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Operating Instructions
Liquiline CM14

Four-wire transmitter with Memosens input for conductivity

Endress+Hauser
People for Process Automation

Table of contents

1 About this document

1.1 Document function

These Operating Instructions contain all the information required in the various life cycle phases of the device: from product identification, incoming acceptance and storage, to installation, connection, operation and commissioning, through to troubleshooting, maintenance and disposal.

1.2 Symbols

1.2.1 Safety symbols

⚠ DANGER
This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.

⚠ WARNING
This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in serious or fatal injury.

⚠ CAUTION
This symbol alerts you to a potentially dangerous situation. Failure to avoid this situation can result in minor or medium injury.

NOTICE
This symbol alerts you to a potentially harmful situation. Failure to avoid this situation can result in damage to the product or something in its vicinity.

1.2.2 Symbols for certain types of information

Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation
	Reference to page
	Reference to graphic

Symbol	Meaning
	Notice or individual step to be observed
1., 2., 3...	Series of steps
	Result of a step
	Help in the event of a problem
	Visual inspection

1.2.3 Electrical symbols

	Direct current		Alternating current		Direct and alternating current
	Ground connection		Protective earth (PE)		

2 Basic safety instructions

Safe operation of the transmitter is only guaranteed if these Operating Instructions have been read and the safety instructions have been observed.

2.1 Requirements for the personnel

The personnel for installation, commissioning, diagnostics and maintenance must fulfill the following requirements:

- Trained, qualified specialists must have a relevant qualification for this specific function and task.
- Are authorized by the plant owner/operator.
- Are familiar with federal/national regulations.
- Before starting work, read and understand the instructions in the manual and supplementary documentation as well as the certificates (depending on the application).
- Follow instructions and comply with basic conditions.

The operating personnel must fulfill the following requirements:

- Are instructed and authorized according to the requirements of the task by the facility's owner-operator.
- Follow the instructions in this manual.

2.2 Intended use

The transmitter evaluates measured values of an analytical sensor and visualizes them on its multicolored display. Processes can be monitored and controlled with the device's outputs and limit relays. The device is equipped with a wide array of software functions for this purpose.

- The manufacturer is not liable for harm caused by improper or unintended use. The device must not be converted or modified in any way.
- The device is designed for installation in a panel and must only be operated in an installed state.

2.3 Product liability

The manufacturer does not accept any responsibility for damage that results from non-designated use and from failure to comply with the instructions in this manual.

2.4 Workplace safety

For work on and with the device:
- ▶ Wear the required personal protective equipment according to federal/national regulations.

2.5 Operational safety

Damage to the device!
- ▶ Operate the device in proper technical condition and fail-safe condition only.
- ▶ The operator is responsible for the interference-free operation of the device.

Modifications to the device

Unauthorized modifications to the device are not permitted and can lead to unforeseeable dangers!
- ▶ If modifications are nevertheless required, consult with the manufacturer.

Repair

To ensure continued operational safety and reliability:
- ▶ Carry out repairs on the device only if they are expressly permitted.
- ▶ Observe federal/national regulations pertaining to the repair of an electrical device.
- ▶ Use only original spare parts and accessories.

2.6 Product safety

This state-of-the-art device is designed and tested in accordance with good engineering practice to meet operational safety standards. It left the factory in a condition in which it is safe to operate.

It meets general safety standards and legal requirements. It also complies with the EU directives listed in the device-specific EU declaration of conformity. The manufacturer confirms this by affixing the CE mark.

2.7 IT security

The manufacturer 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.

3 Incoming acceptance and product identification

3.1 Incoming acceptance

Proceed as follows on receipt of the device:

1. Check whether the packaging is intact.
2. If damage is discovered:
   Report all damage immediately to the manufacturer.
3. Do not install damaged material, as the manufacturer cannot otherwise guarantee compliance with the safety requirements and cannot be held responsible for the consequences that may result.
4. Compare the scope of delivery to the contents of the order.
5. Remove all the packaging material used for transportation.

3.2 Product identification

The device can be identified in the following ways:
- Nameplate specifications
- Extended order code with breakdown of the device features on the delivery note

3.2.1 Nameplate

Do you have the correct device?

The nameplate provides you with the following information on the device:
- Manufacturer identification, device designation
- Order code
- Extended order code
- Serial number
- Tag name (TAG) (optional)
- Technical values, e.g. supply voltage, current consumption, ambient temperature, communication-specific data (optional)
- Degree of protection
- Approvals with symbols
- Reference to Safety Instructions (XA) (optional)

▶ Compare the information on the nameplate with the order.

3.2.2 Name and address of manufacturer

Name of manufacturer:	Endress+Hauser Conducta GmbH+Co. KG
Address of manufacturer:	Dieselstraße 24, D-70839 Gerlingen

3.3 Storage and transport

Note the following points:
The permitted storage temperature is −40 to 85 °C (−40 to 185 °F); it is possible to store the device at borderline temperatures for a limited period (48 hours maximum).

Pack the device for storage and transportation in such a way that it is reliably protected against impact and external influences. The original packaging offers the best protection.

Avoid the following environmental influences during storage:
- direct sunlight
- proximity to hot objects
- mechanical vibration
- aggressive media

4 Installation

4.1 Installation requirements

NOTICE

Overheating due to buildup of heat in the device

▶ To prevent heat buildup, always ensure adequate cooling of the device.

Operating the display in the upper temperature limit range decreases the operating life of the display.

The transmitter is designed for use in a panel.

The orientation is determined by the readability of the display. The connections and outputs are provided on the rear. The cables are connected via coded terminals.

Ambient temperature range: −10 to +60 °C (14 to 140 °F)

4.2 Dimensions

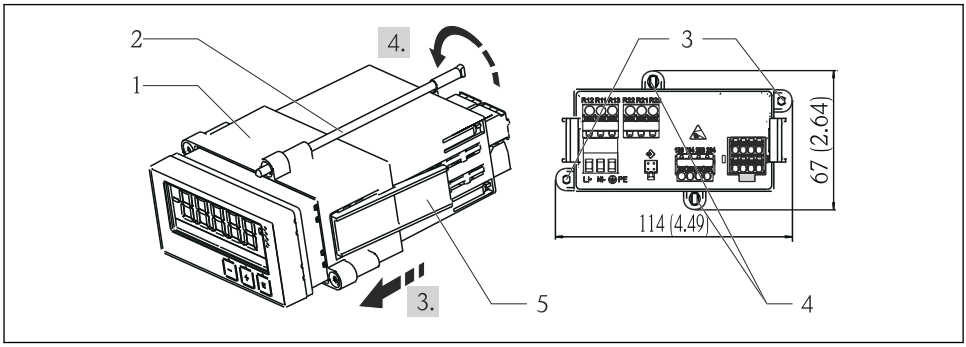
Observe an installation depth of 150 mm (5.91 in) for devices incl. terminals and fastening clips.

Further dimensions are provided in the "Technical data" section → 35.

- Panel cutout: 92 mm x 45 mm (3.62 in x 1.77 in).
- Panel thickness: max. 26 mm (1 in).
- Max. viewing angle range: 45° to the left and right from the central display axis.
- If the devices are arranged horizontally beside one another in the X-direction, or arranged vertically on top of one another in the Y-direction, the mechanical distance (specified by the housing and front section) must be observed.

4.3 Installing the device

The necessary panel cutout is 92 mm x 45 mm (3.62 in x 1.77 in).



1 Installation in a panel

1. Screw the threaded rods (item 2) into the positions provided on the mounting frame (item 1). Four opposing screw positions (item 3/4) are available for this purpose.
2. Push the device with the sealing ring through the panel cutout from the front.
3. To secure the casing in the panel, hold the device level and push the mounting frame (item 1), with the threaded rods screwed in, over the casing until the frame locks into position.
4. Tighten the threaded rods to fix the device in place.

