version</b></p> <p>680 VA + 660 VA per hose heater, max. 2000 VA (version with cooling system) <sup>1)</sup></p>
<b>Fuse</b>	5 x 20 mm 10 A/250 V fine-wire fuse for hose trace heating system
<b>Cable entries</b>	<ul style="list-style-type: none"> <li>▪ 4 x bores for M16, G3/8, NPT3/8", Memosens connection <sup>2)</sup></li> <li>▪ 4 x bores for M20, G1/2, NPT1/2"</li> </ul>

Cable specification	Cable gland	Permitted cable diameter
	M16x1.5 mm	4 to 8 mm (0.16 to 0.32")
M12x1.5 mm (for order version M12 socket for Memosens sensors)	2 to 5 mm (0.08 to 0.20")	
M20x1.5 mm	6 to 12 mm (0.24 to 0.48")	
NPT <sup>3</sup> / <sub>8</sub> "	4 to 8 mm (0.16 to 0.32")	
G <sup>3</sup> / <sub>8</sub>	4 to 8 mm (0.16 to 0.32")	
NPT <sup>1</sup> / <sub>2</sub> "	6 to 12 mm (0.24 to 0.48")	
G <sup>1</sup> / <sub>2</sub>	7 to 12 mm (0.28 to 0.48")	



Cable glands mounted at the factory are tightened with 2 Nm.

<b>Heating for dilution water</b>	The dilution water and the hose for dilution water must be heated onsite at the place of installation!
-----------------------------------	--

**Connecting optional modules** With extension modules you can purchase additional functions for your device.

### NOTICE

#### Unacceptable hardware combinations (due to conflicts in power supply)

Incorrect measurements or total failure of the measuring point as a result of heat build-up or overloading

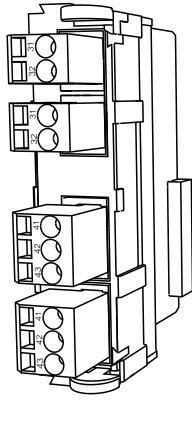
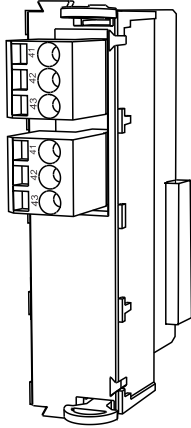
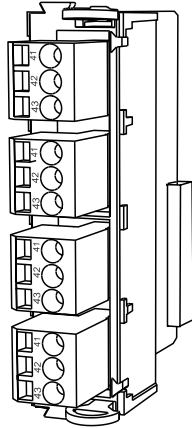
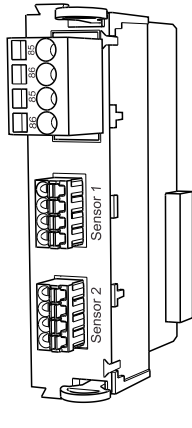
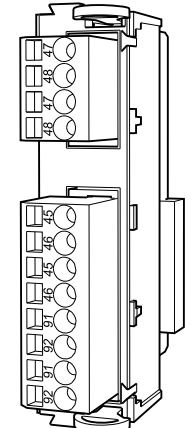
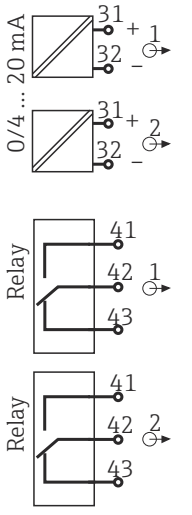
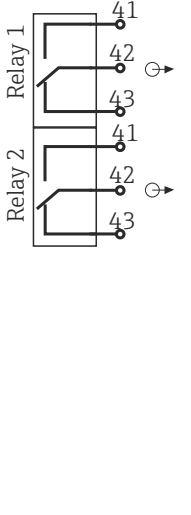
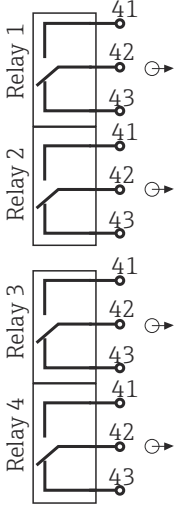
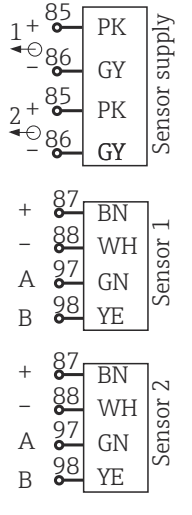
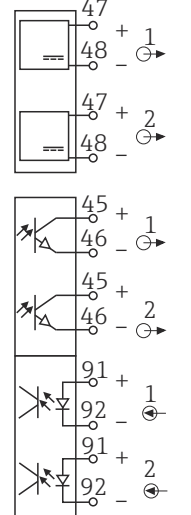
- ▶ Find out if the planned upgrade of your device results in a permitted hardware combination (configurator on [www.endress.com/CA80PH](http://www.endress.com/CA80PH)).
- ▶ A maximum of eight current inputs and current outputs is permitted.
- ▶ A maximum of two "DIO" modules is permitted.
- ▶ Please contact your Endress+Hauser sales center should you have any questions.



Cable bushings and possible cable diameters

- 1) The power value indicated on the nameplate refers to the power consumption when commissioning at 5 °C (41 °F) after an operating time of one minute.
- 2) In the case of the "Outdoor" version, 2 bores are occupied; for this reason only 2 Memosens sensors are possible

Overview of all the optional modules

Module name				
AOR	2R	4R	2DS	DIO
				
<ul style="list-style-type: none"> <li>2 x 0/4 to 20 mA analog outputs</li> <li>2 relays</li> <li>Order No. 71111053</li> </ul>	<ul style="list-style-type: none"> <li>2 relays</li> <li>Order No. 71125375</li> </ul>	<ul style="list-style-type: none"> <li>4 relays</li> <li>Order No. 71125376</li> </ul>	<ul style="list-style-type: none"> <li>2 digital sensor inputs</li> <li>2 power supply systems for digital sensors</li> <li>Order No. 71135631</li> </ul>	<ul style="list-style-type: none"> <li>2 digital inputs</li> <li>2 digital outputs with auxiliary voltage</li> <li>Order No. 71135638</li> </ul>
				

