Technical Information
Liquiline System CA80AM

Colorimetric analyzer for ammonium

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

Application

- Digital fieldbuses (Modbus TCP or Modbus RS485) and integrated web server
- Monitoring and optimization of the cleaning capacity of municipal and industrial wastewater treatment plants
- Monitoring of the wastewater treatment plant outlet for documentation purposes
- Monitoring and optimization of activated sludge basins

Your benefits

- Easy upgrade to measuring station by connecting with up to four Memosens sensors
- Automatic calibration and cleaning
- User-configurable measuring, cleaning and calibration intervals
- Optional cooling module for longer reagent life time
- Low maintenance costs thanks to long reagent life
- User-definable measuring ranges
- Modular design for easily extensible functionality
- Digital communication for remote access
- Two-channel device available

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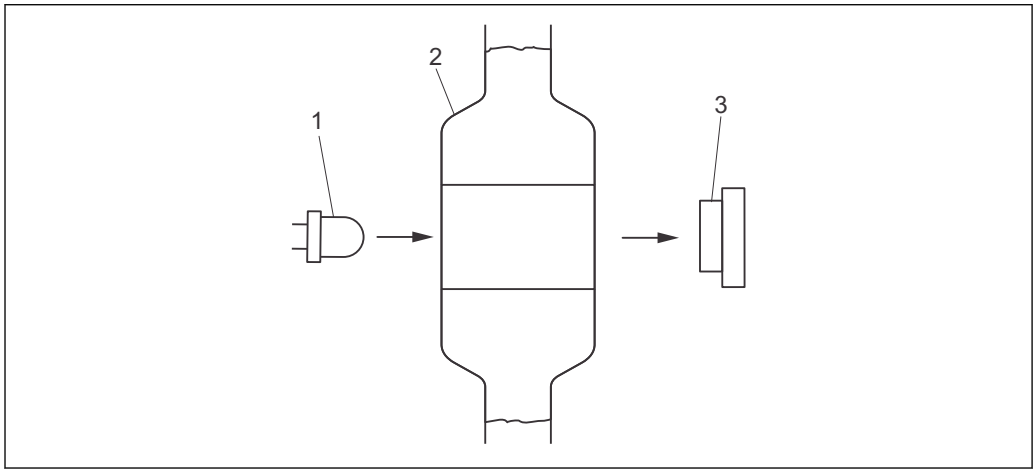
Function and system design

Colorimetric measuring principle

After application-specific 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 measures the level of absorption by the sample or the stain solution 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. To compensate for any interference influences resulting from turbidity and fouling, as well as from the deterioration and aging of the LEDs, 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 with a short period of time.



1 Colorimetric measuring principle

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

Ammonium

Ammonium occurs in a number of ways including biological decomposition of organic nitrogen compounds. Natural bodies of water normally do not have an ammonium load. Higher concentrations indicate the influence of waste water, landfill leachate or pollution from industry and agriculture. The level of ammonium in a body of water is therefore a good indicator of the water quality.

Photometric ammonium determination

Indophenol blue method
Sodium dichloroisocyanurate and sodium salicylate react with ammonium in an alkaline solution to form a green/blue dye. The method is defined according to ISO 7150-1 (GB 7481-87, DIN 38406-5). Using a combination of different wavelengths the absorption is measured across the entire concentration range. Here, the amount of light absorption is directly proportional to the concentration of ammonium in the sample.

Cross-sensitivity

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.

500 mg/l (ppm)	Na^+, K^+, SO_4^{2-}
250 mg/l (ppm)	NO_3^--N, PO_4^{3-}
50 mg/l (ppm)	Cr^{3+}, Zn^{2+}
30 mg/l (ppm)	NO_2^--N
2 mg/l (ppm)	Ag^+

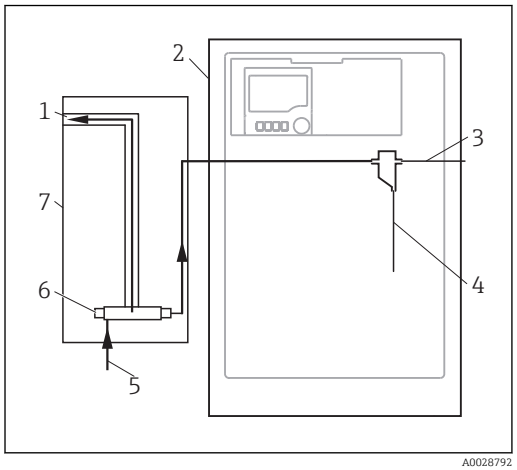
Measuring system

A complete measuring system comprises:
- Liquiline System CA80AM analyzer in the configuration ordered
- Reagentsand standard solutions (to be ordered separately)
- Liquiline System CAT8x0 sample preparation (optional)

Micro-filtration (Liquiline System CAT810)
- Function: pressure pipe sampling + filtration
- Sieve filter, 50 µm
- Control via CA80
  optional: time control via integrated timer
- Backflushing, with compressed air or water
- Panel version or integration into analyzer stand
- Application: wastewater treatment plant outlet

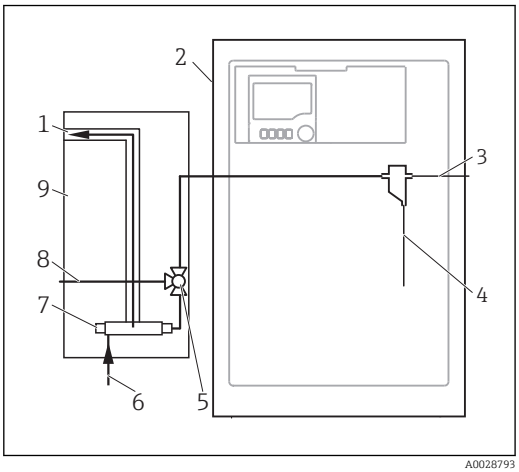
Membrane filtration Liquiline System CAT820, ceramic filter version
- Function: sampling + filtration
- Ceramic membrane filter cartridge; pore size 0.1 µm
- Communication via Memosens protocol, control via CA80
- Backflushing with compressed air (version with Memosens technology)
- Easy installation with Flexdip CYH112 (TI00430C)
- Application: sludge activation, wastewater treatment plant outlet, surface water

Membrane filtration (Liquiline System CAT860)
- Function: sampling + filtration
- Ceramic membrane filter cartridge; pore size 0.1 µm
- Communication via Memosens protocol, control via CA80
- Automatic backflush function with cleaning solution and compressed air
- Easy installation via Flexdip CYH112 (TI00430C)
- Application: WWTP inlet



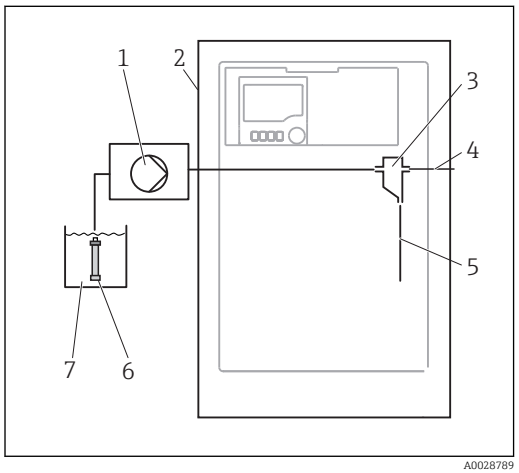
2 Measuring system with Liquiline System CAT810

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



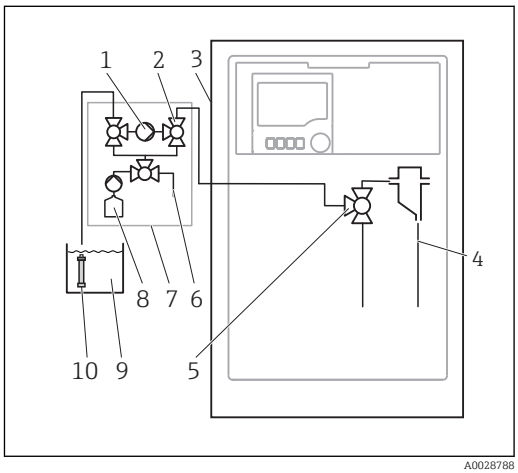
3 Measuring system with Liquiline System CAT810 and cleaning valve