To remove the device, the mounting frame can be unlocked at the locking elements (item 5) and then removed.

4.4 Post-installation check

- Is the sealing ring undamaged?
- Is the mounting frame securely fastened on the housing of the device?
- Are the threaded rods properly tightened?
- Is the device located in the center of the panel cutout?

5 Electrical connection

5.1 Connecting requirements

WARNING

Danger! Electric voltage

▶ The entire connection of the device must take place while the device is de-energized.

Danger if protective ground is disconnected

▶ The protective ground connection must be established before all other connections.

NOTICE

Cable heat load

▶ Use suitable cables for temperatures of 5 °C (9 °F) above ambient temperature.

Incorrect supply voltage can damage the device or cause malfunctions

▶ Before commissioning the device, make sure that the supply voltage matches the specifications on the nameplate (bottom side of the housing).

Check emergency shutdown for device

▶ Provide suitable switch or circuit breaker in building installation. This switch must be provided close to the device (within easy reach) and marked as a circuit breaker.

Protect the device from overload

▶ Provide overload protection (nominal current = 10 A) for power cable.

Incorrect wiring may result in the device being destroyed

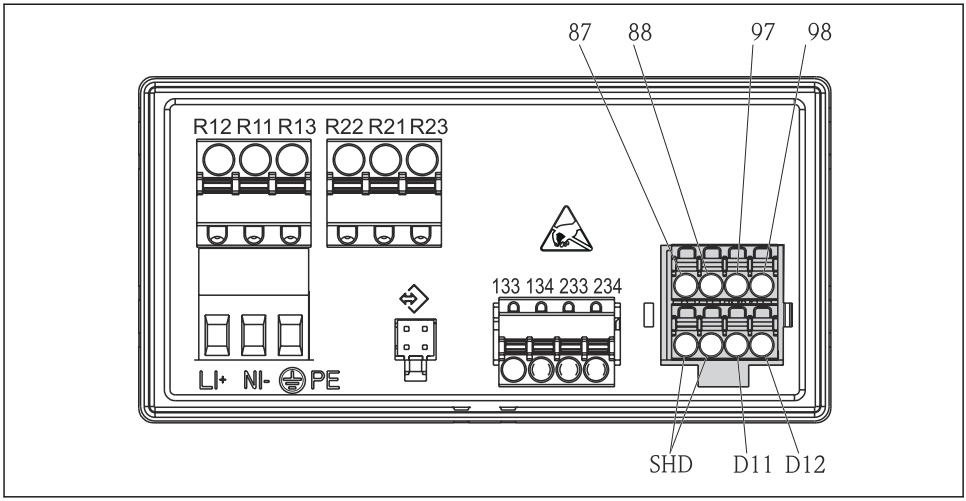
▶ Note terminal designation on the rear of the device.

Energy-rich transients in the case of long signal lines

▶ Connect a suitable overvoltage protection in series upstream.

The mixed connection of safety extra-low voltage and dangerous contact voltage to the relay is permitted.

5.2 Connecting the device



2 Connection diagram of the device

Terminal	Description
87	Terminal for Memosens cable, brown, sensor power supply U+
88	Terminal for Memosens cable, white, sensor power supply U-
97	Terminal for Memosens cable, green, Com A
98	Terminal for Memosens cable, yellow, Com B
SHD	Terminal for Memosens cable, shield
D11	Terminal for alarm output, +
D12	Terminal for alarm output, -
L/+	Terminal for transmitter supply voltage
N/-	
⏚ PE	
133	Terminal for analog output 1, +
134	Terminal for analog output 1, -
233	Terminal for analog output 2, +
234	Terminal for analog output 2, -
R11, R12, R13	Terminal for relay 1
R21, R22, R23	Terminal for relay 2

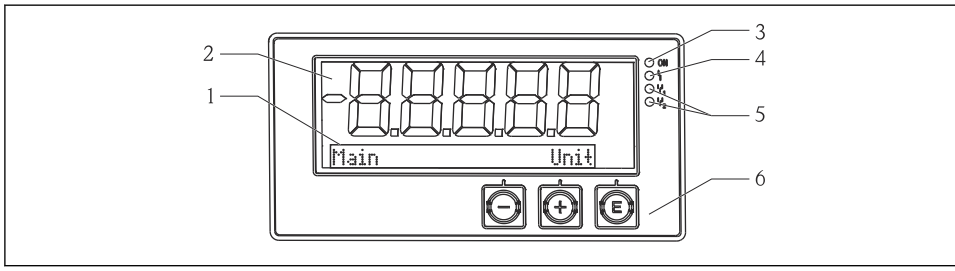
5.3 Post-connection check

Device condition and specifications	Notes
Are cables or the device damaged?	Visual inspection
Electrical connection	**Notes**
Does the supply voltage match the information on the nameplate?	24 to 230 V AC/DC (−20 % / +10 %) 50/60 Hz
Are all terminals firmly engaged in their correct slot? Is the coding on the individual terminals correct?	-
Are the mounted cables strain-relieved?	-
Are the power supply and signal cables correctly connected?	See connection diagram, → 2, 10 and on the housing.

6 Operation options

Thanks to the device's simple operating concept, it is possible to commission the device for many applications without a printed set of Operating Instructions.

6.1 Display and device status indicator / LED



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3 *Device display*

1 Dot matrix section
2 7-segment display
3 LED status indicator, power supply connected
4 LED status indicator, alarm function
5 LED status indicator, limit switch relay 1/2
6 Operating keys

The device offers users a backlit LC display which is divided into two sections. The segment section displays the measured value.

In the dot matrix section, additional channel information, such as the TAG, unit or bar graph, is shown in the display mode. Operating text in English is displayed here during operation.

The parameters for configuring the display are explained in detail in the "Commissioning" section.

In the event of a fault, the device automatically switches between displaying the fault and displaying the channel, see the "Device diagnostics" (Diagnostics menu) and "Diagnostics and troubleshooting" sections.

6.2 Local operation at the device

The device is operated using the three keys integrated in the front of the device

	▪ Open the Configuration menu ▪ Confirm an entry ▪ Select a parameter or submenu offered in the menu
	Within the Configuration menu: ▪ Gradually scroll through the parameters / menu items / characters offered ▪ Change the value of the selected parameter (increase or decrease) Outside the Configuration menu: Display enabled and calculated channels, as well as min. and max. values for all the active channels.

You can always exit menu items / submenus by selecting "x Back" at the end of the menu.

Leave the setup directly without saving the changes by pressing the '-' and '+' keys simultaneously for longer (> 3 s).

6.3 Symbols

6.3.1 Display symbols

⧗	Hold function → 🖹 13 active.
Max	Maximum value/value of the maximum indicator of the channel displayed
Min	Minimum value/value of the minimum indicator of the channel displayed
-----	Error, under/over range. No measured value is displayed.
🔒	The device is locked / operator lock; the device setup is locked for changes to parameters; the display can be changed.

The error and the channel identifier (TAG) are specified in the dot matrix section.

6.3.2 Icons in the editing mode

The following characters are available for entering customized text:

‘0-9’, ‘a-z’, ‘A-Z’, ‘+’, ‘-’, ‘*’, ‘/’, ‘\’, ‘%’, ‘°’, ‘2’, ‘3’, ‘m’, ‘.’, ‘,’, ‘;’, ‘:’, ‘!’, ‘?’, ‘_’, ‘#’, ‘$’, ‘"”, ‘ ´’, ‘(’, ‘)’, ‘~’

For numerical entries, the numbers ‘0-9’ and the decimal point are available.

