Technical Information
OUSTF10

Optical sensor combined with flow assembly OUA260 for measurement of turbidity and non-dissolved solids

Application
The OUSTF10 scattered light turbidity sensor is used for measurement of non-dissolved solids, emulsions, and immiscible fluids in process liquids. The sensor operates in the VIS/NIR region of the electromagnetic spectrum. It is suitable for a variety of industries.

Turbidity measurement for
- Quality control/Purity monitoring
- Condensate control
- Turbidity in Breweries
- Filter control
- Turbidty in potable water
- Heat exchanger in leak detection
- Turbidty in brine

Your benefits

- Accurately measures low level particulates up to the equivalent of 0 to 200 FTU formazine or 0 to 200 ppm Diatomaceous Earth, using scattered light detection at 11° angle from excitation beam
- FM and ATEX approved explosion proof lamps for hazardous area applications
- Low voltage incandescent lamp provides long dependable life
- The OUSTF10 can be fitted with long pass NIR filter to minimize color related measurement errors

The OUA260 flow assembly used with the sensor offers the following benefits:
- Broad variety of wetted materials provides resistance against any process medium
- Flexible process adaptation with various process connections
- Hygienic versions with certified materials and SIP/CIP-resistance
- Air purge ports available for preventing condensate formation on the optical windows
- Pyrex windows deliver accurate and reproducible performance under industrial conditions, Quartz or Sapphire optional

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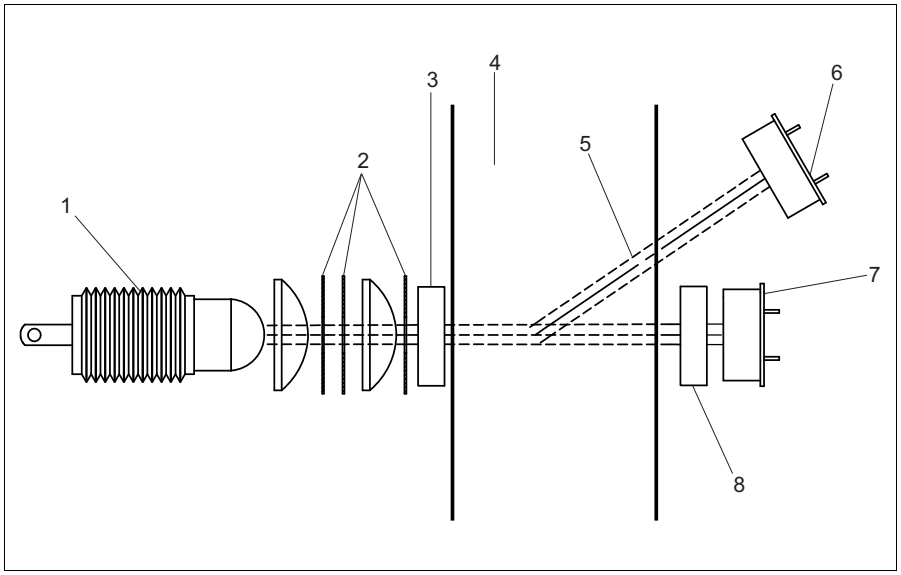
Function and system design

Measuring principle

General Information

Turbidity is the visual appearance of a liquid containing suspended solids. The presence of these solids causes light to be scattered and absorbed, making the liquid appear 'turbid'. The amount of light that is scattered or absorbed in a liquid can be used in a measurement system to determine the actual level of turbidity.

The simplified optical diagram below illustrates the basic principles of scattering measurements. A focused parallel beam of light is projected through the liquid. This beam is called the Direct Beam and is measured by the Direct Light detector. If the fluid in the sample cell is free of particles, then all light projected from the lamp is seen by the Direct Light detector. If particles are present in the fluid, then light is scattered in all directions, most of the scattering taking place in a forward direction. The optical system was designed to measure scattered light centered around 11° angle in the forward direction. This viewing angle of the Scatter Light detector assures that the maximum available scatter signal is detected.



