

# Operating Instructions

## Conducual CLY421

Conductivity calibration kit for ultrapure water applications








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
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# 1 About this document

## 1.1 Warnings

Structure of information	Meaning
 <b>DANGER</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation <b>will</b> result in a fatal or serious injury.
 <b>WARNING</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation <b>can</b> result in a fatal or serious injury.
 <b>CAUTION</b> <b>Causes (/consequences)</b> If necessary, Consequences of non-compliance (if applicable) ▶ Corrective action	This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.
<b>NOTICE</b> <b>Cause/situation</b> If necessary, Consequences of non-compliance (if applicable) ▶ Action/note	This symbol alerts you to situations which may result in damage to property.

## 1.2 Symbols

	Additional information, tips
	Permitted
	Recommended
	Forbidden or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of a step

## 1.3 Documentation


The following manuals, which complement these Operating Instructions, can be found on the product pages on the Internet:

 Technical Information Conducual CLY421, TI00496C

## 2 Basic safety instructions

### 2.1 Requirements for the personnel

- Installation, commissioning, operation and maintenance of the measuring system may be carried out only by specially trained technical personnel.
- The technical personnel must be authorized by the plant operator to carry out the specified activities.
- The electrical connection may be performed only by an electrical technician.
- The technical personnel must have read and understood these Operating Instructions and must follow the instructions contained therein.
- Faults at the measuring point may only be rectified by authorized and specially trained personnel.

 Repairs not described in the Operating Instructions provided must be carried out only directly at the manufacturer's site or by the service organization.

### 2.2 Intended use

Conducal CLY421 is a calibration kit designed for checking and calibrating conductivity measurements in the pure water and ultrapure water range. With the calibration kit, process measuring devices can be calibrated and checked without the need for calibration solutions. Only the specific conductivity or the resistivity is determined when the calibration kit is operated.

The device may only be operated on a low voltage network that is protected by a circuit breaker.

The cover plate, transmitter and charger may not be opened.

Use of the device for any purpose other than that described, poses a threat to the safety of people and of the entire measuring system and is therefore not permitted.

The manufacturer is not liable for damage caused by improper or non-designated use.

### 2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:

- Installation guidelines
- Local standards and regulations
- Regulations for explosion protection

### 2.4 Operational safety

**Before commissioning the entire measuring point:**

1. Verify that all connections are correct.
2. Ensure that electrical cables and hose connections are undamaged.
3. Do not operate damaged products, and protect them against unintentional operation.
4. Label damaged products as defective.

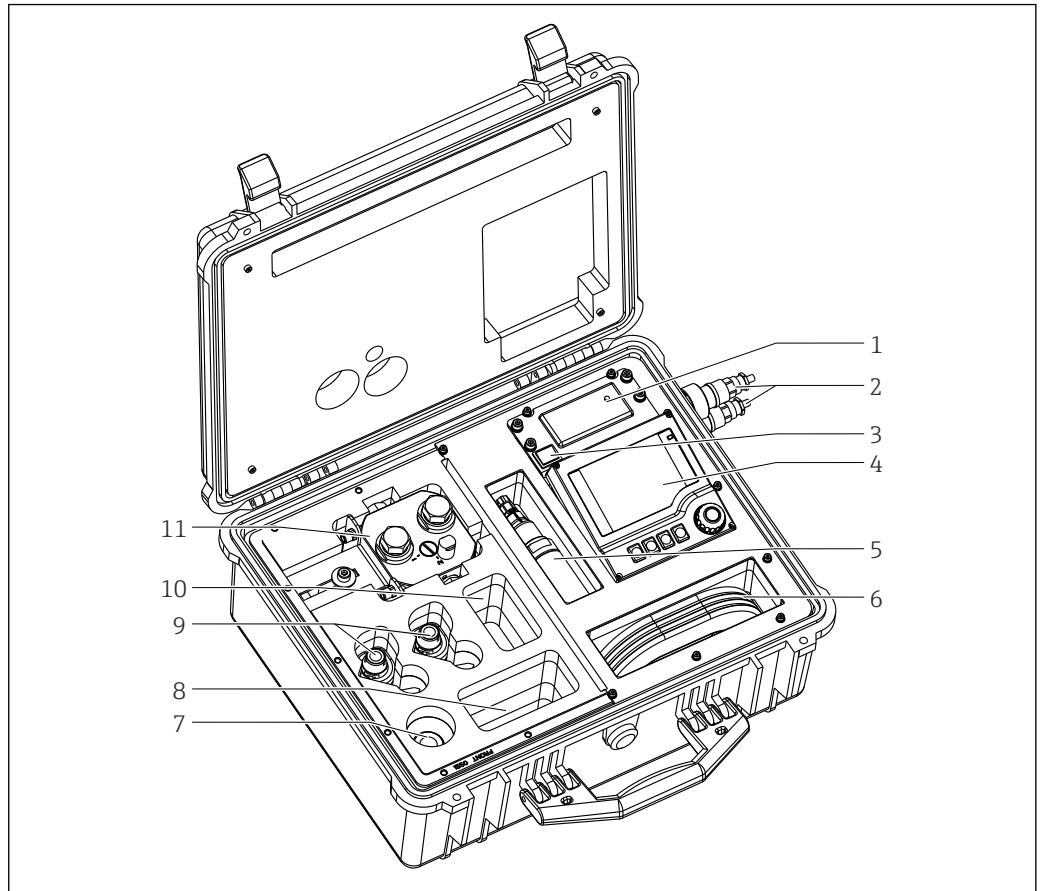
**During operation:**

- ▶ If faults cannot be rectified:  
products must be taken out of service and protected against unintentional operation.

