

# Technical Information

## OUSBT66

NIR absorption sensor for the measurement of cell growth and biomass



### Application

- Cell growth in bacterial fermentation and applications in mammalian cell cultures
- Biomass in fermentation processes
- Monitoring of algae concentration
- Monitoring of crystallization processes
- Measurement of solids

### Your benefits

- Increased product yield thanks to fast and reliable absorption measurement in fermentation and crystallization applications
  - Highest linearity and wide measuring range with LED lamp
- Suitable for pharmaceutical use:
  - Stainless steel 1.4435 (AISI 316L)
  - Sealless sapphire window without gaps
- High degree of product safety:
  - Sterilizable and autoclavable
  - CIP/SIP-resistant
- Cost-effective, time-efficient calibration with traceable plug-on filters
- For use in a wide range of applications:
  - Variety of optical path lengths for different cell cultures and concentrations
  - Process connection Pg 13.5 for installation in assemblies or head plates
  - Suitable for lab-scale, pilot-scale and production-scale bioreactors
  - Available in different lengths for different immersion depths

## 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:

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

$$T = I/I_0$$

*T ... Transmission*

*I ... Intensity of received light at detector*

*I<sub>0</sub> ... Intensity of transmitted light of light source*

*A ... Absorption*

*ε ... Extinction coefficient*

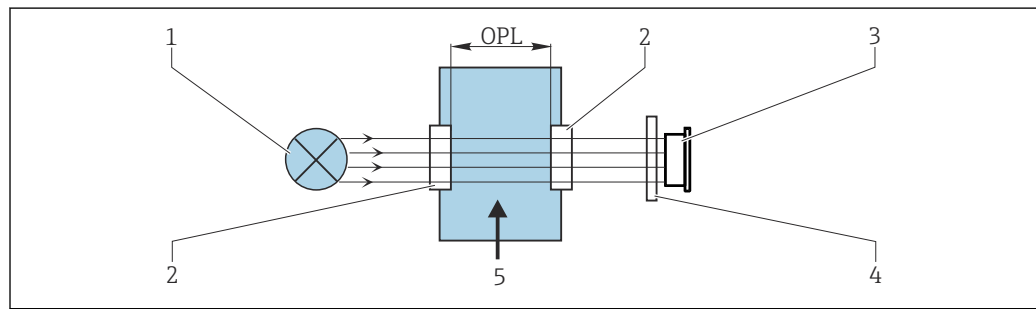
*c ... Concentration*

*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.



1 Absorption measurement

1 Light source

2 Optical windows of the sensor

3 Detector

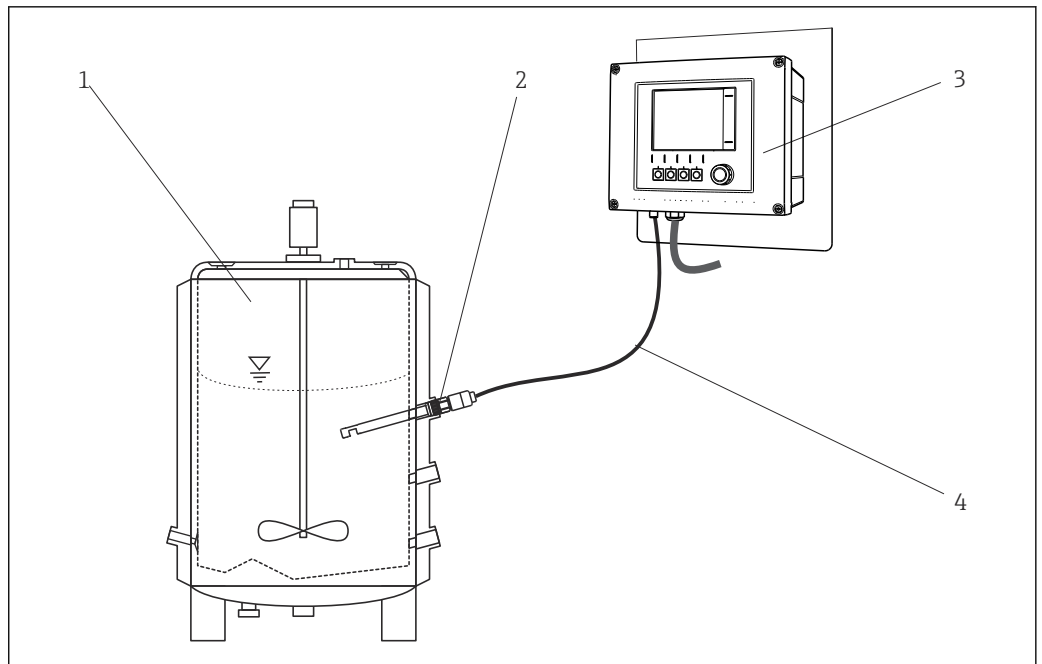
4 Measurement filter (depends on sensor, not provided on all sensors)