Module name				
2AO	4AO	2AI	485DP	485MB
<ul style="list-style-type: none"> <li>2 x 0/4 to 20 mA analog outputs</li> <li>Order No. 71135632</li> </ul>	<ul style="list-style-type: none"> <li>4 x 0/4 to 20 mA analog outputs</li> <li>Order No. 71135633</li> </ul>	<ul style="list-style-type: none"> <li>2 x 0/4 to 20mA analog inputs</li> <li>Order No. 71135639</li> </ul>	<ul style="list-style-type: none"> <li>5V power supply for PROFIBUS DP termination</li> <li>RS485 for PROFIBUS DP</li> <li>Order No. 71575177</li> </ul>	<ul style="list-style-type: none"> <li>RS485 for Modbus</li> <li>Order No. 71575178</li> </ul>



**PROFIBUS DP (module 485DP)**

Contacts 95, 96 and 99 are jumpered in the plug. This ensures that PROFIBUS communication is not interrupted if the connector is disconnected.

**Sensor connection (optional)** *Sensors with Memosens protocol*

Sensor types	Sensor cable	Sensors
Digital sensors <b>without</b> additional internal power supply	With plug-in connection and inductive signal transmission	<ul style="list-style-type: none"> <li>▪ pH sensors</li> <li>▪ ORP sensors</li> <li>▪ Combined sensors</li> <li>▪ Oxygen sensors (amperometric and optical)</li> <li>▪ Conductivity sensors with conductive measurement of conductivity</li> <li>▪ Chlorine sensors (disinfection)</li> </ul>
	Fixed cable	Conductivity sensors with inductive measurement of conductivity
Digital sensors with additional internal power supply	Fixed cable	<ul style="list-style-type: none"> <li>▪ Turbidity sensors</li> <li>▪ Sensors for interface measurement</li> <li>▪ Sensors for measuring the spectral absorption coefficient (SAC)</li> <li>▪ Nitrate sensors</li> <li>▪ Optical oxygen sensors</li> <li>▪ Ion-sensitive sensors</li> </ul>

## Performance characteristics

<b>Maximum measured error</b> <sup>3)</sup>	2 % of end of measuring range With dilution and dilution factor 5: <ul style="list-style-type: none"> <li>▪ Blue method: additionally 2.0 % of end of measuring range</li> <li>▪ Yellow method: additionally 3.0 % of end of measuring range</li> </ul>
---	--

<b>Maximum measurement error for sensor inputs</b>	→ Documentation of the connected sensor
--	---

<b>Maximum measurement error for current inputs and outputs</b>	Typical measured errors: < 20 µA (with current values < 4 mA) < 50 µA (with current values 4 to 20 mA) at 25 °C (77° F) in each case Additional measured error depending on the temperature: < 1.5 µA/K
---	--

<b>LOD (limit of detection, only applies to the blue method)</b>	0.015 mg/l (ppm) PO <sub>4</sub> -P
--	-------------------------------------

<b>Repeatability</b> <sup>3)</sup>	<ul style="list-style-type: none"> <li>▪ Blue method: ± 2% of display value + 0.01 mg/l (ppm)</li> <li>▪ Yellow method: ± 2% of display value + 0.05 mg/l (ppm)</li> </ul> With dilution and dilution factor 5: Additionally 1.5 % of end of measuring range
------------------------------------	---

<b>Repeatability of sensor inputs</b>	→ Documentation of the connected sensor
---------------------------------------	---

<b>Measuring interval</b>	<ul style="list-style-type: none"> <li>▪ Blue method: continuous (approx. 11 min), adjustable &gt; 11 min</li> <li>▪ Yellow method: continuous (approx. 8 min), adjustable &gt; 10 min</li> </ul>
---------------------------	---

<b>Sample requirement</b>	Without dilution module 22 ml (0.74 fl oz)/measurement
---------------------------	---

3) Measurement errors include all the uncertainties of the analyzer. They do not include the uncertainties from the standard solutions used as a reference.



With dilution module

- Sample: 11 to 15 ml (0.37 to 0.51 fl oz)/measurement (depends on dilution factor)
  - Dilution water: 17 to 21 ml (0.57 to 0.71)/measurement (depends on dilution factor)
- Use demineralized water for expected sample concentrations of < 50 mg/l (ppm).

---

<b>Reagent requirement</b>	<ul style="list-style-type: none"> <li>■ Blue method: approx. 50 µl per reagent and measurement <sup>4)</sup></li> <li>■ Yellow method: approx. 115 µl per measurement</li> </ul>
<b>Standard requirement</b>	Given a calibration interval of 48 h approx. 230 ml (7.77 fl.oz) per month
<b>Calibration interval</b>	1 h to 90 days, depending on the application and ambient conditions
<b>Cleaning interval</b>	1 hour to 90 days, depending on the application
<b>Maintenance interval</b>	Every 3 to 6 months, depending on the application
<b>Maintenance effort</b>	<ul style="list-style-type: none"> <li>■ Weekly: visual inspection</li> <li>■ Quarterly: 1 hour</li> </ul>

