

OUSAF44

Measurement of UV
absorption



Technical Information

Optical sensor combined with flow assembly OUA260



Application

The OUSAF44 sensor is used for measuring the spectral absorbance of process liquids in the ultraviolet region of the electromagnetic spectrum. It is suitable for a variety of applications:

- Measurement of protein concentrations
- Chromatography control
- Product purification
- Concentration measurement of organic compounds
- Aromatics detection
- Filtration monitoring

Your benefits

- Accurate measurement
 - Measuring range up to 50 OD
 - Configurable to measure UV absorption at discrete wavelengths between 254 nm and 365 nm
 - Built-in reference detector for lamp compensation
 - Air purge ports available for preventing condensate formation on the optical windows
- Unique precision optical pathlength adjuster available enabling exact adjustment of short pathlengths
- Patented gas discharge light source for long service life and stable operation
- Patented Easycal™ system option for easy, liquid-free online calibration traceable to NIST
- FM and ATEX approved lamps for hazardous area applications

The OUA260 flow assembly used with the sensor offers the following benefits:

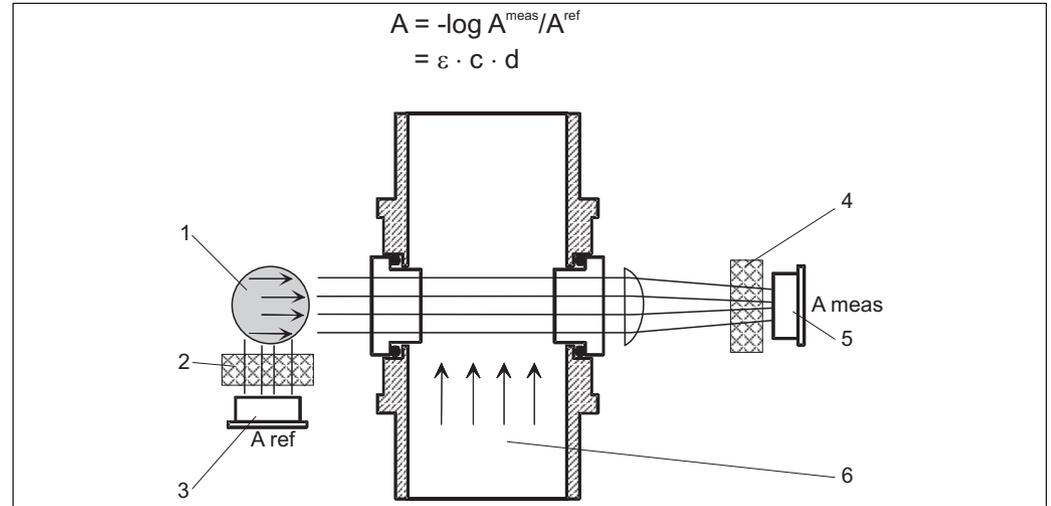
- Hygienic design
 - FDA and USP accepted seal materials available
 - SIP/CIP-resistant flow assembly with minimum retention
- Broad variety of wetted materials and process connections

Function and system design

Measuring principle

Absorption light method

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 light source emits radiation through the medium and the transmitted radiation is measured on the detector side. After passing a filter for wavelength selection, the intensity of light is determined by a photodiode and converted into a photo current. The final conversion into transmission (%) or absorbance (AU, OD) units is done by the related transmitter.



Single-beam absorption

- A Absorbance
- ε Extinction coefficient
- c Concentration
- d Optical path length

- 1 Light source
- 2 Reference filter
- 3 Reference detector
- 4 Interference filter
- 5 Measurement detector
- 6 Medium

Options

Easycal™

Easycal is the most accurate and convenient method for inline verification and calibration without dismantling the sensor from the process.

The Easycal unit comprises an optical detector system with two NIST traceable filters that provide an accurate and reproducible three-point calibration method. Calibration is fast and easy by simply rotating the filters into the light path.

The mechanically sealed and compact design results in the longest lifetime and stability of the traceable filters even under harshest conditions.

Precision optical pathlength adjustment (POPL) for OUA260

This option of the flow assembly allows for precise setting of the distance between the windows. It consists of adjustable window rings and a certified measuring gauge that precisely determines the distance between the windows. This feature provides precise optical pathlengths down to 0.5 mm and results in an increased measuring range, a unique repeatability of measured values, consistent readings between different instruments and fully comparable measuring values to lab results.

The combination of the precision optical pathlength with an Easycal offers the opportunity for a liquid-free, traceable calibration of the whole measuring system and thus eliminates the need for time-consuming calibration with liquid standards.