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*



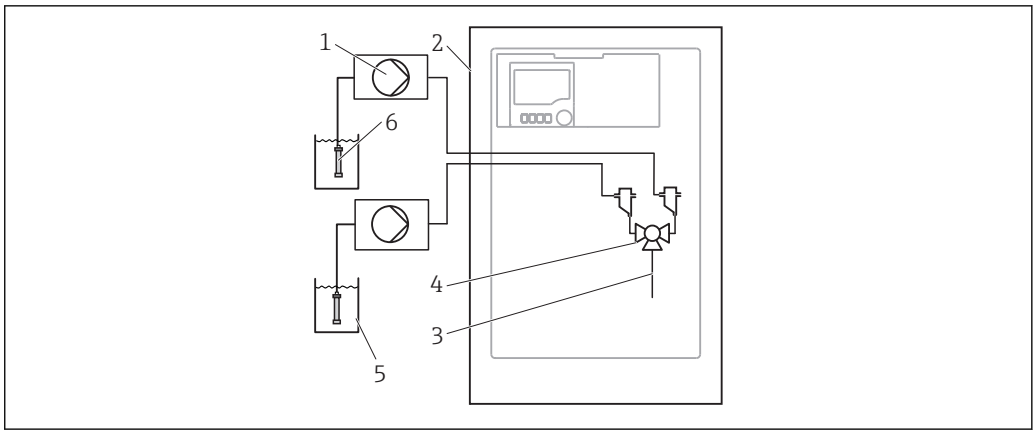
4 Measuring system with Liquiline System CAT820

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



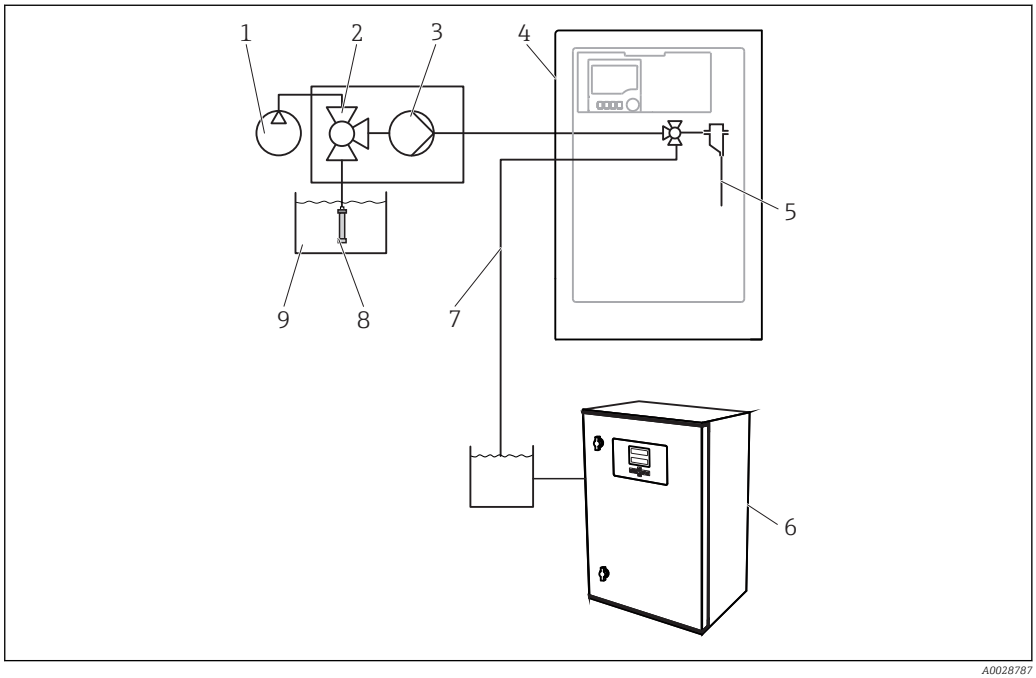
5 Measuring system with Liquiline System CAT860

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)*



6 *Measuring system with two Liquiline Systems CAT820*

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



7 *Measuring system with Liquiline System CA80, Liquiline System CAT820 and a second analyzer*

1 Backflushing with compressed air (optional)
2 Valve (optional)
3 Pump
4 Liquiline System CA80
5 Sample
6 Second analyzer
7 Sample to second analyzer
8 Filter (ceramic)
9 Medium

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.

Reagent cooling module (optional)

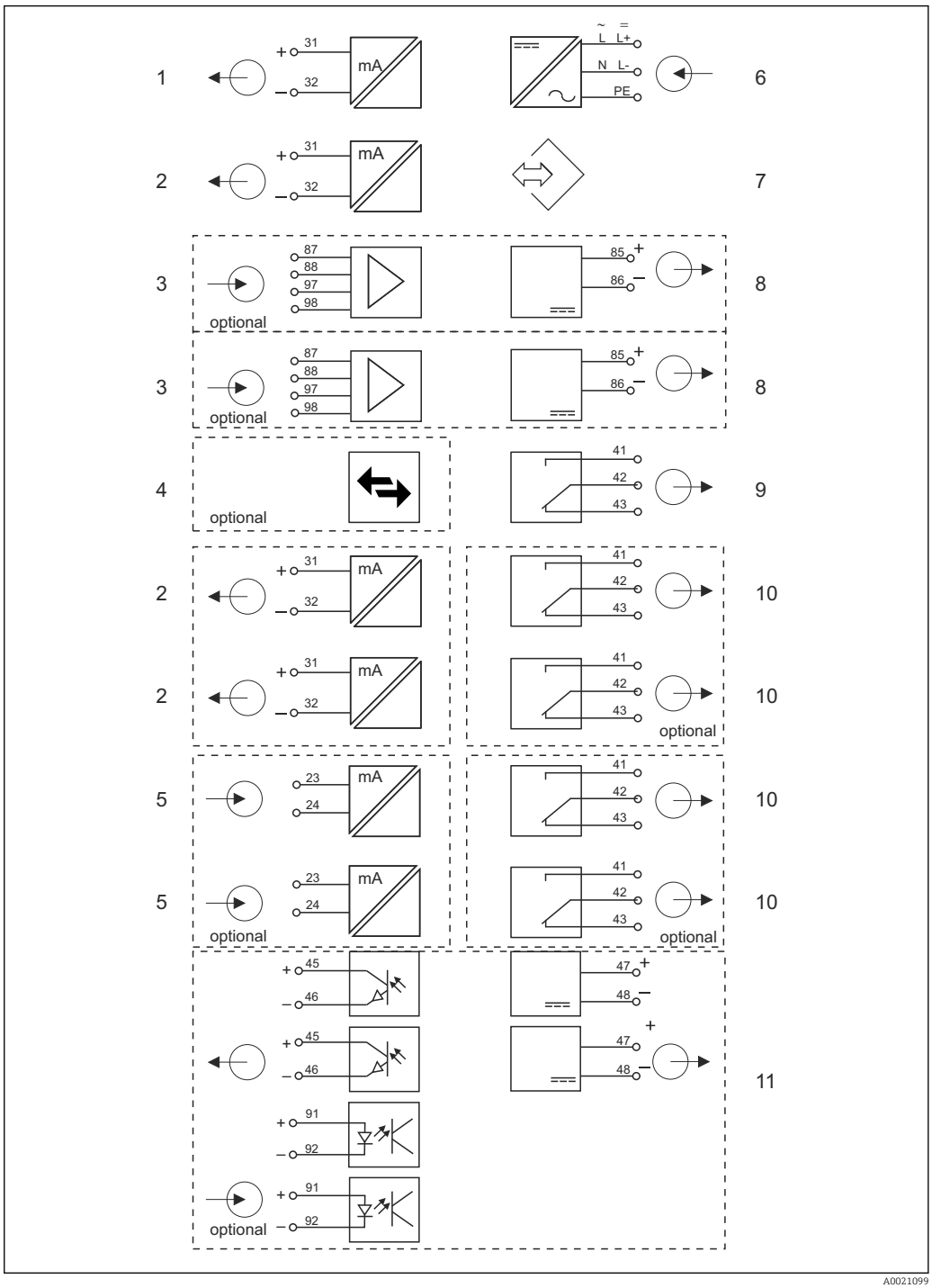
The analyzer can be fitted with a smart, energy-efficient cooling module for the reagents.