---

## Mounting

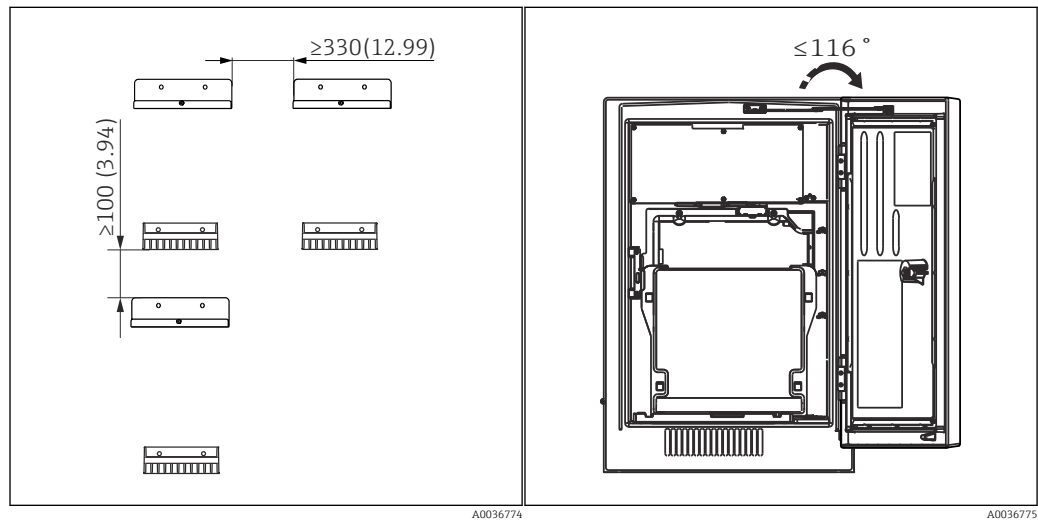
---

<b>Mounting location</b>	<p>Note the following when erecting the device:</p> <ul style="list-style-type: none"> <li>▶ If mounting on a wall, make sure that the wall has sufficient load-bearing capacity and is fully perpendicular.</li> <li>▶ If mounting on a base, set up the device on a level surface. Installing on a base is only permitted indoors.</li> <li>▶ Protect the device against additional heating (e.g. from heaters).</li> <li>▶ Protect the device against mechanical vibrations.</li> <li>▶ Protect the device against corrosive gases, e.g. hydrogen sulfide (H<sub>2</sub>S) .</li> <li>▶ Make sure to pay attention to the maximum height difference and the maximum distance from the sampling point.</li> <li>▶ Ensure that the unit can drain freely, without any siphoning effects.</li> <li>▶ Make sure air can circulate freely at the front of the housing.</li> <li>▶ Open analyzers (i.e. analyzers that are supplied without a door) may only be set up in closed areas or in a protective cabinet or similar facility.</li> <li>▶ "Outdoor" version only: Post mounting is recommended for outdoor installation.</li> </ul>
<b>Installation instructions</b>	<p>The device can be installed in the following ways:</p> <ul style="list-style-type: none"> <li>■ Mounted on a wall</li> <li>■ Mounted on a base</li> <li>■ Post mounting / on a post (accessory)</li> </ul>

---

4) The actual reagent shelf life can be shorter than the reagent longevity depending on the ambient conditions and display value

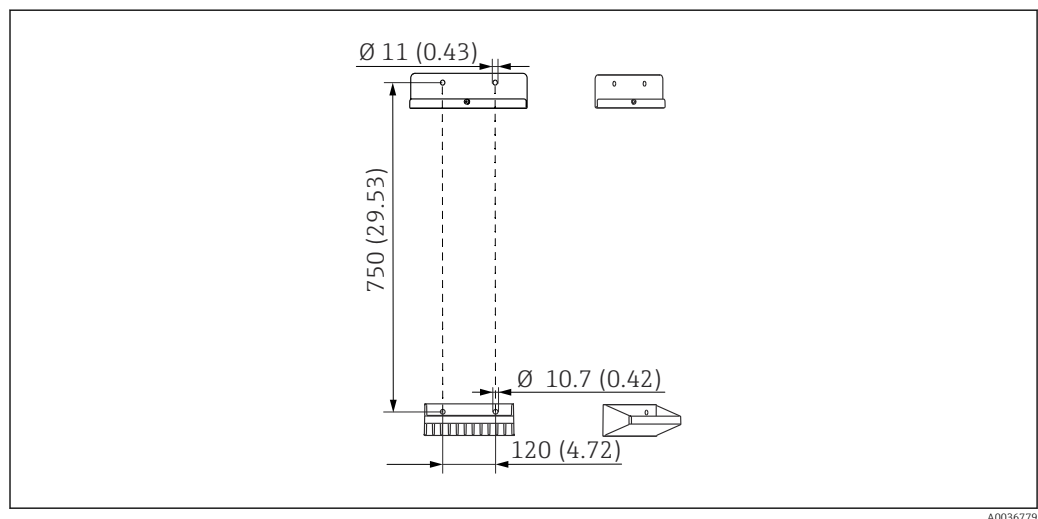
Spacing required for installing analyzer



17 Minimum spacing required for mounting.  
Engineering unit mm (in).

18 Maximum opening angle

Spacing required for installing wall-mount version



19 Holder unit dimensions. Engineering unit mm (in)

## Environment

<b>Ambient temperature range</b>	<b>All housing versions with the exception of the outdoor version</b> +5 to +40 °C (41 to 104 °F)
	<b>Outdoor version</b> -20 to +40 °C (-4 to 104 °F)
<b>Storage temperature</b>	-20 to 60 °C (-4 to 140 °F)
<b>Relative humidity</b>	10 to 95 %, non-condensing
<b>Degree of protection</b>	IP55 (cabinet, analyzer stand), TYPE 3R (cabinet, analyzer stand)

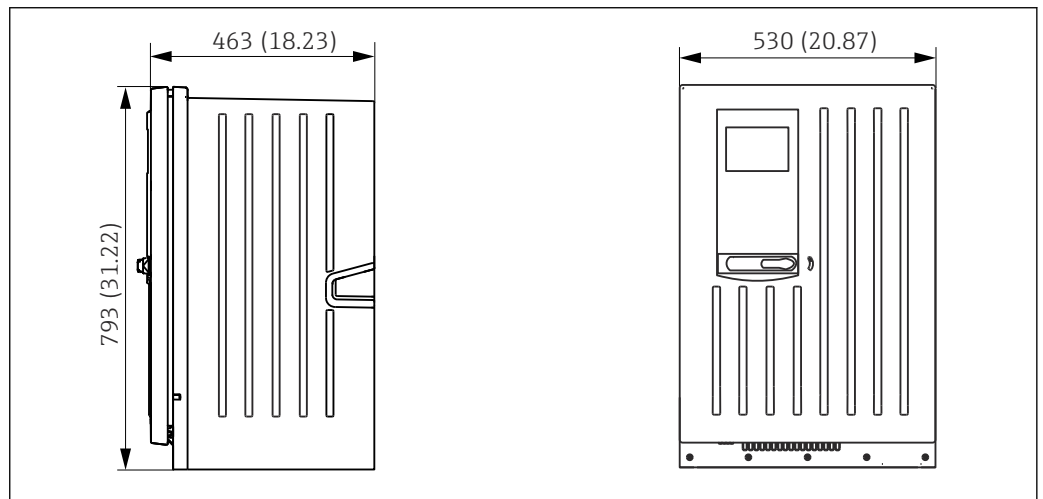
<b>Electromagnetic compatibility<sup>5)</sup></b>	Interference emission and interference immunity as per EN 61326-1, class A for industrial areas
<b>Electrical safety</b>	According to EN/IEC 61010-1:2010, Class I equipment Low voltage: overvoltage category II For installations up to 2000 m (6500 ft) above MSL
<b>Pollution degree</b>	Pollution level 2

