



Level



Pressure



Flow



Temperature



Liquid  
Analysis



Registration



Systems  
Components



Services



Solutions

## Technical Information

# Turbimax CUS71D

Ultrasonic interface sensor

Immersion sensor for interface measurement



### Application

In many instances in process engineering, suspensions are separated into their solid and liquid components by sedimentation. To operate this process economically and efficiently in practice, it is indispensable to monitor the separation and transition zones of the clarification and settling phases continuously.

Turbimax CUS71D is a sensor for many applications of the interface measurement

- Wastewater treatment: primary clarifier, sludge thickener, secondary clarifier
- Water purification: settling basin after flocculant dosage, filter media expansion monitoring to optimize backwash operations, sludge height in contact sludge process
- Chemical industry: static separation process

### Your benefits

- Three different sensor models allow optimal adaption to the measurement task.
- Simple commissioning thanks to predefined calculation models.
- Intelligent sensor - all characteristics and calibration values are stored in the sensor.

## Function and system design

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### Measuring principle

A piezoelectric crystal is integrated in a flat cylindrical plastic housing. When the crystal is excited by an electrical voltage, it generates a sonar signal. The ultrasonic waves are transmitted at a frequency of 657 kHz at an angle of 6° to scan the separation zones.

The parameter measured is the time it takes for the transmitted ultrasonic signal to reach the solid particles in the separation zone and return to the receiver.

A sensor version with wiper avoids film formation at the sensor membrane. If a turbidity signal is also needed a sensor version with wiper and integrated turbidity measurement is available.

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### Function

The speed of the sound varies according to the physical properties of the measuring medium and is affected by temperature and air pressure. The liquid zones and solids content of the medium also vary.

To obtain precise measurement results, it is therefore vital to adapt system variables to the process, e. g. pulselength and the speed of the sound.

The CM44x offers the following possibilities for signal evaluation:

- Mask out regions where the separation zone is not expected.
  - Evaluate received signal strengths differently.
  - Select leading or trailing signal edges in the evaluation.
  - Amplify sensor signals at different rates, e. g. for floating sludge.
  - Define a region (gate) above and below the separation zone. Signal evaluation only takes place in the defined region. The gate wanders with the separation zone. This makes smoothing algorithms unnecessary.
  - Arrow indicator for basin floor.
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### Sensor monitoring

The optical signals are continuously monitored und checked for plausibility. Discrepancies are reported via error messages by the transmitter.

The sensor check system of the Liquiline CM44x reports the following failure conditions:

- Implausible high or low measuring values
- Disturbed controlling due to erroneous measuring values

