Technical Information
Liquiline
CM442R/CM444R/CM448R
Cabinet controller with a maximum of eight measuring channels based on digital Memosens technology

Extensible multiparameter controller for monitoring and controlling processes in industry and the environmental sector

Application
- Possible to connect up to 8 Memosens sensors
- Mathematic functions calculate new measured values
- Max. 8 analog outputs 0/4 to 20 mA
- Digital fieldbuses (HART, PROFIBUS, Modbus, EtherNet/IP) and integrated web server
- Selectable: cleaning function, controller and alarm relay
- Optional digital inputs/outputs or current inputs for signal transmission from other devices

The primary applications comprise:
- Food and beverages
- Life science
- Water and wastewater
- Chemical industry

Your benefits
- Maximum process safety thanks to:
  - Simple and transparent menu guidance via an optional graphic display
  - Standardized operating concept across all devices from the Liquiline, sampler and analyzer platform
- Fast commissioning thanks to:
  - Memosens: lab-calibrated sensors & hot plug-and-play
  - Preconfigured Liquiline transmitter
  - Easy to expand and adapt system to meet new requirements
- Minimum inventory:
  - Cross-platform, modular concept (e.g. identical modules irrespective of parameters)
  - Integration into Fieldcare and W@M facilitates effective asset management

Endress+Hauser
People for Process Automation
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## Function and system design

### Measuring system

The following overview shows examples of the design and layout of a measuring system. Other sensors and assemblies can be ordered for conditions specific to your application (→ www.endress.com/products).

#### Measuring point

A complete measuring system consists of:
- Liquiline transmitter
- Sensors with Memosens technology
- Assemblies to suit the sensors used

#### pH value or ORP

- pH measurement in drinking water
  - Retractable assembly Cleanfit CPA471
  - Sensor Orbisint CPS11D
  - Measuring cable CYK10
  - → graphic
- ORP in drinking water
  - Immersion assembly Dipfit CYA112
  - Sensor Orbisint CPS12D
  - Measuring cable CYK10

#### Conductivity

Inductive conductivity measurement in wastewater treatment
- Sensor Indumax CLS50D with fixed cable
Conductive conductivity measurement in power plant cooling water
- Sensor Condumax CLS15D

#### Oxygen

Oxygen in aeration basins
- Immersion assembly Dipfit CYA112
- Holder CYH112
- Sensor
  - COS61D (optical) with fixed cable,
  - COS51D (amperometric) cable CYK10

**Figure:** CYA112 with COS61D

#### Nitrate and SAC

Nitrate in wastewater
- Sensor CAS51D-**A2 with fixed cable
- Assembly CYA112
- Holder CYH112

SAC in the wastewater treatment outlet
- Sensor CAS51D-**2C2 with fixed cable
- Assembly CYA112
- Holder CYH112

#### Turbidity and interface

Turbidity in industrial water
- Sensor Turbimax CUS51D with fixed cable
- Assembly Flowfit CUA250
- Spray head CUR3 (optional)

Interface in the primary clarifier
- Sensor Turbimax CUS71D
- Assembly CYA112
- Holder CYH112

**Figure:** CUA250 with CUS51D

#### Chlorine

Chlorine (and pH) in drinking water
- Sensor CCS142D
- Sensor CPS11D
- Measuring cable CYK10
- Flow assembly CCA250

#### Ion selective electrodes

Ammonium and nitrate measurement in the aeration basin
- Sensor CAS40D with fixed cable
- Holder CYH112

---

Cabinet installation (excluding sensor cable and signal cable)

1. Optional display (back)
2. Liquiline
3. External power unit (only CM444R and CM448R)
4. Power supply cable (to be provided by the customer, not part of the scope of supply)
5. Display cable
Application example

- Transmitter CM444R-AAM44AOFM6 with:
  4 x Memosens, Modbus TCP, 2 x digital input and 2 x digital output, 2 x relay for cleaning/limit value, 2 x analog current input
- pH and temperature with CPS71D, item 1, (www.products.endress.com/cps71d)
- Chlorine with CCS142D, item 4 (www.products.endress.com/ccs142d)
- 2 x inductive conductivity with CLS50D, item 2 and 3, (www.products.endress.com/cls50d)
- 1 x conductivity measuring range switching via Modbus module
- Flow assembly CCA250 with optional proximity switch INS (www.products.endress.com/cca250)
- Chlorine regulation with dosing stopped in the event of no flow: proximity switch via digital input of DIO module, flow feedforward control (via digital or analog input), PFM-controlled dosing pump via digital output of DIO module

Measuring point in CIP process

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 and storage in a tamper-proof database (Field Data Manager)
- Data export to csv file (for Microsoft Excel)
Device architecture

Slot and port assignment

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 485
- Memosens input module 2DS (DS = digital sensor)
- Extension module for digital inputs and outputs DIO (DIO = digital input and output)
- Current output module 4AO or 2AO (AO = analog output)
- Relay modules AOR, 4R or 2R (AOR = analog output + relay, R = relay)

Also, 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:
The sum of all current inputs and outputs may not exceed 8!
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.
- **Current outputs and relays**
  - Various module combinations can exist.
  
  The following table will help you find out which modules you get depending on the type and number of outputs.

<table>
<thead>
<tr>
<th>Current outputs</th>
<th>Relays</th>
<th>2</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>-</td>
<td>1 x 2R</td>
<td>1 x 4R</td>
</tr>
<tr>
<td>4</td>
<td>1 x 2AO</td>
<td>1 x AO</td>
<td>1 x 2AO + 1 x 4R</td>
</tr>
<tr>
<td>6</td>
<td>1 x 4AO</td>
<td>1 x 4AO + 1 x 2AO</td>
<td>1 x 4AO + 1 x 4AO</td>
</tr>
<tr>
<td>8</td>
<td>1 x 4AO + 1 x 2AO</td>
<td>1 x 4AO + 1 x 2AO + 1 x 2AO</td>
<td>1 x 4AO + 1 x 2AO + 1 x 4AO</td>
</tr>
</tbody>
</table>

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

Terminal diagram

The unique terminal name is derived from the following:

- Slot No. : Port No.
- Terminal

**Example, NO contact of a relay:**

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

- **Basic module BASE-E**
  (contains 2 sensor inputs, 2 current outputs)
- **Module 2DS** (2 sensor inputs)
- **Module 2AO** (2 current outputs)
- **Module 4R** (4 relays)
### Device configuration using the example of a CM442R-**M1A1F0**

