

# Technical Information

## Liquiline CM442/CM444/CM448

Multiparameter transmitter with a maximum of eight measuring channels based on digital Memosens technology



For monitoring and controlling processes in industry and the environmental sector

### Application

- Water and wastewater
- Power stations
- Chemical industry
- Other industrial applications

### Your benefits

- Highly flexible:
  - Able to connect up to 8 Memosens sensors
  - Mathematics functions calculate new measured values
  - Digital fieldbuses (HART, PROFIBUS, Modbus, Ethernet/IP, PROFINET) and integrated web server
  - Choice of cleaning function, controller and alarm relay
- Optional digital or analog inputs/outputs
- Maximum process safety thanks to standardized operating concept across all devices in the Liquiline, sampler and analyzer platform
- Fast commissioning thanks to:
  - Memosens: lab-calibrated sensors & hot plug-and-play
  - Preconfigured Liquiline transmitters
  - Easy extension and adaptation
- Minimum inventory:
  - Cross-platform, modular concept (e.g. identical modules irrespective of parameters)
  - Integration into FieldCare and W@M facilitates effective asset management

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## Function and system design

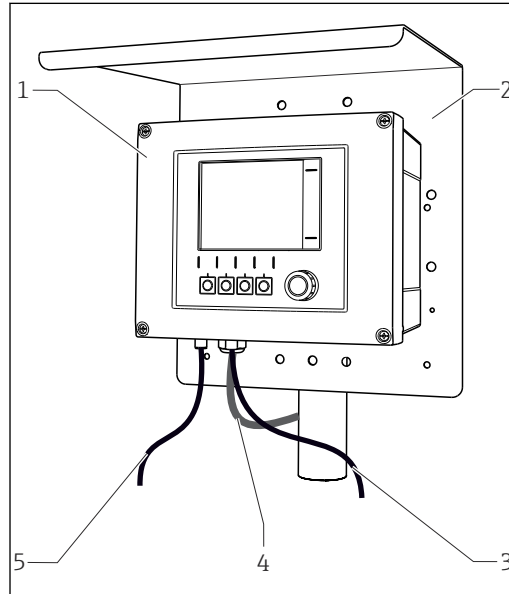
### Measuring system

The overview shows examples of measuring systems. Other sensors and assemblies can be ordered for conditions specific to your application ([www.endress.com/products](http://www.endress.com/products)).

#### Measuring point

A complete measuring system comprises:

- Liquiline transmitter
- Sensors with Memosens technology
- Assemblies to suit the sensors used
- Post retainer or railing (optional)
- Weather protection cover (optional)



1 Measuring system (e.g. two-channel device)

- 1 Liquiline  
 2 Weather protection cover CYY101 (optional)  
 3, 5 Sensor cable CYK10 or fixed cable  
 4 Power supply cable (to be provided by the customer)

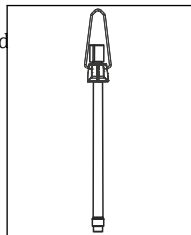
#### Nitrate and SAC

Nitrate in wastewater

- Sensor CAS51D-\*\*A2 with fixed cable
- Dipfit CYA112 immersion assembly
- CYH112 holder

SAC in the wastewater treatment outlet

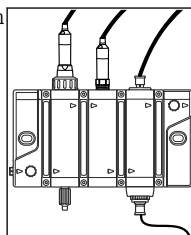
- Sensor CAS51D-\*\*2C2 with fixed cable
- Dipfit CYA112 immersion assembly
- CYH112 holder



#### Disinfection

Free available chlorine (and pH) in drinking water

- CCS51D sensor
- Memosens CPS11E sensor
- Measuring cable CYK10
- CYA27 flow assembly



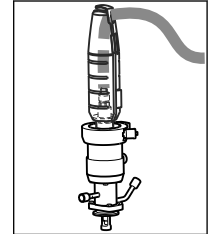
#### pH value or ORP

pH measurement in drinking water

- Cleanfit CPA871 retractable assembly
- Memosens CPS11E sensor
- Measuring cable CYK10

ORP in drinking water

- Dipfit CYA112 immersion assembly
- Memosens CPS12E sensor
- Measuring cable CYK10



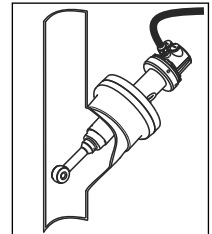
#### Conductivity

Inductive conductivity measurement in wastewater treatment

- Indumax CLS50D sensor
- Sensor fixed cable

Conductive conductivity measurement in power plant cooling water

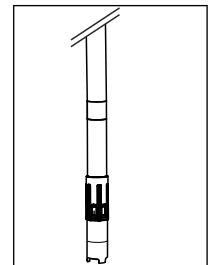
- Memosens CLS15E sensor
- Measuring cable CYK10



#### Oxygen

Oxygen in aeration basins

- Dipfit CYA112 immersion assembly
- CYH112 holder
- Sensor
  - COS61D (optical) with fixed cable
  - COS51E (amperometric), CYK10 cable



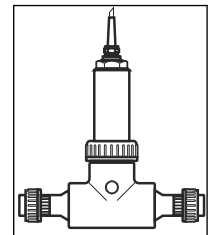
#### Turbidity and interface

Turbidity in industrial water

- Turbimax CUS51D sensor with fixed cable
- Flowfit CUA250 assembly
- CUR3 spray head (optional)

Interface in the primary clarifier

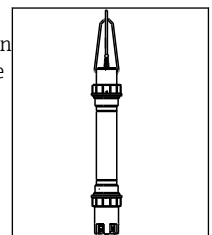
- Turbimax CUS71D sensor
- CYA112 assembly
- CYH112 holder



#### Ion-selective electrodes

Ammonium and nitrate measurement in the aeration basin

- CAS40D sensor with fixed cable
- CYH112 holder

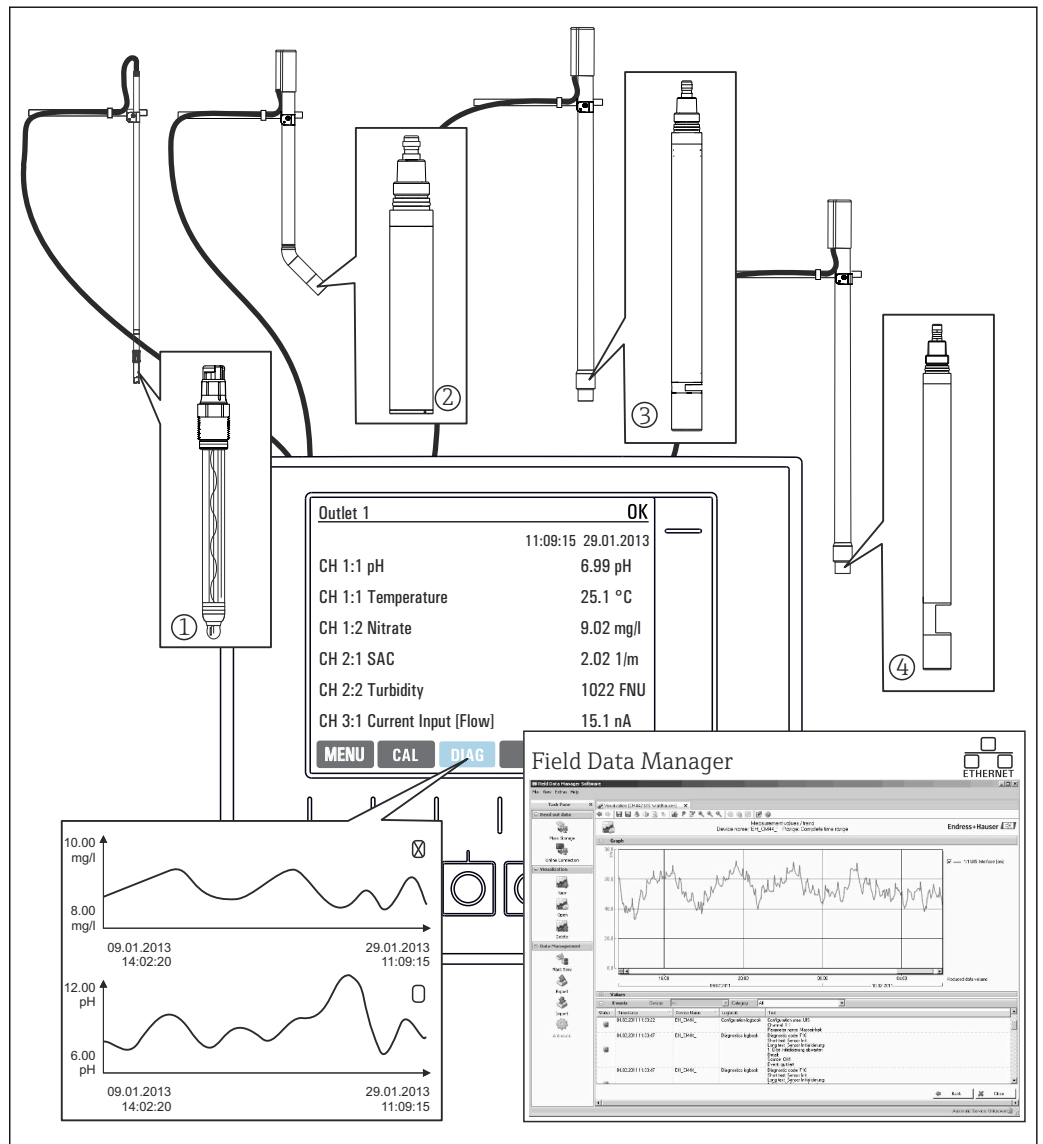


**i** If mounting outdoors, always use the weather protection cover (see "Accessories") to protect the transmitter against weather conditions.

**Application example**

**Measuring point at wastewater treatment plant outlet (open channel)**

- Transmitter CM444-AAM44A0FF with:
  - 4 x Memosens, Modbus TCP, 4 x relays for cleaning/limit value, 2 x analog current input
- pH and temperature with CPS11E, item 1 ([www.endress.com/cps11e](http://www.endress.com/cps11e))
- Turbidity with CUS51D, item 2 ([www.endress.com/cus51d](http://www.endress.com/cus51d))
- Nitrate with CAS51D, item 3 ([www.endress.com/cas51d](http://www.endress.com/cas51d))
- Spectral absorption coefficient with CAS51D, item 4 ([www.endress.com/cas51d](http://www.endress.com/cas51d))
- Flow from external measurement via current input
- Assembly holder CYH112 with assemblies CYA112 ([www.endress.com/cyh112](http://www.endress.com/cyh112))



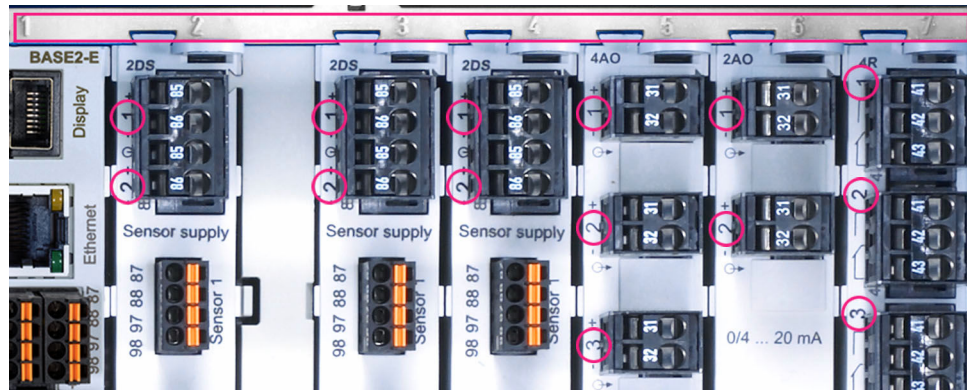
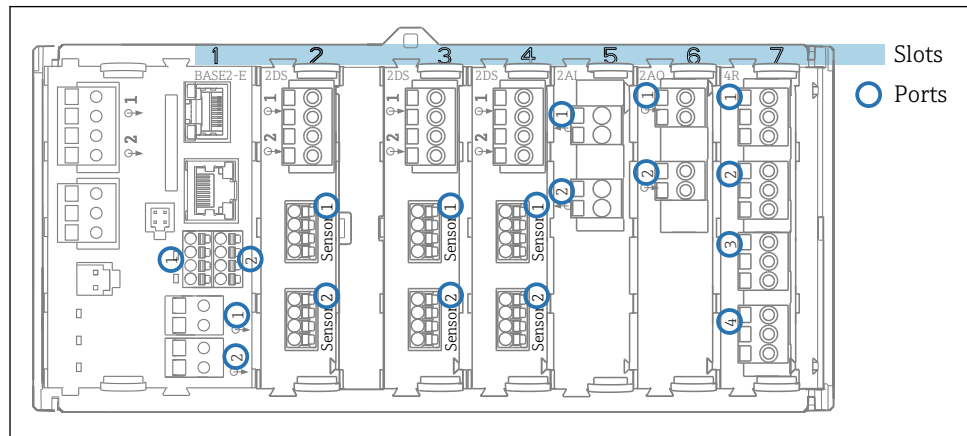
**2** Measuring point at wastewater treatment plant outlet

**Data retention**

- Storage of all measured values, incl. values of external sources, in the non-volatile memory (data logbook)
- Data called up on site via user-defined measuring menu and load curve display of the data logbook
- Transmission of data by Ethernet, CDI interface or SD card and storage in a tamper-proof database (Field Data Manager)
- Data export to CSV file (for Microsoft Excel)

# Equipment architecture

## Slot and port assignment



3 Slot and port assignment of the hardware modules

Outlet 1	OK	Port	Slot
CH1: 1:1 pH Glass	ATC 6.95 pH		
CH2: 1:2 TU/TS	500.0 g/l		
CH3: 5:1 SAC	500.0 1/m		
CH4: 5:2 Cond i	ATC 2.62 mS/cm		
CH5: 6:1 Chlorine	28.33 mg/l		
CH6: 6:2 Redox	± 51 mV		
CH7: 7:1 Oxygen (am...)	32.36 mg/l		
CH8: 7:2 Cond c	ATC 131.1 µS/cm		

4 Slot and port assignment on the display

- Inputs are assigned to measuring channels in the ascending order of the slots and ports. Adjacent example: "CH1: 1:1 pH glass" means: Channel 1 (CH1) is slot 1 (basic module) : Port 1 (input 1), pH glass sensor
- Outputs and relays are named according to their function, e.g. "current output", and are displayed in ascending order with the slot and port numbers

## Order of the modules

Depending on the version ordered, the device is supplied with a number of electronic modules, which are assigned in a specific sequence in ascending order to slots 0 to 7. If you do not have a particular module, the next moves up automatically:


- The basic module (which is always present) always occupies slots 0 and 1
- Fieldbus module 485DP or 485MB
- Memosens input module 2DS (DS = digital sensor)
- Extension module for digital inputs and outputs DIO (DIO = digital input and output)
- Current input module 2AI (AI = analog input)
- Current output modules 4AO or 2AO (AO = analog output)
- Relay modules AOR, 4R or 2R (AOR = analog output + relay, R = relay)

With intrinsically safe sensor communication module 2DS Ex-i:

- CM442/CM442R: always in slot 2
- CM444/CM444R: always in slot 7 (two channel) and slot 6 (four channel)
- CM448/CM448: slot 7, 6, 5

**i** Modules with 4 ports are connected before modules of the same type with 2 ports.

**Basic rule for hardware upgrades**


-  **Please note the following if upgrading the device:**
- Upgrade only to 1x 4 AO module possible
  - A maximum of two "DIO" modules may be used.

**Determining the hardware delivery status**


You must be aware of the type of modules and the number of them supplied with the device you have ordered to determine the delivery status of your Liquiline.

- **Basic module**  
One basic module in all versions. Always occupies slots 0 and 1.
- **Fieldbus module**  
Optional, and only one fieldbus module is possible.
- **Input modules**
  - Must be clearly assigned to the number of optional inputs ordered.
  - **Examples:**
    - 2 current inputs = module 2AI
    - 4 Memosens inputs = 2 inputs with basic module + module 2DS with 2 further inputs
- **Current outputs and relays**  
Various module combinations can exist.  
The following table will help you determine which modules your device has, depending on the type and number of outputs.

Current outputs	Relays		
	0	2	4
2	-	1 x 2R	1 x 4R
4	1 x 2AO	1 x AOR	1 x 2AO + 1 x 4R
6	1 x 4AO	1 x 4AO + 1 x 2R	1 x 4AO + 1 x 4R
8	1 x 4AO + 1 x 2AO	1 x 4AO + 1 x 2AO + 1 x 2R	1 x 4AO + 1x 2AO + 1 x 4R

- ▶ Sum up the number of modules and sort them according to the specified sequence →  6.  
↳ This will give you the slot assignment for your device.