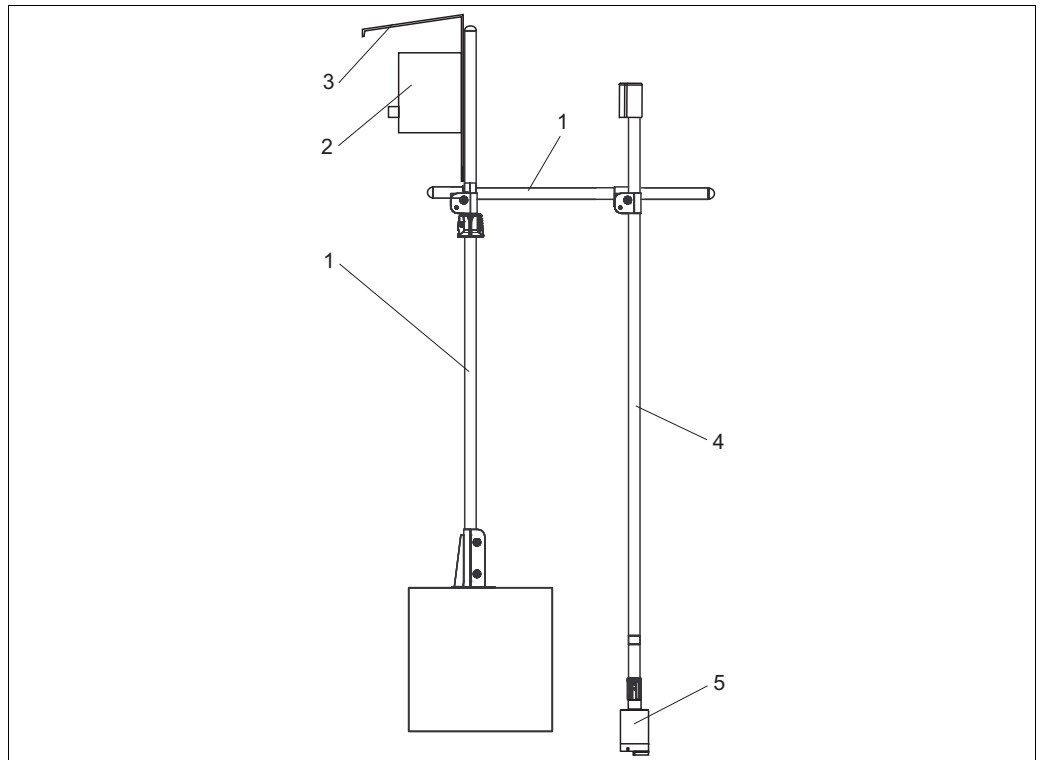
**Measuring system**

A complete measuring system comprises:

- Ultrasonic sensor Turbimax CUS71D
- Multi-channel transmitter Liquiline CM44x

and optional:

- Weather protection roof CYY101
- Holder system Flexdip CYH11
- Fixed or rotatable immersion pipe Flexdip CYA112



*Ultrasonic sensor with holder system and multi-channel transmitter*

0014923

- |   |   |
|---|---|
| <p>1 Holder system Flexdip CYH112</p> <p>2 Multi-channel transmitter Liquiline CM44x</p> <p>3 Weather protection roof</p> | <p>4 Assembly Flexdip CYA112</p> <p>5 Ultrasonic sensor Turbimax CUS71D</p> |
|---|---|

## Input

### Measuring variables

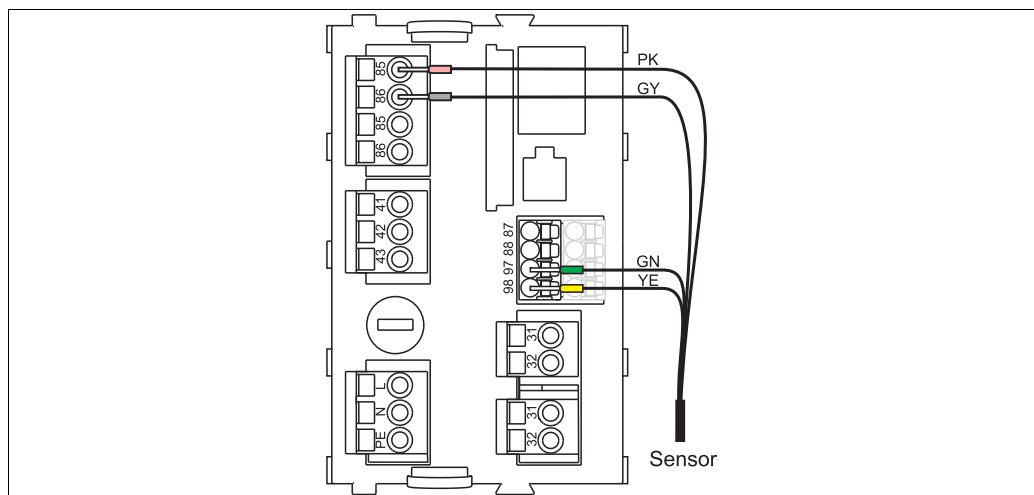
Standard sensor	Interface
Sensor with wiper	Interface
Sensor with wiper and turbidity measurement	Interface Turbidity

### Measuring range

Standard sensor	0.3 to 10.0 m (1.0 to 32 ft)
Sensor with wiper	0.3 to 10.0 m (1.0 to 32 ft)
Sensor with wiper and turbidity measurement	0.3 to 10.0 m (1.0 to 32 ft) 0 to 50 (200) NTU

## Power supply

The sensor will be connected to the transmitter as follows:



*Sensor connection*

a0012460

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

You can connect only 1 sensor to the transmitter Liquiline CM442.

You can connect up to 4 sensors to the transmitter Liquiline CM444 and CM448.

