



Technical Information

Memosens Wave CAS80E

Spectrometer for water analysis



Application

Memosens Wave CAS80E is a spectrometer for the measurement of a variety of parameters: SAC, spectral attenuation coefficient, TOCeq, CODEq, BODEq, turbidity (TU/TSS), nitrate (NO₃-N, NO₃), APHA Hazen color. The spectrometer ensures reliable measurements and efficient process monitoring in the following areas:

- Drinking water
- Wastewater
- Surface water

Your benefits

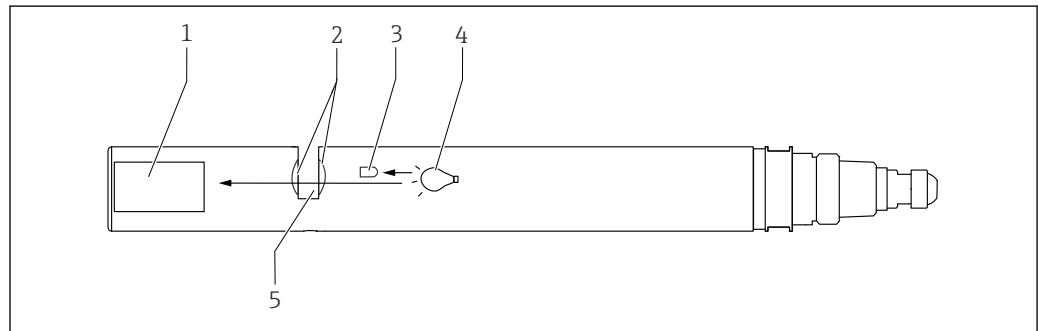
- Optimally adapted to process conditions
- 3 different measuring path lengths
- Titanium version for demanding applications
- Sapphire window for a longer operating life
- Data conditioning in the spectrometer:
 - Minimum sensitivity to interference during signal transmission
 - Short response time
- Early, continuous detection of load peaks without delay
- Out of the box and ready to go: standardized communication (Memosens technology) enables "plug and play"
- Long maintenance intervals by using compressed air cleaning
- Application-specific and customer calibrations - in the laboratory or at place of installation

Function and system design

Measuring principle

The spectrometer consists of the following modules:

- Power supply
- High-voltage generation for the strobe lamp
- Xenon strobe lamp
- Monitor diode
- Measurement gap
- Spectrometer: UV-VIS 200 to 800 nm
- Microcontroller



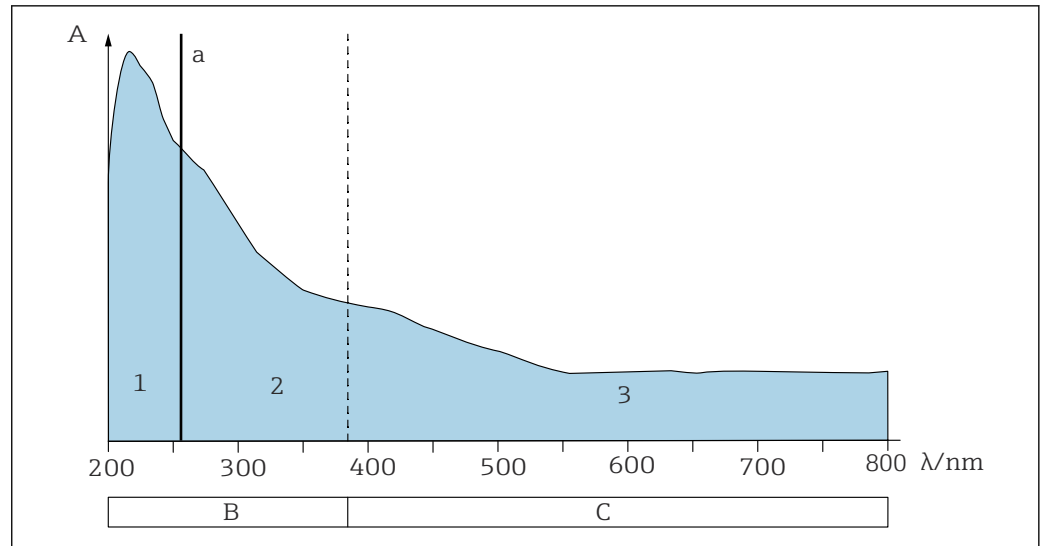
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1 Product design

- 1 Spectrometer module
- 2 Lens
- 3 Monitor diode
- 4 Light source
- 5 Measurement gap

A light source sends a beam of light through the medium via the lenses. The medium under analysis is located in the measurement gap. In the spectrometer module, the beam of light is converted to electrical, measurable signals. A two-beam principle with compensation for lamp changes is applied
→  1,  2.