Furthermore, the following icons are used in the editing mode:

	Symbol for setup
	Symbol for expert setup
	Symbol for diagnostics
	Accept entry. If this symbol is selected, the entry is applied at the position specified by the user, and you quit editing mode.
	Reject entry. If this symbol is selected, the entry is rejected and you quit editing mode. The previously set text remains.
	Jump one position to the left. If this symbol is selected, the cursor jumps one position to the left.
	Delete backwards. If this symbol is selected, the character to the left of the cursor position is deleted.
	Delete all. If this symbol is selected, the entire entry is deleted.

6.4 Operating functions

The operating functions of the device are divided into the following menus:

Display	Settings for the device display: contrast, brightness, time for alternating measured values on the display
Setup	Device settings A description of the individual settings is provided in the "Commissioning" section→ 🖹 14.
Calibration	Execution of the sensor calibration A description of the calibration functions can be found in the "Calibration" section.
Diagnostics	Device information, diagnostics logbook, sensor information, simulation

6.5 Hold function

The hold function causes the current outputs and relay states to "freeze". This function can be switched on and off manually (menu **Setup** → **Manual hold**). In addition, the hold function is automatically activated during sensor calibration.

When the hold condition no longer applies, the hold function continues to be active for the configurable hold release time. The hold release time is configured in the menu **Setup** → **Extended setup** → **System** → **Hold release**.

The hold function does not affect the display of the measured value. The hold symbol is also displayed after the measured value.

7 Commissioning

7.1 Post-installation check and switching on the device

Make sure that all post-connection checks have been carried out before putting your device into operation:
- "Post-installation check" checklist, → 8
- "Post-connection check" checklist, → 11.

After the operating voltage is applied, the green LED lights up and the display indicates the device is ready for operation.

If you are commissioning the device for the first time, program the setup as described in the following sections of the Operating Instructions.

If you are commissioning a device that is already configured or preset, the device starts measuring immediately as defined in the settings. The values of the channels currently activated are shown on the display.

Remove the protective film from the display as this would otherwise affect the readability of the display.

7.2 Display settings (Display menu)

You can access the main menu by pressing the 'E' key during operation. The Display menu appears on the display. Press the 'E' key again to open this menu. Use the "x Back" option, which can be found at the bottom of each menu/submenu, to move up one level in the menu structure.

Parameter	Possible settings	Description
Contrast	1-7 Default: **5**	Setting for the display contrast.
Brightness	1-7 Default: **5**	Setting for the brightness of the display.
Alternating time	0, 3, **5**, 10 sec	Switching time between the two measured values. 0 means that the values do not alternate on the display.

7.3 Notes on setup access protection

Access to the Setup, Diagnostics and Calibration is enabled by default (factory setting) and can be locked via the setup settings.

Proceed as follows to lock the device:

1. Press **E** to enter the configuration menu.
2. Press **+** repeatedly until **Setup** is displayed.
3. Press **E** to open the **Setup** menu.
4. Press **+** repeatedly until **Extended Setup** is displayed.
5. Press **E** to open the **Extended Setup** menu; **System** is displayed.
6. Press **E** to open the **System** menu.
7. Press **+** repeatedly until **Access code** or **Calib Code** is displayed.
8. Press **E** to open the setting for access protection.
9. Set the code: press the **+** and **-** buttons to set the desired code. The access code is a four-digit number. The corresponding position of the number is displayed in plain text. Press **E** to confirm the value entered and go to the next position.
10. Confirm the last position of the code to exit the menu. The full code is displayed. Press **+** to scroll back to the last item of the **x Back** submenu and confirm this item. By confirming the point, the value is adopted and the display returns to the **Setup** level. Again select the last parameter **x Back** to also exit this submenu and return to the measured value/channel display level.

Once access protection has been successfully activated, the lock symbol appears on the display.

To lock the calibration menu, the **Access Code** and the **Calib Code** must be activated.

This makes it possible to implement a role concept (administrator/maintenance staff) for operating the device.

Administrator role: Access to all menus (Setup, Diagnostics, Calibration) once the **Access Code** is entered.

Role of maintenance staff: Access to the Calibration menu once the **Calib Code** is entered.

If only the **Access Code** is activated, the Setup and Diagnostics menus are locked. Access to the remaining menus (including calibration) is enabled.

The **x Back** item at the end of every picklist/menu item takes the user from the submenu to the next menu level up.

If access protection is enabled, the device locks automatically after 600 seconds without operation. The display switches back to the operating display.

To enable the setup, set the setup access code in the **System** Setup to **0000** or delete the code by pressing **C**.

If you lose/misplace the code, a reset can only be performed by the Service Department.

7.4 Configuration of the device (Setup menu)

You can access the main menu by pressing the 'E' key during operation. Navigate through the available menus with the '+' and '–' keys. When the desired menu is displayed, press the 'E' key to open the menu. Use the "x Back" option, which can be found at the bottom of each menu/ submenu, to move up one level in the menu structure.

The Setup menu contains the most important settings for the operation of the device.

Parameter	Possible settings	Description
Tag	User-defined text Max. 16 characters	Use this function to enter the device tag.
Current range	**4-20 mA** 0-20 mA	Configuration of the measuring range for the current output.
Out 1 0/4 mA	Numerical value 0.000 to 99 999 **0.0 mS/cm**	Physical value which corresponds to the lower range limit of the analog output. When the configured value is undershot, the current output is set to the saturation current of 0/3.8 mA.
Out 1 20 mA	Numerical value 0.000 to 99 999 **0.2 mS/cm** (conductive), **200 mS/cm** (inductive)	Physical value which corresponds to the upper range limit of the analog output. When the configured value is exceeded, the current output is set to the saturation current of 20.5 mA.
Out 2 0/4 mA	Numerical value –50 to 250 °C **0.0 °C**	Temperature which corresponds to the measuring range lower limit of the temperature input. When the configured value is undershot, the current output is set to the saturation current of 0/3.8 mA.
Out 2 20 mA	Numerical value –50 to 250 °C **100 °C**	Temperature which corresponds to the measuring range upper limit of the temperature input. When the configured value is exceeded, the current output is set to the saturation current of 20.5 mA.
Damping main value	0 to 60 s **0 s**	Configuration of the damping for low-pass filtering of the input signals.
Extended setup		Advanced settings for the device, such as the relay, limit values etc. The functions are described in the following section, → 16.
Manual hold	**Off**, On	Function for freezing the current and relay outputs

7.5 Extended configuration (Extended setup menu)

You can access the main menu by pressing the 'E' key during operation. Navigate through the available menus with the '+' and '–' keys. When the desired menu is displayed, press the 'E' key

to open the menu. Use the "x Back" option, which can be found at the bottom of each menu/ submenu, to move up one level in the menu structure.

Parameter		Possible settings	Description
System			General settings
	Tag	Customized text, max. 16 characters Default: **Aa**	Use this function to enter the device tag.
	Temp. unit	**°C** °F	Setting of the temperature unit
	Hold release	0 to 600 s **0 s**	Sets the time by which a device hold is extended after the hold condition is discontinued.
	Alarm delay	0 to 600 s **0 s**	Delay time for outputting an alarm. This suppresses alarm conditions that are present for a period that is shorter than the alarm delay time.
	Access code	0000 to 9999 Default: **0000**	User code to protect the device configuration. **Additional information:** 0000 = user code protection is disabled
	Calib Code	0000 to 9999 Default: **0000**	User code to protect the calibration function. **Additional information:** 0000 = user code protection is disabled
Input			Input settings
	Operating mode	**conductivity** resistivity TDS	Configuration of the mode of operation
	Cell constant	Read only (Only available if a sensor is connected)	Displays the cell constant of the connected sensor (see sensor certificate).
	Install factor	0.1 to 5.0 **1.0**	Installation factor for inductive conductivity sensors to correct the conductivity measurement. Configuration by entering the factor. For additional information on the installation factor, → 19.
	Unit	**auto**, µS/cm, mS/cm	Unit of the physical value. "auto" toggles automatically between µS/cm and mS/cm.
	Format	**None**, one, two	Number of places after decimal point for the display.
	Damping main value	0 to 60 s **0 s**	Configuration of the damping for low-pass filtering of the input signals.

