

Operating Instructions





CUD33 compact turbidity device

Optical device for phase separation











1 About this document

1.1 Warnings



Structure of information	Meaning
<p> DANGER</p> <p>Causes (/consequences) If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation will result in a fatal or serious injury.</p>
<p> WARNING</p> <p>Causes (/consequences) If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid the dangerous situation can result in a fatal or serious injury.</p>
<p> CAUTION</p> <p>Causes (/consequences) If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Corrective action 	<p>This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or more serious injuries.</p>
<p> NOTICE</p> <p>Cause/situation If necessary, Consequences of non-compliance (if applicable)</p> <ul style="list-style-type: none"> ▶ Action/note 	<p>This symbol alerts you to situations which may result in damage to property.</p>

1.2 Symbols

1.2.1 Symbols

	Additional information, tips
	Permitted
	Recommended
	Not permitted or not recommended
	Reference to device documentation
	Reference to page
	Reference to graphic
	Result of an individual step

1.2.2 Symbols on the device

	Do not dispose of products bearing this marking as unsorted municipal waste. Instead, return them to the manufacturer for disposal under the applicable conditions.
	Reference to device documentation

1.3 Documentation



Special Documentation for hygienic applications, SD02751C

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

The compact turbidity measuring device for phase separation monitors production processes in the food industry.

The device is particularly suitable for the following applications:

- Food/dairy industry (e.g. differentiation between milk and water, yeast recovery in breweries)
- Hygienic applications (CIP/SIP)
- Monitoring of production processes
- Other applications with medium and high turbidity

Any use other than that intended puts the safety of people and the measuring system at risk. Therefore, any other use is not permitted.

The manufacturer is not liable for harm caused by improper or unintended use.

2.3 Workplace safety

The operator is responsible for ensuring compliance with the following safety regulations:

- Installation guidelines
- Local standards and regulations

Electromagnetic compatibility

- The product has been tested for electromagnetic compatibility in accordance with the applicable international standards for industrial applications.
- The electromagnetic compatibility indicated applies only to a product that has been connected in accordance with these Operating Instructions.

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.

Procedure for damaged products:

1. Do not operate damaged products, and protect them against unintentional operation.
2. Label damaged products as defective.

During operation:

- ▶ If errors cannot be rectified, take products out of service and protect them against unintentional operation.