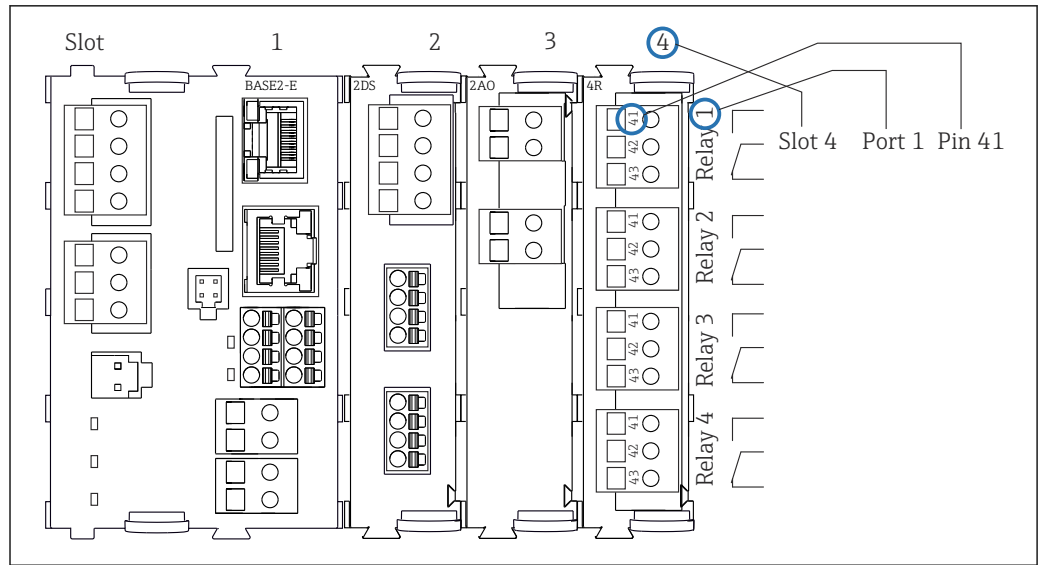
**Terminal diagram**

-  The unique terminal name is derived from:  
Slot no. : Port no. : Terminal

**Example, NO contact of a relay**

Device with 4 inputs for digital sensors, 4 current outputs and 4 relays

- Base module BASE2-E (contains 2 sensor inputs, 2 current outputs)
- 2DS module (2 sensor inputs)
- 2AO module (2 current outputs)
- 4R module (4 relays)

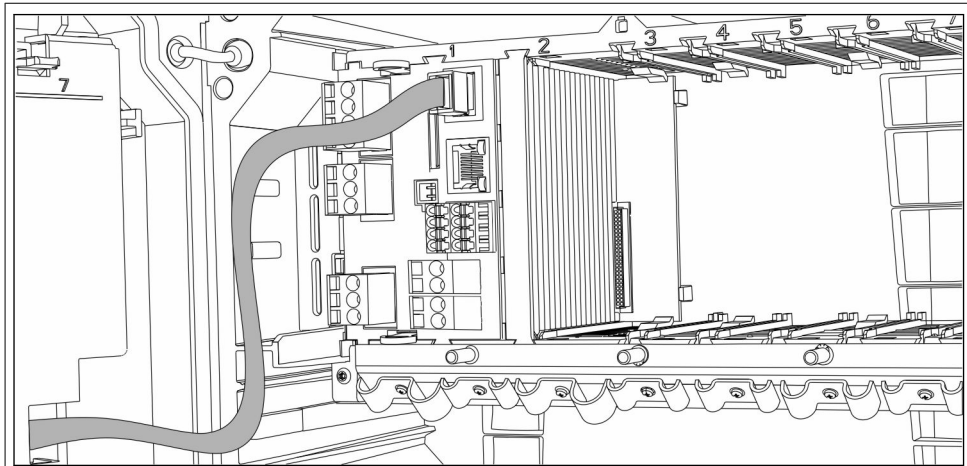



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5 Creating a terminal diagram using the example of the NO contact (terminal 41) of a relay

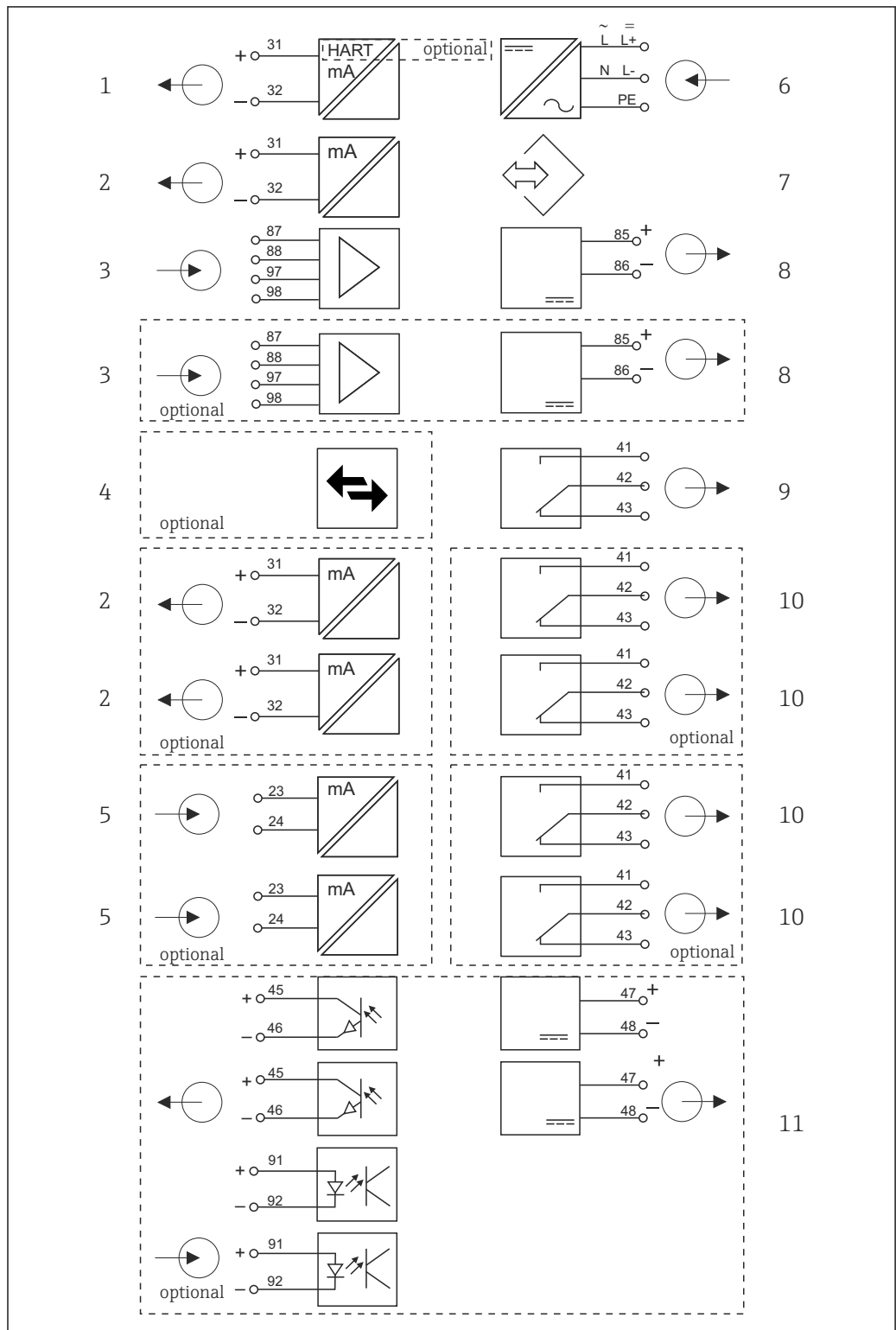


Device configuration using the example of a CM442-**\*\*M1A1F0\***



<p><b>Ordered basic device (example)</b></p>	<ul style="list-style-type: none"> <li>▪ Order code CM442-<b>**M1A1F0*</b></li> <li>▪ Functionality: 1 x Memosens, 2 current outputs without HART</li> </ul>
<p><b>Extension options without additional modules</b></p>	<p>Activation with activation code:</p> <ul style="list-style-type: none"> <li>▪ Second Memosens input (71114663)</li> <li>▪ HART (71128428)</li> <li>▪ EtherNet/IP + web server (71449914)</li> <li>▪ Modbus TCP + web server (71449915)</li> <li>▪ PROFINET + web server (71449901)</li> <li>▪ Web server (71449918)</li> </ul>
<p><b>Extension options by using an extension module in free slot 2</b></p>	<p>PROFIBUS DP with module 485DP or Modbus RS485 with module 485MB:</p> <ul style="list-style-type: none"> <li>▪ PROFIBUS DP Module 485DP (71575177)</li> <li>▪ Modbus RS485 Module 485MB (71575178)</li> </ul> <p> If module 485DP or 485MB is retrofitted, any existing current outputs are disabled!</p> <p>Additional inputs or outputs, relays:</p> <ul style="list-style-type: none"> <li>▪ Module 2AI (71135639): 2 current inputs</li> <li>▪ Module 2AO (71135632): 2 current outputs</li> <li>▪ Module AOR (71111053): 2 current outputs, 2 relays</li> <li>▪ Module 2R (71125375) or 4R (71125376): 2 or 4 relays</li> <li>▪ Module DIO (71135638): 2 digital inputs and 2 digital outputs</li> </ul>
<p><b>Device upgrade to CM444 or CM448</b></p>	<ul style="list-style-type: none"> <li>▪ Upgrade kit 71470973 (100 to 230 V AC) or 71470975 (24 V DC) <ul style="list-style-type: none"> <li>▪ Extension power supply unit and backplane</li> <li>▪ Basic module BASE2-E (Memosens inputs same as for base device)</li> <li>▪ 6 slots for extension modules</li> </ul> </li> <li>▪ Extension options: <ul style="list-style-type: none"> <li>▪ Second Memosens input (71114663), additional modules same as for CM442</li> <li>▪ Up to 8 measuring channels by using an appropriate number of Memosens input modules 2DS (71135631)</li> </ul> </li> </ul>
<p><b>Basic rule for extensions</b></p>	<p>The sum of all current inputs and outputs must not exceed 8.</p>
<p><b>Restrictions if using CUS71D sensors for interface measurement</b></p>	<ul style="list-style-type: none"> <li>▪ CM442: Only one CUS71D can be connected. The second Memosens input may not be used.</li> <li>▪ If extending to CM444: Every combination of CUS71D or other sensors is possible. All Memosens inputs (max. 4) can be used.</li> <li>▪ An extension to CM448 is <b>not advisable</b> as the maximum number of Memosens inputs remains limited to 4.</li> </ul>
<p><b>Product Configurator</b></p>	<p><a href="http://www.endress.com/cm442">www.endress.com/cm442</a></p>

Block circuit diagram CM442

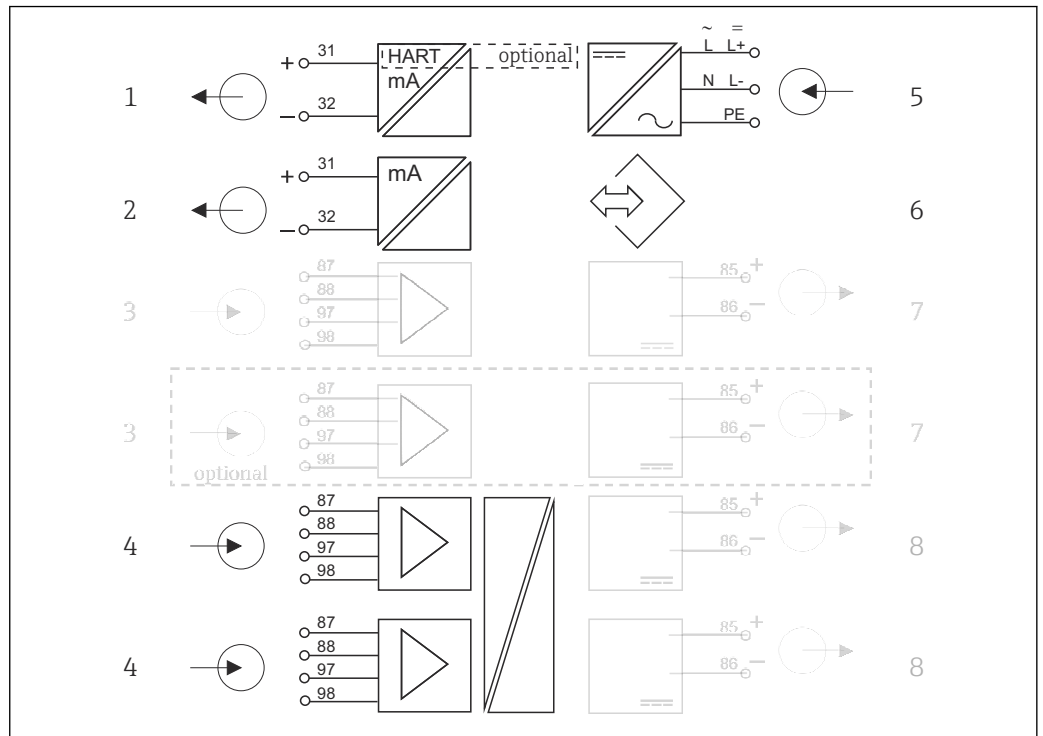


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6 Function diagram CM442

- |   |  |    |   |
|---|--|----|---|
| 1 | Current output 1:1, + HART (optional)  | 6  | Power supply                            |
| 2 | Current outputs (2 x optional)         | 7  | Service interface                       |
| 3 | 2 x Memosens input (1 x optional)      | 8  | Power supply, fixed cable sensors       |
| 4 | PROFIBUS DP/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) |

Block circuit diagram CM442 with sensor communication module 2DS Ex-i

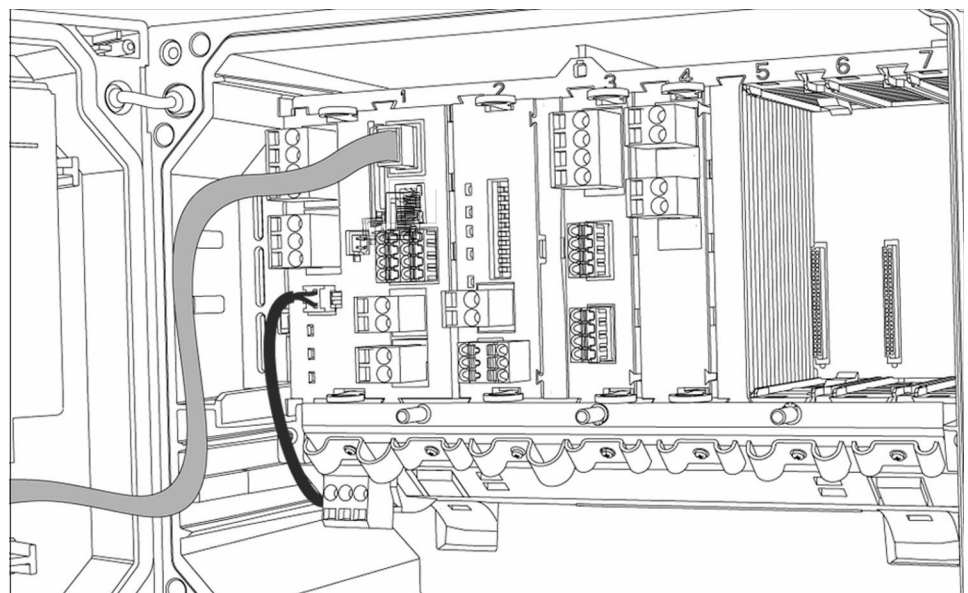


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7 Block circuit diagram CM442 with intrinsically safe sensor communication module 2DS Ex-i

- |   |   |   |  |
|---|---|---|--|
| 1 | Current output 1:1, + HART (optional)                               | 5 | Power supply                                       |
| 2 | Current outputs (2 x optional)                                      | 6 | Service interface                                  |
| 3 | 2 x Memosens input BASE2 (disabled)                                 | 7 | Power supply, fixed cable sensors BASE2 (disabled) |
| 4 | 2 x Memosens input 2DS Ex-i for intrinsically safe Memosens sensors | 8 | Power supply, fixed cable sensors                  |

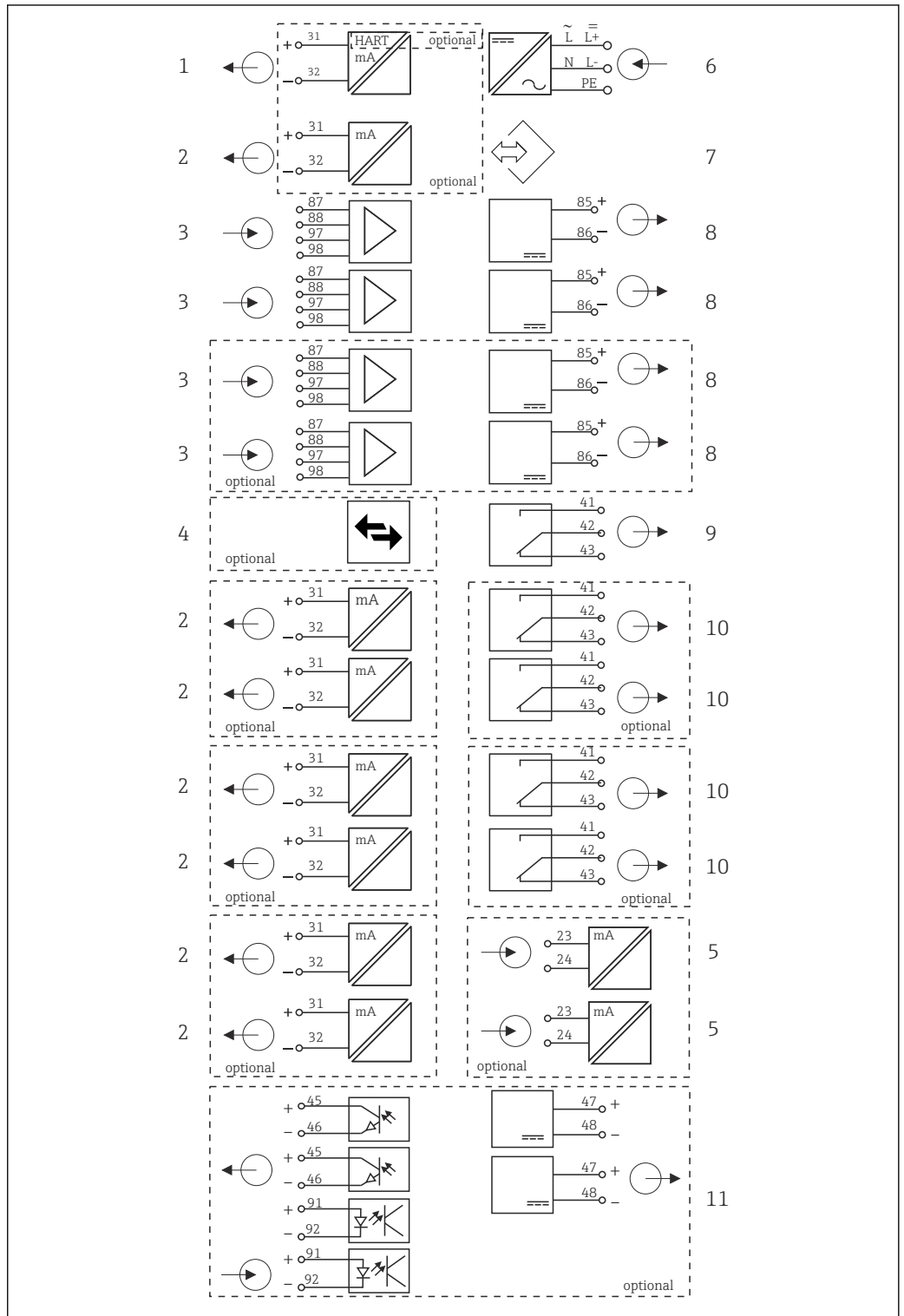
Device configuration using the example of a CM444-  
\*\*M42A1FA\*