## 2.5 Product safety

The product is designed to meet state-of-the-art safety requirements, has been tested, and left the factory in a condition in which it is safe to operate. The relevant regulations and international standards have been observed.

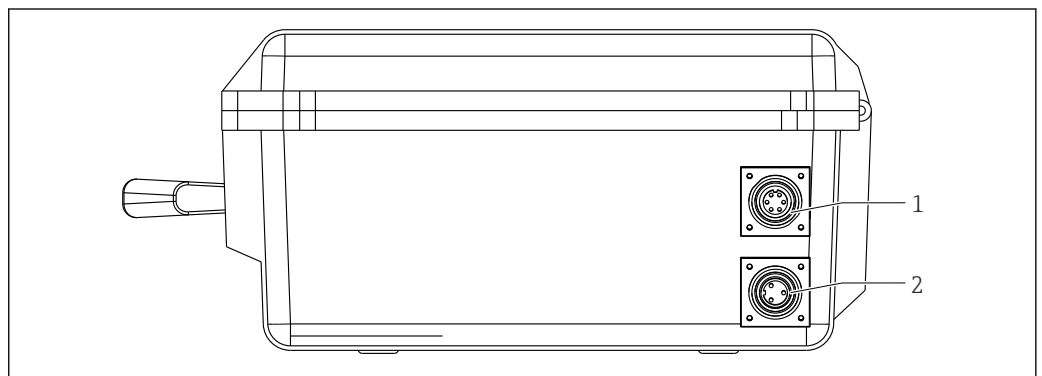
### 3 Product description



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#### 1 Elements

- 1 Charger
- 2 Connections for power supply and measuring cable
- 3 On/off switch for CM42 transmitter
- 4 CM42 transmitter
- 5 Conductivity sensor Condumax CLS15Dor Condumax CLS15E
- 6 Measuring cable and power supply cable
- 7 G1 clamp adapter
- 8 Compartment for accessories
- 9 DN 20 hose connection adapters
- 10 Spare compartment
- 11 Flow assembly with holder



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#### 2 External connections

- 1 Connection for measuring cable (with cap)
- 2 Connection for power supply (with cap)

## 4 Incoming acceptance and product identification

### 4.1 Incoming acceptance

1. Verify that the packaging is undamaged.
  - ↳ Notify the supplier of any damage to the packaging.  
Keep the damaged packaging until the issue has been resolved.
2. Verify that the contents are undamaged.
  - ↳ Notify the supplier of any damage to the delivery contents.  
Keep the damaged goods until the issue has been resolved.
3. Check that the delivery is complete and nothing is missing.
  - ↳ Compare the shipping documents with your order.
4. Pack the product for storage and transportation in such a way that it is protected against impact and moisture.
  - ↳ The original packaging offers the best protection.  
Make sure to comply with the permitted ambient conditions.

If you have any questions, please contact your supplier or your local Sales Center.

### 4.2 Product identification

#### 4.2.1 Nameplate

The nameplate provides you with the following information on your device:

- Manufacturer identification
  - Extended order code
  - Serial number
  - Safety information and warnings
- ▶ Compare the information on the nameplate with the order.

#### 4.2.2 Product identification

##### Product page

[www.endress.com/CLY421](http://www.endress.com/CLY421)

##### Interpreting the order code

The order code and serial number of your product can be found in the following locations:

- On the nameplate
- In the delivery papers

##### Obtaining information on the product

1. Go to [www.endress.com](http://www.endress.com).
2. Page search (magnifying glass symbol): Enter valid serial number.
3. Search (magnifying glass).
  - ↳ The product structure is displayed in a popup window.
4. Click the product overview.
  - ↳ A new window opens. Here you fill information pertaining to your device, including the product documentation.



**Manufacturer address**

Endress+Hauser Conducta GmbH+Co. KG  
Dieselstraße 24  
D-70839 Gerlingen

**4.3 Scope of delivery**

The scope of delivery includes:

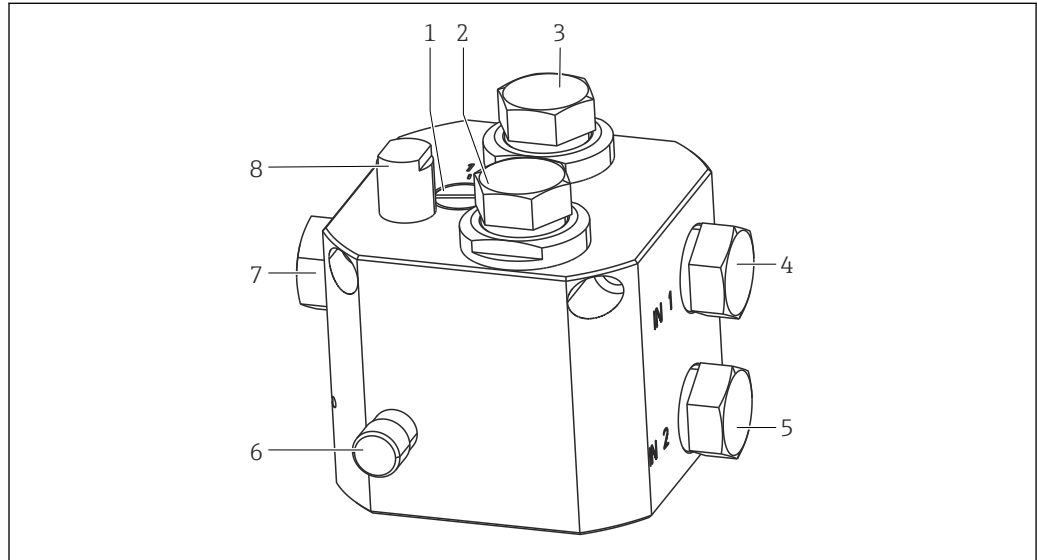
- Calibration kit in the version ordered
- Operating Instructions Conducal CLY421
- Calibration certificate

If you have any questions, please contact your supplier or your local sales center.

## 5 Mounting

The calibration kit can be used for two measuring arrangements:

- Comparison measurement in the bypass. Here, only the sensor of the calibration kit is installed in the measuring cell.
- Direct comparison measurement. Here, the sensor of the calibration kit and the process sensor are installed in the measuring cell.



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### 3 Flow assembly

- 1 Switchover option 1 (bypass, inlet IN 1) or option 2 (direct, inlet IN 2)
- 2 Installation slot for calibration kit conductivity sensor (always used)
- 3 Installation slot for process conductivity sensor (optionally used)
- 4 Inlet for bypass measurement (no sensor in pos. 3)
- 5 Inlet for direct comparison measurement (with sensor in pos. 3)
- 6 Flow control valve
- 7 Outlet
- 8 Flow monitoring

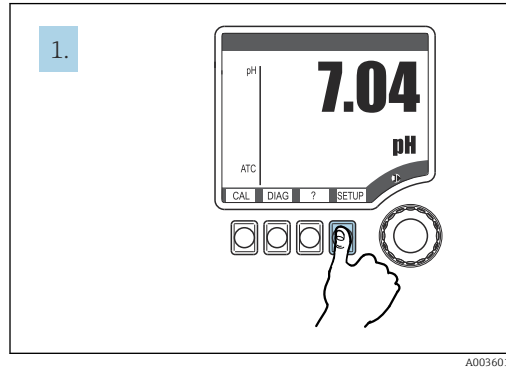
## 6 Electrical connection

Connecting the calibration kit:

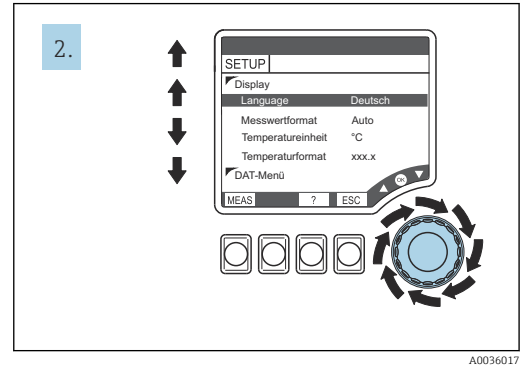
1. Install the measuring cable between the sensor, calibration kit and transmitter (outside of the case).
2. For direct comparison measurement:  
Install the measuring cable between the process sensor and process transmitter.
3. If a power supply is available:  
Connect the power cable (outside of the case).

## 7 Operation options

### 7.1 Access to operating menu via local display



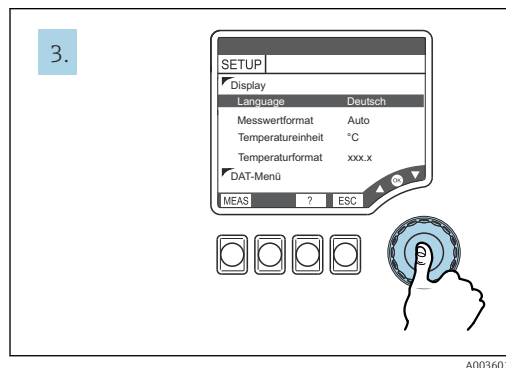
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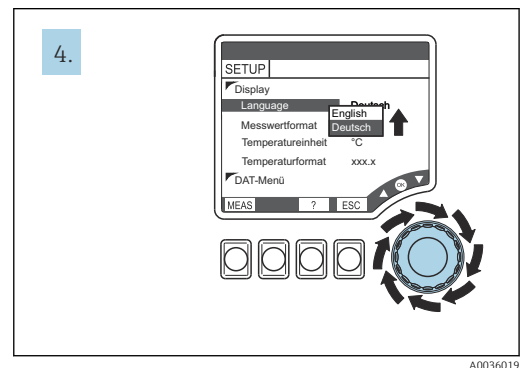
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4 Press the soft key: select the menu directly

