Technical Information

OUSAF11

Optical sensor for measurement of VIS/NIR absorption

Application
The OUSAF11 sensor is used for determining the VIS/NIR absorption of a liquid medium. It is suitable for a variety of applications:

- Product interphase detection
- Dairy applications:
  - Milk detection in CIP solutions
  - Phase separation milk/water
  - Product loss detection in effluent
- Suspended solids measurement in:
  - Primaries
  - Mining

Your benefits
- Flexible:
  - Submersible sensor for applications in open tanks and basins
  - Insertion sensor with Tri-Clamp or Varivent connection for sanitary applications in pipes and vessels
- Glass-free and certified according to 3-A Standard 46-03
- Two pathlengths available: 5 and 10 mm
- Measuring range: 0 to 3 AU (absorption units)
- Low voltage incandescent lamp provides long service life and stable operation
- Robust design with stainless steel body and fouling resistant sensor head made of FEP
- Operating temperature range: 0 to 90°C (32 to 194°F)
- Color independent measurement with optional NIR detector
- Easy to maintain
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 light absorption 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. The light intensity is determined by a photodiode and converted into a photo current. The final conversion into absorption units (AU, OD) is done by the related transmitter.

![Diagram](attachment:image.png)

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**Single-wavelength absorption sensor**

\[ A = \varepsilon \cdot c \cdot OPL \]

- **A**: Absorption
- **ε**: Extinction coefficient
- **c**: Concentration
- **OPL**: Optical pathlength

1. Light source
2. Measurement detector

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**Diagram notes**

- Light source
- Measurement detector
- Optical pathlength
- Absorption
- Extinction coefficient
- Concentration

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**Formula**

\[ A = \varepsilon \cdot c \cdot OPL \]
A complete measuring system is typically comprised of:
- Transmitter Memograph CVM40
- Optical sensor OUSAF11

For applications in open tanks and basins a typical measuring system is comprised of:
- Transmitter Memograph CVM40
- Optical sensor OUSAF11
- Assembly Flexdip CYA112 and holder system Flexdip CYH112

Example of a measuring system with immersion assembly:
1. Holder system Flexdip CYH112
2. Transmitter Memograph CVM40
3. Assembly Flexdip CYA112
4. Optical sensor OUSAF11

### Input

<table>
<thead>
<tr>
<th>Measured variable</th>
<th>VIS/NIR absorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>0 to 3 AU, 0 to 6 OD (depending on optical pathlength)</td>
</tr>
<tr>
<td>Wavelengths</td>
<td>NIR, broadband (VIS and NIR)</td>
</tr>
<tr>
<td>Optical pathlengths</td>
<td>5 or 10 mm</td>
</tr>
</tbody>
</table>
Wiring

Electrical connection

Terminals and labeling might vary with the transmitter in use. Up to two sensors can be connected to the transmitter Memograph CVM40.

Terminal CVM40 | Sensor OUSAF11
--- | ---
S1.5 | GY | Shield
S1.1 | RD | Sensor +
S1.2 | WH | Sensor -
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)

Installation

Installation instructions

The sensor can be installed up to the horizontal in an assembly, holder or a suitable process connection. Other installation positions are not recommended. Do not install the sensor vertically through the bottom of a pipe. This avoids possible sediment formation and guarantees steady flow through the measuring section. It ensures correct measured values and proper drainage required in sanitary applications.

Angle of installation

A  Permissible installation positions: 0 to 180°
Pipe installation

The following figure illustrates various installation positions in pipes and indicates whether they are permitted or not.

- The pipeline diameter must be at least 50 mm (2”).
- Install the sensor in places with uniform flow conditions.
- The best installation location is in the ascending pipe (item 1). Installation is also possible in the horizontal pipe (item 5).
- Do not install the sensor in places where air may collect or foam bubbles form (item 3) or where suspended particles may settle (item 2).
- Avoid installation in the down pipe (item 4).