The spectrometer uses the substance-specific absorption of electromagnetic radiation to indicate the measurement parameters from the recorded spectrum.



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2 Ranges of parameters in the absorption spectrum

- λ Wavelength range
- A Absorption
- B Ultraviolet light (UV)
- C Visible light (VIS)
- a 254 nm, SAC, SSK
- 1 Nitrate
- 2 Sum parameters BODEq, CODEq, TOCeq, DOCEq
- 3 Color, turbidity, TSS

A specific absorption spectrum can be assigned to every molecule. By comparing a zero spectrum I_0 determined previously in ultrapure water and the measuring spectrum with the intensity I , the absorption A can be calculated as follows:

$$A = -\log_{10} (I/I_0) = \epsilon \cdot c \cdot d$$

The absorption A depends directly on the concentration c , the measurement gap length d and the extinction coefficient ϵ .

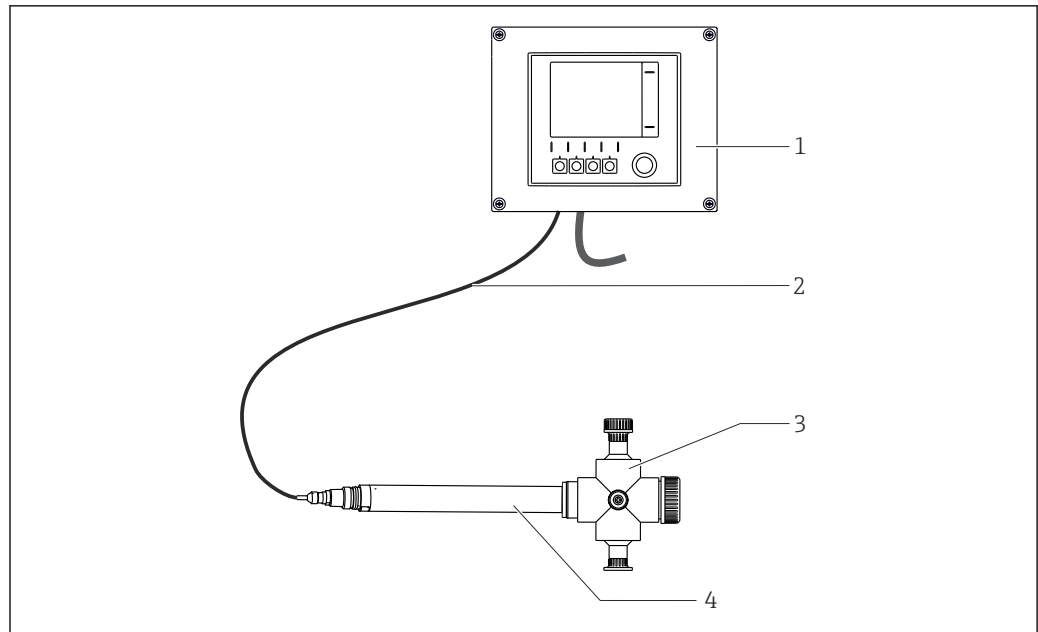
Analytical models programmed into the spectrometer calculate the concentration of the parameters from the absorption spectra. These analytical models have been determined by correlating known parameter concentrations with their related absorption spectra.

The calculation uses the same wavelengths to determine different parameters. This results in what are termed "cross-sensitivities". For example, if turbidity increases less light is detected when determining the chemical oxygen demand (COD).

