

Operating Instructions

OUSBT66

NIR absorption sensor for measurement of cell growth and biomass



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1 About this document

1.1 Warnings

Structure, signal words and color coding of warning information are in compliance with ANSI Z535.6 specifications ("Product safety information in product manuals, instructions and other collateral materials").


Structure of information	Meaning
<p>⚠ DANGER Causes (/consequences) Possible consequences if ignored ▶ Corrective action</p>	<p>This symbol alerts you to a dangerous situation . Failure to avoid the situation will result in a fatal or serious injury.</p>
<p>⚠ WARNING Causes (/consequences) Possible consequences if ignored ▶ Corrective action</p>	<p>This symbol alerts you to a dangerous situation . Failure to avoid the situation can result in a fatal or serious injury.</p>
<p>⚠ CAUTION Causes (/consequences) Possible consequences if ignored ▶ Corrective action</p>	<p>This symbol alerts you to a dangerous situation . Failure to avoid this situation can result in minor or more serious injuries.</p>
<p>NOTICE Cause/situation Possible consequences if ignored ▶ Measure/note</p>	<p>This symbol alerts you to situations which may result in damage to property.</p>

1.2 Symbols used

-  Additional information, tip
-  Permitted or recommended
-  Not permitted or not recommended

2 Basic safety instructions

2.1 Requirements for personnel

- ▶ Installation, commissioning, operation and maintenance of the measuring system must only be carried out by trained technical personnel.
 - ▶ The technical personnel must be authorized by the plant operator to carry out the specified activities.
 - ▶ The electrical connection may only be performed by an electrical technician.
 - ▶ The technical personnel must have read and understood these Operating Instructions and must follow the instructions they contain.
 - ▶ Measuring point faults may only be rectified by authorized and specially trained personnel.
-  Repairs not described in the enclosed Operating Instructions may only be carried out directly at the manufacturer's or by the service organization.

2.2 Designated use

The OUSBT66 sensor is used for determining the NIR absorption for measurement of cell growth and biomass. It is suitable for a variety of applications:

- Cell growth in bacterial fermentation and mammalian cell culture applications
- Biomass during fermentation processes
- Monitoring of alga concentration
- Control of crystallization processes
- Suspended solids measurement

Any use other than that described jeopardizes the safety of staff and of the entire measuring system and is thus not permitted.

The manufacturer is not liable for damage resulting from incorrect or non-designated use.

2.3 Workplace safety

As the user, you are responsible for complying with the following safety conditions:

- Regulations for explosion protection
- Installation instructions
- Local standards and regulations

2.4 Operational safety

- ▶ Before commissioning the entire measuring point, make sure all the connections are correct. Ensure that the electrical cables and hose connections are not damaged.
- ▶ Do not operate damaged products, and safeguard them to ensure that they are not operated inadvertently. Mark the damaged product as defective.
- ▶ If faults cannot be rectified, the products must be taken out of service and secured against unintentional commissioning.

2.5 Product safety

The product is designed to meet state-of-the-art safety requirements, has been tested and left the factory in a condition in which it is safe to operate.

Relevant regulations and European standards have been observed.

3 Product description

3.1 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. The intensity of light 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.

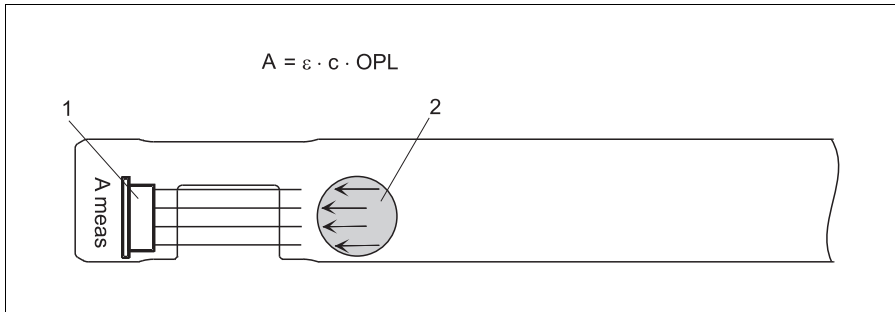


Fig. 1: NIR absorption sensor OUSBT66

A Absorption
 ε Extinction coefficient
 c Concentration
 OPL Optical pathlength

1 Measurement detector
 2 Light source

4 Incoming acceptance and product identification

4.1 Incoming acceptance

- Make sure the packaging is undamaged!
Inform the supplier about any damage to the packaging.
Keep the damaged packaging until the matter has been settled.
- Make sure the contents are undamaged!
Inform the supplier about damage to the contents. Keep the damaged products until the matter has been settled.
- Check that the order is complete and agrees with your shipping documents.
- The packaging material used to store or to transport the product must provide shock protection and humidity protection. The original packaging offers the best protection. Also, keep to the approved ambient conditions (see "Technical data").
- If you have any questions, please contact your supplier or your local sales center.

