

Technical Information

Liquiline System CA80AM

Colorimetric analyzer for ammonium

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



Application

- 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 with up to four Memosens sensors
- Automatic calibration and cleaning
- User-configurable measuring, cleaning and calibration intervals
- Optional cooling module for longer reagent shelf life
- Low maintenance costs thanks to longevity of reagents
- User-definable measuring ranges
- Modular design for easily extensible functionality
- Digital communication for remote access
- Two-channel device available

Table of contents

Function and system design	4	Power supply	16
Colorimetric measuring principle	4	Supply voltage	16
Ammonium	4	Fieldbus connection	16
Photometric ammonium determination	4	Power consumption	16
Interferences	4	Fuse	16
Measuring system	5	Hose entries	16
Reagent cooling module (optional)	7	Cable specification	16
Equipment architecture	8	Connecting optional modules	17
Function diagram	8	Sensor connection (optional)	19
Slot and port assignment	9	Performance characteristics	20
Communication and data processing	10	Measured error	20
Dependability	10	Maximum measured error Sensor inputs	20
Reliability thanks to Memosens technology	10	Measured error current inputs and outputs	20
Maintainability	10	Repeatability	20
Self-monitoring functions	12	Repeatability Sensor inputs	20
Data security	12	Measuring interval	20
IT security	12	Sample requirement	20
Input	12	Reagent requirement	20
Measured variables	12	Calibration interval	20
Measuring range	12	Cleaning interval	20
Types of input	12	Maintenance interval	20
Input signal	12	Maintenance effort	20
Current input, passive	12	Environment	21
Self-priming hose specification	13	Ambient temperature range	21
Cable specification (for optional sensors with Memosens technology)	13	Storage temperature	21
Output	13	Humidity	21
Output signal	13	Degree of protection	21
Signal on alarm	13	Electromagnetic compatibility	21
Load	13	Electrical safety	21
Transmission behavior	13	Pollution degree	21
Current outputs, active	14	Process	21
Span	14	Sample temperature	21
Signal characteristic	14	Sample flow rate	21
Electrical specification	14	Consistency of the sample	21
Cable specification	14	Sample supply	21
Relay outputs	14	pH value of the sample	21
Electrical specification	14	Mechanical construction	22
Protocol-specific data	15	Dimensions	22
Modbus RS485	15	Weight	22
Modbus TCP	15	Materials	23
Web server	15	Operability	24
		Operating concept	24
		Display	24
		Remote operation	24
		Language packages	25
		Ordering information	26
		Product page	26
		Product structure	26
		Scope of delivery	26

Certificates and approvals	26
CE mark	26
Accessories	27
Consumables for CA80AM	27
Maintenance kit CAV800	27
Cleaner for hoses CY820	27
Upgrade kits CAZ800	28
Sensors with Memosens technology (option)	28
Additional functionality	31
Measuring cable	31
Other accessories	31

Function and system design

Colorimetric measuring principle

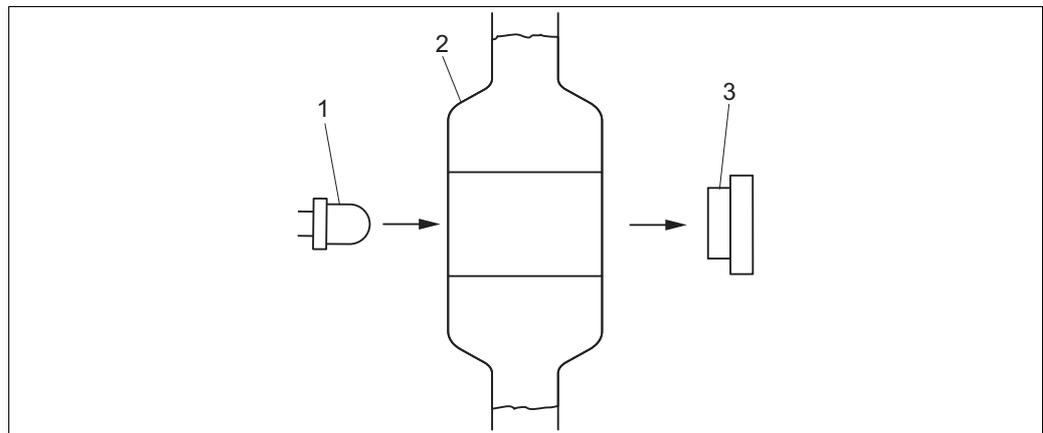
After application-specific sample conditioning, some of the permeate is pumped into the mixing/ reaction chamber. The specific color reagent is metered exactly in a defined mixture ratio. The chemical reaction causes the characteristic change in the color of the sample.

The multispectral photometer measures the level of absorption by the sample or the stain solution at parameter-specific 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.

A temperature control system actively keeps the temperature in the photometer constant to ensure a reproducible reaction which takes place within a short time frame.



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 follows 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.

Interferences

The ions listed have been checked with the given concentrations. A summary effect has not been studied. Up to the given concentrations no interference effect were observed.

- 500 mg/l Na⁺, K⁺, SO₄²⁻
- 250 mg/l NO₃⁻-N, PO₄³⁻
- 50 mg/l Cr³⁺, Zn²⁺
- 30 mg/l NO₂⁻-N
- 2 mg/l Ag⁺

Primary amines are detected in the reaction resulting in excess findings. Reducing agent leading to lower values.

Measuring system

A complete measuring system consists of:

- Liquiline System CA80AM analyzer in the configuration ordered
- Reagents, cleaners and standard solutions (to be ordered separately)
- Liquiline System CAT8x0 sample preparation (optional)

Micro-filtration (Liquiline System CAT810)

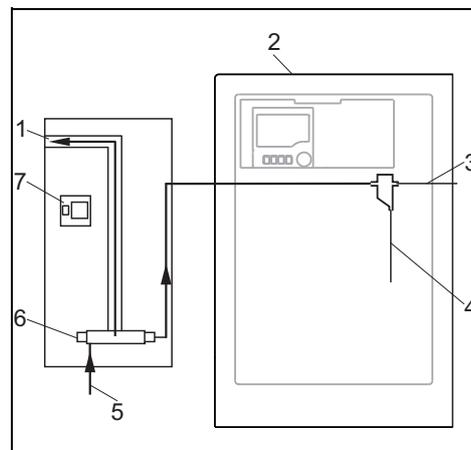
- Function: pressure pipe sampling + filtration
- Sieve filter
- Control via CA80
 - optional: time control via integrated timer
- Backflushing, with compressed air or water
- Panel version or integration into analyzer stand housing
- Application: wastewater treatment plant outlet

Membrane filtration (Liquiline System CAT820, ceramic filter version)

- Function: sampling + filtration
- Ceramic membrane filter; pore size 0.1 µm
- Communication via Memosens protocol, control via CA80
 - also optionally available with own time control system
- Backflushing with compressed air (version with Memosens technology)
- Easy installation with Flexdip CYH112 (TI00430C)
- Application: sludge activation, wastewater treatment plant outlet, surface water