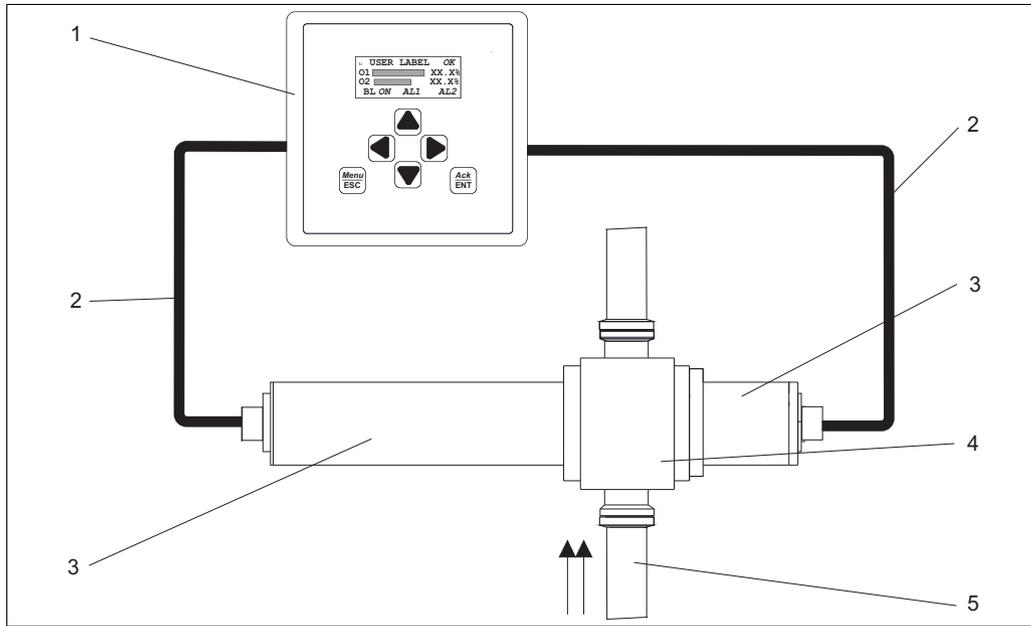
Installation in hazardous areas

The explosion-proofed lamp housing allows the 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.

A complete measuring system comprises:

- UV sensor OUSAF44
- Flow assembly OUA260
- UV transmitter, e.g. OUM960
- UV cable set OUK40

Measuring system



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Complete measuring system OUSAF44

- 1 Transmitter, e.g. OUM960
- 2 OUK40 cable set
- 3 OUSAF44 sensor
- 4 OUA260 flow assembly
- 5 Process piping

Input

UV absorbance [OD]

Measured variable

0 to 50 OD (depending on optical path length)

Measuring range

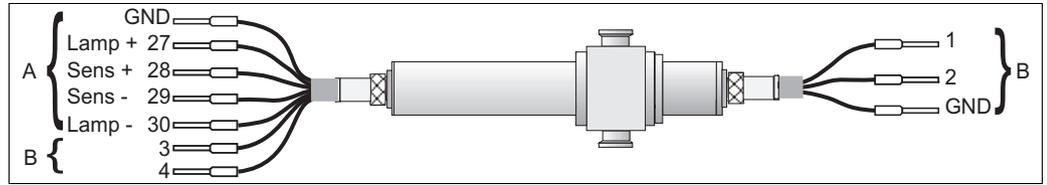
Discrete wavelength at 254, 280, 295, 302, 313 or 365 nm; further versions available on request

Wavelengths

Wiring

Electrical connection

The OUSAF44 sensor is connected to the UV transmitter via the pre-terminated and labeled cable set OUK40 (to be ordered separately).
Terminals and labeling might vary with the transmitter in use.



Connecting cable for OUSAF44

- A Power supply for lamp and reference detector
- B Signal transmission of measurement detector

Cable length

max. 100 m (328 ft)