Simplified forward scatter optical diagram

1	*Lamp*	*6*	*Scatter beam detector*
2	*Aperture lenses*	*7*	*Direct beam detector*
3	*Optional long pass NIR (780 nm and above)*	*8*	*Anti-reflection coated broad band neutral density filter*
4	*Sample area*		
5	*Scatter beam*		

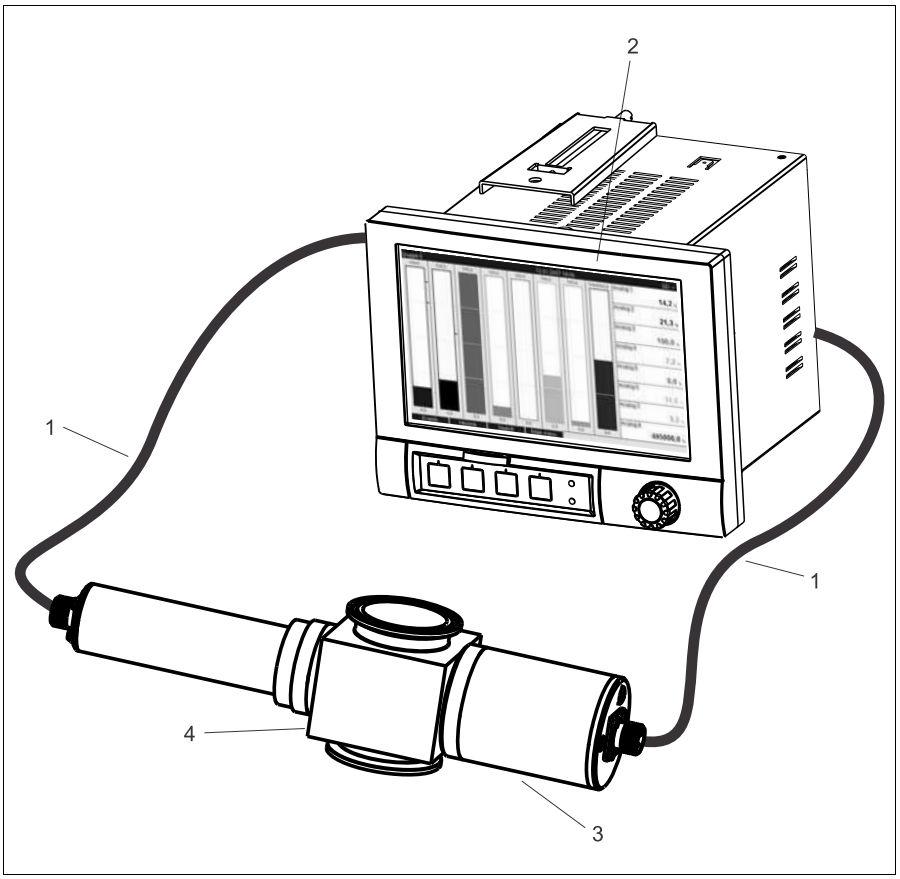
Options

Installation in hazardous areas

The explosion-proof lamp housing allows for installation in hazardous areas. This sensor version is rated for FM Class 1, Division 1, Groups B, C, D and ATEX II 2G EExd IIC T5.

