

# Technical Information

## OUSA44

Optical sensor combined with the OUA260 flow assembly for the measurement of UV absorption



### Application

The sensor measures the spectral absorption of process liquids in the ultraviolet region of the electromagnetic spectrum.

- Measurement of protein concentrations
- Chromatography monitoring
- Filtration monitoring
- Concentration measurement of organic compounds
- Detection of aromates

### Your benefits

- Improved process control and easier quality control thanks to quick and reliable monitoring of product concentration
  - Measuring range up to 2.5 AU or 50 OD (depending on optical path length)
  - Measurement of UV absorption at discrete wavelengths between 254 nm and 365 nm
  - Outstanding filter properties for highest linearity
  - Direct concurrence with laboratory values
  - Integrated reference detector for lamp compensation
  - Gas discharge lamp for long service life and stable measured values
- Patented Easycal system (optional)
  - Cost-effective, time-efficient calibration
  - Easy, in-line calibration which is traceable to NIST without any liquid standards
- FM- and ATEX-approved lamps for applications in the hazardous area
- Compliance with life sciences sector thanks to hygienic design and FDA- and USP-compliant sealing materials
- High degree of product safety as SIP/CIP-resistant
- High product yield thanks to low volume requirements
- Maximum durability in all applications owing to wide range of materials and process connections
- Can be adapted to process requirements:
  - Optional air purge ports to prevent the formation of condensate on the optical windows
  - Optional adjuster for optical path length

## 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:

$$A = -\log A_m = \epsilon \cdot c \cdot OPL$$

*A ... absorption,  $A_m$  ... absorption measured by detector*

*$\epsilon$  ... Extinction coefficient*

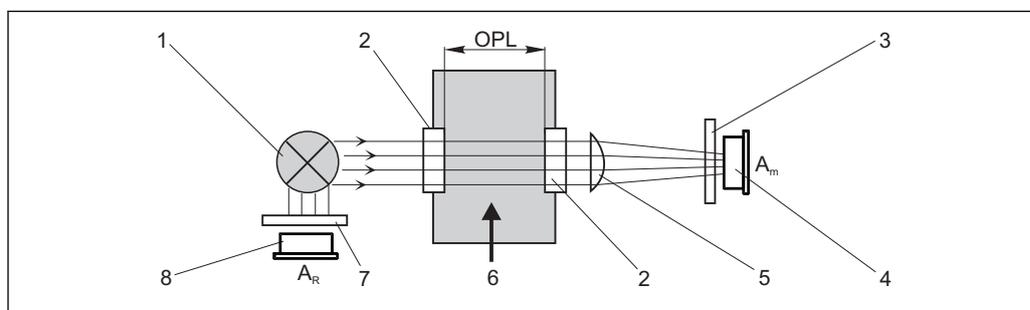
*c ... Concentration*

*OPL ... Optical path length*

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

Once the light has passed through a filter for wavelength selection, the intensity of the light is determined by a photodiode and converted to a photocurrent.

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



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1 Absorption measurement with reference