Measuring system

The complete measuring system comprises at least the following:

- Memosens Wave CAS80E spectrometer
- Liquiline CM44x transmitter
- Assembly, e.g. Flowfit CYA251 flow assembly



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 3 Example of a measuring system

3 CYA251 assembly

4 Memosens Wave CAS80E

2 Fixed cable

1 Liquiline CM44x transmitter

Communication and data processing

Communication with the transmitter



Always connect digital sensors with Memosens technology to a transmitter with Memosens technology. Data transmission to a transmitter for analog sensors is not possible.

Digital sensors can store measuring system data in the sensor. These include the following:

- Manufacturer data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Number of calibrations
 - Serial number of the transmitter used to perform the last calibration or adjustment
- Operating data
 - Temperature application range
 - Date of initial commissioning

Dependability

Reliability

Easy handling

Sensors with Memosens technology have integrated electronics that store calibration data and other information (e.g. total operating hours or operating hours under extreme measuring conditions). Once the sensor has been connected, the sensor data are transferred automatically to the transmitter and used to calculate the current measured value. As the calibration data are stored in the sensor, the sensor can be calibrated and adjusted independently of the measuring point. The result:

- Easy calibration in the measuring lab under optimum external conditions increases the quality of the calibration.
- Pre-calibrated sensors can be replaced quickly and easily, resulting in a dramatic increase in the availability of the measuring point.
- The availability of sensor data means that maintenance intervals can be accurately defined and predictive maintenance is possible.
- The sensor history can be documented with external storage media and evaluation programs.
- The application range of the sensor can be determined based on its previous history.

Input

Measured variable

- CODEq ¹⁾ (mg/l)
- BODEq (mg/l)
- TOCe_q (mg/l)
- TSS (mg/l)
- TU (FAU)
- APHA Hazen ²⁾ (TU compensated/True Color or TU uncompensated/Apparent Color)
- SAC ³⁾ (1/m)
- SSK ⁴⁾ (1/m)
- Nitrate NO₃-N (mg/l)
- Nitrate NO₃ (mg/l)

Measuring range

The measuring range that can actually be achieved can depend on the composition of the water matrix and the application. The data apply to homogeneous media.

The selection of the optimal optical measuring path length is based on the measuring ranges of the respective parameters. A longer measuring path length results in a smaller measuring range (measurement at low concentrations) and low limits of quantification and detection. A shorter measuring path length results in a larger measuring range (measurement at high concentrations) and higher limits of quantification and detection.

1) eq = equivalent

2) According to US Standard Methods 2120C (Single Wavelength Method) 23. Edition

3) Spectral absorption coefficient_{sAK_254} according to DIN ISO 38404-3

4) Spectral attenuation coefficient_{SSK_254} according to DIN ISO 38404-3

Wastewater treatment plant inlet

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
TSS	0 to 10 000 mg/l	0 to 2 000 mg/l	0 to 400 mg/l
SAC	0 to 1 000 1/m	0 to 200 mg/l	0 to 40 mg/l
CODeq	0 to 20 000 mg/l	0 to 4 000 mg/l	0 to 800 mg/l
TOCeq	0 to 8 000 mg/l	0 to 1 600 mg/l	0 to 320 mg/l
BODeq	0 to 5 000 mg/l	0 to 1 000 mg/l	0 to 200 mg/l

Wastewater treatment plant outlet

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	0 to 4 000 FAU	0 to 800 FAU	0 to 160 FAU
TSS	0 to 5 000 mg/l	0 to 1 000 mg/l	0 to 200 mg/l
SAC	0 to 1 000 1/m	0 to 200 1/m	0 to 40 1/m
CODeq	0 to 3 000 mg/l	0 to 600 mg/l	0 to 120 mg/l
TOCeq	0 to 1 200 mg/l	0 to 240 mg/l	0 to 48 mg/l
BODeq	0 to 450 mg/l	0 to 90 mg/l	0 to 18 mg/l
Nitrate NO ₃ -N	0 to 2 500 mg/l	0 to 500 mg/l	0 to 100 mg/l
APHA Hazen true	0 to 12 500 Hazen ¹⁾	0 to 2 500 Hazen ¹⁾	0 to 500 Hazen
APHA Hazen apparent	0 to 12 500 Hazen ¹⁾	0 to 2 500 Hazen ¹⁾	0 to 500 Hazen