**CM442R-**M1A1F0**

| Ordered basic device (example) | • Order code CM442R-**M1A1F0**
|                              | • Functionality: 1 x Memosens, 2 current outputs without HART, no extension module |
| Extension options without additional modules | • Second Memosens input (71114663)
|                              | • HART with activation code (71128428) |
| Extension options by using an extension module in free slot 2 | • Ethernet/PROFIBUS DP/Modbus with module 485 incl. activation code for the desired communication type:
|                              |   - PROFIBUS DP (71140888)
|                              |   - Modbus RS485 (71140889)
|                              |   - Modbus TCP (71140890)
|                              |   - EtherNet/IP (71219868)
|                              |   - Only Ethernet without fieldbus (71135634)
|                              |   If fieldbus communication is subsequently required, an activation code is needed for this.
|                              |   If you retrofit a 485 module, any existing current outputs are disabled! |
|                              | • Additional inputs or outputs, relays:
|                              |   - Module 2AI (71135639): 2 current inputs
|                              |   - Module 2AO (71135632): 2 current outputs
|                              |   - Module AOR (71111053): 2 current outputs, 2 relays
|                              |   - Module 2R (71125375) or 4R (71125376): 2 or 4 relays
|                              |   - Module DIO (71135638): 2 digital inputs and 2 digital outputs |
| Basic rule for extensions | The sum of all current inputs and outputs may not exceed 8! |
| Restrictions if using CUS71D sensors for interface measurement | • Only one CUS71D can be connected. The second Memosens input may not be used. |
| Product Configurator | [www.products.endress.com/cm442r](http://www.products.endress.com/cm442r) |
Function diagram CM442R

1. Current output 1:1, + HART (optional)
2. Current outputs (2 x optional)
3. 2 x Memosens input (1 x optional)
4. PROFIBUS DP/Modbus/Ethernet (optional)
5. 2 x current input (optional)
6. Power supply
7. Service interface
8. Power supply, fixed cable sensors
9. Alarm relays
10. 2 or 4 x relays (optional)
11. 2 digital inputs and outputs (optional)
Device configuration using the example of a CM444R-**M42A1FA**

**Ordered basic device (example)**
- Order code CM444R-**M42A1FA**
- Functionality:
  - 4 x Memosens (2 on BASE-E module + 2 on an extension module 2DS)
  - PROFIBUS communication (module 485)
  - 2 current outputs without HART (on BASE-E module)
  - 2 current inputs (module 2AI)
- 3 slots are still free in this example. More or fewer slots can be free in other versions.

**Extension options without additional modules**
None

**Modification options without additional modules**
- Communication type changed by entering activation code
  This disables the communication type used previously!
  - Modbus RS485 (71135636)
  - Modbus TCP (71135637)
  - EtherNet/IP (71219868)
- Retrofit to HART by removing module 485 and entering activation code for HART (71128428)

**Extension options by using extension modules in free slots 5-7**
- Additional inputs or outputs, relays:
  - Module 2AI (71135639): 2 current inputs
  - Module AOR (71111053): 2 current outputs, 2 relays
  - Module 2R (71125375) or 4R (71125376): 2 or 4 relays
  - Module DIO (71135638): 2 digital inputs and 2 digital outputs
- If fieldbus module 485 is used, no other current outputs are available!

**Device upgrade to CM448R**
- 6 or 8 measuring channels by using one or two Memosens input modules 2DS (71135631)

**Basic rule for extensions**
The sum of all current inputs and outputs may not exceed 8!

**Restrictions if using CUS71D sensors for interface measurement**
- Any combination of a maximum of 4 Memosens sensors is possible with CM444R.
- An extension to CM448R is not advisable as the maximum number of Memosens inputs remains limited to 4 if a CUS71D is used.

**Product Configurator**
[www.products.endress.com/cm444r](http://www.products.endress.com/cm444r)
Function diagram CM444R

1. Current output 1:1 + HART (both optional)
2. Max. 7 x current output (optional)
3. Memasens input (2 x standard + 2 x optional)
4. PROFIBUS DP/Modbus/Ethernet (optional)
5. 2 x current input (optional)
6. Power supply (on separate DIN rail power unit)
7. Service interface
8. Power supply, fixed cable sensors
9. Alarm relays
10. 2 or 4 x relays (optional)
11. 2 digital inputs and outputs (optional)
Device configuration using the example of a CM448R-**26A1**

**Ordered basic device (example)**
- Order code CM448R-**26A1**
- Functionality:
  - 6 x Memosens (2 on BASE-E module + 2 on two extension modules 2DS)
  - PROFINET communication (module 485)
- 3 slots are still free in this example. More or fewer slots can be free in other versions.

**Extension options without additional modules**
None

**Modification options without additional modules**
- Communication type changed by entering activation code
  This disables the communication type used previously!
  - Modbus RS485 (71135636)
  - Modbus TCP (71135637)
  - EtherNet/IP (71219868)
- Retrofit to HART by removing module 485 and entering activation code for HART (71128428)

**Extension options by using extension modules in free slots 5-7**
Only the following is possible for the example above:
- Module 2R (71125375) or 4R (71125376): 2 or 4 relays
  If extending to eight measuring channels:
  - Module 2DS (71135631): 2 Memosens inputs
  - Use of the 2 current outputs in the basic module by entering activation code (71140891)

Additional inputs or outputs and relays if fieldbus module 485 is removed:
- Module 2AO (71135632): 2 current outputs
- Module AOR (71111053): 2 current outputs, 2 relays
- Module 2R (71125375) or 4R (71125376): 2 or 4 relays
- Module DIO (71135638): 2 digital inputs and 2 digital outputs

**Basic rule for extensions**
The sum of all current inputs and outputs may not exceed 8!

**Restrictions if using CUS71D sensors for interface measurement**
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.

**Product Configurator**
www.products.endress.com/cm448r
Liquiline CM442R/CM444R/CM448R

Function diagram CM448R

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

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Communication and data processing

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

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

Extension module 485 and current outputs
For communication types PROFIBUS DP, Modbus and Ethernet:
- CM442R:
  - Current outputs cannot be used in parallel. Any existing current outputs are deactivated with the installation of 485.
- CM444R/CM448R:
  - Max. of 2 current outputs can be used in parallel.

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

Dependability

Reliability

Memosens technology

Memosens makes your measuring point safer and more reliable:
- Non-contact, digital signal transmission enables optimum galvanic isolation
- No contact corrosion
- Completely watertight
- Laboratory sensor calibration possible, thus increasing measured value availability
- Predictive maintenance thanks to recording of sensor data, e.g.:
  - Total hours of operation
  - Hours of operation with very high or very low measured values
  - Hours of operation with high temperatures
  - Number of steam sterilizations
  - Sensor condition

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.

Upper and lower limit values can be enabled or disabled independently of one another for the SCS.