4.2 Product identification

4.2.1 Nameplate

Nameplates can be found:

- On the outside of the housing
- On the packaging (adhesive label, portrait format)

The nameplate provides you with the following information on your device:


- Order code
- Extended order code
- Serial number
- Protection class
- Environment

Compare the data on the nameplate with your order.

4.2.2 Product identification

The order code and serial number of your device can be found in the following locations:

- On the nameplate

 To find out what device version you have, enter the serial number indicated on the nameplate in the search screen at the following address:
www.products.endress.com/OUSBT66

4.3 Scope of delivery

The scope of delivery includes:

- Sensor OUSBT66
- Operating Instructions

If the sensor is ordered together with a transmitter, the complete measuring system is factory-calibrated and ready to use.

If you have any questions, please contact your supplier or your local sales center.

5 Mounting

5.1 Mounting conditions

5.1.1 Measuring system

A complete measuring system comprises:

- Optical sensor OUSBT66
- Transmitter Memograph CVM40
- Measuring cable OUK60

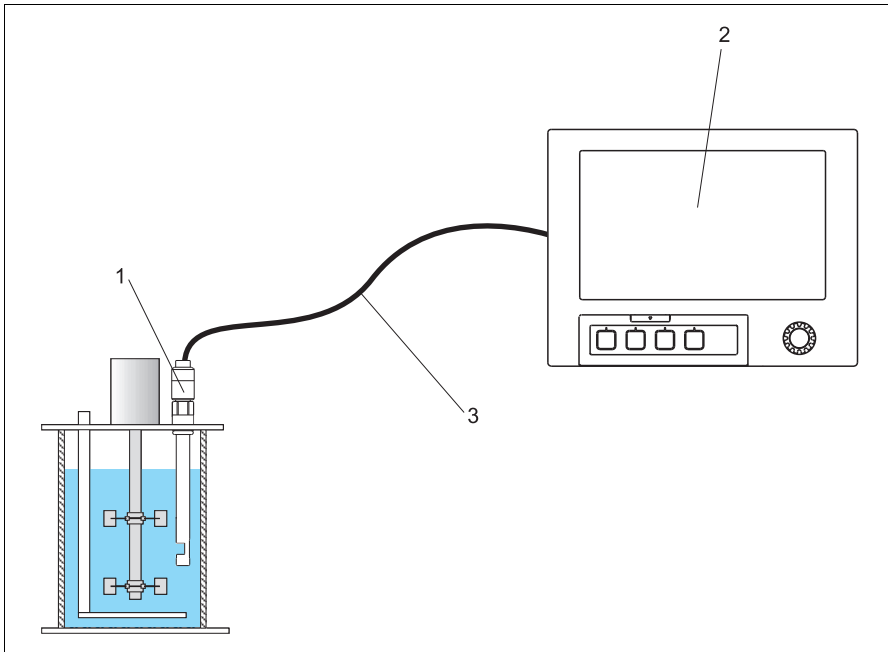
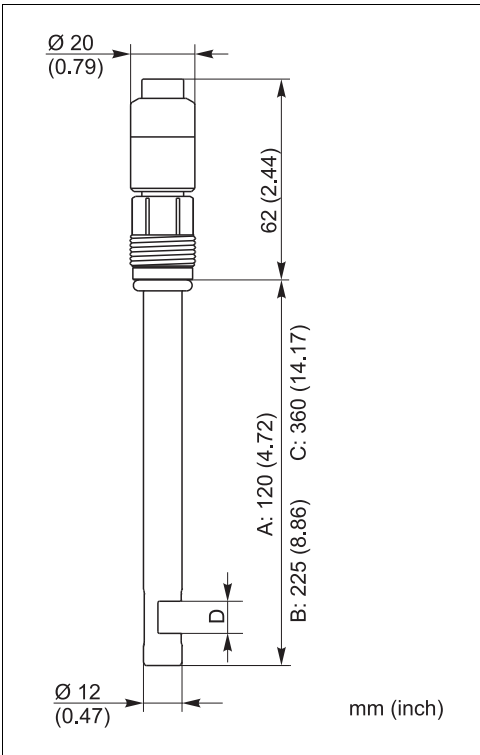