- 1) A minimum path length of 25 mm (0.98 in) is required in US Standard Methods 2120C (Single Wavelength Method) 23rd Edition

Drinking water

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	0 to 4 000 FAU	0 to 800 FAU	0 to 160 FAU
TSS	0 to 5 000 mg/l	0 to 1 000 mg/l	0 to 200 mg/l
SAC	0 to 1 000 1/m	0 to 200 1/m	0 to 40 1/m
SSK	0 to 1 000 1/m	0 to 200 1/m	0 to 40 1/m
TOCeq	0 to 2 000 mg/l	0 to 400 mg/l	0 to 80 mg/l
Nitrate NO ₃ -N	0 to 2 500 mg/l	0 to 500 mg/l	0 to 100 mg/l
Nitrate NO ₃	0 to 10 000 mg/l	0 to 2 000 mg/l	0 to 400 mg/l
APHA Hazen true	0 to 12 500 Hazen ¹⁾	0 to 2 500 Hazen ¹⁾	0 to 500 Hazen
APHA Hazen apparent	0 to 12 500 Hazen ¹⁾	0 to 2 500 Hazen ¹⁾	0 to 500 Hazen

- 1) A minimum path length of 25 mm (0.98 in) is required in US Standard Methods 2120C (Single Wavelength Method) 23rd edition

Surface water

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	0 to 4 000 FAU	0 to 800 FAU	0 to 160 FAU
TSS	0 to 5 000 mg/l	0 to 1 000 mg/l	0 to 200 mg/l

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
SAC	0 to 1000 1/m	0 to 200 1/m	0 to 40 1/m
CODeq	0 to 5 000 mg/l	0 to 1 000 mg/l	0 to 200 mg/l
BODeq	0 to 750 mg/l	0 to 150 mg/l	0 to 30 mg/l
Nitrate NO ₃ -N	0 to 2 500 mg/l	0 to 500 mg/l	0 to 100 mg/l

Power supply

Electrical connection

⚠ WARNING

Device is live!

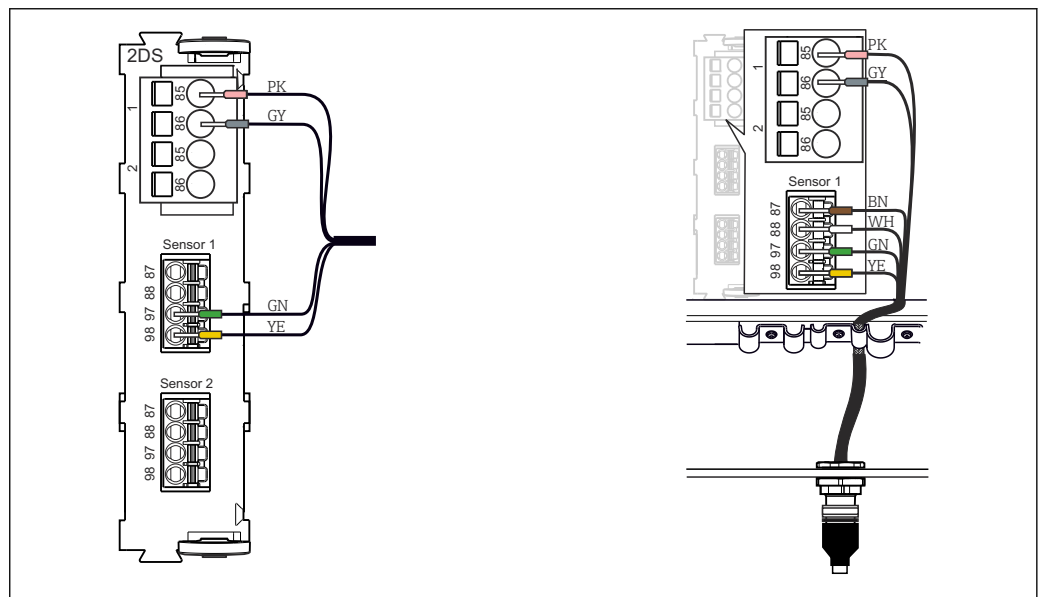
Incorrect connection may result in injury or death!

