



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Operating Instructions

Turbimax CUS71D

Ultrasonic interface sensor

Immersion sensor for interface measurement

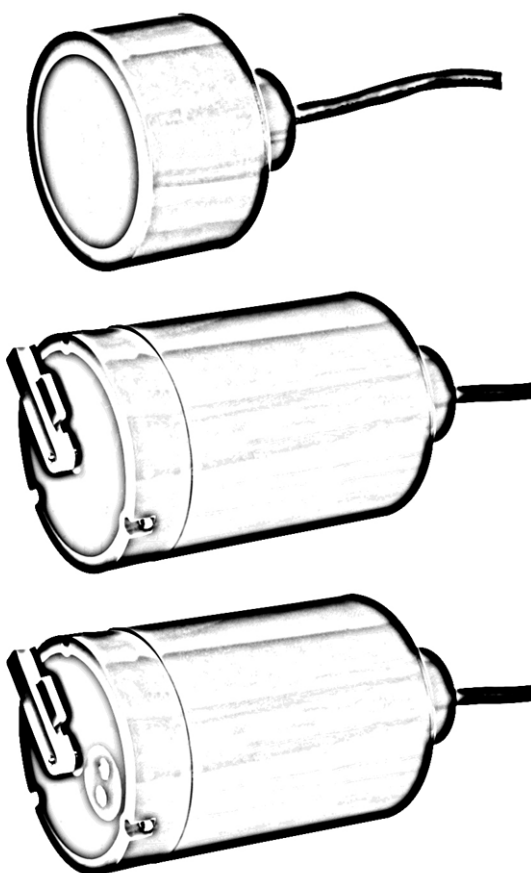


Table of contents

1	Safety instructions	4	10	Technical Data	28
1.1	Designated use	4	10.1	Input	28
1.2	Installation, commissioning and operation	4	10.2	Performance characteristics	28
1.3	Operational safety	4	10.3	Environment	28
1.4	Return	4	10.4	Process	28
1.5	Notes on safety icons and symbols	5	10.5	Mechanical construction	28
2	Identification	6		Index	29
2.1	Nameplate	6			
2.2	Scope of delivery	6			
2.3	Certificates and approvals	6			
3	Installation	7			
3.1	Incoming acceptance, transport, storage	7			
3.2	Dimensions	7			
3.3	Installation instructions	8			
3.4	Installation conditions	10			
3.5	Post-installation check	11			
4	Wiring	12			
4.1	Connecting to the transmitter	12			
4.2	Post-connection check	12			
5	Device description	13			
5.1	Sensor design	13			
5.2	Measuring principle	13			
5.3	Function	13			
5.4	Sensor monitoring	13			
5.5	Calibration	14			
5.6	Cyclic cleaning	14			
6	Commissioning	15			
6.1	Firmware update	15			
6.2	Basic settings	16			
7	Maintenance	24			
7.1	Cleaning the sensor	24			
8	Accessories	25			
8.1	Assemblies	25			
8.2	Holder	25			
8.3	Transmitter	25			
9	Troubleshooting	26			
9.1	Troubleshooting instructions	26			
9.2	Spare parts	26			
9.3	Return	27			
9.4	Disposal	27			

1 Safety instructions

1.1 Designated use

CUS71D is an immersion 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 purification: settling basin after flocculant dosage, sludge height in contact sludge process
- Chemical industry: static separation process

Any other use than the one described here compromises the safety of persons and the entire measuring system and is not permitted.

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

1.2 Installation, commissioning and operation

Please note the following items:

- Installation, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.
Trained personnel must be authorized for the specified activities by the system operator.
- Electrical connection must only be carried out by a certified electrician.
- Technical personnel must have read and understood these Operating Instructions and must adhere to them.
- Before commissioning the entire measuring point, check all the connections. Ensure that electrical cables and hose connections are not damaged.
- Do not operate damaged products and secure them against unintentional commissioning.
Mark the damaged product as being defective.
- Measuring point faults may only be rectified by authorized and specially trained personnel.
- If faults can not be rectified, the products must be taken out of service and secured against unintentional commissioning.
- Repairs not described in these Operating Instructions may only be carried out at the manufacturer's or by the service organization.

1.3 Operational safety

The sensor has been designed and tested according to the state of the art and left the factory in perfect functioning order.

Relevant regulations and European standards have been met.

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

- Installation instructions
- Local prevailing standards and regulations.

1.4 Return

If the sensor has to be repaired, please return it *cleaned* to the sales center responsible.

Please use the original packaging, if possible.

Before returning the device, please clarify all formalities – such as obtaining an identification number – with your sales center.

Please enclose the completed "Declaration of Hazardous Material and De-Contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents. **No repair without completed declaration!**

1.5 Notes on safety icons and symbols



Warning!

This symbol alerts you to hazards that can cause serious damage to the instrument or to persons if ignored.



Caution!

This symbol alerts you to possible faults which could arise from incorrect operation. They could cause damage to the instrument if ignored.



Note!

This symbol indicates important items of information.

2 Identification

2.1 Nameplate

Compare the order code indicated on the nameplate to the product structure and your order.

The nameplate contains the following information:

- Manufacturer data
- Order code (device version)
- Extended order code
- Serial number



Note!

To discover what sensor version you have, enter the order code on the nameplate into the search screen at the following address:

www.products.endress.com/order-ident

2.2 Scope of delivery

The scope of delivery comprises:

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

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

2.3 Certificates and approvals

Declaration of conformity

The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.

The manufacturer confirms successful testing of the product by affixing the **CE** symbol.

3 Installation

3.1 Incoming acceptance, transport, storage

- Make sure the packaging is undamaged!
- Inform the supplier about any damage to the packaging.
Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
- Inform the supplier about damage to the contents. Keep the damaged products until the matter has been settled.
- Check that the order is complete and agrees with your shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection. Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your local sales center.