1 Light source

2 Optical windows

3 Measurement filter

4 Measuring detector

5 Lens

6 Medium flow

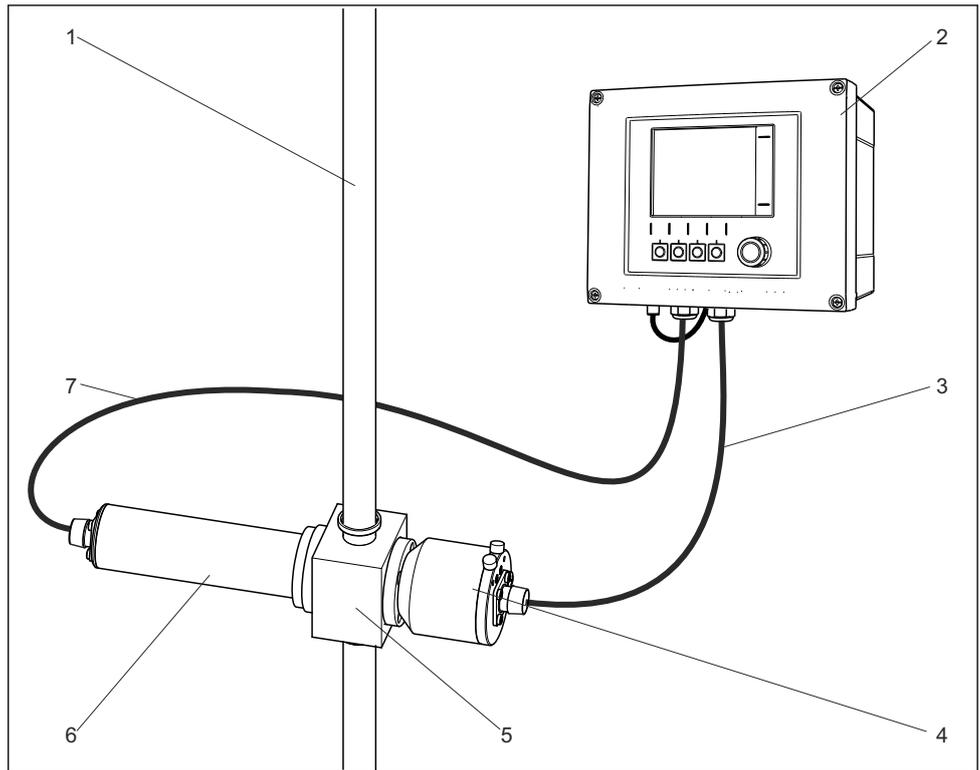
7 Reference filter

8 Reference detector

### Measuring system

An optical measuring system comprises:

- Sensor (photometer) OUSAF44
- Liquiline CM44P transmitter
- Cable set CUK80
- Assembly to suit the sensor, e.g. OUA260



2 Example of a measuring system with a photometer sensor

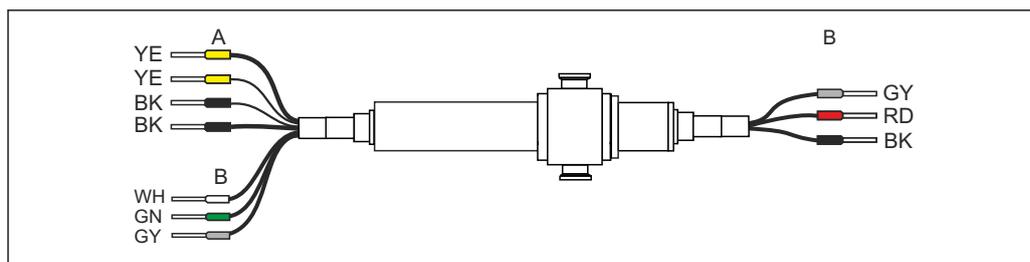
1	pipe	5	Flow assembly OUA260
2	Transmitter CM44P	6	Sensor: light source (lamp)
3	Cable set CUK80	7	Cable set CUK80
4	Sensor: detector		

## Input

<b>Measured variable</b>	UV absorption
<b>Measuring range</b>	<ul style="list-style-type: none"> <li>■ 0 to 2.5 AU</li> <li>■ Max. 50 OD (depending on the optical path length)</li> </ul>
<b>Wavelength</b>	Discrete wavelength at 254, 280, 295, 302, 313 or 365 nm More available on request

## Power supply

<b>Electrical connection</b>	The sensor is connected to the transmitter using the pre-terminated or labeled cable set CUK80 (for connection to CM44P) or OUK40 (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 OUSAF44 connecting cable

A Light source (lamp) power supply

B Signals of measurement and reference 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	Measuring detector sensor +
C(1)	S1.2	BK	Measuring detector 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]
	OUSAF44-xxxx	Dual beam, low-pressure mercury lamp	11.9 ± 0.1

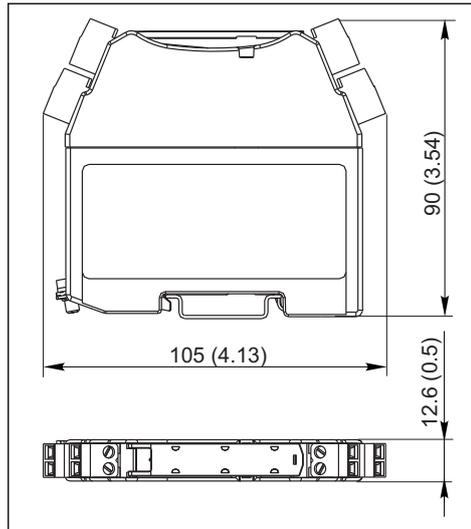
**Versions for use in hazardous areas**

 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.