2.5 Product safety

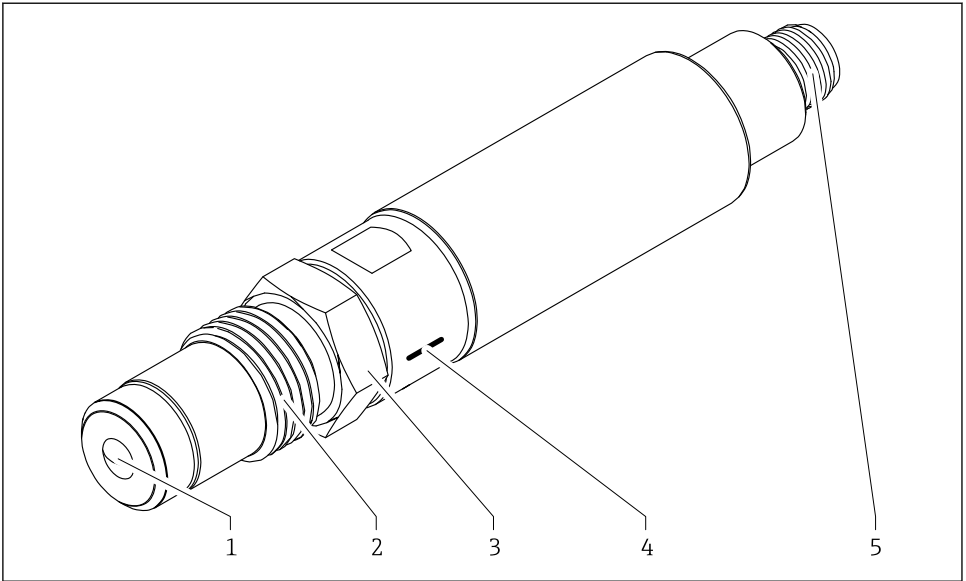
2.5.1 State of the art

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

3.1 Product design

The device monitors the turbidity of liquids, reliably detects changes and enables continuous process control. It is particularly suitable for phase separation but also for turbidity-dependent concentration measurements, e.g. filter monitoring. The device is mounted on vessels or pipes via the process connection (item 2). The optical sensor head (item 1) extends into the process fluid and measures physical properties by backscattering the irradiated light.



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 1 *Optical device for phase separation*

- 1 *Optical sensor head (sapphire lens)*
- 2 *Process connection*
- 3 *Compression fitting*
- 4 *Laser marking for reference standards*
- 5 *M12 plug connection*

4 Incoming acceptance and product identification

4.1 Incoming acceptance

On receipt of the delivery:

1. Check the packaging for damage.
 - ↳ Report all damage immediately to the manufacturer.
Do not install damaged components.
2. Check the scope of delivery using the delivery note.
3. Compare the data on the nameplate with the order specifications on the delivery note.
4. Check the technical documentation and all other necessary documents, e.g. certificates, to ensure they are complete.



If one of the conditions is not satisfied, contact the manufacturer.

4.2 Product identification

4.2.1 Nameplate

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

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

4.2.2 Identifying the product

Product page

www.endress.com/cud33

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.
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 will find information pertaining to your device, including the product documentation.

4.2.3 Manufacturer address

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

4.3 Scope of delivery

The scope of delivery comprises:

- Device, version as ordered
 - Protective sleeve the optical measuring system
 - Operating instructions
- If you have any queries:
Please contact your supplier or local sales center.

4.4 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**.

5 Installation

5.1 Installation requirements

5.1.1 Preparing the plant

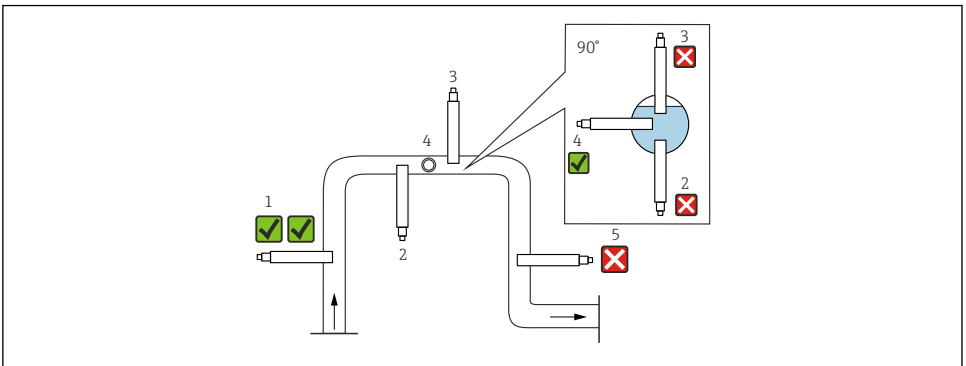
Requirements for installation:

- Ensure sufficient working space is available for operation of the device.
- The process is shut down.
- The vessel and/or pipe are depressurized, empty and clean.
- The connection nozzle and process connection are compatible.
- The pipeline is grounded.

5.1.2 Integrating the device into the process

The process connection integrates the device directly into pipelines or vessels. Adapters connect the device to existing process connections. The minimum permitted pipe diameter depends on the process connection or adapter selected. The insertion depth of the weld-in nozzle or the nozzle height of a Tri-Clamp connection determines the required pipe size.