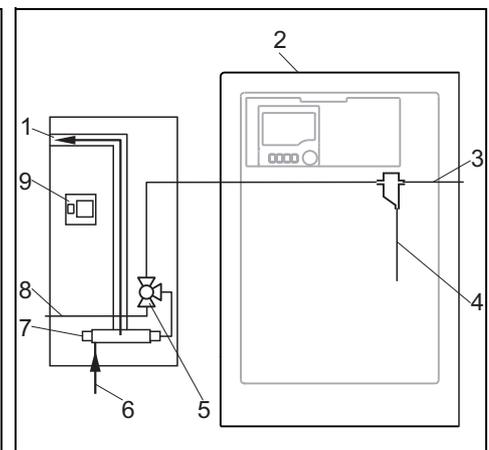
Membrane filtration (Liquiline System CAT860)

- Function: sampling + filtration
- Ceramic membrane filter; 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: wastewater treatment plant inlet



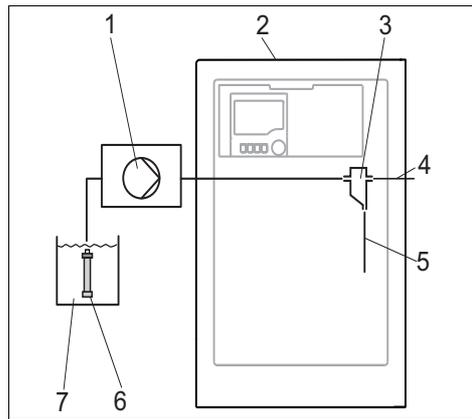
Measuring system with Liquiline System CAT810

- 1 Overflow
- 2 Liquiline System CA80
- 3 Overflow collecting vessel
- 4 Sample
- 5 Pressurized sample
- 6 Filter unit
- 7 Time control, optional



Measuring system with Liquiline System CAT810 and cleaning valve

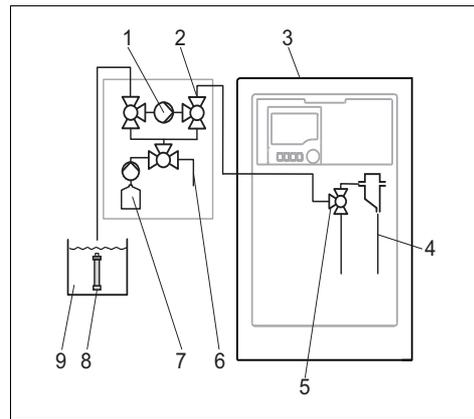
- 1 Overflow
- 2 Liquiline System CA80
- 3 Overflow collecting vessel
- 4 Sample
- 5 Cleaning valve
- 6 Pressurized sample
- 7 Filter unit
- 8 Flush connection
- 9 Time control, optional



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Measuring system with Liquiline System CAT820

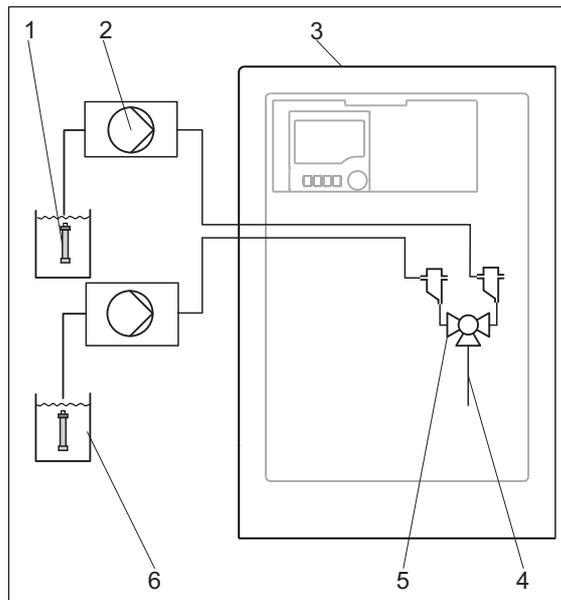
- 1 Pump
- 2 Liquiline System CA80
- 3 Sample collecting vessel
- 4 Outlet
- 5 Sample
- 6 Filter (ceramic)
- 7 Medium



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Measuring system with Liquiline System CAT860

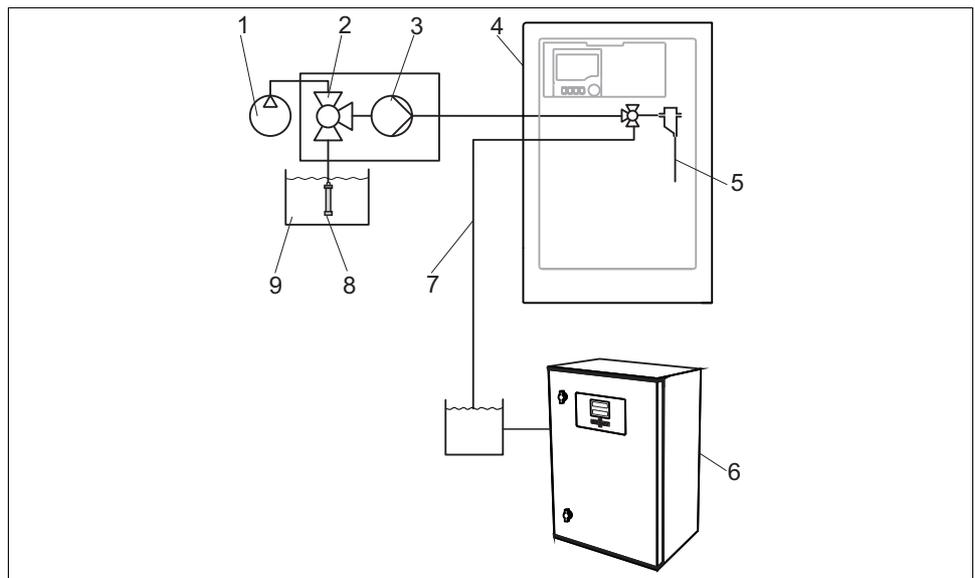
- 1 Pump
- 2 Valve
- 3 Liquiline System CA80
- 4 Sample
- 5 Valve
- 6 Compressed air
- 7 Cleaning solution
- 8 Filter (ceramic)
- 9 Medium



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Measuring system with two Liquiline System CAT820

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



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

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

Customer-specific solution

Before analysis the sample must be prepared at the customer's site and must be 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.