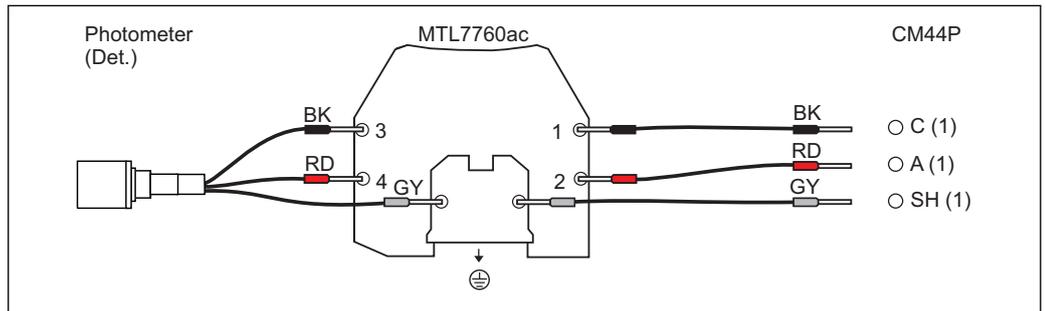
The safe area is separated from the hazardous area by one safety barrier MTL7760AC.



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.

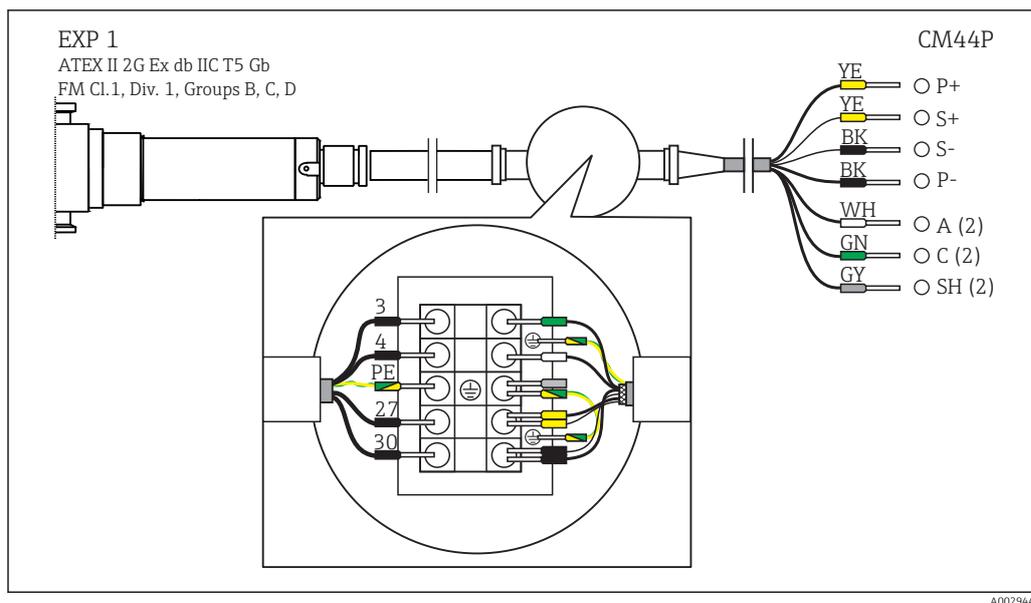


**Connecting the hazardous area lamp using a junction box**

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.

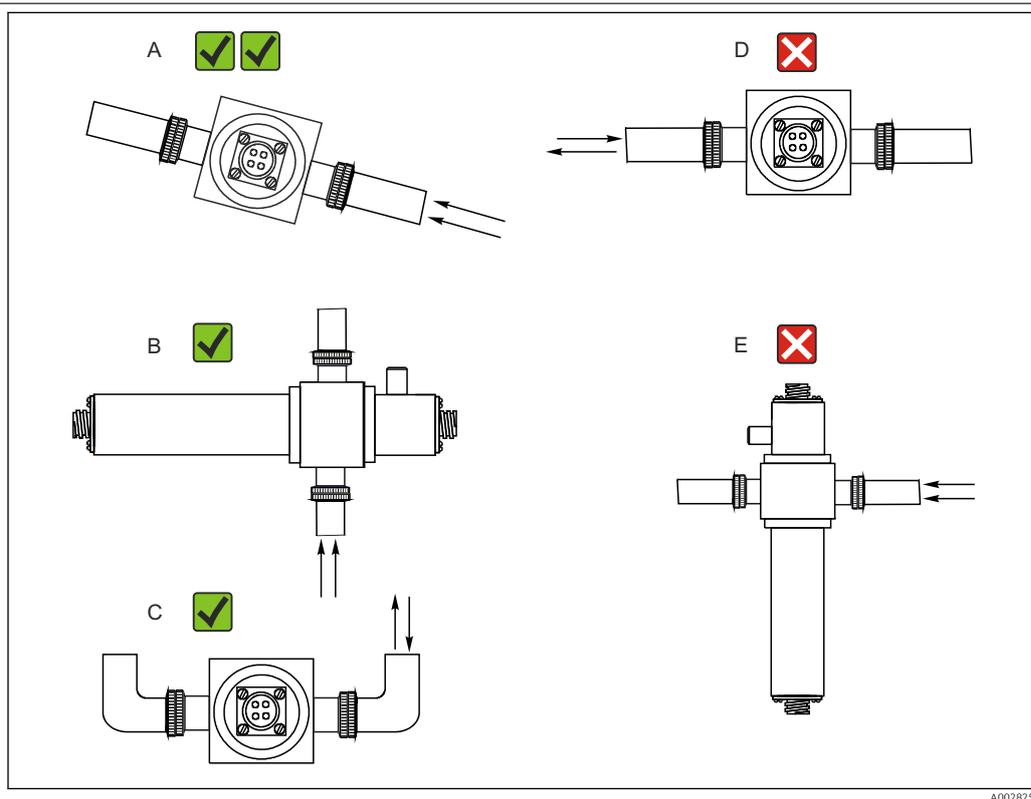
For versions with ATEX approval, the junction box is not included in the delivery and it and the cable glands required must be provided by the customer at the place of installation. You must connect the cables entirely on your own (CUK80 of transmitter and lamp cable of photometer sensor).