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

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

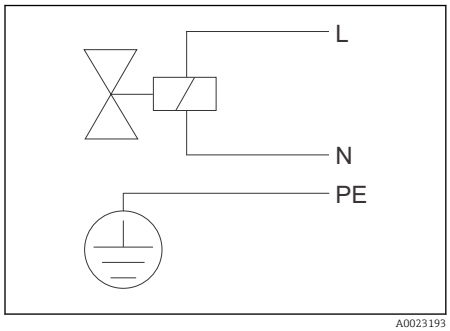
Equipment architecture

Block diagram

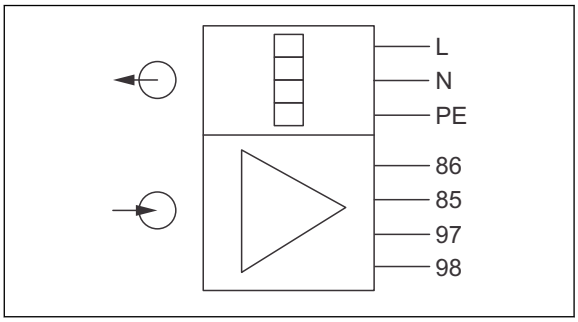


8 Function diagram CA80

1 *Current output 1:1*
2 *Current outputs*
3 *2 x Memosens input (1 x optional)*
4 *Modbus/Ethernet (optional)*
5 *2 x current input (optional)*
6 *Power connection*
7 *Service interface*
8 *Power supply, fixed cable sensors*
9 *Alarm relay*
10 *2 or 4 x relays (optional)*
11 *2 digital inputs and outputs (optional)*



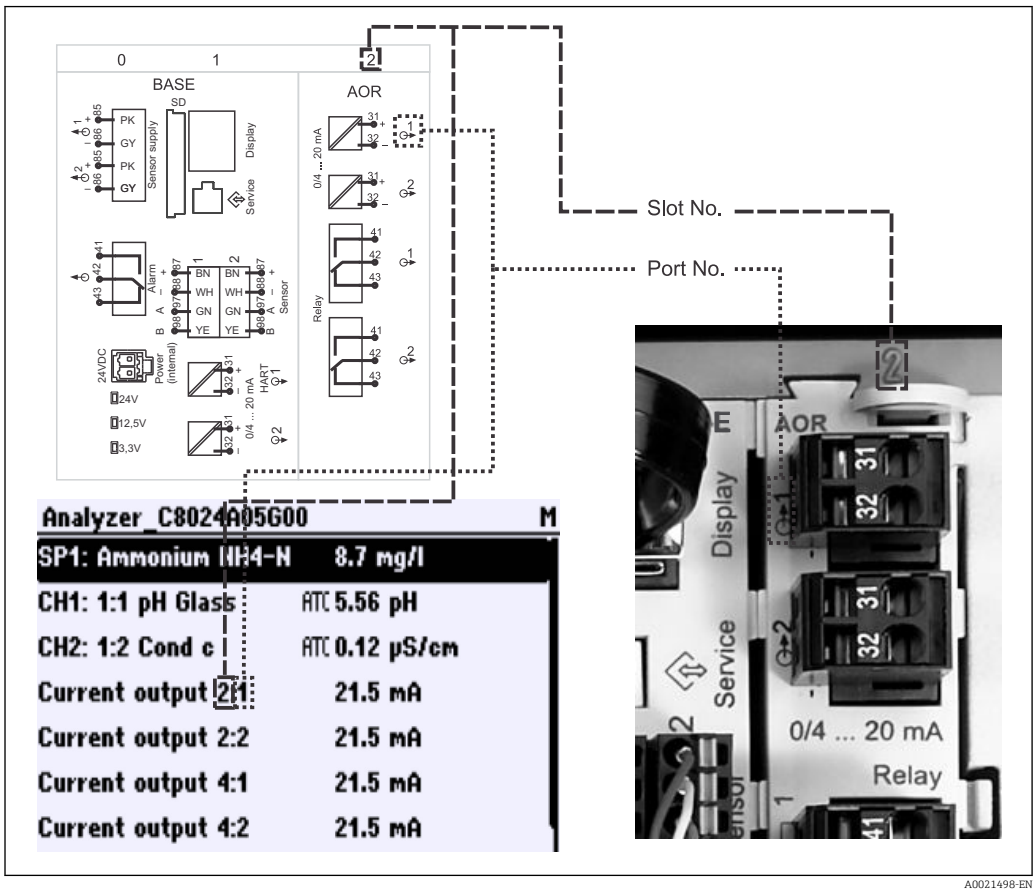
9 Sample preparation block circuit diagram: Liquiline System CAT810 with cleaning valve



10 Sample preparation block circuit diagram: Liquiline System CAT820 and CAT860

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

Slot and port assignment



11 Slot and port assignment of hardware and presentation on the display

The electronics configuration follows a modular concept:

- There are several slots for electronics modules. These are referred to as "slots".
- These slots are numbered consecutively in the housing. Slots 0 and 1 are always reserved for the basic module.
- Each electronics module has one or more inputs and outputs or relays. Here they are all collectively known as "ports".

- Ports are consecutively numbered per electronics module and are recognized automatically by the software.
- 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.
  Example:
  "Current output 2:1" shown on the display means: slot 2 (e.g. AOR module) : port 1 (current output 1 of the AOR module)
- Inputs are assigned to measuring channels in the ascending order of "slot:port number"
  Example:
  – "SP1: **Ammonium** shown on the display means:
    Sampling point SP1 is assigned to analyzer measuring channel 1.
  – "CH1: 1:1 pH glass" shown on the display for sensors means:
    Channel 1 (CH1) is slot 1 (basic module) : port 1 (input 1) and a pH glass sensor is connected here.

Communication and data processing

Types of communication:
- Fieldbuses
  - PROFIBUS DP (Profile 3.02)
  - Modbus TCP or RS485
- Configuration via Ethernet
- EtherNet/IP

Extension module 485 and current outputs
For Modbus and Ethernet communication protocols:
Max. of 2 current outputs can be used in parallel.

Extension module ETH and current outputs
- Communication via Ethernet or EtherNet/IP
- Max. of 4 current outputs can be used in parallel.

Bus termination on the device
- Via slide switch at bus module 485
- Displayed via LED "T" on bus module 485

Dependability

Reliability thanks to Memosens technology

Memosens 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
- 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

Maintainability

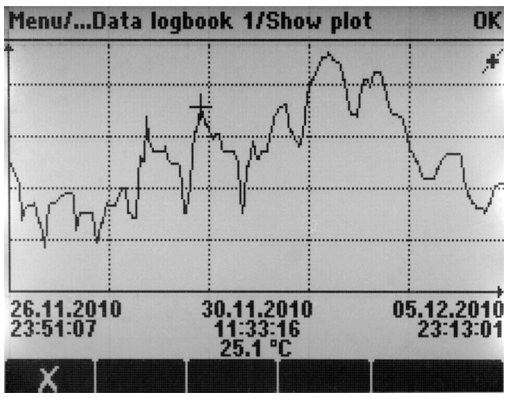
Modular design

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

Memory

- 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
  - 150,000 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:
  - Including. software updates
  - Max. 50 entries
- Event logbook
- Analyzer event logbook
  - Analyzer-specific events
  - Max. 2500 entries, ring memory or fill-up buffer for recording
- Operations logbook: max. 250 entries
- Diagnostic logbook: max. 250 entries



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12 Data logbook: Graphic 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:

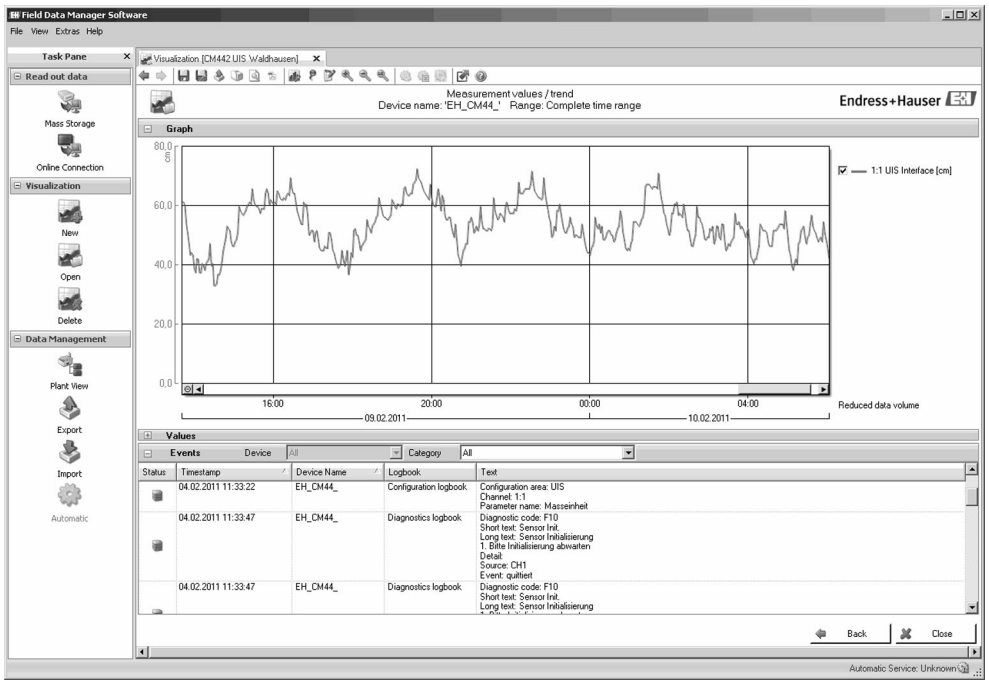
- Output via a current output or a fieldbus
- Used as a regulating control variable
- Assigned as a measured variable to a limit contactor
- Used as a measured variable to trigger cleaning
- Displayed in user-defined measuring menus