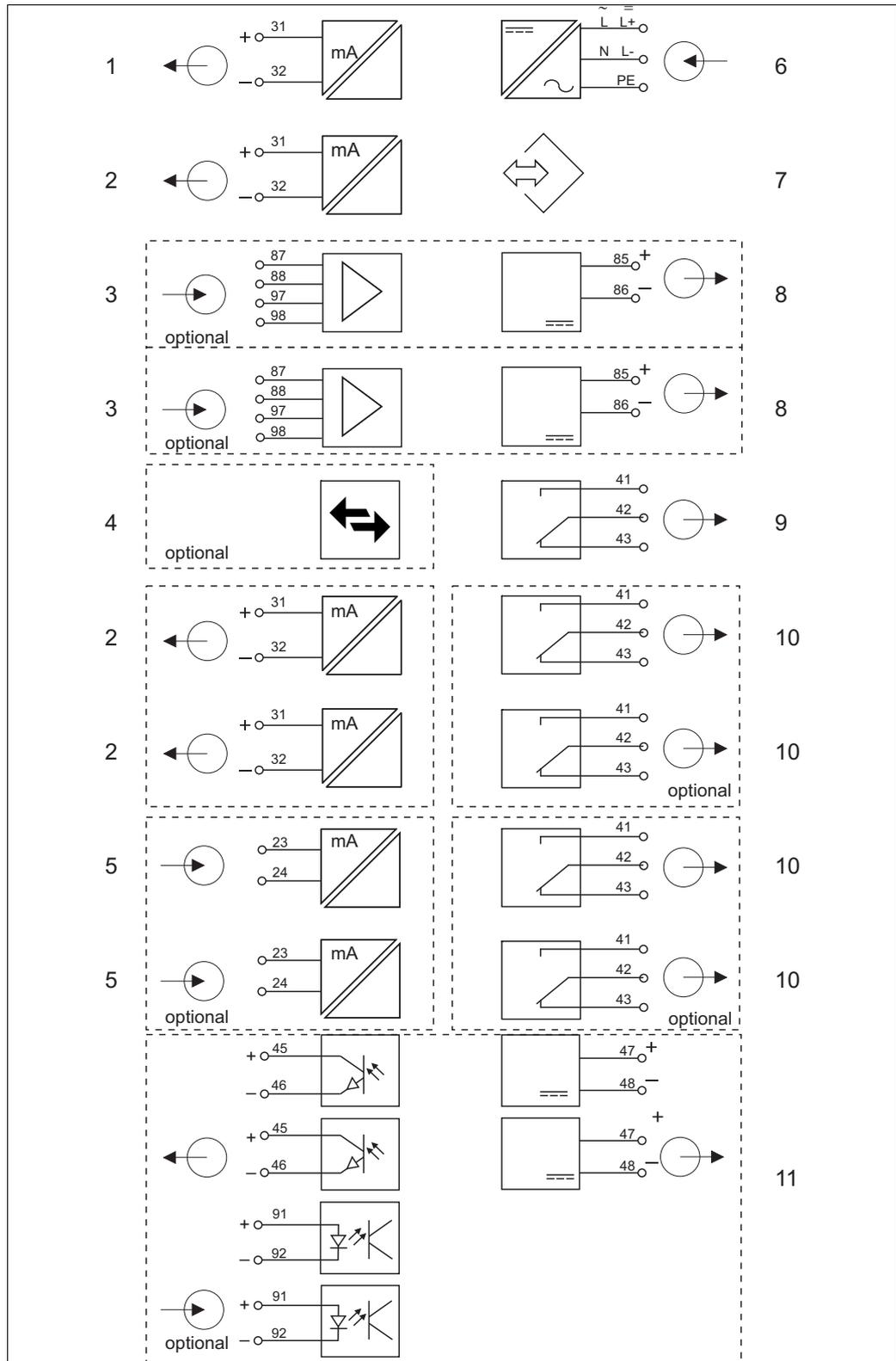
Reagent cooling module (optional)

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.

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

Equipment architecture

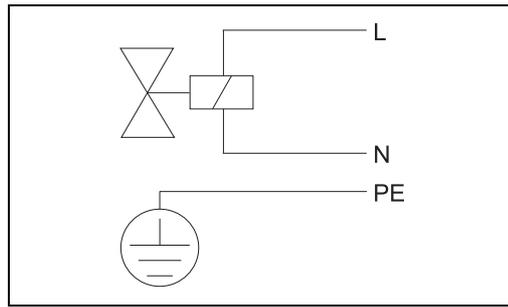
Function diagram



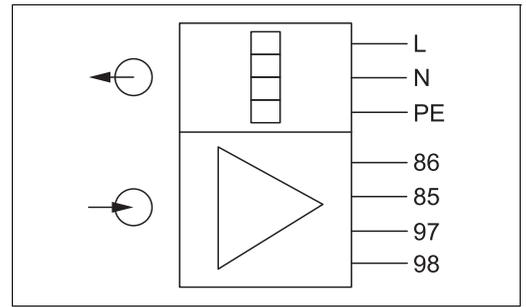
Function diagram CA80

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



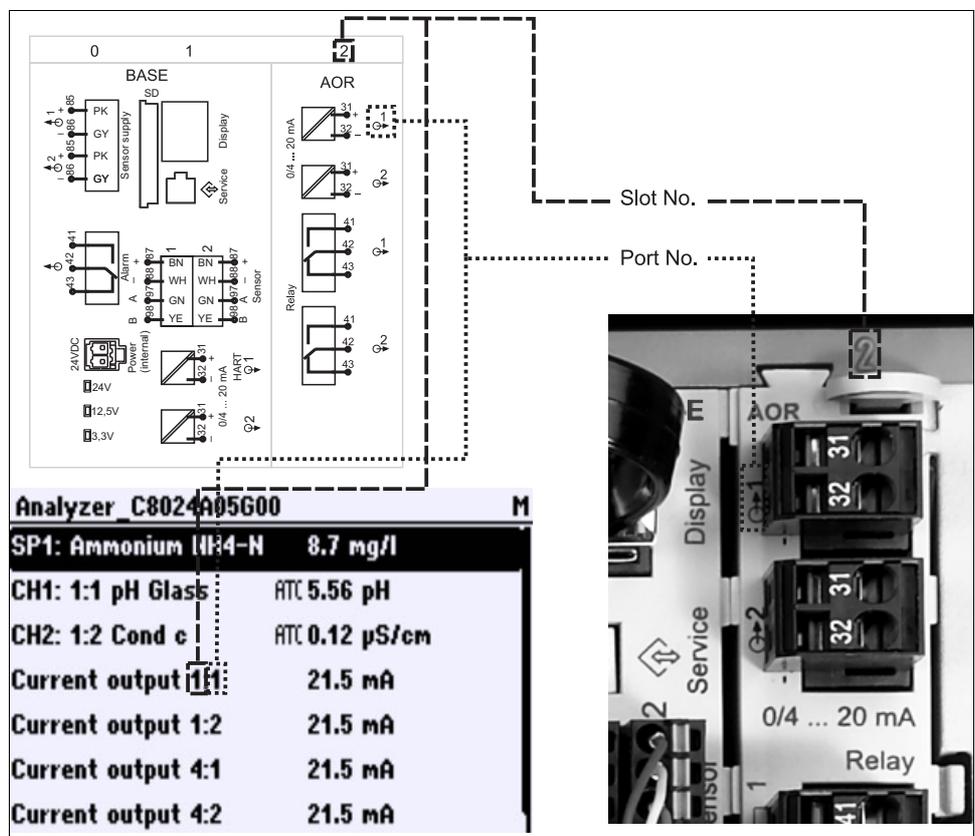
Function diagram for sample preparation
Liquiline System CAT810 with cleaning valve



Function diagram for sample preparation
Liquiline System CAT820 and CAT860

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

Slot and port assignment



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 slots are numbered consecutively in the housing. Slots 0 and 1 are always reserved for the basic module.
- In addition there are also inputs and outputs for the control module. These slots are labeled "S".
- 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 with the slot and port numbers in ascending order

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 to the port

Communication and data processing

Types of communication:

- Fieldbuses
 - Modbus TCP or RS485
- Configuration via Ethernet

Extension module 485 and current outputs

For communication types, Modbus and Ethernet:

- Max. of 2 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 makes your measuring point safer and more reliable:

- Non-contact, digital signal transmission enables optimum galvanic isolation
- No contact corrosion
- Completely watertight
- Laboratory sensor calibration possible, thus increasing measured value availability
- 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 with high temperatures
 - Number of steam sterilizations
 - Sensor condition