3.2 Dimensions

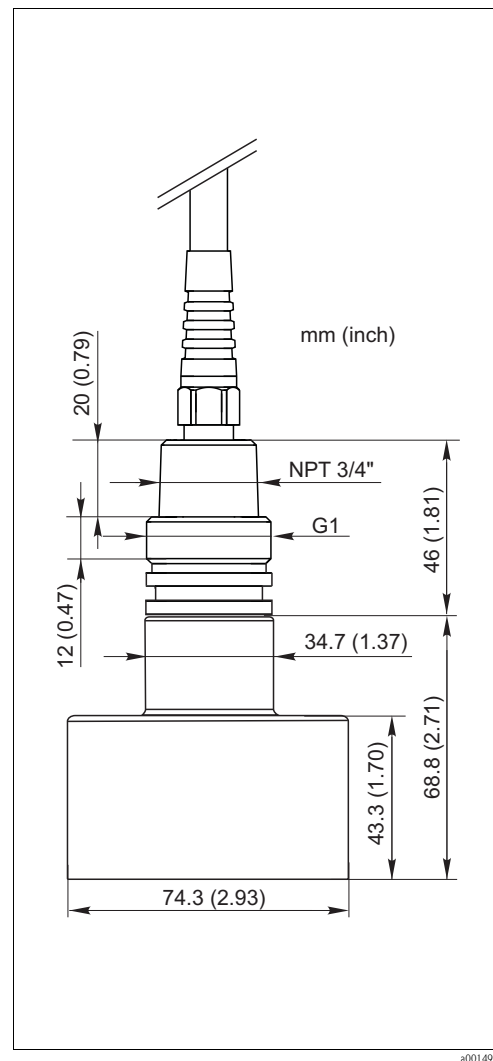


Fig. 1: Dimensions of standard sensor

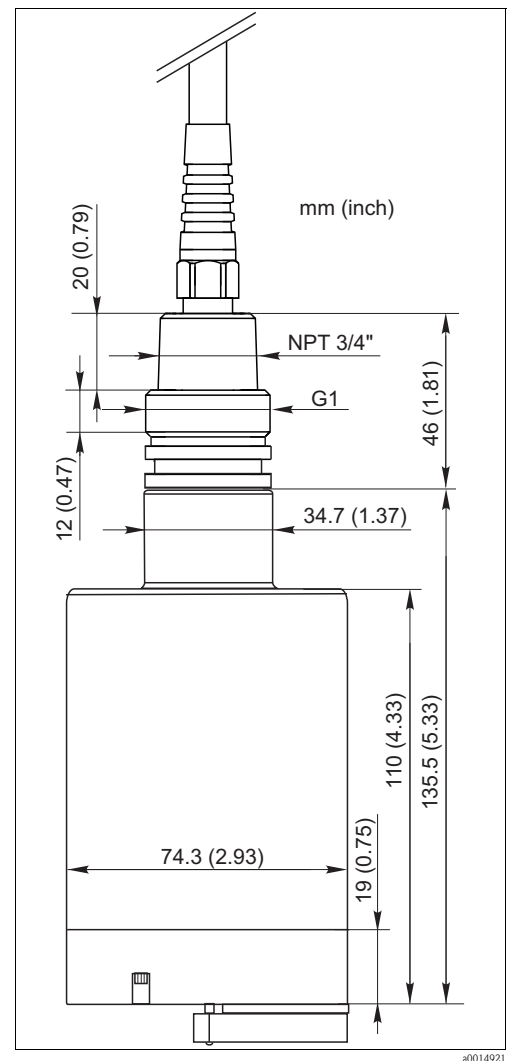


Fig. 2: Dimensions of sensor with wiper

3.3 Installation instructions

3.3.1 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

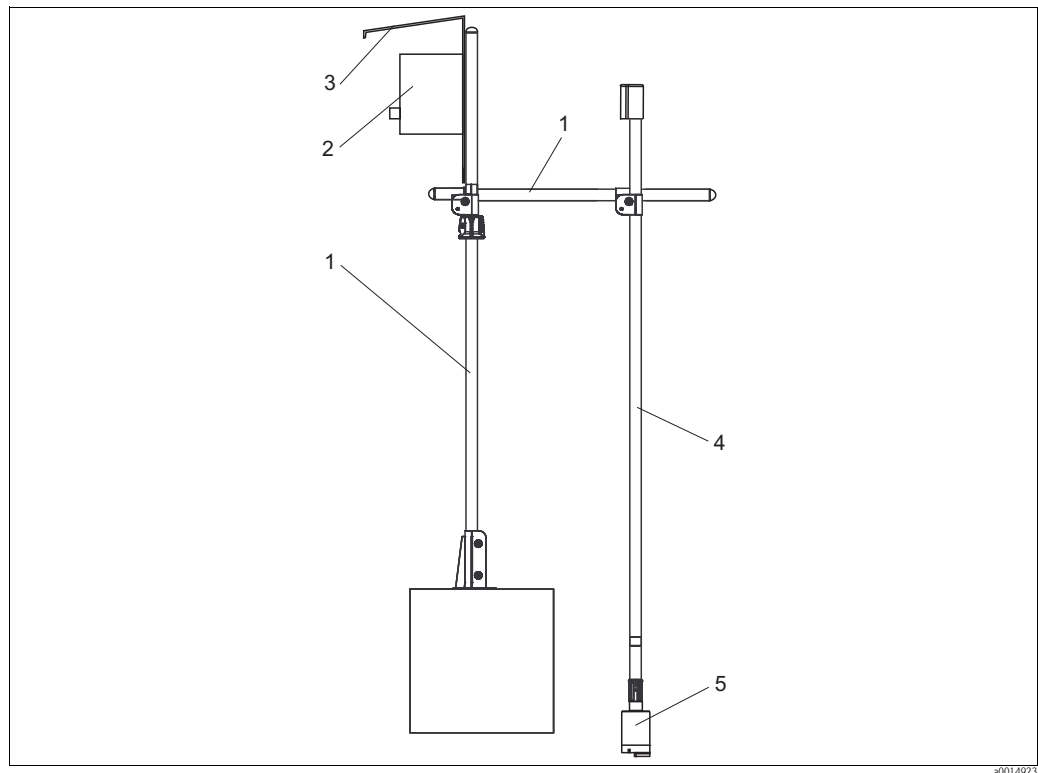


Fig. 3: Ultrasonic sensor with holder system and multi-channel transmitter

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

