Technical Information
Turbimax CUS71D

Ultrasonic interface sensor

Application

CUS71D is a sensor designed for interface measurement in water and wastewater.

The sensor is particularly suited for use in the following applications:
- Wastewater treatment: primary clarifier, sludge thickener, secondary clarifier
- Water treatment: sedimentation tank after flocculant dosage, sludge height in contact sludge processes
- Static separation processes: with/without slow stirring and without introduction of air

Your benefits

- Reliable: sensor guarantees accurate and continuous measurement of interface level or range
- Safe: real-time interface information ensures quick control of valves and actuators
- Easy: simple commissioning thanks to predefined calculation models
- Cost-saving: automatic wiper cleaning function enables long-term, maintenance-free operation
- Smart: all calibration- and sensor-related data saved in the sensor
- Flexible: mounting hardware suits all clarifier designs, ensuring optimum adaptation to the measurement task

Endress+Hauser

People for Process Automation

Function and system design

Measuring principle

A piezoelectric crystal is enclosed in a flat cylindrical plastic housing. When the crystal is excited by an electrical voltage, it generates a sonar signal. This causes ultrasonic waves to be transmitted at a frequency of approx. 650 kHz and at an angle of 6° to scan the separation zones.

The measured variable is the time the transmitted ultrasonic signal needs to reach the solid particles in the separation zone and return to the receiver. The separation zone is computed after the maximum slope and the maximum signal amplitude.

A sensor version featuring a wiper is available to reliably avoid the buildup of deposit on the sensor membrane.

Sensor monitoring

The acoustic signals are continuously monitored and analyzed for plausibility. If inconsistencies occur, an error message is output via the transmitter.

In addition, the following fault conditions are detected by the sensor diagnostics of Liquiline CM44x:
• Implausibly high or low measured values
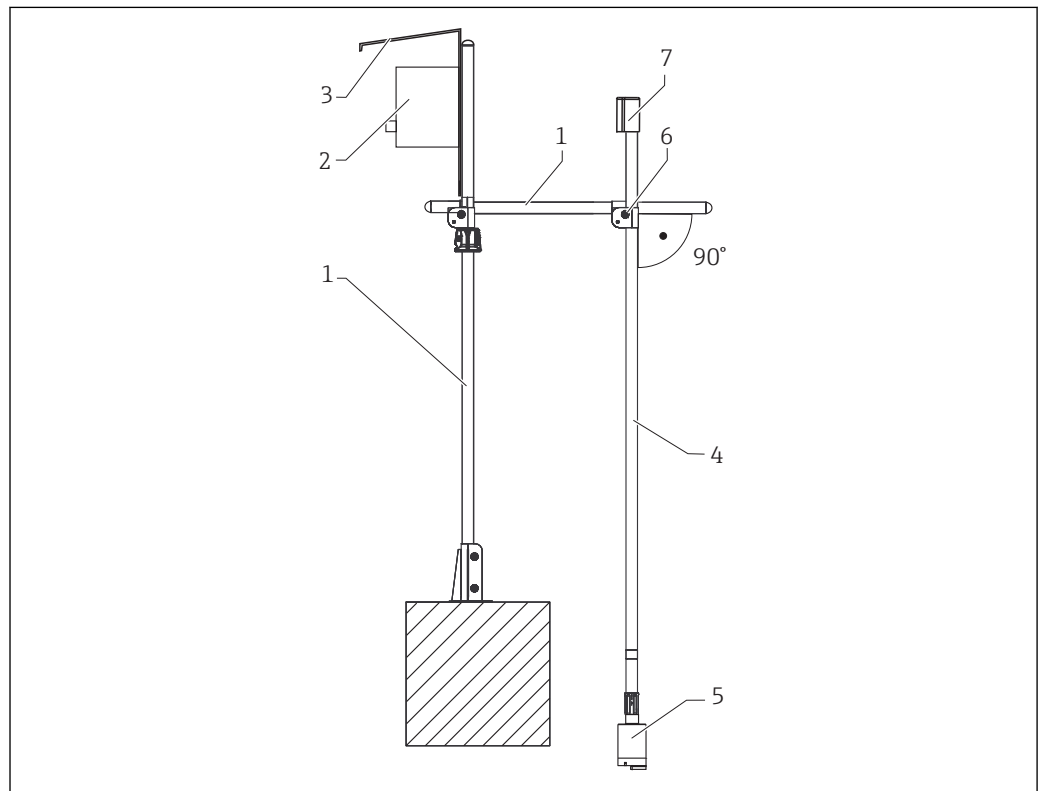• Disturbed regulation due to incorrect measured values