Fig. 2: Example of a measuring system

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- 1 Optical sensor OUSBT66
- 2 Transmitter Memograph CVM40
- 3 Measuring cable OUK60

5.1.2 Dimensions



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Fig. 3: Dimensions

- 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 pathlength: 5, 10 or 20 mm

5.2 Mounting angle

The sensor can be installed either directly in fermenters and bioreactors through the head plate ports or in an assembly or suitable process connection.

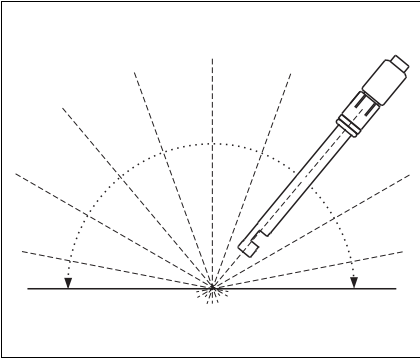


Fig. 4: Permitted angle of installation

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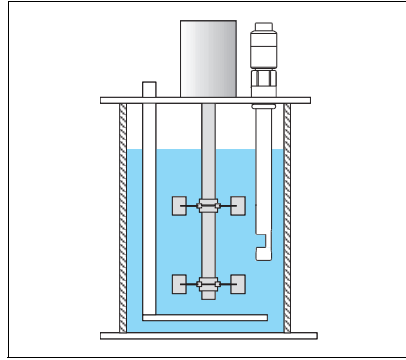


Fig. 5: Installation of OUSBT66 in fermenter

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5.3 Mounting the sensor

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

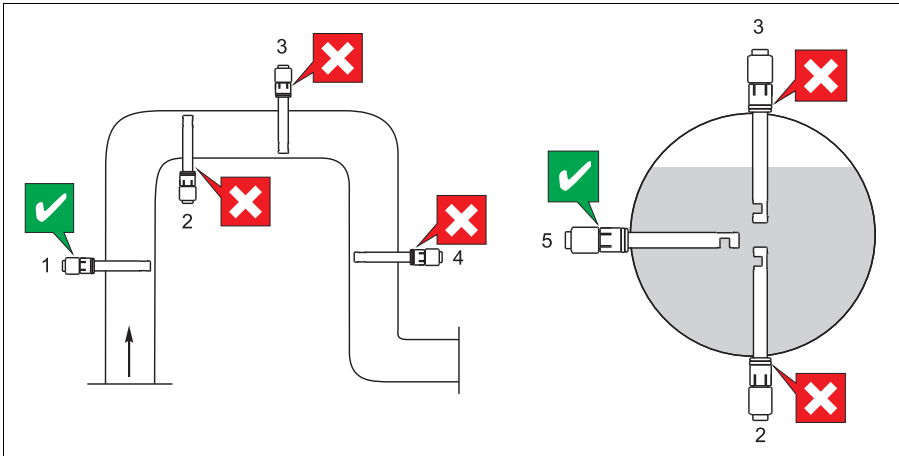


Fig. 6: Orientation and installation positions

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- The pipeline diameter must be at least 76.2 mm (3") with Unifit CPA442 TriClamp 50.8 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).
- Orientate the sensor in such a way that the medium flows through the measurement section (self-cleaning effect), refer to figure 5: Orientation of OUSBT66.

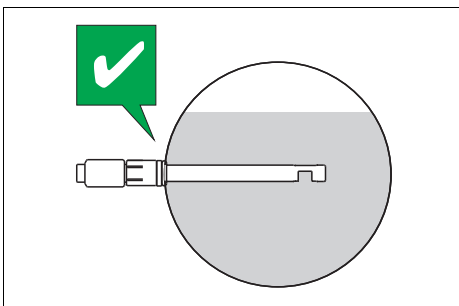


Fig. 7: Orientation of OUSBT66

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NOTICE**External forces**

Make sure to leave enough space when installing the sensor to prevent sensor damage. Make sure the cable is not twisted.

