

Technical Information

OUSAF12

Optical sensor combined with the OUA260 flow assembly for absorbance measurement



Application

The sensor is used to determine the VIS/NIR absorption of a liquid medium.

- Suspended solids measurement
 - Pharmaceuticals and biotechnology
 - Chemical industry
 - Paper and pulp industry
- Interphase detection
 - Food and beverage industry
 - Chemical industry
 - Oil and gas industry
- Centrifuge and separator control

Your benefits

- Quality control and enhanced production efficiency thanks to reliable absorption measurement
 - Measuring range up to 2.5 AU or 50 OD (depending on optical path length)
 - Can be configured to measure absorption at discrete wavelengths in the visible region and NIR region
 - Color-independent measurement with optional broadband filter
 - Incandescent lamp for long service life and stable measured values
- Cost-effective, time-efficient verification (liquid-free)
- FM- and ATEX-approved lamps for applications in the hazardous area
- Deployable and durable in numerous applications:
 - Variety of materials and process connections
- 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

Light absorption

The measuring principle is based on the Lambert-Beer law.

There is a linear dependency between the absorption of light and the concentration of the absorbing substance:

$$A = -\log(T) = \varepsilon \cdot c \cdot OPL$$

$$T = I/I_0$$

T ... Transmission

I ... Intensity of received light at detector

I₀ ... Intensity of transmitted light of light source

A ... Absorption

ε ... Extinction coefficient

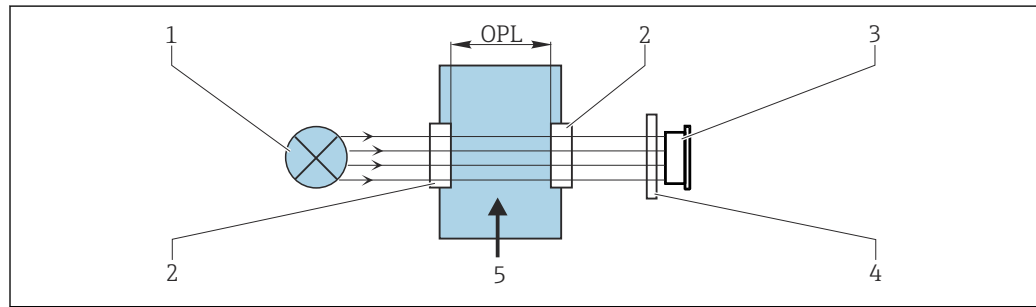
c ... Concentration

OPL ... Optical path length

A light source emits radiation through the medium and the incident radiation is measured on the detector side.

The intensity of the light is determined by a photodiode and converted to a photocurrent.

The subsequent conversion to absorbance units (AU, OD) is performed in the associated transmitter.



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1 Absorption measurement

1 Light source

2 Optical windows (assembly)

3 Detector

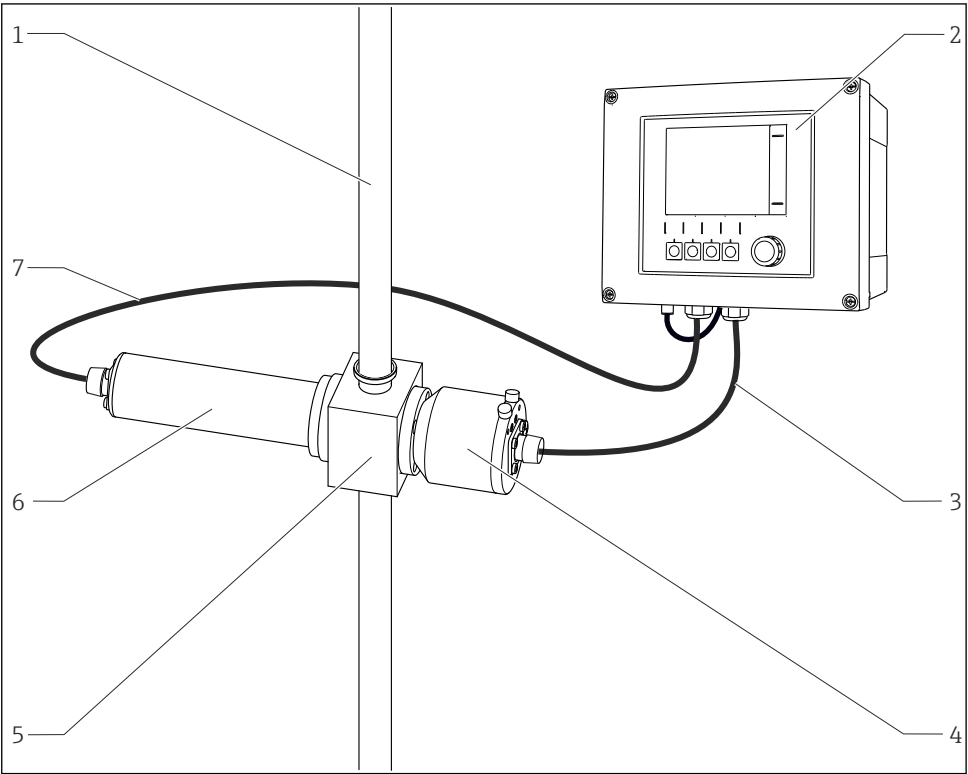
4 Measurement filter (depends on sensor, not provided on all sensors)