Maintainability

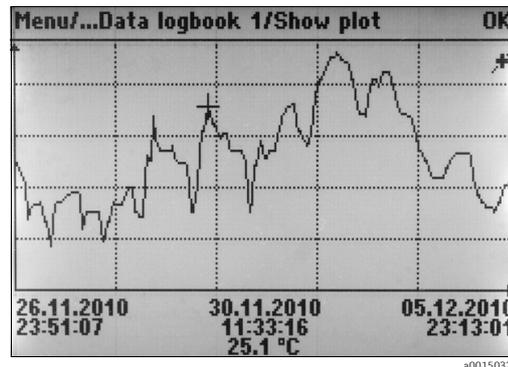
Modular design

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

- 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
- Retrofit extension modules for new or extended range of functions, e.g. current outputs, relays and digital communication

Memory

- Independent, integrated ring memory (FIFO) or fill-up buffer for recording:
 - Events (e.g. power failure)
 - An analog value
- 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:
 - E.g. software updates
 - Max. 50 entries
- Event logbook
- Analyzer event logbook
 - Analyzer-specific events
 - Max. 2500 entries, ring memory or fill-up buffer for recording
- Operation logbook: max. 250 entries
- Diagnostics logbook: max. 250 entries



Data logbook: Graphic display

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

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. logs)
- 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	<p>Electronics</p> <ul style="list-style-type: none"> ▪ Current inputs are deactivated in the event of overcurrent and reactivated automatically once the overcurrent stops ▪ Board voltages are monitored and the board temperature is also measured <p>Counter</p> <p>Counters monitor consumables such as reagents, cleaners or dispensers.</p> <p>Photometer</p> <ul style="list-style-type: none"> ▪ Automatic temperature monitoring ▪ Active monitoring of communication between the photometer module and the analyzer electronics <p>Sample preparation (optional)</p> <ul style="list-style-type: none"> ▪ Active monitoring of communication between sample preparation with Memosens communication and the analyzer ▪ Counter for consumables, such as hoses of the peristaltic pump. <p>Sample collecting vessel (optional)</p> <ul style="list-style-type: none"> ▪ Active monitoring of liquid level in the sample collecting vessel to ensure the supply of liquid to the analyzer
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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.
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IT security	<p>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.</p> <p>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. Support in the performance of this task can be requested from Endress+Hauser.</p>
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Input

Measured variables	NH ₄ -N, NH ₄ , NH ₃ [mg/l, ppm]						
Measuring range	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">CA80AM-AAA1:</td> <td>0.05 to 20 mg/l NH₄-N</td> </tr> <tr> <td>CA80AM-AAA2:</td> <td>0.5 to 50 mg/l NH₄-N</td> </tr> <tr> <td>CA80AM-AAA3:</td> <td>1 to 100 mg/l NH₄-N</td> </tr> </table>	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
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	<ul style="list-style-type: none"> ▪ 1 or 2 measuring channels ▪ 1 to 4 digital sensor inputs for sensors with Memosens protocol (optional) ▪ Analog current inputs (optional) 						
Input signal	<p>Depending on version</p> <ul style="list-style-type: none"> ▪ Max. 4 x binary sensor signal (optional) ▪ 2 x 0/4 to 20 mA (optional), passive, potentially isolated from one another and from the sensor inputs/sample preparation 						
Current input, passive	<p>Span</p> <p>> 0 to 20 mA</p> <p>Signal characteristic</p> <p>Linear</p> <p>Internal resistance</p> <p>Non-linear</p> <p>Test voltage</p> <p>500 V</p>						

Self-priming hose specification**External sample collecting vessel**

- Distance: 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 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 from one another and from the sensor circuits/sample preparation
- 4 x 0/4 to 20 mA, active, potentially isolated from one another and from the sensor circuits/sample preparation
- 6 x 0/4 to 20 mA, active, potentially isolated from one another and from the sensor circuits/sample preparation

Modbus RS485

Signal coding	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 coding	IEEE 802.3 (Ethernet)
Data transmission rate	10 / 100 MBd
Galvanic isolation	Yes
IP address	DHCP or configuration using 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	<p>Output voltage Max. 24 V</p> <p>Test voltage 500 V</p>
Cable specification	<p>Cable type Recommended: shielded cable</p> <p>Cable specification Max. 2.5 mm² (14 AWG)</p>

Relay outputs

Electrical specification	<p>Relay types</p> <ul style="list-style-type: none"> ▪ 1 single-pin changeover contact (alarm relay) ▪ 2 or 4 single-pin changeover contacts (optional with extension modules)
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Relay switching capacity

Basic 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 modules

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 with 5 V DC
- Min. 1 mA with 24 V DC
- Min. 5 mA with 24 V AC
- Min. 1 mA with 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 router with a user-defined IP address.

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

Power supply

Supply voltage

 The analyzer is fitted with a connector with a cable length of 5 m (10 ft).

- 100 to 120 VAC / 200 to 240 VAC \pm 10%
or
24 VDC \pm 10%
- 50 \pm 1 or 60 \pm 1.2 Hz

NOTICE

The device does not have a mains switch.

- ▶ The customer must provide a protected circuit breaker in the vicinity of the device.
- ▶ This must be a switch or a power-circuit breaker and must be labeled 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 trace heating system, max. 1450 VA (version with cooling)

Fuse

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

Hose entries

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

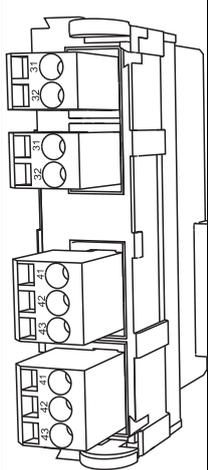
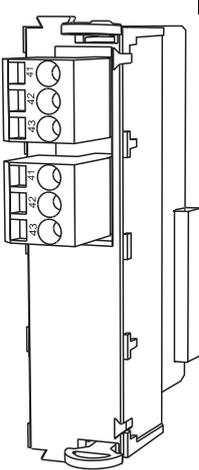
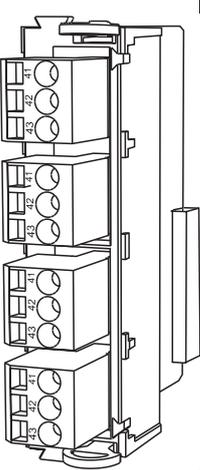
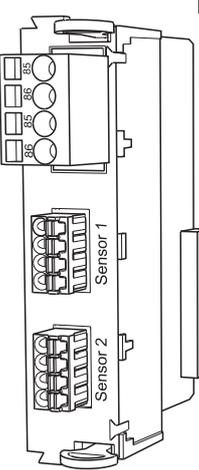
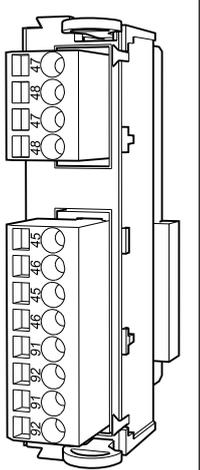
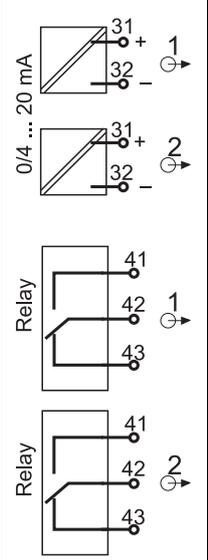
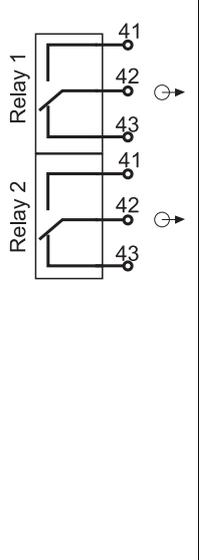
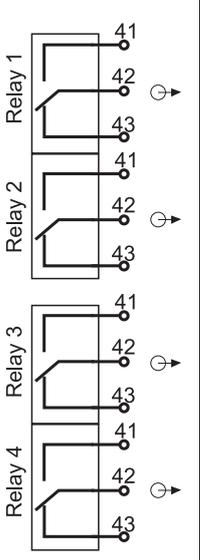
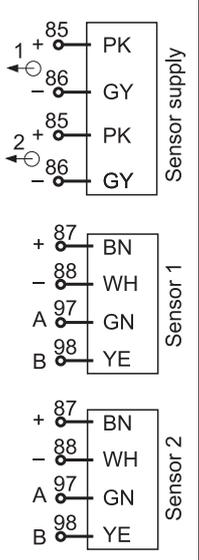
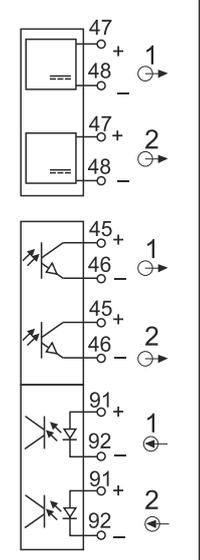
Connecting optional modules