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 failure
- 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 with the tables set down in the standards. An alarm is triggered if the limit value is exceeded. In addition, a prealarm can be set that flags undesirable operating statuses 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

<table>
<thead>
<tr>
<th>Maintainability</th>
<th>Modular design</th>
</tr>
</thead>
<tbody>
<tr>
<td>The modular transmitter design means</td>
<td>The modular transmitter design means it can be easily adapted to suit your needs:</td>
</tr>
<tr>
<td>it can be easily adapted to suit</td>
<td>• Retrofit extension modules for new or extended range of functions, e.g. current</td>
</tr>
<tr>
<td>your needs:</td>
<td>outputs, relays and digital communication</td>
</tr>
<tr>
<td>• Upgrade to maximum of eight-channel</td>
<td>• Upgrade to maximum of eight-channel measurement</td>
</tr>
<tr>
<td>measurement</td>
<td>• Optional: external graphic display for cabinet installation or portable service</td>
</tr>
<tr>
<td>• Optional: external graphic display</td>
<td>display for commissioning</td>
</tr>
</tbody>
</table>

![CM448R: example](image1)

Fitting the 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

![Data logbook: Graphic display](image)

Logbooks remain unchanged even after a software update.

**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

SD card
The exchangeable storage medium enables:
- Quick and easy software updates and upgrades
- Data storage of internal device memory (e.g. logs)
- Transfer of complete configurations to a device with an identical setup (backup function)
- Transfer of configurations without the TAG and bus address to devices with an identical setup (copy function)

Endress+Hauser offers industry-approved SD cards as accessories. These memory cards provide maximum data security and integrity. Other SD cards can also be used. However, Endress+Hauser does not accept any responsibility for the data security of such cards.
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 6 'virtual' process values.

The 'virtual' process values can be:
- Output via a current output or a Fieldbus
- Used as a regulating control variable
- Assigned as a measured variable to a limit contactor
- Used as a measured variable to trigger cleaning
- Displayed in user-defined measuring menus.

The following mathematical functions are possible:
- pH calculation based on two conductivity values acc. to VGB 405 RL, e.g. in boiler feed water
- Difference between two measured values from different sources, e.g. for membrane monitoring
- Differential conductivity, e.g. monitoring the efficiency of ion exchangers
- Degassed conductivity, e.g. for process controls in power plants
- Redundancy for monitoring two or three redundantly measuring sensors
- rH calculation based on the measured values of a pH and an ORP sensor

<table>
<thead>
<tr>
<th>Security</th>
<th>Real-time clock</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

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

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

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

Support in the performance of this task can be requested from Endress+Hauser.
## Input

### Measured variables

---> Documentation of the connected sensor

### Measuring ranges

---> Documentation of the connected sensor

### Types of input

- Digital sensor inputs for sensors with Memosens protocol
- Analog current inputs (optional)
- Digital inputs (optional)

### Input signal

Depending on the version
- Max. 8 x binary sensor signal
- 2 x 0/4 to 20 mA (optional), passive, potentially isolated from one another and from the sensor inputs
- 0 to 30 V

### Cable specification

#### Cable type

Memosens data cable CYK10 or fixed sensor cable, each with cable end sleeves or M12 round pin plug

#### Cable length

Max. 100 m (330 ft)

## Digital inputs, passive

### Electrical specification

- drawing power (passive)
- galvanically isolated

### Span

<table>
<thead>
<tr>
<th></th>
<th>High: 11 to 30 V DC</th>
<th>Low: 0 to 5 V DC</th>
</tr>
</thead>
</table>

### Nominal input current

Max. 8 mA

### PFM function

Minimum pulse width: 500 μs (1 kHz)

## Current input, passive

### Span

> 0 to 20 mA

### Signal characteristic

Linear

### Internal resistance

Non-linear

### Testing voltage

500 V
Output

Output signal

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

HART

<table>
<thead>
<tr>
<th>Signal encoding</th>
<th>FSK ± 0.5 mA above current signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission rate</td>
<td>1200 baud</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>Load</td>
<td>250 Ω</td>
</tr>
<tr>
<td>(communication resistor)</td>
<td></td>
</tr>
</tbody>
</table>

PROFIBUS DP/RS485

<table>
<thead>
<tr>
<th>Signal encoding</th>
<th>EIA/TIA-485, PROFIBUS-DP-compliant as per IEC 61158</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission rate</td>
<td>9.6 kbd, 19.2 kbd, 45.45kb, 93.75 kbd, 187.5 kbd, 500 kbd, 1.5 Mbd, 6 Mbd, 12 Mbd</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>Bus termination</td>
<td>Internal slide switch with LED display</td>
</tr>
</tbody>
</table>

Modbus RS485

<table>
<thead>
<tr>
<th>Signal encoding</th>
<th>EIA/TIA-485</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission rate</td>
<td>2400, 4800, 9600, 19200, 38400, 57600 and 115200 Baud</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>Bus termination</td>
<td>Internal slide switch with LED display</td>
</tr>
</tbody>
</table>

Ethernet and Modbus TCP

<table>
<thead>
<tr>
<th>Signal encoding</th>
<th>IEEE 802.3 (ethernet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission rate</td>
<td>10 / 100 MBd</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>IP address</td>
<td>DHCP or configuration via menu</td>
</tr>
</tbody>
</table>

EtherNet/IP

<table>
<thead>
<tr>
<th>Signal encoding</th>
<th>IEEE 802.3 (ethernet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data transmission rate</td>
<td>10 / 100 MBd</td>
</tr>
<tr>
<td>Galvanic isolation</td>
<td>Yes</td>
</tr>
<tr>
<td>Connection</td>
<td>RJ45</td>
</tr>
<tr>
<td>IP address</td>
<td>DHCP (default) or configuration via menu</td>
</tr>
</tbody>
</table>
| **Signal on alarm** | Adjustable, as per NAMUR Recommendation NE 43  
- In the measuring range 0 to 20 mA (HART is not available with this measuring range):  
  Error current from 0 to 23 mA  
- In the measuring range 4 to 20 mA:  
  Error current from 2.4 to 23 mA  
- Factory setting of the error current for both measuring ranges:  
  21.5 mA |
| **Load** | Max. 500 Ω |
| **Linearization/transmission behavior** | Linear |

### Digital outputs, passive

| **Electrical specification** | passive  
- open collector, max. 30 V, 15 mA |
| **PFM function** | Minimum pulse width: 500 μs (1 kHz) |
| **Auxiliary voltage** | **Electrical specification**  
- galvanically isolated  
- unregulated, 24 V DC ± 20%  
- max. 50 mA |

### Current outputs, active

| **Span** | 0 to 23 mA  
2.4 to 23 mA for HART communication |
| **Signal characteristic** | Linear |
| **Electrical specification** | **Output voltage**  
Max. 24 V  
**Testing voltage**  
500 V |
| **Cable specification** | **Cable type**  
Recommendation: shielded cable  
**Cable specification**  
Max. 2.5 mm² (14 AWG) |
Relay outputs