Measuring system

A complete measuring system comprises:
- Transmitter Memograph CVM40
- Optical sensor OUSTF10
- Flow assembly OUA260
- Cable set OUK20



Example of a measuring system

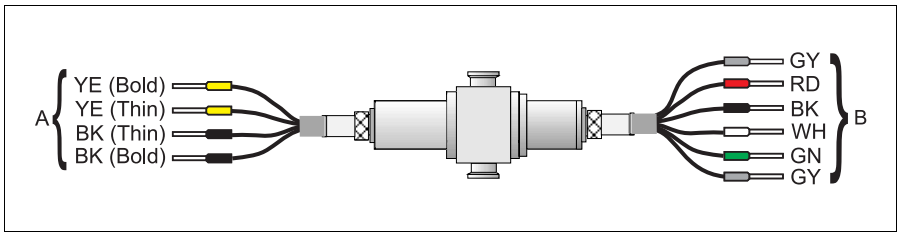
1 Cable set OUK20
2 Transmitter Memograph CVM40
3 Optical sensor OUSTF10
4 Flow assembly OUA260

Input

Measured variable	Turbidity in FTU (Formazin Turbidity Units) or ppm
Measuring range	Measuring range 0 to 200 FTU or 0 to 200 ppm DE
Wavelengths	Broadband (VIS and NIR) Long pass (780 nm and above) Optical path length 40 mm standard

Wiring

Electrical connection	The OUSTF10 sensor is connected to the transmitter via the pre-terminated and labeled cable set OUK20 (to be ordered separately). Terminals and labeling might vary with the transmitter in use.



Connecting cable for OUSTF10
A Power supply for lamp
B Signal transmission of scatter and direct detectors

Terminal CVM40	Cable OUK20 for sensor OUSTF10	
	Core	Assignment
S1.S	GY	Shield
S1.1	RD	Sensor Scatter +
S1.2	BK	Sensor Scatter -
S2.S	GY	Shield
S2.1	WH	Sensor Direct +
S2.2	GN	Sensor Direct -
V1.1	YE (Bold)	Lamp voltage +
V1.3	YE (Thin)	Lamp sense +
V1.4	BK (Thin)	Lamp sense -
V1.2	BK (Bold)	Lamp voltage -

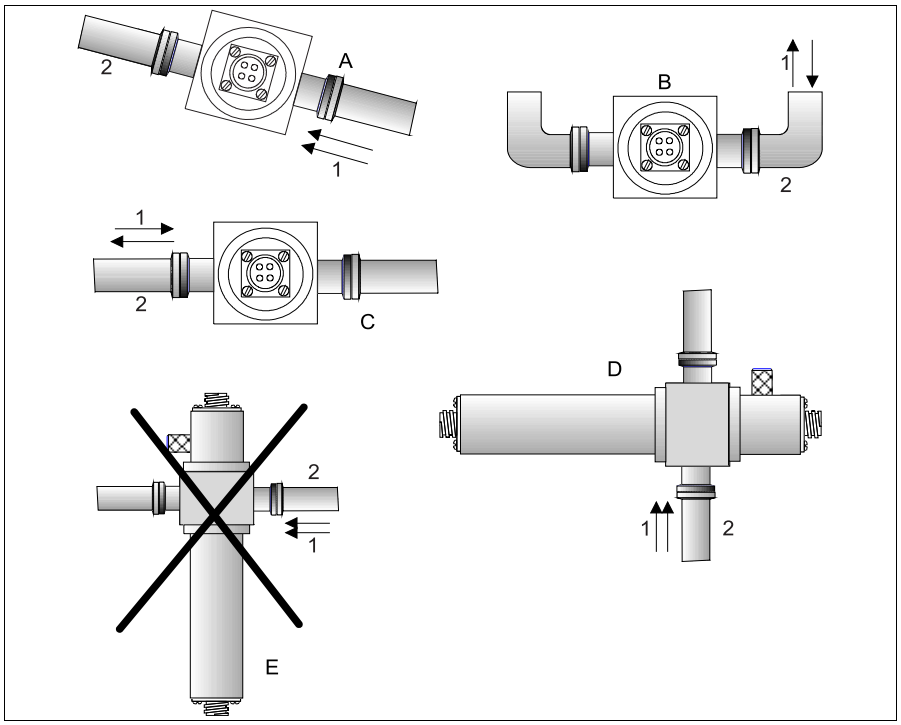
Cable length
max. 100 m (328 ft)

Cable connectors
Nickel-plated brass

Installation

Installation instructions
Sensors are designed for in-line use with the related OUA260 flow assembly. The flow assembly can be installed either directly in a process line or in a by-pass line. The OUSTF10 sensor cannot be used without the OUA260.