Cable connectors

Nickel-plated brass

Installation

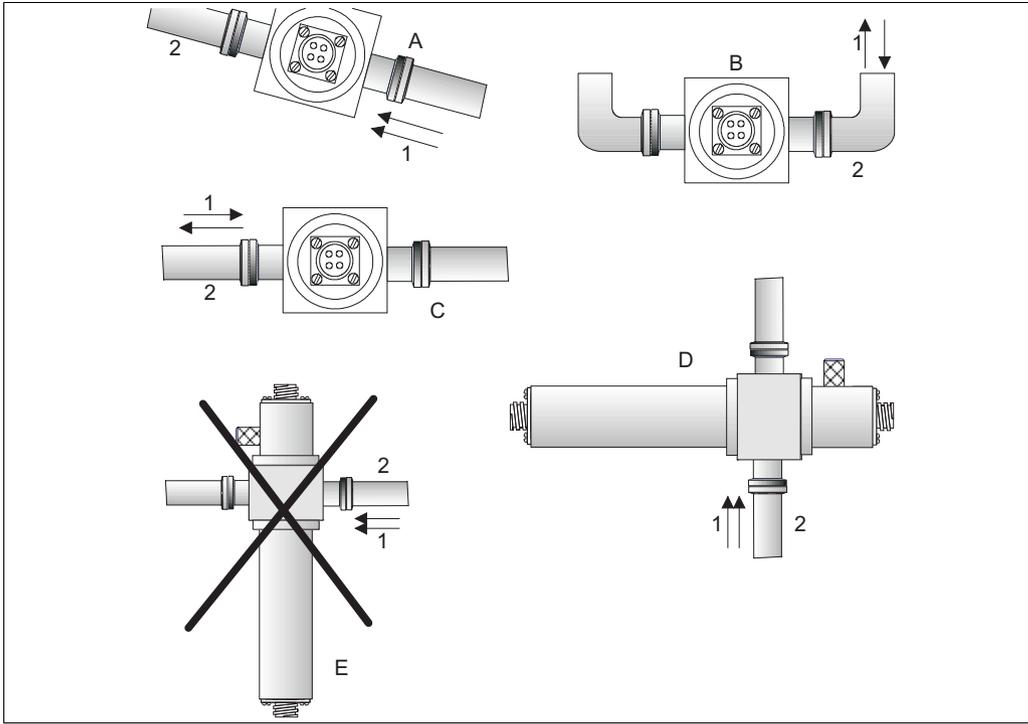
Installation instructions



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 OUSAF44 sensor cannot be used without the OUA260.

Note!

- 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 evolution.



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Sensor installation

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

Environment

-20 to 70 °C (-4 to 158 °F)

Storage temperature

IP 65 (≅ NEMA 4) for all optical parts

Ingress protection

Process

-5 to 90 °C (23 to 194 °F) continuous
 max. 135 °C (275 °F), 1 hour/day for sterilization

Process temperature

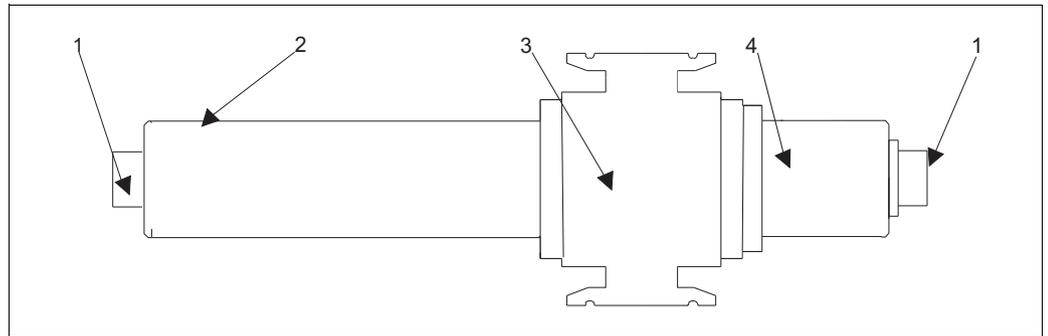
up to 100 bar (1450 psi), depending on material, line size and process connection of flow assembly

Process pressure

Mechanical construction

Design

General design:



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Design of OUSAF44 with OUA260 flow assembly

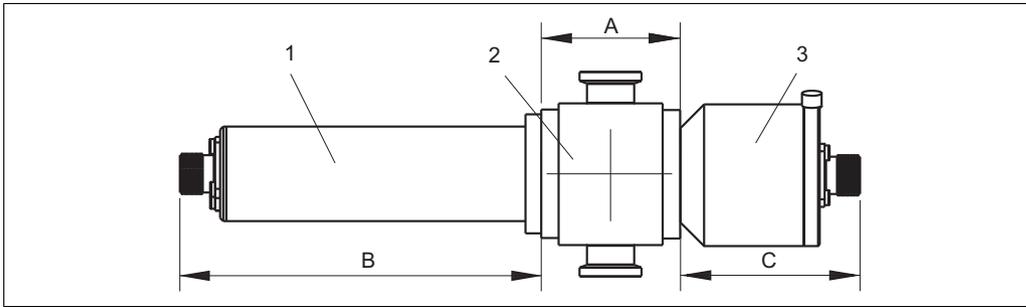
- 1 *Environmental connector*
- 2 *Lamp housing*
- 3 *OUA260 flow assembly (to be ordered separately)*
- 4 *Detector*