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<b>Ordered basic device (example)</b>	<ul style="list-style-type: none"> <li>▪ Order code CM444-**M42A1FA*</li> <li>▪ Functionality: <ul style="list-style-type: none"> <li>▪ 4 x Memosens (2 on BASE2-E module + 2 on an extension module 2DS)</li> <li>▪ PROFIBUS communication (module 485DP)</li> <li>▪ Web server (BASE2-E module)</li> <li>▪ 2 current outputs without HART (on BASE2-E module)</li> <li>▪ 2 current inputs (module 2AI)</li> </ul> </li> </ul> <p>3 slots are still free in this example. More or fewer slots can be free in other versions.</p>
<b>Extension options without additional modules</b>	None
<b>Modification options without additional modules</b>	<p>Retrofit by removing module 485DP and entering the activation code for:</p> <ul style="list-style-type: none"> <li>▪ Modbus TCP + web server (71449915)</li> <li>▪ EtherNet/IP + web server (71449914)</li> <li>▪ PROFINET + web server (71449901)</li> <li>▪ HART (71128428)</li> <li>▪ Web server (71449918)</li> </ul>
<b>Modification options by replacing existing modules</b>	<p>Change the communication type by replacing module 485DP with module 485MB. This disables the communication type used previously!</p> <p>Module 485MB: Modbus RS485 + web server (Order No. 71575178)</p>
<b>Extension options by using extension modules in free slots 5-7</b>	<p>Only the following is possible for the example above:</p> <ul style="list-style-type: none"> <li>▪ Module 2R (71125375) or 4R (71125376): 2 or 4 relays</li> <li>▪ Module DIO (71135638): 2 digital inputs and 2 digital outputs</li> </ul> <p>If extending to 8 measuring channels: Module 2DS (71135631): 2 Memosens inputs</p> <p>Additional inputs or outputs and relays if fieldbus module 485DP is removed:</p> <ul style="list-style-type: none"> <li>▪ Module 2AO (71135632): 2 current outputs</li> <li>▪ Module AOR (71111053): 2 current outputs, 2 relays</li> <li>▪ Module 2R (71125375) or 4R (71125376): 2 or 4 relays</li> <li>▪ Module DIO (71135638): 2 digital inputs and 2 digital outputs</li> </ul> <p> If module 485DP is removed and an Ethernet-based fieldbus is used via BASE2-E module, a maximum of up to 6 current outputs can be operated in addition. Only two current outputs are possible with module 485DP.</p>
<b>Basic rule for extensions</b>	The sum of all current inputs and outputs must not exceed 8.
<b>Restrictions if using CUS71D sensors for interface measurement</b>	<ul style="list-style-type: none"> <li>▪ In the case of CM444, every combination of Memosens sensors (max. 4) is possible.</li> <li>▪ An extension to CM448 is not advisable as the maximum number of Memosens inputs when using CUS71D remains limited to 4.</li> </ul>
<b>Product Configurator</b>	<a href="http://www.endress.com/cm444">www.endress.com/cm444</a>

Block circuit diagram CM444

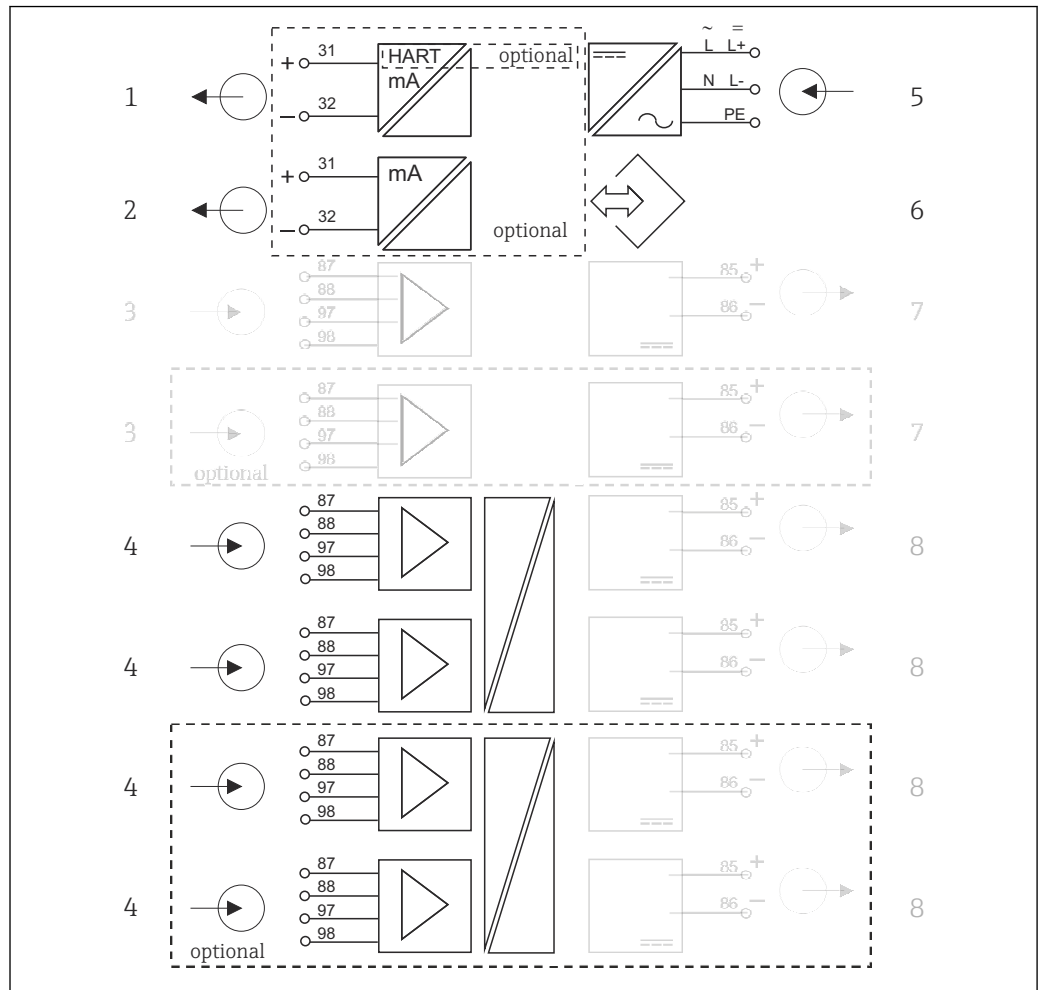


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8 Function diagram CM444

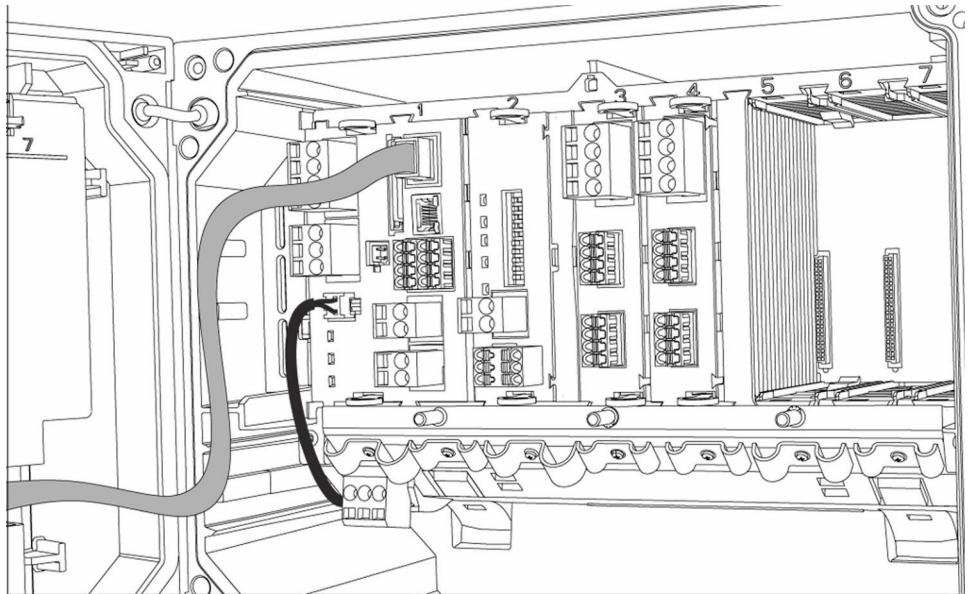
- |   |  |    |   |
|---|--|----|---|
| 1 | Current output 1:1, + HART (both optional)   | 6  | Power supply                            |
| 2 | Max. 7 x current output (optional)           | 7  | Service interface                       |
| 3 | Memosens input (2 x standard + 2 x optional) | 8  | Power supply, fixed cable sensors       |
| 4 | PROFIBUS DP/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) |

Block circuit diagram CM444 with sensor communication module 2DS Ex-i



- 9 Block circuit diagram CM444 with intrinsically safe sensor communication module 2DS Ex-i
- |   |   |   |  |
|---|---|---|--|
| 1 | Current output 1:1, + HART (optional)                               | 5 | Power supply                                       |
| 2 | Current outputs (2 x optional)                                      | 6 | Service interface                                  |
| 3 | 2 x Memosens input BASE2 (disabled)                                 | 7 | Power supply, fixed cable sensors BASE2 (disabled) |
| 4 | 2 x Memosens input 2DS Ex-i for intrinsically safe Memosens sensors | 8 | Power supply, fixed cable sensors                  |

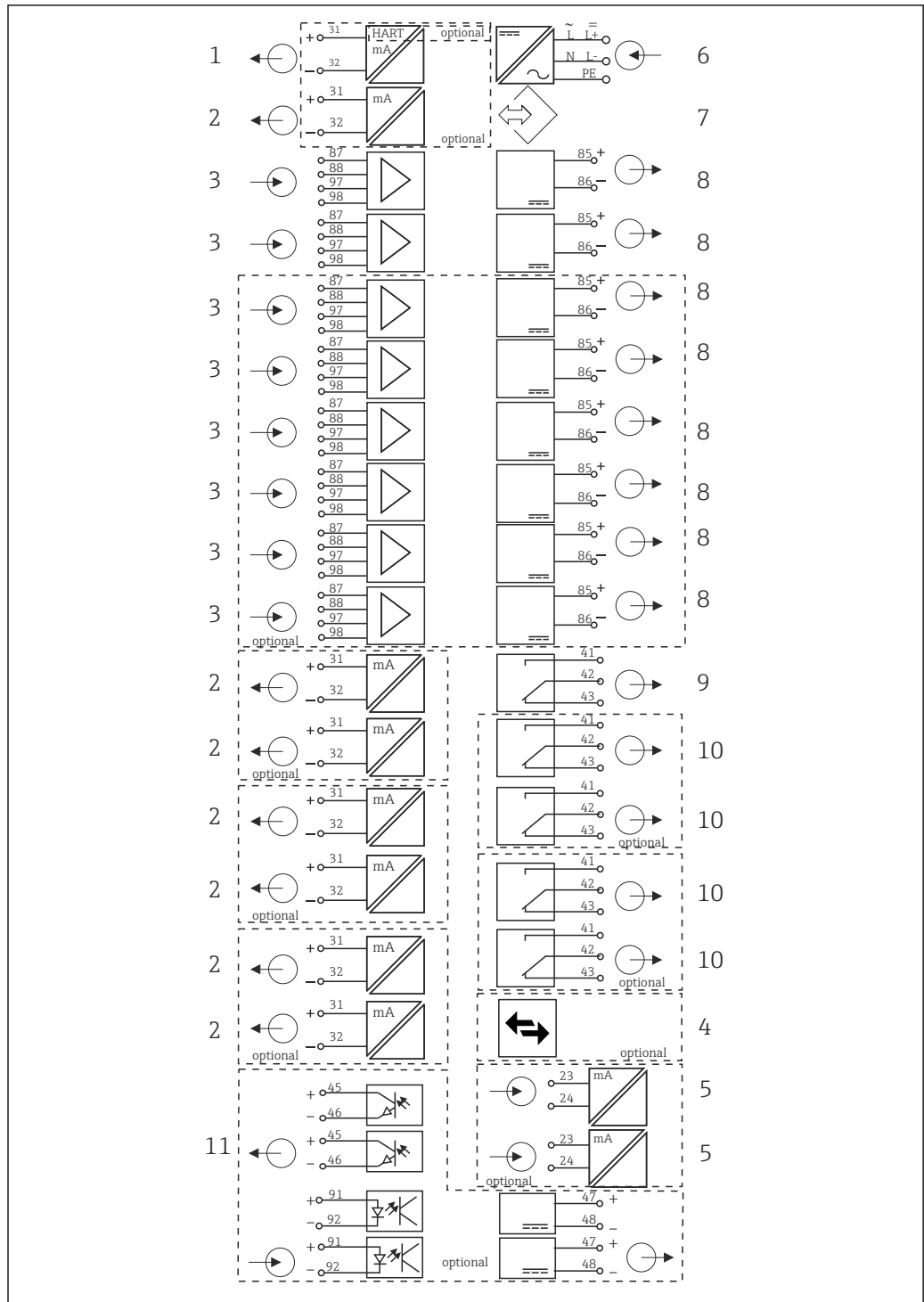
Device configuration using the example of a CM448-\*\*26A1\*



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<p><b>Ordered basic device (example)</b></p>	<ul style="list-style-type: none"> <li>■ Order code CM448-**26A1*</li> <li>■ Functionality:             <ul style="list-style-type: none"> <li>■ 6 x Memosens (2 on BASE2-E module + 2 on two 2DS extension modules)</li> <li>■ PROFIBUS communication (module 485DP)</li> <li>■ Web server (BASE2-E module)</li> </ul> </li> </ul> <p>3 slots are still free in this example. More or fewer slots can be free in other versions.</p>
<p><b>Extension options without additional modules</b></p>	<p>Activation code for the use of current outputs of the basic module: 2 current outputs (71140891)</p>
<p><b>Modification options without additional modules</b></p>	<p>Retrofit by removing module 485DP and entering the activation code for communication via the BASE2 module:</p> <ul style="list-style-type: none"> <li>■ Modbus TCP + web server (71449915)</li> <li>■ EtherNet/IP + web server (71449914)</li> <li>■ PROFINET + web server (71449901)</li> <li>■ HART (71128428)</li> <li>■ Web server (71449918)</li> </ul>
<p><b>Modification options by replacing existing modules</b></p>	<p>Change the communication type by replacing module 485DP with module 485MB. This disables the communication type used previously! Module 485MB: Modbus RS485 + web server (Order No. 71575178)</p>
<p><b>Extension options by using extension modules in free slots 5-7</b></p>	<p>If extending to 8 measuring channels: Module 2DS (71135631): 2 Memosens inputs</p> <p>Additional inputs or outputs, relays:</p> <ul style="list-style-type: none"> <li>■ Module 2AO (71135632): 2 current outputs</li> <li>■ Module 2AI (71135639): 2 current inputs</li> <li>■ Module AOR (71111053): 2 current outputs, 2 relays</li> <li>■ Module 2R (71125375) or 4R (71125376): 2 or 4 relays</li> <li>■ Module DIO (71135638): 2 digital inputs and 2 digital outputs</li> </ul> <p><b>i</b> If module 485DP is removed and an Ethernet-based fieldbus is used, a maximum of up to 6 current outputs can be operated in addition. Only two current outputs are possible with module 485DP.</p>
<p><b>Basic rule for extensions</b></p>	<p>The sum of all current inputs and outputs must not exceed 8.</p>
<p><b>Restrictions if using CUS71D sensors for interface measurement</b></p>	<p>The maximum number of Memosens inputs that can be used is limited to 4! Here, every combination of CUS71D and other Memosens sensors is then possible.</p>
<p><b>Product Configurator</b></p>	<p><a href="http://www.endress.com/cm448">www.endress.com/cm448</a></p>

Block circuit diagram CM448



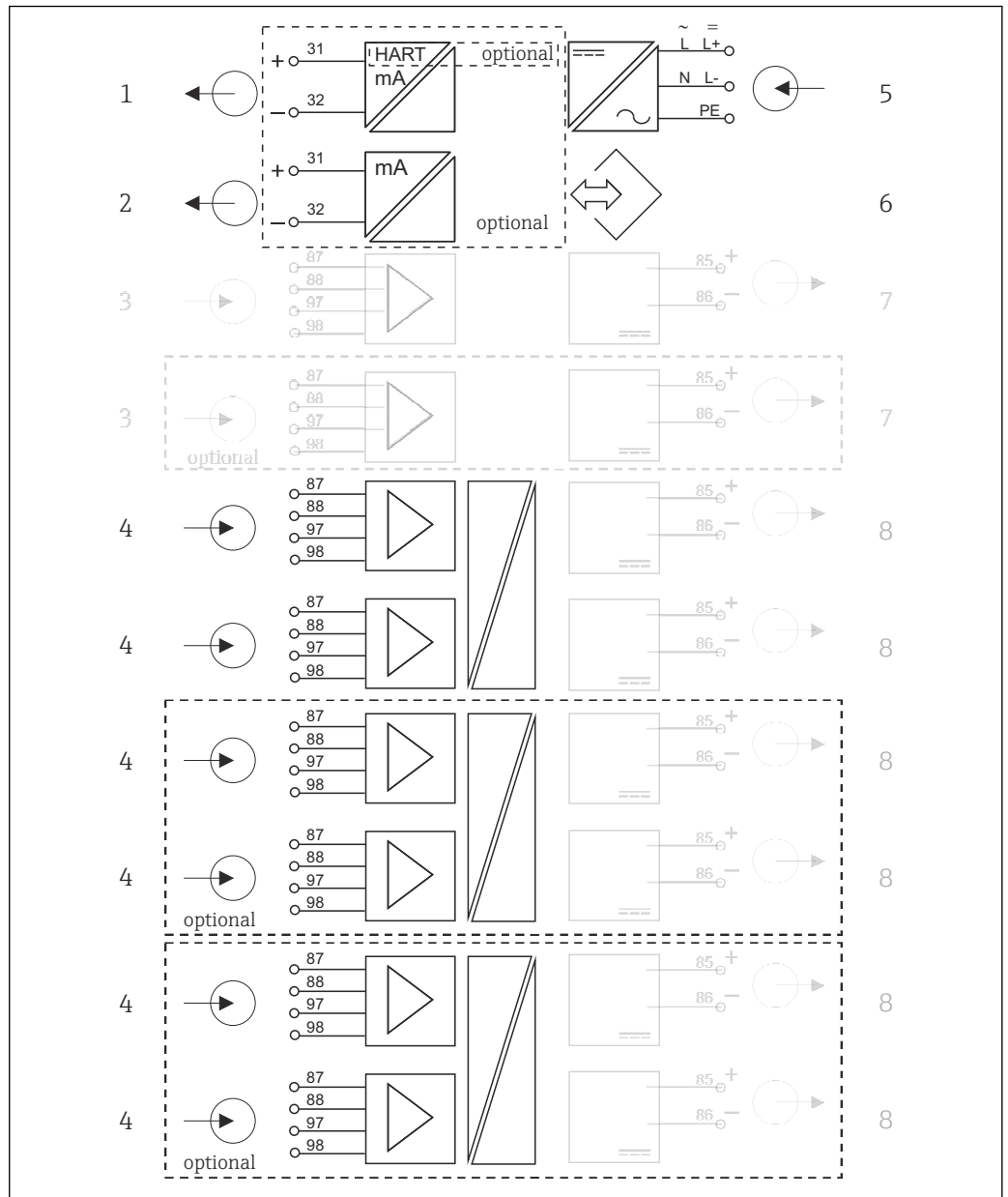
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10 Function diagram CM448

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



Block circuit diagram CM448 with sensor communication module 2DS Ex-i



- 11 Block circuit diagram CM448 with intrinsically safe sensor communication module 2DS Ex-i
- |   |   |   |  |
|---|---|---|--|
| 1 | Current output 1:1, + HART (optional)                               | 5 | Power supply                                       |
| 2 | Current outputs (2 x optional)                                      | 6 | Service interface                                  |
| 3 | 2 x Memosens input BASE2 (disabled)                                 | 7 | Power supply, fixed cable sensors BASE2 (disabled) |
| 4 | 2 x Memosens input 2DS Ex-i for intrinsically safe Memosens sensors | 8 | Power supply, fixed cable sensors                  |


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## Communication and data processing

### Communication protocols:

Fieldbus systems

- HART
- PROFIBUS DP (Profile 3.02)
- Modbus TCP or RS485
- PROFINET
- EtherNet/IP

 Only one type of fieldbus communication can ever be active. The last activation code entered decides which bus is used.

