

# Technical Information

## OUSTF10

Optical sensor with the OUA260 flow assembly for the measurement of turbidity and undissolved solids



### Application

The scattered light turbidity sensor is used to measure undissolved solids, emulsions and immiscible media in process liquids.

- Outgoing goods inspection/purity monitoring
- Filter control
- Condensate regulation
- Turbidity measurement in
  - Breweries
  - Drinking water
  - Brine
- Leak detection in heat exchanger

### Your benefits

- Quality control of products and processes with the precise measurement of minute particle concentrations up to the equivalent of 0 to 200 FTU Formazin or 0 to 200 ppm diatomaceous earth through the use of scattered light detection at an angle of 11° from the excitation beam
- Operational safety thanks to low-voltage incandescent lamp for long service life and stable measured values
- Optional broadband NIR filter minimizes color-related measured errors
- FM- and ATEX-approved lamps for applications in the hazardous area
- Deployable and durable in numerous applications:
  - Variety of materials and process connections
  - Pyrex window for precise, reproducible performance under industrial conditions, quartz or sapphire window optionally available
- Hygienic design for high degree of product safety: certified materials and CIP/SIP-resistance
- Can be adapted to process requirements:
  - Optional air purge ports to prevent the formation of condensate on the optical windows

## Function and system design

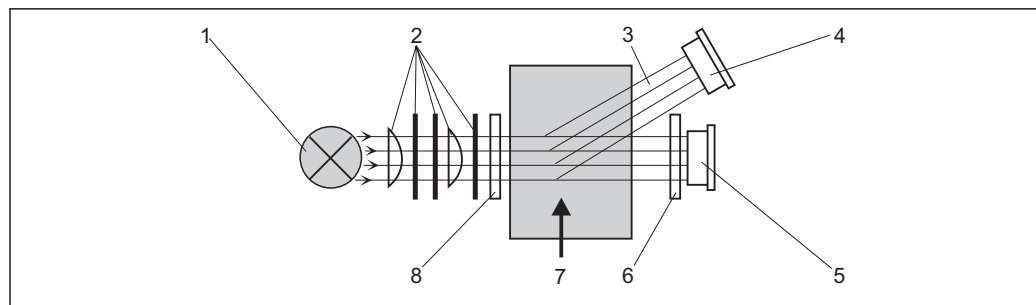
### Measuring principle

#### Turbidity

Turbidity refers to the appearance of a liquid that contains suspended particles. The presence of these particles causes the light to be scattered and absorbed, giving the liquid a turbid, or cloudy, appearance. The amount of light scattered or absorbed in a liquid can be used in a measuring system to determine the degree of turbidity.

#### Scattered light method

A focused parallel beam of light is passed through the medium. This beam is known as the transmitted light and is measured by a transmitted light detector. If the medium does not contain any particles, the transmitted light detector detects all the light transmitted by the light source. If there are particles in the medium, the light is scattered in all directions, but primarily in a forward direction. The optical system is designed such that the scattered light is measured at an angle of  $11^\circ$ . This angle of measurement ensures that the maximum scattering signal present is detected at the scattered light detector.



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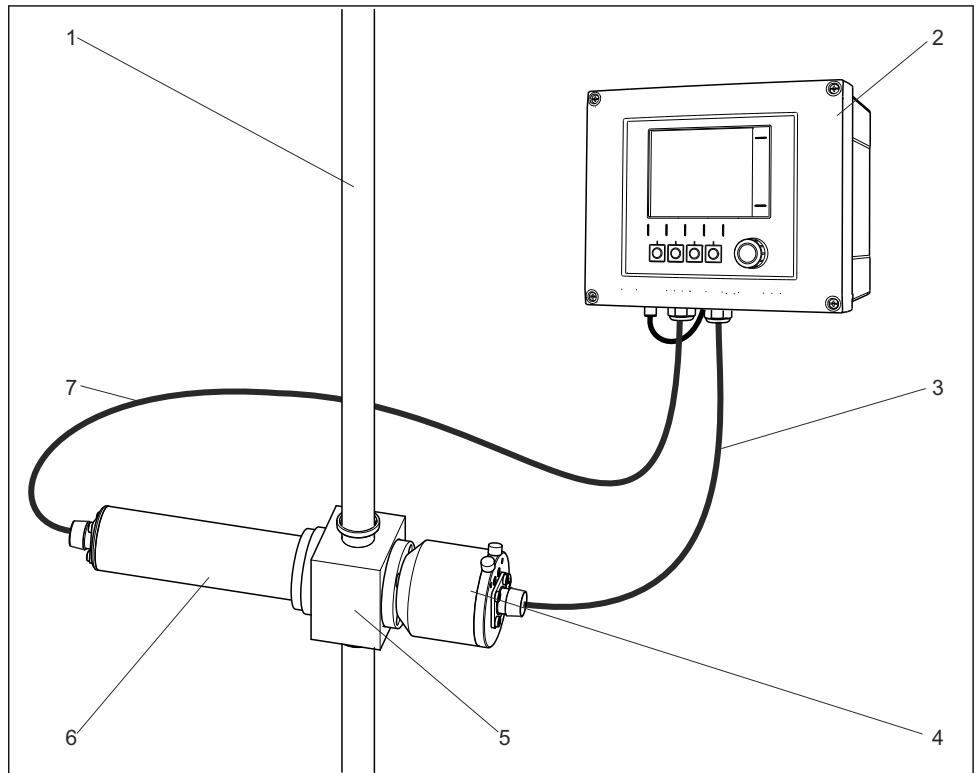
#### 1 Scattered light measurement