5 Turn the navigator: move the cursor



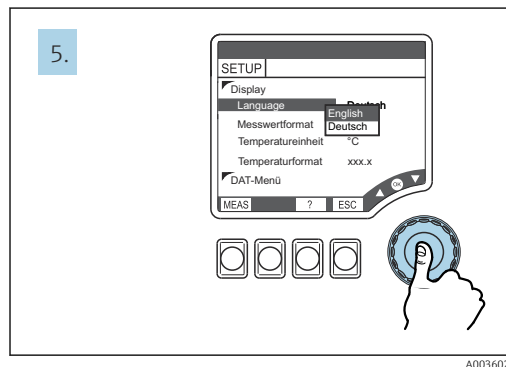
A0036018



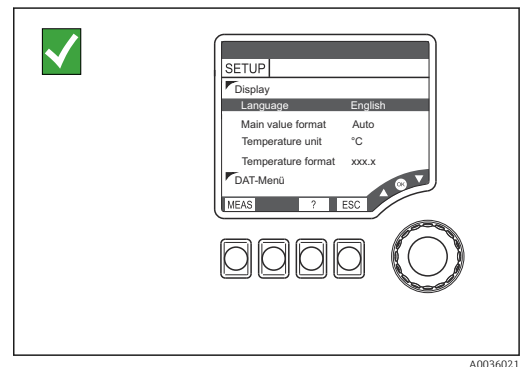
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6 Press the navigator: select the values

7 Turn the navigator: change the value



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8 Press the navigator: accept a new value

9 Result: setting is changed

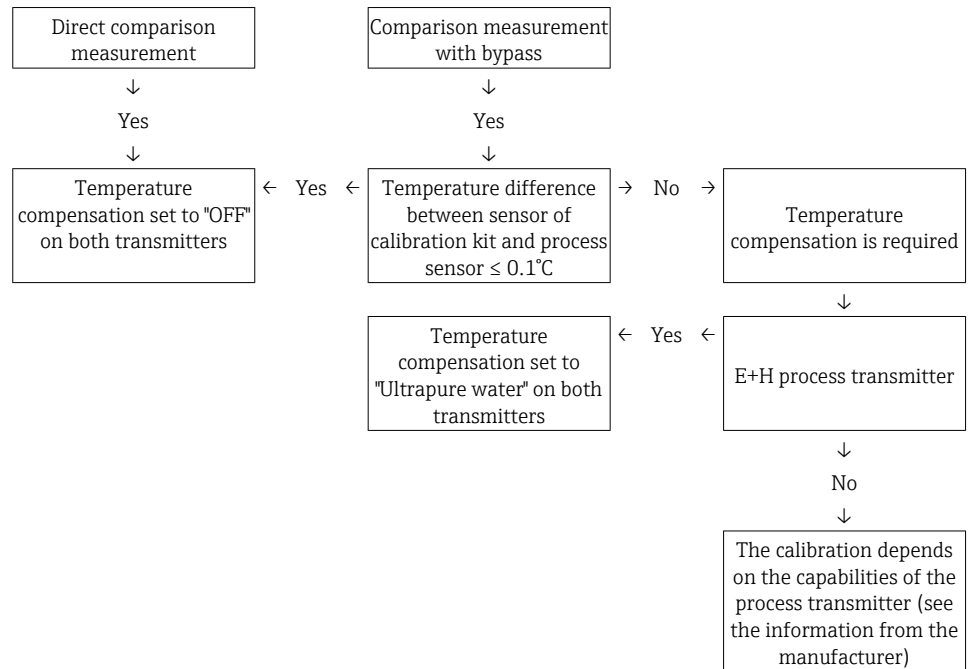
**i** The transmitter of the CLY421 is already configured. You just have to switch on the transmitter. The transmitter displays the measured value after a few moments. You need only switch on temperature compensation if the difference in temperature between the calibration sensor and the process sensor is  $> 0.1^{\circ}\text{C}$  (see  $\rightarrow$  13).

## 7.2 Measuring arrangements

The calibration kit can be used for two measuring arrangements:

- Comparison measurement in the bypass
- Direct comparison measurement

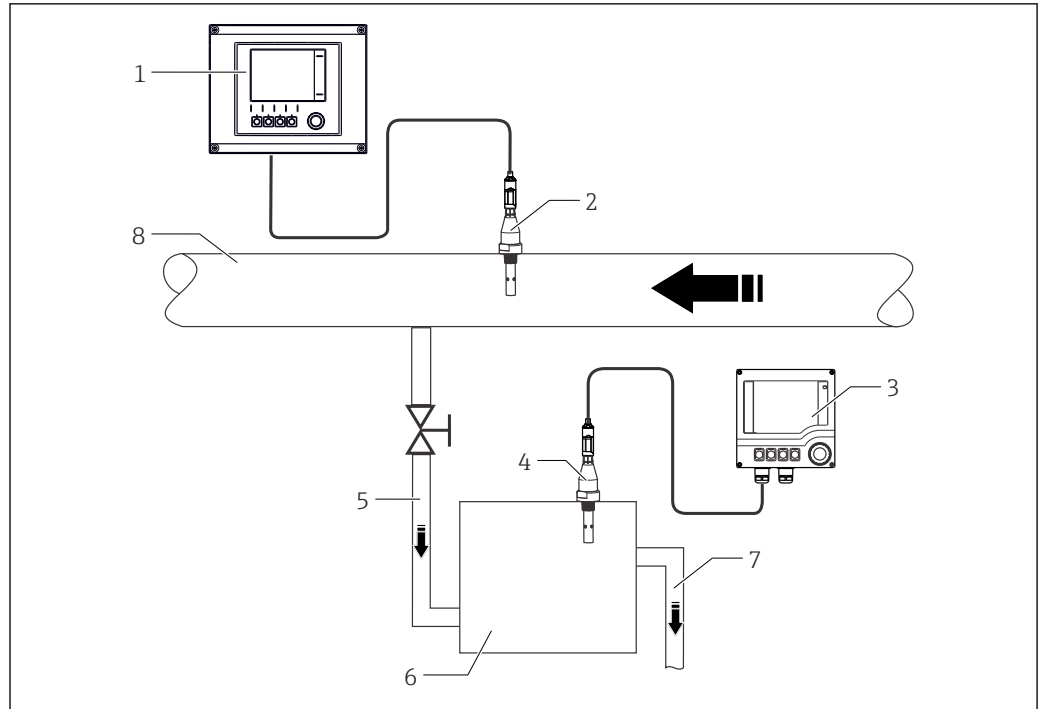
*Comparison of bypass comparison measurement and direct comparison measurement*



### Comparison measurement in the bypass

With this arrangement, please ensure that the composition of the medium and the temperature at the process measurement point and comparison measurement point are the same. This is ensured by:

- Using short hose connections
- Waiting until the temperature in the flow assembly adjusts to match the process temperature.

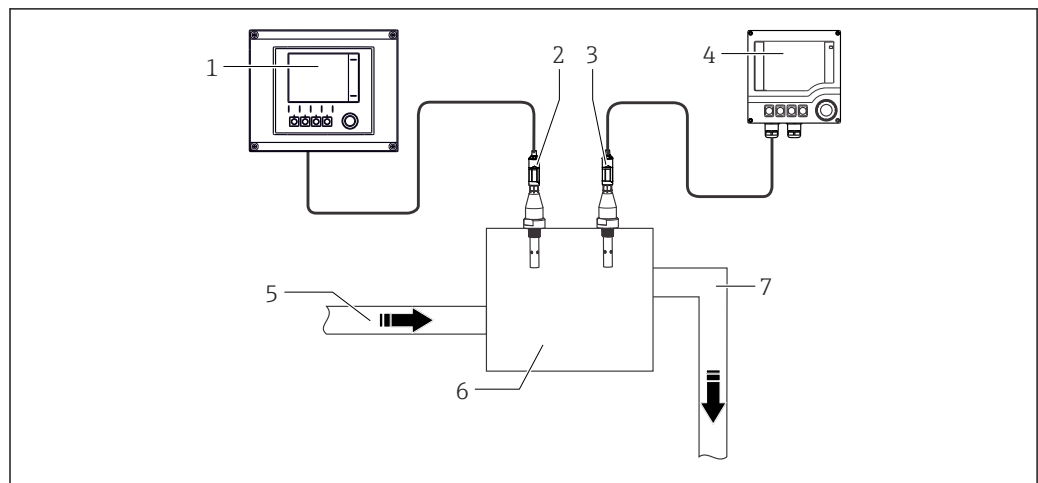


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10 Measuring arrangement for comparison measurement in the bypass

- 1 Process transmitter
- 2 Process conductivity sensor
- 3 Calibration kit transmitter
- 4 Calibration kit conductivity sensor
- 5 Inlet (IN1)
- 6 Calibration kit flow cell
- 7 Outlet
- 8 Sterile main pipe

**Direct comparison measurement**




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11 Measuring arrangement for direct comparison measurement

- 1 Process transmitter
- 2 Process conductivity sensor
- 3 Calibration kit conductivity sensor
- 4 Calibration kit transmitter
- 5 Inlet (IN2)
- 6 Calibration kit flow cell
- 7 Outlet

In the direct comparison measurement, all the important parameters match:

- Temperature and
- Absolutely identical medium

 When measuring in the bypass, it is important to position the bypass as close as possible to the process sensor and to keep the hose to the measuring cell short. Furthermore, sufficient flow must be ensured.

As it is necessary to remove the sensor from the process, the medium can become contaminated.

## 8 Commissioning

### 8.1 Preliminaries

#### Preparatory steps for comparison measurement with a bypass

Install the measuring arrangement as follows:

1. Secure the flow assembly with the holder on a pipe (e.g. railing). On square pipes mount the clamping jaw with the V-notch facing outwards, and facing inwards on circular pipes, or mount the flow assembly at a secure place.
2. Set the **Bypass - Direct** switch to **Bypass** (position 1).
3. Using a hose connection adapter (provided in the case) mount the outflow hose on the **OUT** outlet of the flow assembly (7). Only screw the hose connection adapter finger-tight into the flow assembly.
4. Place the second end of the hose in a drain (discharge channel etc.).
5. Using a hose connection adapter mount the medium hose on the **IN 1** inlet of the flow assembly (4).
6. Seal the **IN 2** inlet (5) with a stopper (provided in the case).
7. Screw the sensor of the calibration kit into the flow assembly (2).
8. Seal the installation slot for the process sensor (3) in the flow assembly with a stopper.