## Process

<b>Sample temperature</b>	4 to 40 °C (39 to 104 °F)
<b>Consistency of the sample</b>	Low solids content (turbidity < 50 NTU), aqueous, homogenized
<b>Sample supply</b>	Unpressurized

## Mechanical construction

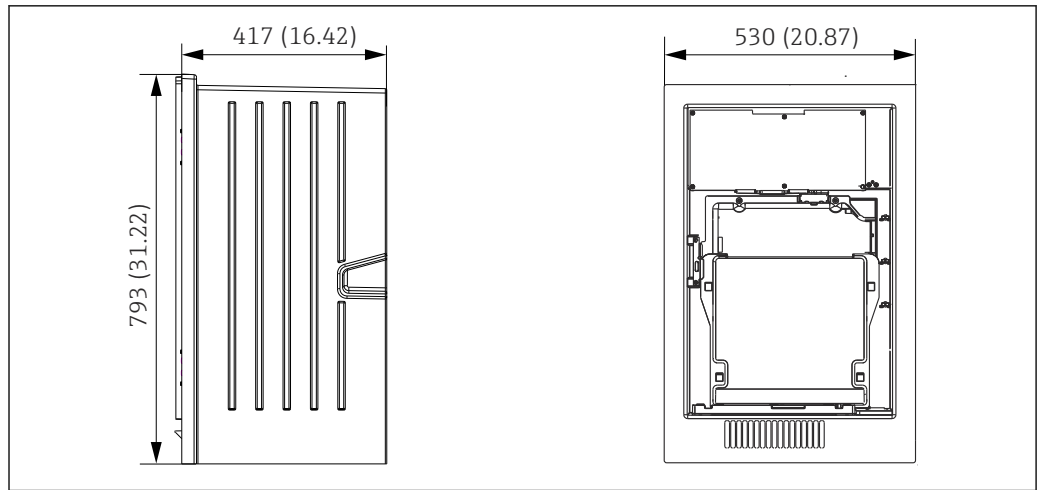
### Dimensions



20 Liquiline System CA80 closed version, dimensions in mm (in)

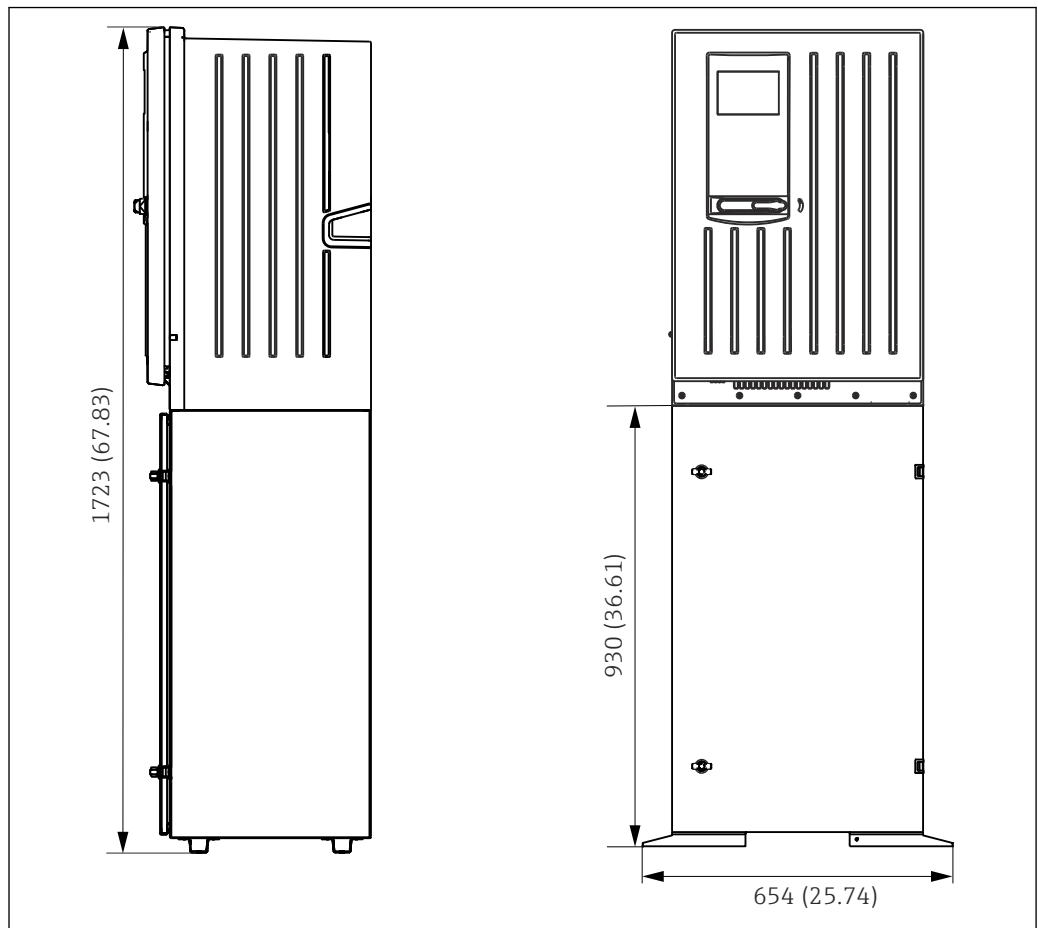
A0028820

5) Sufficient mains quality is required to operate the product as intended.