5.1.3 Orientation

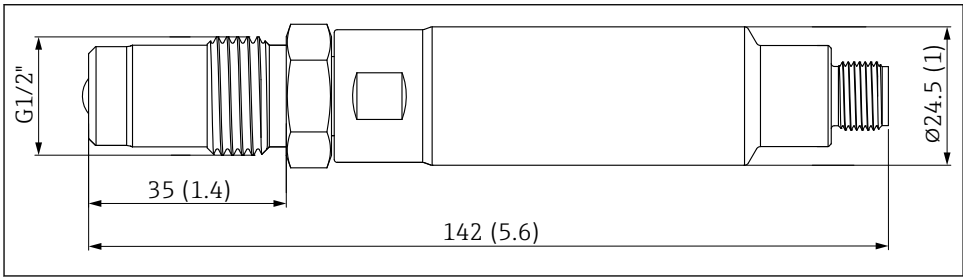


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2 Permitted orientations in pipelines

- Install the device at locations with uniform flow conditions.
- The best installation location is in a riser pipe (item 1).
- Installation in a horizontal pipe (item 4) is also possible.
- Avoid installation in down pipes (item 5).
- Do not install the device in the following locations:
 - In the case of strong turbulence in the medium (air bubbles may form)
 - Directly after a pipe bend or inlet into the pipeline
- Minimum pipeline diameter DN10.

5.1.4 Dimensions and process connection



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3 Dimensions with process connection G1/2". Unit: mm (in)

5.2 Installation depth

Type of installation	Installation depth
Process connection G1/2" with weld-in nozzle	Depends on the position of the weld-in nozzle
Process connection with TriClamp (A)	
Process connection with Varivent (B)	

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4 Unit: mm (in)

5.3 Installing the measuring instrument



Leaking process medium. Risk of injury from high pressure, high temperatures or chemical hazards!

- ▶ Wear protective gloves, protective goggles and protective clothing.
- ▶ Install or dismantle the device only when vessels or pipes are empty and depressurized.

1. Use a suitable process adapter with 35° sealing cone.
2. Tighten the compression fitting to 10 to 20 Nm.

5.4 Post-installation check

Put the device into operation only if you can answer "yes" to the following questions:

- Are the device and cable undamaged?
- Is the orientation correct?
- Is the device installed in the process connection and not suspended from the cable?

6 Electrical connection



Device is live!

Incorrect connection may result in injury or death!

- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present on any cable.

6.1 Connecting requirements

Requirements for the electrical connection:

- The connecting cable must run entirely within a building and must not exit it.
- The maximum cable length is 30 m (98.4 ft).
- Use an unshielded standard cable M12 (5-pin) with a suitable connector.

6.2 Connecting the device

1. Plug the M12 connector into the device socket.
2. Tighten the coupling nut by hand.
3. Use a wrench on the flats of the device to hold it steady while loosening the cable.

M12 plug, 3-pin

Pin	Color	Description	
1	Brown	DC + (24 V _{DC})	
2	-	-	
3	Blue	DC - (GND)	

Pin	Color	Description	
4	Black	Analog output 4 to 20 mA	
5	-	-	

7 Commissioning

7.1 Function check

1. Check whether the device has been installed correctly.
2. Check the electrical connection.
3. Before commissioning, check the chemical material compatibility, the temperature range and the pressure range.

8 Diagnostics and troubleshooting

8.1 General troubleshooting

When troubleshooting, the entire measuring point must be taken into account:

- Electrical connections and cables
- Device

The possible causes of error in the following table relate mainly to the device.

Problem	Possible cause	Remedy
No measurement or incorrect measurement	No supply voltage at the device	Check or establish the electrical connection.
	Lens is coated with buildup.	Clean the lens.
Highly fluctuating measured value	Air bubbles in the system	Ensure that the medium flows with no or only minimal air bubbles and vent the system accordingly if necessary.
	Device not fully immersed in the process liquid	Change the installation site.

Please contact Endress+Hauser Support if the problem cannot be rectified or if other faults occur.

9 Maintenance

Take all the necessary precautions in time to ensure the operational safety and reliability of the entire measuring system.

NOTICE

Effects on process and process control!