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 from the measured values of a pH and an ORP sensor

FieldCare and Field Data Manager

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



13 Field Data Manager: Load curves

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 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

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 values

NH_4-N, NH_4, NH_3 [mg/l, ppm]

Measuring range

CA80AM-AAA1:	0.05 to 20 mg/l NH_4-N
CA80AM-AAA2:	0.5 to 50 mg/l NH_4-N
CA80AM-AAA3:	1 to 100 mg/l NH_4-N

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)

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

Hose specification (self-priming)

- Spacing: max. 1.0 m (3.3 ft)
- Height: max. 0.5 m (1.6 ft)
- Hose ID: 1.6 mm (1/16 inch)

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 outputs")
- 6 x 0/4 to 20 mA, active, potentially isolated (version with "4 additional outputs")

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

Ethernet 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

Signal on alarm

Adjustable, as per NAMUR Recommendation NE 43
- In measuring range 0 to 20 mA:
  Error current from 0 to 23 mA
- In measuring range 4 to 20 mA:
  Error current from 2.4 to 23 mA
- Factory setting for error current for both measuring ranges:
  21.5 mA

Load

Max. 500 Ω

Transmission behavior

Linear

Current outputs, active

Span
0 to 23 mA

Signal characteristic
Linear

Electrical specification

Output voltage
Max. 24 V

Test voltage
500 V

Cable specification

Cable type
Recommended: shielded cable

Cable specification
Max. 2.5 mm^2 (14 AWG)

Relay outputs

Electrical specification

Relay types
- 1 single-pin changeover contact (alarm relay)
- 2 or 4 single-pin changeover contacts (optional with extension modules)

Relay switching capacity

Base module (Alarm relay)

Switching voltage	Load (max.)	Switching cycles (min.)
230 V AC, cosΦ = 0.8 to 1	0.1 A	700,000
	0.5 A	450,000
115 V AC, cosΦ = 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, cosΦ = 0.8 to 1	0.1 A	700,000
	0.5 A	450,000
	2 A	120,000
115 V AC, cosΦ = 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

Modbus RS485

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

Modbus TCP

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	▪ Remote-controlled device configuration(1 session) ▪ Save/restore device configuration (via SD card) ▪ Logbook export (file formats: CSV, FDM) ▪ Access to web server via DTM or Internet Explorer ▪ Login ▪ Web server can be switched off

EtherNet/IP

Protocol	EtherNet/IP	
ODVA certification	Yes	
Device profile	Generic device (product type: 0x2B)	
Manufacturer ID	$0x049E_h$	
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: ▪ 16 AI (analog input) + Status + Unit ▪ 8 DI (discrete input) + Status
	Output (O → T)	Actuating values: ▪ 4 A0 (analog output) + status + unit ▪ 8 DO (discrete output) + Status

Power supply

Supply voltage

The analyzer is fitted with a connector with a cable length of 4.3 m (14.1 ft).

- 100 to 120 V AC / 200 to 240 V AC
  or 24 V DC
- 50 or 60 Hz

NOTICE

The device does not have a power switch

- ▶ The customer must provide a protected circuit breaker in the vicinity of the device.
- ▶ The circuit breaker must be a switch or power switch, and you must label it as the circuit breaker for the device.
- ▶ At the supply point, the power supply for the 24 V versions must be isolated from dangerous live cables by double or reinforced insulation.

Fieldbus connection

Supply voltage: not applicable

Power consumption

130 VA + 660 VA per hose heater, max. 1450 VA (version with cooling system)

Fuse

5 x 20 mm 10 A/250 V fine-wire fuse for hose trace heating system

Cable entries

- 4 x bores for M16, G3/8, NPT3/8", Memosens connection
- 4 x bores for M20, G1/2, NPT1/2"

Hose entries

4 x bores for M32 for sample inflow and outflow

Cable specification

Cable gland	Permitted cable diameter
M16x1.5 mm	4 to 8 mm (0.16 to 0.32")
M12x1.5 mm	2 to 5 mm (0.08 to 0.20")
M20x1.5 mm	6 to 12 mm (0.24 to 0.48")
NPT3/8"	4 to 8 mm (0.16 to 0.32")
G3/8	4 to 8 mm (0.16 to 0.32")
NPT1/2"	6 to 12 mm (0.24 to 0.48")
G1/2	7 to 12 mm (0.28 to 0.48")

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

Connecting optional modules

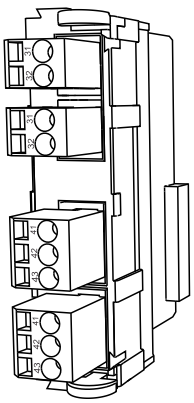
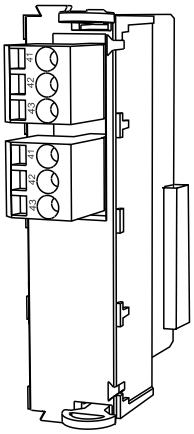
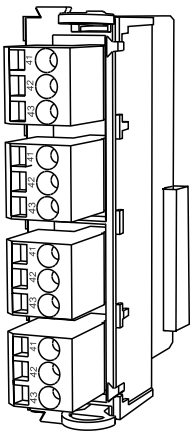
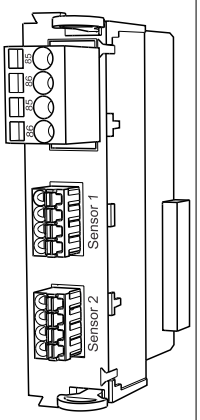
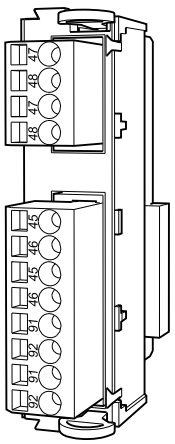
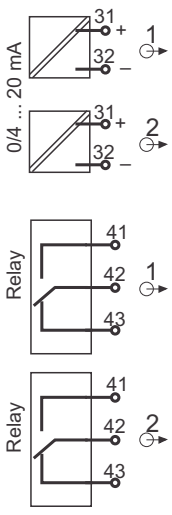
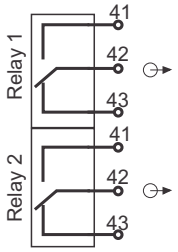
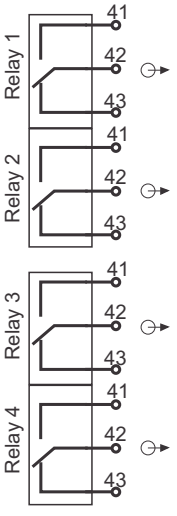
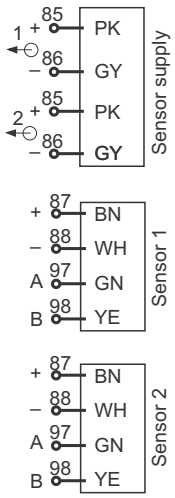
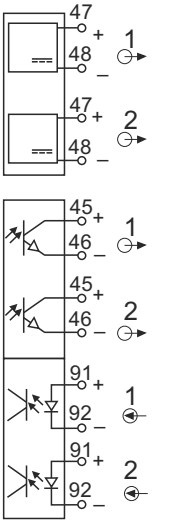
NOTICE