A0030419

21 Liquiline System CA80 open version, dimensions in mm (in)



A0028821

22 Liquiline System CA80 with base, dimensions in mm (in)

**Weight**

Order	Weight with cooling module	Weight without cooling module
Cabinet version	42 kg (92.6 lbs)	39.5 kg (87.1 lbs)
Open installation	34 kg (74.96 lbs)	31.5 kg (69.45 lbs)
Analyzer stand	75 kg (165.3 lbs)	72.5 kg (159.8 lbs)

**Materials**

Parts not in contact with medium	
Cabinet version, exterior cover	ASA + PC

Open installation, exterior cover	
Cabinet version, interior lining	PP
Open installation, interior lining	
Window	Safety glass, coated
Reagent container	PP
Insulation	EPP (extruded PP)
Base, analyzer stand	Powder-coated sheet steel

<b>Parts in contact with medium</b>	
Dispenser body	PP
Piston seal	TPE
Liquid Manager housing	PP
Liquid Manager seal	FKM
Hoses	C-Flex (TPE), NORPRENE (PP)
Optical window	Borosilicate glass
Form seal, cuvette	FFKM
Sample collecting vessel (optional) <ul style="list-style-type: none"> <li>▪ Beaker</li> <li>▪ Cover</li> <li>▪ Level detector pins</li> <li>▪ Seal, solenoid valve</li> <li>▪ Seal for sample collecting vessel valve</li> </ul>	<ul style="list-style-type: none"> <li>▪ PMMA</li> <li>▪ PP</li> <li>▪ Stainless steel 1.4404 (V4A)</li> <li>▪ EPDM</li> <li>▪ FKM</li> </ul>
Valve on sample collecting vessel (optional) <ul style="list-style-type: none"> <li>▪ Housing</li> <li>▪ Seal</li> </ul>	<ul style="list-style-type: none"> <li>▪ PEEK</li> <li>▪ FKM</li> </ul>

<b>Process connection</b>	Sample inlet:	
	With sample collecting vessel	Plug-in connector for rigid hoses with OD 4 mm
	Without sample collecting vessel	Hose barb for flexible hoses with ID 1.6 mm
	Dilution water:	Hose barb for flexible hoses with ID 3.2 mm
	Outlet:	Hose barb for flexible hoses with ID 13 mm

<b>Hose entries</b>	4 x bores for M32 for sample inflow and outflow
---------------------	---

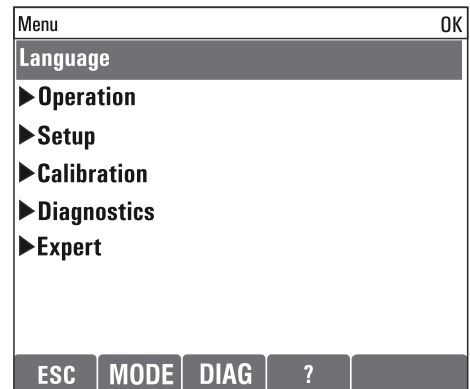
<b>Hose specification (self-priming)</b>	<ul style="list-style-type: none"> <li>▪ Clearance: max. 1.0 m (3.3 ft)</li> <li>▪ Height: max. 0.5 m (1.6 ft)</li> <li>▪ Hose ID: 1.6 mm (<math>1/16</math> in)</li> </ul>
--	---

## Operability

<b>Operation concept</b>	<p>The simple and structured operating concept sets new standards:</p> <ul style="list-style-type: none"> <li>▪ Intuitive operation with the navigator and soft keys</li> <li>▪ Fast configuration of application-specific measurement options</li> <li>▪ Easy configuration and diagnosis thanks to plain-text display</li> <li>▪ All languages that can be ordered are available in every device</li> </ul>
--------------------------	---



☐ 23 Easy operation



☐ 24 Plain-text menu

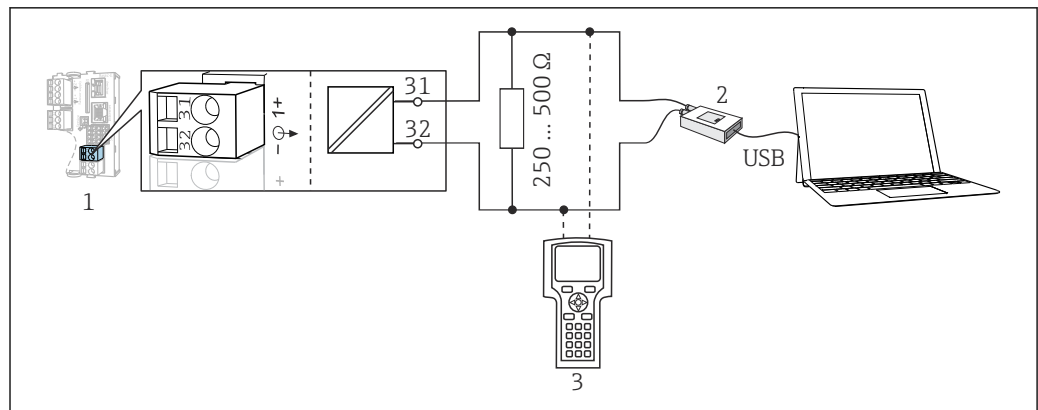
## Display

Graphic display:

- Resolution: 240 x 160 pixel
- Back light with switch-off function
- Red display background for alarms alerts users to errors
- Transflective display technology for maximum contrast even in bright environments

## Remote operation

Via HART (e.g. via HART modem and FieldCare)