Parameter			Possible settings	Description
	Temp. comp.		off, **Linear**, UPW HCl, UPW NaCl, NaCl (IEC 746-3), Water ISO 7888	Configuration of the temperature compensation. Various methods are available to compensate for the temperature dependency. This depends on the processes in which the measurement is used. For additional information on temperature compensation, → 🖹 20.
	T. comp. cal.		**off**, Linar	Configuration of the temperature compensation for cell constant calibration.
	Alpha coeff.		1.0 to 20.0 %/K **2.1 %/K**	Coefficient for linear temperature compensation.
	Ref. temp.		**25 °C**	Reference temperature for calculating the linear temperature-compensated conductivity. For more information on alpha coefficients and the alpha reference temperature, refer to the "Temperature compensation" section, → 🖹 20.
	Process check			Checks the process settings
		Function	On, **Off**	Switch on the process check.
		Inactive time	1 to 240 min **60 min**	Duration of the process check
		Band width	1 to 20 % **1 %**	Bandwidth for the process check
Analog outputs				Settings for analog outputs
	Current range		**4-20 mA** 0-20 mA	Current range for analog output
	Out 1 0/4 mA		Numerical value 0.000 - 99999 **0.1 mS/cm**	Physical value which corresponds to the lower range limit of the analog output.
	Out 1 20 mA		Numerical value 0.000 - 99999 **200 mS/cm**	Physical value which corresponds to the upper range limit of the analog output.
	Out 2 0/4 mA		Numerical value −50 to 250 °C **0 °C**	Temperature which corresponds to the measuring range lower limit of the temperature input.
	Out 2 20 mA		Numerical value −50 to 250 °C **100 °C**	Temperature which corresponds to the measuring range upper limit of the temperature input.
	Damping main value		0 to 60 s **0 s**	Configuration of the damping for low-pass filtering of the input signals.
Relay 1/2				Settings for the relay outputs. For additional information on the configuration of the relays, → 🖹 22.

Parameter		Possible settings	Description
	Function	**Off**, USP alarm, EP alarm, USP pre-alarm, EP pre-alarm, Min limit, Max limit, In band, Out band, Error	Configuration of the relay function.
	Assignment	**Main**, Temp	Assignment of the relay to the main input or temperature input
	Set point	Numerical value **0.0**	Cannot be configured for the **Error** function (error signaling relay).
	Set point 2	Numerical value **0.0**	Only for the **In band** or **Out band** function
	Hyst.	Numerical value **0.0**	Configuration of the hysteresis. Not for the **Error** function.
	Delay time	0 to 60 s **0 s**	Configuration of the delay time until the relay switches. Not for the **Error** function.
Factory default			Resets the device settings to the factory default settings.
	Please confirm	**no**, yes	Confirm the reset.

7.5.1 Configuration of the relays

The device has two relays with limit values that are either switched off or can be allocated to the input signal. The limit value is entered as a numerical value including the decimal position. The mode of operation of the relays as normally open or normally closed is determined by the wiring of the changeover contact (→ 🖹 37). Limit values are always assigned to a relay. Each relay can be assigned to a channel or a calculated value. In the "Error" mode, the relay functions as an alarm relay and switches each time a fault or alarm occurs.

The following settings can be made for each of the 2 limit values: assignment, limit, hysteresis, switching behavior, delay and failure mode.

7.5.2 Installation factor (inductive conductivity sensors only)

In confined installation conditions, the conductivity measurement is affected by the pipe walls.

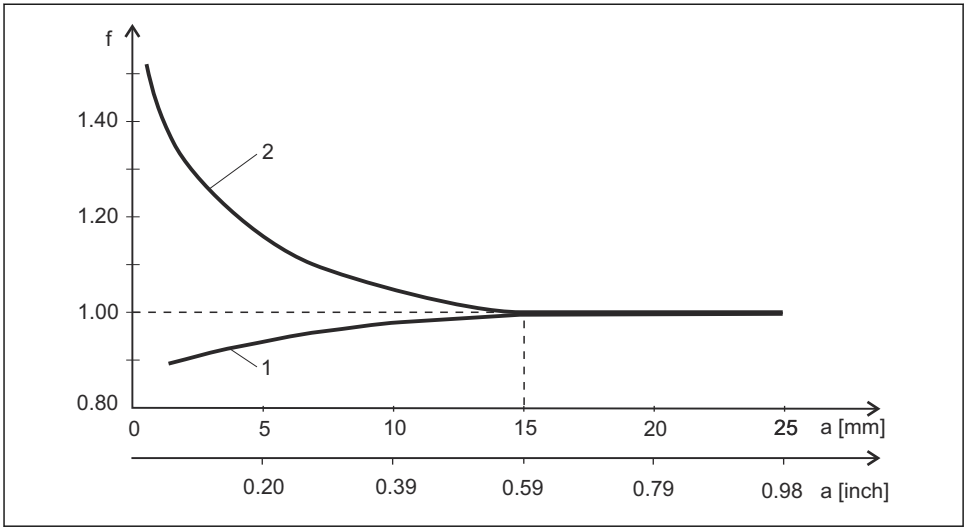
The installation factor compensates for this effect. The transmitter corrects the cell constant by multiplying by the installation factor.

The value of the installation factor depends on the diameter and the conductivity of the pipe nozzle as well as the sensor's distance to the wall.

If the wall distance is sufficient (a > 15 mm (0.59 in), DN 80 or higher), the installation factor f does not have to be taken into account (f = 1.00).

For small distances to the wall, the installation factor increases for electrically insulating pipes (f > 1) and decreases for electrically conductive pipes (f < 1).

It can be measured using calibration solutions, or determined by approximation from the following diagram.



4 Relationship between the installation factor (f) and the distance from wall (a)

1 Electrically conductive pipe wall
2 Electrically insulating pipe wall

7.5.3 Temperature compensation

The conductivity of a liquid depends heavily on the temperature, as the mobility of the ions and the number of dissociated molecules are temperature-dependent. In order to compare measured values, they must be referenced to a defined temperature. The reference temperature is 25 °C (77 °F).

When specifying the conductivity, it is always necessary to specify the temperature. $K(T_0)$ is the conductivity measured at 25 °C (77 °F) or recalculated to 25 °C (77 °F).

The temperature coefficient α represents the percentage change in the conductivity per degree of temperature change. The conductivity K at the process temperature is calculated as follows:

$K(T) = K(T_0)\ (1 + \alpha\ (T - T_0))$

K(T) conductivity at process temperature T

$K(T_0)$ conductivity at reference temperature T_0

The temperature coefficient depends on both the chemical composition of the solution and on the temperature, and is between 1 % and 5 % per °C. The electrical conductivity of the majority of diluted saline solutions and natural waters changes in a close-to-linear fashion.

Typical values for the temperature coefficient Alpha:

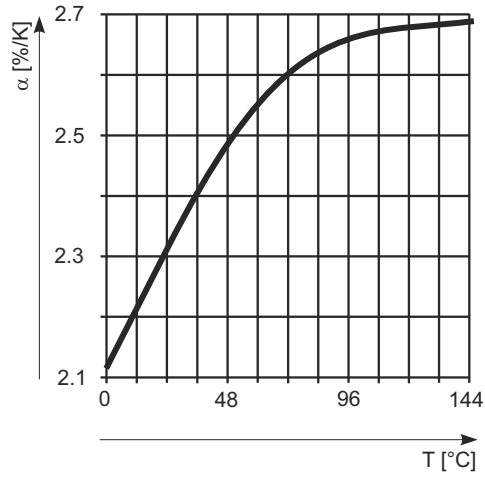
Natural water	approx.2 %/K
Salts (e.g. NaCl)	approx.2.1 %/K

Alkali (e.g. NaOH)	approx.1.9 %/K
Acids (e.g. HNO3)	approx.1.3 %/K

NaCl compensation

NaCl compensation is activated using the setting **Extended setup** → **Input** → **Temp. comp.** = **NaCl (IEC 746-3)**.