3.3.2 Measuring system with pendulum holder

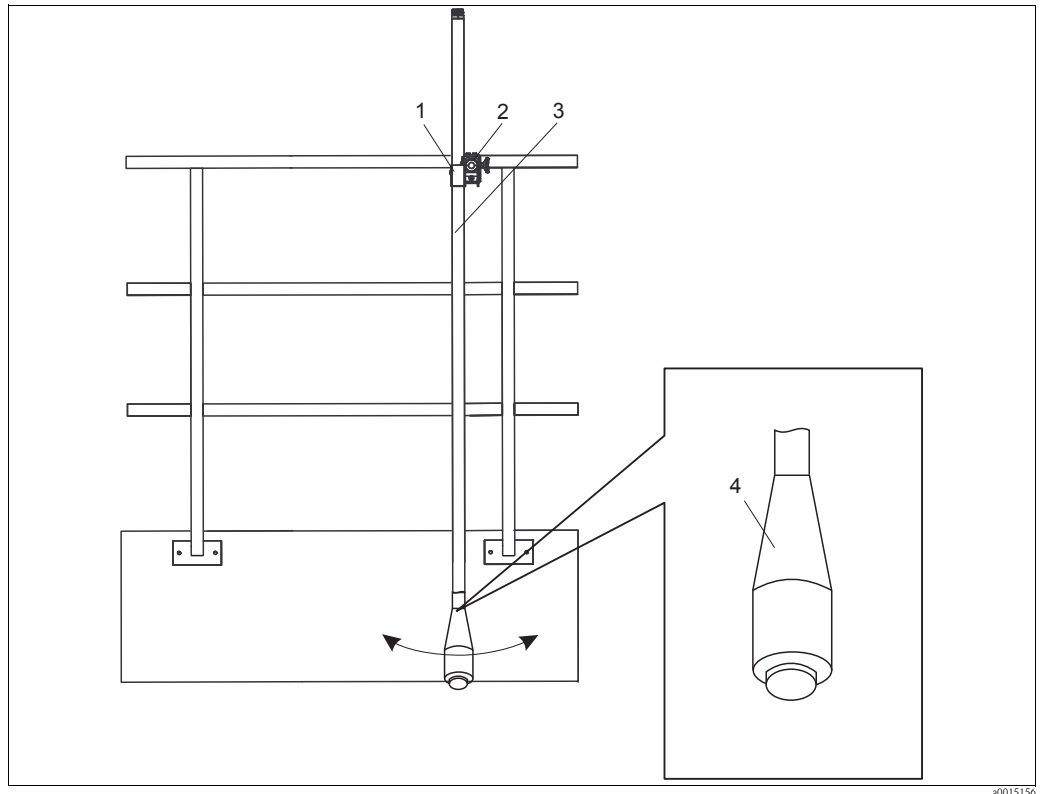


Abb. 4: Measuring system with pendulum holder

- | | | | |
|---|--|---|-------------------------------------|
| 1 | Holder system Flexdip CYH112 (cross clamp) | 3 | Assembly Flexdip CYA112 with CUS71D |
| 2 | Holder system Flexdip CYH112 (pendulum holder) | 4 | PVC wiper (C-UA 100826-61) |

The PVC wiper (C-UA 110818-60) protects the ultrasonic sensor from getting damaged by the surface skimmer.