5 Medium flow

Measuring system

An optical measuring system comprises:

- Sensor (photometer) OUSAf12
- Transmitter, e. g. Liquiline CM44P
- Cable set, e. g. CUK80
- Assembly OUA260



2 Example of a measuring system with a photometer sensor

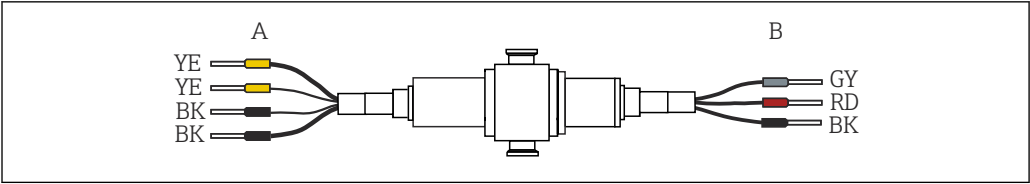
1	Pipe	5	Flow assembly OUA260
2	Transmitter CM44P	6	Sensor: light source (lamp)
3	CUK80 cable set	7	CUK80 cable set
4	Sensor: detector		


Input

Measured variable	Process-absorption
Measuring range	<ul style="list-style-type: none">0 to 2.5 AUMax. 50 OD (depending on the optical path length)
Wavelength	Broadband, NIR (780 nm+), 400 nm, 420 nm, 430 nm, 540 nm, 950 nm and 1134 nm

Power supply

Electrical connection	<p>The sensor is connected to the transmitter via the pre-terminated or labeled cable set CUK80 (for connection to CM44P) or OUK10 (for connection to CVM40) . The terminals and labeling may vary depending on the transmitter in use. The cable set must be ordered separately.</p> <p>► Do not shorten or otherwise modify the CUK80 cable!</p>
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 3 OUSAF12 connecting cable
A Light source (lamp) power supply
B Signals of detector

CM44P terminal	Cable color	Assignment
P+	YE (thick)	Lamp voltage +
S+	YE (thin)	Detection of lamp voltage +
S-	BK (thin)	Detection of lamp voltage -
P-	BK (thick)	Lamp voltage -
A (1)	RD	sensor measuring detector +
C(1)	BK	sensor measuring detector -
SH (1)	GY	Shield

Cable length Maximum 100 m (330 ft)