- ▶ The electrical connection may be performed only by an electrical technician.
- ▶ The electrical technician must have read and understood these Operating Instructions and must follow the instructions contained therein.
- ▶ **Prior** to commencing connection work, ensure that no voltage is present on any cable.

Connecting the device

The following connection options are available:

- Via M12 plug (version: fixed cable, M12 plug)
- Via the cable of the spectrometer to the plug-in terminals of a transmitter input (version: fixed cable, wire end ferrules)



4 Spectrometer connection to input (left) or via M12 plug (right)

The maximum cable length is 100 m (328.1 ft).

Connecting the cable shield

The device cable must be shielded cables.

i Only use terminated original cables where possible.

1. Loosen a suitable cable gland on the bottom of the housing.
2. Remove the dummy plug.
3. Attach the gland to the cable end, making sure the gland is facing the right direction.

4. Pull the cable through the gland and into the housing.
5. Route the cable in the housing in such a way that the **exposed** cable shield fits into one of the cable clamps and the cable cores can be easily routed as far as the connection plug on the electronics module.
6. Connect the cable to the cable clamp.
7. Clamp the cable.
8. Connect cable cores as per the wiring diagram.
9. Tighten the cable gland from outside.

Performance characteristics

Reference operating conditions 20 °C (68 °F), 1013 hPa (15 psi)

Long-term reliability

Drift

The drift data were determined in air under laboratory conditions based on DIN ISO 15839.

Wastewater treatment plant inlet

Measured variable	Drift over 100 days in % of end of measuring range
TSS	0.02
SAC	0.04
CODeq	0.02
TOCeq	0.02
BODeq	0.02

Wastewater treatment plant outlet

Measured variable	Drift over 100 days in % of end of measuring range
Turbidity	0.02
TSS	0.02
SAC	0.04
CODeq	0.05
TOCeq	0.05
BODeq	0.05
Nitrate NO ₃ -N	0.002
APHA Hazen true	0.01
APHA Hazen apparent	0.01

Drinking water

Measured variable	Drift over 100 days in % of end of measuring range
Turbidity	0.02
TSS	0.02
SAC	0.04
SSK	0.08
TOCeq	0.03
Nitrate NO ₃ -N	0.002

Measured variable	Drift over 100 days in % of end of measuring range
Nitrate NO ₃	0.002
APHA Hazen true	0.01
APHA Hazen apparent	0.01

Surface water

Measured variable	Drift over 100 days in % of end of measuring range
Turbidity	0.02
TSS	0.02
SAC	0.04
COD _{eq}	0.03
BOD _{eq}	0.03
Nitrate NO ₃ -N	0.002

Limit of detection

The limits of quantification were determined for the individual measured variables in ultrapure water under laboratory conditions based on DIN ISO 15839.

Wastewater treatment plant inlet

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
TSS	20 mg/l	4 mg/l	0.8 mg/l
SAC	1 1/m	0.2 1/m	0.04 1/m
COD _{eq}	10 mg/l	2 mg/l	0.4 mg/l
TOC _{eq}	4 mg/l	0.8 mg/l	0.16 mg/l
BOD _{eq}	2.5 mg/l	0.5 mg/l	0.1 mg/l

Wastewater treatment plant outlet

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	12.5 FAU	2.5 FAU	0.5 FAU
TSS	11.5 mg/l	2.3 mg/l	0.46 mg/l
SAC	1 1/m	0.2 1/m	0.04 1/m
COD _{eq}	2 mg/l	0.4 mg/l	0.08 mg/l
TOC _{eq}	1 mg/l	0.2 mg/l	0.04 mg/l
BOD _{eq}	0.5 mg/l	0.1 mg/l	0.02 mg/l
Nitrate NO ₃ -N	1 mg/l	0.2 mg/l	0.04 mg/l
APHA Hazen true	62.5 Hazen ¹⁾	12.5 Hazen ¹⁾	2.5 Hazen
APHA Hazen apparent	62.5 Hazen ¹⁾	12.5 Hazen ¹⁾	2.5 Hazen

- 1) A minimum path length of 25 mm (0.98 in) is required in US Standard Methods 2120C (Single Wavelength Method) 23rd edition