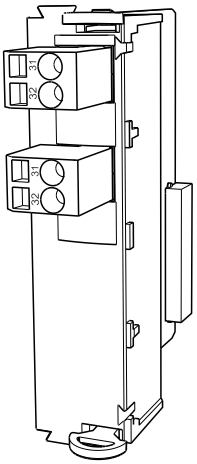
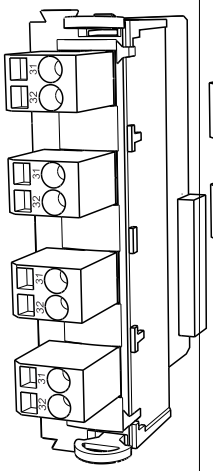
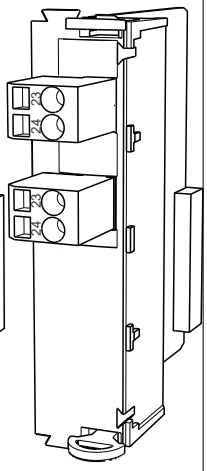
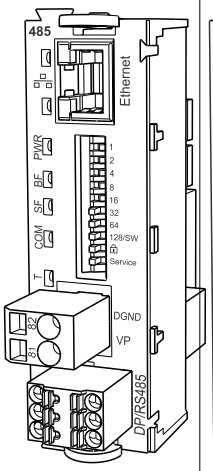
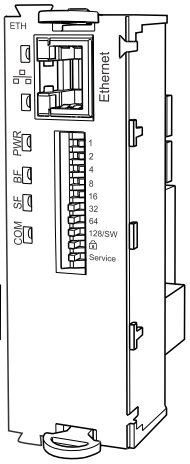
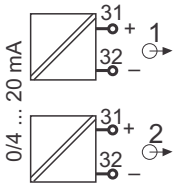
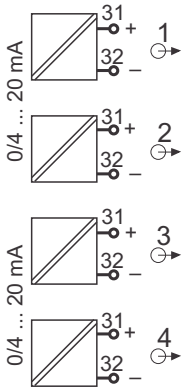
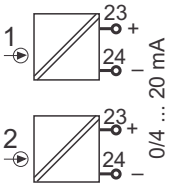
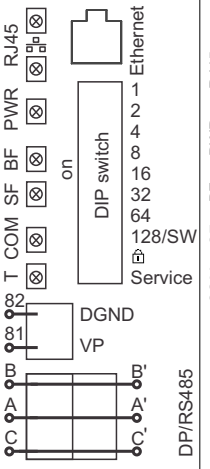
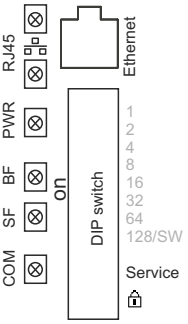
Unacceptable hardware combinations (due to conflicts in power supply)

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

- ▶ If you are planning to extend your controller, make sure the resulting hardware combination is permitted (Configurator on www.endress.com/CA80AM).
- ▶ Remember that the sum of all current inputs and outputs may not exceed 8!
- ▶ Make sure not to use more than two "DIO" modules. More "DIO" modules are not permitted.
- ▶ Please contact your Endress+Hauser sales center should you have any questions.

Overview of all the modules available

Module name				
AOR	**2R**	**4R**	**2DS**	**DIO**
				
▪ 2 x 0/4 to 20mA analog outputs ▪ 2 relays ▪ Order No. 71111053	▪ 2 relays ▪ Order No. 71125375	▪ 4 relays ▪ Order No. 71125376	▪ 2 digital sensor inputs ▪ 2 power supply systems for digital sensors ▪ Order No. 71135631	▪ 2 digital inputs ▪ 2 digital outputs with auxiliary voltage ▪ Order No. 71135638
				

Module name				
2AO	**4AO**	**2AI**	**485**	**ETH**
				
▪ 2 x 0/4 to 20mA analog outputs ▪ Order No. 71135632	▪ 4 x 0/4 to 20mA analog outputs ▪ Order No. 71135633	▪ 2 x 0/4 to 20mA analog inputs ▪ Order No. 71135639	▪ Ethernet (web server or Modbus TCP) ▪ Order No. 71135634	▪ Web server and Ethernet/IP or Modbus TCP ▪ Order No. 71272410
				

PROFIBUS DP (module 485)
Contacts A - A', B - B' and C - C' are bridged in the connector. 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 **without** additional internal power supply	With plug-in connection and inductive signal transmission	▪ pH sensors ▪ ORP sensors ▪ Combined sensors ▪ Oxygen sensors (amperometric and optical) ▪ Conductivity sensors with conductive measurement of conductivity ▪ Chlorine sensors
	Fixed cable	Conductivity sensors with inductive measurement of conductivity
Digital sensors with additional internal power supply	Fixed cable	▪ Turbidity sensors ▪ Sensors for interface measurement ▪ Sensors for measuring the spectral absorption coefficient (SAC) ▪ Nitrate sensors ▪ Optical oxygen sensors ▪ Ion-sensitive sensors

Performance characteristics

Measured error [1]	CA80AM-AAA1:	0.05 to 20 mg/l (ppm) NH_4-N	± 2 % of the display value + 0.05 mg/l (ppm) NH_4-N
	CA80AM-AAA2:	0.5 to 20 mg/l (ppm) NH_4-N	± 2 % of the display value + 0.05 mg/l (ppm) NH_4-N
		> 20 to 50 mg/l (ppm) NH_4-N	± 2 % of the display value + 0.5 mg/l (ppm) NH_4-N
	CA80AM-AAA3:	1.0 to 50 mg/l (ppm) NH_4-N	± 3 % of the display value + 0.5 mg/l (ppm) NH_4-N
		> 50 to 100 mg/l (ppm) NH_4-N	± 3 % of the display value + 1.0 mg/l (ppm) NH_4-N
Measured error for sensor inputs	→ Documentation of the connected sensor		
Measured error for current inputs and outputs	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		
Repeatability [1]	± 2% of the display value + 0.05 mg/l (ppm) NH_4-N		
Repeatability Sensor inputs	→ Documentation of the connected sensor		
Measuring interval	Continuous (approx. 10 min), adjustable > 15 min		
Sample requirement	22 ml/measurement		
Reagent requirement	▪ Approx. 70 µl per reagent and measurement ▪ Approx. 250 ml per reagent and month with a measuring interval of 15 min		
Standard requirement	Approx. 230 ml per month given a calibration interval of 48 h		
Calibration interval	1 h to 90 days, depending on the application and ambient conditions		
Maintenance interval	Every 3 to 6 months, depending on the application		
Maintenance effort	▪ Weekly: visual inspection ▪ Quarterly: 1 hour		

1) According to ISO 15839 with standard solutions and freshly prepared reagent. Measured errors include all the uncertainties of the analyzer. They do not include the uncertainties from the standard solutions used as a reference.

Environment

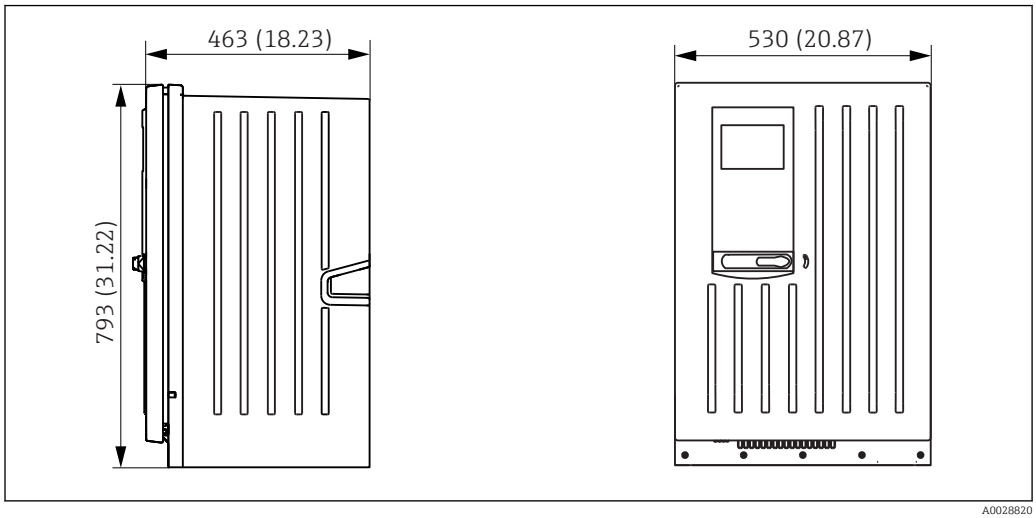
Ambient temperature range	5 to 40 °C (41 to 104 °F)
Storage temperature	-20 to +60 °C (-4 to 140 °F)
Humidity	10 to 95%, not condensing
Degree of protection	IP55 (cabinet, analyzer stand)
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1:2013, Class A for Industry
Electrical safety	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
Degree of contamination	The product is suitable for pollution degree 2.