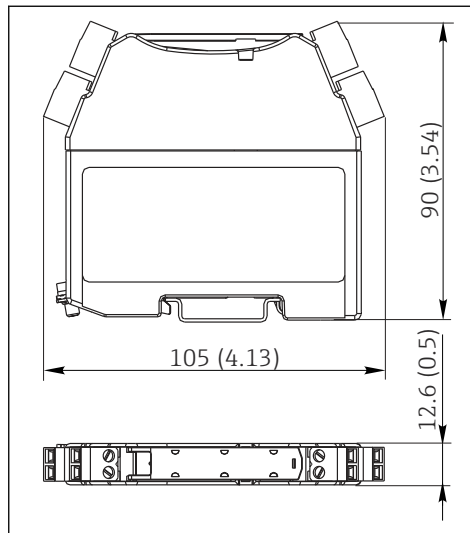
Lamp voltage	Sensor version	Lamp type	Lamp voltage [V]
	OUSAF12-xxA0x	Standard incandescent lamp	3.4 ± 0.1
	OUSAF12-xxA1x OUSAF12-xxA2x OUSAF12-xxA3x	Standard incandescent lamp	4.9 ± 0.1
	OUSAF12-xxBxx	Collimated incandescent lamp	4.9 ± 0.1
	OUSAF12-xxCxx	High-luminescence lamp	4.9 ± 0.1
	OUSAF12-xxDxx	Gas-filled high-performance lamp	4.9 ± 0.1

- Versions for use in hazardous areas**
-  Section applies only to measuring points consisting of a photometer, cable set CUK80 and a Liquiline CM44P transmitter.
 -  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 and Class I, Division 1 environments.

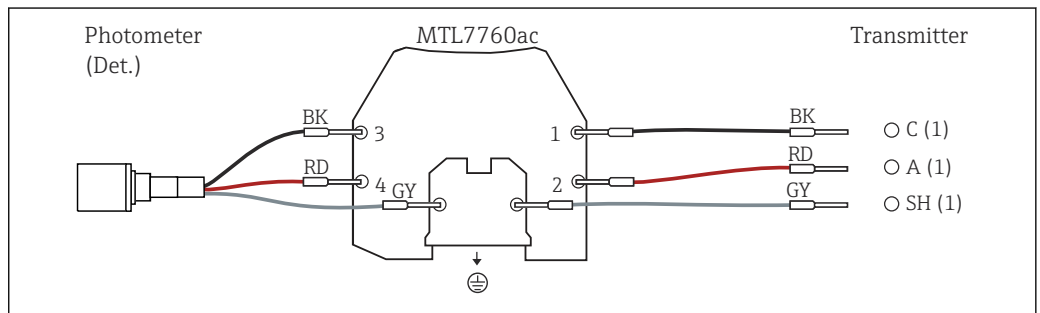
The safe area is separated from the hazardous area by one safety barrier MTL7760AC.



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 barrier. All you have to do is simply connect the individual cable ends to the detector and transmitter.

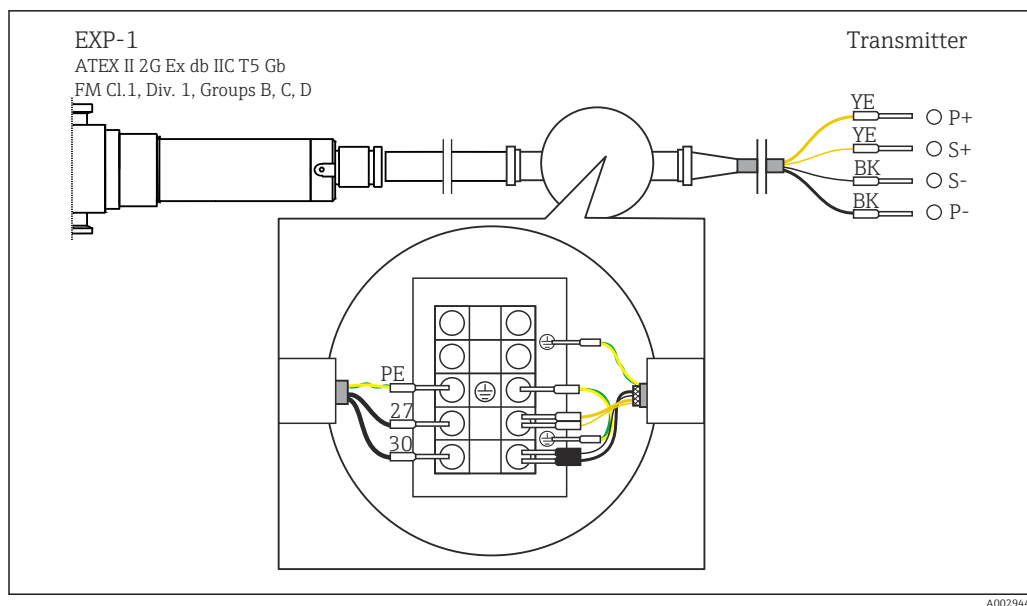


Connecting the hazardous area lamp using a junction box

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.