Flow assembly OUA260

- Process connections: Tri-clamp, weld stubs, tube compression fittings, Swagelok, ANSI flange, DIN flange
(further connections available on request)
- Materials: SS316, SS316L, Kynar
(further materials such as titanium, Hastelloy, etc. available on request)
- Line size: ¼" to 4" (DN 6 to DN 100)
- Path lengths: 0.5 to 100 mm (0.02" to 3.94"), depending on line size and process connection
- Windows: quartz, sapphire
- O-rings: EPDM, Viton, Teflon-coated Viton, Kalrez
(further materials available on request)

The sensor dimensions depend on the flow assembly.

Dimensions



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General dimensions

- 1 Lamp assembly
- 2 Flow assembly
- 3 Detector assembly

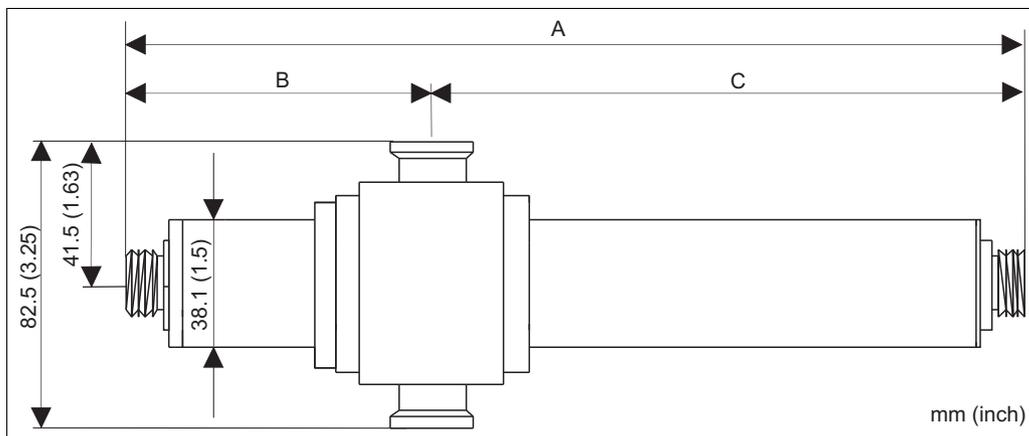
| Flowcell type | A | Lamp assy type | B | Detector assy type | C |
|---------------|------------------|----------------|------------------|--------------------------|-----------------|
| ¼" to ¾" TC | 56.1 mm (2.21") | Standard lamp | 142 mm (5.60") | EasyCal | 69 mm (2.70") |
| 1" to 1½" TC | 66.0 mm (2.60") | EXP-1 lamp | 165.0 mm (6.50") | Standard AF44 w/ Ref rod | 60.2 mm (2.37") |
| 2" TC | 86.1 mm (3.39") | | | | |
| 2½" TC | 99.8 mm (3.89") | | | | |
| 3" TC | 107.7 mm (4.24") | | | | |
| 4" TC | 131.8 mm (5.19") | | | | |

Note!

Make sure to leave an additional clearance of approx. 5 cm (1.97") for installation of the sensor cable.



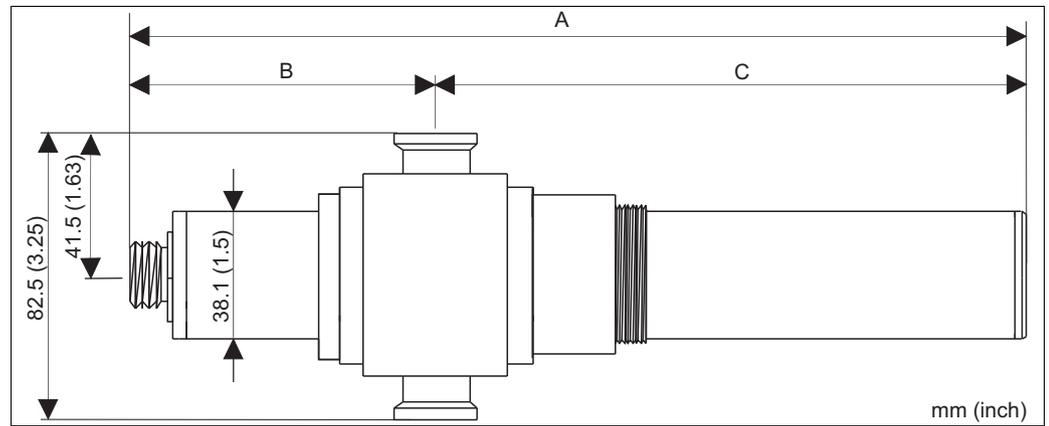
Example: Triclamp flow assembly



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Dimensions of standard sensor; dimensions A, B, C depend on the process connection size (see table below)