Make sure that the sensor and detector housings are horizontal. This will ensure that the optical window surfaces are in a vertical position which will help to prevent buildup on the window surfaces. Install the sensor upstream of pressure regulators. Allow adequate space for the connection of cables at the ends of the lamp and the detector housing. Operating sensors under pressure will help to avoid air or gas bubble creation.



Sensor installation

A	*Preferred*	*E*	*Never*
B	*Avoid*	*1*	*Process flow*
C	*Acceptable*	*2*	*Process piping*
D	*Best*		

Environment

Ambient temperature	0 to 55 °C (32 to 131 °F)
Storage temperature	-20 to 70 °C (-4 to 158 °F)
Relative humidity	5 to 95 %
Ingress protection	IP 65 (NEMA 4)

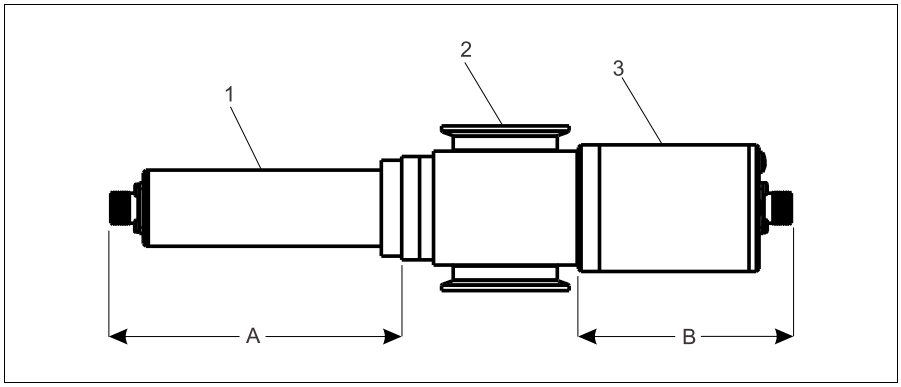
Process

Process temperature	0 to 90 °C (32 to 194 °F) continuous max. 130 °C (266 °F) for 2 hours
Process pressure	up to 100 bar (1450 psi), depending on material, line size and process connection of flow assembly

Mechanical construction

Design, dimensions

The sensor dimensions depend on the flow assembly.



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Design of OUSTF10 with OUA260 flow assembly
1 Lamp assembly
2 OUA260 flow assembly (to be ordered separately)
3 Detector assembly

Lamp assembly type	"A" Dimension
Standard lamp	151.3 mm (5.96")

Detector assembly type	"B" Dimension
OUSTF10	106.7 mm (4.20")

Detector and lamp may vary depending on options ordered.

Flow assembly OUA260

Process connections: Tri-clamp, weld stubs, tube compression fittings, Swagelok, ANSI flange, DIN flange
(further connections available on request)
Materials: SS316L, Kynar
(further materials such as titanium, Hastelloy, etc. available on request)
Line size: ½" to 4" (DN 6 to DN 100), Sanitary connections must be 2" or larger
Path length: 40 mm
Windows: Quartz, Sapphire
O-rings: EPDM, Viton, Kalrez, Silicone
(further materials available on request)

For flowcell dimensions please refer to OUA260 documentation.

Make sure to leave an additional clearance of approx. 5 cm (2") at the lamp end and detector end of the sensor to allow for installation of the sensor cables.