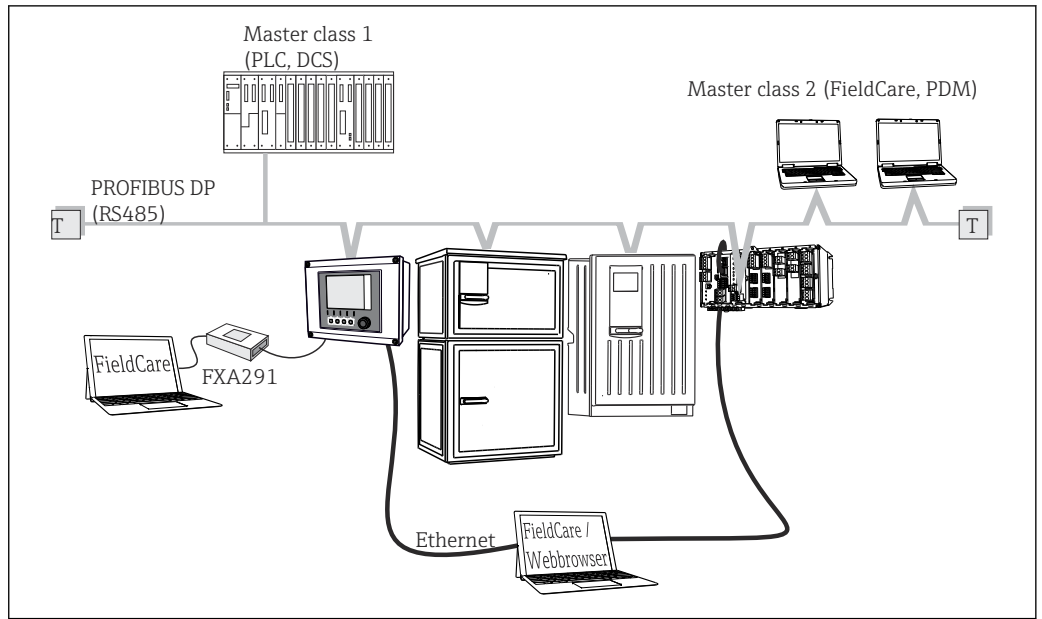


☐ 25 HART using modem

- 1 Device module Base2-E: current output 1 with HART
- 2 HART modem for connection to PC, e.g. Commubox FXA191 (RS232) or FXA195 <sup>1)</sup> (USB)
- 3 HART handheld terminal

<sup>1)</sup> Switch position "on" (substitutes the resistor)

Via PROFIBUS DP

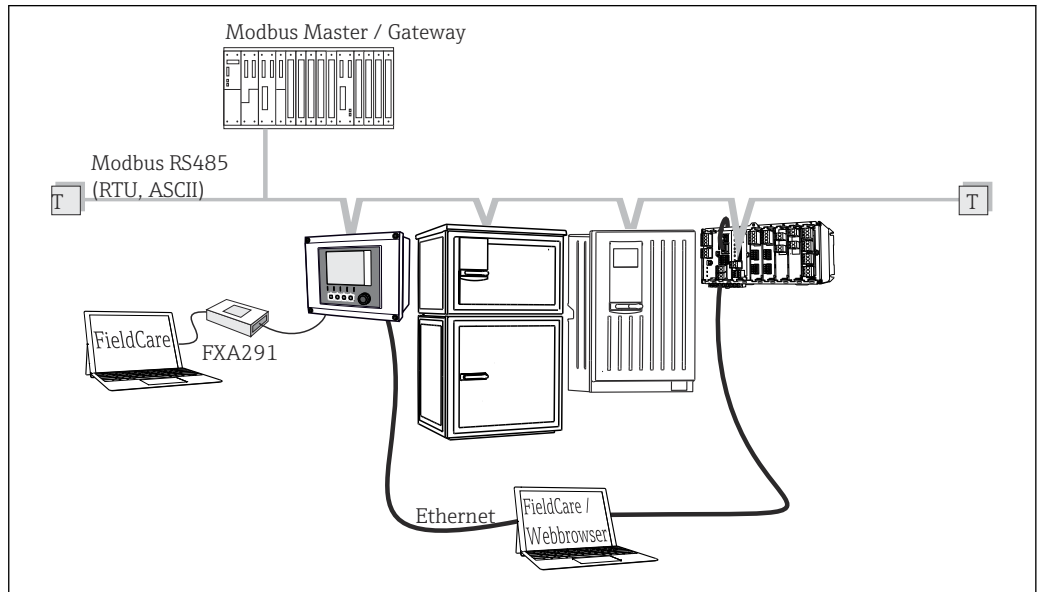


A0039617

26 PROFIBUS DP

T Terminating resistor

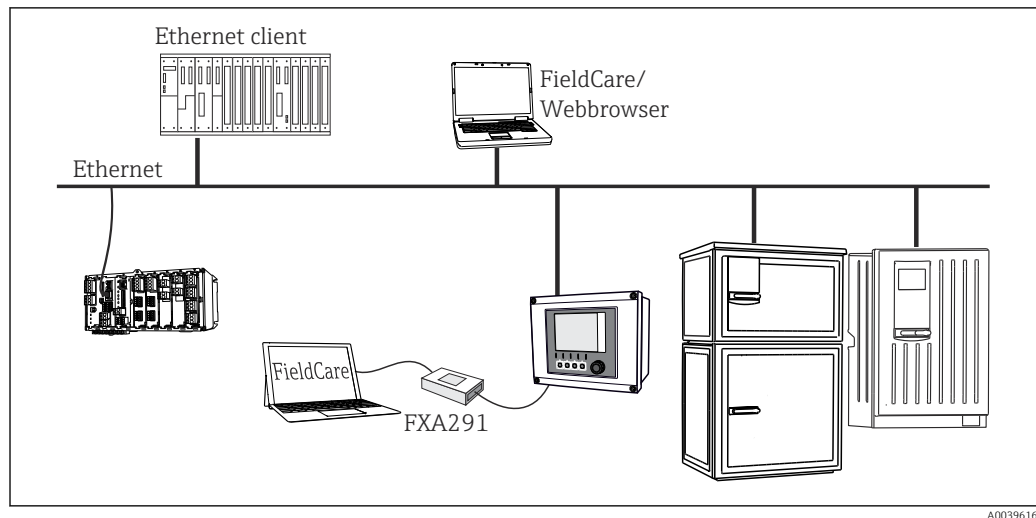
Via Modbus RS485



A0039615

27 Modbus RS485

T Terminating resistor

**Via Ethernet: web server/Modbus TCP/PROFINET/Ethernet/IP**

28 Modbus TCP or EtherNet/IP or PROFINET

**Language packages**

The language selected in the product structure is the operating language preset at the factory. All other languages can be selected using the menu.

- English (US)
- German
- Chinese (Simplified, PR China)
- Czech
- Dutch
- French
- Italian
- Japanese
- Polish
- Portuguese
- Russian
- Spanish
- Turkish
- Hungarian
- Croatian
- Vietnamese

The availability of other languages can be checked via the product structure at [www.endress.com/ca80ph](http://www.endress.com/ca80ph).