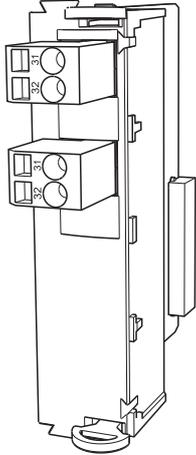
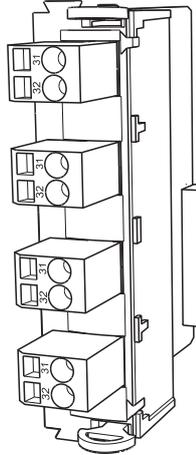
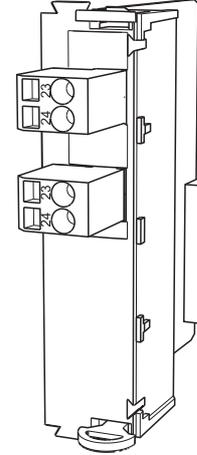
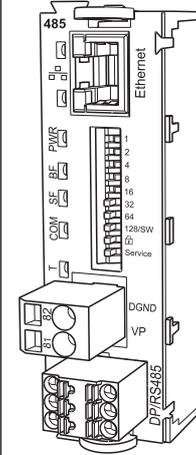
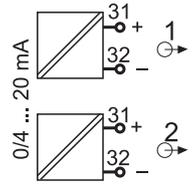
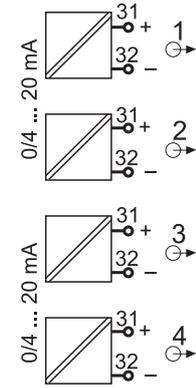
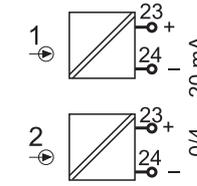
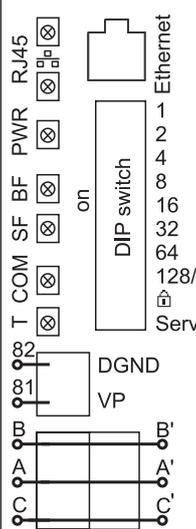
NOTICE

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

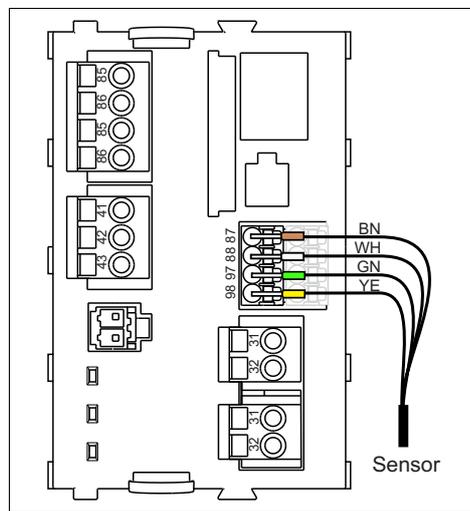
- ▶ Remember that the sum of all current inputs and outputs may not exceed 8!
- ▶ Please contact your Endress+Hauser sales center should you have any questions.

Module name				
AOR	2R	4R	2DS	DIO
 a0015747	 a0015748	 a0015749	 a0015754	 a0019835
<ul style="list-style-type: none"> ▪ 2 x 0/4 to 20 mA analog outputs ▪ 2 relays ▪ Order no. 71111053 	<ul style="list-style-type: none"> ▪ 2 relays ▪ Order no. 71125375 	<ul style="list-style-type: none"> ▪ 4 relays ▪ Order no. 71125376 	<ul style="list-style-type: none"> ▪ 2 digital sensor inputs ▪ 2 power supply systems for digital sensors ▪ Order no. 71135631 	<ul style="list-style-type: none"> ▪ 2 digital inputs ▪ 2 digital outputs with auxiliary voltage ▪ Order no. 71135638
 a0015755	 a0015758	 a0015757	 a0015756	 a0019836

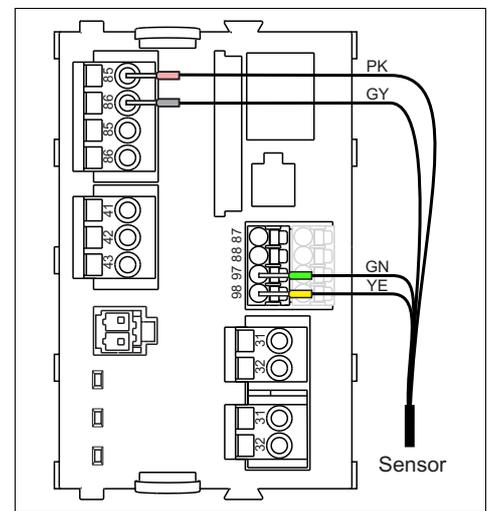
Module name			
2AO	4AO	2AI	485
 <p style="text-align: right;">a0015750</p>	 <p style="text-align: right;">a0015751</p>	 <p style="text-align: right;">a0015752</p>	 <p style="text-align: right;">a0015753</p>
<ul style="list-style-type: none"> ■ 2 x 0/4 to 20 mA analog outputs ■ Order no. 71135632 	<ul style="list-style-type: none"> ■ 4 x 0/4 to 20 mA analog outputs ■ Order no. 71135633 	<ul style="list-style-type: none"> ■ 2 x 0/4 to 20 mA analog inputs ■ Order no. 71135639 	<ul style="list-style-type: none"> ■ Ethernet (web server or Modbus TCP) ■ Order no. 71135634
 <p style="text-align: right;">a0015759</p>	 <p style="text-align: right;">a0015760</p>	 <p style="text-align: right;">a0015761</p>	 <p style="text-align: right;">a0015762</p>