**Electrical specification**

**Relay types**
- 1 one-pin changeover contact (alarm relay)
- 2 or 4 one-pin changeover contacts, (optionally with extension modules)

**Relay switching capacity**

**Basic module**
(Alarm relay)

<table>
<thead>
<tr>
<th>Switching voltage</th>
<th>Load (max.)</th>
<th>Switching cycles (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 V AC, cosφ = 0.8 to 1</td>
<td>0.1 A</td>
<td>700,000</td>
</tr>
<tr>
<td>0.5 A</td>
<td>450,000</td>
<td></td>
</tr>
<tr>
<td>115 V AC, cosφ = 0.8 to 1</td>
<td>0.1 A</td>
<td>1,000,000</td>
</tr>
<tr>
<td>0.5 A</td>
<td>650,000</td>
<td></td>
</tr>
<tr>
<td>24 V DC, L/R = 0 to 1 ms</td>
<td>0.1 A</td>
<td>500,000</td>
</tr>
<tr>
<td>0.5 A</td>
<td>350,000</td>
<td></td>
</tr>
</tbody>
</table>

**Extension modules**

<table>
<thead>
<tr>
<th>Switching voltage</th>
<th>Load (max.)</th>
<th>Switching cycles (min.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>230 V AC, cosφ = 0.8 to 1</td>
<td>0.1 A</td>
<td>700,000</td>
</tr>
<tr>
<td>0.5 A</td>
<td>450,000</td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>120,000</td>
<td></td>
</tr>
<tr>
<td>115 V AC, cosφ = 0.8 to 1</td>
<td>0.1 A</td>
<td>1,000,000</td>
</tr>
<tr>
<td>0.5 A</td>
<td>650,000</td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>170,000</td>
<td></td>
</tr>
<tr>
<td>24 V DC, L/R = 0 to 1 ms</td>
<td>0.1 A</td>
<td>500,000</td>
</tr>
<tr>
<td>0.5 A</td>
<td>350,000</td>
<td></td>
</tr>
<tr>
<td>2 A</td>
<td>150,000</td>
<td></td>
</tr>
</tbody>
</table>

**Minimum load (typical)**
- Min. 100 mA with 5 V DC
- Min. 1 mA with 24 V DC
- Min. 5 mA with 24 V AC
- Min. 1 mA with 230 V AC

**Cable specification**

**Cross-section**
Max. 2.5 mm² (14 AWG)
## Protocol-specific data

### HART

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>11_{h}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device type</td>
<td>119C_{h} (CM44x), 119D_{h} (CSFxx)</td>
</tr>
<tr>
<td>Device revision</td>
<td>001_{h}</td>
</tr>
<tr>
<td>HART version</td>
<td>7.2</td>
</tr>
</tbody>
</table>
| Device description files (DD/DTM) | www.endress.com
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

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>11_{h}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device type</td>
<td>155D_{h} (CM44x)</td>
</tr>
<tr>
<td>Profile version</td>
<td>3.02</td>
</tr>
</tbody>
</table>
| Device master files (GSD) | www.products.endress.com/profibus
Device Integration Manager DIM |
| Output         | 16 AI blocks, 8 DI blocks |
| Input          | 4 AO blocks, 8 DO blocks |
| Supported features | • 1 MSCY0 connection (cyclical communication, master class 1 to slave)  
• 1 MSAC1 connection (acyclic communication, master Class 1 to slave)  
• 2 MSAC2 connections (acyclic communication, master Class 2 to slave)  
• Device lock: the device can be locked via the hardware or software.  
• Addressing using DIL switches or via the software  
• GSD, PDM DD, DTM |

### Modbus RS485

<table>
<thead>
<tr>
<th>Protocol</th>
<th>RTU / ASCII</th>
</tr>
</thead>
<tbody>
<tr>
<td>Function codes</td>
<td>03, 04, 06, 08, 16, 23</td>
</tr>
<tr>
<td>Broadcast supported for function codes</td>
<td>06, 16, 23</td>
</tr>
<tr>
<td>Output data</td>
<td>16 measured values (value, unit, status), 8 digital values (value, status)</td>
</tr>
<tr>
<td>Input data</td>
<td>4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information</td>
</tr>
<tr>
<td>Supported features</td>
<td>Address can be configured via switches or the software</td>
</tr>
</tbody>
</table>
## Modbus TCP

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP port</td>
<td>502</td>
</tr>
<tr>
<td>TCP connections</td>
<td>3</td>
</tr>
<tr>
<td>Protocol</td>
<td>TCP</td>
</tr>
<tr>
<td>Function codes</td>
<td>03, 04, 06, 08, 16, 23</td>
</tr>
<tr>
<td>Broadcast supported for function codes</td>
<td>06, 16, 23</td>
</tr>
<tr>
<td>Output data</td>
<td>16 measured values (value, unit, status), 8 digital values (value, status)</td>
</tr>
<tr>
<td>Input data</td>
<td>4 setpoints (value, unit, status), 8 digital values (value, status), diagnostic information</td>
</tr>
<tr>
<td>Supported features</td>
<td>Address can be configured via DHCP or the software</td>
</tr>
</tbody>
</table>

## EtherNet/IP

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol</td>
<td>EtherNet/IP</td>
</tr>
<tr>
<td>ODVA certification</td>
<td>Yes</td>
</tr>
<tr>
<td>Device profile</td>
<td>Generic device (product type: 0x2B)</td>
</tr>
<tr>
<td>Manufacturer ID</td>
<td>0x049E h</td>
</tr>
<tr>
<td>Device type ID</td>
<td>0x109C h</td>
</tr>
<tr>
<td>Polarity</td>
<td>Auto-MDI-X</td>
</tr>
<tr>
<td>Connections (max.)</td>
<td>CIP: 12, I/O: 6, Explicit message: 6, Multicast: 3 consumers</td>
</tr>
<tr>
<td>Minimum RPI</td>
<td>100 ms (default)</td>
</tr>
<tr>
<td>Maximum RPI</td>
<td>10000 ms</td>
</tr>
<tr>
<td>System integration</td>
<td>EtherNet/IP, EDS</td>
</tr>
<tr>
<td>Rockwell</td>
<td>Add-on Profile Level 3, Faceplate for FactoryTalk SE</td>
</tr>
<tr>
<td>IO data</td>
<td>Input (T → O): Device status and diagnostic message with highest priority, Measured values: 16 AI (analog input) + Status + Unit, 8 DI (discrete input) + Status</td>
</tr>
<tr>
<td>Output (O → T): Actuating values: 4 AO (analog output) + status + unit, 8 DO (discrete output) + Status</td>
<td></td>
</tr>
</tbody>
</table>