| Connection size | A | B | C |
|-----------------|-------------------|------------------|------------------|
| ¼" - ¾" | 266.7 mm (10.5") | 95.3 mm (3.75") | 171.5 mm (6.75") |
| 1" - 1 ½" | 276.2 mm (10.88") | 100.0 mm (3.94") | 176.2 mm (6.94") |
| 2" | 295.3 mm (11.63") | 109.5 mm (4.31") | 185.7 mm (7.31") |



Dimensions of sensor version EXP-1; dimensions A, B, C depend on the process connection size (see table below)

| Connection size | A | B | C |
|-----------------|-------------------|------------------|------------------|
| 1/4" - 3/4" | 301.0 mm (11.85") | 95.3 mm (3.75") | 205.8 mm (8.10") |
| 1" - 1 1/2" | 310.9 mm (12.24") | 100.0 mm (3.94") | 210.8 mm (8.30") |
| 2" | 329.2 mm (12.96") | 109.5 mm (4.31") | 219.7 mm (8.65") |

Weight

Sensor

Lamps

- High-intensity lamp: 0.365 kg (0.805 lbs)
- UV lamp: 0.580 kg (1.28 lbs)
- UV lamp with SS-braided cable (1.2 m (4ft)) and junction box (Ex-proofed sensor): 3.202 kg (6.66 lbs)

Detectors

- Easycal detector: 0.650 kg (1.43 lbs)
- Standard detector: 0.360 kg (0.794 lbs)

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

- TC 1/4", 316 SS: 1.14 kg (2.51 lbs)
- TC 1", 316 SS: 1.39 kg (3.07 lbs)
- TC 2", 316 SS: 1.88 kg (4.15 lbs)
- TC 4", 316 SS: 3.38 kg (7.45 lbs)

Materials

Sensor housing: stainless steel 316

Light source

Pre-focused low pressure mercury lamp

Lamp life: 1000 hours (3000 hours typical)

Detectors

UV enhanced silicon detectors, hermetically sealed

Filters

Multilayer narrow passband interference filter designed for extreme UV conditions

Certificates and approvals

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

Ex approval

Ordering information

| Wavelength | |
|------------|----------------------------------|
| A | 254 nm |
| B | 280 nm |
| C | 295 nm |
| D | 302 nm |
| E | 313 nm |
| F | 365 nm |
| Y | Special version, to be specified |

| Calibration / Validation | |
|--------------------------|----------|
| 0 | Standard |
| 1 | Easycal |

| Lamp approval | |
|---------------|---------------------------------|
| A | Standard |
| B | FM Class 1 Div 1 groups B, C, D |
| C | ATEX II 2G EEx d IIC T5 |

| Assembly | |
|----------|---------------------------------------|
| 0 | Isolated order / spare part |
| 1 | Assembled to flow cell order position |
| 9 | Special version, to be specified |

| | | | | | |
|----------|--|--|--|--|---------------------|
| OUSAF44- | | | | | complete order code |
|----------|--|--|--|--|---------------------|

Product structure

Scope of delivery

The scope of delivery depends on the ordered version.

Isolated order

- 1 detector and lamp arm without flow assembly

Assembled to flow assembly

- Detector and lamp arm mounted on
- OUA260 flow assembly
- Operating Instructions depending on the used transmitter

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

Scope of delivery

Accessories

Flow assembly

OUA260 flow assembly for hygienic sensors

- For sensor installation in pipe lines
 - Materials: stainless steel 316, 316L or Kynar (further materials available on request)
 - Many process connections and pathlength versions available
 - Ordering acc. to product structure, see Technical Information TI418C/07/en
-

Transmitters

OUM960 transmitter

- Transmitter for measurement of UV absorption
 - Ordering acc. to product structure, see Technical Information TI417C/07/en
-

Cables

OUK40 cable set

- Pre-terminated and labeled cables for connection of OUSAF44 sensors
 - Ordering according to product structure
-

Calibration

Easycal™ retrofit

- Patented, NIST traceable system for online calibration of UV and solids flow through sensors
- Ordered acc. to product structure, see price list

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