3.4 Installation conditions

Basin configuration

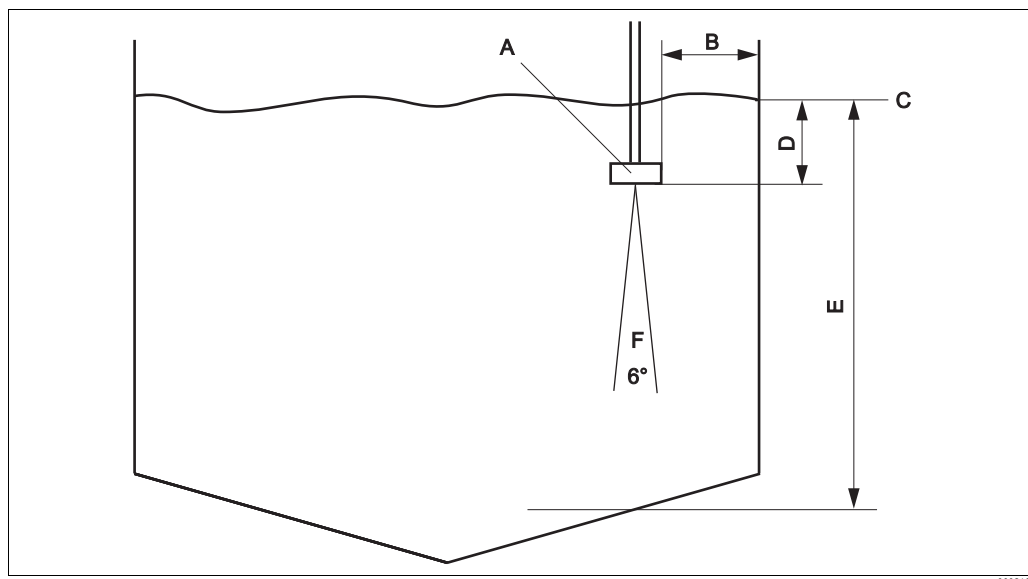


Fig. 5: Basin configuration

- 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

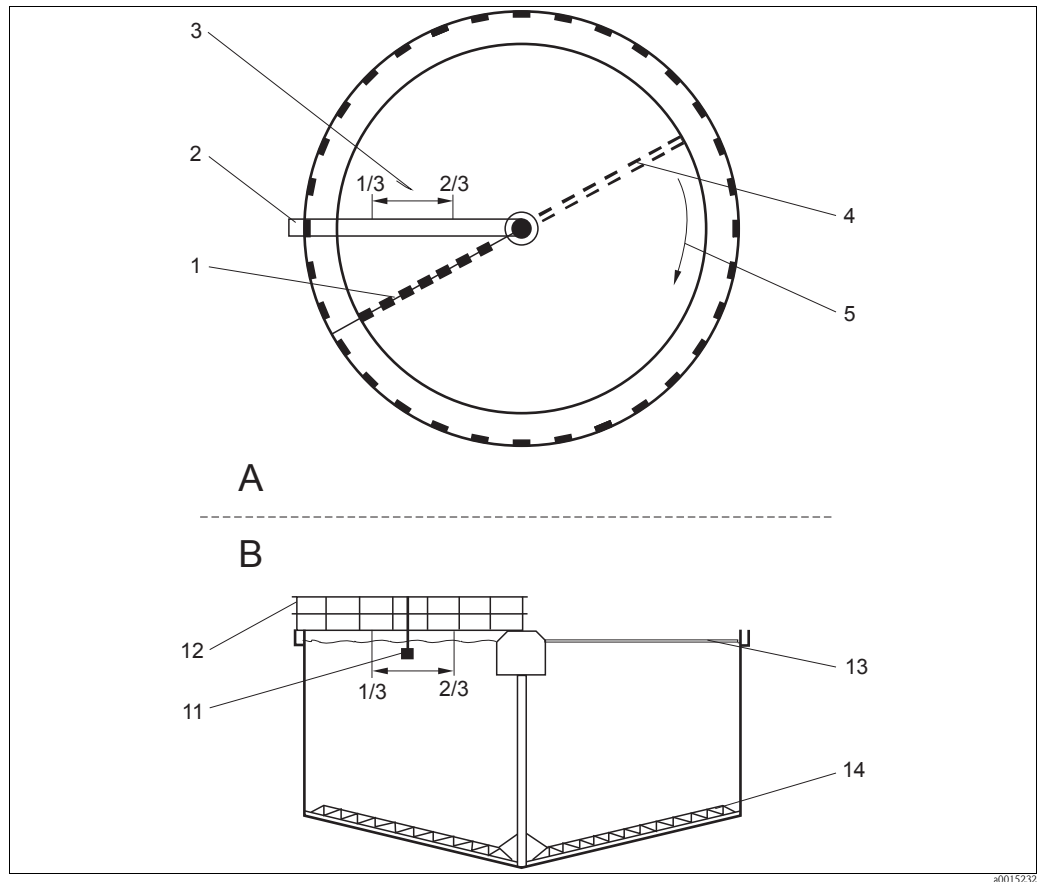


Fig. 6: Basin configuration in circular clarifier

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		

3.5 Post-installation check

- Sensor and cable undamaged?
- Cap undamaged?
- Compliance with permissible sensor installation position?
- Is the sensor installed in an assembly and is not suspended from the cable?
- Avoid moisture by rain by putting the protective cap on the assembly?

4 Wiring



Warning!

- The electrical connection must only be carried out by a certified electrician.
- Technical personnel must have read and understood the instructions in this manual and must adhere to them.
- Ensure that there is no voltage at the power cable before beginning the connection work.

4.1 Connecting to the transmitter

The sensor will be connected to the transmitter as follows:

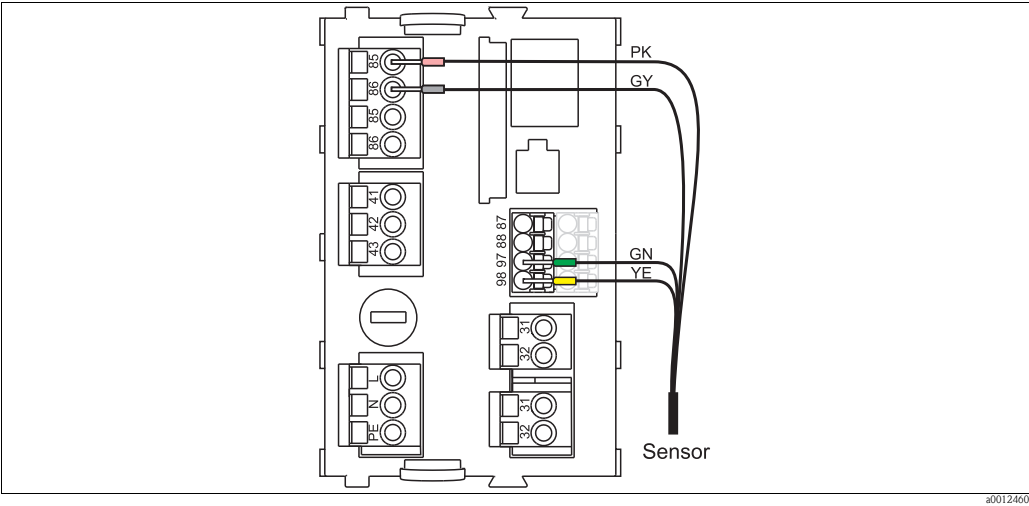


Fig. 7: Sensor connection

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.

4.2 Post-connection check

Instrument status and specifications	Remarks
Are the sensor, assembly, junction box or cable damaged?	Visual inspection
Electrical connection	Remarks
Does the supply voltage of the transmitter match the specifications on the nameplate?	
Are the installed cables strain-relieved and not twisted ?	
Is the cable type route completely isolated ?	Power cable/weak current cable
Are the power supply and signal cable correctly connected to the transmitter ?	Use the connection diagram of the transmitter.
Long enough length of cable core stripped and correct in terminal?	Check seating (pull slightly)
Are all the screws terminals properly tightened ?	Tighten
Are all the cable entries installed, tightened and sealed ?	For cable entries lateral: cable loops downwards for water to be able to drip off.
Are all the cable entries installed downwards or lateral ?	

5 Device description

5.1 Sensor design

The sensor is designed for continuous in-situ determination of interfaces.

The sensor includes all necessary modules:

- Power supply
- Ultrasonic source sends the measurement signals.
- Ultrasonic receiver receives the measurement signals, digitalizes and converts the signals to a measurement value.
- The microcontroller of the sensor controls the internal operations and the data transmission.

All data – including calibration data – are stored in the sensor. That means:

- A pre-calibrated sensor can be used at the measuring point.
- The sensor can be calibrated externally.
- The sensor can be used at multiple measuring points with different calibration data.