Measuring system

A complete measuring system comprises:
• Turbimax CUS71D ultrasonic sensor
• Liquiline CM44x multi-channel transmitter

and is optionally delivered with the following accessories:
• A weather protection cover CYY101
• A Flexdip CYH112 holder
• A fixed or rotatable Flexdip CYA112 dip pipe

A0031577

⊡ *1   Ultrasonic sensor with basin holder system and multi-channel transmitter*

1   Flexdip CYH112 holder
2   Liquiline CM44x multi-channel transmitter
3   Protective cover
4   Flexdip CYA112 assembly
5   Turbimax CUS71D ultrasonic sensor
6   Vertical from all sides
7   Splash protection cap

Endress+Hauser

Measuring system with pendulum holder
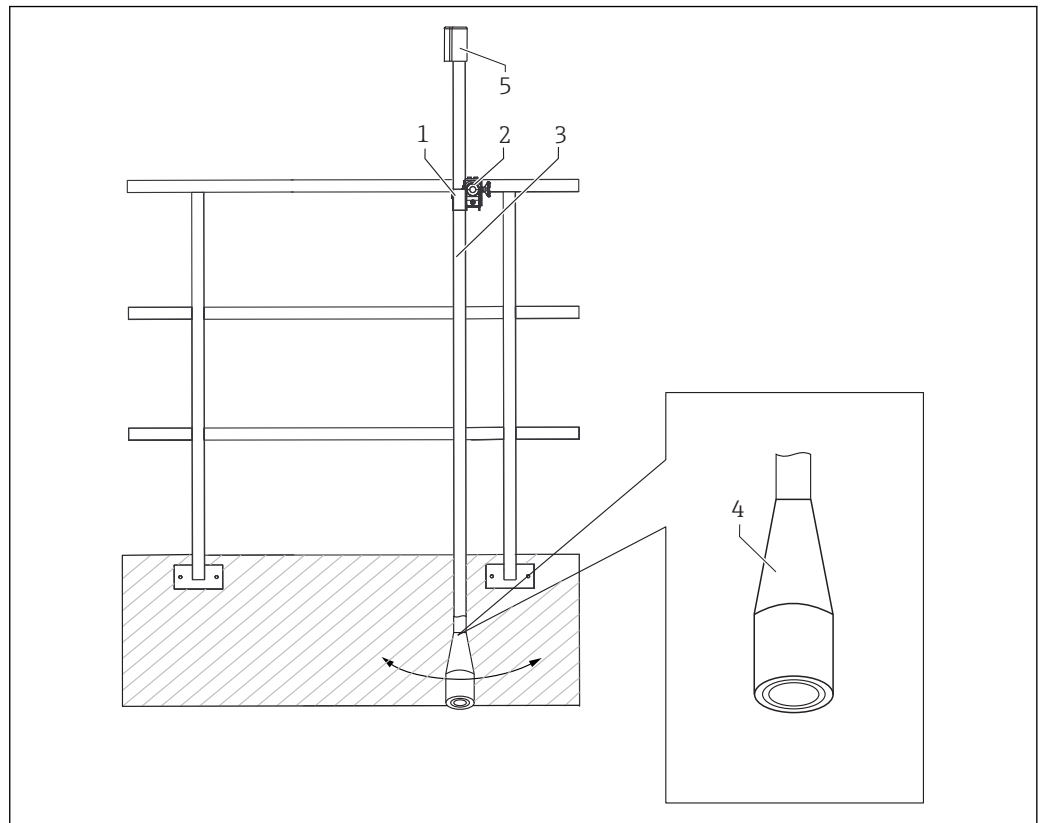
A0031578

⊞ *2   Measuring system with pendulum holder*

1   Flexdip CYH112 holder (cross clamp)
2   Flexdip CYH112 holder (pendulum holder)
3   Flexdip CYA112 assembly with CUS71D
4   PVC sensor protector
5   Splash protection cap

The PVC sensor protector protects the ultrasonic sensor from being damaged by the surface skimmer.

🛈 In the case of surface skimmers, only use the sensor without a wiper and with a PVC sensor protector (→ 🕮 10).