- ▶ Ensure that sensor bodies are protected against damage caused by external forces.
- ▶ Avoid exerting excessive tensile force on the cable.

 When using metallic assemblies and installation equipment, comply with national grounding regulations.

5.4 Post-mounting check

- Sensor and cable undamaged?
- Compliance with permissible sensor installation position?

6 Electrical connection

⚠ WARNING

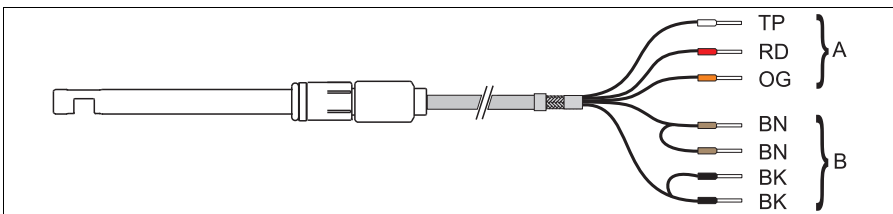
Device is energized

Inappropriate connection can cause serious injuries or death

- ▶ The electrical connection must only be carried out by a certified electrician.
- ▶ Technical personnel must have read and understood the instructions in this manual and must adhere to them.
- ▶ **Prior to beginning** any wiring work, make sure voltage is not applied to any of the cables.

6.1 Connecting the sensor

Up to two sensors can be connected to the transmitter Memograph CVM40. Refer to the operating instructions of the Memograph CVM40 (BA457C/07/EN) for further information.



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Fig. 8: Connection to transmitter Memograph CVM40

- A Signal transmission of detector
- B Power supply for lamp and lamp voltage signal

Terminal CVM40	Sensor OUSBT66	
	Core	Assignment
S1.S	TP	Shield
S1.1	RD	Sensor +
S1.2	OG	Sensor -
V1.1	BN	Lamp voltage +
V1.3	BN	Lamp sense +
V1.4	BK	Lamp sense -
V1.2	BK	Lamp voltage -

Lamp voltage adjustment with the lamp voltage sense tool

The lamp of OUSBT66 needs a supply voltage of 7.5 V. More than 7.5 V will reduce the life time of the lamp. The lamp voltage is adjusted in factory but for every commissioning it should be checked to avoid lamp damages.

Refer to the operating instructions of the Memograph CVM40 (BA457C), chapter Wiring, on how to use the lamp voltage sense tool.

6.2 Post-connection check

Instrument status and specifications	Remarks
Are the sensor, assembly or cable damaged?	Visual inspection
Electrical connection	Remarks
Are the installed cables strain-relieved and not twisted ?	
No loops and cross-overs in the cable run?	Check seating (pull slightly)
Are the signal cables correctly connected according to the wiring diagram?	
Are all screw terminals tightened?	
Are all cable entries installed, tightened and sealed?	
Are the PE distributor rails grounded (if present)?	Grounding at place of installation

7 Commissioning

7.1 Function check

Before first commissioning, check if:

- the sensor is installed correctly
- the electrical connection is correct.

7.2 Sensor calibration

Calibration is a means of adapting the transmitter to the characteristic values of the sensor.

When ordered as a complete measuring loop, the OUSBT66 sensor has been factory-calibrated. Therefore, an optical calibration is not needed. Check optical zero regularly.

For calibration of OUSBT66 use the calibration kit (order code: 71128340).

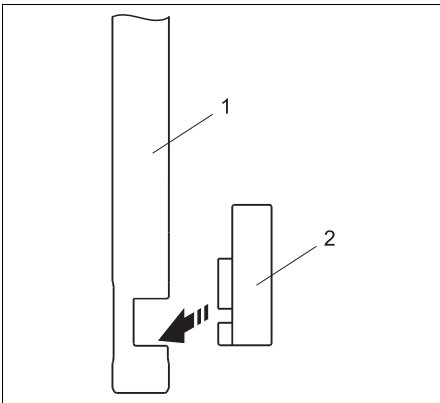


Fig. 9: Clip calibration filter onto the sensor shaft

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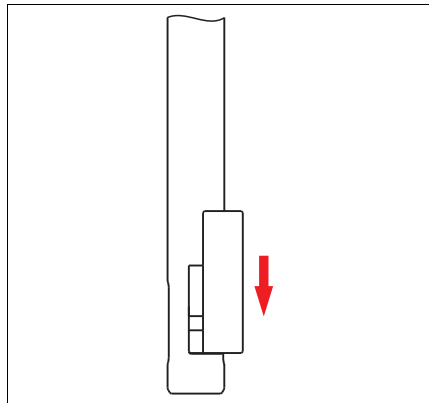