Drinking water

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	12.5 FAU	2.5 FAU	0.5 FAU
TSS	11.5 mg/l	2.3 mg/l	0.46 mg/l
SAC	1 1/m	0.2 1/m	0.04 1/m
SSK	1 1/m	0.2 1/m	0.04 1/m
TOCeq	1 mg/l	0.2 mg/l	0.04 mg/l
Nitrate NO ₃ -N	1 mg/l	0.2 mg/l	0.04 mg/l
Nitrate NO ₃	4.5 mg/l	1 mg/l	0.2 mg/l
APHA Hazen true	62.5 Hazen ¹⁾	12.5 Hazen ¹⁾	2.5 Hazen
APHA Hazen apparent	62.5 Hazen ¹⁾	12.5 Hazen ¹⁾	2.5 Hazen

1) A minimum path length of 25 mm (0.98 in) is required in US Standard Methods 2120C (Single Wavelength Method) 23rd edition

Surface water

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	12.5 FAU	2.5 FAU	0.5 FAU
TSS	11.5 mg/l	2.3 mg/l	0.46 mg/l
SAC	1 1/m	0.2 1/m	0.04 1/m
CODeq	2 mg/l	0.4 mg/l	0.08 mg/l
BODeq	0.5 mg/l	0.1 mg/l	0.02 mg/l
Nitrate NO ₃ -N	1 mg/l	0.2 mg/l	0.04 mg/l

Limit of quantification

The limits of quantification were determined for the individual measured variables in ultrapure water under laboratory conditions based on DIN ISO 15839.

Wastewater treatment plant inlet

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
TSS	66.7 mg/l	13.3 mg/l	2.7 mg/l
SAC	3.5 1/m	0.7 1/m	0.15 1/m
CODeq	33.3 mg/l	6.7 mg/l	1.35 mg/l
TOCeq	13.3 mg/l	2.7 mg/l	0.55 mg/l
BODeq	8.3 mg/l	1.7 mg/l	0.35 mg/l

Wastewater treatment plant outlet

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	42.5 FAU	8.5 FAU	1.7 FAU
TSS	37.5 mg/l	7.5 mg/l	1.5 mg/l
SAC	3.5 1/m	0.7 1/m	0.15 1/m
CODeq	7.5 mg/l	1.5 mg/l	0.3 mg/l
TOCeq	3.25 mg/l	0.75 mg/l	0.15 mg/l
BODeq	1 mg/l	0.2 mg/l	0.04 mg/l

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Nitrate NO ₃ -N	3.5 mg/l	0.7 mg/l	0.15 mg/l
APHA Hazen true	167.5 Hazen ¹⁾	33.5 Hazen ¹⁾	6.7 Hazen
APHA Hazen apparent	167.5 Hazen ¹⁾	33.5 Hazen ¹⁾	6.7 Hazen

- 1) A minimum path length of 25 mm (0.98 in) is required in US Standard Methods 2120C (Single Wavelength Method) 23rd edition

Drinking water

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	42.5 FAU	8.5 FAU	1.7 FAU
TSS	37.5 mg/l	7.5 mg/l	1.5 mg/l
SAC	3.5 1/m	0.7 1/m	0.15 1/m
SSK	3.5 1/m	0.7 1/m	0.15 1/m
TOCeq	3.25 mg/l	0.75 mg/l	0.15 mg/l
Nitrate NO ₃ -N	3.5 mg/l	0.7 mg/l	0.15 mg/l
Nitrate NO ₃	14.8 mg/l	3 mg/l	0.6 mg/l
APHA Hazen true	167.5 Hazen ¹⁾	33.5 Hazen ¹⁾	6.7 Hazen
APHA Hazen apparent	167.5 Hazen ¹⁾	33.5 Hazen ¹⁾	6.7 Hazen