Dependability

Reliability

Memosens MEMOSENS

Memosens makes your measuring point safer and more reliable:
- Non-contact, digital signal transmission enables optimum galvanic isolation
- Completely watertight
- Sensor can be calibrated in a lab, thus increasing the availability of the measuring point in the process
- Predictive maintenance thanks to recording of sensor data, e.g.:
    – Total hours of operation
    – Hours of operation with very high or very low measured values
    – Hours of operation at high temperatures
    – Number of steam sterilizations
    – Sensor condition

Maintainability

Easy handling
Sensors with Memosens
technology have integrated electronics that store calibration data and other information (e.g. total hours of
Once the sensor has been connected, the sensor data are transferred automatically to the transmitter

and used to calculate the current measured value. As the calibration data are stored in the sensor, the sensor can be calibrated and adjusted independently of the measuring point. The result:
• Easy calibration in the measuring lab under optimum external conditions increases the quality of the calibration.
• Pre-calibrated sensors can be replaced quickly and easily, resulting in a dramatic increase in the availability of the measuring point.
• Thanks to the availability of the sensor data, maintenance intervals can be accurately defined and predictive maintenance is possible.
• The sensor history can be documented on external data carriers and in evaluation programs,.
• Thus, the current application of the sensors can be made to depend on their previous history.

Security

Data security thanks to digital data transmission
Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a non-contact connection that is free from potential interference. The result:
• Automatic error message if sensor fails or connection between sensor and transmitter is interrupted
• Immediate error detection increases measuring point availability

Input

Measured variable	Interface
Measuring range	0.3 to 10 m (1 to 32 ft)

Power supply

Electrical connection

1. Connect one sensor (maximum) to the Liquiline CM442. Connect up to 4 sensors to the Liquiline CM444 and CM448 transmitters.
2. Connect the fixed cable of the sensor to the Liquiline CM44x transmitter as follows:
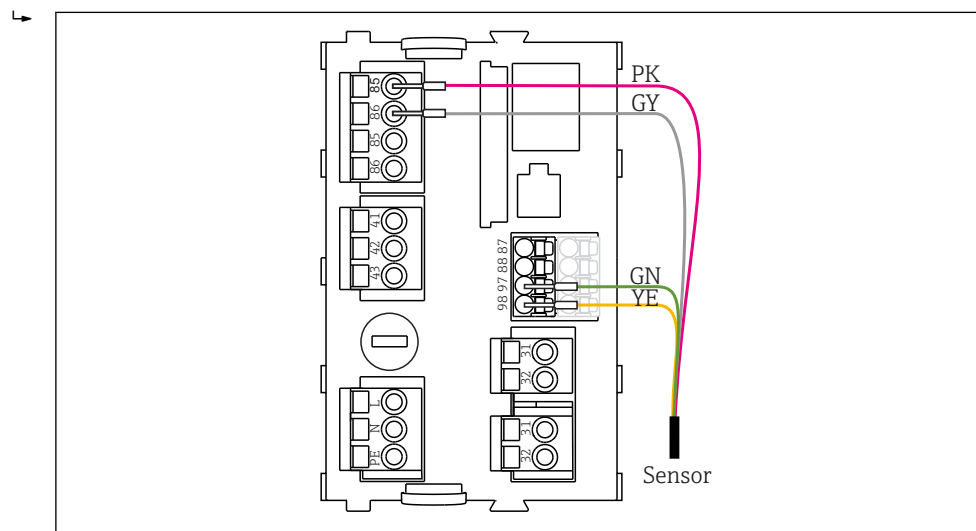

3   Sensor connection

The maximum cable length is 100 m (328 ft).

3. Use the following accessories to extend the sensor cable if necessary:

• CYK11 measuring cable with ferrules → 🕮 11
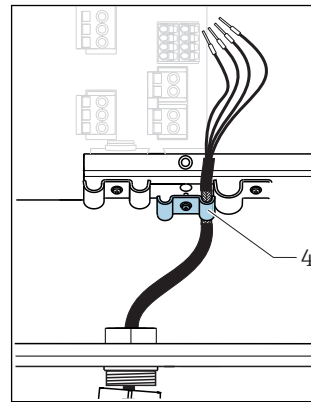• Cable/cable junction box → 🕮 11

Connecting the cable shield

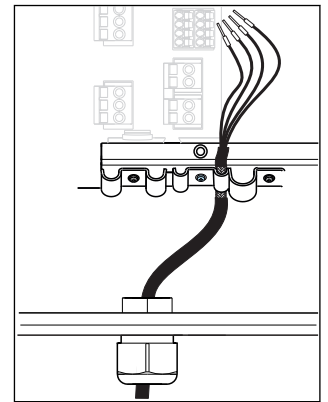ℹ️ Only use terminated original cables where possible. The sensor cables must be shielded cables.