Sensor connection (optional) Sensors with Memosens protocol

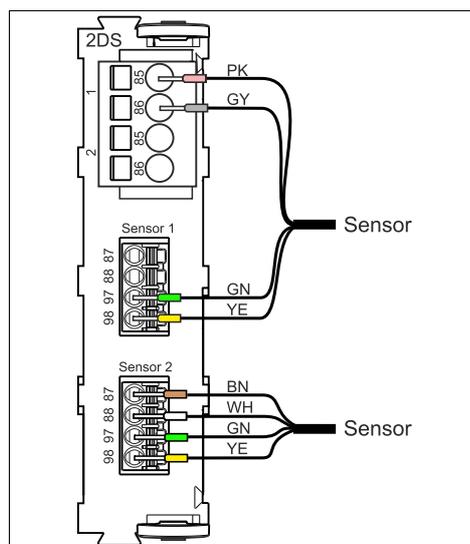
Sensor types	Sensor cables	Sensors
Digital sensors without additional internal power supply	with plug connection and inductive signal transmission	<ul style="list-style-type: none"> ▪ pH sensors ▪ ORP sensors ▪ Combi sensors ▪ Amperometric oxygen sensors ▪ Conductive conductivity sensors ▪ Chlorine sensors
	Fixed cable	Inductive conductivity sensors
Digital sensors with additional internal power supply	Fixed cable	<ul style="list-style-type: none"> ▪ Turbidity sensors ▪ Sensors for interface measurement ▪ Sensors for measuring the spectral absorption coefficient (SAC) ▪ Nitrate sensors ▪ Optical oxygen sensors ▪ Ion-sensitive sensors



Sensors without additional supply voltage



Sensors with additional supply voltage



Sensors with and without additional supply voltage at sensor module 2DS

Performance characteristics

Measured error¹⁾	CA80AM-AAA1:	$\pm 2\%$ of the display value + 0.05 mg/l NH ₄ -N
	CA80AM-AAA2:	0.5 to 20 mg/l NH ₄ -N $\pm 2\%$ of the display value + 0.05 mg/l NH ₄ -N
		> 20 to 50 mg/l NH ₄ -N $\pm 2\%$ of the display value + 0.5 mg/l NH ₄ -N
	CA80AM-AAA3:	1.0 to 50 mg/l NH ₄ -N $\pm 3\%$ of the display value + 0.5 mg/l NH ₄ -N
		> 50 to 100 mg/l NH ₄ -N $\pm 3\%$ of the display value + 1.0 mg/l NH ₄ -N
Maximum measured error Sensor inputs	--> Documentation of the connected sensor	
Measured error current inputs and outputs	Typical measured errors: < 20 μ A (for current values < 4 mA) < 50 μ A (with current values 4 to 20 mA) at 25 °C (77 °F) each Additional measured error depending on the temperature: < 1.5 μ A/K	
Repeatability¹⁾	$\pm 2\%$ of the display value + 0.05 mg/l NH ₄ -N	
Repeatability Sensor inputs	--> Documentation of the connected sensor	
Measuring interval	Continuous (approx. 8 min), adjustable > 15 min	
Sample requirement	22 ml/measurement	
Reagent requirement	<ul style="list-style-type: none"> ▪ Approx. 70 μl per reagent and measurement ▪ With a measuring interval of 15 min, approx. 250 ml per reagent and month 	
Calibration interval	1 to 90 days, depending on the application and ambient conditions	
Cleaning interval	1 to 90 days, depending on the application	
Maintenance interval	Every 3 - 6 months, depending on the application	
Maintenance effort	<ul style="list-style-type: none"> ▪ Weekly: visual inspection ▪ Quarterly: 1 hour ▪ Annually: 2 hours 	

1) Following ISO 15839 with standard solutions and freshly prepared reagents

Environment

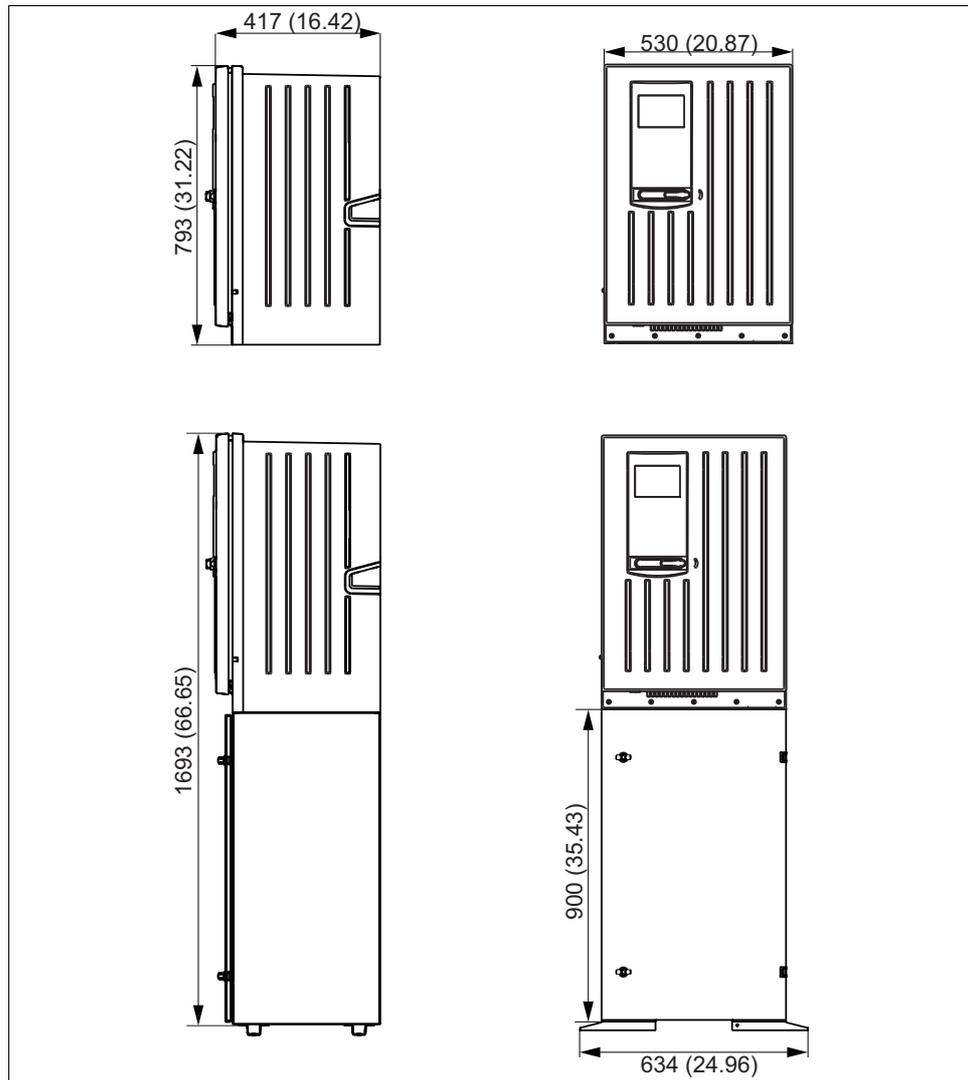
Ambient temperature range	5 to 40 °C (41 to 104 °F)
Storage temperature	-20 to 60 °C (-4 to 140 °F)
Humidity	10 to 95%, not condensing
Degree of protection	IP55 (cabinet, stand housing)
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1: 2013, class A for industry
Electrical safety	IEC 61010-1, Class I equipment Low voltage: overvoltage category II Environment < 2000 m (< 6562 ft) above MSL
Pollution degree	The product is suitable for pollution degree 2.