The device drivers available make it possible to perform a basic setup and display measured values and diagnostics information via the fieldbus. A full device configuration via the fieldbus is not possible.

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

For PROFIBUS DP and Modbus RS485 communication protocols:

- CM442  
Current outputs cannot be used in parallel. Any existing current outputs are deactivated with the installation of 485DP/485MB. PROFIBUS DP and Modbus RS485 are not possible in conjunction with the sensor communication module 2DS Ex-i.
- CM444/CM448  
A maximum of 2 current outputs can be used in parallel.

### Ethernet functionality via Base2 module and current outputs

- CM442  
A maximum of 2 current outputs can be used in parallel.
- CM444 and CM448  
A maximum of 6 current outputs can be used in parallel.

### Bus termination on the device

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

## Dependability

### Reliability

#### Memosens

Memosens makes your measuring point safer and more reliable:

- Non-contact, digital signal transmission enables optimum galvanic isolation
- No contact corrosion
- Completely watertight
- Sensor can be calibrated in a lab, thus increasing the availability of the measuring point in the process
- Intrinsically safe electronics mean operation in hazardous areas is not a problem.
- Predictive maintenance thanks to recording of sensor data, e.g.:
  - Total hours of operation
  - Hours of operation with very high or very low measured values
  - Hours of operation at high temperatures
  - Number of steam sterilizations
  - Sensor condition

#### Heartbeat diagnostics

- Heartbeat diagnostics screen with graphic indicators for the health of the device and sensor and with a maintenance or (sensor-dependent) calibration timer
- Heartbeat status information on the health of the device and condition of the sensor
  - ☺: Sensor/device condition and maintenance timer > 20 %; no action is required
  - ☹: Sensor/device condition or maintenance timer > 5 ≤ 20 %, maintenance not yet urgent but should be scheduled
  - ☹: Sensor/device condition or maintenance timer < 5 %, maintenance is recommended
- The Heartbeat sensor condition is the assessment of the calibration results and the sensor diagnostic functions.

An unhappy smiley can be due to the calibration result, the measured value status or to the operating hours limit having been exceeded. These limits can be configured in the sensor setup in a way that adapts the Heartbeat diagnostics to the application.

### Heartbeat and NAMUR category

The Heartbeat status indicates the sensor or device condition while the NAMUR categories (F, C, M, S) assess the reliability of the measured value. The two conditions can correlate but do not have to.

#### ■ Example 1

- The number of remaining cleaning cycles for the sensor reaches 20% of the defined maximum number. The Heartbeat symbol changes from ☺ to ☹. The measured value is still reliable so the NAMUR status signal does not change.
- If the maximum number of cleaning cycles is exceeded, the Heartbeat symbol changes from ☹ to ☹. While the measured value can still be reliable, the NAMUR status signal changes to M (maintenance required).

#### ■ Example 2

The sensor breaks. The Heartbeat status changes immediately from ☺ to ☹ and the NAMUR status signal also changes immediately to F (failure).

### Heartbeat Monitoring


Sensor data from Memosens sensors are transmitted via the EtherNet/IP, PROFINET, PROFIBUS DP, HART, Modbus RTU and Modbus TCP fieldbus protocols. These data can be used for predictive maintenance, for instance.

Examples include:


- 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 identification
- Calibration information

 For detailed information on "Ethernet/IP communication", see the product pages on the Internet (→ SD01293C).

 For detailed information on "Modbus communication", see the product pages on the Internet (→ SD01189C).

 For detailed information on "PROFINET communication", see the product pages on the internet (→ SD02490C).

 For detailed information on "PROFIBUS communication", see the product pages on the Internet (→ SD01188C).

 More detailed information on HART communication is provided on the product pages on the Internet (→ SD01187C).

### Heartbeat Verification

Heartbeat Verification makes it possible to verify the correct operation of the measuring device without interrupting the process. This verification can be documented anytime.

### Sensor Check System (SCS)

The Sensor Check System (SCS) monitors the high impedance of the pH glass. An alarm is issued if a minimum impedance value is undershot or a maximum impedance is exceeded.

- Glass breakage is the main reason for a drop in high impedance values
- The reasons for increasing impedance values include:
  - Dry sensor
  - Worn pH glass membrane

 For the SCS, upper and lower limit values can be enabled or disabled independently of one another.

### Process Check System (PCS)

The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a specific period (several measured values).

The main causes of stagnating measured values are:

- Contaminated sensor, or sensor outside of medium
- Sensor defective
- Process error (e.g. through control system)

### Self-monitoring functions

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.

### USP and EP

The limit functions for pharmaceutical water in accordance with USP and EP specifications are implemented in the software for conductivity measurements:

- "Water for Injection" (WFI) as per USP <645> and EP
- "Highly Purified Water" (HPW) as per EP
- "Purified Water" (PW) as per EP

The uncompensated conductivity value and the temperature are measured for the USP/EP limit functions. The measured values are compared against the tables defined in the standards. An alarm is triggered if the limit value is exceeded. Furthermore, it is also possible to configure an early warning alarm that signals undesired operating states before they occur.

### ChemocleanPlus

Freely programmable sequence control

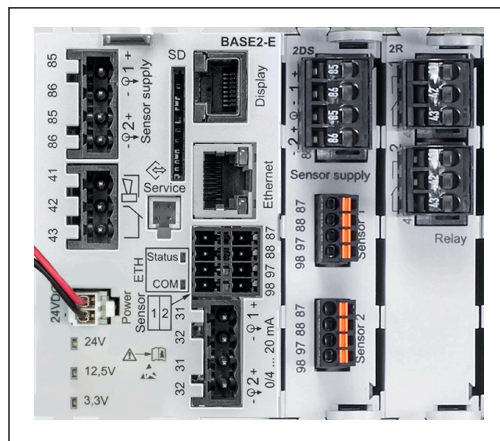
- e.g. for automatic sensor cleaning in retractable assemblies for reliable measurement results in processes with a high risk of contamination
- Individual, time-based activation of 4 outputs e.g. relays
- Starting, stopping or pausing of activities via digital input or fieldbus signals e.g. from limit position switches

## Ease of maintenance

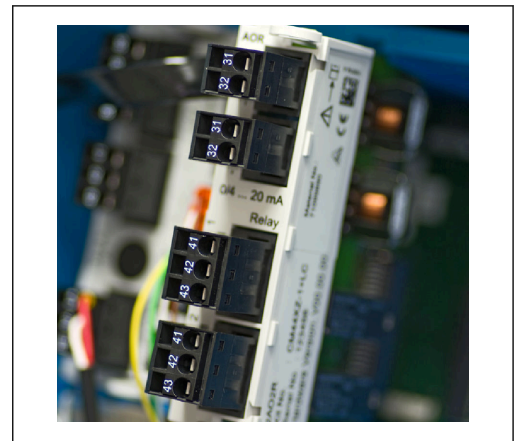
### Modular design

The modular transmitter design means it 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 to maximum eight-channel measurement
- Optional: M12 sensor connector for connecting any kind of Memosens sensor
- Optional: CDI connector for external access to the service interface (avoids having to unscrew the housing cover)



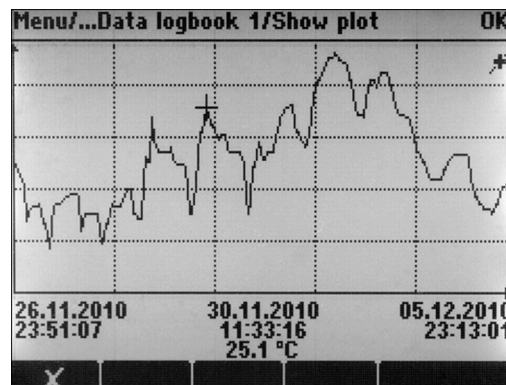
12 CM444: example



13 Extension module


### Data logger function

- Adjustable scan time: 1 to 3600 s (1 h)
- Data logbooks:
  - Max. 8 data logbooks
  - 150,000 entries per logbook
  - Graphic display (load curves) or numerical list
- Calibration logbook: max. 75 entries
- Hardware version logbook:
  - Hardware configuration and modifications
  - Max. 125 entries
- Version logbook:
  - E.g. software updates
  - Max. 50 entries
- Operation logbook: max. 250 entries
- Diagnostics logbook: max. 250 entries



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14 Data logbook: Graphic display

 Logbooks remain unchanged even after a software update.

### SD card

The exchangeable storage medium enables:

- Quick and easy software updates and upgrades
- 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)
- Saving of screenshots for documentation purposes

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

Other industrial quality SD cards, 1 to 32 GB and with a maximum weight of 5 g can also be used. However, Endress+Hauser does not accept any responsibility for the data security of such cards.

### External signals for device control and for activating external devices

Hardware options, e.g. the "DIO" module with 2 digital inputs and 2 digital outputs or fieldbus module 485DP/485MB enable the following:

- via a digital input signal
  - measuring range switching for conductivity (upgrade code required, see accessories)
  - switching between different calibration datasets in the case of optical sensors
  - an external hold
  - a cleaning interval to be triggered
  - switching on and off a PID controller, e.g. via the proximity switch of the CCA250
  - the use of the input as an "analog input" for pulse-frequency modulation (PFM)
- via a digital output signal
  - the static transmission (similar to a relay) of diagnostic states, point level switch states etc.
  - the dynamic transmission (comparable to a non-wearing "analog output") of PFM signals, e.g. to control dosing pumps.

## FieldCare and Field Data Manager

### FieldCare

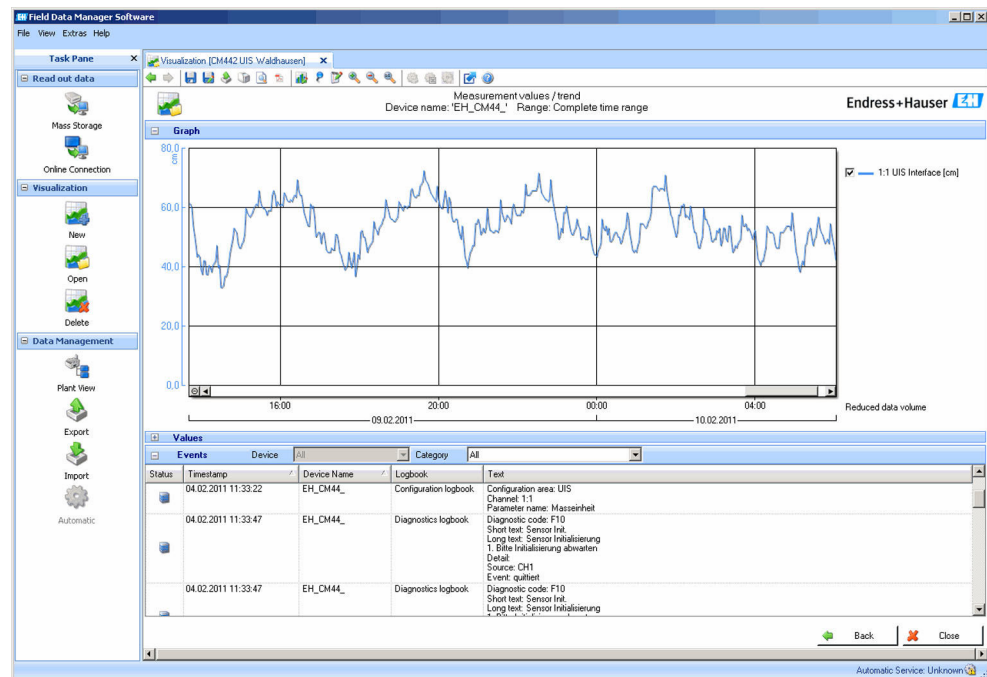
Configuration and asset management software based on FDT/DTM technology

- 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



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15 Field Data Manager: Load curves

### Virtual process values (mathematical functions)

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 8 "virtual" process values.

The "virtual" process values can be:

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

The following mathematical functions are possible:

- Calculation of pH from two conductivity values according to VGB 405 RL, e.g. in boiler feedwater
- Difference between two measured values from different sources, e.g. for membrane monitoring
- Differential conductivity, e.g. for monitoring the efficiency of ion exchangers
- Degassed conductivity, e.g. for process controls in power plants
- Redundancy for monitoring two or three redundant sensors
- rH calculation from the measured values of a pH sensor and an ORP sensor
- Calculation of the remaining capacity of a cation exchanger
- Calculation of the combined chlorine concentration. This calculation involves subtracting the free chlorine concentration from the total chlorine concentration. This requires both a sensor for free chlorine CCS51E and a sensor for total chlorine CCS53E.
- Formula editor

**Concentration tables**

When the device is delivered from the factory, tables are saved in the device that allow inductive conductivity measurements to be converted to concentrations of certain substances. 4 user-defined tables are also possible.

*The following factory concentration tables are available:*

NaOH	0 to 15 %	0 to 100 °C (32 to 212 °F)
NaOH	25 to 50%	2 to 80 °C (36 to 176 °F)
HCl	0 to 20 %	0 to 65 °C (32 to 149 °F)
HNO <sub>3</sub>	0 to 30 %	2 to 80 °C (36 to 176 °F)
H <sub>2</sub> SO <sub>4</sub>	0.5 to 27 % and 35 to 85 %	0 to 100 °C (32 to 212 °F)
H <sub>2</sub> SO <sub>4</sub>	93 to 100 %	10 to 115 °C (50 to 239 °F)
H <sub>3</sub> PO <sub>4</sub>	0 to 40 %	2 to 80 °C (36 to 176 °F)
NaCl	0 to 26 %	2 to 80 °C (36 to 176 °F)

---

**Safety****Real-time clock**

The device has a real-time clock, which is buffered by a button cell battery if the power supply fails. This ensures that the device continues to keep the correct date and time when it is restarted and that the time stamp for the logbooks is correct.

**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.

**Measuring range switching for conductivity**

- Can be used in CIP processes e.g. for safe monitoring of phase separations
- Switching between 4 complete parameter sets:
  - Conductivity operating mode
  - Concentration tables
  - Temperature compensation
  - Output signal range
  - Limit value switch
- Via digital inputs or fieldbus

**Measured value compensation for oxygen and conductivity**

- Pressure or temperature compensation
- Input signals from external sensors via current input or fieldbus
- Signals from connected temperature sensors

**Password protection**

Password-protected login

- For remote operation via web server
- For local operation

**Process safety**

Two independent PID controllers


- One- or two-sided control
- Limit switches
- 4 cleaning programs which can be programmed independently of each other

**IT security**

Our warranty is valid only if the product is installed and used as described in the Operating Instructions. The product is equipped with security mechanisms to protect it against any inadvertent changes to the settings.

IT security measures, which provide additional protection for the product and associated data transfer, must be implemented by the operators themselves in line with their security standards.

## Input

<b>Measured variables</b>	→ Documentation of the connected sensor
<b>Measuring ranges</b>	→ Documentation of the connected sensor
<b>Types of input</b>	<ul style="list-style-type: none"> <li>■ Digital sensor inputs for sensors with Memosens protocol</li> <li>■ Analog current inputs (optional)</li> <li>■ Digital inputs (optional)</li> <li>■ Digital sensor inputs for intrinsically safe sensors with Memosens protocol and Ex approval (optional)</li> </ul>
<b>Input signal</b>	<p>Depending on version:</p> <ul style="list-style-type: none"> <li>■ Without sensor communication module 2DS Ex-i: max. 8 x binary sensor signal</li> <li>■ With sensor communication module 2DS Ex-i: max. 6 x binary sensor signal</li> <li>■ 2 x 0/4 to 20 mA (optional), passive, potentially isolated from one another and from the sensor inputs</li> <li>■ 0 to 30 V</li> </ul>
<b>Cable specification</b>	<p><b>Cable type</b></p> <ul style="list-style-type: none"> <li>■ Without sensor communication module 2DS Ex-i: Memosens data cable CYK10 or sensor fixed cable, each with cable end sleeves or M12 circular plug (optional)</li> <li>■ With sensor communication module 2DS Ex-i: Memosens data cable CYK10 or sensor fixed cable, each with cable end sleeves</li> </ul> <p> Only Memosens data cables CYK10 with an appropriate approval may be connected to the intrinsically safe digital sensor inputs of the sensor communication module 2DS Ex-i.</p> <p><b>Cable length</b></p> <p>Max. 100 m (330 ft)</p>

## Digital inputs, passive

<b>Electrical specification</b>	<ul style="list-style-type: none"> <li>■ Drawing power (passive)</li> <li>■ Galvanically isolated</li> </ul>
<b>Span</b>	<ul style="list-style-type: none"> <li>■ High: 11 to 30 V DC</li> <li>■ Low: 0 to 5 V DC</li> </ul>
<b>Nominal input current</b>	max. 8 mA
<b>PFM function</b>	Minimum pulse width: 500 µs (1 kHz)
<b>Test voltage</b>	500 V
<b>Cable specification</b>	Max. 2.5 mm <sup>2</sup> (14 AWG)

## Current input, passive

<b>Span</b>	> 0 to 20 mA
<b>Signal characteristic</b>	Linear
<b>Internal resistance</b>	Non-linear



Test voltage	500 V
--------------	-------

## Output

### Output signal

Depending on version:

- 2 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- 4 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- 6 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- 8 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits
- Optional HART communication (only via current output 1:1)

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

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

Modbus RS485	
Signal encoding	EIA/TIA-485
Data transmission rate	2,400, 4,800, 9,600, 19,200, 38,400, 57,600 and 115,200 baud
Galvanic isolation	Yes
Connectors	Spring terminal (max. 1.5 mm), bridged internally (T-function), optional M12
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, optional M12
IP address	DHCP (default) or configuration via menu