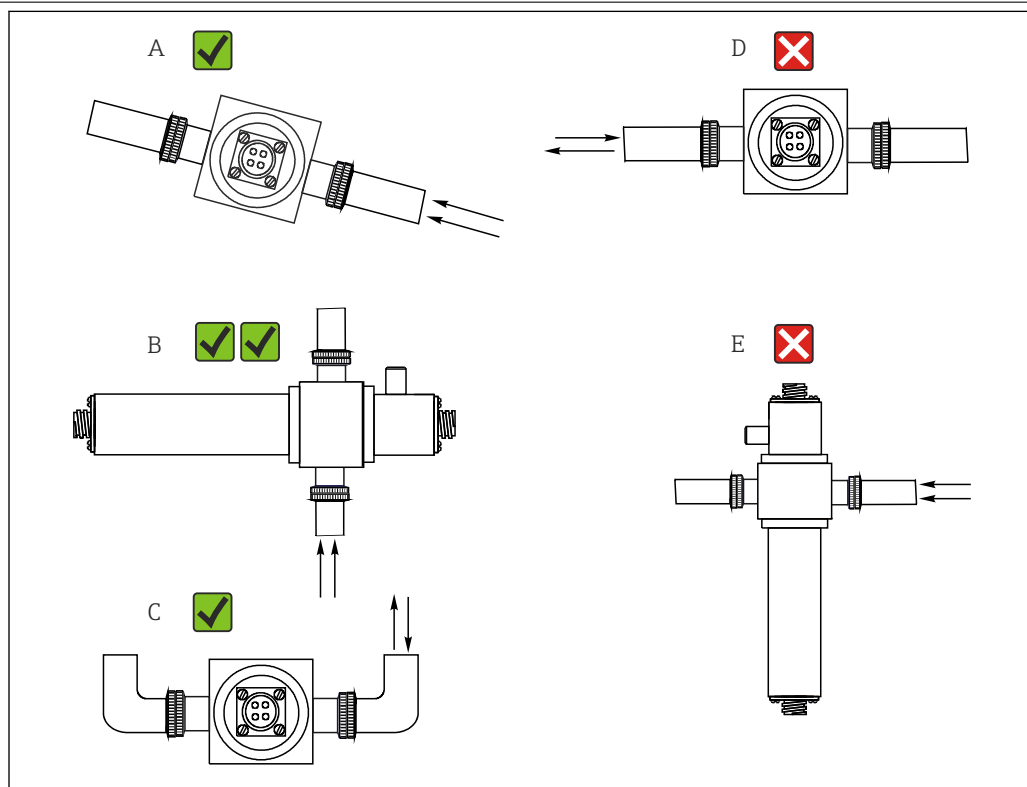
For versions with ATEX approval, the junction box is not included in the delivery and it and the cable glands required must be provided by the customer at the place of installation. You must connect the cables entirely on your own (CUK80 of transmitter and lamp cable of photometer sensor).



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

Installation

Installation instructions



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

- A Suitable mounting angle, better than C
- B Optimum mounting angle, best installation position
- C Acceptable mounting angle
- D Mounting angle to be avoided
- E Forbidden mounting angle