Process

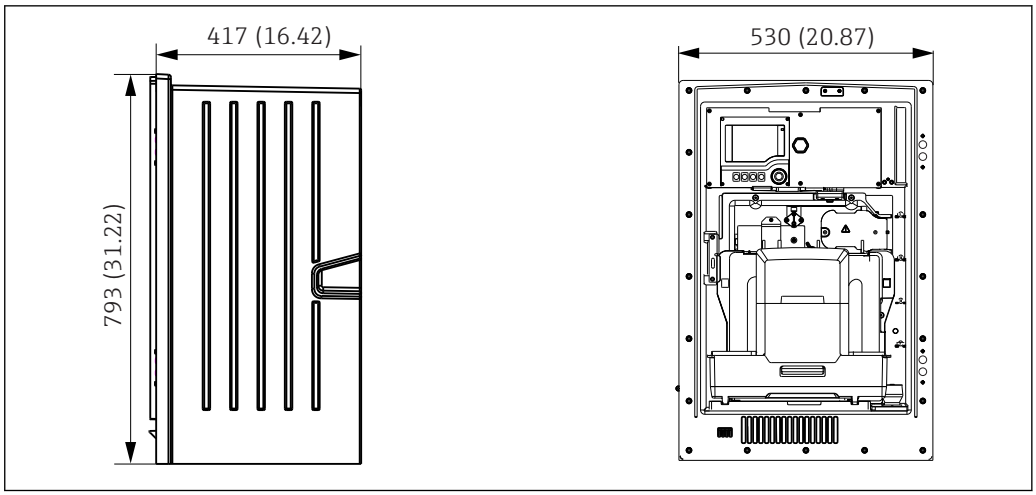
Sample temperature	4 to 40 °C (39 to 104 °F)
Sample flow rate	Min. 5 ml/min (0.17 fl.oz./min)
Consistency of the sample	Low solids content (turbidity < 50 NTU), aqueous, homogenized
Sample supply	Unpressurized

Mechanical construction

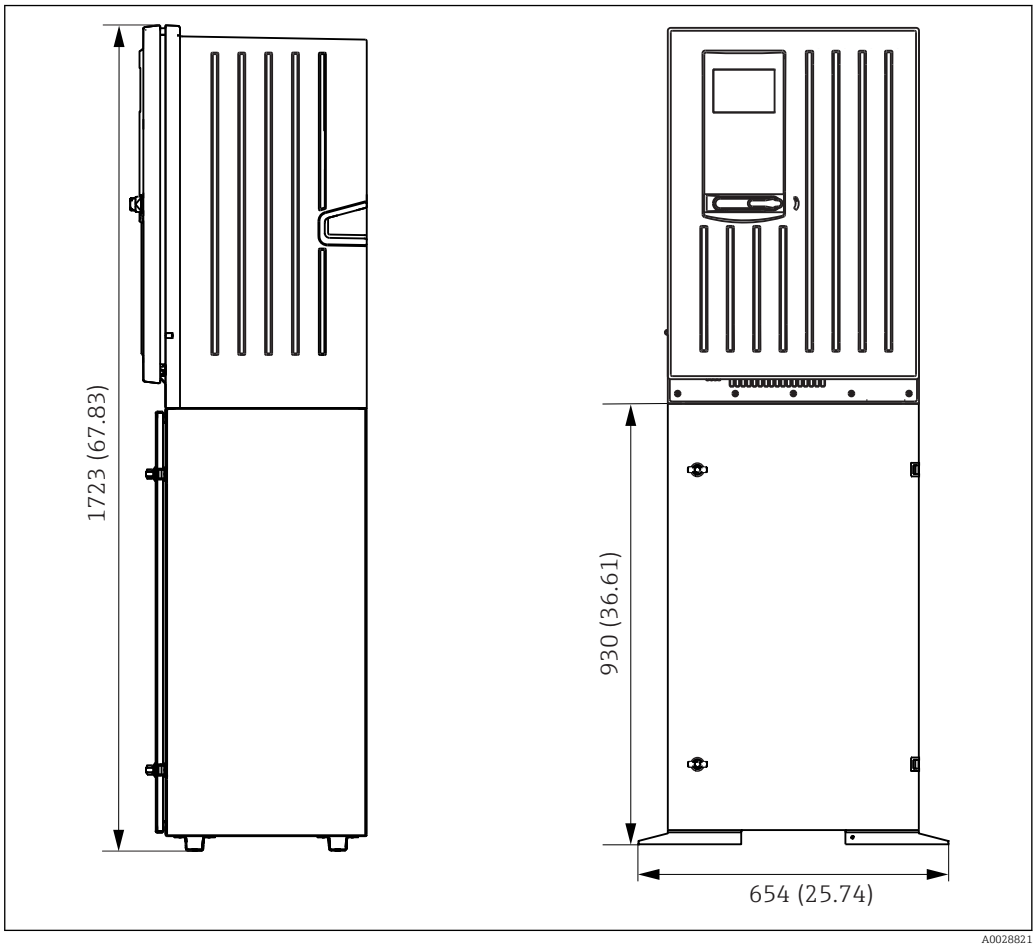
Dimensions



14 Liquiline System CA80 closed version, dimensions in mm (inch)



15 *Liquiline System CA80 open version with cooling module, dimensions in mm (inch)*



16 *Liquiline System CA80 with base, dimensions in mm (inch)*

Weight	**Order version**	**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	Plastic ASA+PC
Open installation, exterior cover	
Cabinet version, interior lining	Plastic PP
Open installation, interior lining	
Window	Shatterproof glass, coated
Reagent container	Plastic PP
Insulation	Plastic EPP (extruded PP)
Base, analyzer stand	Powder-coated sheet steel

Parts in contact with medium	
Dispensers	Plastic PP and elastomer TPE
Liquid manager	Plastic PP and elastomer FKM
Hoses	C-Flex, NORPRENE
Optical window	Glass
Molded seal	Elastomer EPDM
Drain pipe	Plastic PP
Sample collecting vessel (optional)	
Beaker	Plastic PMMA
Cover	Plastic PP
Level detector pins	Stainless steel 1.4404 (V4A)
Seal	EPDM
Valve (optional)	PVDF

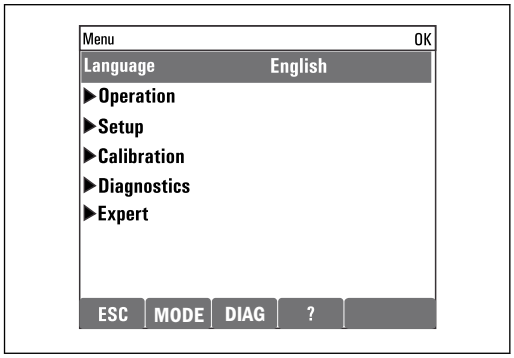
Operability

Operating concept

The simple and structured operating concept sets new standards:
- Intuitive operation with the navigator and soft keys
- Fast configuration of application-specific measurement options
- Easy configuration and diagnosis thanks to plain-text display
- All languages that can be ordered are available in every device

A0028642-EN

17 Easy operation



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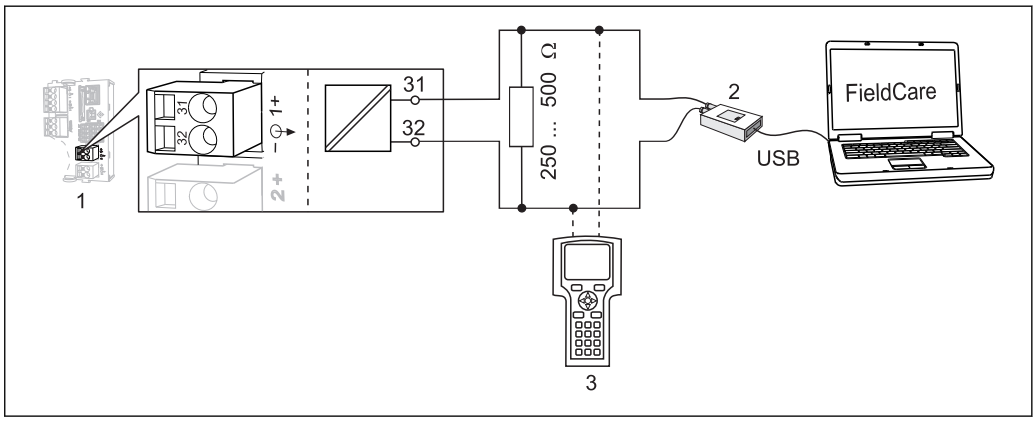
18 Plain-text menu

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
- User-definable measuring menus mean you can always keep track of the values that are important for your application.