## Web server

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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>TCP port</td>
<td>80</td>
</tr>
<tr>
<td>Supported features</td>
<td>Remote-controlled device configuration (1 session), Device configuration saved/restored, Logbook export (file formats: CSV, FDM), Web server accessed via DTM or Internet Explorer, Login, Web server can be switched off</td>
</tr>
</tbody>
</table>
### Power supply

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>CM442R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depending on the version:</td>
<td></td>
</tr>
<tr>
<td>100 to 230 V AC ± 15%, 50/60 Hz</td>
<td></td>
</tr>
<tr>
<td>24 V AC/DC +20/-15 %, 50/60 Hz</td>
<td></td>
</tr>
</tbody>
</table>

**CM444R and CM448R**

Via external DIN rail power unit depending on version:

- 100 to 230 V AC ± 15%, 50/60 Hz
- 24 V DC +20 / -15 %

**NOTICE**

The device does not have a power switch

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

<table>
<thead>
<tr>
<th>Fieldbus connection</th>
<th>Supply voltage: not applicable</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Power consumption</th>
<th>CM442R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depending on supply voltage</td>
<td></td>
</tr>
<tr>
<td>- 100 to 230 V AC and 24 V AC:</td>
<td></td>
</tr>
<tr>
<td>Max. 55 VA</td>
<td></td>
</tr>
<tr>
<td>- 24 V DC:</td>
<td></td>
</tr>
<tr>
<td>Max. 22 W</td>
<td></td>
</tr>
</tbody>
</table>

**CM444R and CM448R**

Depending on supply voltage

- 100 to 230 V AC:
  - Max. 150 VA
- 24 V DC:
  - Max. 59 W

<table>
<thead>
<tr>
<th>Fuse</th>
<th>CM442R</th>
</tr>
</thead>
<tbody>
<tr>
<td>5x20 mm, 250 V, 4.0 A, slow-blow (T4.0A)</td>
<td></td>
</tr>
</tbody>
</table>

**CM444R and CM448R**

Fuse cannot be replaced
## Electrical connection

### Basic module

Basic module BASE-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\(^1\)
4. Service interface
5. Connections for 2 Memosens sensors
6. Current outputs
7. Power connection
8. Fuse
9. Alarm relay connection

Basic module BASE-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\(^1\)
4. Service interface
5. Connections for 2 Memosens sensors
6. Current outputs
7. LEDs
8. Socket for internal supply cable\(^2\)
9. Alarm relay connection

---

1) For optional external display
2) Power supply for DIN rail power unit
Connecting supply voltage for CM442R

Power supply connection on BASE-H or -L

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

Overall wiring diagram BASE-H or -L
Connecting supply voltage for CM444R and CM448R

Both device versions must be operated exclusively using the power unit provided, including its cable. Also comply with the instructions in the Operating Instructions supplied with the power unit.

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

- If you are planning to extend your controller, make sure the resulting hardware combination is permitted (Configurator at www.products.endress.com/cm442r or .../cm444r or .../CM448r).
- Remember that the sum of all current inputs and outputs may not exceed 8!
- Please contact your Endress+Hauser sales center should you have any questions.
Liquiline CM442R/CM444R/CM448R

Module name

<table>
<thead>
<tr>
<th>Module</th>
<th>AOR</th>
<th>2R</th>
<th>4R</th>
<th>2DS</th>
<th>DIO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Module</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>a0015747</td>
<td>a0015748</td>
<td>a0015749</td>
<td>a0015754</td>
<td>a0019835</td>
</tr>
<tr>
<td>• 2 x 0/4 to 20 mA analog outputs</td>
<td>• 2 relays</td>
<td>• 4 relays</td>
<td>• 2 digital sensor inputs</td>
<td>• 2 digital inputs</td>
<td></td>
</tr>
<tr>
<td>• 2 relays</td>
<td>Order no.</td>
<td>Order no.</td>
<td>2 power supply systems for digital sensors</td>
<td>2 digital outputs with auxiliary voltage</td>
<td></td>
</tr>
<tr>
<td>• Order no. 71111053</td>
<td>71125375</td>
<td>71125376</td>
<td>Order no. 71135631</td>
<td>Order no. 71135638</td>
<td></td>
</tr>
</tbody>
</table>

- 2 power supply systems for digital sensors
- Order no. 71135631
- 2 digital outputs
- 2 digital outputs with auxiliary voltage
- Order no. 71135638
### PROFIBUS DP (module 485)

Contacts A - A', B - B' and C - C' are bridged in the connector. This ensures that PROFIBUS communication is not interrupted if the connector is disconnected.

### Functional ground connection

Mounting rail for functional ground connections
Sensor connection

Sensors with Memosens protocol

<table>
<thead>
<tr>
<th>Sensor types</th>
<th>Sensor cable</th>
<th>Sensors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital sensors without additional internal power supply</td>
<td>CYK10 with plug-in connection and inductive signal transmission</td>
<td>pH sensors, ORP sensors, Combined sensors, Amperometric oxygen sensors, Conductive conductivity sensors, Chlorine sensors</td>
</tr>
<tr>
<td>Digital sensors with additional internal power supply</td>
<td>Fixed cable</td>
<td>Turbidity sensors, Sensors for interface measurement, Sensors for measuring the spectral absorption coefficient (SAC), Nitrate sensors, Optical oxygen sensors, Ion-sensitive sensors</td>
</tr>
</tbody>
</table>

The following rule applies if connecting CUS71D sensors:

- **CM442R**
  - 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.
- **CM444R**
  - No restrictions. All the sensor inputs can be used as required.
- **CM448R**
  - 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.

Connection methods

1. Sensor cable directly connected to the terminal connector of the sensor module 2DS or the basic module -L, -H or -E
## Performance characteristics

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Response time</strong></td>
<td></td>
</tr>
<tr>
<td>Current outputs</td>
<td>Current outputs: $t_{90} =$ max. 500 ms for an increase from 0 to 20 mA</td>
</tr>
<tr>
<td>Current inputs</td>
<td>Current inputs: $t_{90} =$ max. 330 ms for an increase from 0 to 20 mA</td>
</tr>
<tr>
<td>Digital inputs and outputs</td>
<td>Digital inputs and outputs: $t_{90} =$ max. 330 ms for an increase from low to high</td>
</tr>
<tr>
<td><strong>Reference temperature</strong></td>
<td>25 °C (77 °F)</td>
</tr>
<tr>
<td><strong>Maximum measured error of sensor inputs</strong></td>
<td>--&gt; Documentation of the connected sensor</td>
</tr>
</tbody>
</table>
| **Measured error for current inputs and outputs** | Typical measured errors:  
- < 20 μA (for current values < 4 mA)  
- < 50 μA (for current values  
  4 to 20 mA)  
  each at 25 °C (77 °F)  
- Additional measured error depending on the temperature:  
  < 1.5 μA/K |
| **Frequency tolerance of digital inputs and outputs** | ≤ 1 % |
| **Resolution of current inputs and outputs**  | < 5 μA                                                                       |
| **Repeatability**                             | --> Documentation of the connected sensor                                     |