- 1 Light source (lamp)
- 2 Orifice plates and lenses
- 3 Scattered light
- 4 Scattered light detector
- 5 Transmitted light detector
- 6 Neutral broadband density filter with anti-reflex coating
- 7 Medium
- 8 Broadband NIR filter (780 nm +)

### Measuring system

An optical measuring system comprises:

- Sensor (photometer) OUSTF10
- Liquiline CM44P transmitter
- Cable set CUK80
- Assembly to suit the sensor, e.g. OUA260



2 Example of a measuring system with a photometer sensor

- |   |                   |   |                             |
|---|-------------------|---|-----------------------------|
| 1 | pipe              | 5 | Flow assembly OUA260        |
| 2 | Transmitter CM44P | 6 | Sensor: light source (lamp) |
| 3 | Cable set CUK80   | 7 | Cable set CUK80             |
| 4 | Sensor: detector  |   |                             |

## Input

**Measured variable** process absorption

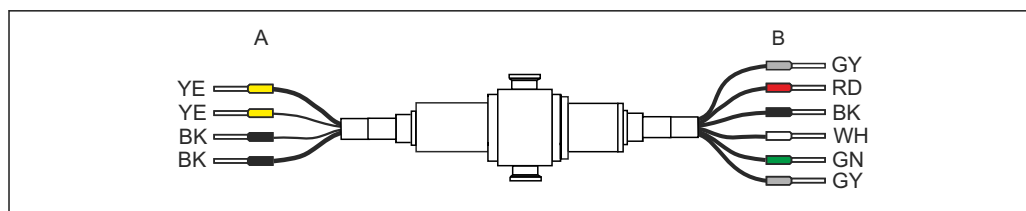
**Measuring range**

- 0 to 200 FTU
- 0 to 200 ppm DE

**Wavelength** Broadband (VIS and NIR)  
Broadband filter (780 nm and above)

## Power supply

**Electrical connection** The sensor is connected to the transmitter using the pre-terminated or labeled cable set CUK80 (for connection to CM44P) or OUK20 (for connection to CVM40). The terminals and labeling may vary depending on the transmitter in use. The cable set must be ordered separately.



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3 OUSTF10 connecting cable

A Light source (lamp) power supply

B Signals of scattered light and transmitted light detector

CM44P terminal	CVM40 terminal	Cable color	Assignment
P+	V1.1	YE (thick)	Lamp voltage +
S+	V1.3	YE (thin)	Detection of lamp voltage +
P-	V1.2	BK (thick)	Lamp voltage -
S-	V1.4	BK (thin)	Detection of lamp voltage -
A (1)	S1.1	RD	Scattered light sensor +
C(1)	S1.2	BK	Scattered light sensor -
SH (1)	S1.S	GY	Shield
A (2)	S2.1	WH	Sensor reference +
C(2)	S2.2	GN	Sensor reference -
SH (2)	S2.S	GY	Shield

**Cable length** Maximum 100 m (330 ft)

**Lamp voltage**

Sensor version	Lamp type	Lamp voltage [V]
OUSATF10-xxxxx	Dual beam, collimated incandescent lamp	4.9 ± 0.1

