

# Technical Information

## Conducual CLY421

Conductivity calibration set for ultrapure water applications  
Factory calibrated measurement box



Certified for comparison measurement in ultrapure water up to 20  $\mu\text{S}/\text{cm}$

### Application

Ultrapure water is used in sensitive areas of the pharmaceutical and food industries and in process engineering. Calibration of process conductivity measurement is obligatory for these applications.

Since calibration solutions with very low conductivity are unstable, there is no standardization for conductivities below 74  $\mu\text{S}/\text{cm}$ .

Conducual is a reference unit that permits the calibration of process measuring devices by means of a certified comparison measurement.

### Areas of application

- Calibration of quality-relevant process measurements in the ultrapure water range up to 20  $\mu\text{S}/\text{cm}$
- Checking of in-line measurements in the process, e.g. after inspections or interruptions in operation

- Checking of conductivity measuring equipment primarily in the pharmaceutical and food industries
- Checking and calibration for product quality assurance, e.g. in semiconductor production

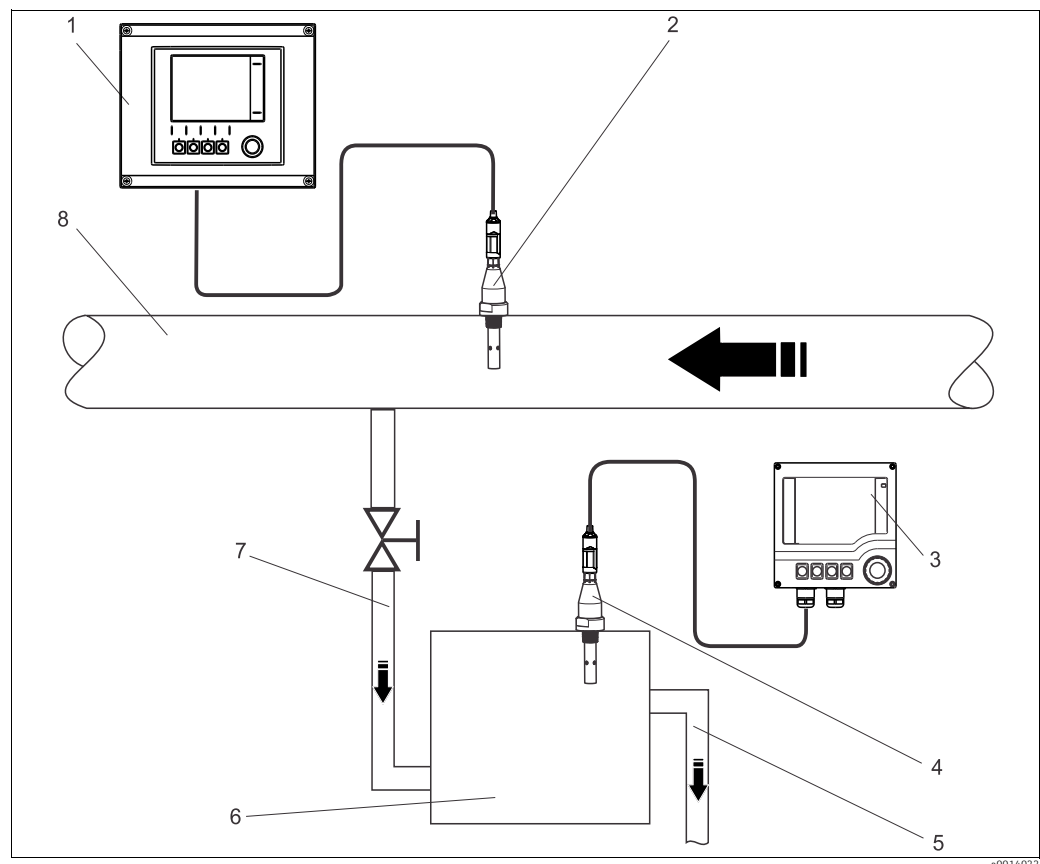
### Your benefits

- Factory calibration traceable to SRM by NIST and DAkkS
- Factory calibration of Conducual system according to ASTM D-5391-93
- Flow assembly with adjusting and monitoring functions according to ASTM D-5391
- Flexible applicable in the field thanks to:
  - battery-driven system (independent of power network)
  - robust case IP67 with external power connection