#### Preparatory steps for direct comparison measurement

Install the measuring arrangement as follows:

1. Secure the flow assembly with the holder on a pipe (e.g. railing). On square pipes mount the clamping jaw with the V-notch facing outwards, and facing inwards on circular pipes, or mount the flow assembly at a secure place.
2. Set the **Bypass - Direct** switch to **Direct** (position 2).
3. Using a hose connection adapter (provided in the case) mount the outflow hose on the **OUT** outlet of the flow assembly (7). Only screw the hose connection adapter finger-tight into the flow assembly.
4. Place the second end of the hose in a drain (discharge channel etc.).
5. Using a hose connection adapter mount the medium hose on the **IN 2** inlet of the flow assembly (5).
6. Seal the **IN 1** inlet (4) with a stopper (provided in the case).
7. Screw the sensor of the calibration kit into the flow assembly (2).
8. Screw the process sensor into the flow assembly (3). For sensors with a G1 process connection, use the G1 adapter clamp (provided in the case).

### 8.2 Charging the battery

The lithium-ion battery must be charged before the calibration kit can be connected.

1. Insert the round connector of the power supply cable into the power supply connection on the right-hand side of the case.
2. Insert the mains plug of the power supply cable into the socket.
  - ↳ The lithium-ion battery will now be charged.



The light emitting diode on the charger can indicate two charge states:

- **Amber:** The battery is being charged.
- **Green:** The battery is fully charged.

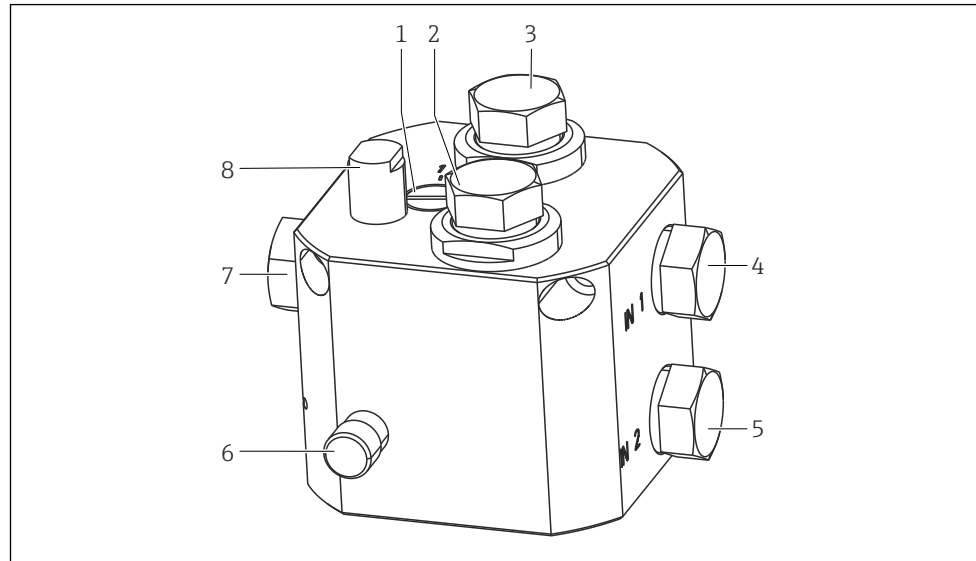
It can take several hours to charge the battery.

## 9 Operation

### Performing a comparison measurement

1. Open the medium flow to the flow assembly.

- 2.



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Optimize the flow with the control valve (6). To do so, close the control valve and then open it again slowly until the flowmeter (8) is at the upper limit stop.

3. Switch on the two transmitters.

↳ It takes up to 8 seconds until information is displayed on the transmitter of the calibration kit.

4. If performing a comparison measurement with a bypass:

Wait until the temperature of the flow assembly adjusts to match the process temperature (around 30 minutes).

- i** If the temperature difference is  $< 0.1 \text{ }^\circ\text{C}$ , no settings need to be made at the transmitter.

If the temperature difference is  $> 0.1 \text{ }^\circ\text{C}$ , the temperature compensation on both transmitters must be set to ultrapure water. Setting on the transmitter of the calibration kit: **SETUP** → **Operating mode** → **Temp.compensation** → **Ultrapure water (NaCl)**

Now select the measuring mode again.

5. Vent the flow assembly by unscrewing the sensor of the calibration kit slightly. Tighten the sensor again as soon as water comes out.

- i** If using in the bypass, the unused sensor slot for the process sensor acts as a ventilation cyclone. In this case, loosen the dummy plug (3) until water comes out and then close it again. If necessary, use vibration to assist ventilation (using a large screwdriver handle or similar). Repeat this step several times if necessary.

6. Start the measurement.

7. Adjust the process measuring point (see the Operating Instructions of the process transmitter) with the comparison value.

8. Disconnect the calibration kit from the power supply.

**NOTICE****Water can damage the electrical parts of the calibration kit**

- ▶ On completion of the work, empty the flow assembly completely before you put it back in the case.