Fig. 10: Slide down calibration filter all the way to the stop

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- 1 Sensor shaft
2 Calibration filter

i Before calibration, the unit has to be powered up for at least 30 minutes to warm up the lamp.

To calibrate the sensor, proceed as follows:

1. Ensure that the unit is powered up for at least 30 minutes.
2. Select in the main menu of CVM40 "Diagnosis/simulation" and then "Optical calibration".
3. Select "Calibration".
4. Verify the calibration filter values according to filter kit certificate.
5. Select "Start calibration".
6. Confirm that previous calibration values will be overridden. Press OK to continue.
7. Put the sensor into beaker with water and confirm no filter is placed in the sensor head. Press OK to continue.

8. Remove the sensor from the beaker, dry the sensor before continuing with the calibration filter.
9. Place the blue calibration filter onto the sensor, see figures 9 and 10. Slide down the filter all the way to the stop. Press OK to continue.
10. Place the red verification filter onto sensor, see figures 9 and 10. Slide down the filter all the way to the stop. Check the filter value according to filter kit certificate. Value should be within ± 0.03 AU. Press OK to continue
11. Confirm no filter is placed in the sensor head. Press OK to continue.
12. Calibration is completed.

8 Maintenance

Cleaning the sensor

Sensor fouling can affect the measurement results and even cause a malfunction. The sensor must be cleaned at regular intervals to ensure reliable measurement results. The frequency and intensity of the cleaning process depends on the medium.

Clean the sensor:

- Before every calibration/ before zero point adjustment
- Before returning the sensor for repair

Type of fouling	Cleaning measure
Lime deposits	Immerse the sensor in 1-5 % hydrochloric acid (for a few minutes).
Dirt particles on the optical windows	Fold a cloth and swipe it through the cuvette.


NOTICE

Residue of cleaning agents

Any residue of cleaning agents may impair measurement.

- ▶ After cleaning, thoroughly rinse the sensor with water.

9 Accessories

 In the following sections, you will find the accessories available at the time of issue of this documentation.

For information on accessories that are not listed here, please contact your local service or sales office.

9.1 Transmitters

CVM40 Memograph

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

9.2 Assembly

Unifit CPA442 (120 mm length only with 5 and 10 mm OPL. 225 mm and 360 mm length sensor with any OPL)

- Installation assembly for food, biotechnology and pharmaceuticals, with EHEDG and 3A certificate
- Technical Information TI306C/07/EN

9.3 Measuring cable

OUK60 cable set

- Pre-terminated and labeled cables for connection of OUSBT66 sensors
- Order according to product structure

9.4 Calibration

Calibration kit OUSBT66

- Case contains 2 calibration filters 2.0 - 0.35 AU

 Nominal values, refer to calibration kit certificate for actual values

- Order no. 71128340

10 Technical data

10.1 Input

Measured variable	NIR absorption
Measuring range	0 to 4 AU, 0 to 8 OD (depending on optical pathlength)
Wavelength	880 nm
Optical pathlengths	5, 10 or 20 mm

10.2 Environment

Ambient temperature	0 to 55 °C (32 to 131 °F)
Storage temperature	0 to 70 °C (32 to 158 °F)
Relative humidity	5 to 95 %
Ingress protection	IP 68 Fischer locking (at a depth of 2 m (6.6 ft) for 24 hours)

10.3 Process

Process temperature	0 to 70 °C (32 to 158 °F), up to 135 °C (275 °F) when LED is switched off
Process pressure	10 bar (150 psi) max. at 25 °C

10.4 Mechanical construction

Dimensions	See section "Mounting".	
Weight	0.2 kg (0.44 lbs)	
Materials	Sensor:	Stainless steel 1.4435 (316L)
	Windows:	Sapphire
Light source	LED	
Process connection	PG 13.5 thread	
Surface roughness	$R_a < 0.76 \mu\text{m}$	

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