5 Medium flow

**Measuring system**

An optical measuring system comprises:

- OUSBT66 sensor (photometer)
- Transmitter, for example Liquiline CM44P
- Sensor cable, for example CUK80



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2 Example of a measuring system with a photometer sensor

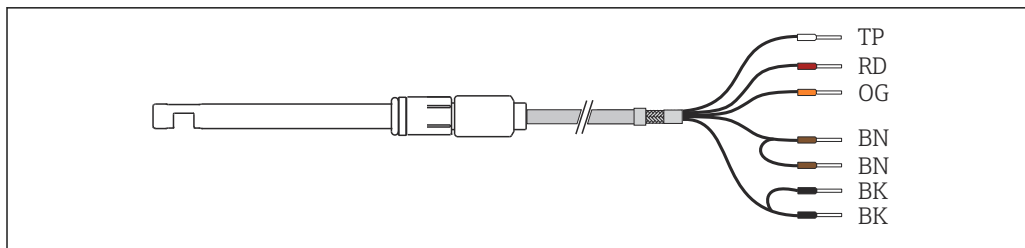
- 1 Bioreactor (example)
- 2 OUSBT66 sensor
- 3 CM44P transmitter
- 4 CUK80 sensor cable

## Input

Measured variable	NIR-absorption
Measuring range	<ul style="list-style-type: none"> <li>■ 0 to 4 AU</li> <li>■ 0 to 8 OD (depending on the optical path length)</li> </ul>
Wavelength	880 nm
Optical path length	5, 10 or 20 mm

## Power supply

**Electrical connection** The sensor is connected to the transmitter using the pre-terminated or labeled sensor fixed cable.



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3 Sensor cable

CM44P terminal	Cable color	Assignment
P+	BN	Lamp voltage +
S+	BN	Detection of lamp voltage +
S-	BK	Detection of lamp voltage -
P-	BK	Lamp voltage -
A (1)	RD	Sensor +
C(1)	OG	Sensor -
SH (1)	TP	Shield