In the case of NaCl compensation (as per IEC 60746), a fixed non-linear curve specifying the relationship between the temperature coefficient and temperature is saved in the device. This curve applies to low concentrations of up to approx. 5 % NaCl.



A0008939

Compensation for natural water

Compensation for natural water is activated using the setting **Extended setup** → **Input** → **Temp. comp.** = **Water ISO 7888**.

A non-linear function in accordance with ISO 7888 is saved in the device for temperature compensation in natural water.

Ultrapure water compensation (for conductive sensors)

Compensation for ultrapure water is activated using the setting **Extended setup** → **Input** → **Temp. comp.** = **UPW HCl** or **UPW NaCl**.

Algorithms for pure and ultrapure water are stored in the device. These algorithms take the dissociation of the water and its temperature dependency into account. They are used up to conductivity levels of approx. 100 µS/cm.

- UPW NaCl: optimized for pH-neutral impurities
- UPW HCl: optimized for measuring the acid conductivity downstream of a cation exchanger. Also suitable for ammonia (NH_3) and caustic soda (NaOH).

7.5.4 Configuration of the relays

The device has two relays with limit values that are either switched off or can be allocated to the input signal. The limit value is entered as a numerical value including the decimal position. Limit values are always assigned to a relay. Each relay can be assigned to a channel or a calculated value. In the "Error" mode, the relay functions as an alarm relay and switches each time a fault or alarm occurs.

The following settings can be made for each of the 2 limit values: assignment, mode of operation, limit, hysteresis, switching behavior, delay and failure mode.

Limit values for pharmaceutical water according to United States Pharmacopoeia (USP) and European Pharmacopoeia (EP) (only for conductive sensors)

For conductive sensors, the transmitter has functions for monitoring "Water for Injection" (WFI), "Highly Purified Water" (HPW) and "Purified Water" (PW) according to the United States Pharmacopoeia (USP) Part 645 and European Pharmacopoeia (EP) standards.

USP function: The temperature-dependent limit values in the following table apply for "Water for Injection" (WFI) according to USP and EP and for "Highly Purified Water" (HPW) according to EP. The table is programmed into the transmitter.

Temperature [°C]	Conductivity [µS/cm]	Temperature [°C]	Conductivity [µS/cm]
0	0.6	55	2.1
5	0.8	60	2.2
10	0.9	65	2.4
15	1.0	70	2.7
20	1.1	75	2.7
25	1.3	80	2.7
30	1.4	85	2.7
35	1.5	90	2.7
40	1.7	95	2.9
45	1.8	100	3.1
50	1.9		

The measurement is performed in the following steps:
- The transmitter determines the uncompensated conductivity and the water temperature.
- The transmitter rounds the temperature down to the nearest 5 °C and compares the measured conductivity with the associated value in the table.
- If the measured value is greater than the value in the table, an alarm is triggered (E151).

EP-PW function: The following table lists the temperature-dependent limit values for "Purified Water" (PW) in accordance with EP; this table is also programmed into the transmitter.

Temperature [°C]	Conductivity [µS/cm]	Temperature [°C]	Conductivity [µS/cm]
0	2.4	60	8.1
10	3.6	70	9.1
20	4.3	75	9.7
25	5.1	80	9.7
30	5.4	90	9.7
40	6.5	100	10.2
50	7.1		

The measurement is performed in the following steps:
- The transmitter determines the uncompensated conductivity and the water temperature.
- If the temperature is between two table entries, the limit value for the conductivity is determined by interpolation of the two neighboring points.
- An alarm is triggered if the measured value is greater than the limit value.

Pre-alarm

In addition, a USP pre-alarm is available that is activated at an adjustable switch-on point of 80 % of the USP/EP limit value. This means that users are alerted in time to the need to regenerate their system.

7.6 Device diagnostics (Diagnostics menu)

You can access the main menu by pressing the 'E' key during operation. Navigate through the available menus with the '+' and '–' keys. When the desired menu is displayed, press the 'E' key to open the menu. Use the "x Back" option, which can be found at the bottom of each menu/ submenu, to move up one level in the menu structure.

Parameter		Possible settings	Description
Current diag.		Read only.	Displays the current diagnostic message
Last diag.		Read only.	Displays the last diagnostic message
Diagnost logbook		Read only	Displays the last diagnostic messages
Device info		Read only.	Displays the device information
	Device tag	Read only.	Displays the device tag
	Device name	Read only.	Displays the device name
	Serial number	Read only.	Displays the serial number of the device
	Order ident	Read only.	Displays the order code of the device
	FW revision	Read only.	Displays the firmware version

Parameter		Possible settings	Description
	ENP version	Read only.	Displays the version of the electronic nameplate
	Module ID	Read only.	Displays the module ID
	Manufact. ID	Read only.	Displays the manufacturer ID
	Manufact. name	Read only.	Displays the manufacturer name

8 Calibration (Calibration menu)

8.1 General

Determining the relationship between the measured or expected value of the output variable and the corresponding true or correct value of the measured variable (input variable) for a measuring device under specified conditions.

During calibration, there is no intervention that changes the measuring instrument.

8.2 Device functions for calibration

Press the 'E' button during operation to call up the main menu. Use the '+'- and '-' buttons to navigate through the available menus. When the desired menu is displayed, press the 'E' key to open the menu. Select the "x Back" option at the end of each menu/submenu to navigate one level higher in the menu structure.

Parameter		Configuration options	Description
Conductivity			Calibrate the conductivity measurement.
	C calib. start	Read only	
	k	Read only	Current cell constant
	C cal.	Numerical value 0 mS/cm	
	k	Read only	Newly calculated cell constant
	Save calib data?	**Yes**, No	Save or discard calibration data?
Temperature			Calibrate the temperature measurement.
	T cal. start	Read only	
	T cal.	Numerical value	
	Save calib data?	**Yes**, No	Save or discard calibration data?

8.2.1 Calibrate cell constant

A conductivity measurement system is always calibrated such that the exact cell constant is determined/verified using suitable calibration solutions. This method is described, for

example, in the EN 7888 and ASTM D 1125 standards, each of which details the manufacture of a few calibration solutions. Another option is to obtain international calibration standards from government metrology authorities. This is particularly important in the pharmaceutical industry, where traceability of the calibration to internationally recognized standards is mandatory. To calibrate its test equipment, Endress+Hauser uses the SRM (Special Reference Material) of the US government agency NIST (National Institute of Standards and Technology).

Calibrating the cell constant

In the cell constant calibration, always use a defined conductivity reference solution with raw conductance values that are specified at the various temperatures. The correct calibration always takes place without temperature compensation.

Setting: In the menus, navigate to **Extended Setup** → **Input** → **T.comp.cal**: Select "off".

This switches off the temperature compensation for the calibration.

The new cell constant is calculated from the new conductivity reference solution.

The method for cell constant calibration is the same for conductive and inductive conductivity. Only the conductivity reference or standard solutions that are adapted to the measuring ranges may be used.

For the conductive sensors (CLS15D,CLS16D and CLS21D), standard solution CLY11-A 74.02 µS/cm, CLY11-B 149.75 µS/cm.

For the inductive sensor (CLS50D), standard solution CLY11-C 1.40 mS/cm, CLY11-D 12.65 mS/cm.