## Performance characteristics

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**Maximum measured error**

Interface	35 mm at 3.0 m
Turbidity	1 % of the measuring range at 50 NTU

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**Measured value resolution**

Interface	3 mm at 3.0 m
Turbidity	1 NTU

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**Measurement interval**Adjustable

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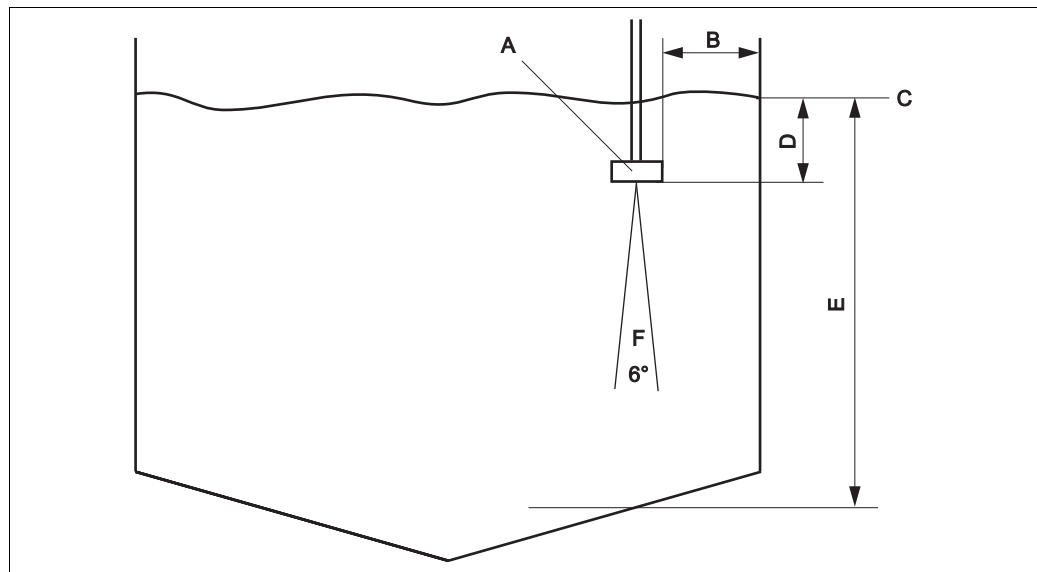
**Calibration**

The sensor is factory calibrated delivered.  
The "speed of sound" is adjustable and preprogrammed for the application "water".

## Installation conditions

### Installation instructions

### Basin configuration



#### Basin configuration

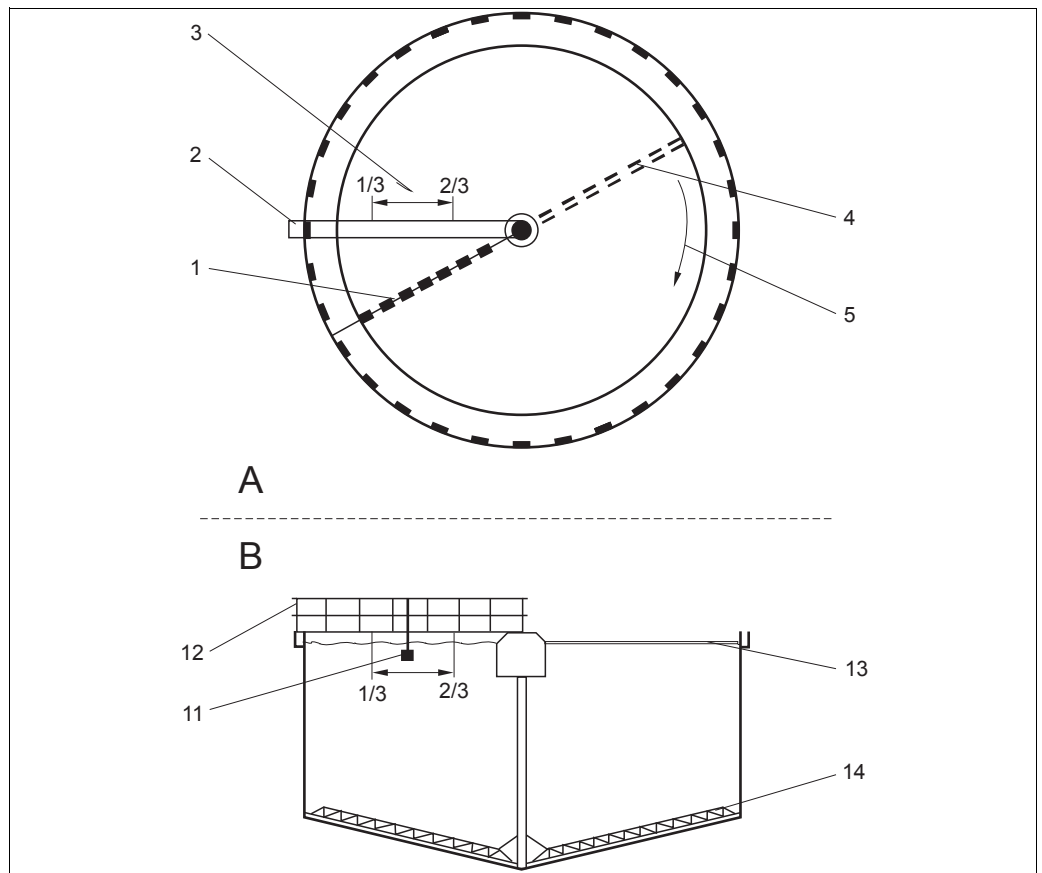
- A Sensor
- B Minimum distance of sensor to basin wall = 45 cm (1.48 ft.)
- C Reference point e.g. water surface
- D Zero point
- E Basin depth
- F Opening angle of ultrasonic cone, 6°