Remote operation

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



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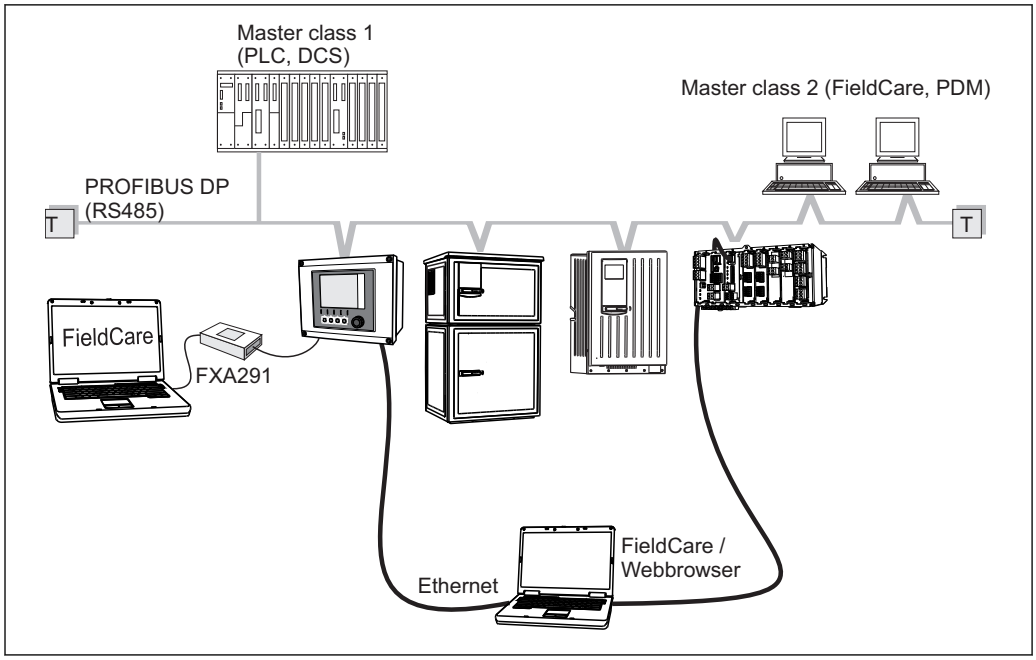
19 HART using modem

1 Device module Base E: current output 1 with HART
2 HART modem for connection to PC, e.g. Commubox FXA191 (RS232) or FXA195 [1] (USB)
3 HART handheld terminal

[1] Switch position "on" (substitutes the resistor)

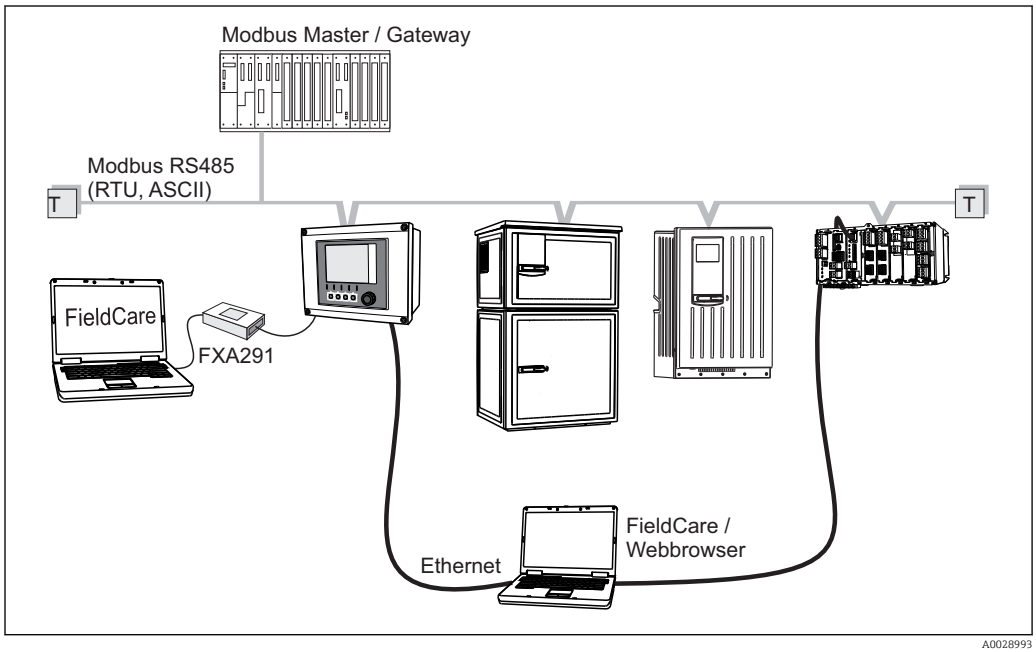
Via PROFIBUS DP



20 PROFIBUS DP

T Terminating resistor

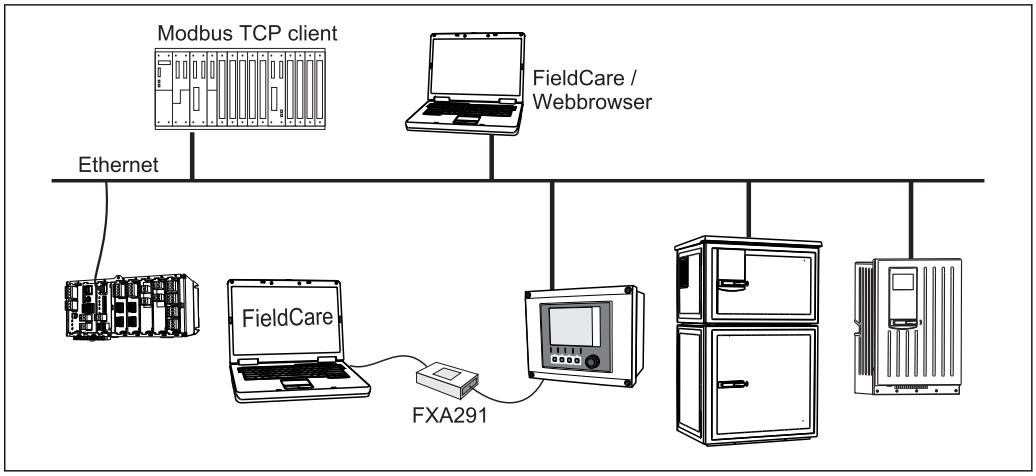
Via Modbus RS485



21 Modbus RS485

T Terminating resistor

Via Ethernet/Web server/Modbus TCP/EtherNet/IP



22 Modbus TCP and/or EtherNet/IP

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
- Swedish
- Turkish
- Hungarian
- Croatian
- Vietnamese

The availability of other languages can be checked via the product structure at www.endress.com/ca80am.

Certificates and approvals

CE mark

Declaration of Conformity

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

Ordering information

Product page

www.endress.com/ca80am

Product Configurator

On the product page there is a "Configuration" button to the right of the product image.

1. Click this button.
   ↳ The Configurator opens in a separate window.
2. Select all the options to configure the device in line with your requirements.
   ↳ In this way, you receive a valid and complete order code for the device.
3. Export the order code as a PDF or Excel file. To do so, click the appropriate button on the right above the selection window.

For many products you also have the option of downloading CAD or 2D drawings of the selected product version. To do so, click the "CAD" tab and select the desired file type using drop-down lists.

Scope of delivery

The scope of delivery comprises:
- 1 analyzer in the version ordered with optional hardware
- 1 print version of Brief Operating Instructions in the language ordered
- 1 Maintenance Manual
- Optional accessories

Accessories

The following are the most important accessories available at the time this documentation was issued. For accessories not listed here, please contact your service or sales office.

Sample preparation

Liquiline System CAT810
- Pressure pipe sampling + microfiltration
- Order according to product structure
  (--> Online Configurator, www.endress.com/cat810)
- Technical Information TI01138C/07/EN

Liquiline System CAT820
- Sampling + membrane filtration
- Order according to product structure
  (--> Online Configurator, www.endress.com/cat820)
- Technical Information TI01131C/07/EN

Liquiline System CAT860
- Pressure pipe sampling + membrane filtration
- Order according to product structure
  (--> Online Configurator, www.endress.com/cat860)
- Technical Information TI01137C/07/EN

Consumables for CA80AM

Reagent set CY80AM

NOTICE

Reagents can be harmful to the environment

► Pay particular attention to the information provided in the safety data sheets concerning the disposal of reagents.