**Versions for use in hazardous areas**

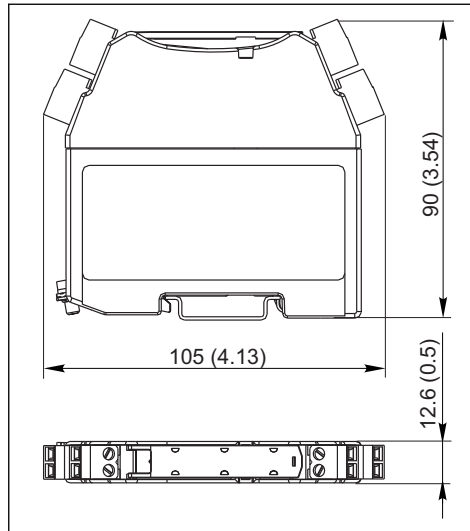


Safety instructions for electrical apparatus in explosion-hazardous areas, XA01403C

**Connecting the detector using a safety barrier**

The photometer sensors use silicon photovoltaic cells as detectors which are operated in the current mode. The detectors are intrinsically safe and can be deployed in Zone 1 environments.

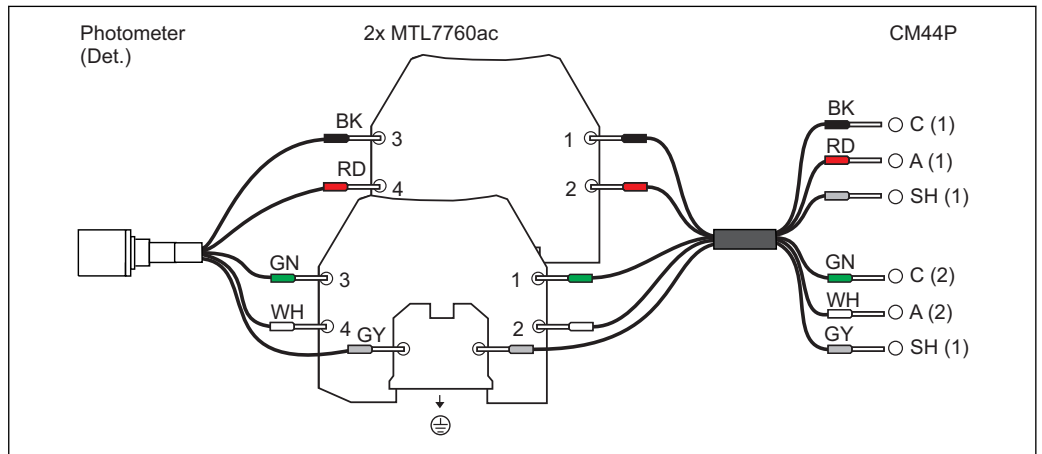
The safe area is separated from the hazardous area by two safety barriers MTL7760AC.



4 Safety barrier, dimensions in mm (inch)

**i** The safety barrier may only have a very low leak current since the optical signals from the sensor can be in the nanoampere range. Therefore, the sensor cable shield is connected to the ground terminal of the barrier.

On delivery, the CUK80 detector cable is permanently wired to the safety barriers. All you have to do is simply connect the individual cable ends to the detector and transmitter.

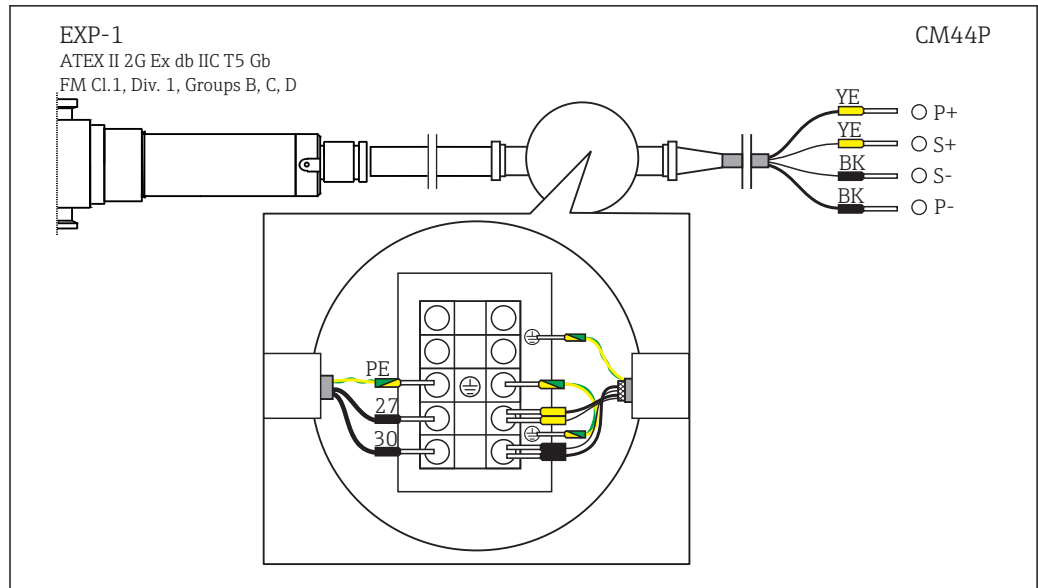


**Connecting the hazardous area lamp using a junction box**

The hazardous area lamp (EXP-1) must be connected to the transmitter using a certified junction box.