Weight

Sensor

Lamp housings	
Lamp:	0.54 kg (1.19 lbs)
Hazardous lamp with SS-braided cable (1.2 m (4ft)) and junction box (FM Ex-sensor only):	3.2 kg (6.66 lbs)
ATEX lamp	1.34 kg (2.95 lbs)
Detector housings	
Detector:	0.72 kg (1.59 lbs)

Flow assembly OUA260 (assembled with windows and window rings, no sensor)

TC 2", 316 SS:	1.88 kg (4.15 lbs)
TC 4", 316 SS:	3.38 kg (7.45 lbs)

For other options please consult the Technical Information for the OUA260 flowcell.

Materials

Sensor housing: Stainless Steel 316L

Light source

Collimated lamp
Lamp life: Typically 10,000 hours

Detectors

Visible/IR enhanced silicon detectors, hermetically sealed

Filters

Multilayer long pass NIR filter > 780 nm optional

Certificates and approvals

Ex approval

- ATEX II 2G EEx d IIC T5
- FM Cl.1, Div. 1, Group B, C, D

FDA

All non metallic wetted parts as in rubber and plastics comply with FDA Regulations 21 CFR 177.2600. The plastic and elastomeric wetted parts of the sensor have passed the bio-reactivity tests according to USP <87> and <88> class VI.

Ordering information

Product page

You can create a complete and valid order code by using the configurator on the internet product page.

Enter the following address to access the product page:
www.products.endress.com/OUSTF10

Online configurator

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 represents the status of printing. You can create a complete and valid order code on the Internet using the configurator tool.

Sensor OUSTF10

	Wavelength						
	W	W/o Filter (visible range + NIR)					
	X	Long Pass NIR					
	Y	Special version, TSP-no. to be spec.					
		Calibration					
		0	0-200 FTU				
		1	0-20 FTU				
		2	0-2 FTU				
		3	0-200 ppm DE				
		4	0-20 ppm DE				
		5	0-2 ppm DE				
		9	Special version, TSP-no. to be spec.				
			Lamp				
			B	Collimated Incandescent			
				Lamp Approval			
				0	Non-hazardous area		
				1	FM Class 1, Div 1, Groups B, C, D		
				2	ATEX II 2G Eex d IIC T5		
					Assembly		
					A	Single order / spare part	
					B	Assembled with assembly, position	
					Y	Special version, TSP-no. to be spec.	
OUSTF10-							Complete order code

Cable set OUK20

	Sensor	
	1	OUSTF10
	2	OUSAF21/OUSAF22
	3	OUSAF23

		Transmitter	
		A	OUM900 Series
		B	OUM600 Series
		C	OUM700 Series
		D	Memograph CVM40

			Cable length	
			10	10 ft / 3 m
			15	15 ft /4.5 m
			25	25 ft / 7.5 m
			50	50 ft / 15 m
			80	.... ft; cable
			90	.... m; cable

				Barrier	
				A	Non-hazardous area
				B	FM Busbar
				C	ATEX Busbar
				D	FM DIN rail
				E	ATEX DIN rail

OUK20-						Complete order code

Scope of delivery

The scope of delivery depends on the ordered version.

Isolated order
- 1 detector and lamp assembly without flow assembly
- Operating Instructions

Assembled to flow assembly
- Detector and lamp assembly mounted
- OUA260 flow assembly
- Operating Instructions

When the sensor is ordered together with a transmitter, the complete measuring system is factory-calibrated and shipped as one package.

Accessories

The most important accessories that could be delivered at the time this document went to print are listed below.

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For information on accessories that are not listed here, please contact your local service or sales representation.

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m
b OUA260 flow assembly
l
- For sensor installation in pipe lines
y
- Materials: stainless steel 316L or Kynar (further materials available on request)

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- Many process connections and pathlength versions available
- Order according to product structure, see Technical Information TI418C/07/EN

OUSTF10 always requires 40 mm optical path length

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- Graphic transmitter for inline photometers and data manager
- Order according to product structure, see Technical Information TI457C/07/EN

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e
OUK20 cable set
- Pre-terminated or labeled cable set for connection of OUSTF10 sensors
- Order according to product structure

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