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

PROFINET	
Signal encoding	IEEE 802.3 (Ethernet)
Data transmission rate	100 MBd
Galvanic isolation	Yes
Connection	RJ45, optional M12 (D-coded)
Name of station	Via DCP protocol by means of configuration tool (e.g. Siemens PRONETA)
IP address	Via DCP protocol by means of configuration tool (e.g. Siemens PRONETA)

<b>Signal on alarm</b>	Adjustable, as per NAMUR Recommendation NE 43 <ul style="list-style-type: none"> <li>■ In measuring range 0 to 20 mA (HART is not available with this measuring range): Failure current from 0 to 23 mA</li> <li>■ In measuring range 4 to 20 mA: Failure current from 2.4 to 23 mA</li> <li>■ Factory setting for failure current for both measuring ranges: 21.5 mA</li> </ul>
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<b>Load</b>	Max. 500 Ω
-------------	------------

<b>Linearization/transmission behavior</b>	Linear
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## Digital outputs, passive

<b>Electrical specification</b>	<ul style="list-style-type: none"> <li>■ Passive</li> <li>■ Open collector, max. 30 V, 15 mA</li> <li>■ Maximum voltage drop 3 V</li> </ul>
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<b>External power supply</b>	When using an onsite auxiliary voltage supply and an onsite digital input: Recommended minimum auxiliary voltage = $3\text{ V} + V_{IHmin}$ ( $V_{IHmin}$ = minimum input voltage required (high-level input voltage))
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<b>PFM function</b>	Minimum pulse width: 500 μs (1 kHz)
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<b>Auxiliary voltage</b>	<b>Electrical specification</b> <ul style="list-style-type: none"> <li>■ Galvanically isolated</li> <li>■ Unregulated, 24 V DC</li> <li>■ Max. 50 mA (per DIO module)</li> </ul>
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<b>Test voltage</b>	500 V
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<b>Cable specification</b>	Max. 2.5 mm <sup>2</sup> (14 AWG)
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## Current outputs, active

<b>Span</b>	0 to 23 mA 2.4 to 23 mA for HART communication
<b>Signal characteristic</b>	Linear
<b>Electrical specification</b>	<b>Output voltage</b> Max. 24 V <b>Test voltage</b> 500 V
<b>Cable specification</b>	<b>Cable type</b> Recommended: shielded cable <b>Cable specification</b> Max. 2.5 mm <sup>2</sup> (14 AWG)

## Relay outputs

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

### Base module (Alarm relay)

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

### Extension 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

Cable specification Max. 2.5 mm<sup>2</sup> (14 AWG)

## Protocol-specific data

HART	
Manufacturer ID	11 <sub>h</sub>
Device type	155D <sub>h</sub>
Device revision	001 <sub>h</sub>
HART version	7.2
Device description files (DD/DTM)	<a href="http://www.endress.com/hart">www.endress.com/hart</a> Device Integration Manager DIM
Device variables	16 user-definable and 16 predefined device variables, dynamic variables PV, SV, TV, QV
Supported features	PDM DD, AMS DD, DTM, Field Xpert DD

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

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

**EtherNet/IP**

Log	EtherNet/IP	
ODVA certification	Yes	
Device profile	Generic device (product type: 0x2B)	
Manufacturer ID	0x049E <sub>h</sub>	
Device type ID	0x109C <sub>h</sub>	
Polarity	Auto-MIDI-X	
Connections	CIP	12
	I/O	6
	Explicit message	6
	Multicast	3 consumers
Minimum RPI	100 ms (default)	
Maximum RPI	10000 ms	
System integration	EtherNet/IP	EDS
	Rockwell	Add-on-Profile Level 3, Faceplate for Factory Talk SE
IO data	Input (T → O)	Device status and diagnostic message with highest priority Measured values: <ul style="list-style-type: none"> <li>▪ 16 AI (analog input) + Status + Unit</li> <li>▪ 8 DI (discrete input) + Status</li> </ul>
	Output (O → T)	Actuating values: <ul style="list-style-type: none"> <li>▪ 4 AO (analog output) + status + unit</li> <li>▪ 8 DO (discrete output) + Status</li> </ul>

## PROFINET

Protocol	"Application layer protocol for decentral device periphery and distributed automation", PNIO Version 2.34
Communication type	100 MBit/s
Conformance Class	Conformance Class B
Netload Class	Netload Class II
Baud rate	Automatic 100 Mbps with full-duplex detection
Cycle times	From 32 ms
Device profile	Application interface identifier 0xF600 Generic device
PROFINET interface	1 port, Realtime Class 1 (RT_CLASS_1)
Manufacturer ID	0x11 <sub>h</sub>
Device type ID	0x859C D <sub>h</sub>
Device description files (GSD)	Information and files under: <ul style="list-style-type: none"> <li>▪ <a href="http://www.endress.com">www.endress.com</a> On the product page for the device: Documents/Software → Device drivers</li> <li>▪ <a href="http://www.profibus.com">www.profibus.com</a> On the website under Products/Product Finder</li> </ul>
Polarity	Auto-polarity for automatic correction of crossed TxD and RxD pairs
Supported connections	<ul style="list-style-type: none"> <li>▪ 1 x AR (IO Controller AR)</li> <li>▪ 1 x AR (IO-Supervisor Device AR connection allowed)</li> <li>▪ 1 x Input CR (Communication Relation)</li> <li>▪ 1 x Output CR (Communication Relation)</li> <li>▪ 1 x Alarm CR (Communication Relation)</li> </ul>
Configuration options for measuring device	<ul style="list-style-type: none"> <li>▪ Web browser</li> <li>▪ Manufacturer-specific software (FieldCare, DeviceCare)</li> <li>▪ Device master file (GSD), can be read out via the integrated web server of the measuring device</li> </ul>
Configuration of the device name	DCP protocol
Supported functions	<ul style="list-style-type: none"> <li>▪ Identification &amp; maintenance Simple device identification via: <ul style="list-style-type: none"> <li>▪ Process control system</li> <li>▪ Nameplate</li> </ul> </li> <li>▪ Measured value status The process variables are communicated with a measured value status</li> <li>▪ Blinking feature (FLASH_ONCE) via the local display for simple device identification and assignment</li> <li>▪ Device operation via operating tools (e.g. FieldCare, DeviceCare)</li> </ul>
System integration	For information on system integration, see the Operating Instructions <ul style="list-style-type: none"> <li>▪ Cyclic data transmission</li> <li>▪ Overview and description of the modules</li> <li>▪ Status coding</li> <li>▪ Startup configuration</li> <li>▪ Factory setting</li> </ul>

**Web server**

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

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

## Power supply

**Supply voltage****CM442**

Depending on version:

- 100 to 230 V AC, 50/60 Hz

Maximum permitted fluctuation of mains supply voltage:  $\pm 15\%$  of nominal voltage

- 24 V AC/DC, 50/60 Hz

Maximum permitted fluctuation of mains supply voltage:  $+ 20\%$  /  $- 15\%$  of nominal voltage

**CM444 and CM448**

Depending on the version,:

- 100 to 230 V AC, 50/60 Hz

Maximum permitted fluctuation of mains supply voltage:  $\pm 15\%$  of nominal voltage

- 24 V DC

Maximum permitted fluctuation of mains supply voltage:  $+ 20\%$  /  $- 15\%$  of nominal voltage

**NOTICE****The device does not have a power switch!**

- ▶ Provide a protected circuit breaker in the vicinity of the device at the place of installation.
- ▶ The circuit breaker must be a switch or power switch, and must be labeled as the circuit breaker for the device.
- ▶ At the supply point, the power supply must be isolated from dangerous live cables by double or reinforced insulation in the case of devices with a 24 V supply voltage.

**Power consumption****CM442**

Depending on supply voltage

- 100 to 230 V AC and 24 V AC:

Max. 55 VA

- 24 V DC:

Max. 22 W

**CM444 and CM448**

Depending on supply voltage

- 100 to 230 V AC:

Max. 73 VA

- 24 V DC:

Max. 68 W

**Fuse**

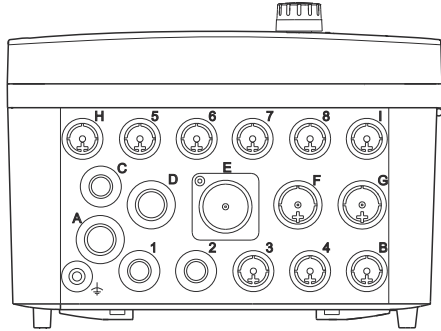
Fuse not exchangeable

**Overvoltage protection**

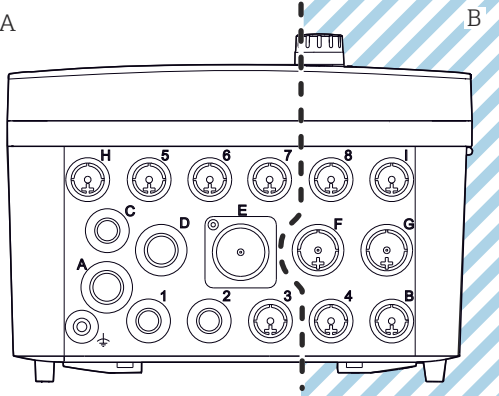
Integrated overvoltage/lightning protection as per EN 61326-1/-2  
Protection category 1 and 3

**Cable entries**

*Cable entries for transmitters for the non-hazardous area*

Identification of the cable entry on housing base	Suitable gland
B, C, H, I, 1-8	M16x1.5 mm/NPT3/8"/G3/8
A, D, F, G	M20x1.5 mm/NPT1/2"/G1/2
E	-
≡	M12x1.5 mm
	
<b>Recommended assignment</b> 1-8          Sensors 1-8 A            Power supply B            Unrestricted use C            RS485 Out or M12 Ethernet D,F,G       Current outputs and inputs, relays H            RS485 In or M12 DP/RS485 I            Unrestricted use E            Do not use	

*Cable entries for transmitters with sensor communication module 2DS Ex-i for the hazardous area*

Identification of the cable entry on housing base	Suitable gland
B, C, H, I, 1-8	M16x1.5 mm/NPT3/8"/G3/8
A, D, F, G	M20x1.5 mm/NPT1/2"/G1/2
E	-
≡	M12x1.5 mm
	
<b>Recommended assignment</b> 1/2/3        Do not use 5/6/7 4/8          Intrinsically safe sensors B/F/G/I A            Power supply C            RS485 Out or M12 Ethernet D            Current outputs and inputs, relays H            RS485 In or M12 DP/RS485 E            Do not use	


16 A: Non-hazardous area, B: Hazardous area

**i** Do not cross cables for the non-hazardous area and the hazardous area in the housing. Select a suitable cable entry for the connection.



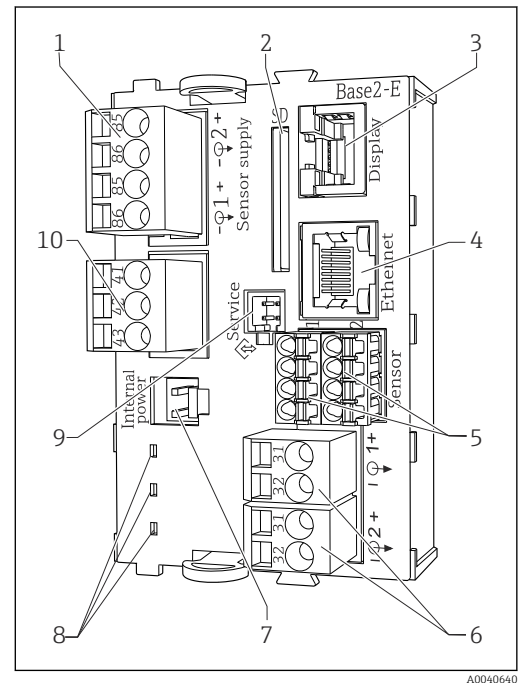
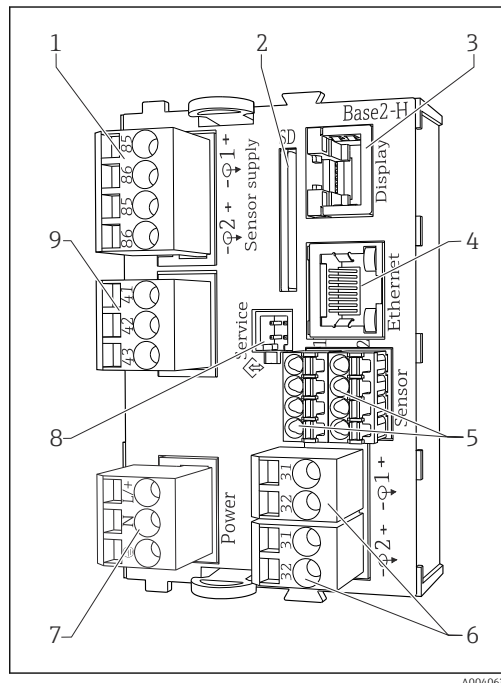
**Cable specification**


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.


**Electrical connection**

**Basic module**



 17 Basic module BASE2-H or -L (two-channel device)

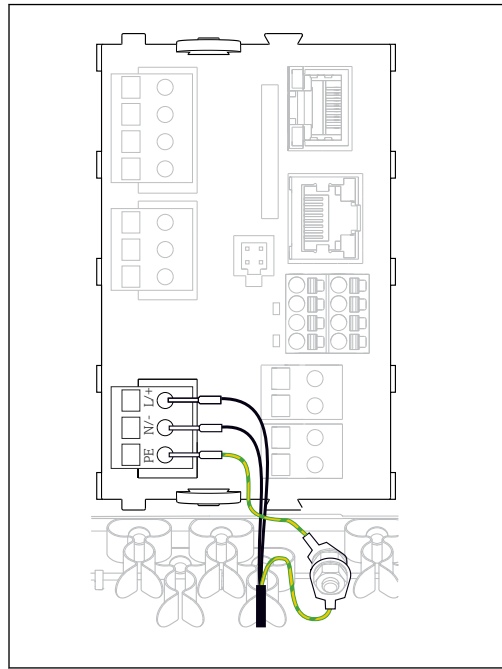
- 1 Power supply for digital fixed cable sensors with Memosens protocol
- 2 SD card slot
- 3 Slot for display cable <sup>1)</sup>
- 4 Ethernet interface
- 5 Connections for 2 Memosens sensors
- 6 Current outputs
- 7 Power connection
- 8 Service interface
- 9 Alarm relay connection

 18 Basic module BASE2-E (four- and eight-channel device)

- 1 Power supply for digital fixed cable sensors with Memosens protocol
- 2 SD card slot
- 3 Slot for display cable <sup>1)</sup>
- 4 Ethernet interface
- 5 Connections for 2 Memosens sensors
- 6 Current outputs
- 7 Socket for internal power supply cable <sup>1)</sup>
- 8 LEDs
- 9 Service interface
- 10 Alarm relay connection

<sup>1)</sup> Internal device connection. Do not disconnect the plug!

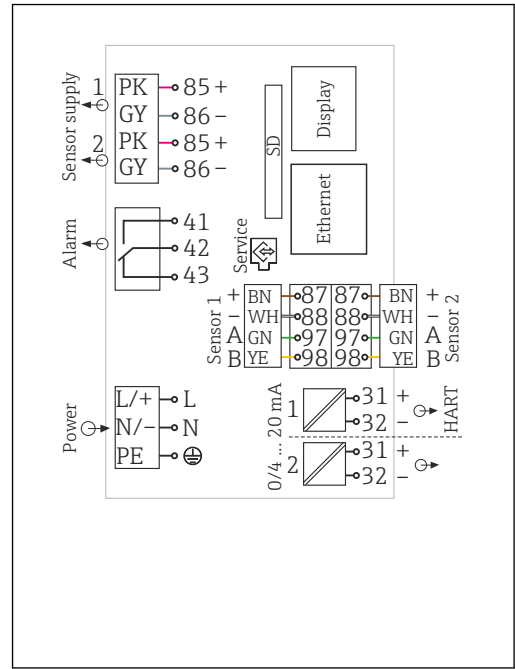
**Connecting the supply voltage for CM442**



A0039627

19 Connecting the power supply using the example of the BASE2-H or -L

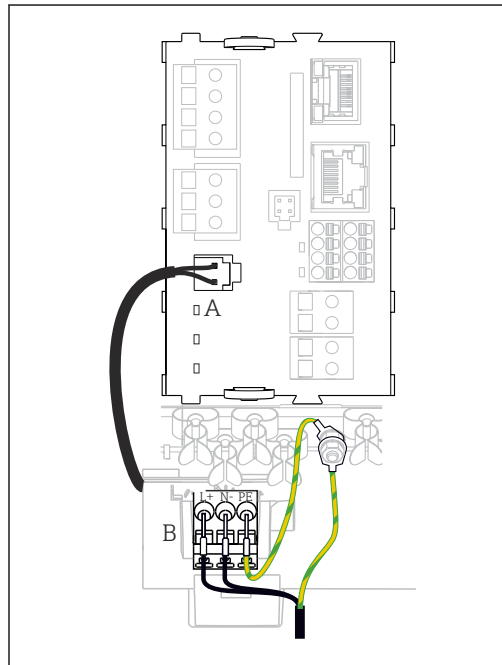
H Power unit 100 to 230 VAC  
L Power unit 24 VAC or 24 VDC



A0039625

20 Complete wiring diagram using the example of the BASE2-H or -L

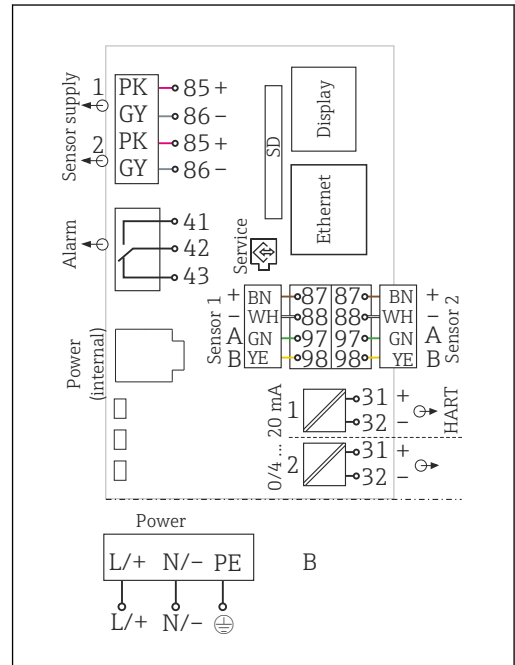
**Connecting the supply voltage for CM444 and CM448**