Cable sample (does not necessarily correspond to the original cable supplied)
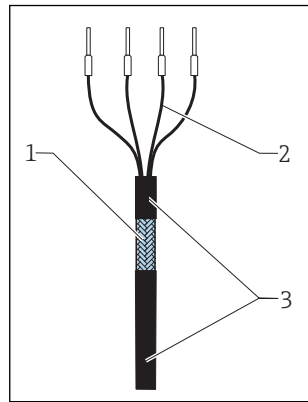
🔲 *4   Terminated cable*

1   Outer shield (exposed)
2   Cable cores with ferrules
3   Cable sheath (insulation)

🔲 *5   Insert the cable*

4   Grounding clip

🔲 *6   Tighten screw (2 Nm)*

*The cable shield is grounded by the grounding clip.*

Performance characteristics

Reference operating conditions	20 ℃ (68 ℉), 1013 hPa
Measured value resolution	± 0.3 % with end of measuring range up to 3 m (9.8 ft) ± 0.15 % with end of measuring range from 3 m (9.8 ft)
Maximum measured error	± 2 % of end of measuring range

Measuring interval	Sensor-internal	Configurable
	Sensor to transmitter	12 seconds

Calibration	The sensor is factory-configured when delivered.

Installation

Installation instructions   *Basin configuration*
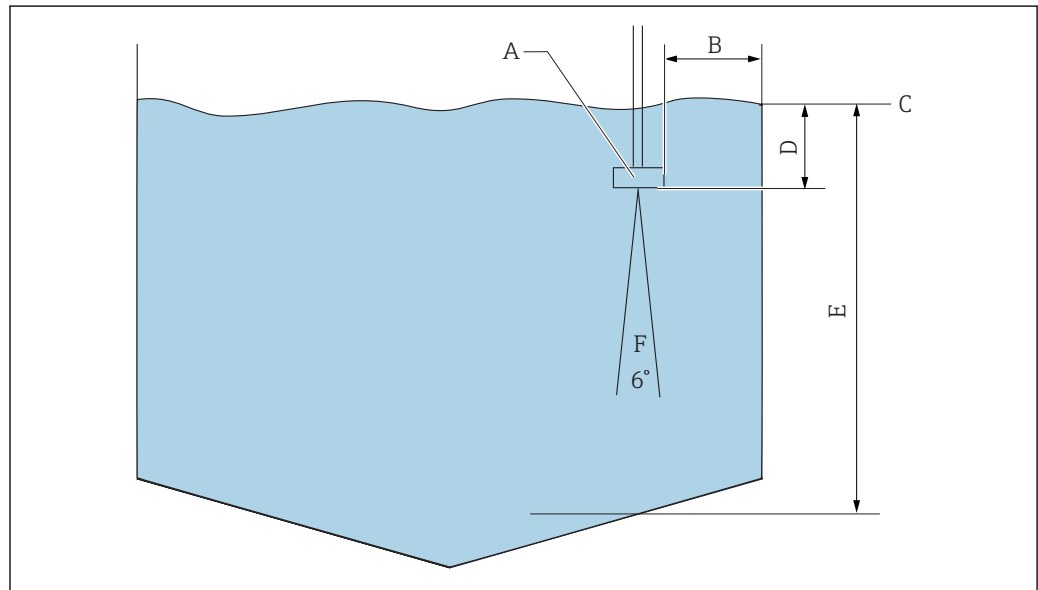
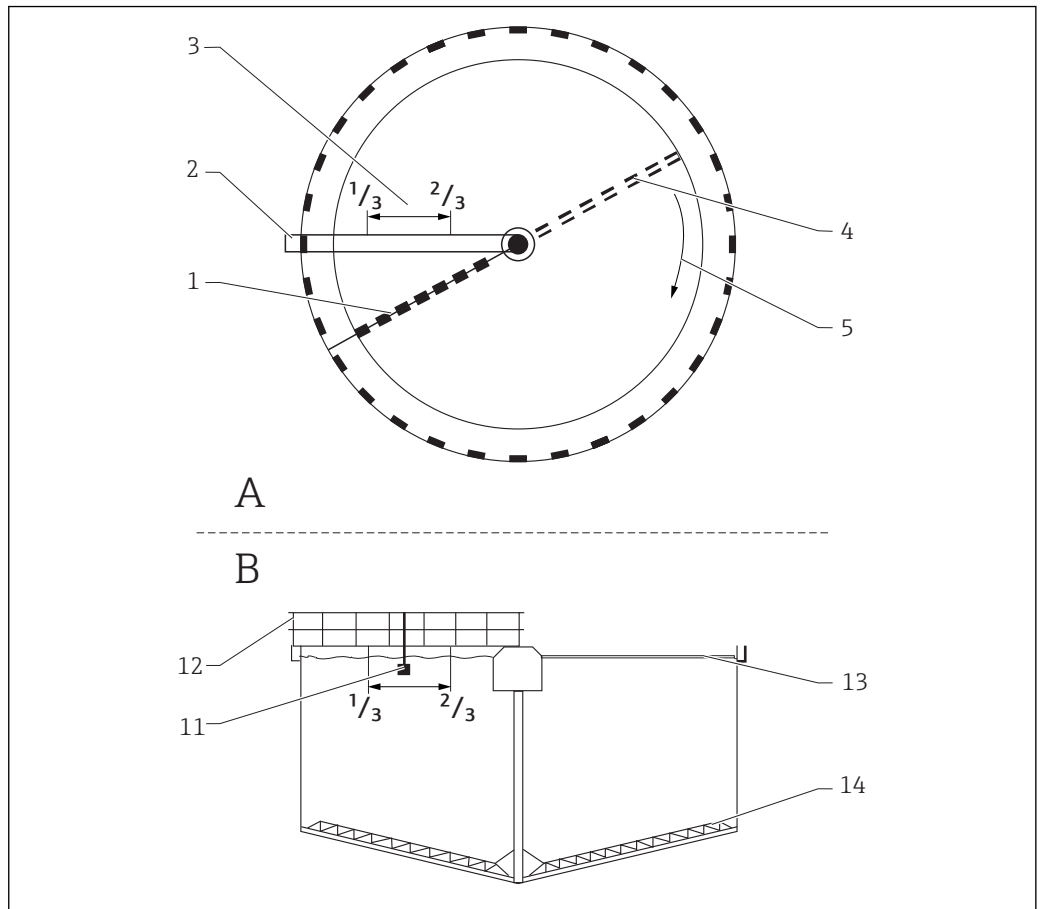A0031574

⊡ *7   Basin configuration*

A   Sensor
B   50 cm (1.64 ft) Minimum distance between sensor and basin rim
C   Fixed reference point, e.g. surface of water, basin rim, bridge/walkway etc.
D   Sensor offset
E   Basin depth
F   Opening angle of ultrasonic cone 6˚

Installation instructions

Find a suitable installation position for the sensor in the basin. Take the following points into consideration when selecting the installation position:

1. Ensure the distance from the basin rim is at least 50 cm (1.64 ft) (the sensor emits ultrasonic waves in a conical pattern).
    ↳ There should not be any conduits or basin wall protrusions in the measuring range below the sensor. Scraper units that are only temporarily in this area are permitted.

2. Mount the sensor so that it is straight and parallel to the basin wall (measured value offset).
    ↳ Do not install the sensor in zones where air bubbles, turbulence, high concentrations of turbid material and suspended matter, or foam formation occur (e.g. inlet).

3. Using a dip pipe, install the sensor at least 20 cm (0.66 ft) beneath the surface of the water.

Circular clarifier

🖼 *8   Basin configuration in circular clarifiers*

A	View from above	B	Cross-section
1	Surface skimmer	11	Sensor
2	Bridge/walkway	12	Rail
3	Sensor position range	13	Surface skimmer
4	Floor rake	14	Floor rake
5	Direction of rake movement		

Environment

Storage temperature   −20 to 50 °C (−4 to 120 °F)