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

DIN rail mounting

Mounting on DIN rail as per IEC 60715

**NOTICE**

Incorrect mounting location in cabinet, safety distances not observed
Possible failure as a result of heat generation, interference from neighboring devices
- Do not position the device directly above sources of heat. Comply with temperature specifications.
- The components are designed for convection-based cooling. Avoid heat build-up and ensure openings are not covered over (by cables, for instance).
- Make sure to maintain the specified distances to other devices.
- Physically separate the device from frequency converters and high-voltage instruments.
- Recommended installation direction: horizontal. The specified ambient conditions, and particularly the ambient temperatures, only apply for this orientation.
- A vertical alignment is possible. For this, however, you must provide additional fixing clamps at the point of installation to hold the device in position on the DIN rail.
- Recommended installation position of the power unit on CM444R and CM448R devices: to the left of the device.

The following minimum spacing must be observed:
- Distances at the side in relation to other devices incl. power units and to the wall of the cabinet:
  At least 20 mm (0.79 inch)
- Above and below the device and with regard to the depth of the device (in relation to the cabinet door or other devices installed there):
  At least 50 mm (1.79 inch)

Wall mounting

Using eyelets and slotted holes on housing
Mounting the external display

The mounting plate also acts as the drilling template. The marks at the side help you mark out the position for the drill holes.

Mounting plate for external display in mm (inch)

a  Holding clip
b  Production-related cut-outs, no function for user
## Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Ambient temperature range</strong></td>
<td></td>
</tr>
<tr>
<td><strong>CM442R</strong></td>
<td>0 to 60 °C (32 to 140 °F)</td>
</tr>
</tbody>
</table>
| **CM444R**                    | - Generally 0 to 55 °C (32 to 130 °F), with the exception of packages under the second point in the list.  
- 0 to 50 °C (32 to 120 °F) for the following packages:  
  - CM444R-**M40A7FI*+...  
  - CM444R-**M40A7FK*+... |
| **CM448R**                    | - Generally 0 to 55 °C (32 to 130 °F), with the exception of packages under the second point in the list.  
- 0 to 50 °C (32 to 120 °F) for the following packages:  
  - CM448R-***6AA*+...  
  - CM448R-***8A4*+...  
  - CM448R-***8A5*+...  
  - CM448R-***28A3*+...  
  - CM448R-***38A3*+...  
  - CM448R-***48A3*+...  
  - CM448R-***58A3*+...  
  - CM448R-***68A3*+...  
  - CM448R-***26A5*+...  
  - CM448R-***36A5*+...  
  - CM448R-***46A5*+...  
  - CM448R-***56A5*+...  
  - CM448R-***66A5*+...  
  - CM448R-***22A7*+...  
  - CM448R-***32A7*+...  
  - CM448R-***42A7*+...  
  - CM448R-***52A7*+...  
  - CM448R-***62A7*+... |
| **External display (optional)**| -20 to 60 °C (0 to 140 °F)                         |
| **Storage temperature**       | -25 to 85 °C (-13 to 185 °F)                      |
| **Relative humidity**         | **DIN rail device**                                |
|                               | 5 to 85%, not condensing                          |
| **External display (when installed)** | 10 to 95%, not condensing                          |
| **Degree of protection**      | **DIN rail device**                                |
|                               | Shock protection IP20                              |
| **External display**          | IP 66 at front, when installed correctly and using appropriate protective enclosure |
| **Climate class**             | As per 60654-1: B2                                 |
| **Vibration resistance**      | **Environmental tests**                            |
|                               | Vibration test based on DIN EN 60068-2, October 2008 |
|                               | Vibration test based on DIN EN 60654-3, August 1998 |
| **Wall mounting**             |                                                   |
|                               | **Frequency range**                               |
|                               | 10 to 150 Hz (sinusoidal)                         |
|                               | **Amplitude**                                     |
|                               | 10 to 12.9 Hz: 0.75 mm                             |
|                               | 12.9 to 150 Hz: 0.5 g 1)                          |
|                               | **Test duration**                                  |
|                               | 10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min) |
Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326-1: 2006, class A for industry

Electrical safety

IEC 61010-1, Class I equipment
Low voltage: overvoltage category II
Environment < 2000 m (< 6562 ft) above MSL

Pollution degree

DIN rail device
The product is suitable for pollution degree 2.

External display
The product is suitable for pollution degree 4.

Mechanical construction

Dimensions

CM442R

Dimensions in mm (inch)
Optional, external display

Dimensions of external optional display in mm (inch)

External power units (only CM444R and CM448R)
For the dimensions please refer to the enclosed operating manuals of the power units

**Weight**

<table>
<thead>
<tr>
<th>Description</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM442R (fully assembled)</td>
<td>approx. 0.45 kg (1 lbs)</td>
</tr>
<tr>
<td>CM444R and CM448R (fully assembled)</td>
<td>approx. 0.95 kg (2.1 lbs)</td>
</tr>
<tr>
<td>Individual module</td>
<td>approx. 0.06 kg (0.13 lbs)</td>
</tr>
<tr>
<td>External display (excluding cable)</td>
<td>approx. 0.56 kg (1.2 lbs)</td>
</tr>
<tr>
<td>External power unit (CM444R, CM448R)</td>
<td>See Operating Instructions for power unit</td>
</tr>
</tbody>
</table>

**Material**

<table>
<thead>
<tr>
<th>Item</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN rail housing</td>
<td>PC-FR</td>
</tr>
<tr>
<td>Display cover</td>
<td>PC-FR</td>
</tr>
<tr>
<td>Soft keys</td>
<td>EPDM</td>
</tr>
<tr>
<td>Display seal</td>
<td>EPDM</td>
</tr>
<tr>
<td>Module covers</td>
<td>PBT GF30 FR</td>
</tr>
<tr>
<td>Terminal strip</td>
<td>Brass, nickel-plated</td>
</tr>
<tr>
<td>Ground terminals</td>
<td>Stainless steel 1.4301 (AISI304)</td>
</tr>
<tr>
<td>Screws</td>
<td>Stainless steel 1.4301 (AISI304)</td>
</tr>
<tr>
<td>Mounting plate (display)</td>
<td>Stainless steel 1.4301 (AISI304)</td>
</tr>
<tr>
<td>Securing screws (display)</td>
<td>Steel, galvanized</td>
</tr>
</tbody>
</table>
Operability

**Operation concept**
The simple and structured operating concept sets new standards:
- Local operation via external, optional display or remote operation via web server/Ethernet or fieldbus (optional)
- 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