A0039626

21 Connecting the power supply using the example of the BASE2-E

A Internal power supply cable  
B Extension power unit



A0039624

22 Complete wiring diagram using the example of the BASE2-E and extension power supply unit (B)

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

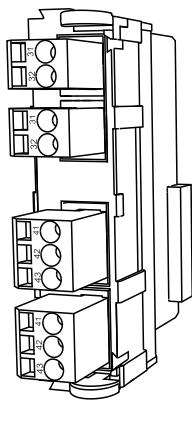
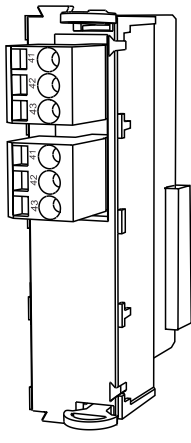
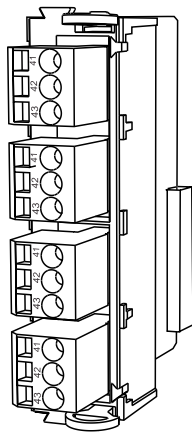
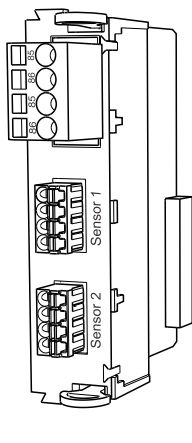
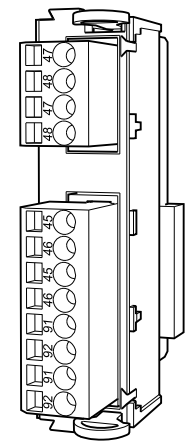
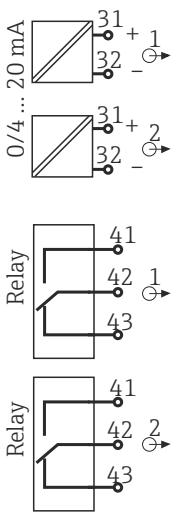
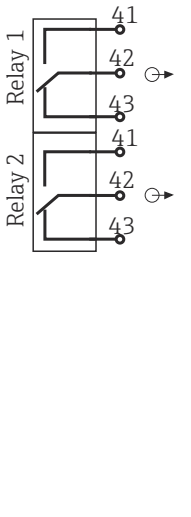
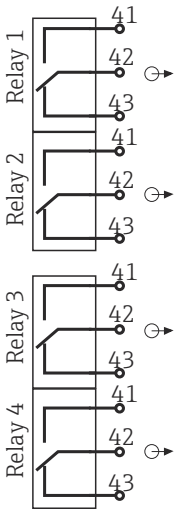
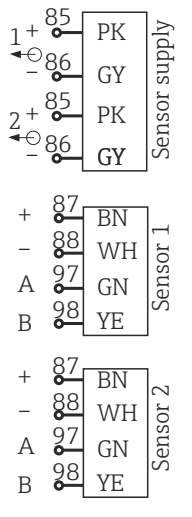
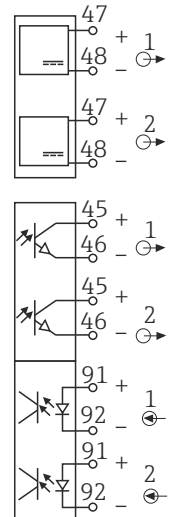
**NOTICE**

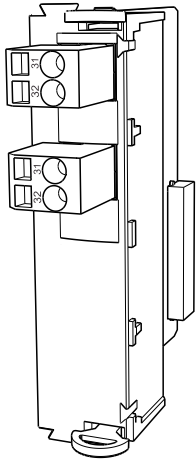
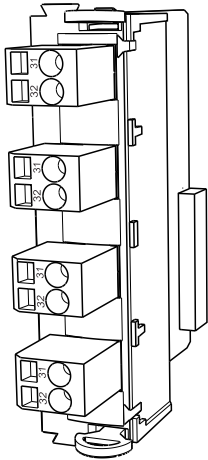
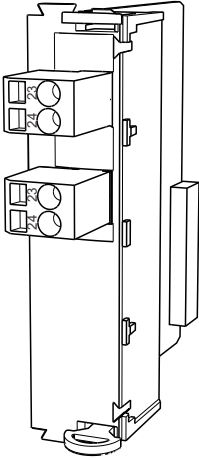
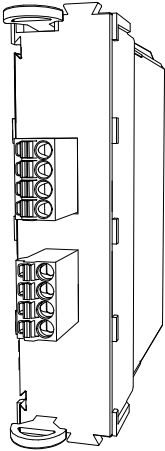
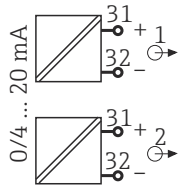
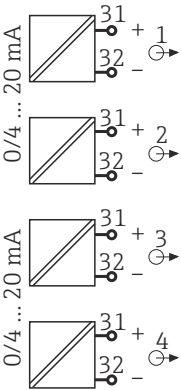
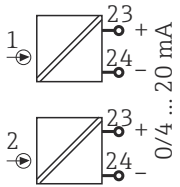
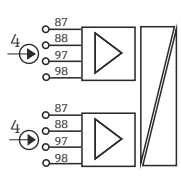
**Unacceptable hardware combinations (due to conflicts in power supply)**

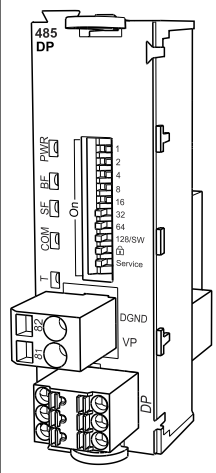
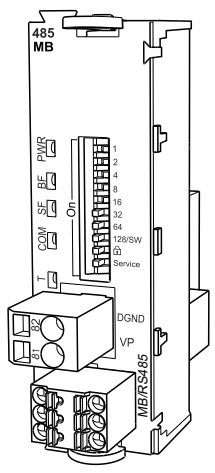
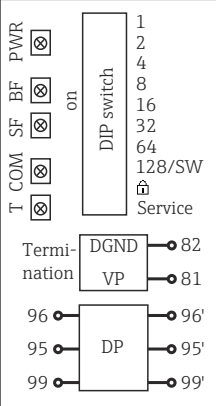
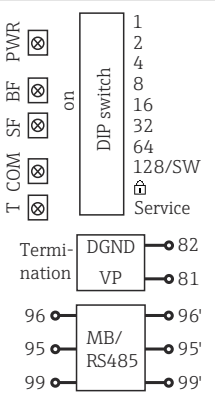
Incorrect measurements or total failure of the measuring point as a result of heat build-up or overloading

- ▶ Find out whether the planned extension for your controller results in a permitted hardware combination (Configurator on [www.endress.com/CM442](http://www.endress.com/CM442) or .../CM444 or .../CM448).
- ▶ Please note that if you are extending CM442 to CM444 or CM448, you must additionally fit an extension power supply unit and an extension backplane. You must then also use basic module BASE-E.
- ▶ Remember that the sum of all current inputs and outputs may not exceed 8.
- ▶ Make sure not to use more than 2 "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
				
A0025110	A0025111		A0025113	A0025114
<ul style="list-style-type: none"> <li>▪ 2 x 0/4 to 20 mA analog outputs</li> <li>▪ 2 relays</li> <li>▪ Order No. 71111053</li> </ul>	<ul style="list-style-type: none"> <li>▪ 2 relays</li> <li>▪ Order No. 71125375</li> </ul>	<ul style="list-style-type: none"> <li>▪ 4 relays</li> <li>▪ Order No. 71125376</li> </ul>	<ul style="list-style-type: none"> <li>▪ 2 digital sensor inputs</li> <li>▪ 2 power supply systems for digital sensors</li> <li>▪ Order No. 71135631</li> </ul>	<ul style="list-style-type: none"> <li>▪ 2 digital inputs</li> <li>▪ 2 digital outputs with auxiliary voltage</li> <li>▪ Order No. 71135638</li> </ul>
				
A0033234	A0033235	A0025125	A0025128	A0025129

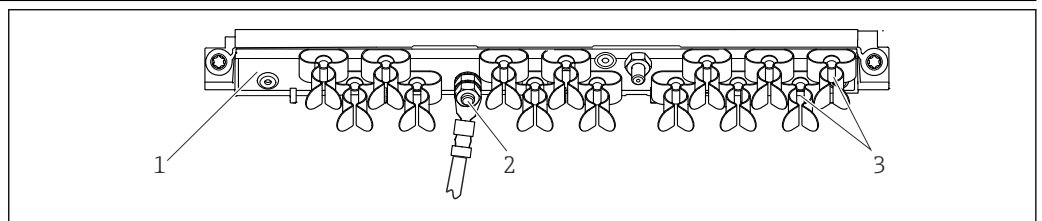
Module name			
2AO	4AO	2AI	2DS Ex-i
 <p style="text-align: right;">A0025132</p>	 <p style="text-align: right;">A0025133</p>	 <p style="text-align: right;">A0025135</p>	 <p style="text-align: right;">A0046513</p>
<ul style="list-style-type: none"> <li>■ 2 x 0/4 to 20 mA analog outputs</li> <li>■ Order No. 71135632</li> </ul>	<ul style="list-style-type: none"> <li>■ 4 x 0/4 to 20 mA analog outputs</li> <li>■ Order No. 71135633</li> </ul>	<ul style="list-style-type: none"> <li>■ 2 x 0/4 to 20mA analog inputs</li> <li>■ Order No. 71135639</li> </ul>	<ul style="list-style-type: none"> <li>■ 2 intrinsically safe digital inputs for Memosens sensors with Ex approval</li> <li>■ Inputs on BASE2 module are disabled</li> <li>■ Module 2DS EX-i is equipped in the right slot of the device</li> <li>■ Order No. 71477718</li> </ul>
 <p style="text-align: right;">A0025137</p>	 <p style="text-align: right;">A0025138</p>	 <p style="text-align: right;">A0025139</p>	 <p style="text-align: right;">A0046512</p>

Module name	
<b>485DP</b>	<b>485MB</b>
	
<small>A0050399</small>	<small>A0050401</small>
<ul style="list-style-type: none"> <li>■ 5V power supply for PROFIBUS DP termination</li> <li>■ RS485 (PROFIBUS DP)</li> <li>■ Order No. 71575177</li> </ul>	<ul style="list-style-type: none"> <li>■ RS485 (Modbus RS485)</li> <li>■ Order No. 71575178</li> </ul>
	
<small>A0050400</small>	<small>A0050402</small>

**i PROFIBUS DP (module 485DP)**

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

**Protective ground connection**



A0048299

**23 Cable mounting rail and associated function**

1 Cable mounting rail

2 Threaded bolt (protective ground connection, central grounding point)

3 Cable clamps (fixing and grounding the sensor cables)

## Sensor connection

## Sensor types with Memosens protocol for non-hazardous area



*Sensors with Memosens protocol*

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

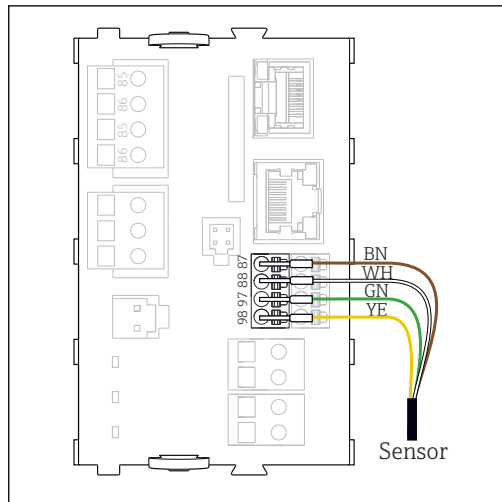
**The following rule applies if connecting CUS71D sensors:**

- CM442
  - Only one CUS71D is possible; an additional sensor is not permitted.
  - The second sensor input may also not be used for another type of sensor.
- CM444
  - No restrictions. All the sensor inputs can be used as required.
- CM448
  - If a CUS71D is connected, the number of sensor inputs that can be used is limited to a maximum of 4.
  - Of these, all 4 inputs can be used for CUS71D sensors.
  - Every combination of CUS71D and other sensors is possible, provided that the total number of connected sensors does not exceed 4.

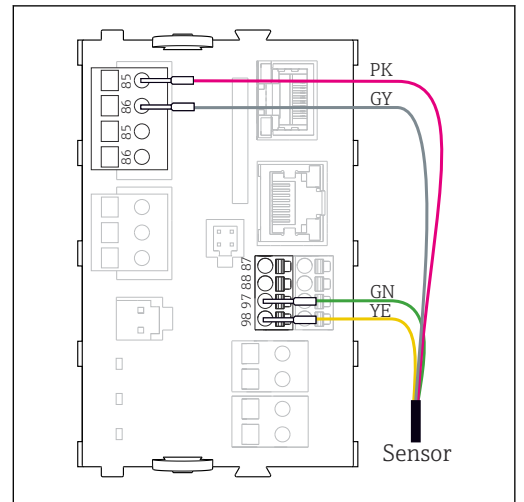
**Types of connection**

- Direct connection of the sensor cable to the terminal connector of the , basic module-L, -H or -E (→  24 ff.)
- Optional: Sensor cable plug connected to the M12 sensor socket on the underside of the device  
With this type of connection, the device is already wired at the factory (→  27).

Sensor cable connected directly



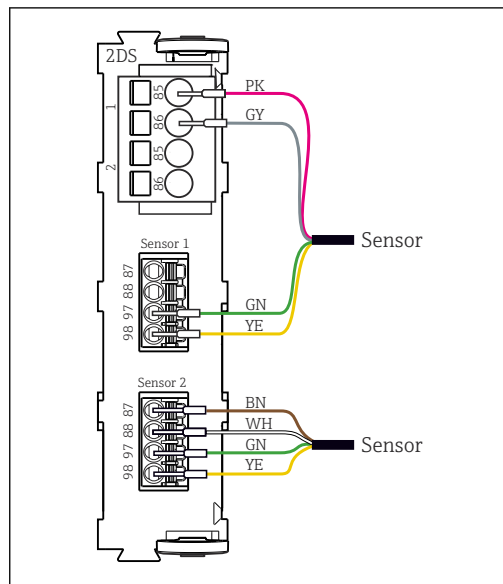
A0039629



A0039622

24 sensors without additional supply voltage

25 sensors with additional supply voltage



A0033206

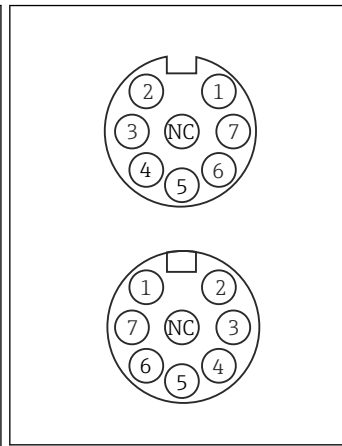
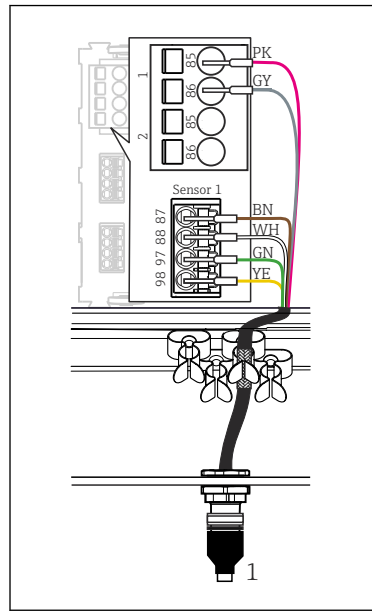
26 Sensors with and without additional supply voltage at sensor module 2DS



**In the case of a single-channel device:**  
The left-hand Memosens input on basic module must be used!

**connection via M12 connection**

Only for connection in non-hazardous area.



Device versions with a pre-installed M12 socket are ready-wired upon delivery.

Please note the following:

- The internal device wiring is always the same regardless of what kind of sensor you connect to the M12 socket (plug&play).
- The signal or power supply cables are assigned in the sensor head in such a way that the PK and GY power supply cables are either used (e.g. optical sensors) or not (e.g. pH or ORP sensors).

28 M12 assignment, top: socket, bottom: connector (top view in each case)

- 1 PK (24 V)
- 2 GY (Ground 24 V)
- 3 BN (3 V)
- 4 WH (Ground 3 V)
- 5 GN (Memosens)
- 6 YE (Memosens)
- 7, Not connected
- NC

27 M12 connection (e.g. on sensor module)

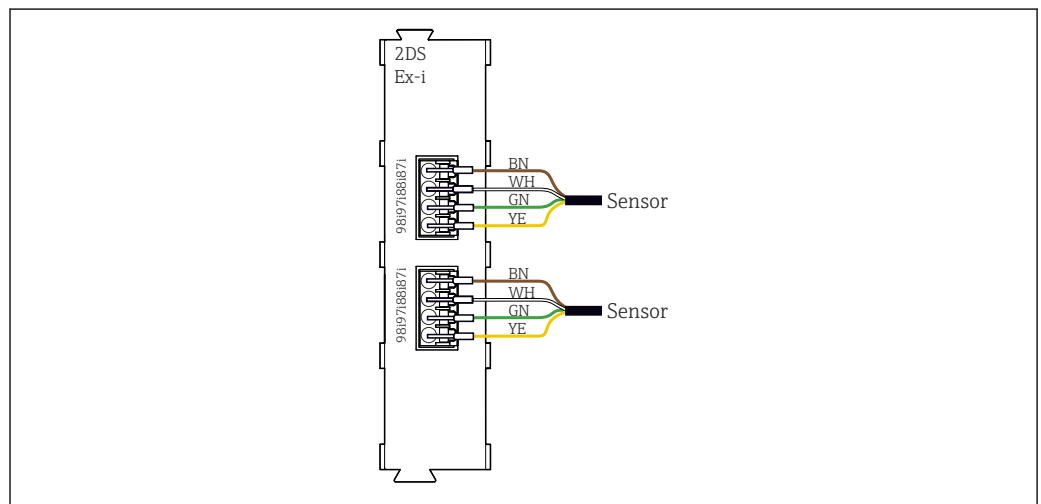
1 Sensor cable with M12 connector

**i** When connecting intrinsically safe sensors to transmitters with sensor communication module type 2DS Ex i, the M12 plug-in connector is **not** permitted.

**Connecting intrinsically safe sensors to sensor communication module type 2DS Ex i**

Sensor cable connected directly

- ▶ Connect the sensor cable to the terminal connector of the sensor communication module 2DS Ex-i.



29 Sensors without additional supply voltage at sensor communication module type 2DS Ex-i

**i** Intrinsically safe sensors for use in explosive atmospheres may only be connected to the sensor communication module type 2DS Ex-i. Only the sensors covered by the certificates may be connected (see XA).