A graduated cylinder (1000 ml) is not included in the delivery.

Premixed reagent, 1 l (33.81 fl.oz.) in each case
Order No. CY80AM-AA+SB

Standard solution CY80AM

1 l (34 fl.oz.) standard solution in each case with different concentrations of ammonium.
- 5 mg/l NH_4-N (6.45 mg/l NH_4, 6.05 mg/l NH_3); Order No. CY80AM-AA+T1
- 10 mg/l NH_4-N (12.90 mg/l NH_4, 12.10 mg/l NH_3); Order No. CY80AM-AA+T2
- 30 mg/l NH_4-N (38.7 mg/l NH_4, 36.30 mg/l NH_3); Order No. CY80AM-AA+T4
- 50 mg/l NH_4-N (64.50 mg/l NH_4, 60.50 mg/l NH_3); Order No. CY80AM-AA+T3

Maintenance kit CAV800

Order according to product structure

Standard
- Dispensers, 4 x 2.5 ml and 4 x 10 ml, including mounted adapter
- Hoses
- Silicone grease, medium-viscosity, tube 2 g
- Blind plug
- Sealing caps
- Filter mats

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

Cleaner CY820 (hoses for sample preparation and sample collecting vessel)

Cleaning concentrates to clean the hoses of the sample preparation system and the sample collecting vessel
- Base cleaner, concentrate 1 l (33.81 fl.oz.), Order No. CY820-1+TA
- Acid cleaner, concentrate 1 l (33.81 fl.oz.), Order No. CY820-1+T1
- Oxidizing cleaning solution, concentrate 1 l (33.81 fl.oz.), Order No. CY820-1+UA

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
- Order No. CAZ800-AAA1

Kit for upgrade from one-channel device 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
- Order No. CAZ800-AAA2

Kit for upgrade with cooling system
- Cooling module integrated in base of housing
- Bottle tray with recess and insulation
- Activation code
- Order No. CAZ800-AAN1

Kit for upgrade for second, downstream analyzer
- Valve for switching sample flow
- Hoses, connection adapters
- Activation code
- Order No. CAZ800-AAM1

Sensors

pH glass electrodes

Orbisint CPS11D
- pH electrode for process technology
- Optional SIL version for connecting to SIL transmitter
- With dirt-repellent PTFE diaphragm
- Product Configurator on the product page: www.endress.com/cps11d

Technical Information TI00028C

Memosens CPS31D
- pH electrode with gel-filled reference system with ceramic diaphragm
- Product Configurator on the product page: www.endress.com/cps31d

Technical Information TI00030C

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

Technical Information TI00468C

Ceragel CPS71D
- pH electrode with double-chamber reference system and integrated bridge electrolyte
- Product Configurator on the product page: www.endress.com/cps71d

Technical Information TI00245C

Orbipore CPS91D
- pH electrode with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps91d

Technical Information TI00375C

Orbipac CPF81D
- Compact pH sensor for installation or immersion operation
- In industrial water and wastewater
- Product Configurator on the product page: www.endress.com/cpf81d

Technical Information TI00191C

ORP electrodes

Orbisint CPS12D
- ORP sensor for process technology
- Product Configurator on the product page: www.endress.com/cps12d

Technical Information TI00367C

Ceraliquid CPS42D
- ORP electrode with ceramic junction and KCl liquid electrolyte
- Product Configurator on the product page: www.endress.com/cps42d

Technical Information TI00373C

Ceragel CPS72D
- ORP electrode with double-chamber reference system and integrated bridge electrolyte
- Product Configurator on the product page: www.endress.com/cps72d

Technical Information TI00374C

Orbipac CPF82D
- Compact ORP sensor for installation or immersion operation in process water and wastewater
- Product Configurator on the product page: www.endress.com/cpf82d

Technical Information TI00191C

Orbipore CPS92D
- ORP electrode with open aperture for media with high dirt load
- Product Configurator on the product page: www.endress.com/cps92d

Technical Information TI00435C

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

Technical Information TI00182C

Conductivity sensors with conductive measurement of conductivity

Condumax CLS21D
- Two-electrode sensor in plug-in head version version
- Product Configurator on the product page: www.endress.com/CLS21d

Technical Information TI00085C

Oxygen sensors

Oxymax COS51D
- Amperometric sensor for dissolved oxygen
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos51d

Technical Information TI00413C

Oxymax COS61D
- Optical oxygen sensor for drinking water and industrial water measurement
- Measuring principle: quenching
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos61d

Technical Information TI00387C

Chlorine sensors

CCS142D
- Membrane-covered amperometric sensor for free chlorine
- Measuring range 0.01 to 20 mg/l
- With Memosens technology
- Product Configurator on the product page: www.endress.com/ccs142d

Technical Information TI00419C

Ion-selective sensors

ISEmax CAS40D
- Ion selective sensors
- Product Configurator on the product page: 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

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

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

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

Technical Information TI00490C

Additional functionality

	Communication; software
51516983	Commubox FXA291 (hardware)
71127100	SD card with Liquiline firmware, 1 GB, industrial flash drive You must quote the serial number of the device when ordering the activation code.
71135636	Activation code for Modbus RS485
71135637	Activation code for Modbus TCP
71219871	Activation code for EtherNet/IP
71279813	Activation code for Modbus TCP for module ETH
71279830	Activation code for EtherNet/IP for module ETH
71211288	Activation code for feedforward control
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)
71218507	KitCA80: interface module CM44
71111053	Kit CM442/CM444/CM448/CSF48/CA80: extension module AOR; 2 x relay, 2 x 0/4 to 20 mA analog output
71125375	Kit CM442/CM444/CM448/CSF48/CA80: extension module 2R; 2 x relay
71125376	Kit CM442/CM444/CM448/CSF48/CA80: extension module 4R; 4 x relay
71135632	Kit CM442/CM444/CM448/CSF48/CA80: extension module 2AO; 2 x 0/4 to 20 mA analog output
71135633	Kit CM442/CM444/CM448/CSF48/CA80: extension module 4AO; 4 x 0/4 to 20 mA analog output
71135631	Kit CM444/CM448/CSF48/CA80: extension module 2DS; 2 x digital sensor, Memosens
71135634	Kit CM442/CM444/CM448/CSF48/CA80: extension module 485; Ethernet configuration; can be extended to PROFIBUS DP or Modbus RS485 or Modbus TCP or EtherNet/IP. This requires an additional activation code, which can be ordered separately (see kit CM444/CM448/CSF48/CA80: extension module DIO; 2 x digital input; 2 x digital output; auxiliary power supply for digital output communication; software).
71135638	Kit CM444/CM448/CSF48/CA80: extension module DIO; 2 x digital input; 2 x digital output; auxiliary power supply for digital output
71135639	Kit CM442/CM444/CM448/CSF48/CA80: extension module 2AI; 2 x 0/4 to 20 mA analog input
71140889	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module 485; Modbus RS485 (+ web server)
71140890	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module 485; Modbus TCP (+ web server)
71219868	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module 485; EtherNet/IP (+ web server)
71279809	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module ETH + Modbus TCP

	Retrofit kits
71279812	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module ETH + EtherNet/IP
71141366	Kit CM442/CM444/CM448/CSF48/CA80: extension backplane

Measuring cable

CYK10 Memosens data cable
- For digital sensors with Memosens technology
- Product Configurator on the product page: 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

Technical Information TI00118C

Measuring cable CYK81
- Unterminated cable for extending sensor cables (e.g. Memosens, CUS31/CUS41)
- 2 x 2 cores, twisted with shielding and PVC sheath (2 x 2 x 0.5 mm^2 + shielding)
- Sold by meter, Order No.: 51502543

Software

Memobase Plus CYZ71D
- PC software to support laboratory calibration
- Visualization and documentation of sensor management
- Sensor calibrations saved in the database
- Order as per product structure, www.endress.com/cyz71d

Technical Information TI00502C

Field Data Manager Software MS20
- PC software for central data management
- Visualization of series of measurements and logbook events
- SQL database for secure data storage
- Order No. 71129799

Other accessories

SD card
- Industrial Flash Drive, 1 GB
- Order No. 71110815

Cable junction with Velcro strip
- 4 pieces, for sensor cable
- Order No. 71092051

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