5.2 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.

5.3 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.

5.4 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

5.5 Calibration

5.5.1 Factory calibration

The sensor is precalibrated when leaving the factory. After adaption of the basin parameters, the sensor can be used in a wide range of applications without additional calibration.

The factory calibration cannot be deleted and can be retrieved at any time. All other calibrations – performed as customized calibrations – are referenced to this factory calibration.

5.5.2 Calibration in the process

Sensor calibration in the process is performed by inputs at Liquiline CM44x (see BA451C/07/EN).

5.6 Cyclic cleaning

For cyclic cleaning a ultrasonic sensor with integrated wiper is available. The time interval is selectable via software.

6 Commissioning

6.1 Firmware update

Turbimax CUS71D needs a firmware version "01.02.02-0048" or later.

Your current firmware version can be found at:

Menu/Diagnostics/System information/Software version

If your controller is equipped with an older firmware version you have to perform a firmware update.



Note!

First save your current setup on an SD card since a firmware update overwrites your settings with the factory settings. After updating the firmware, you can restore your setup by uploading it from the SD card.

To install a firmware update, you must have the update available on an SD card.

1. Insert the SD card into the controller card reader.
2. Go to: Menu/Setup/General settings/Extended setup/Data management/Firmware update.
—> The update files on the SD card are displayed.
3. Select the desired update and select yes when the following question is displayed: The current firmware will be overwritten. After this the device will reboot. Do you want to proceed?
—> The firmware is loaded and the device is then started with the new firmware.

6.2 Basic settings

After switching on the controller you have to perform some settings to get correct measurement
Path: Menu/Setup/Inputs/UIS/Tank configuration

	The menu Tank configuration defines tank depth and zero adjust. The quality of the measuring results depends on the accuracy of these inputs.
	Select the blanket definition: ■ Interface level The distance from bottom to blanket is displayed. ■ Interface range The distance from waterline to blanket is displayed.
	Any change to the Unit of measure applies automatically to all other displays (example: cm to m).
	Enter the Tank depth (distance from the waterline to the bottom of the tank or vessel).

Menu/...ensor/Tank configuration		OK
Blanket definition	Interface level	
Unit of measure	m	
Tank depth	8.0 m	
Zero adjust	0.4 m	
Blanking zone	Off	
ESC	CAL	DIAG ?

Enter the **Zero adjust** (distance from the waterline to the sensor diaphragm)

Menu/...ensor/Tank configuration		OK
Blanket definition	Interface level	
Unit of measure	m	
Tank depth	8.0 m	
Zero adjust	0.4 m	
Blanking zone	On	
Upper window limit	0.3 m	
Lower window limit	3.3 m	
ESC	CAL	DIAG ?

Outside the **Blanking zone** (above **Upper window limit** and below **Lower window limit**) the permanent echo signals are blanked as interference signals. For upper and lower window limit enter the distance to the waterline.

In the adjacent example the permanent echo signals are blanked outside the range of 0.3 to 3.3 m.

Path: Menu/Setup/Inputs/UIS/Sensor signal

Menu/...trasonic interface sensor		OK
Sensor operation	Current sensor	
Turbidity measurement	Off	
Manual hold	Off	
▶ Tank configuration		
▶ Sensor signal		
▶ Extended setup		
▶ Channel assignment view		
ESC	CAL	DIAG ?

The parameters in the menu **Sensor signal** are factory preset.
If measurement failures are observed the parameters can be adjusted.

Menu/...ace sensor/Sensor signal		OK
Acoustic control	Automatic	
Current gain	30	
Gain control set point	10	
Refresh rate	6 s	
Damping	130	
ESC	CAL	DIAG ?

Acoustic control
■ **Automatic**
Automatic amplification control
■ **Manual**
Manual amplification control

Menu/...ace sensor/Sensor signal		OK
Acoustic control	Automatic	
Current gain	30	
Gain control set point	10	
Refresh rate	6 s	
Damping	130	
ESC	CAL	DIAG ?

In automatic mode you cannot modify the parameter **Current gain**.
In the manual mode you can modify the parameter **Current gain** in the range of 0 to 100.
(In standard applications the Current gain shows 20 to 60)

Menu/...ace sensor/Sensor signal		OK
Acoustic control	Automatic	
Current gain	30	
Gain control set point	10	
Refresh rate	6 s	
Damping	130	
ESC	CAL	DIAG ?

The **Gain control set point** (automatic mode only) determines the relative signal strength.
You can enter a value from 1 to 50.
Increase this parameter to cause **Auto Gain** to seek a generally higher level of signal amplification.
Decrease this parameter to cause **Auto Gain** to seek a generally lower level of signal amplification.

Menu/...ace sensor/Sensor signal		OK
Acoustic control	Automatic	
Current gain	30	
Gain control set point	10	
Refresh rate	4 s	
Damping	130	
ESC CAL DIAG ?		

The **Refresh rate** determines the time span to update the current measurement. You can select 2, 4, 6, or 8 seconds.

Menu/...ace sensor/Sensor signal		OK
Acoustic control	Automatic	
Current gain	30	
Gain control set point	10	
Refresh rate	4 s	
Damping	130	
ESC CAL DIAG ?		

Damping

This parameter establishes the number of updates that are averaged to determine the current measurement. It is used to remove the effects of random fluctuations caused by settling or disturbed material. Also it prevents sudden changes in the measurement resulting from the action of rakes and skimmers. Enter a value from 5 to 255.

Path: Menu/Setup/Inputs/UIS/Extended Setup

Menu/...e sensor/Extended setup		OK
▶ Sensor signal		
▶ Tracking		
▶ Diagnostics settings		
▷ Reboot track		
Sensor change	Off	
▷ Factory default measurement processing		
▷ Factory default sensor		
ESC CAL DIAG ?		