**i** For versions with FM approval, the junction box is included in the delivery and already pre-terminated on the lamp side. You simply have to connect the cable of the transmitter (CUK80) to the terminals of the junction box.

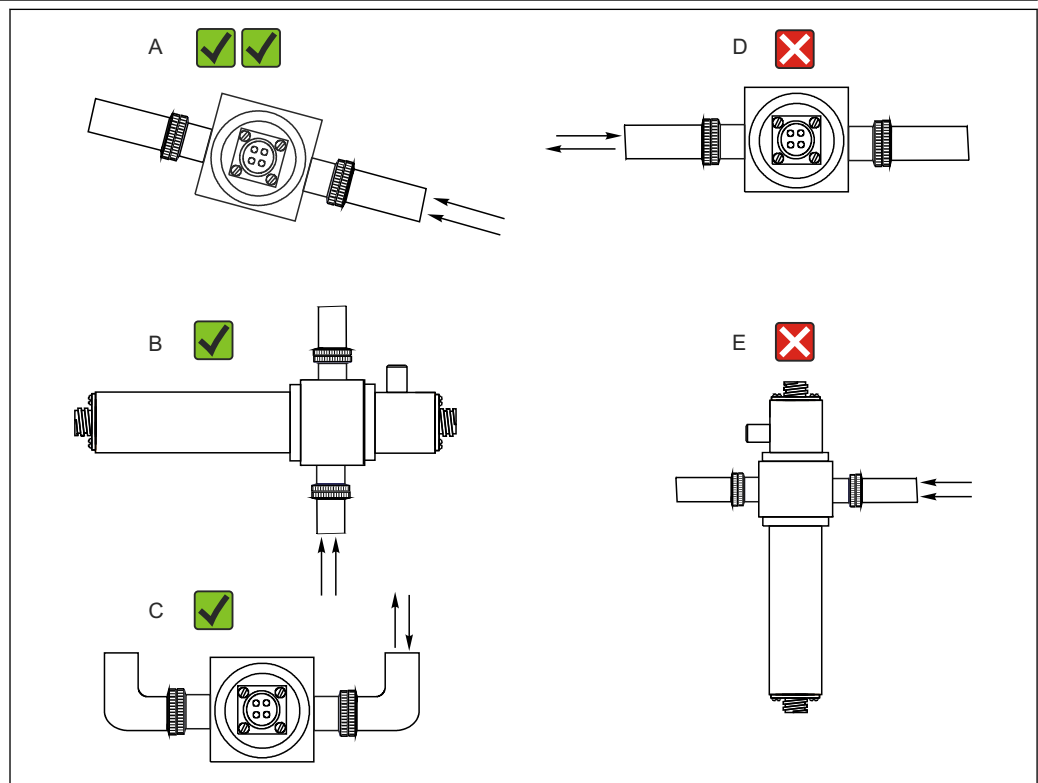
For versions with ATEX approval, the junction box is not included in the delivery and it and the cable glands required must be provided by the customer at the place of installation. You must connect the cables entirely on your own (CUK80 of transmitter and lamp cable of photometer sensor).



5 Connecting the hazardous area lamp to CM44P using a junction box

## Installation

### Installation instructions



6 Mounting angles. The arrows indicate the direction of medium flow in the pipe.

- A Preferred mounting angle
- B Optimum mounting angle
- C Acceptable mounting angle
- D Mounting angle to be avoided
- E Forbidden mounting angle

## Environment

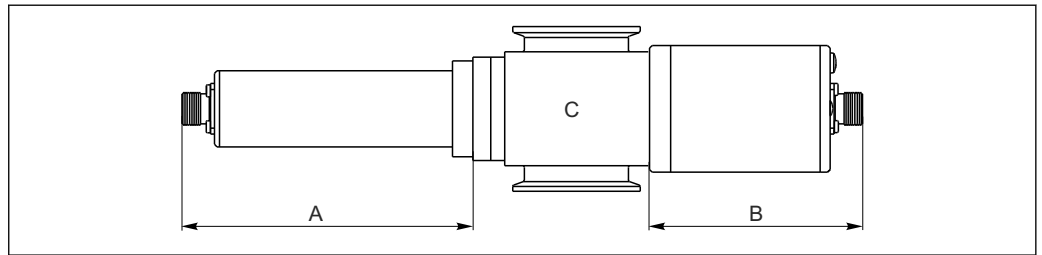
<b>Ambient temperature range</b>	0 to 55 °C (32 to 130 °F)
<b>Storage temperature</b>	-10 to +70 °C (+10 to +160 °F)
<b>Humidity</b>	5 to 95 %
<b>Degree of protection</b>	IP 65 (NEMA 4) for all optical parts