Process

Sample temperature	4 to 40 °C (40 to 104 °F)
Sample flow rate	Min. 5 ml/min (0.17 fl.oz./min)
Consistency of the sample	Low solids content (TS < 50 mg/l (ppm))
Sample supply	Unpressurized
pH value of the sample	pH 5 to 9

Mechanical construction

Dimensions



Liquiline System CA80 without/with base, dimensions in mm (inch)

Weight

	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)
Stand housing	75 kg (165.3 lbs)	72.5 kg (159.8 lbs)

Materials

Parts not in contact with medium	
Cabinet housing, exterior cover	Plastic ASA+PC
Open installation, exterior cover	
Cabinet housing, interior lining	Plastic PP
Open installation, interior lining	
Window	Shatterproof glass, coated
Reagent container	Plastic PP
Insulation	Plastic EPP (extruded PP)
Base, stand housing	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
Photometer cuvette <ul style="list-style-type: none"> ▪ Outer material ▪ Optical window ▪ Molded seal 	<ul style="list-style-type: none"> ▪ PP-GF30 ▪ Glass ▪ Elastomer EPDM
Drain pipe	Plastic PP
Sample collecting vessel (optional) <ul style="list-style-type: none"> ▪ Beaker ▪ Cover ▪ Level detector pins ▪ Seal 	<ul style="list-style-type: none"> ▪ Plastic PMMA ▪ Plastic PP ▪ Stainless steel 1.4404 (V4A) ▪ EPDM
Valve (optional)	PVDF

Operability

Operating concept

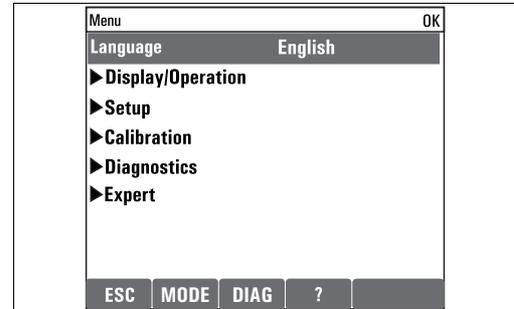
The simple and structured operating concept sets new standards:

- 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



a0023013-en

Easy operation



a0023002-en

Plain-text menu

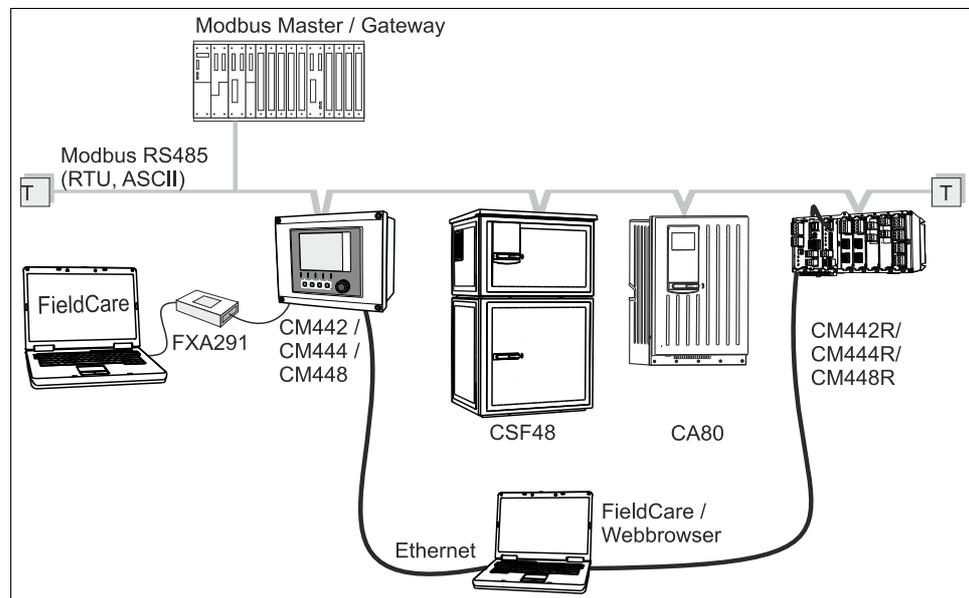
Display

Graphic display:

- 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.
- Display of analyzer load curves

Remote operation

Via Modbus RS485

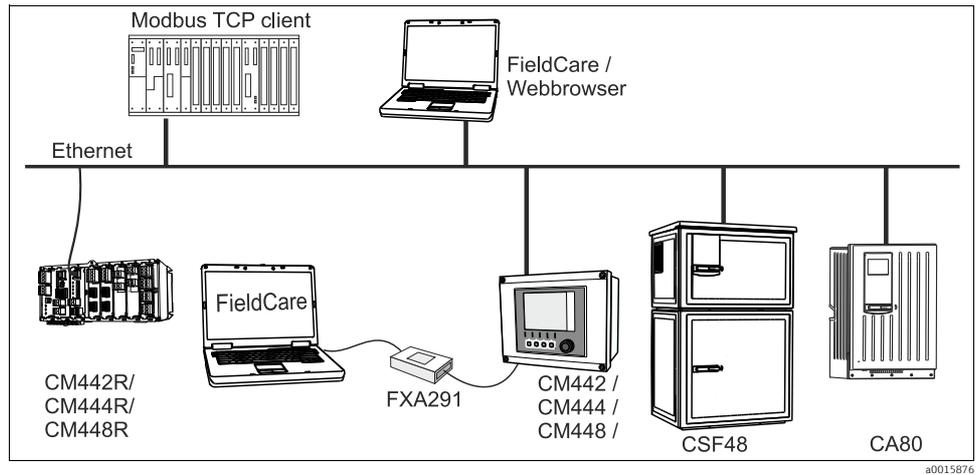


a0015875

Modbus RS485

T Terminating resistor

Via Ethernet/web server/Modbus TCP



Modbus TCP and/or Ethernet

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)

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

Ordering information

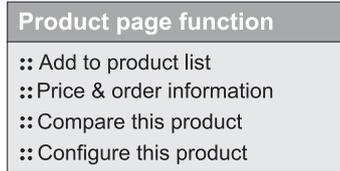
Product page

You can create a valid and complete order code using the Endress + Hauser Configurator tool on the Internet.

Enter the following address in your browser to access the relevant product page:
www.products.endress.com/ca80am

Product structure

1. You can choose from the following options on the right-hand side of the Product page:



2. Select "Configure this product".
3. A new window opens with the Configurator. Using this tool, you can configure your device and you will receive a valid and complete order code for this.
4. Then export the order code as a PDF or as an Excel file selecting from the buttons provided at the top of the page.

Scope of delivery

- 1 analyzer in the version ordered and optional hardware
- 1 CD with Operating Instructions
- 1 Brief Operating Instructions (hard copy)
- 1 Maintenance Manual
- Optional accessories

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.

Accessories

- i** The most important accessories that could be delivered at the time this document went to print are listed below. For information on accessories that are not listed here, please contact your local service or sales representation.

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.

- i** Graduated cylinder (1000 ml) is not included in the delivery.