## 10 Diagnostics and troubleshooting

### 10.1 Classification of diagnostic messages

You can find more detailed information on the errors currently pending in the **DIAG** → **Error messages** menu (red alarm LED lit <sup>1)</sup>).

The error messages are characterized by:

- Error class (internal variable, not visible)
- Error status (letter in front of the error number)
  - F=Failure, general error message
  - M=Maintenance required, action must be taken (the measured value may still be valid)
  - C=Device is in service (Check), queue (no error)
  - U=Device status is uncertain, unidentifiable error
- Type of message
  - Alarm
  - Maintenance
  - Service

 You have the option of increasing or decreasing the priority of an error. You do so by re-sorting the diagnostics list (see the "SETUP/Sensor/Sensor diagnostics" section).


The following tables are categorized by the type of error message.

### 10.2 Available diagnostic messages

The table of diagnostic messages is sorted by the message number. This number cannot be edited. The "Cat." column contains the error category as assigned at the factory.

No.	Display text	Cat.	Tests and/or remedial measures
003	Temp. sensor failure	F	Check the wiring
004	Scanning sensor	C	Connecting to the sensor
010	Sensor initialization	C	Wait for the initialization to finish.
011	Sensor no communication	F	<ul style="list-style-type: none"> <li>▪ Data processing interrupted due to user interaction with DAT module (F011)</li> <li>▪ Test the measuring chain with a new sensor</li> <li>▪ Check the settings for the sensor type used</li> </ul>
012	Sensor failure alarm	F	
013	Wrong sensor type	F	
104	Operating voltage fluctuating	F	
108	Cell const upper limit	F	
109	Cell const lower limit	F	
110	Cell const upper limit	M	
114	Cell const lower limit	M	
119	Temp offset upper limit	F	
120	Temp offset lower limit	F	
127	Temp offset upper limit	F	
128	Temp offset lower limit	F	
129	Sensor change aborted	C	
130	Calibration active	C	Wait for the calibration to finish
131	PV not stable	M	<ul style="list-style-type: none"> <li>▪ Sensor too old</li> <li>▪ Cable or connector defective</li> </ul>

1) Red LED is only lit if the failure current is  $\geq 20$  mA

No.	Display text	Cat.	Tests and/or remedial measures
132	Temperature not stable	M	
133	Polarization warning	M	
180	Cal. expired alarm	M	
183	Operation > 80 °C warning	M M	
194	Operation > 140 °C warning	M	
195	Operation > 80°C < 100 nS alarm	M	
200	Transmitter initialization	C	Wait for the initialization to finish.
201	Transmitter no comm.	F	Check that the sensor module is correctly seated on the DIN rail, and check the lateral pin contacts to the CPU module for damage.
202	Transmitter defective	F	
203	Wrong transmitter type	F	
215	Simulation active	C	Active corresponding to your settings
216	Hold active	C	Active corresponding to your settings
218	Current output defective	F	Contact the Service Team.
220	Multidrop mode active	C	Information that the device is being operated in the HART Multidrop mode
221	Multidrop switch on	C	
404	Lower limit current output	S	<ul style="list-style-type: none"> <li>■ Measured value outside the specified current range</li> <li>■ Check plausibility</li> <li>■ Adjust current output limits (Setup/Current output.../ Lower value range (4 mA) or Upper value range (20 mA))</li> </ul>
405	Upper limit current output	S	
406	Setup active	C	End parameter entry
407	Diag active	C	End interrogation of device and sensor information
408	Calib. aborted	M	
500	Software invalid	F	Contact the Service Team.
501	Device open	M	Close the housing and tighten the screws.
504	New user created	C	Message relating to changes in user administration
505	User deleted	C	
506	Data change by user	C	
510	Parameter invalid	F	Check your settings and correct them if necessary.
513	InternCFW (xxxxxxx)	F	Contact the Service Team. Quote the error number and the text displayed. (xxxxxxx) here stands for the text actually displayed.
514	InternCFW (xxxxxxx)	M	
531	(Logbook): full	M	The ring memory of the specified logbook is full. From now on, new events will overwrite the oldest entries.
810	PV upper limit	F	<ul style="list-style-type: none"> <li>■ Sensor in air</li> <li>■ Air pockets in the assembly</li> <li>■ Check measuring chain</li> </ul> PV = Primary value
811	PV lower limit	F	
812	Temp upper limit	F	
840	PV upper limit	M	<ul style="list-style-type: none"> <li>■ Check process conditions.</li> <li>■ Adjust the measuring range where necessary.</li> </ul>  These messages only apply for the concentration tables saved at the factory. These messages do not appear if you use user-defined tables.
841	PV lower limit	M	
842	Temp upper limit	M	
843	Temp lower limit	M	
950	Conc. temperature too low	M	
951	Conc. temperature too high	M	
952	Conc. conductivity too low	M	

No.	Display text	Cat.	Tests and/or remedial measures
953	Conc. conductivity too high	M	
954	Concentration too low	M	
955	Concentration too high	M	
956	Conductivity temp too low	M	
957	Conductivity temp too high	M	
958	Conductivity too low	M	
959	Conductivity too high	M	
960	Comp. conductivity too low	M	
961	Comp. conductivity too low	M	

## 11 Maintenance


### 11.1 Cleaning the device

 **WARNING**

**The device is live**

Performing cleaning work on live parts can result in injury or death.