## Function and system design

### Measuring arrangements

### Comparison measurement with a bypass (preferred)



Measuring system for bypass comparison measurement

- |   |                                     |   |                               |
|---|-------------------------------------|---|-------------------------------|
| 1 | Process transmitter                 | 5 | Bypass outlet                 |
| 2 | Process conductivity sensor         | 6 | Flow assembly calibration set |
| 3 | Transmitter calibration set         | 7 | Bypass inlet                  |
| 4 | Conductivity sensor calibration set | 8 | Sterile main pipe             |

With this arrangement, it is important to make sure 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.

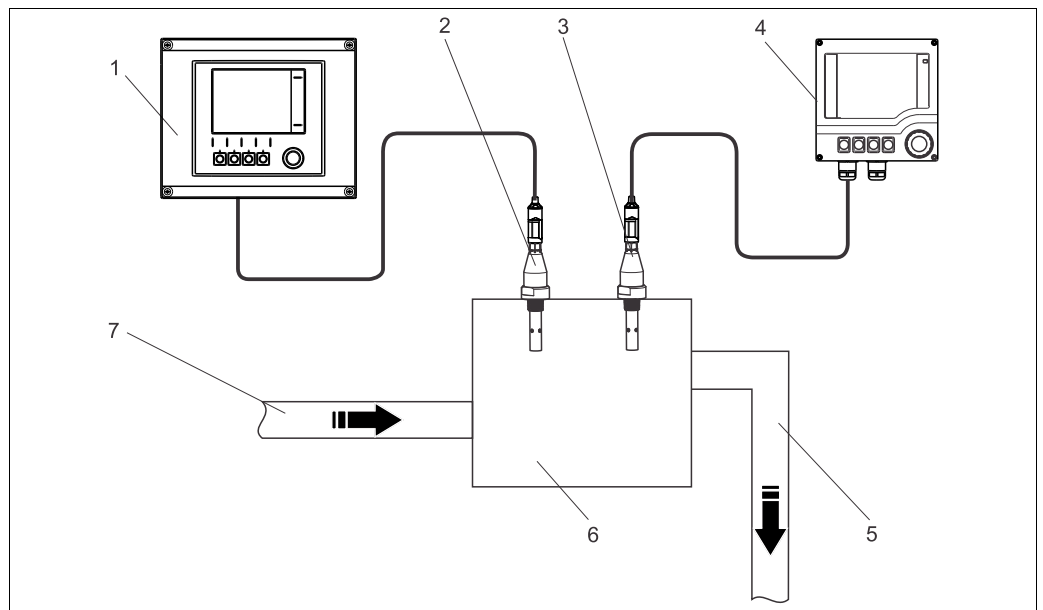
Advantage:

- Process stays hygienic

Disadvantage:

- Waiting time for temperature harmonization

### Direct comparison measurement



Measuring system for direct comparison measurement

- |   |                                     |   |                               |
|---|-------------------------------------|---|-------------------------------|
| 1 | Process transmitter process         | 5 | Outlet                        |
| 2 | Process conductivity sensor         | 6 | Flow assembly calibration set |
| 3 | Conductivity sensor calibration set | 7 | Inlet                         |
| 4 | Transmitter calibration set         |   |                               |

The flow assembly included with the calibration set has two mounting positions for conductivity sensors. This allows a direct comparison measurement.