**Certificates and approvals**

Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page:

1. Select the product using the filters and search field.
2. Open the product page.
3. Select **Downloads**.


**Order information**

Product page [www.endress.com/ca80ph](http://www.endress.com/ca80ph)

Product Configurator 

1. **Configure**: Click this button on the product page.



2. Select **Extended selection**.
    - ↳ The Configurator opens in a separate window.
  3. Configure the device according to your requirements by selecting the desired option for each feature.
    - ↳ In this way, you receive a valid and complete order code for the device.
  4. **Accept**: Add the configured product to the shopping cart.
-  For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.
5. **CAD**: Open this tab.
    - ↳ The drawing window is displayed. You have a choice between different views. You can download these in selectable formats.

---

**Scope of delivery**

- The scope of delivery comprises:
- 1 analyzer in the version ordered with optional hardware
  - 1 x Brief Operating Instructions (hard copy)
  - 1 x Maintenance Manual
  - Optional accessories

## Accessories

The following are the most important accessories available at the time this documentation was issued.

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible. Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.


---

**Device-specific accessories**

**Sample preparation**


**Liquiline System CAT810**

- Pressure pipe sampling and microfiltration
- Product Configurator: [www.endress.com/cat810](http://www.endress.com/cat810))

 Technische Information Liquiline System CAT810, TI01138C


**Liquiline System CAT820**


- Sampling and membrane filtration
- Product Configurator: [www.endress.com/cat820](http://www.endress.com/cat820))

 Technical Information Liquiline System CAT820, TI01131C

**Liquiline System CAT860**

- Sampling and membrane filtration
- Product Configurator: [www.endress.com/cat860](http://www.endress.com/cat860))

 Technical Information Liquiline System CAT860, TI01137C

 The Liquiline System CAT860 can only be operated with a Liquiline System CA80 single-channel device.

**Installation accessories**

- Kit, post with bracket CA80, outd.
- Post 60 x 60 x 1800 mm, stainless steel 1.4571
  - Post mount clamp CA80xx
  - Kit installation instructions
  - Order No. 71458285

**Consumables**

1. <https://portal.endress.com/webapp/SparePartFinder>
2. Specify the serial number or product code.

The following consumables are available:

- Reagents and standard solutions CY80PH
- Cleaner CY800 (for hoses in the device)
- Cleaner CY820 (for hoses of sample preparation system and of sample collecting vessel)
- CAC880, inlet and outlet hoses for CA80

**Maintenance kit CAV800**

<https://portal.endress.com/webapp/SparePartFinder>

**Standard**

- Dispensers, 4 x 10 ml, including mounted adapter
  - Blue method: additionally 4 x 2.5 ml
  - Yellow method: additionally 2 x 2.5 ml
- Hoses for reagents and standard solution for reagents, standard solution and cleaner
- Silicone grease, medium-viscosity, tube 2 g
- Plug
- Sealing caps
- Filter mats

**Optional**

- Inlet and outlet hoses
- Liquid Manager without motor
- Collecting vessel, beaker (2 pcs.)

**Upgrade kits CAZ800**

Kit for upgrade with sample collecting vessel

- Sample collecting vessel with level monitoring, pre-fitted on mounting bracket
- Hoses, connection adapters
- Activation code
- Blue method: Order No. CAZ800-EAA1
- Yellow method: Order No. CAZ800-EBA1

Kit for upgrade to two-channel device

- Valve for switching sample flow
- Two sample collecting vessels with level monitoring, pre-fitted on mounting bracket
- Hoses, connection adapters
- Activation code
- Blue method: Order No. CAZ800-EAA2
- Yellow method: Order No. CAZ800-EBA2

Kit for upgrade with cooling system

- Cooling module integrated in base of housing
- Bottle tray with recess and insulation
- Activation code
- Blue method: Order No. CAZ800-EAN1
- Yellow method: Order No. CAZ800-EBN1

Kit for upgrade for second, downstream analyzer<sup>6)</sup>

- Valve for switching sample flow
- Hoses, connection adapters
- Activation code
- Blue method: Order No. CAZ800-EAM1
- Yellow method: Order No. CAZ800-EBM1

Kit for upgrade from yellow method to blue method

- Linear drive
- Dispensers, hoses
- Activation codes
- Order No. CAZ800-EBE1

6) Not for analyzers operated with CAT860 and not for two-channel versions.

Kit for upgrade from blue method to yellow method

- Dispensers, hose
- Activation codes
- Order No. CAZ800-EAE3

Kit for upgrading the dilution function

- Hose with identification marking
- Modified cable gland
- Activation code
- Blue method: Order No. CAZ800-EAN6
- Yellow method: Order No. CAZ800-EBN5

## Sensors

*pH glass electrodes*

### **Memosens CPS11E**

- pH sensor for standard applications in process and environmental engineering
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps11e](http://www.endress.com/cps11e)



Technical Information TI01493C

### **Memosens CPS41E**

- pH sensor for process technology
- With ceramic junction and KCl liquid electrolyte
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps41e](http://www.endress.com/cps41e)



Technical Information TI01495C

### **Memosens CPS71E**

- pH sensor for chemical process applications
- With ion trap for poison-resistant reference
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps71e](http://www.endress.com/cps71e)



Technical Information TI01496C

### **Memosens CPS91E**

- pH sensor for heavily polluted media
- With open aperture
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps91e](http://www.endress.com/cps91e)



Technical Information TI01497C

### **Memosens CPS31E**

- pH sensor for standard applications in drinking water and swimming pool water
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps31e](http://www.endress.com/cps31e)



Technical Information TI01574C

### **Ceramax CPS341D**

- pH electrode with pH-sensitive enamel
- Meets highest demands of measuring accuracy, pressure, temperature, sterility and durability
- Product Configurator on the product page: [www.endress.com/cps341d](http://www.endress.com/cps341d)



Technical Information TI00468C

### **Memosens CPF81E**

- pH sensor for mining operations, industrial water and wastewater treatment
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cpf81e](http://www.endress.com/cpf81e)



Technical Information TI01594C

*ORP electrodes***Memosens CPS12E**

- ORP sensor for standard applications in process and environmental engineering
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps12e](http://www.endress.com/cps12e)