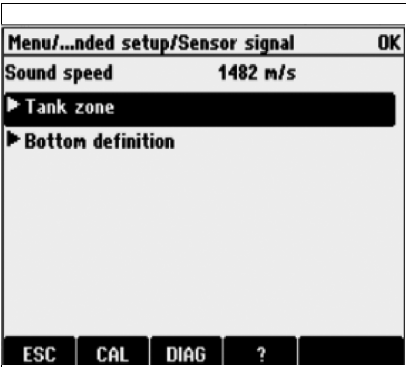
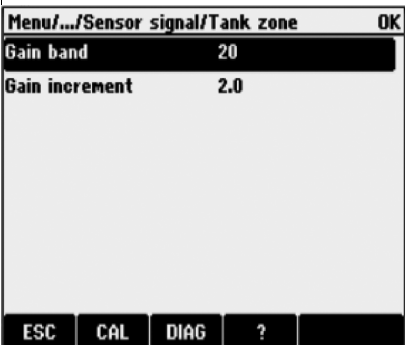
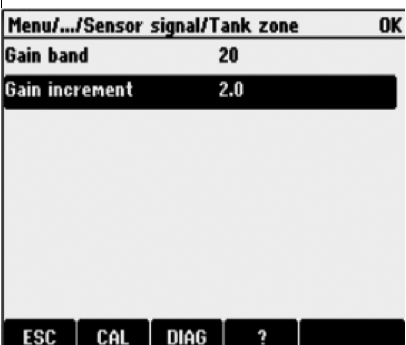
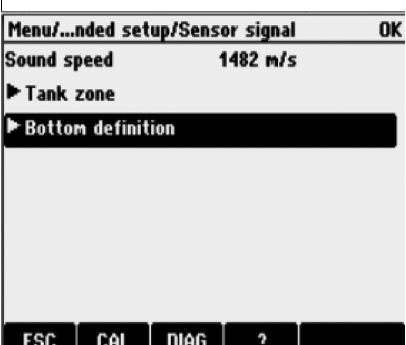
You can adjust the parameters of the **Sensor signal** to fit to the measuring point.

Menu/...nded setup/Sensor signal		OK
Sound speed	1482 m/s	
▶ Tank zone		
▶ Bottom definition		
ESC CAL DIAG ?		

Note!

Before changing the parameter **Sound speed** contact E+H service.

You can compensate the influence of the ambient conditions to the sound speed.

	You can change the parameters of the Tank zone.
	Gain band establishes the maximum amount that Current gain (with Automatic ON) can vary once the initial gain level has been established. Enter a value from 5 to 30.
	Gain increment determines the change rate of the gain. Enter a value from 0.1 to 5.
	You can change the parameters of the Bottom definition.

Menu/...r signal/Bottom definition		OK
Range above bottom	0.1 m	
Bottom signal set point	60	
ESC	CAL	DIAG ?

Range above bottom establishes a zone near the bottom of tank that permits special handling of a dominant signal that originates from the tank floor. This signal will be suppressed for the calculation of the measuring value.
Enter a value from 0.0 to 1.0 m.

Menu/...r signal/Bottom definition		OK
Range above bottom	0.1 m	
Bottom signal set point	60	
ESC	CAL	DIAG ?

Bottom signal set point limits gain amplification when the primary signal is a reflection from the tank bottom.
It prevents over-amplification of the signal in applications with low density material, or when the tank is empty.
Enter a value from 0 to 100.
100 gives maximum gain.

Menu/...e sensor/Extended setup		OK
▶ Sensor signal		
▶ Tracking		
▶ Diagnostics settings		
▷ Reboot track		
Sensor change	Off	
▷ Factory default measurement processing		
▷ Factory default sensor		
ESC	CAL	DIAG ?

In **Tracking** you can change the interface parameters

Menu/...Extended setup/Tracking		OK
Interface	Top layer	
Interface window	On	
Above interface	0.6 m	
Below interface	0.6 m	
Gate response rate	1	
Threshold	0	
ESC	CAL	DIAG ?

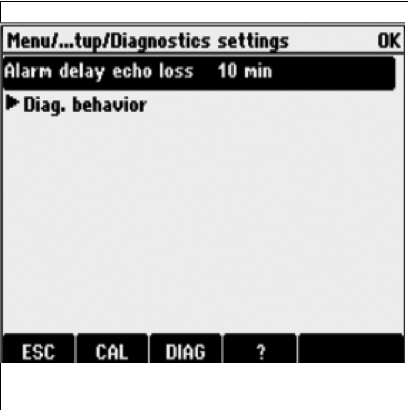
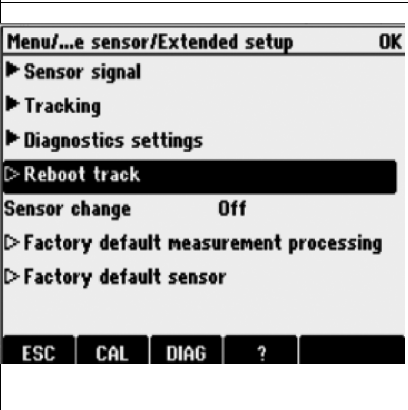
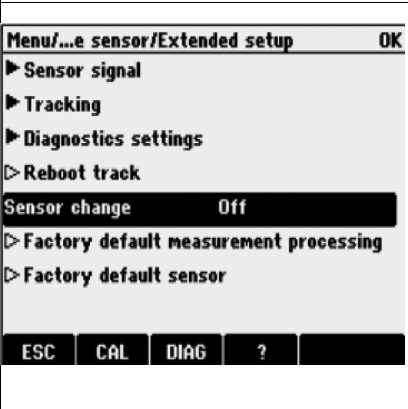
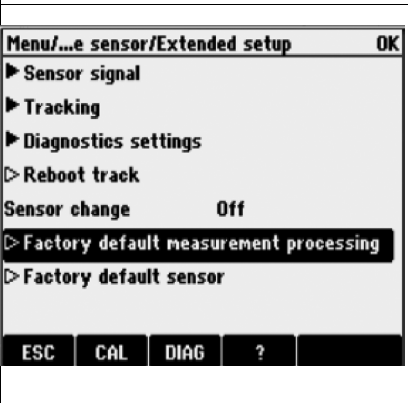
■ **Top layer**

Measures an interface consisting of light-density material that is at a higher elevation in the tank.

■ **Lower layer**

Measures an interface consisting of denser material that is nearer the bottom of the tank.