**Cable length** Maximum 20 m (65 ft)

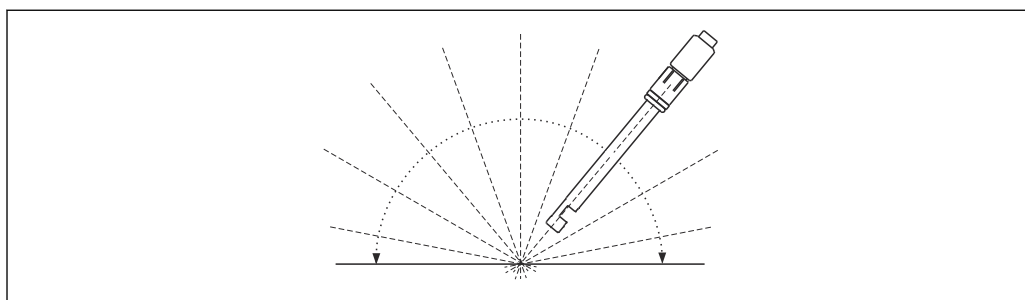
**Lamp voltage**

Sensor version	Lamp type	Lamp voltage [V]
OUSBT66-xxxxx	LED	7.5 ± 0.1

## Mounting

**Installation instructions**

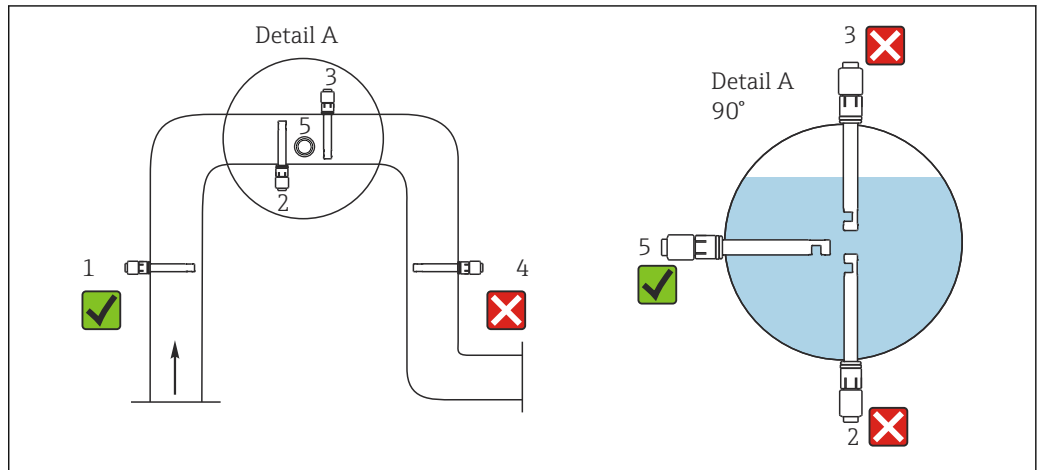
The sensor can be installed up to the horizontal in an assembly, support or suitable process connection. Other angles of inclination are not recommended.



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4 Permitted mounting angle

Mounting in pipes



5 Permitted and unacceptable installation positions in pipes

Comply with the following conditions. Otherwise you run the risk of damaging the measuring point or obtaining incorrect measured values.

- ▶ The diameter of the pipe must be at least 50 mm (2").
- ▶ Install the sensor in places with consistent flow conditions.
- ▶ The best installation location is in the ascending pipe (item 1).
- ▶ Installation in the horizontal pipe (item 5) is also possible.
- ▶ Do not install the sensor in places where air pockets or bubbles occur (→ 5, item 3) or where sedimentation may occur (item 2).
- ▶ Avoid installation in the down pipe (item 4).
- ▶ Align the sensor in such a way that the medium flows through the measuring gap (self-cleaning effect).

## Environment

Ambient temperature	0 to 55 °C (32 to 131 °F)
Storage temperature	0 to 70 °C (32 to 160 °F)
Humidity	5 to 95 %
Degree of protection	IP 68, Fischer connector (up to 2 m (6.6 ft) water column for 24 h)
Vibration-resistance and shock-resistance	<ul style="list-style-type: none"> <li>▪ Vibration-resistance, sinusoidal vibration according to IEC 60068-2-6                             <ul style="list-style-type: none"> <li>▪ 2 to 8.4 Hz, 3.5 mm peak</li> <li>▪ 8.4 to 500 Hz, 1 g peak</li> <li>▪ 20 sweeps/Achse</li> </ul> </li> <li>▪ Vibration-resistance, broad-band random vibration according to IEC 60068-2-64                             <ul style="list-style-type: none"> <li>▪ 10 to 200 Hz, 0.003 g<sup>2</sup>/Hz</li> <li>▪ 200 to 2 000 Hz, 0.001 g<sup>2</sup>/Hz</li> <li>▪ Total: 1.54 g rms</li> <li>▪ 120 Minuten/Achse</li> </ul> </li> <li>▪ Shock-resistance, half-sine shocks according to IEC 60068-2-27 6 ms 30 g</li> </ul>