Technical Information TI01494C

**Memosens CPS42E**

- ORP sensor for process technology
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps42e](http://www.endress.com/cps42e)



Technical Information TI01575C

**Memosens CPS72E**

- ORP sensor for chemical process applications
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps72e](http://www.endress.com/cps72e)



Technical Information TI01576C

**Memosens CPS92E**

- ORP sensor for use in heavily polluted media
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps92e](http://www.endress.com/cps92e)



Technical Information TI01577C

**Memosens CPF82E**

- ORP sensor for mining operations, industrial water and wastewater treatment
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cpf82e](http://www.endress.com/cpf82e)



Technical Information TI01595C

*Conductivity sensors with inductive measurement of conductivity***Indumax CLS50D**

- High-durability inductive conductivity sensor
- For standard and hazardous area applications
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/cls50d](http://www.endress.com/cls50d)



Technical Information TI00182C

*Conductivity sensors with conductive measurement of conductivity***Memosens CLS21E**

- Digital conductivity sensor for media with medium or high conductivity
- Conductive measurement
- With Memosens 2.0
- Product Configurator on the product page: [www.endress.com/cls21e](http://www.endress.com/cls21e)



Technical Information TI01528C

*Oxygen sensors***Memosens COS51E**

- Amperometric oxygen sensor for water, wastewater and utilities
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cos51e](http://www.endress.com/cos51e)



Technical Information TI01620C

#### **Memosens COS81E**

- Hygienic optical oxygen sensor with maximum measurement stability over multiple sterilization cycles
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cos81e](http://www.endress.com/cos81e)



Technical Information TI01558C

#### **Memosens COS22E**

- Hygienic amperometric oxygen sensor with maximum measurement stability over multiple sterilization cycles
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cos22e](http://www.endress.com/cos22e)



Technical Information TI01619C

#### *Chlorine dioxide and chlorine sensors*

#### **Memosens CCS50E**

- Membrane-covered amperometric sensor for chlorine dioxide
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/ccs50e](http://www.endress.com/ccs50e)



Technical Information TI01353C

#### **Memosens CCS51E**

- Sensor for measuring free available chlorine
- Product Configurator on the product page: [www.endress.com/ccs51e](http://www.endress.com/ccs51e)



Technical Information TI01423C

#### *Ion-selective sensors*

#### **ISEmax CAS40D**

- Ion selective sensors
- Product Configurator on the product page: [www.endress.com/cas40d](http://www.endress.com/cas40d)



Technical Information TI00491C

#### *Turbidity sensors*

#### **Turbimax CUS51D**

- For nephelometric measurements of turbidity and solids in wastewater
- 4-beam scattered light method
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/cus51d](http://www.endress.com/cus51d)



Technical Information TI00461C

#### **Turbimax CUS52D**

- Hygienic Memosens sensor for turbidity measurement in drinking water, process water and in utilities
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/cus52d](http://www.endress.com/cus52d)



Technical Information TI01136C

#### *SAC and nitrate sensors*

#### **Viomax CAS51D**

- SAC and nitrate measurement in drinking water and wastewater
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/cas51d](http://www.endress.com/cas51d)



Technical Information TI00459C

*Interface measurement***Turbimax CUS71D**

- Immersion sensor for interface measurement
- Ultrasonic interface sensor
- Product Configurator on the product page: [www.endress.com/cus71d](http://www.endress.com/cus71d)



Technical Information TI00490C

**Cable junction with Velcro strip**

- 4 pieces, for sensor cable
- Order No. 71092051

**Communication-specific accessories****Additional functionality**

- ▶ Always quote the serial number of your device when ordering activation codes.

Order code	Communication; software
51516983	Commubox FXA291 (hardware)
71127100	SD card with Liquiline Firmware, 1 GB, Industrial Flash Drive
XPC0018	Activation code for EtherNet/IP + web server
XPC0020	Activation code for Modbus TCP + web server
XPC0021	Activation code for web server for BASE2
XPC0022	Activation code for PROFINET + web server for BASE2
XPC0024	Activation code for Profibus DP for module 485
XPC0025	Activation code for Modbus RS485 for module 485
71249548	Kit CA80: activation code for 1st digital sensor input
71249555	Kit CA80: activation code for 2nd digital sensor input

	Retrofit kits
71136999	Kit CSF48/CA80: retrofit service interface (CDI flange connector, counter nut)
71111053	Kit module AOR: 2 x relay, 2 x analog output 0/4 to 20 mA
71125375	Kit module 2R: 2 x relay
71125376	Kit module 4R: 4 x relay
71135632	Kit module 2AO: 2 x analog output 0/4 to 20 mA
71135633	Kit module 4AO: 4 x analog output 0/4 to 20 mA
71135631	Kit module 2DS: 2 x digital sensor, Memosens
71135634	Kit module 485: PROFIBUS DP or Modbus RS485. This requires an additional activation code which can be ordered separately.
71135638	Kit module DIO: 2 x digital input; 2 x digital output; auxiliary power supply for digital output
71135639	Kit module 2AI: 2 x analog input 0/4 to 20 mA
71140888	Upgrade kit module 485 + Profibus DP
71140889	Upgrade kit module 485 + Modbus RS485
71141366	Kit, extension backplane module

### Software

#### Memobase Plus CYZ71D

- PC software to support laboratory calibration
- Visualization and documentation of sensor management
- Sensor calibrations stored in database
- Product Configurator on the product page: [www.endress.com/cyz71d](http://www.endress.com/cyz71d)



Technical Information TI00502C

#### Field Data Manager Software MS20/21

- PC software for central data management
- Visualization of series of measurements and logbook events
- SQL database for secure data storage

---

### System components

#### Measuring cables

##### Memosens data cable CYK10

- For digital sensors with Memosens technology
- Product Configurator on the product page: [www.endress.com/cyk10](http://www.endress.com/cyk10)



Technical Information TI00118C

##### Memosens data cable CYK11

- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: [www.endress.com/cyk11](http://www.endress.com/cyk11)



Technical Information TI00118C

#### SD card

- Industrial Flash Drive, 1 GB
- Order number: 71110815



[www.addresses.endress.com](http://www.addresses.endress.com)

---