**External display**
Graphic display:
- Back light with switch-off function
- Red display background for alarms alerts users to errors
- Transflective display technology for maximum contrast even in bright environments
- User-definable measuring menus mean you can always keep track of the values that are important for your application.
- Load curve display
Local operation via external, optional display

![Local operation via external display](image)

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

Remote operation

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

![Remote operation via HART](image)

HART via modem

1. Device module Base-L, -H or -E: current output 1 with HART
2. HART modem to connect to PC, e.g. FA195
3. HART handheld terminal

1) Switch position "on" (replaces resistance)
Via PROFIBUS DP

PROFIBUS DP

T Terminating resistor

Via Modbus RS485

Modbus RS485

T Terminating resistor

Endress+Hauser
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
- French
- Swedish
- Spanish
- Italian
- Dutch
- Portuguese
- Polish
- Russian
- Turkish
- Chinese (Simplified, PR China)
- Japanese
- Czech
Liquiline CM442R/CM444R/CM448R

Ordering information

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

www.products.endress.com/cm442r
www.products.endress.com/cm444r
www.products.endress.com/cm448r

1. On the right-hand side of the product page, you will find the following selection options:

   Product page function
   :: Add to product list
   :: Price & order information
   :: Compare this product
   :: Configure this product

2. Select "Configure this product".

3. A new window opens with the Configurator. Using this tool, you can configure your device and you will receive a valid and complete order code for this.

4. Then export the order code as a PDF or as an Excel file selecting from the buttons provided at the top of the page.

Scope of delivery
- 1 controller in the version ordered
- 1 external display (optional)
- 1 DIN rail power unit incl. cable (only CM444R and CM448R)
- 1 printed copy of the Operating Instructions for the DIN rail power unit
- 1 CD with Operating Instructions
- 1 printed copy of the Brief Operating Instructions in the language ordered

Certificates and approvals

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

cCSAus  Application submitted.
Accessories

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

Measuring cable

- **Memosens data cable CYK10**
  - For digital sensors with Memosens technology
  - pH, ORP, oxygen (amperometric), chlorine, conductivity (conductive)
  - Order as per product structure (→ online Configurator, www.products.endress.com/cyk10)
  - Technical Information TI00118C/07/EN

- **Memosens data cable CYK11**
  - Extension cable for digital sensors with Memosens protocol
  - Order as per product structure (→ online Configurator, www.products.endress.com/cyk11)

- **Measuring cable CYK81**
  - Unterminated cable for extending sensor cables (e.g. Memosens)
  - 2 x 2 cores, twisted with shielding and PVC sheath (2 x 2 x 0.5 mm² + shielding)
  - Material sold by the meter, Order No.: 51502543

Sensors

Glass electrodes

- **Orbisint CPS11D**
  - pH sensor with Memosens technology
  - Dirt-repellent PTFE diaphragm
  - Order as per product structure (→ online Configurator, www.products.endress.com/cps11d)
  - Technical Information TI00028C/07/EN

- **Memosens CPS31D**
  - pH sensor with Memosens technology
  - Gel-filled reference system with ceramic diaphragm
  - Order as per product structure (→ online Configurator, www.products.endress.com/cps31d)
  - Technical Information TI00030C/07/EN

- **Ceraliquid CPS41D**
  - pH sensor with Memosens technology
  - Ceramic diaphragm and KCl liquid electrolyte
  - Order as per product structure (→ online Configurator, www.products.endress.com/cps41d)
  - Technical Information TI00079C/07/EN

- **Ceragel CPS71D**
  - pH sensor with Memosens technology
  - Poison-resistant reference with ion trap
  - Order as per product structure (→ online Configurator, www.products.endress.com/cps71d)
  - Technical Information TI00245C/07/EN

- **Orbipore CPS91D**
  - pH sensor with Memosens technology
  - Open aperture diaphragm for media with high dirt load
  - Order as per product structure (→ online Configurator, www.products.endress.com/cps91d)
  - Technical Information TI00375C/07/EN

- **Orbipac CPF81D**
  - Compact pH sensor for installation or immersion operation in process water and wastewater
  - Order as per product structure (→ online Configurator, www.products.endress.com/cpf81d)
  - Technical Information TI191C/07/EN

Enamel pH electrodes

- **Ceramax CPS341D**
  - pH electrode with pH-sensitive enamel
  - Meets highest demands of measuring accuracy, pressure, temperature, sterility and durability
  - Order as per product structure (→ online Configurator, www.products.endress.com/cps341d)
  - Technical Information TI00468C/07/EN
ORP sensors

Orbisint CPS12D
- ORP sensor with Memosens technology
- Dirt-repellent PTFE diaphragm;
- Order as per product structure (--> online Configurator, www.products.endress.com/cps12d)
- Technical Information TI367C/07/EN

Ceraliquid CPS42D
- ORP sensor with Memosens technology
- Ceramic diaphragm and KCl liquid electrolyte
- Order as per product structure (--> online Configurator, www.products.endress.com/cps42d)
- Technical Information TI373C/07/EN

Ceragel CPS72D
- ORP sensor with Memosens technology
- Poison-resistant reference with ion trap
- Order as per product structure (--> online Configurator, www.products.endress.com/cps72d)
- Technical Information TI374C/07/EN

Orbipac CPF82D
- Compact ORP sensor for installation or immersion operation in process water and wastewater
- Order as per product structure (--> online Configurator, www.products.endress.com/cpf82d)
- Technical Information TI191C/07/EN

Orbipore CPS92D
- ORP sensor with Memosens technology
- Open aperture diaphragm for media with high dirt load
- Order as per product structure (--> online Configurator, www.products.endress.com/cps92d)
- Technical Information TI435C/07/EN

pH ISFET sensors

Tophit CPS471D
- Sterilizable and autoclavable ISFET sensor with Memosens technology
- For the food and pharmaceutical industries, process engineering, water treatment and biotechnology
- Order as per product structure (--> online Configurator, www.products.endress.com/cps471d)
- Technical Information TI283C/07/EN

Tophit CPS441D
- Sterilizable ISFET sensor with Memosens technology
- For media with low conductivity, with liquid KCl electrolyte
- Order as per product structure (--> online Configurator, www.products.endress.com/cps441d)
- Technical Information TI352C/07/EN

Tophit CPS491D
- ISFET sensor with Memosens technology
- Open aperture diaphragm for media with high dirt load
- Order as per product structure (--> online Configurator, www.products.endress.com/cps491d)
- Technical Information TI377C/07/EN

pH ORP combined sensors

Memosens CPS16D
- pH ORP combined sensor for process engineering with dirt-repellant PTFE junction
- With Memosens technology
- Order as per product structure (--> online Configurator, www.products.endress.com/cps16d)
- Technical Information TI00503C/07/EN