- ▶ Disconnect the case from the power supply before commencing the cleaning tasks.
- ▶ Clean the front of the transmitter housing and the case with commercially available cleaning agents.

 **Cleaning agents can damage the surface of the device**

Never use any of the following to clean the device:

- Concentrated mineral acids or bases
- Benzyl alcohol
- Methylene chloride
- High-pressure steam

If used correctly in the pure and ultrapure water range, no contamination will occur on the flowmeter and the comparison sensor. Nevertheless, if the units do need to be cleaned, they can be rinsed with hot, pure water or isopropyl alcohol.

### 11.2 Device calibration

Depending on the operating conditions and the frequency of use, the conductivity calibration kit must be calibrated regularly at the factory (annual recalibration is recommended). An updated factory calibration certificate is issued after calibration.

## 12 Repair

### 12.1 General information

The repair and conversion concept provides for the following:

- The product has a modular design
- Spare parts are grouped into kits which include the associated kit instructions
- Only use original spare parts from the manufacturer
- Repairs are carried out by the manufacturer's Service Department or by trained users
- Certified devices can only be converted to other certified device versions by the manufacturer's Service Department or at the factory
- Observe applicable standards, national regulations, Ex documentation (XA) and certificates

1. Carry out the repair according to the kit instructions.
2. Document the repair and conversion and enter, or have entered, in the Life Cycle Management tool (W@M).

### 12.2 Spare parts

Device spare parts that are currently available for delivery can be found on the website:

[www.endress.com/device-viewer](http://www.endress.com/device-viewer)

- ▶ Quote the serial number of the device when ordering spare parts.

### 12.3 Return

The product must be returned if repairs or a factory calibration are required, or if the wrong product was ordered or delivered. As an ISO-certified company and also due to legal regulations, Endress+Hauser is obliged to follow certain procedures when handling any returned products that have been in contact with medium.

To ensure the swift, safe and professional return of the device:

- ▶ Refer to the website [www.endress.com/support/return-material](http://www.endress.com/support/return-material) for information on the procedure and conditions for returning devices.

### 12.4 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.



## 13 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.

### 13.1 Device-specific accessories

#### **Memosens CLS15E**

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



Technical Information TI01526C

#### **Flowfit CYA21**

- Universal assembly for analysis systems in industrial utilities
- Product Configurator on the product page: [www.endress.com/CYA21](http://www.endress.com/CYA21)



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## 14 Technical data

### 14.1 Input

Measured variables	Conductivity [ $\mu\text{S}/\text{cm}$ ] or [ $\text{M}\Omega\text{cm}$ ]; configurable
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### 14.2 Power supply

Supply voltage	Wide range power supply 100 to 240 VAC, 47 to 63 Hz, Class II equipment with functional grounding
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Battery	Integrated lithium-ion battery 14.4 V; 2.4 Ah The fully charged battery enables a calibration kit operating time of over 80 hours.
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External sensor cable connection	Buccaneer plug, 6-pin, IP 68
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### 14.3 Performance characteristics

Error calculation	<b>Reference system adjustment with standard NIST reference material</b>	
	Uncertainty of reference solution	0.2 %
	Uncertainty of temperature measurement	<< 0.1 %
	Uncertainty of reference system display	0.2 %
	Total uncertainty of reference system adjustment	0.3 %
	<b>Conducal adjustment with 5 <math>\mu\text{S}/\text{cm}</math> (or 200 <math>\text{k}\Omega\text{cm}</math>)</b>	
	Uncertainty of reference system adjustment	0.3 %
	Uncertainty of reference system measurement at 5 $\mu\text{S}/\text{cm}$	0.6 %
	Uncertainty of Conducal display at 5 $\mu\text{S}/\text{cm}$	0.6 %
	Total uncertainty of Conducal adjustment at 5 $\mu\text{S}/\text{cm}$	0.9 %
	(Only corresponds to the uncertainty of Conducal. The adjustment of measuring points with Conducal requires an additional uncertainty analysis.)	
	The change of the Memosens CLS15E cell constant in the conductivity range between the standard reference material and 5 $\mu\text{S}/\text{cm}$ is not considered.	

Reference devices	Reference measuring device used	Liquiline CM42
	Reference measuring cell used	Condumax CLS15E

### 14.4 Environment

Ambient temperature	+5 to +40 °C (41 to 104 °F)
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Relative humidity	Max. 80 %
Operating altitude	Up to 2000 m
Degree of protection	IP 30 with case open IP 67 with case closed without power cable Indoor use (Pollution degree II)

## 14.5 Process

Process temperature	0 to 100 °C (32 to 210 °F)
Process pressure	Max. 6 bar (87 psi)
Minimum flow	30 l/h (8 gal/h)

## 14.6 Mechanical construction

Dimensions	L x W x H (case)	530 x 442 x 215 mm (20.9" x 17.4" x 8.5")
Weight	Approx. 12.7 kg (28 lb)	
Materials	Flow assembly:	PVDF
	Clamp seal:	EPDM
	Adapter	PVDF
Process connection	Inlet:	G½ or Clamp ½" outlet
	Outlet	G½ or Clamp ½"
	Vent	G½

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