### Installation instructions

Look at the construction drawing of the basin for a suitable position for the sensor. In doing so, you must take the following factors into account:

- The minimum distance between the basin wall and the sensor is 45 cm (1.48 ft.) (sensor emits ultrasound in conical form).
- There should not be any basin wall protrusions or piping in the measuring range below the sensor. Scrapers that are only temporarily in this area are permitted.
- Do not install the sensor in zones in which air bubbles, turbulence, high levels of turbid material or suspended matter or foam formation occur (e.g. inlet).
- Using an immersion tube, install the sensor 20 cm (0.66 ft.) beneath the surface of the water.
- The transmitter may not be installed in a second enclosure (heat accumulation).
- If possible, do not install the transmitter near high voltage sources. In addition, also avoid sources of magnetic fields, e.g. large transformers or frequency converters.
- The system can only detect a separation zone if there is a clear transition between the zones. Unclear transition from the liquid to the solid phase cannot be detected.

### Circular Clarifier



Basin configuration in circular clarifier

a0015232

- |   |                 |    |                 |
|---|-----------------|----|-----------------|
| A | View from top   | B  | Cross section   |
| 1 | Surface skimmer | 11 | Sensor          |
| 2 | Walk way        | 12 | Hand rail       |
| 3 | Sensor mounting | 13 | Surface skimmer |
| 4 | Bottom rake     | 14 | Bottom rake     |
| 5 | Rake direction  |    |                 |