Advantage:

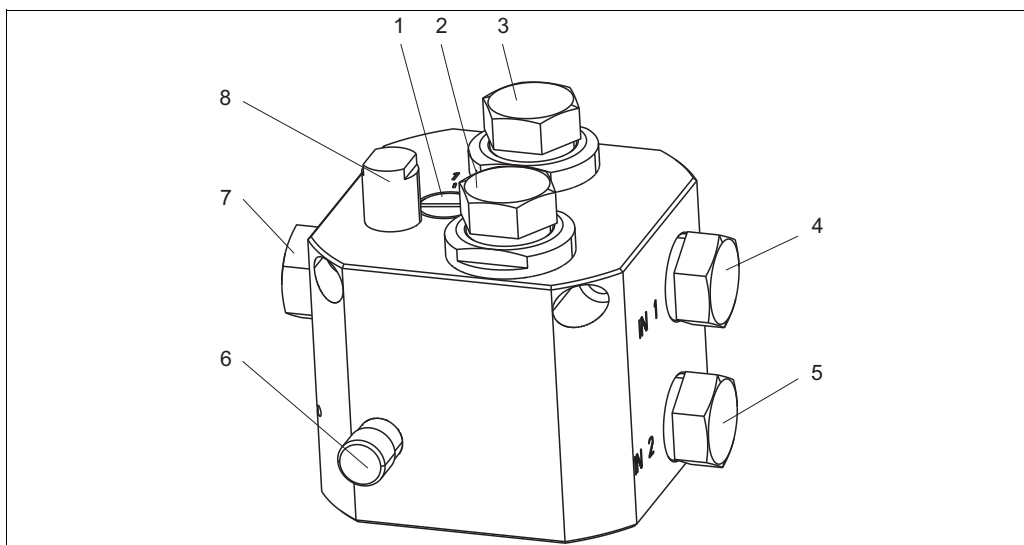
- No temperature difference, that means no waiting time
- Absolutely identical medium

Disadvantage

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

**Flow assembly**

The Conducual calibration set contains a special flow assembly for the conductivity sensor CLS15D.



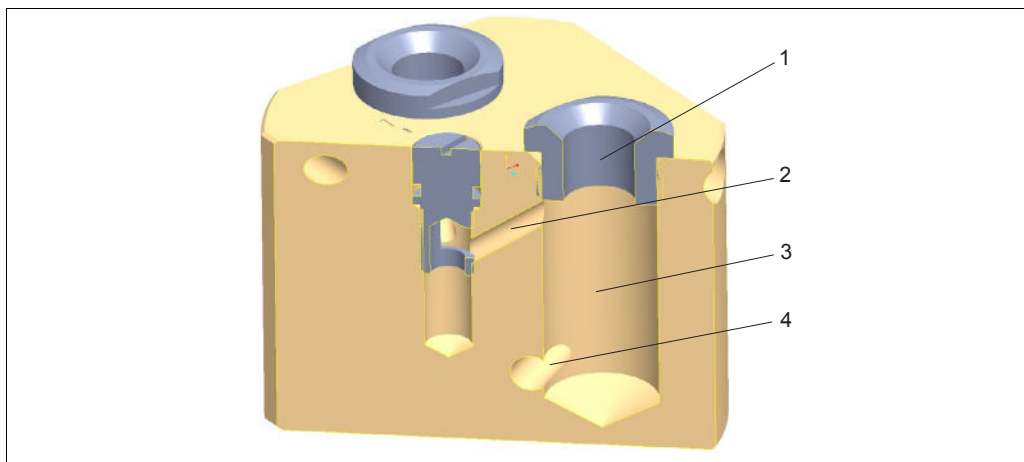
a0014030

*Flow assembly*

- |   |  |   |   |
|---|--|---|---|
| 1 | Switch over from bypass (1) to direct (2)                  | 5 | Inlet for direct comparison measurement |
| 2 | Installation point for calibration set conductivity sensor | 6 | Flow control valve                      |
| 3 | Installation point for process conductivity sensor         | 7 | Outlet                                  |
| 4 | Inlet for bypass measurement                               | 8 | Flow monitoring                         |

**Bubble trap**

To prevent corrupted conductivity measurement the medium has to be bubble free. Outgassing can occur when the medium relaxes tension. That means also in this bypass arrangement. Thanks to the integrated bubble trap the medium around the conductivity sensor stays bubble free.