Degree of protection   IP 68 (1 m (3.3 ft) water column over 60 days, 1 mol/l KCl)
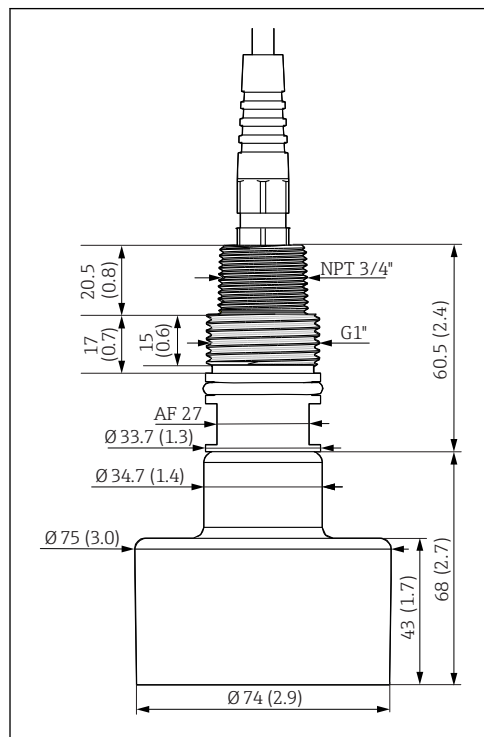
Process
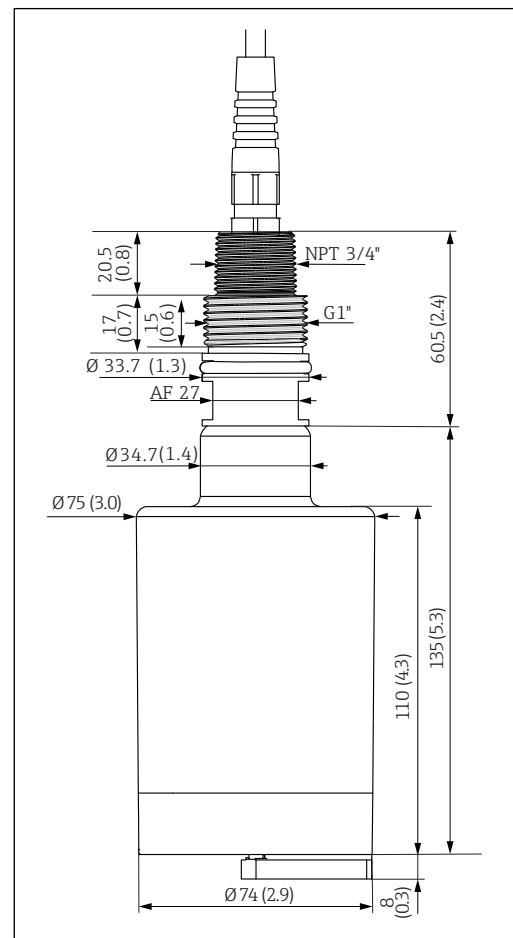
Process temperature range   1 to 50 °C (34 to 122 °F)

Process pressure range

Standard version:	0 to 6 bar (0 to 87 psi)
Version with wiper:	0 to 0.3 bar (0 to 4.4 psi)

Mechanical construction

Dimensions

🖼 9   *Dimensions for standard sensor. Dimensions: mm (in)*

🖼 10   *Dimensions for sensor with wiper. Dimensions: mm (in)*

Weight	Standard sensor:	1.02 kg (2.25 lb)
	Sensor with wiper:	1.25 kg (2.75 lb)

Materials	Sensor:	ABS and epoxy resin
	Wiper:	EPDM
	Housing:	Polyamide

Process connections	G1 and NPT ¾"

Certificates and approvals

CE mark

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

EAC

The product has been certified according to guidelines TP TC 004/2011 and TP TC 020/2011 which apply in the European Economic Area (EEA). The EAC conformity mark is affixed to the product.

Electromagnetic compatibility	Interference emission and interference immunity: Industrial environment as per • EN 61326-1:2013 • EN 61326-2-3:2013 • NAMUR NE21: 2012

Ordering information

Product page	www.endress.com/cus71d

Product Configurator	On the product page there is a **Configure** button to the right of the product image. 1. Click this button. ↳ The Configurator opens in a separate window. 2. Select all the options to configure the device in line with your requirements. ↳ In this way, you receive a valid and complete order code for the device. 3. Export the order code as a PDF or Excel file. To do so, click the appropriate button on the right above the selection window. 🛈 For many products you also have the option of downloading CAD or 2D drawings of the selected product version. Click the **CAD** tab for this and select the desired file type using picklists.