1. Press "E" to call up the main menu.
2. Press the "+" button to navigate to the "Calibration" menu.
3. Press "E" to open the menu.
4. Press "E" to open the "Cell const." submenu.
   ↳ The current cell constant is displayed.
5. Remove the sensor from the measurement medium, flush with distilled water and dry.
6. Press "+" to enter the conductivity reference solution "cond. Ref."
   ↳ Entering the value of the conductivity reference solution at the current temperature
7. Press "+".
   ↳ "Insert sensor in med." is displayed.
8. Insert the sensor into the conductivity reference solution.
9. Press "+".
   ↳ "wait for stable value" is displayed.
   Display reads "wait for stable value", when the value is stable, the display switches to "New cell constant".
10. Press "+".
    ↳ "Save Calib. Data" is displayed.
    Press E and apply calibration data using "Yes".

9 Diagnostics and troubleshooting

9.1 General troubleshooting

⚠ WARNING

Danger! Electric voltage

▶ Do not operate the device in an open condition for error diagnosis!

User interface	Cause	Remedial action
No measured value displayed	No power supply connected	Check the power supply to the device.
	Power is supplied, device is defective	The device must be replaced.
Diagnostic message is displayed	The list of diagnostic messages is provided in the following section.	

9.2 Diagnostic messages

The diagnostic message consists of a diagnostic code and an event text.

The diagnostic code consists of the status signal as per Namur NE 107 and the event number.

Status signal (letter in front of the event number)

- F = Failure, a malfunction has been detected.
  The measured value of the affected channel is no longer reliable. The cause of the malfunction is to be found in the measuring point. Any connected control system must be switched to manual operation.
- M = Maintenance required, action should be taken as soon as possible.
  The device still measures correctly. Immediate measures are not necessary. Maintenance will prevent a potential malfunction.
- C = Function check, queue (no error).
  Maintenance work is being performed on the device.
- S = Out of specification, the measuring point is being operated outside its specifications.
  Operation is still possible. However, this may cause increased wear, shorter service life, or reduced measurement accuracy. The cause of the problem is to be found outside the measuring point.

Examples of how messages are displayed:

A0015896

F 61
sensor elec.

A0015897

M 915
USP warning

A0015898

S 844
Process value

A0015899

C 107
Calib. active

Diagnostic code	Event text	Description
F5	Sensor data	Sensor data invalid. Remedial action: ▪ Update the transmitter data ▪ Replace sensor
F12	Writing data	Not possible to write the sensor data. Remedial action: ▪ Repeat writing the sensor data ▪ Replace sensor
F13	Sensor type	Incorrect sensor type. Remedial action: Change to a sensor of the type that is configured.
F61	Sensor elec.	Sensor electronics defective. Remedial action: ▪ Replace sensor ▪ Contact the Service Team
F62	Sens. Connect	Sensor connection. Remedial action: ▪ Replace sensor ▪ Contact the Service Team
F100	Sensor comm.	Sensor not communicating. Possible reasons: ▪ No sensor connection ▪ Incorrect sensor connection ▪ Short-circuit in sensor cable ▪ Short-circuit in adjacent channel ▪ Sensor firmware update interrupted incorrectly Remedial action: ▪ Check sensor cable connection ▪ Check sensor cable for short-circuit ▪ Change sensor ▪ Restart the firmware update ▪ Contact the Service Team

Diagnostic code	Event text	Description
F130	Sensor supply	Sensor check. Poor sensor power supply. Remedial action: ▪ Check cable connections ▪ Replace sensor
F142	Sensor signal	Sensor check. No conductivity displayed. Possible reasons: ▪ Sensor in air ▪ Sensor defective Remedial action: ▪ Check sensor installation ▪ Replace sensor
F143	Self-test	Sensor self-test error. Remedial action: ▪ Replace sensor ▪ Contact the Service Team
F152	No airset	Sensor data. No calibration data available Remedial action: Perform airset calibration
F523	Cell const.	Sensor calibration warning. Invalid cell constant, maximum range reached. Remedial action: ▪ Repeat the calibration ▪ Enter cell constant as per factory specifications ▪ Replace sensor
F524	Cell const.	Sensor calibration alarm. Minimum possible cell constant undershot. Remedial action: ▪ Repeat the calibration ▪ Enter cell constant as per factory specifications
F845	Device id	Incorrect hardware configuration
F846	Param error	Incorrect parameter checksum Possible cause: Firmware update Remedial action: Reset parameter to factory defaults
F847	Couldn't save param	The parameters could not be saved
F848	Calib AO1	Incorrect calibration values for analog output 1

Diagnostic code	Event text	Description
F849	Calib AO2	Incorrect calibration values for analog output 2
F904	Process check	Process check system alarm. Measuring signal has not changed for a long time. Possible reasons ▪ Sensor contaminated or exposed to air ▪ No flow to sensor ▪ Sensor defective ▪ Software error Remedial action: ▪ Check measuring chain ▪ Check sensor ▪ Restart the software

Diagnostic code	Event text	Description
C107	Calib. active	Sensor calibration is active. Remedial action: Wait for calibration to be finished
C154	No calib. data	Sensor data. No calibration data available, factory settings are used. Remedial action: ▪ Check the calibration information of the sensor ▪ Calibrating the cell constant
C850	Simu AO1	Simulation of analog output 1 is active
C851	Simu AO2	Simulation of analog output 2 is active
C852	Simu DO	Simulation of status output is active
C853	Download act.	Parameter transmission is active

Diagnostic code	Event text	Description
S844	Process value	Measured value outside the specified range. Possible reasons: ▪ Sensor in air ▪ Air pockets in the assembly ▪ Incorrect flow to sensor ▪ Sensor defective Remedial action: ▪ Increase process value ▪ Check measuring chain ▪ Change sensor type
S910	Limit switch	Limit switch activated

Diagnostic code	Event text	Description
M500	Not stable	Sensor calibration aborted. Main measured value fluctuating. Possible reasons: ▪ Sensor overaged ▪ Sensor temporarily dry ▪ Buffer value not constant Remedial action: ▪ Check sensor, replace if necessary ▪ Check buffer
M526	Cell const.	Sensor calibration warning. Invalid cell constant, maximum range reached. Remedial action: ▪ Repeat the calibration ▪ Enter cell constant as per factory specifications ▪ Replace sensor
M528	Cell const.	Sensor calibration warning. Minimum possible cell constant undershot. Remedial action: ▪ Repeat the calibration ▪ Enter cell constant as per factory specifications
M914	USP alarm	USP alarm Conductivity limit value for USP exceeded. Remedial action: Check process
M915	USP warning	USP warning. Conductivity limit value for USP undershot. Remedial action: Check process

10 Maintenance

No special maintenance work is required for the device.

10.1 Cleaning

A clean, dry cloth can be used to clean the device.