a0016297

*Medium feeding at comparison measurement with bypass*

- |   |                           |
|---|---------------------------|
| 1 | Vent hole                 |
| 2 | Inlet                     |
| 3 | Second installation place |
| 4 | Lateral bore hole         |

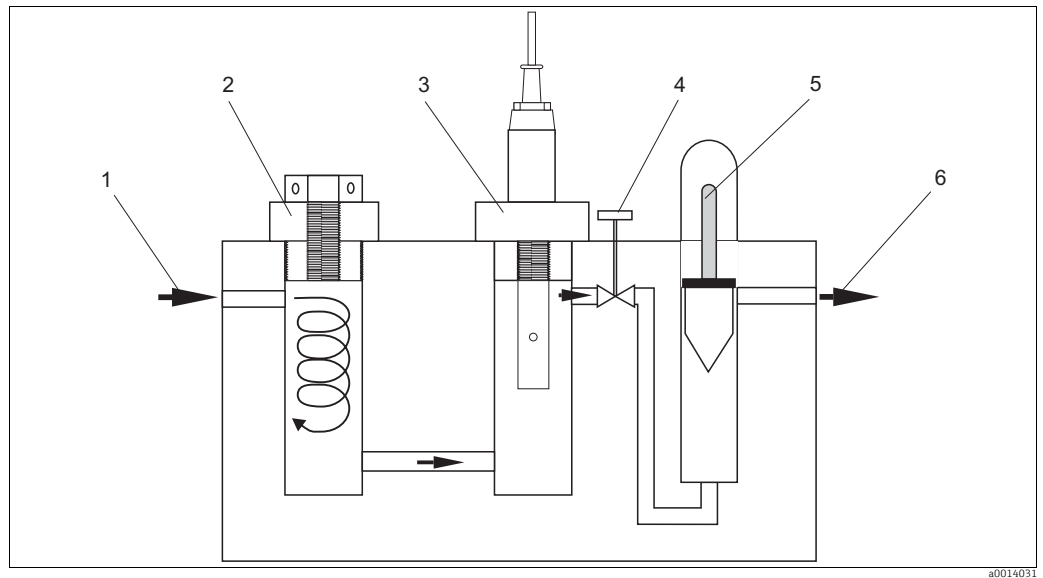
When the flow assembly is used in the bypass mode, the second installation place is used as hydrocyclone. The tangential medium inlet induces a turbulent flow. The bubbles can exhaust upwards through the vent hole. The medium is fed to the measurement chamber via the lateral bore hole.

### Controlled conditions with flow monitoring

For the calibration with Conducual according to ASTM D-5391, a minimum flow specified by the sensor manufacturer has to be kept.

The flow assembly of the calibration set is designed according to the standard specifications of the conductivity calibration.

- Bubble trap (at the bypass measurement)
- Float-type flow meter
- Flow adjustment with control valve
- Temperature resistant up to 100 °C (210 °F)