Environment

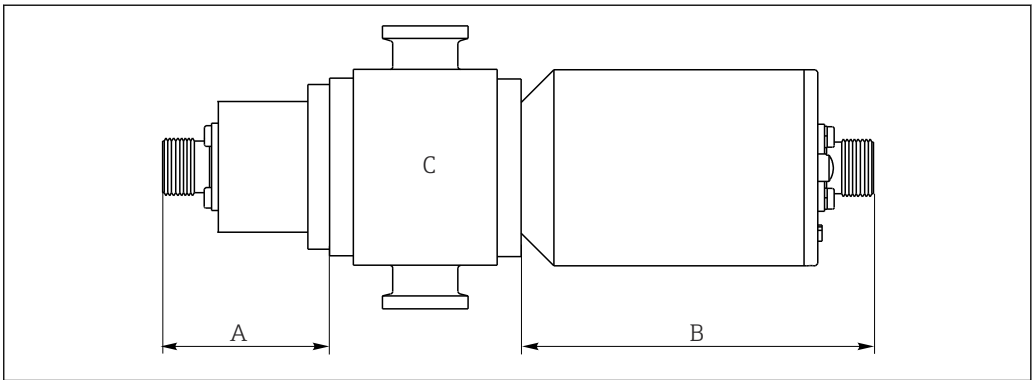
Atmospheric temperature	0 to 55 °C (32 to 131 °F)
Storage temperature	-10 to +70 °C (+10 to +160 °F)
Humidity	5 to 95 %
Degree of protection	IP 65 (NEMA 4) for all optical parts

Process

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

Mechanical construction

Design, dimensions



A0028304

7 Sensor module

A Dimension of lamp, depends on lamp type → Table

B Dimension of detector → Table

C Assembly, see Technical Information for assembly




Lamp type	Dimension A in mm (inch)
High-luminescence lamp or standard incandescent lamp	33.78 (1.33)
Gas-filled lamp	33.78 (1.33)
Collimated incandescent lamp	151.3 (5.96)
Detector type	Dimension B in mm (inch)
Standard version with test filter	101.6 (4.0)
Easycal	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.

- Allow an additional gap of 5 cm (2") on both the lamp side and detector side of the sensor to connect the sensor cable.

Weight	1.225 kg (2.7 lbs.), without flow assembly	
Materials	Sensor housing	Stainless steel 316L
	Assembly OUA260	 Technical Information OUA260, TI00418C
	Assembly CUA261	 Operating Instructions CUA261, BA01652C
	Cable connector ends	Nickel-plated brass
Light source	High-luminescence lamp (wavelength filter 450 nm and above)	
	Gas-filled high-performance lamp (wavelength filter below 450 nm)	
	Collimated incandescent lamp (enhanced resolution)	
	Standard incandescent lamp	
	Lamp operating life: typically 10 000 h	
	 The lamp will not operate at full capacity until a warm-up period of 30 minutes has elapsed.	
Detector	silicon detector, hermetically sealed	
Filter	Multilayer narrow-band interference filter	


Certificates and approvals

Current certificates and approvals for the product are available via the Product Configurator at www.endress.com.

1. Select the product using the filters and search field.
2. Open the product page.

The **Configuration** button opens the Product Configurator.

Ordering information

Product page	www.endress.com/ousaf12
Product Configurator	<p>On the product page there is a Configure button to the right of the product image.</p> <ol style="list-style-type: none"> 1. Click this button. <ul style="list-style-type: none"> ↳ The Configurator opens in a separate window. 2. Select all the options to configure the device in line with your requirements. <ul style="list-style-type: none"> ↳ 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. <p> 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.</p>

Scope of delivery

The scope of delivery comprises the following, depending on the version ordered:

- Detector and lamp module without flow assembly or
- Detector and lamp module mounted on flow assembly OUA260
- Operating Instructions



Ordering the sensor together with a transmitter:

If you select the calibration option in the **Product Configurator for the transmitter**, the complete measuring system (transmitter, sensor, cable) is factory-calibrated and shipped as one package.

- ▶ 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.

Flow assembly**OUA260**

- Flow assembly for hygienic sensors
- For sensor installation in pipes
- Numerous materials, process connections and path length versions available
- Product Configurator on the product page: www.endress.com/oua260



Technical Information TI00418C

CUA261

- VARIVENT adapter for installation in VARINLINE housing
- Hygienic process connection, suitable for cleaning in the process (CIP) and sterilization in the process (SIP)
- Numerous window materials and path length versions available
- Product Configurator on the product page: www.endress.com/cua261



Operating Instructions BA01652C

Cables**CUK80 cable set**

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

OUK10 cable set

- Pre-terminated and labeled cables for connecting OUSAF12-type sensors to Memograph CVM40
- Order as per product structure



www.addresses.endress.com