## Process

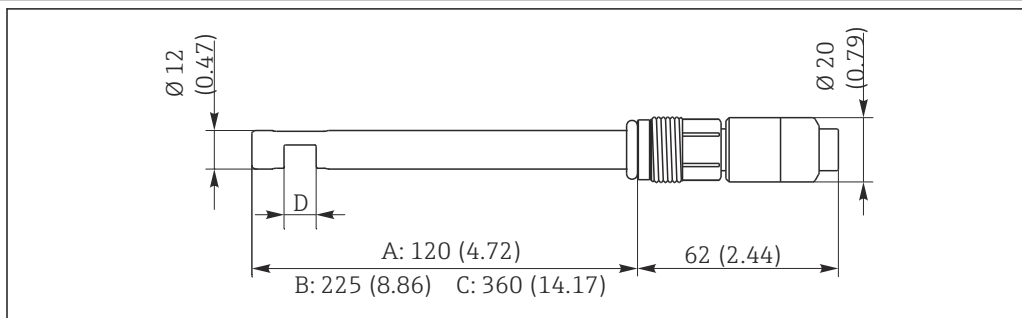
Process temperature	0 to 90 °C (32 to 194 °F) continuous
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Max. 135 °C (275 °F) for 2 hours maximum

**Process pressure** Max. 10 bar (150 psi) absolute, at 90 °C (194 °F)

## Mechanical construction

### Design, dimensions



6 Dimensions in mm (inch)

A Version with shaft length 120 mm (4.72")

B Version with shaft length 225 mm (8.86")

C Version with shaft length 360 mm (14.17")

D Optical path length: 5, 10 or 20 mm

**Weight** Approx. 0.2 kg (0.44 lbs)

<b>Materials</b>	Sensor	Stainless steel 1.4435 (316L)
	Optical windows	Sapphire
	Optical window sealing	AuSn 80/20
	O-ring	EPDM

**Process connections** Pg 13.5

**Surface roughness**  $R_a < 0.38 \mu\text{m}$

**Light source** LED

## Certificates and approvals

Current certificates and approvals for the product are available at [www.endress.com](http://www.endress.com) on the relevant product page:


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

## Order information

**Product page** [www.endress.com/ousbt66](http://www.endress.com/ousbt66)

**Product Configurator**


1. **Configure:** Click this button on the product page.
2. Select **Extended selection**.
  - ↳ The Configurator opens in a separate window.

3. Configure the device according to your requirements by selecting the desired option for each feature.
  - ↳ In this way, you receive a valid and complete order code for the device.
4. **Accept:** Add the configured product to the shopping cart.
-  For many products, you also have the option of downloading CAD or 2D drawings of the selected product version.
5. **CAD:** Open this tab.
  - ↳ The drawing window is displayed. You have a choice between different views. You can download these in selectable formats.

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**Scope of delivery**

The scope of delivery comprises the following, :

- Sensor OUSBT66
- Life sciences package certificates
  - Inspection certificate 3.1
  - Pharma CoC  
Certificate of conformity to pharmaceutical requirements, conformity to bioreactivity test USP Class VI, FDA material conformity, TSE-/BSE-free, surface roughness
- 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.

Listed accessories are technically compatible with the product in the instructions.

1. Application-specific restrictions of the product combination are possible.  
Ensure conformity of the measuring point to the application. This is the responsibility of the operator of the measuring point.
2. Pay attention to the information in the instructions for all products, particularly the technical data.
3. For accessories not listed here, please contact your Service or Sales Center.

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**Assembly**

**Unifit CPA842**

- Installation assembly for food, biotechnology and pharmaceuticals
- With EHEDG and 3A certificate
- Product Configurator on the product page: [www.endress.com/cpa842](http://www.endress.com/cpa842)



Technical Information TI00306C

**Cleanfit CPA875**

- Retractable process assembly for sterile and hygienic applications
- For in-line measurement with standard sensors with 12 mm diameter, e.g. for pH, ORP, oxygen
- Product Configurator on the product page: [www.endress.com/cpa875](http://www.endress.com/cpa875)



Technical Information TI01168C

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**Calibration**

**OUSBT66 calibration kit**

- 2/0.35 AU
- Order no.: 71128340



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

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