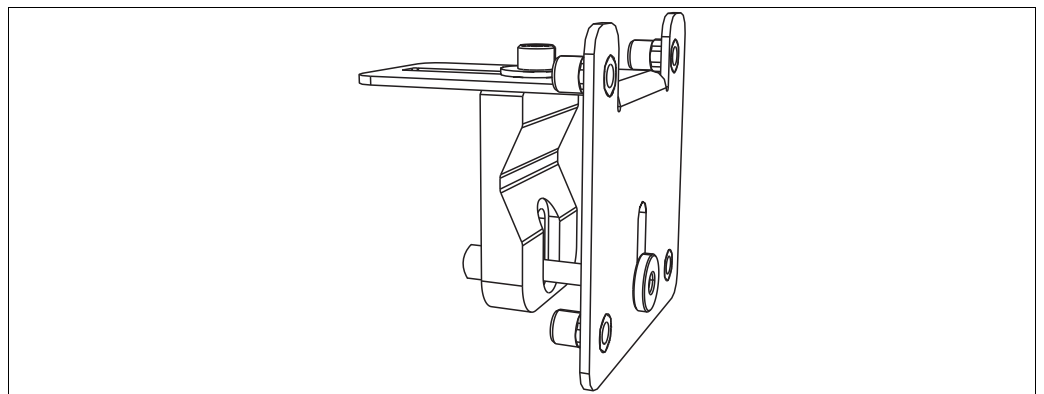


Schematic of bypass arrangement

- |   |                                     |   |                               |
|---|-------------------------------------|---|-------------------------------|
| 1 | Inlet G½                            | 4 | Flow adjustment control valve |
| 2 | Venting                             | 5 | Flow monitoring               |
| 3 | Conductivity sensor calibration set | 6 | Outlet G½                     |

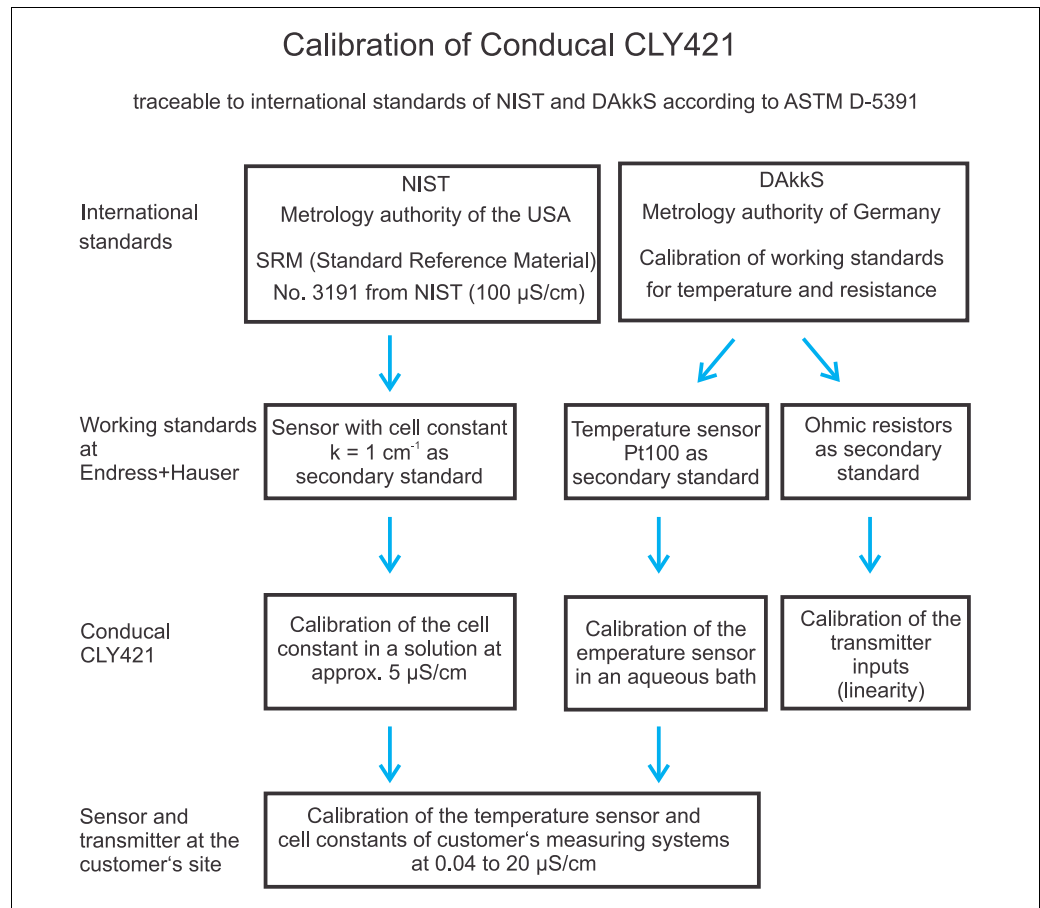
### Carrier for pipe mounting

The flow assembly is equipped with a flexible carrier system for mounting at round and rectangular pipes. This makes comparison measurement in the field safe and easy.