5 Connecting the hazardous area lamp to CM44P 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

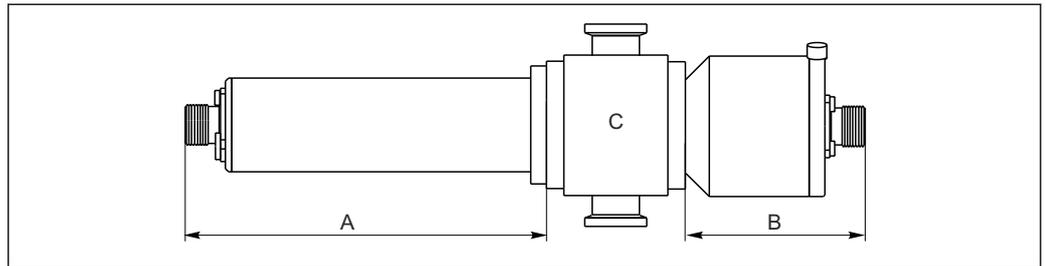
<b>Ambient temperature range</b>	0 to 55 °C (32 to 130 °F)
<b>Storage temperature</b>	-10 to +70 °C (+10 to +160 °F)
<b>Humidity</b>	5 to 95 %
<b>Degree of protection</b>	IP 65 (NEMA 4) for all optical parts

## 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



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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	142 (5.60)
Detector type	Dimension B in mm (inch)
Standard with reference rod	60.2 (2.37)
Easycal	69 (2.70)

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>	Sensor	
	UV lamp	0.58 kg (1.28 lbs)
	UV lamp with wire-braided cable (1.2 m (4 ft)) and junction box (sensor for hazardous area)	3.2 kg (6.66 lbs)
	Easycal detector	0.65 kg (1.43 lbs)
	Standard detector	0.36 kg (0.794 lbs)
	OUA260 assembly	
	TC ¼"	1.14 kg (2.51 lbs)
	TC 1"	1.39 kg (3.07 lbs)
	TC 2"	1.88 kg (4.15 lbs)
	TC 4"	3.38 kg (7.45 lbs)
<b>Materials</b>	Sensor housing	Stainless steel 316
	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>	Pre-set, low-pressure mercury lamp Lamp operating life: typically 3000 h, at least 1000 h	
<b>Detector</b>	UV silicon detectors, hermetically sealed	
<b>Filter</b>	Multilayer interference filter, designed for extreme UV conditions	

## 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/ousaf44">www.endress.com/ousaf44</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> </ol>

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.

 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.

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**Scope of delivery**

The scope of delivery consists of the following depending on the version ordered:

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

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

If you have any questions, please contact your supplier or your 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 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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**Calibration**

**OUSAF44 EasyCal retrofit kit**

- Patented system traceable to NIST for the online calibration of UV absorption sensors
- Order numbers:
  - 254 nm: 71210149
  - 280 nm: 71210150
  - 295 nm: 71210156
  - 302 nm: 71210153
  - 313 nm: 71210151
  - 365 nm: 71210152

**Reference rod**

Order number: 71108543

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

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