## Performance characteristics

<b>Response time</b>	<b>Current outputs</b> $t_{90}$ = max. 500 ms for an increase from 0 to 20 mA
	<b>Current inputs</b> $t_{90}$ = max. 330 ms for an increase from 0 to 20 mA
	<b>Digital inputs and outputs</b> $t_{90}$ = max. 330 ms for an increase from low to high

<b>Reference temperature</b>	25 °C (77 °F)
------------------------------	---------------

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

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

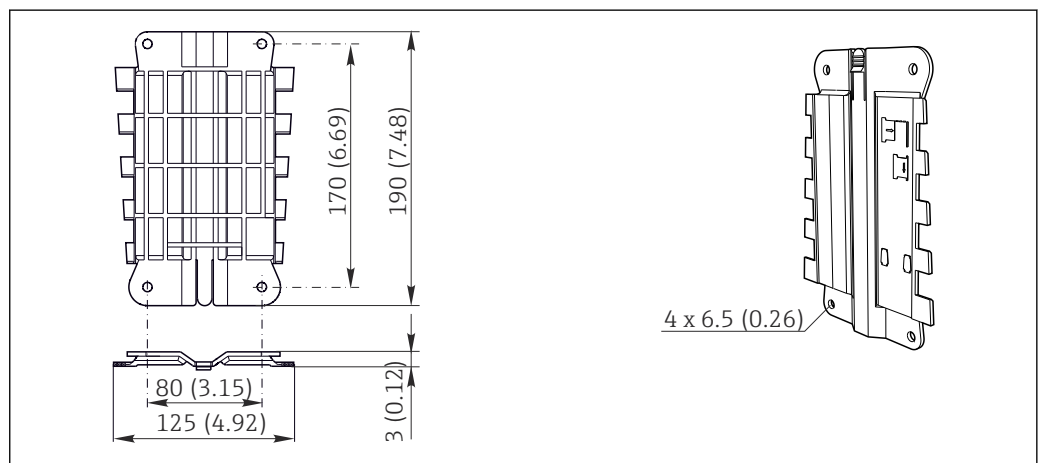
<b>Frequency tolerance of digital inputs and outputs</b>	≤ 1%
--	------

<b>Resolution of current inputs and outputs</b>	< 5 µA
---	--------

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

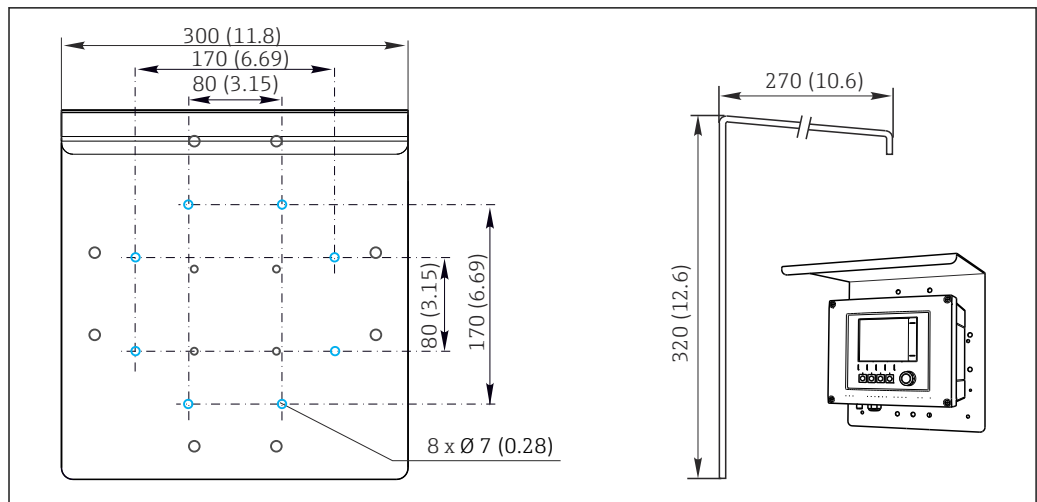
## Mounting

<b>Mounting requirements</b>	<b>Mounting plate</b>
------------------------------	-----------------------



30 Mounting plate. Engineering unit: mm (in)

**Weather protection cover**



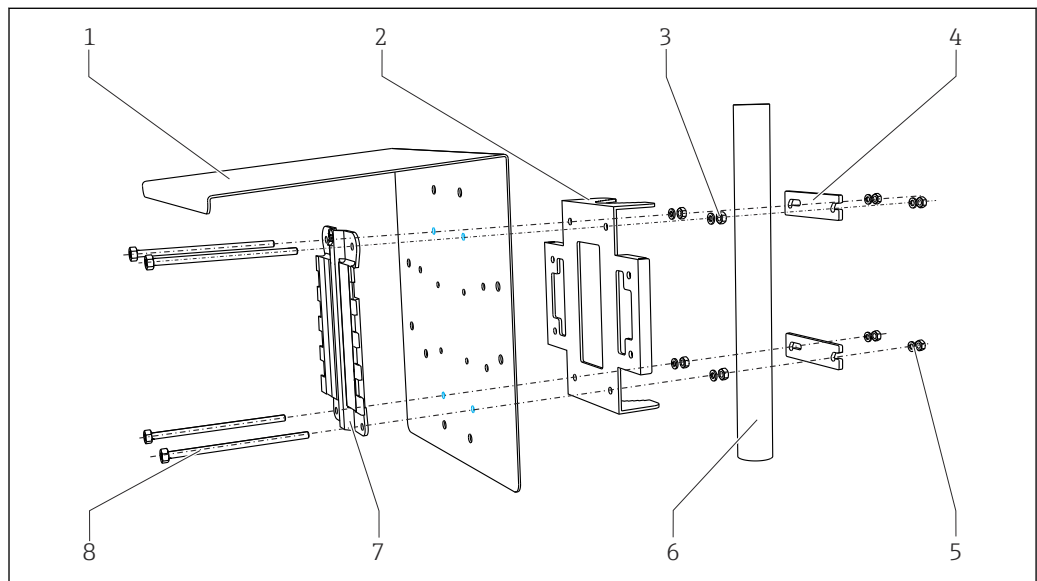
A0012428

31 Dimensions in mm (in)

**Installation**

**Post mounting**

**i** You require the post mounting kit (optional) to mount the unit on a pipe, post or railing (square or circular, clamping range 20 to 61 mm (0.79 to 2.40")).

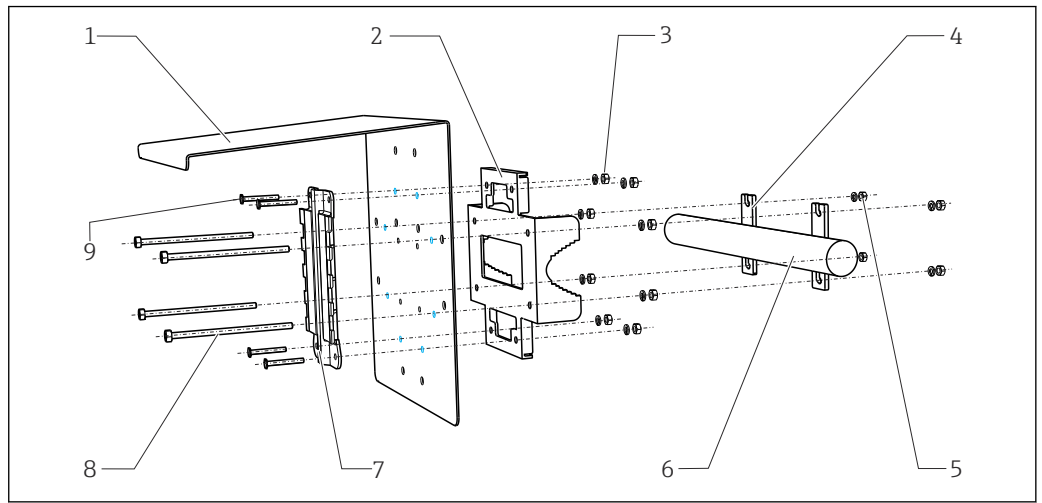


A0033044

32 Post mounting

- |   |   |   |   |
|---|---|---|---|
| 1 | Weather protection cover (optional)         | 5 | Spring washers and nuts (post mounting kit) |
| 2 | Post mounting plate (post mounting kit)     | 6 | Pipe or railing (circular/square)           |
| 3 | Spring washers and nuts (post mounting kit) | 7 | Mounting plate                              |
| 4 | Pipe clamps (post mounting kit)             | 8 | Threaded rods (post mounting kit)           |

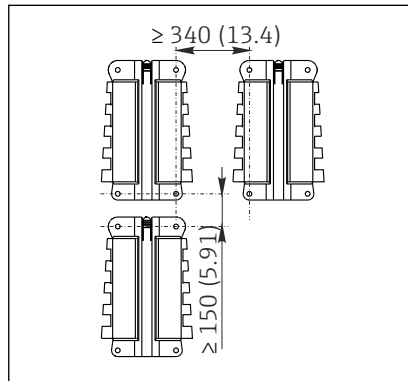
**Rail mounting**



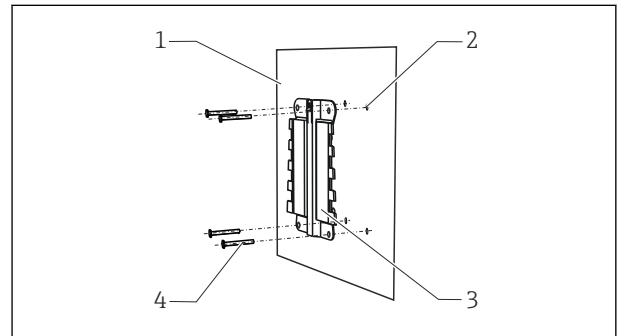
33 Rail mounting

- |   |   |   |                                   |
|---|---|---|-----------------------------------|
| 1 | Weather protection cover (optional)         | 6 | Pipe or railing (circular/square) |
| 2 | Post mounting plate (post mounting kit)     | 7 | Mounting plate                    |
| 3 | Spring washers and nuts (post mounting kit) | 8 | Threaded rods (post mounting kit) |
| 4 | Pipe clamps (post mounting kit)             | 9 | Screws (post mounting kit)        |
| 5 | Spring washers and nuts (post mounting kit) |   |                                   |

**Wall mounting**



34 Installation clearance in mm (in)



35 Wall mounting

- |   |   |
|---|---|
| 1 | Wall  |
| 2 | 4 drill holes <sup>1)</sup>                 |
| 3 | Mounting plate                              |
| 4 | Screws Ø 6 mm (not part of scope of supply) |

<sup>1)</sup>The size of the drill holes depends on the wall plugs used. The wall plugs and screws must be provided by the customer.

**Environment**

**Ambient temperature**

**CM442**

- -20 to 60 °C (-4 to 140 °F)
- -20 to 50 °C (-4 to 122 °F) for the following devices:
  - CM442-BM
  - CM442-IE
  - CM442-CL
  - CM442-UM
  - CM442-CD

**CM444**

- Generally -20 to 55 °C (-4 to 131 °F), with the exception of packages under the second point in the list
- -20 to 50 °C (-4 to 122 °F) for the following packages:
  - CM444-\*\*-M40A7FI\*\*\*\*\*+...
  - CM444-\*\*-M40A7FK\*\*\*\*\*+...
  - CM444-\*\*-N40A7FI\*\*\*\*\*+...
  - CM444-\*\*-N40A7FK\*\*\*\*\*+...
  - CM444-\*\*-M4AA5F4\*\*\*\*\*+...
  - CM444-\*\*-M4AA5FF\*\*\*\*\*+...
  - CM444-\*\*-M4AA5FH\*\*\*\*\*+...
  - CM444-\*\*-M4AA5FI\*\*\*\*\*+...
  - CM444-\*\*-M4AA5FK\*\*\*\*\*+...
  - CM444-\*\*-M4AA5FM\*\*\*\*\*+...
  - CM444-\*\*-M4BA5F4\*\*\*\*\*+...
  - CM444-\*\*-M4BA5FF\*\*\*\*\*+...
  - CM444-\*\*-M4BA5FH\*\*\*\*\*+...
  - CM444-\*\*-M4BA5FI\*\*\*\*\*+...
  - CM444-\*\*-M4BA5FK\*\*\*\*\*+...
  - CM444-\*\*-M4BA5FM\*\*\*\*\*+...
  - CM444-\*\*-M4DA5F4\*\*\*\*\*+...
  - CM444-\*\*-M4DA5FF\*\*\*\*\*+...
  - CM444-\*\*-M4DA5FH\*\*\*\*\*+...
  - CM444-\*\*-M4DA5FI\*\*\*\*\*+...
  - CM444-\*\*-M4DA5FK\*\*\*\*\*+...
  - CM444-\*\*-M4DA5FM\*\*\*\*\*+...
  - CM444-BM
  - CM444-IE
  - CM444-CL
  - CM444-UM
  - CM444-CD

**CM448**

- Generally -20 to 55 °C (-4 to 131 °F), with the exception of packages under the second point in the list
- -20 to 50 °C (-4 to 122 °F) for the following packages:
  - CM448-\*\*\*6AA\*\*\*\*\*+...
  - CM448-\*\*\*8A4\*\*\*\*\*+...
  - CM448-\*\*\*8A5\*\*\*\*\*+...
  - CM448-\*\*28A3\*\*\*\*\*+...
  - CM448-\*\*38A3\*\*\*\*\*+...
  - CM448-\*\*48A3\*\*\*\*\*+...
  - CM448-\*\*58A3\*\*\*\*\*+...
  - CM448-\*\*68A3\*\*\*\*\*+...
  - CM448-\*\*26A5\*\*\*\*\*+...
  - CM448-\*\*36A5\*\*\*\*\*+...
  - CM448-\*\*46A5\*\*\*\*\*+...
  - CM448-\*\*56A5\*\*\*\*\*+...
  - CM448-\*\*66A5\*\*\*\*\*+...
  - CM448-\*\*22A7\*\*\*\*\*+...
  - CM448-\*\*32A7\*\*\*\*\*+...
  - CM448-\*\*42A7\*\*\*\*\*+...
  - CM448-\*\*52A7\*\*\*\*\*+...
  - CM448-\*\*62A7\*\*\*\*\*+...
  - CM448-\*\*A6A5\*\*\*\*\*+...
  - CM448-\*\*A6A7\*\*\*\*\*+...
  - CM448-\*\*B6A5\*\*\*\*\*+...
  - CM448-\*\*B6A7\*\*\*\*\*+...
  - CM448-\*\*C6A5\*\*\*\*\*+...
  - CM448-\*\*C6A7\*\*\*\*\*+...
  - CM448-\*\*D6A5\*\*\*\*\*+...
  - CM448-\*\*D6A7\*\*\*\*\*+...
  - CM448-BM
  - CM448-IE
  - CM448-CL
  - CM448-UM
  - CM448-CD

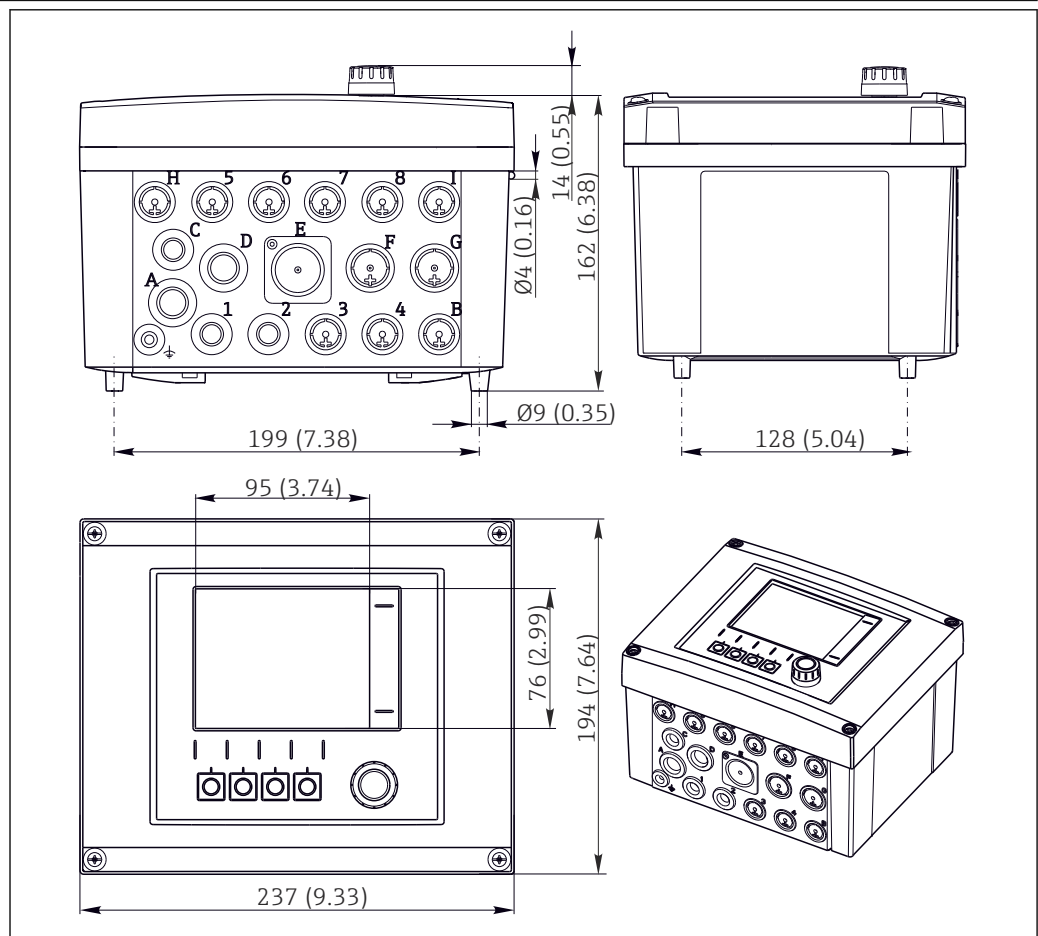
<b>Storage temperature</b>	-40 to +80 °C (-40 to 176 °F)																									
<b>Relative humidity</b>	10 to 95 %, non-condensing																									
<b>Degree of protection</b>	IP66/67 as per IEC 60529 Housing protection rating NEMA Type 4X as per UL 50E																									
<b>Vibration resistance</b>	<p><b>Environmental tests</b> Vibration test according to DIN EN 60068-2 Vibration test according to DIN EN 60654-3</p> <p><b>Post or pipe mounting</b></p> <table border="0"> <tr> <td>Frequency range</td> <td colspan="2">10 to 500 Hz (sinusoidal)</td> </tr> <tr> <td>Amplitude</td> <td>10 to 57.5 Hz:</td> <td>0.15 mm</td> </tr> <tr> <td></td> <td>57.5 to 500 Hz:</td> <td>2 g<sup>1)</sup></td> </tr> <tr> <td>Test duration</td> <td colspan="2">10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)</td> </tr> </table> <p><b>Wall mounting</b></p> <table border="0"> <tr> <td>Frequency range</td> <td colspan="2">10 to 150 Hz (sinusoidal)</td> </tr> <tr> <td>Amplitude</td> <td>10 to 12.9 Hz:</td> <td>0.75 mm</td> </tr> <tr> <td></td> <td>12.9 to 150 Hz:</td> <td>0.5 g<sup>1)</sup></td> </tr> <tr> <td>Test duration</td> <td colspan="2">10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)</td> </tr> </table>		Frequency range	10 to 500 Hz (sinusoidal)		Amplitude	10 to 57.5 Hz:	0.15 mm		57.5 to 500 Hz:	2 g <sup>1)</sup>	Test duration	10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)		Frequency range	10 to 150 Hz (sinusoidal)		Amplitude	10 to 12.9 Hz:	0.75 mm		12.9 to 150 Hz:	0.5 g <sup>1)</sup>	Test duration	10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)	
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	12.9 to 150 Hz:	0.5 g <sup>1)</sup>																								
Test duration	10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)																									

1) g ... acceleration due to gravity (1 g ≈ 9.81 m/s<sup>2</sup>)

<b>Electromagnetic compatibility</b>	Interference emission and interference immunity as per EN 61326-1, class A for industrial areas
<b>Electrical safety</b>	IEC 61010-1, Class I equipment Low voltage: overvoltage category II Environment < 3000 m (< 9840 ft) above MSL
<b>Pollution degree</b>	The product is suitable for pollution degree 2.
<b>Pressure compensation to environment</b>	Filter made of GORE-TEX used as pressure compensation element Ensures pressure compensation to environment and guarantees IP protection.