Carrier

## Calibration



Flow chart


## Input

<b>Measured variables</b>	$\mu\text{S}/\text{cm}$ or $\text{M}\Omega\text{cm}$ ; configurable
---------------------------	---

## Power supply

<b>Supply voltage</b>	Wide-area power pack 100 to 240 VAC, 47 to 63 Hz, Class II equipment with functional grounding
<b>Rechargeable battery</b>	Integrated lithium ion battery 14.4 V; 2.4 Ah The fully charged battery enables a calibration set operating time of over 80 hours.
<b>External sensor cable connection</b>	Buccaneer plug, 6-pin , IP 68

## Performance characteristics

<b>Error calculation</b>	<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>Conducual 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 Conducual display at 5 $\mu\text{S}/\text{cm}$	0.6 %
	Total uncertainty of Conducual adjustment with 5 $\mu\text{S}/\text{cm}$ (Only corresponds to the uncertainty of Conducual. The adjustment of measuring points with Conducual requires an additional uncertainty analysis)	0.9 %
<b>Reference devices</b>	The change of the CLS15D cell constant in the conductivity range between the standard reference material and 5 $\mu\text{S}/\text{cm}$ is not considered.	
	 Depending on availability, different standard NIST reference materials are used to adjust the reference system. Normally SRM 3191 is used with a nominal value of 100 $\mu\text{S}/\text{cm}$ .	
	Reference measuring device used	Liquiline CM42
	Reference measuring cell used	Condumax CLS15D

## Environment

<b>Ambient and storage temperature range</b>	5 to 40 °C (41 to 104 °F)
<b>Humidity</b>	max. 80 %
<b>Altitude</b>	Up to 2000 m
<b>Degree of protection</b>	IP 30 with case open IP 67 at closed case without power cord Use indoors (pollution level II)

## Process

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

## Mechanical construction

<b>Dimensions</b>	L x W x H	530 x 442 x 215 mm (20.9" x 17.4" x 8.5")
<b>Weight</b>	Approx. 12.7 kg (28 lbs)	
<b>Materials</b>	Flow assembly Clamp seal Adapter	PVDF EPDM PVDF
<b>Process connections</b>	Inlet Outlet Vent	G½ or Clamp ½" G½ or Clamp ½" G½



## Certificates and approvals

---

**Electromagnetic compatibility**

Interference emission and interference immunity complies with EN 61326: 2005, Namur NE 21:2007

---

**Factory calibration certificate**

The Conducual CLY421 calibration set is calibrated and adjusted at the factory. With the aid of a reference system, the CLS15D reference sensor is calibrated precisely in accordance with the specifications of ASTM Standard D-5391-93. In this way, the cell constant and temperature offset of the sensor are determined and recorded in the factory calibration certificate.

The certificate, which is created for each individual Conducual CLY421 kit, is enclosed in the calibration set.

Removing covers or opening the housing results in termination of the factory calibration.

## Ordering information

---

**Product structure**

You can create a valid and complete order code with the configurator on the internet.

To get to the product page enter the following address into your browser:  
[www.products.endress.com/cly421](http://www.products.endress.com/cly421)

1. You can choose from the following options on the product page located on the right:

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

2. Click "Configure this product".
3. The configurator opens in a separate window. You can now configure your device and receive the complete order code that applies for the device.
4. Afterwards, export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the page.

---

**Scope of delivery**

The delivery comprises:

- 1 Calibration set in the version ordered
- 1 Set of Operating Instructions for Conducual CLY421
- 1 Certificate of calibration

## Accessories

---

### Calibration service

#### Recalibration

- Depending on the operating conditions and the frequency of use, the conductivity calibration set must be calibrated regularly at the manufacturer's factory.
- Recommended recalibration interval: 1 year



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

---