Orientation and installation positions

Orientation of OUSAF11

Environment

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>0 to 55 °C (32 to 131 °F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-20 to 70 °C (-4 to 158 °F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>5 to 95 %</td>
</tr>
<tr>
<td>Ingress protection</td>
<td>IP 67 (NEMA 4)</td>
</tr>
<tr>
<td></td>
<td>IP 68 when mounted with CYH112</td>
</tr>
</tbody>
</table>
**Process**

**Process temperature**
0 to 90 °C (32 to 194 °F) continuous, max. 130 °C (266 °F) for 2 hours

**Process pressure (for version with Tri-Clamp and Varivent process connection)**
10 bar (150 psi), at 20 °C (70 °F)

**Mechanical construction**

**Design, dimensions**

```
1  
135.5 (5.33)  

2  
139.0 (5.47)  
38.1 (1.5)  

3  
149.1 (5.87)  

mm (inch)
```

*Design and dimensions of OUSAF11*

1 Immersion sensor OUSAF11
2 OUSAF11 with Tri-Clamp or Varivent flange
3 Immersion sensor OUSAF11 with external thread

**Weight**
appr. 0.82 kg (1.81 lbs)

**Materials**
Sensor head: FEP (Fluorinated Ethylene Propylene)
Sensor body: Stainless steel 316
O-ring: EPDM

**Light source**
Incandescent lamp

Lamp life: 10,000 hours typical

**Detectors**
VIS/NIR enhanced silicon detectors, hermetically sealed

**Filters**
NIR or broadband filter integrated in detector
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/OUSAF11

**Online configurator**
1. You can choose from the following options on the product page located on the right:

<table>
<thead>
<tr>
<th>Product page function</th>
</tr>
</thead>
<tbody>
<tr>
<td>:: Add to product list</td>
</tr>
<tr>
<td>:: Price &amp; order information</td>
</tr>
<tr>
<td>:: Compare this product</td>
</tr>
<tr>
<td>:: Configure this product</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA Non-hazardous area</td>
</tr>
<tr>
<td>YY Special version, TSP-no. to be spec.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Wavelength</th>
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</thead>
<tbody>
<tr>
<td>1 NIR, 725 - 1100 nm</td>
</tr>
<tr>
<td>2 Broadband (VIS and NIR), 390 - 1100 nm</td>
</tr>
<tr>
<td>9 Special version, TSP-no. to be spec.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optical pathlength (OPL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>05 5 mm</td>
</tr>
<tr>
<td>10 10 mm</td>
</tr>
<tr>
<td>99 Special version, TSP-no. to be spec.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Process connection</th>
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</thead>
<tbody>
<tr>
<td>A1 Immersion sensor</td>
</tr>
<tr>
<td>A2 Immersion sensor, thread G1</td>
</tr>
<tr>
<td>A3 Immersion sensor, thread NPT 1&quot;</td>
</tr>
<tr>
<td>B1 Tri-Clamp 2&quot;</td>
</tr>
<tr>
<td>B2 Tri-Clamp 2.5&quot;</td>
</tr>
<tr>
<td>B3 Tri-Clamp 3&quot;</td>
</tr>
<tr>
<td>C1 Varivent N DN40-125</td>
</tr>
<tr>
<td>Y9 Special version, TSP-no. to be spec.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sealing material</th>
</tr>
</thead>
<tbody>
<tr>
<td>A EPDM (FDA, USP Class VI)</td>
</tr>
<tr>
<td>Y Special version, TSP-no. to be spec.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cable length</th>
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</thead>
<tbody>
<tr>
<td>10 10 ft / 3 m</td>
</tr>
<tr>
<td>15 15 ft / 4.5 m</td>
</tr>
<tr>
<td>25 25 ft / 7.5 m</td>
</tr>
<tr>
<td>50 50 ft / 15 m</td>
</tr>
<tr>
<td>88 ... ft; cable</td>
</tr>
<tr>
<td>89 ... m; cable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cable labelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>D Memograph CVM40</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Approval</th>
</tr>
</thead>
<tbody>
<tr>
<td>L2 Hygiene 3-A</td>
</tr>
</tbody>
</table>
Scope of delivery

The scope of delivery includes:
- Optical sensor OUSAF11
- Operating Instructions, English

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

Accessories

Assembly, holder

Holder system Flexdip CYH112 and assembly Flexdip CYA112:
- Modular holder system for sensors and assemblies in open basins, channels and tanks
- The holder system CYH112 works for nearly any type of mounting - mounting on the floor, wall or directly on a rail.
- Material: stainless steel
- Ordering according to product structure (Technical Information TI430C/07/EN)

Transmitters

CVM40 Memograph
- Graphic transmitter for inline photometers and data manager
- Ordering according to product structure, see Technical Information TI457C/07/EN