Scope of delivery	The delivery comprises: • 1 Turbimax CUS71D sensor, version as ordered • 1 set of Operating Instructions BA00490C/07/EN ▸ If you have any queries: Please contact your supplier or local sales center.

Accessories

The following are the most important accessories available at the time this documentation was issued.

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

Device-specific accessories

Assemblies

FlexdipCYA112
- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Material: PVC or stainless steel
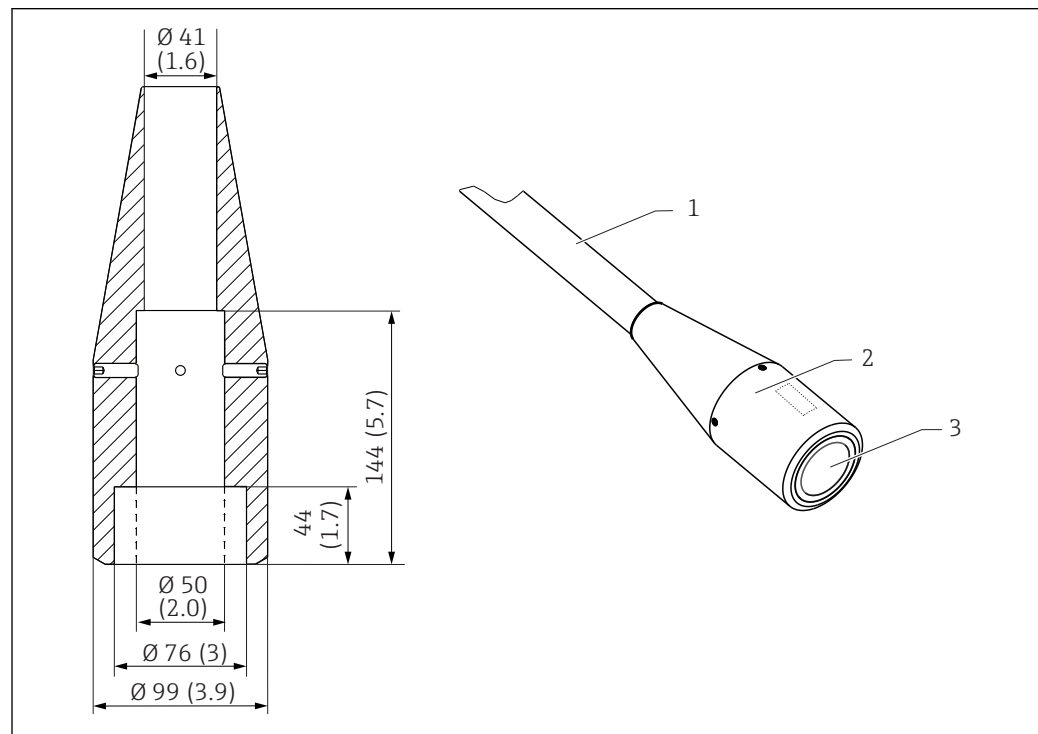- Product Configurator on the product page: www.endress.com/cya112

📖 Technical Information TI00432C

PVC sensor protector for pendulum holder
- The PVC sensor protector protects the CUS71D ultrasonic sensor from being damaged by the surface skimmer.
- Available for order via the product structure
- Can be ordered individually via order number: 71404869

ℹ️ Only use the PVC sensor protector for the sensor version without a wiper.

A0037314

🖻 *11   PVC sensor protector for CUS71D. Dimensions: mm (in)*

1   CYA112 assembly
2   PVC sensor protector
3   CUS71D ultrasonic sensor

Holder

Flexdip CYH112
- Modular holder system for sensors and assemblies in open basins, channels and tanks
- For Flexdip CYA112 water and wastewater assemblies
- Can be affixed anywhere: on the ground, on the capstone, on the wall or directly onto railings.
- Stainless steel version
- Product Configurator on the product page: www.endress.com/cyh112

📖 Technical Information TI00430C

Cable extension

Memosens data cable CYK11
- Extension cable for digital sensors with Memosens protocol
- Product Configurator on the product page: www.endress.com/cyk11

📖 Technical Information TI00118C

Junction box, cable/cable
- Material: aluminum, painted
- Cable extension: Memosens sensors, Liquiline
- Order number: 71145499

Endress+Hauser

People for Process Automation

www.addresses.endress.com