Memosens CPS76D
- pH/ORP combined sensor for process engineering, hygienic and sterile applications
- With Memosens technology
- Order as per product structure (--> online Configurator, www.products.endress.com/cps76d)
- Technical Information TI00506C/07/EN
Memosens CPS96D
- pH/ORP combined sensor for chemical processes
- With poison-resistant reference with ion trap
- With Memosens technology
- Order as per product structure (→ online Configurator, www.products.endress.com/cps96d)
- Technical Information TI00507C/07/EN

Inductive conductivity sensors
Indumax CLS50D
- High-stability inductive conductivity sensor for standard, Ex and high-temperature applications
- Memosens protocol
- Order as per product structure (→ online Configurator, www.products.endress.com/cls50d)
- Technical Information TI182C/07/EN
Indumax H CLS54D
- Conductive conductivity sensor with certified, hygienic design for foodstuffs, beverages, pharmaceuticals and biotechnology
- Order as per product structure, (→ Online Configurator, www.products.endress.com/cls54d)
- Technical Information TI00508C/07/EN

Conductive conductivity sensors
Condumax CLS15D
- Conductive conductivity sensor for measurement in pure and ultrapure water and in Ex applications
- Order as per product structure (→ online Configurator, www.products.endress.com/cls15d)
- Technical Information TI00109C/07/EN
Condumax CLS16D
- Hygienic conductivity sensor for measurement in pure and ultrapure water and in Ex applications
- With EHEDG and 3A certificates
- Order as per product structure (→ online Configurator, www.products.endress.com/cls16d)
- Technical Information TI227C/07/EN
Condumax CLS21D
- Two-electrode sensor in fixed cable and plug-in head version
- Order as per product structure (→ online Configurator, www.products.endress.com/cls21d)
- Technical Information TI085C/07/EN

Oxygen sensors
Oxymax COS51D
- Amperometric sensor for dissolved oxygen, with Memosens technology
- Order as per product structure (→ online Configurator, www.products.endress.com/cos51d)
- Technical Information TI00413C/07/EN
Oxymax COS61D
- Optical oxygen sensor for drinking water and industrial water measurement
  - Measuring principle: quenching
  - Memosens protocol
  - Material: stainless steel 1.4571 (AISI 316Ti)
  - Order as per product structure (→ online Configurator, www.products.endress.com/cos61d)
  - Technical Information TI387C/07/EN
Oxymax COS22D
- Sterilizable sensor for dissolved oxygen
  - Order as per product structure (→ online Configurator, www.products.endress.com/cos22d)
  - Technical Information TI446C/07/EN

Chlorine sensors
CCS142D
- Membrane-covered amperometric sensor for free chlorine
- Memosens technology
- Measuring range 0.01 to 20 mg/l
- Order as per product structure (→ online Configurator, www.products.endress.com/ccs142d)
- Technical Information TI446C/07/EN
**Ion selective sensors**
ISEmax CAS40D
- Ion selective sensors
- Order as per product structure (--> online Configurator, www.products.endress.com/cas40d)
- Technical Information TI491C/07/EN

**Turbidity sensors**
Turbimax CUS51D
- For nephelometric measurements of turbidity and solids in wastewater
- 4-beam scattered light method
- With Memosens protocol
- Order as per product structure (--> online Configurator, www.products.endress.com/cus51d)
- Technical Information TI461C/07/EN

**SAC and nitrate sensors**
Viomax CAS51D
- SAC and nitrate measurement in drinking water and wastewater
- With Memosens protocol
- Order as per product structure (--> online Configurator, www.products.endress.com/cas51d)
- Technical Information TI459C/07/EN

**Interface measurement**
Turbimax CUS71D
- Immersion sensor for interface measurement
- Ultrasonic interface sensor
- Order as per product structure (--> online Configurator, www.products.endress.com/cus71d)
- Technical Information TI490C/07/EN

**Additional functionality**
**Hardware extension modules**
Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module AOR
- 2 x relay, 2 x 0/4 to 20 mA analog output
- Order no. 71111053

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 2R
- 2 x relay
- Order no. 71125375

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 4R
- 4 x relay
- Order no. 71125376

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 2AO
- 2 x 0/4 to 20 mA analog output
- Order no. 71135632

Kit CM442/CM444/CM448/CM444R/CM448R/CSF48: extension module 4AO
- 4 x analog output 0/4 to 20 mA
- Order no. 71135633

Kit CM444/CM448/CM444R/CM448R/CSF48: extension module 2DS
- 2 x digital sensor, Memosens
- Order no. 71135631

Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 2AI
- 2 x 0/4 to 20 mA analog input
- Order no. 71135639

Kit CM442/CM444/CM448/CM444R/CM448R/CSF48: extension module DIO
- 2 x digital input
- 2 x digital output
- Auxiliary voltage supply for digital output
- Order no. 71135638
Kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48: extension module 485

- Ethernet configuration
- Can be extended to PROFIBUS DP or Modbus RS485 or Modbus TCP or EtherNet/IP. This requires an additional activation code which can be ordered separately (→ 48).
- Order no. 71135634

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- PROFIBUS DP (+ Ethernet configuration)
- Order no. 71140888

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- Modbus RS485 (+ Ethernet configuration)
- Order no. 71140889

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- Modbus TCP (+ Ethernet configuration)
- Order no. 71140890

Upgrade kit CM442/CM444/CM448/CM442R/CM444R/CM448R/CSF48

- Extension module 485
- EtherNet/IP
  (+ Ethernet configuration)
- Order no. 71219868

**Firmware and activation codes**

SD card with Liquiline firmware

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

Activation code for digital HART communication

- Order no. 71128428

Activation code for PROFIBUS DP

- Order no. 71135635

Activation code for Modbus RS485

- Order no. 71135636

Activation code for Modbus TCP

- Order no. 71135637

Activation code for EtherNet/IP

- Order no. 71219871

Kit CM442R: activation code for 2nd digital sensor input

- Order no. 71114663

Kit CM444R/CM448R: Upgrade code for 2 x 0/4 to 20 mA for BASE-E

- Order no. 71140891

Activation code for feedforward control

- Order no. 71211288

Activation code for measuring range switch

- Order no. 71211289

**Software**

Memobase Plus CYP71D

- PC software to support laboratory calibration
- Visualization and documentation of sensor management
- Sensor calibrations saved in the database
- Order as per product structure, www.products.endress.com/cyp71d
- Technical Information TI00502C/07/EN

Field Data Manager Software MS30

- PC software for central data management
- Visualization of series of measurements and logbook events
- SQL database for secure data storage
- Order no. 71129799
Other accessories

External display
- Graphic display
  - For installation in the cabinet door or cover panel
  - Order no. 71185295

Service display
- Portable, for commissioning
  - Order no. 71185296

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

Communication-specific accessories
- Commubox FXA195 HART
  - 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

- WirelessHART 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

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

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

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

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