## Mechanical construction

### Dimensions



A0012396

36 Dimensions of field housing in mm (in)

<b>Weight</b>	Complete device	Approx. 2.1 kg (4.63 lbs), depending on the version
	Individual module	Approx. 0.06 kg (0.13 lbs)

**Materials**

Housing base	PC-FR
Display cover	PC-FR
Display film and soft keys	PE
Housing seal	EPDM
Module side panels	PC-FR
Module housing 2DS Ex-i	PC-PBT
Module covers	PBT GF30 FR
Cable mounting rail	PBT GF30 FR, stainless steel 1.4301 (AISI304)
Clamps	Stainless steel 1.4301 (AISI304)
Screws	Stainless steel 1.4301 (AISI304)
Cable glands	Polyamide V0 as per UL94
Separation element	PC-PBT GF30

## Operability

**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

**Operation concept**

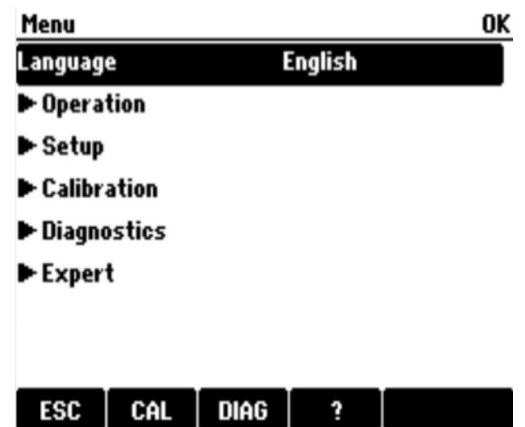
The simple and structured operating concept sets new standards:

- 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



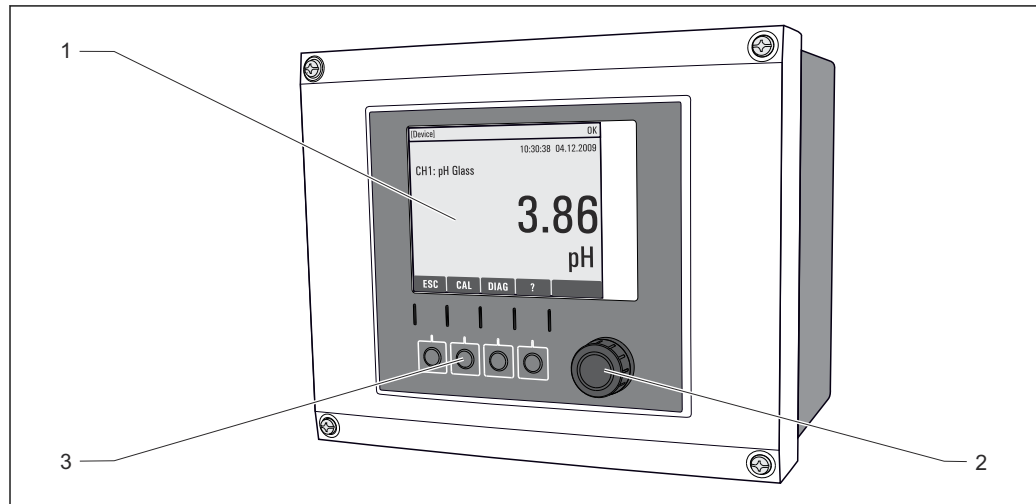
37 Easy operation

A0025228



38 Plain-text menu

## Local operation



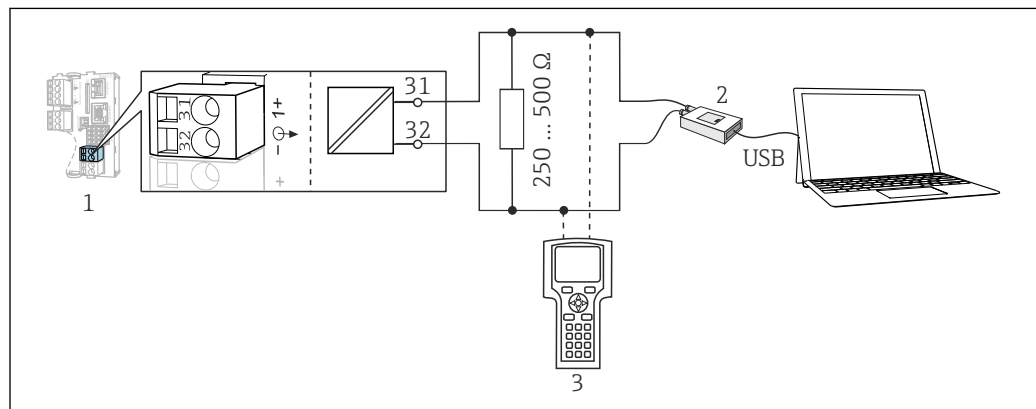
A0011764

39 Overview of operation

- 1 Display (with red display background in alarm condition)
- 2 Navigator (jog/shuttle and press/hold function)
- 3 Soft keys (function depends on menu)

## Remote operation

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



A0039620

40 HART using modem

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

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

## 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/cm442](http://www.endress.com/cm442) or [.../cm444](http://www.endress.com/cm444) or [.../cm448](http://www.endress.com/cm448).

## Certificates and approvals

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

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

## Ordering information


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**Product page** [www.endress.com/cm442](http://www.endress.com/cm442)  
[www.endress.com/cm444](http://www.endress.com/cm444)  
[www.endress.com/cm448](http://www.endress.com/cm448)

---

**Product Configurator**

1. **Configure:** Click this button on the product page.
2. Select **Extended selection**.
  - ↳ The Configurator opens in a separate window.
3. Configure the device according to your requirements by selecting the desired option for each feature.
  - ↳ In this way, you receive a valid and complete order code for the device.
4. **Accept:** Add the configured product to the shopping cart.

 For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.

5. **CAD:** Open this tab.
  - ↳ The drawing window is displayed. You have a choice between different views. You can download these in selectable formats.

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**Scope of delivery**

The scope of delivery comprises:

- 1 multichannel controller in the version ordered
- 1 mounting plate
- 1 wiring label (attached at the factory to the inside of the display cover)
- 1 printed copy of the Brief Operating Instructions in the language ordered
- Separation element (pre-installed on hazardous area version type 2DS Ex-i)
- Safety instructions for the hazardous area (for hazardous area version type 2DS Ex-i)

## Accessories

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

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

1. Application-specific restrictions of the product combination are possible.  
Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.

2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

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**Device-specific accessories**
**Weather protection cover****CYY101**

- Weather protection cover for field devices
- Absolutely essential for field installation
- Material: stainless steel 1.4301 (AISI 304)
- Order No. CYY101-A

**Post mounting kit****Post mounting kit CM44x**

- For securing the field housing to horizontal and vertical posts and pipes
- Order No. 71096920

**Measuring cables****Memosens data cable CYK10**

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



Technical Information TI00118C

**Memosens data cable CYK11**

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



Technical Information TI00118C

**Sensors***Glass electrodes***Memosens CPS11E**

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



Technical Information TI01493C

**Memosens CPS41E**

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



Technical Information TI01495C

**Memosens CPS71E**

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



Technical Information TI01496C

**Memosens CPS91E**

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



Technical Information TI01497C

**Memosens CPS31E**

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



Technical Information TI01574C

**Memosens CPS61E**

- pH sensor for bioreactors in life sciences and for the food industry
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps61e](http://www.endress.com/cps61e)



Technical Information TI01566C

**Memosens CPF81E**

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



Technical Information TI01594C

*Enamel pH electrodes*

**Ceramax CPS341D**

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



Technical Information TI00468C

*ORP sensors*

**Memosens CPS12E**

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



Technical Information TI01494C

**Memosens CPS42E**

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



Technical Information TI01575C

**Memosens CPS72E**

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



Technical Information TI01576C

**Memosens CPF82E**

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



Technical Information TI01595C

**Memosens CPS92E**

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



Technical Information TI01577C

**Memosens CPS62E**

- ORP sensor for hygienic and sterile applications
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps62e](http://www.endress.com/cps62e)



Technical Information TI01604C

*pH ISFET sensors***Memosens CPS47E**

- ISFET sensor for pH measurement
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps47e](http://www.endress.com/cps47e)



Technical Information TI01616C

**Memosens CPS77E**

- Sterilizable and autoclavable ISFET sensor for pH measurement
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps77e](http://www.endress.com/cps77e)



Technical Information TI01396

**Memosens CPS97E**

- ISFET sensor for pH measurement
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps97e](http://www.endress.com/cps97e)



Technical Information TI01618C

*Combined pH/ORP sensors***Memosens CPS16E**

- pH/ORP sensor for standard applications in process technology and environmental engineering
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps16e](http://www.endress.com/cps16e)



Technical Information TI01600C

**Memosens CPS76E**

- pH/ORP sensor for process technology
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps76e](http://www.endress.com/cps76e)



Technical Information TI01601C

**Memosens CPS96E**

- pH/ORP sensor for heavily polluted media and suspended solids
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cps96e](http://www.endress.com/cps96e)



Technical Information TI01602C

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

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



Technical Information TI00182C

#### **Indumax H CLS54D**

- Inductive conductivity sensor
- With certified, hygienic design for foodstuffs, beverages, pharmaceuticals and biotechnology
- Product Configurator on the product page: [www.endress.com/cls54d](http://www.endress.com/cls54d)



Technical Information TI00508C

*Conductivity sensors with conductive measurement of conductivity*

#### **Memosens CLS15E**

- Digital conductivity sensor for measurements in pure and ultrapure water
- Conductive measurement
- With Memosens 2.0
- Product Configurator on the product page: [www.endress.com/cls15e](http://www.endress.com/cls15e)



Technical Information TI01526C

#### **Memosens CLS16E**

- Digital conductivity sensor for measurements in pure and ultrapure water
- Conductive measurement
- With Memosens 2.0
- Product Configurator on the product page: [www.endress.com/cls16e](http://www.endress.com/cls16e)



Technical Information TI01527C

#### **Memosens CLS21E**

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



Technical Information TI01528C

#### **Memosens CLS82E**

- Hygienic conductivity sensor
- Digital with Memosens 2.0 technology
- Product Configurator on the product page: [www.endress.com/cls82e](http://www.endress.com/cls82e)



Technical Information TI01529C

*Oxygen sensors*

#### **Memosens COS22E**

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



Technical Information TI01619C

#### **Memosens COS51E**

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



Technical Information TI01620C

#### **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](http://www.endress.com/cos61d)



Technical Information TI00387C

**Memosens COS81E**

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



Technical Information TI01558C

*Disinfection sensors***Memosens CCS51D**

- Sensor for measuring free available chlorine
- Product Configurator on the product page: [www.endress.com/ccs51d](http://www.endress.com/ccs51d)



Technical Information TI01423C

*Ion-selective sensors***ISEmax CAS40D**

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



Technical Information TI00491C

*Turbidity sensors***Turbimax CUS51D**

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



Technical Information TI00461C

**Turbimax CUS52D**

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



Technical Information TI01136C

*SAC and nitrate sensors***Viomax CAS51D**

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



Technical Information TI00459C

*Interface measurement***Turbimax CUS71D**

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



Technical Information TI00490C

*Spectrometer sensors***Memosens Wave CAS80E**

- Measurement of various parameters in liquid media
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/cas80e](http://www.endress.com/cas80e)



Technical Information TI01522C

*Fluorescence sensors*

**Memosens CFS51**

- Sensor for fluorescence measurement
- With Memosens technology
- Product Configurator on the product page: [www.endress.com/cfs51](http://www.endress.com/cfs51)



Technical Information TI01630C

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**Communication-specific accessories**

**Device Care SFE100**

- Configuration of Endress+Hauser devices
- Fast and easy installation, online application updates, one-click connection to devices
- Automatic hardware identification and driver catalog update
- Device configuration with DTMs



Technical Information Device Care SFE100, TI01134S

**Commubox FXA195**

Intrinsically safe HART communication with FieldCare via the USB port



Technical Information TI00404F

**Commubox FXA291**

Connects the CDI interface of measuring devices with the USB port of the computer or laptop



Technical Information TI00405C

**Wireless HART adapter SWA70**

- Wireless device connection
- Easily integrated, offers data protection and transmission safety, can be operated in parallel with other wireless networks, minimum cabling complexity



Technical Information TI00061S

**Field Data Manager Software MS20/21**

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

**FieldCare SFE500**

- Universal tool for field device configuration and management
- Supplied with a complete library of certified DTMs (Device Type Manager) for operation of Endress+Hauser field devices
- Order according to product order structure
- [www.endress.com/sfe500](http://www.endress.com/sfe500)

**Memobase Plus CYZ71D**

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



Technical Information TI00502C

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**Service-specific accessories**

**Additional functionality**

*Hardware extension modules*

**Kit, extension module AOR**

- 2 x relay, 2 x 0/4 to 20 mA analog output
- Order No. 71111053

**Kit, extension module 2R**

- 2 x relay
- Order No. 71125375

**Kit, extension module 4R**

- 4 x relay
- Order No. 71125376

**Kit, extension module 2AO**

- 2 x 0/4 to 20 mA analog output
- Order No. 71135632

**Kit, extension module 4AO**

- 4 x analog output 0/4 to 20 mA
- Order No. 71135633

**Kit, extension module 2DS**

- 2 x digital sensor, Memosens
- Order No. 71135631

**Kit extension module 2DS Ex-i**

- 2 x digital sensor, Memosens, Ex approval
- Order No. 71477718

**Kit, extension module 2AI**

- 2 x 0/4 to 20 mA analog input
- Order No. 71135639

**Kit, extension module DIO**

- 2 x digital input
- 2 x digital output
- Auxiliary voltage supply for digital output
- Order No. 71135638

**Upgrade kit, extension module 485DP**

- Extension module 485DP
- PROFIBUS DP
- Order No. 71575177

**Upgrade kit, extension module 485MB**

- Extension module 485MB
- Modbus RS485
- Order No. 71575178

**Kit CM442: upgrade kit to CM444/CM448**

- Extension power supply unit 100 to 230 V AC and extension backplane
- Base module BASE2-E
- You must quote the serial number of the device when ordering the kit.
- Order No. 71470973

**Kit CM442: upgrade kit to CM444/CM448**

- Extension power supply unit 24 V DC and extension backplane
- Base module BASE2-E
- You must quote the serial number of the device when ordering the kit.
- Order No. 71470975

*Firmware and activation codes***SD card with Liquiline firmware**

- Industrial Flash Drive, 1 GB
- Order No. 71127100



You must quote the serial number of the device when ordering the activation code.

**Kit CM442: activation code for 2nd digital sensor input**

Order No. 71114663

**Activation code for feedforward control**

- Requires current input or fieldbus communication
- Order No. 71211288

**Activation code for measuring range switch**

- Requires digital inputs or fieldbus communication
- Order No. 71211289

**Activation code for ChemocleanPlus**

- Requires relays or digital outputs or fieldbus communication and optional digital inputs
- Order No. 71239104

**Activation code for Heartbeat Verification and Monitoring**

Order No. 71367524



**Activation code for mathematics**

- Formula editor
- Order No. 71367541

**Activation code for Ethernet/IP and web server**

Order No. XPC0018

**Activation code for Modbus TCP and web server**

Order No. XPC0020

**Activation code for web server for BASE2**

Order No. XPC0021

**Activation code for PROFINET and web server Base2**

Order No. XPC0022

**Activation code for HART**

Order No. XPC0023

**Activation code for Profibus DP for module 485**

Order No. XPC0024

**Activation code for module 485 Modbus RS485**

Order No. XPC0025

**Activation code for Liquiline inputs/outputs**

Order No. XPC0026

**Activation code for additional functions**

Order No. XPC0027

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**System components**

**RIA14, RIA16**

- Field display unit for integration into 4-20 mA circuits
- RIA14 in flameproof metal enclosure



Technical Information TI00143R and TI00144R

**RIA15**

- Process display unit, Digital display unit for integration into 4-20 mA circuits
- Panel mounting
- With optional HART communication



Technical Information TI01043K

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**Other accessories**

**SD card**

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

**Cable glands**

**Kit CM44x: gland M**

- Set, 6 pieces
- Order number: 71101768

**Kit CM44x: gland NPT**

- Set, 6 pieces
- Order number: 71101770

**Kit CM44x: gland G**

- Set, 6 pieces
- Order number: 71101771

**Kit CM44x: dummy plug for cable gland**

- Set, 6 pieces
- Order number: 71104942

**M12 built-in socket and cable junction with Velcro strip**

**Kit CM442/CM444/CM448/CSF48: M12 built-in socket for digital sensors**

- Pre-terminated
- Order No. 71107456

**Kit CM442/CM444/CM448/CSF48: M12 built-in socket for PROFIBUS DP/Modbus RS485**

- B-coded, pre-terminated
- Order No. 71140892

**Kit CM442/CM444/CM448/CSF48: M12 built-in socket for Ethernet**

- D-coded, pre-terminated
- Order No. 71140893

**Kit: external CDI socket, complete**

- Retrofit kit for CDI interface, with terminated connecting cables
- Order No. 51517507

**Cable junction with Velcro strip**

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

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

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