- Premixed reagent R1+R2, ready-to-use solution, 1 l in each case (33.81 fl.oz.)
- 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 $\text{NH}_4\text{-N}$ (6.45 mg/l NH_4 , 6.05 mg/l NH_3); Order No. CY80AM-AA+T1
- 10 mg/l $\text{NH}_4\text{-N}$ (12.90 mg/l NH_4 , 12.10 mg/l NH_3); Order No. CY80AM-AA+T2
- 30 mg/l $\text{NH}_4\text{-N}$ (38.7 mg/l NH_4 , 36.30 mg/l NH_3); Order No. CY80AM-AA+T4
- 50 mg/l $\text{NH}_4\text{-N}$ (64.50 mg/l NH_4 , 60.50 mg/l NH_3); Order No. CY80AM-AA+T3

Cleaner CY800

- 500 ml (16.91 fl.oz.) container; Order No. CY800-AA11

Maintenance kit CAV800

Maintenance kit CAV800 for CA80

- Standard
 - Dispensers, 4 x 2.5ml and 8 x 10 ml, including mounted adapter
 - Hoses for reagents, standard solution and cleaner
 - Silicone grease, medium-viscosity, tube 2 g
 - Blind plug
 - Screw cap
 - Filter mats
- Optional
 - Inlet and outlet hoses
 - Maintenance Manual
- Order as per product structure

Cleaner for hoses CY820

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 to upgrade from one channel to two channels

- 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 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 for second, downstream analyzer

- Valve for switching sample flow
- Hoses, connection adapters
- Activation code
- Order No. CAZ800-AAM1

Sensors with Memosens technology (option)**pH glass electrodes**

Orbisint CPS11D

- pH sensor with Memosens technology
- Dirt-repellent PTFE diaphragm
- Order as per product structure (--> online Configurator, www.products.endress.com/cps11d)
- Technical Information TI00028C/07/EN

Memosens CPS31D

- pH sensor with Memosens technology
- Gel-filled reference system with ceramic diaphragm
- Order as per product structure (--> online Configurator, www.products.endress.com/cps31d)
- Technical Information TI00030C/07/EN

Ceraliquid CPS41D

- pH sensor with Memosens technology
- Ceramic diaphragm and KCl liquid electrolyte
- Order as per product structure (--> online Configurator, www.products.endress.com/cps41d)
- Technical Information TI00079C/07/EN

Ceragel CPS71D

- pH sensor with Memosens technology
- Poison-resistant reference with ion trap
- Order as per product structure (--> online Configurator, www.products.endress.com/cps71d)
- Technical Information TI00245C/07/EN

Orbipore CPS91D

- pH sensor with Memosens technology
- Open aperture diaphragm for media with high dirt load
- Order as per product structure (--> online Configurator, www.products.endress.com/cps91d)
- Technical Information TI00375C/07/EN

Orbipac CPF81D

- Compact pH sensor for installation or immersion operation in process water and wastewater
- Order as per product structure (--> online Configurator, www.products.endress.com/cpf81d)
- Technical Information TI191C/07/EN

ORP electrodes

Orbisint CPS12D

- ORP sensor with Memosens technology
- Dirt-repellent PTFE diaphragm;
- Order as per product structure (--> online Configurator, www.products.endress.com/cps12d)
- Technical Information TI367C/07/EN

Ceraliquid CPS42D

- ORP sensor with Memosens technology
- Ceramic diaphragm and KCl liquid electrolyte
- Order as per product structure (--> online Configurator, www.products.endress.com/cps42d)
- Technical Information TI373C/07/EN

Ceragel CPS72D

- ORP sensor with Memosens technology
- Poison-resistant reference with ion trap
- Order as per product structure (--> online Configurator, www.products.endress.com/cps72d)
- Technical Information TI374C/07/EN

Orbipac CPF82D

- Compact ORP sensor for installation or immersion operation in process water and wastewater
- Order as per product structure (--> online Configurator, www.products.endress.com/cpf82d)
- Technical Information TI191C/07/EN

Orbipore CPS92D

- ORP sensor with Memosens technology
- Open aperture diaphragm for media with high dirt load
- Order as per product structure (--> online Configurator, www.products.endress.com/cps92d)
- Technical Information TI435C/07/EN

Inductive conductivity sensors

Indumax CLS50D

- High-stability inductive conductivity sensor for standard, Ex and high-temperature applications
- Memosens protocol
- Order as per product structure (--> online Configurator, www.products.endress.com/cls50d)
- Technical Information TI182C/07/EN

Conductive conductivity sensors

Condumax CLS21D

- Two-electrode sensor in fixed cable and plug-in head version
- Order as per product structure (--> online Configurator, www.products.endress.com/cls21d)
- Technical Information TI085C/07/EN

Oxygen sensors

Oxymax COS51D

- Amperometric sensor for dissolved oxygen, with Memosens technology
- Order as per product structure (--> online Configurator, www.products.endress.com/cos51d)
- Technical Information TI00413C/07/EN

Oxymax COS61D

- Optical oxygen sensor for drinking water and industrial water measurement
- Measuring principle: quenching
- Memosens protocol
- Material: stainless steel 1.4571 (AISI 316Ti)
- Order as per product structure (--> online Configurator, www.products.endress.com/cos61d)
- Technical Information TI387C/07/EN

Chlorine sensors

CCS142D

- Membrane-covered amperometric sensor for free chlorine
- Memosens technology
- Measuring range 0.01 to 20 mg/l
- Order as per product structure (--> online Configurator, www.products.endress.com/ccs142d)
- Technical Information TI419C/07/EN

Ion selective sensors

ISEmax CAS40D

- Ion selective sensors
- Order as per product structure (--> online Configurator, www.products.endress.com/cas40d)
- Technical Information TI491C/07/EN

Turbidity sensors

Turbimax CUS51D

- For nephelometric measurements of turbidity and solids in wastewater
- 4-beam scattered light method
- With Memosens protocol
- Order as per product structure (--> online Configurator, www.products.endress.com/cus51d)
- Technical Information TI461C/07/EN

SAC and nitrate sensors

Viomax CAS51D

- SAC and nitrate measurement in drinking water and wastewater
- With Memosens protocol
- Order as per product structure (--> online Configurator, www.products.endress.com/cas51d)
- Technical Information TI459C/07/EN

Interface measurement

Turbimax CUS71D

- Immersion sensor for interface measurement
- Ultrasonic interface sensor
- Order as per product structure (--> online Configurator, www.products.endress.com/cus71d)
- Technical Information TI490C/07/EN

Additional functionality

	Communication; software
51516983	Commbobox FXA291 + FieldCare Device Setup
71127100	SD card with Liquiline Firmware, 1 GB, Industrial Flash Drive
71135636	Activation code for Modbus RS485
71135637	Activation code for Modbus TCP
71211288	Activation code for feedforward control
71211289	Activation code for measuring range switch
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 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. This requires an additional activation code which can be ordered separately (see 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 analog input 0/4 to 20 mA
71140889	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module 485; Modbus RS485 (+ Ethernet configuration)
71140890	Upgrade kit CM442/CM444/CM448/CSF48/CA80; extension module 485; Modbus TCP (+ Ethernet configuration)

Measuring cable

Extension of Memosens data cable CYK81

- Unterminated cable for extending sensor connection cables
- 2 x 2 cores, twisted with shielding and PVC sheath (2 x 2 x 0.5 mm² + shielding), sold by meter
- Minimum length: 10 m
- Order no. 51502543

Other accessories

SD card

SD card

- Industrial Flash Drive, 1 GB
- Order no. 71110815

Cable junction with Velcro strip

Cable junction with Velcro strip

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

www.addresses.endress.com