## Environment

**Storage temperature** -20 to 50 °C (-4 to 122 °F)

**Ingress protection** IP 68 (test conditions: 1 m (3.3 ft) water column during 60 days, 1 mol/l KCl)

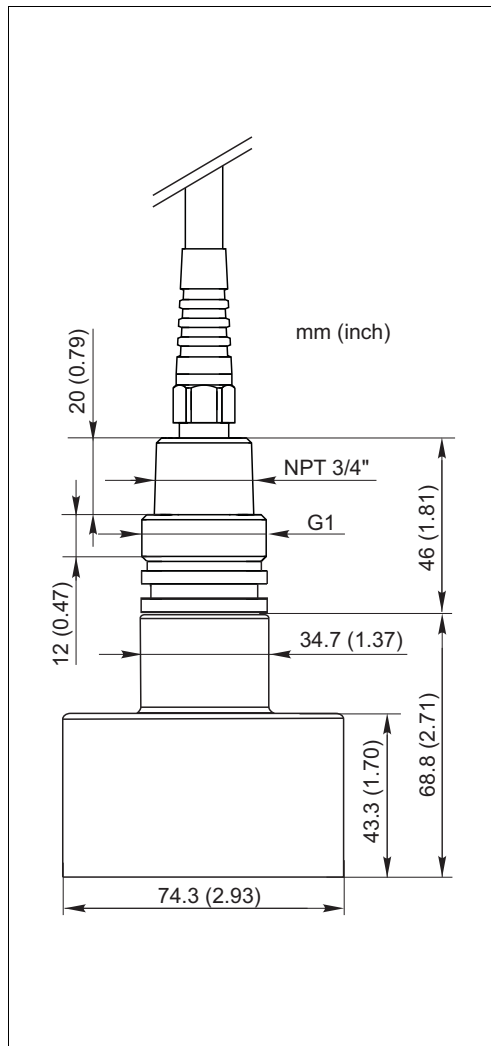
## Process

**Process temperature** 1 to 50 °C (34 to 122 °F)

**Process pressure** 0.0 to 6 bar (0 to 87 psi) absolute

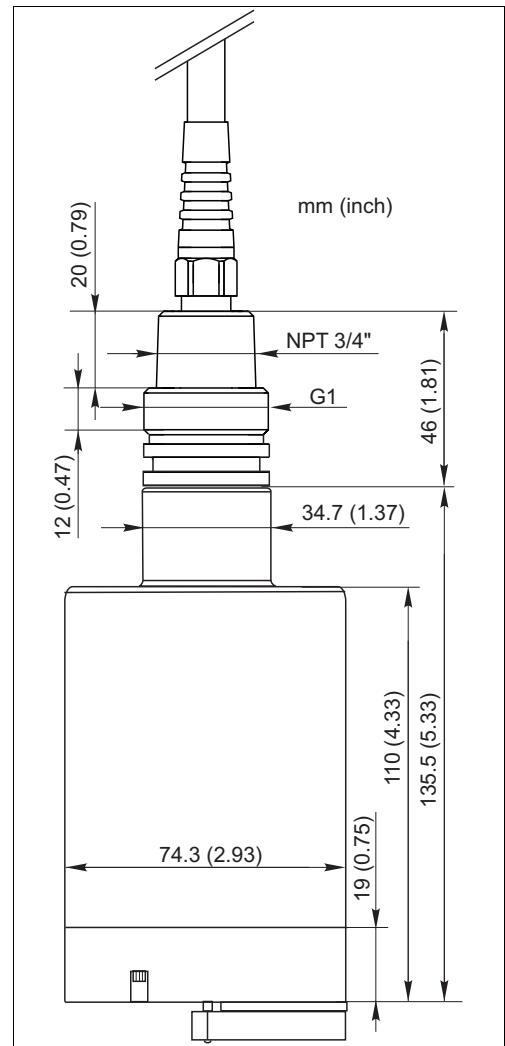
## Mechanical construction

### Dimensions



Dimensions of standard sensor

s0014922



Dimensions of sensor with wiper

s0014921

### Weight

Standard sensor	1.02 kg (2.25 lb)
Sensor with wiper	1.25 kg (2.75 lb)
Sensor with wiper and turbidity measurement	1.25 kg (2.75 lb)

### Materials

Sensor	ABS and epoxy plastic
Wiper	Rubber
Optical window	Sapphire

### Process connections

G1 and NPT 3/4"



## Certificates and approvals

### EMC compatability

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

## Ordering information

### Selection

Standard sensor	Sensor with wiper	Sensor with wiper and turbidity measurement
Clear water sedimentation tanks, secondary clarifier with surface skimmer, secondary clarifier with less floating sludge	Primary clarifier, secondary clarifier, sludge tanks, flotation tanks	Secondary clarifier, settling basin, sequencing batch reactor (SBR)

### Order code


To get to the product page enter the following address into your browser:  
[www.products.endress.com/cus71d](http://www.products.endress.com/cus71d)

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.

### Product structure

 The following product structure is effective on the date of print only. You can create an up-to-date and complete order code with the help of the configurator on the internet product page.

Approval	
AA	Non-harzdous area
Version	
1	Standard sensor
2	Sensor with wiper
3	Sensor with wiper and turbidity measurement
Cable length	
A	15 m (49.2 ft), wire terminals
CUS71D-	Order code

### Scope of delivery

The scope of delivery comprises:

- 1 sensor Turbimax CUS71D in the ordered version
- 1 Operating Instructions BA490C/07/EN

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## Accessories

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### Assemblies

Wastewater assembly Flexdip CYA112

- Modular assembly system for sensors in open basins, channels and tanks
- Versions in stainless steel or PVC
- Ordering acc. to product structure (Technical Information TI432C/07/en)

PVC scraper for flexible mounting

- Order number: C-UA 110818-60
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### Holder system

Holder system Flexdip CYH112 for water and wastewater assembly Flexdip CYA112

- Modular holder system for sensors and assemblies in open basins, channels and tanks
  - The holder system CYH112 works for nearly any type of fixing - fixing on the floor, wall or directly on a rail.
  - Material: stainless steel
  - Ordering acc. to product structure (Technical Information TI430C/07/en)
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### Transmitter

Liquiline CM44x

- Multiple-channel transmitter for the connection of digital sensors with Memosens technology
- Power supply: 85 to 265 V AC, 18 to 36 V DC or 20 to 28 V AC (not CM448)
- Universally upgradeable
- SD card slot
- Alarm relay
- IP 66
- Ordering acc. to product structure (Technical Information TI444C/07/en)



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