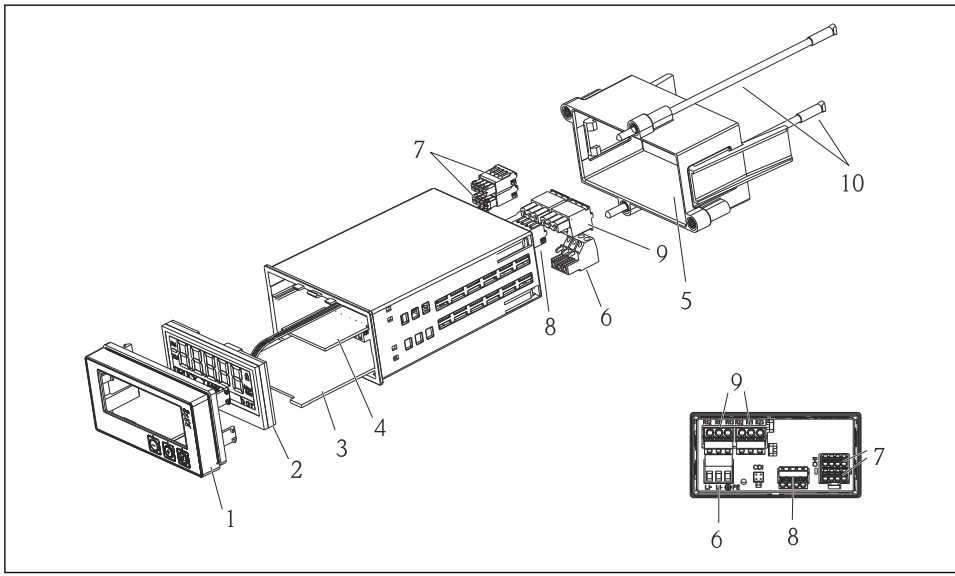
11 Repair

11.1 General information

Repairs that are not described in these Operating Instructions must only be carried out directly by the manufacturer or by the service department.

When ordering spare parts, specify the serial number of the device. Where necessary, installation instructions are supplied with the spare part.

11.2 Spare parts



5 *Spare parts of the device*

Item no.	Description	Order no.
1	Housing front + foil, incl. keyboard CM14, without display	XPM0004-DA
2	CPU/Display board CM14 conductivity conductive CPU/Display board CM14 conductivity inductive	XPM0004-CK XPM0004-CL
3	Mainboard 24-230VDC/AC, CM14	XPM0004-NA
4	Relay board + 2 limit relays	RIA45X-RA
5	Fixing frame for housing W07	71069917
6	Terminal, 3-pole (power supply)	50078843
7	Pluggable terminal, 4-pole (Memosens input)	71037350

Item no.	Description	Order no.
8	Pluggable terminal, 4-pole (current output)	71075062
9	Pluggable terminal, 3-pole (relay terminal)	71037408
10	Threaded bar for tube fixing clip 105mm	71081257

11.3 Return

The requirements for safe device return can vary depending on the device type and national legislation.

1. Refer to the web page for information: https://www.endress.com
2. If returning the device, pack the device in such a way that it is reliably protected against impact and external influences. The original packaging provides the best protection.

11.4 Disposal

If required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), the product is marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.

12 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.

12.1 Device-specific accessories

12.1.1 Measuring cable

Memosens data cable CYK10
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk10

Technical Information TI00118C

12.1.2 Sensors

Glass electrodes

Orbisint CPS11D
- pH sensor for process technology
- With dirt-repellent PTFE diaphragm

Technical Information TI00028C

Orbipore CPS91D
pH electrode with open aperture for media with high dirt load

Technical Information TI00375C

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

Technical Information TI00191C

ORP sensors

Orbisint CPS12D
ORP sensor for process technology

Technical Information TI00367C

Orbipore CPS92D
ORP electrode with open aperture for media with high dirt load

Technical Information TI00435C

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

Technical Information TI00191C

Conductivity sensors with conductive measurement of conductivity

Condumax
- Conductive conductivity sensor
- For pure water, ultrapure water and hazardous area applications

Technical Information TI00109C

Condumax
- Hygienic, conductive conductivity sensor
- For pure water, ultrapure water and Ex applications
- With EHEDG and 3A approval

Technical Information TI00227C

Condumax
Two-electrode sensor in plug-in head version version

Technical Information TI00085C

Conductivity sensors with inductive measurement of conductivity

Indumax
- High-durability inductive conductivity sensor
- For standard and hazardous area applications

Technical Information TI00182C

Oxygen sensors

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

Technical Information TI00413C

Oxymax COS22D
- Sterilizable sensor for dissolved oxygen
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos22d

Technical Information TI00446C

13 Technical data

13.1 Input

13.1.1 Measured variables

→ Documentation of the connected sensor

13.1.2 Measuring ranges

→ Documentation of the connected sensor

13.1.3 Input types

Digital sensor inputs for sensors with Memosens protocol

13.1.4 Cable specification

Cable type

Memosens data cable C OYK10 or fixed sensor cable, each with cable end sleeves or M12 round-pin connector (optional)

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.

Cable length

Max. 100 m (330 ft)

13.2 Output

13.2.1 Output signal

2 x 0/4 to 20 mA, active, galvanically isolated from one another and from the sensor circuits

13.2.2 Load

Max. 500 Ω

13.2.3 Linearization/transmission behavior

Linear

13.2.4 Alarm output

The alarm output is implemented as an "open collector". During normal operation, the alarm output is closed. In the event of a fault (diagnostic message with status "F", device is disconnected from power supply), the "Open Collector" opens.

Max. current	200 mA
Max. voltage	28 V DC

13.3 Current outputs, active

13.3.1 Span

0 to 23 mA

13.3.2 Signal characterization

Linear

13.3.3 Electrical specification

Output voltage
Max. 24 V

Test voltage
500 V

13.3.4 Cable specification

Cable type
Recommended: shielded cable

Cable specification
Max. 1.5 mm^2 (16 AWG)

13.4 Relay outputs

13.4.1 Relay types

2 changeover contacts

13.4.2 Switching capacity

max. 3 A @ 24 V DC

max. 3 A @ 253 V AC

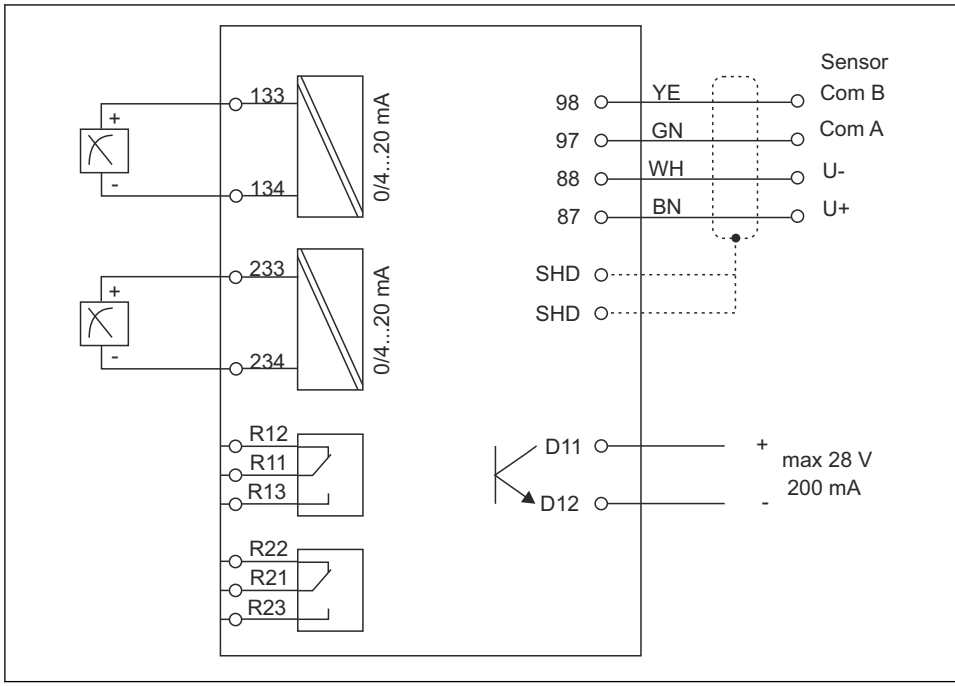
min. 100 mW (5 V / 10 mA)

13.4.3 Cable specification

Max. 2.5 mm^2 (14 AWG)

13.5 Power supply

13.5.1 Electrical connection



6 Electrical connection of the transmitter

Connection	Description
87	Terminal for Memosens cable, brown, sensor power supply U+
88	Terminal for Memosens cable, white, sensor power supply U-
97	Terminal for Memosens cable, green, Com A
98	Terminal for Memosens cable, yellow, Com B
SHD	Terminal for Memosens cable, shield
D11	Terminal for alarm output, +
D12	Terminal for alarm output, -
L/+	Terminal for transmitter supply voltage
N/-	
⏚ PE	

Connection	Description
133	Terminal for analog output 1, +
134	Terminal for analog output 1, -
233	Terminal for analog output 2, +
234	Terminal for analog output 2, -
R11, R12, R13	Terminal for relay 1
R21, R22, R23	Terminal for relay 2

13.5.2 Supply voltage

Universal power supply unit 24 to 230 V AC/DC (-20 % / +10 %) 50/60Hz

The device does not have a power switch
- The customer must provide a protected circuit breaker in the vicinity of the device.
- The circuit breaker must be a switch or power switch, and must be labeled as the circuit breaker for the device.