Menu/...Extended setup/TrackingOK <table><tr><td>Interface</td><td>Top layer</td></tr><tr><td>Interface window</td><td>On</td></tr><tr><td>Above interface</td><td>0.6 m</td></tr><tr><td>Below interface</td><td>0.6 m</td></tr><tr><td>Gate response rate</td><td>1</td></tr><tr><td>Threshold</td><td>0</td></tr></table> ESC CAL DIAG ?	Interface	Top layer	Interface window	On	Above interface	0.6 m	Below interface	0.6 m	Gate response rate	1	Threshold	0	Around the interface you can define a window entering a distance above and below the interface. The signal that is inside the window is given preferential consideration. You can enter a distance from 0.0 to 10.0 m. A signal outside the window must persist in order to be considered valid.
Interface	Top layer												
Interface window	On												
Above interface	0.6 m												
Below interface	0.6 m												
Gate response rate	1												
Threshold	0												
Menu/...Extended setup/TrackingOK <table><tr><td>Interface</td><td>Top layer</td></tr><tr><td>Interface window</td><td>On</td></tr><tr><td>Above interface</td><td>0.6 m</td></tr><tr><td>Below interface</td><td>0.6 m</td></tr><tr><td>Gate response rate</td><td>1</td></tr><tr><td>Threshold</td><td>0</td></tr></table> ESC CAL DIAG ?	Interface	Top layer	Interface window	On	Above interface	0.6 m	Below interface	0.6 m	Gate response rate	1	Threshold	0	Gate response rate determines the response time with respect to the dynamic movements of the window. You can enter a value from 0 to 50. Increase Gate response rate to cause the gate to open faster.
Interface	Top layer												
Interface window	On												
Above interface	0.6 m												
Below interface	0.6 m												
Gate response rate	1												
Threshold	0												
Menu/...Extended setup/TrackingOK <table><tr><td>Interface</td><td>Top layer</td></tr><tr><td>Interface window</td><td>On</td></tr><tr><td>Above interface</td><td>0.6 m</td></tr><tr><td>Below interface</td><td>0.6 m</td></tr><tr><td>Gate response rate</td><td>1</td></tr><tr><td>Threshold</td><td>0</td></tr></table> ESC CAL DIAG ?	Interface	Top layer	Interface window	On	Above interface	0.6 m	Below interface	0.6 m	Gate response rate	1	Threshold	0	Threshold is a signal filter for consideration. Increase this parameter to allow calculation of strong signals. Lower this parameter to allow calculation of softer signals. You can enter a value from 0 to 100. (default = 20)
Interface	Top layer												
Interface window	On												
Above interface	0.6 m												
Below interface	0.6 m												
Gate response rate	1												
Threshold	0												
Menu/...e sensor/Extended setupOK ► Sensor signal ► Tracking ► Diagnostics settings ▷ Reboot track Sensor changeOff ▷ Factory default measurement processing ▷ Factory default sensor ESC CAL DIAG ?	Diagnostics settings allows to adjust the diagnostics performance.												

	Alarm delay echo loss establishes the amount of time that the sensor must experience a loss of echo before initiating the echo loss action. You can enter a time from 0 to 255 minutes.
	Reboot track performs a new initialization of the sensor. The sensor starts in automatic mode and seeks the interface. It takes 3 to 5 minutes for the first measuring value.
	If Sensor change is set to "on", the measured value at the current output is set to hold. In this way you avoid an error being reported at the process control system if the sensor is replaced on site.
	■ Factory default measurement processing Reset transmitter parameters to factory default settings. ■ Factory default sensor Reset sensor parameters to factory default settings.

7 Maintenance

You have to perform maintenance tasks at regular intervals.

We recommend setting the maintenance times in advance in an operations journal or log.

The maintenance cycle primarily depends on the system, the installation conditions and the medium in which measurement takes place.

7.1 Cleaning the sensor

Sensor without wiper

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

The sensor must be cleaned at regular intervals to ensure reliable measurement results. The frequency and intensity of the cleaning process depends on the medium.

Clean the sensor:

- As specified in the maintenance schedule
- Before every calibration
- Before returning the sensor for repair



Note!

You must rinse the sensor thoroughly with water after cleaning.

Sensor with wiper

The time interval is selectable via software. The cleaning time interval depends on the medium. It is recommended to replace the wiper once a year.

8 Accessories

8.1 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

8.2 Holder

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)

8.3 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)

9 Troubleshooting

9.1 Troubleshooting instructions

You must take the entire measuring point into account when troubleshooting:

- Transmitter
- Electrical connections and cables
- Assembly
- Sensor

The possible causes of error indicated in the table below primarily refer to the sensor.

Problem	Check	Remedial measures
Nothing displayed, no reaction from the sensor	Power supplied to the transmitter? Sensor connected correctly? Buildup on sensor membrane?	Connect the mains voltage Connect sensor correctly Clean sensor
Display value too high or too low	Buildup on sensor membrane? Check basin configuration.	Clean Adjust
Display value fluctuates a lot	Check mounting location.	Select other mounting location



Note!

Please observe the troubleshooting instructions provided in the transmitter operating manual. Examine the transmitter if necessary.

9.2 Spare parts

The following spare part kits are available for the sensor with wiper:

Description and kit content	Order number
Wiper assembly ■ rubber blade ■ plastic housing	71156817
Motor assembly ■ gear motor ■ motor cable	71156830
Coupler assembly ■ set screw ■ non-metallic coupler	71156832
Shaft assembly ■ bushing ■ o-ring ■ shaft ■ washer/spacer	71156833

9.3 Return

If the sensor has to be repaired, please return it *cleaned* to the sales center responsible.
Please use the original packaging, if possible.

Before returning the device, please clarify all formalities – such as obtaining an identification number – with your sales center.

Please enclose the completed "Declaration of Hazardous Material and De-Contamination" (copy the second last page of these Operating Instructions) with the packaging and the transportation documents. **No repair without completed declaration!**

9.4 Disposal

The device contains electronic components and must therefore be disposed of in accordance with regulations on the disposal of electronic waste.