## Process

<b>Process temperature</b>	0 to 90 °C (32 to 194 °F) continuous Max. 130 °C (266 °F) for 2 hours
<b>Process pressure</b>	Max. 100 bar (1450 psi) absolute, depending on the material, pipe size and process connection of the flow assembly

## Mechanical construction

### Design, dimensions



 7 Sensor module

- A Dimension of lamp, depends on lamp type, see table
- B Dimension of detector, see table
- C Assembly, see Technical Information for assembly

Lamp type	Dimension A in mm (inch)
Standard lamp	151.3 (5.96)
Detector type	Dimension B in mm (inch)
OUSTF10	101.6 (4.0)



The total length of the sensor module is derived from the lengths of the lamp, the detector and the assembly.

The dimensions of the OUA260 assembly are provided in Technical Information, TI00418C.

- ▶ When connecting the sensor cable, make sure you maintain an additional distance of 5 cm (2") on both the lamp side and the detector side of the sensor.


<b>Weight</b>	1.225 kg (2.7 lbs.), without flow assembly
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<b>Materials</b>	Sensor housing	Stainless steel 316L
	OUA260 assembly	Stainless steel 316, 316L or Kynar or customer-specific material Depends on version
	Cable connection ends	Nickel-plated brass
<b>Light source</b>	Collimated incandescent lamp	
	Lamp operating life: typically 10 000 h	
<b>Detector</b>	UV silicon detectors, hermetically sealed	
<b>Filter</b>	Multilayer narrow-band interference filter	

## Certificates and approvals

<b>CE mark</b>	<b>Declaration of Conformity</b> The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the <b>CE</b> mark.
<b>Ex approvals</b>	<ul style="list-style-type: none"> <li>▪ ATEX II 2G Ex db IIC T5 Gb</li> <li>▪ FM Cl.1, Div. 1, Groups B, C, D</li> </ul>
<b>FDA conformity</b>	All non-metal parts in contact with medium, such as rubber and plastic parts, meet the requirements of FDA 21 CFR 177.2600. The plastic and elastomer parts of the sensor in contact with medium have passed the biological reactivity tests according to USP <87> and <88> Class VI.

## Ordering information

<b>Product page</b>	<a href="http://www.endress.com/oustf10">www.endress.com/oustf10</a>
<b>Product Configurator</b>	<p>On the product page there is a "Configuration" button to the right of the product image.</p> <ol style="list-style-type: none"> <li>1. Click this button. <ul style="list-style-type: none"> <li>↳ The Configurator opens in a separate window.</li> </ul> </li> <li>2. Select all the options to configure the device in line with your requirements. <ul style="list-style-type: none"> <li>↳ In this way, you receive a valid and complete order code for the device.</li> </ul> </li> <li>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.</li> </ol> <p> For many products you also have the option of downloading CAD or 2D drawings of the selected product version. To do so, click the "CAD" tab and select the desired file type using drop-down lists.</p>
<b>Scope of delivery</b>	<p>The scope of delivery consists of the following :</p> <ul style="list-style-type: none"> <li>▪ sensor</li> <li>▪ Detector and lamp module without flow assembly or</li> <li>▪ Detector and lamp module mounted on OUA260 flow assembly</li> <li>▪ Operating Instructions</li> </ul> <p>If the sensor is ordered with a transmitter, the complete measuring system is factory-calibrated and shipped as one package.</p> <p>If you have any questions, please contact your supplier or your local sales center.</p>



## 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 office.

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### Flow assembly

#### OUA260

- Flow assembly for hygienic sensors
- For sensor installation in pipes
- Materials: stainless steel 316, 316L or Kynar (other materials available on request)
- Wide variety of process connections and path lengths available
- Product Configurator on the product page: [www.endress.com/oua260](http://www.endress.com/oua260)



Technical Information TI00418C

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### Cable

#### CUK80 cable set

- Pre-terminated and labeled cables for connecting analog photometer sensors
- Product Configurator on the product page: [www.endress.com/cuk80](http://www.endress.com/cuk80)



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[www.addresses.endress.com](http://www.addresses.endress.com)

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