- ▶ When carrying out any work on the system, bear in mind any potential impact this could have on the process control system and the process itself.
- ▶ For your own safety, only use genuine accessories. With genuine parts, the function, accuracy and reliability are also ensured after maintenance work.

9.1 Maintenance schedule

Interval	Maintenance measures
During initial commissioning / when putting back into service after maintenance	▶ Check that all connections are sealed tightly.
3 months (for process connection G1/2")	▶ Visually inspect the process connection for leaks. ▶ Tighten the compression fitting to 10-20 Nm.
12 months	▶ Remove the device and clean the optical sensor head.

9.2 Maintenance tasks

9.2.1 Cleaning

Cleaning agents not permitted

Possible damage to the housing surface or housing seal!

- ▶ Never use concentrated mineral acids or alkaline solutions for cleaning.
- ▶ Never use organic cleaners such as acetone, benzyl alcohol, methanol, methylene chloride, xylene or concentrated glycerol cleaner.
- ▶ Never use high-pressure steam for cleaning.
- ▶ Clean the product using commercially available cleaning agents only.

The product is resistant to:

- Ethanol (for a short time)
- Diluted bases (max. 3% NaOH)
- Soap-based household cleaning agents

⚠ WARNING

Escaping process medium Risk of injury from high pressure, high temperatures or chemical hazards!

- ▶ Wear protective gloves, protective goggles and protective clothing.
- ▶ Install or dismantle the device only when vessels or pipes are empty and depressurized.

Device fouling can affect the measurement results and even cause a malfunction.

1. Remove the device from the process connection.
2. Clean device.

Type of contamination	Cleaning measure
Lime deposits	▶ Immerse the device in for a few minutes in 1 to 5 % hydrochloric acid.
Dirt particles on the lens on the sensor head	▶ Clean the lens with a cleaning cloth.

After cleaning:

1. Rinse the device thoroughly with water.
2. Check the lens for possible damage.

10 Repair

10.1 General information

Repairs may only be carried out by the manufacturer's service department.

10.2 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.

www.endress.com/support/return-material

10.3 Disposal

The device contains electronic components. The product must be disposed of as electronic waste.

- ▶ Observe the local regulations.

 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.

11 Technical data

11.1 Input

11.1.1 Measured variable

Turbidity

11.1.2 Measuring range

0 to 100 %

11.2 Performance characteristics

11.2.1 Resolution

0.1 %

11.2.2 Accuracy

± 1.5 %

11.2.3 Reproducibility

≤ 1 % of full scale value

11.2.4 Wavelength

850 nm

11.2.5 Light source

LED

11.3 Electrical data

11.3.1 Supply voltage

24 VDC

11.4 Output

11.4.1 Output signal

4 to 20 mA

11.5 Environment

11.5.1 Ambient temperature range

-10 to 70 °C (14 to 158 °F)

11.5.2 Storage temperature

-20 to 80 °C (-4 to 176 °F)

11.6 Process conditions

11.6.1 Max. permitted process pressure

20 bar (290 psi) nominal

11.6.2 Process temperature range

-10 to 100 °C (14 to 212 °F)

11.6.3 Max. permitted sterilization temperature

135 °C (275 °F)(max. 2 hours)

11.7 Mechanical construction

11.7.1 Dimensions

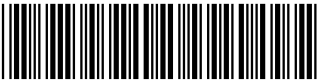
→ Section "Installation"

11.7.2 Materials

Component	Material
Device	Stainless steel 1.4435 (316L) Surface roughness <0.37 µm (14.6 µin)
Optical window	Sapphire
Seal	AgCuTi (Lot)

11.7.3 Weight

Device	Weight
Device without process adapter (with G1/2" connection)	195 g (6.9 oz)
Device with process adapter Tri-Clamp 1½"	260 g (9.2 oz)
Device with process adapter Tri-Clamp 2"	315 g (11.1 oz)
Device with process adapter Varivent N DN 40-125	770 g (27.2 oz)



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