13.5.3 Power consumption

Max. 13.8 VA / 6.6 W

13.6 Performance characteristics

13.6.1 Response time

Current outputs

t_{90} = max. 500 ms for an increase from 0 to 20 mA

13.6.2 Reference temperature

25 °C (77 °F)

13.6.3 Measurement error for sensor inputs

→ Documentation of the connected sensor

13.6.4 Current output resolution

> 13 bit

13.6.5 Repeatability

→ Documentation of the connected sensor

13.7 Mounting

13.7.1 Mounting location

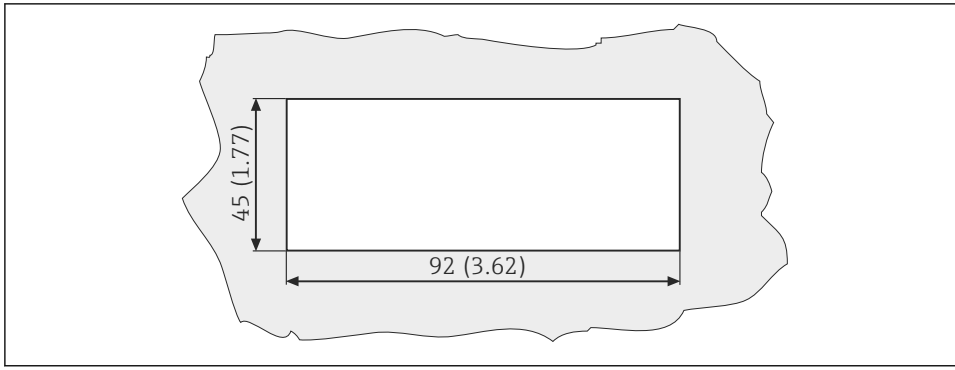
Panel, cutout 92 x 45 mm (3.62 x 1.77 in)

Max. panel thickness 26 mm (1 in)

13.7.2 Installation position

The orientation is determined by the legibility of the display.

Max. viewing angle range of +/- 45° from the central display axis in every direction.



7 Panel cutout. Engineering unit mm (in)

13.8 Environment

13.8.1 Ambient temperature

−10 to +60 °C (14 to 140 °F)

13.8.2 Storage temperature

-40 to +85 °C (-40 to 185 °F)

13.8.3 Relative humidity

5 to 85 %, non-condensing

13.8.4 Operating altitude

< 2 000 m (6 561 ft) above MSL

13.8.5 Degree of protection

Front

Front IP65 / NEMA 4X

Casing

IP20 shock protection

13.8.6 Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326-1, class A for industrial areas

13.9 Mechanical construction

13.9.1 Weight

0.3 kg (0.66 lbs)

13.9.2 Materials

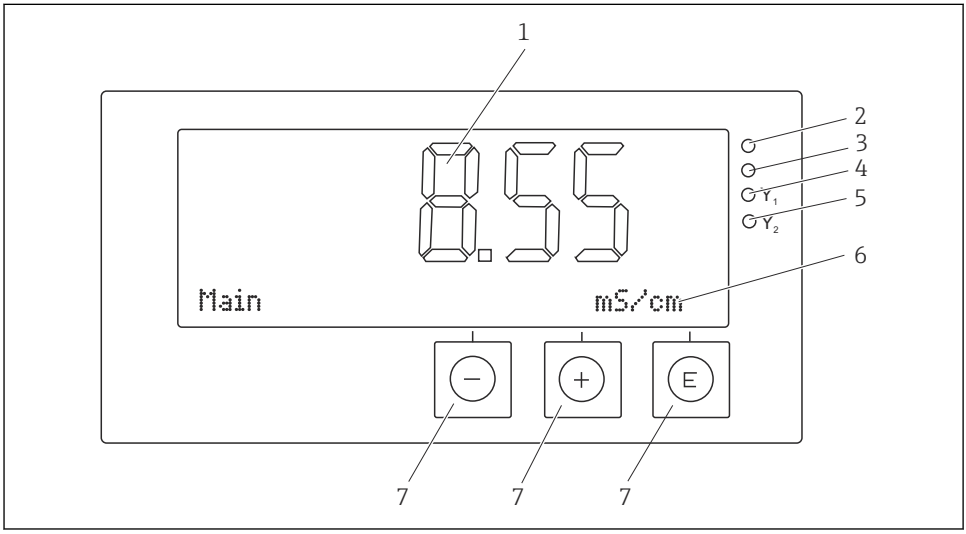
Housing, casing:	Polycarbonate
Front foil:	Polyester, UV-resistant

13.9.3 Terminals

Max. 2.5 mm² (22-14 AWG; torque 0.4 Nm (3.5 lb in)) mains, relay

13.10 Display and user interface

13.10.1 Operating elements



8 Display and operating elements

1 LC display for displaying the measured values and configuration data
2 Status LED, power supply connected
3 Status LED, alarm function
4 Status LED for limit switch relay 1
5 Status LED for limit switch relay 2
6 Dot matrix display for displaying the dimensions and menu items
7 Operating keys

13.11 Certificates and approvals

Current certificates and approvals for the product are available at 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**.

13.12 Ordering information

Detailed ordering information is available from your nearest sales organization www.addresses.endress.com or in the Product Configurator at www.endress.com:

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

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: direct input of information specific to the measuring point, such as the measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

13.13 Accessories

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3. For accessories not listed here, please contact your Service or Sales Center.

13.13.1 Device-specific accessories

Measuring cable

Memosens data cable CYK10
- For digital sensors with Memosens technology
- Product Configurator on the product page: www.endress.com/cyk10

Technical Information TI00118C

Sensors

Glass electrodes

Orbisint CPS11D
- pH sensor for process technology
- With dirt-repellent PTFE diaphragm

Technical Information TI00028C

Orbipore CPS91D
pH electrode with open aperture for media with high dirt load

Technical Information TI00375C

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

Technical Information TI00191C

ORP sensors

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ORP sensor for process technology

Technical Information TI00367C

Orbipore CPS92D
ORP electrode with open aperture for media with high dirt load

Technical Information TI00435C

Orbipac CPF82D
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Technical Information TI00191C

Conductivity sensors with conductive measurement of conductivity

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Technical Information TI00109C

Condumax
- Hygienic, conductive conductivity sensor
- For pure water, ultrapure water and Ex applications
- With EHEDG and 3A approval

Technical Information TI00227C

Condumax
Two-electrode sensor in plug-in head version version

Technical Information TI00085C

Conductivity sensors with inductive measurement of conductivity

Indumax
- High-durability inductive conductivity sensor
- For standard and hazardous area applications

Technical Information TI00182C

Oxygen sensors

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

Technical Information TI00413C

Oxymax COS22D
- Sterilizable sensor for dissolved oxygen
- With Memosens technology
- Product Configurator on the product page: www.endress.com/cos22d

Technical Information TI00446C

www.addresses.endress.com

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