Please observe local regulations.

10 Technical Data

10.1 Input

Measured variable	Standard sensor	Interface
	Sensor with wiper	Interface
	Sensor with wiper and turbidity measurement	Interface Turbidity
Measuring ranges	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

10.2 Performance characteristics

Measured error	Interface	35 mm at 3.0 m
	Turbidity	1 % of the measuring range at 50 NTU
Wavelength	Interface	3 mm at 3.0 m
	Turbidity	1 NTU
Measuring interval	Adjustable	
Calibration	The sensor is factory calibrated delivered. The "speed of sound" is adjustable and preprogrammed for the application "water".	

10.3 Environment

Storage temperature	-20 to 50 °C (-4 to 122 °F)
Degree of protection	IP 68 (test conditions: 1 m (3.3 ft) water column during 60 days, 1 mol/l KCl)

10.4 Process

Process temperature range	1 to 50 °C (34 to 122 °F)
Process pressure	0.0 to 6 bar (0 to 87 psi) absolute

10.5 Mechanical construction

Dimensions	See "Installation conditions"	
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 ¾"	

Index

A

Accessories	25
Assemblies	25

B

Basic settings.....	16
---------------------	----

C

Calibration	14
Factory	14
In the process	14
Checking	
Installation.....	11
Cleaning	24
Commissioning	4, 15
Compressed air cleaning	14
Connection	
Transmitter	12

D

Declaration of conformity	6
Designated use	4
Dimensions	7
Disposal	27

F

Factory calibration.....	14
Firmware update.....	15
Function	13

H

Holder	25
--------------	----

I

Icons.....	5
Incoming acceptance.....	7
Installation	4, 7–8
Installation conditions	10

M

Maintenance.....	24
Measuring principle.....	13
Measuring system	8

N

Nameplate	6
-----------------	---

O

Operation	4
Operational safety	4

P

Post-connection check	12
-----------------------------	----

R

Return	4, 27
--------------	-------

S

Safety icons	5
Scope of delivery	6
Sensor	
Monitoring.....	13
Sensor design	13
Settings	16
Software	15
Spare parts.....	26
Storage	7
Symbols.....	5

T

Technical Data	28
Transmitter	25
Transmitter connection	12
Transport.....	7
Troubleshooting	26
Troubleshooting instructions	26

U

Use	4
-----------	---

W

Wiring.....	12
-------------	----



Declaration of Hazardous Material and De-Contamination *Erklärung zur Kontamination und Reinigung*

RA No.

Please reference the Return Authorization Number (RA#), obtained from Endress+Hauser, on all paperwork and mark the RA# clearly on the outside of the box. If this procedure is not followed, it may result in the refusal of the package at our facility.
Bitte geben Sie die von E+H mitgeteilte Rücklieferungsnummer (RA#) auf allen Lieferpapieren an und vermerken Sie diese auch außen auf der Verpackung. Nichtbeachtung dieser Anweisung führt zur Ablehnung ihrer Lieferung.

Because of legal regulations and for the safety of our employees and operating equipment, we need the "Declaration of Hazardous Material and De-Contamination", with your signature, before your order can be handled. Please make absolutely sure to attach it to the outside of the packaging.

Aufgrund der gesetzlichen Vorschriften und zum Schutz unserer Mitarbeiter und Betriebseinrichtungen, benötigen wir die unterschriebene "Erklärung zur Kontamination und Reinigung", bevor Ihr Auftrag bearbeitet werden kann. Bringen Sie diese unbedingt außen an der Verpackung an.

Type of instrument / sensor
Geräte-/Sensortyp

Serial number
Seriennummer

☐ Used as SIL device in a Safety Instrumented System / *Einsatz als SIL Gerät in Schutzeinrichtungen*

Process data/ *Prozessdaten*

Temperature / *Temperatur* _____ [°F] _____ [°C]

Pressure / *Druck* _____ [psi] _____ [Pa]

Conductivity / *Leitfähigkeit* _____ [µS/cm]

Viscosity / *Viskosität* _____ [cp] _____ [mm²/s]

Medium and warnings

Warnhinweise zum Medium



	Medium / concentration <i>Medium / Konzentration</i>	Identification CAS No.	flammable <i>entzündlich</i>	toxic <i>giftig</i>	corrosive <i>ätzend</i>	harmful/ irritant <i>gesundheitsschädlich/ reizend</i>	other * <i>sonstiges*</i>	harmless <i>unbedenklich</i>
Process medium <i>Medium im Prozess</i>								
Medium for process cleaning <i>Medium zur Prozessreinigung</i>								
Returned part cleaned with <i>Medium zur Endreinigung</i>								

* explosive; oxidising; dangerous for the environment; biological risk; radioactive

* *explosiv; brandfördernd; umweltgefährlich; biogefährlich; radioaktiv*

Please tick should one of the above be applicable, include safety data sheet and, if necessary, special handling instructions.

Zutreffendes ankreuzen; trifft einer der Warnhinweise zu, Sicherheitsdatenblatt und ggf. spezielle Handhabungsvorschriften beilegen.

Description of failure / *Fehlerbeschreibung* _____

Company data / *Angaben zum Absender*

Company / <i>Firma</i> _____	Phone number of contact person / <i>Telefon-Nr. Ansprechpartner:</i> _____
Address / <i>Adresse</i> _____	Fax / E-Mail _____
Your order No. / <i>Ihre Auftragsnr.</i> _____	

"We hereby certify that this declaration is filled out truthfully and completely to the best of our knowledge. We further certify that the returned parts have been carefully cleaned. To the best of our knowledge they are free of any residues in dangerous quantities."

"Wir bestätigen, die vorliegende Erklärung nach unserem besten Wissen wahrheitsgetreu und vollständig ausgefüllt zu haben. Wir bestätigen weiter, dass die zurückgesandten Teile sorgfältig gereinigt wurden und nach unserem besten Wissen frei von Rückständen in gefahrbringender Menge sind."

For more Endress+Hauser product please visit: www.ainstru.com
Mail: Sales@ainstru.com

www.endress.com/worldwide

Endress+Hauser 
People for Process Automation