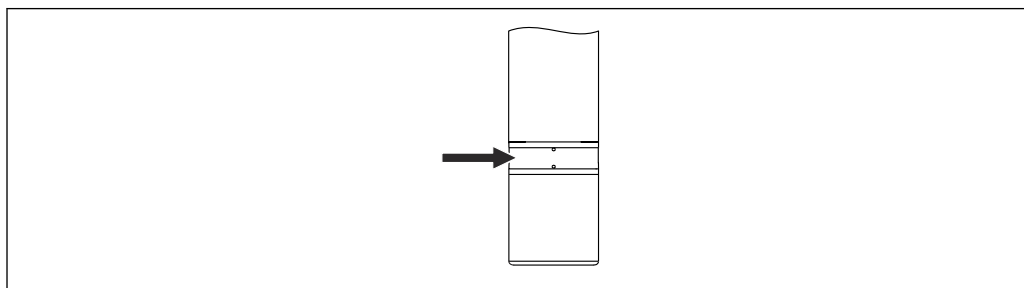
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Surface water

Measured variable	2 mm (0.08 in) gap	10 mm (0.4 in) gap	50 mm (1.97 in) gap
Turbidity	42.5 FAU	8.5 FAU	1.7 FAU
TSS	37.5 mg/l	7.5 mg/l	1.5 mg/l
SAC	3.5 1/m	0.7 1/m	0.15 1/m
CODeq	7.5 mg/l	1.5 mg/l	0.3 mg/l
BODeq	1 mg/l	0.2 mg/l	0.04 mg/l
Nitrate NO ₃ -N	3.5 mg/l	0.7 mg/l	0.15 mg/l

Installation

Orientation



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5 Alignment, arrow points in the flow direction

When aligning the spectrometer, pay attention to the following:

- The measurement gap is rinsed by the flow of medium
- Air bubbles can be rinsed away properly

Installation instructions

1. Do not install the device in places where air pockets and foam bubbles form.
2. Choose a mounting location that can be easily accessed at a later stage.
3. Ensure that upright posts and assemblies are fully secured and vibration-free.
4. Align the device so that the measurement gap is rinsed by the flow of medium.

To ensure correct measurement, the windows at the measurement gap must be free from any sedimentation. The best way to ensure this is through the use of a cleaning unit (accessory) operated by compressed air.

For horizontal orientations:

- Mount the spectrometer in such a way that air bubbles can escape from the measurement gap (do not point it downwards).

Environment

Ambient temperature range -20 to 60 °C (-4 to 140 °F)

Storage temperature -20 to 70 °C (-4 to 158 °F)

Degree of protection

- IP 68 (1 m (3.3 ft) water column over 60 days, 1 mol/l KCl)
- Type 6P (for housing material 1.4404/1.4571)
- NEMA 6P (for housing material 1.4404/1.4571)

Electromagnetic compatibility (EMC)

Interference emission and interference immunity as per

- EN 61326-1:2013
- EN 61326-2-3:2013
- EN 61326-2-5: 2013
- NAMUR NE21: 2012

Process

Process temperature range 0 to 50 °C (32 to 122 °F)

Process pressure range 0.5 to 10 bar (7.3 to 145 psi) (absolute)

Flow limit

Minimum flow

No minimum flow required.

 For media that have a tendency to form deposits, ensure that the medium is mixed sufficiently.

Mechanical construction

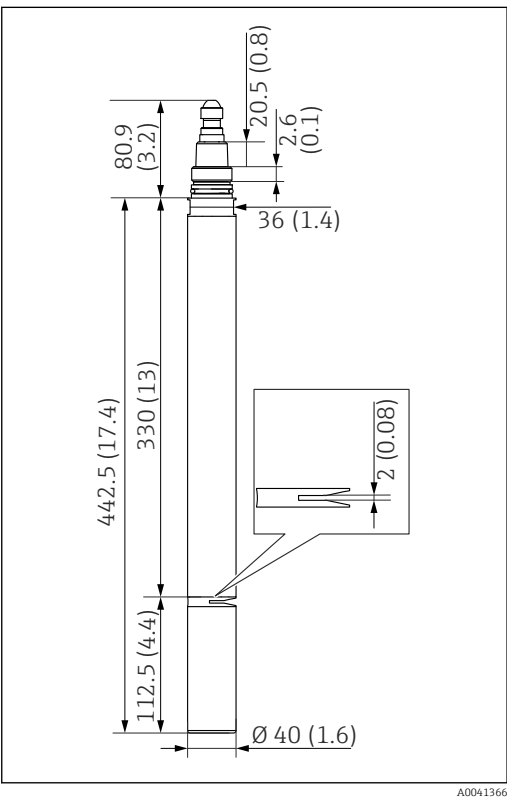
Design, dimensions

Measurement gap with 3 different gap widths:

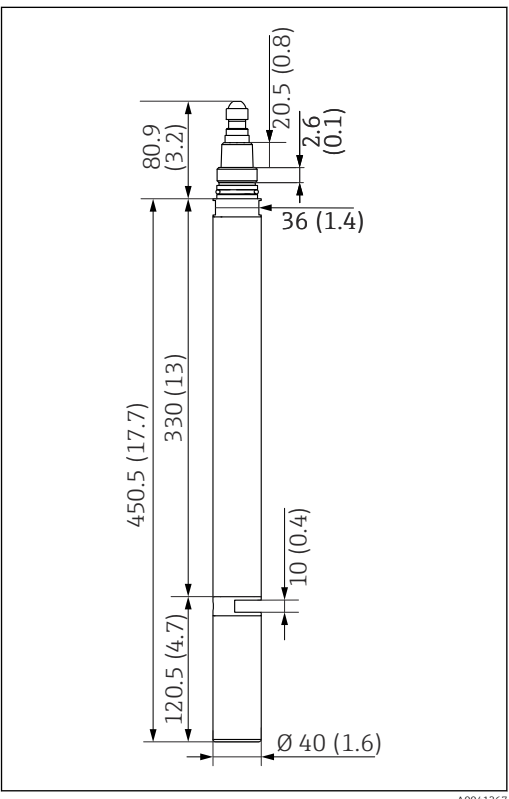
- 2 mm (0.08 in)
- 10 mm (0.4 in)
- 50 mm (1.97 in)

 Spectrometers with 1 mm (0.04 in) and 100 mm (3.9 in) gap widths are available on request.

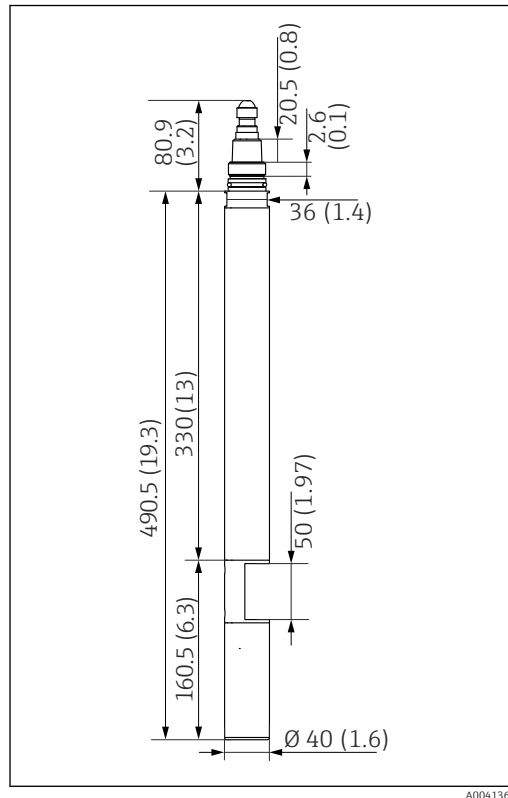
Dimensions



 6 Dimensions of spectrometer with 2 mm (0.08 in) gap. Dimensions: mm (in)



 7 Dimensions of spectrometer with 10 mm (0.4 in) gap. Dimensions: mm (in)



8 Dimensions of spectrometer with 50 mm (1.97 in) gap. Dimensions: mm (in)

Weight	1.6 kg (3.5 lb), without cables
Materials	Wetted materials Housing: Stainless steel 1.4404 / AISI 316L and 1.4571 / AISI 316Ti or titanium 3.7035 Optical windows: Quartz glass or sapphire O-rings: EPDM
Process connections	G1 and NPT ¾"

Certificates and approvals

Current certificates and approvals that are available for the product can be selected via the Product Configurator at www.endress.com:

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

Ordering information

Scope of delivery	The delivery comprises: ■ Spectrometer, version as ordered ■ Cleaning brush (x 2) ■ 32GB SD card for data logging ■ Operating Instructions
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Product page www.endress.com/cas80e

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. **Apply:** 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. **Show details:** Open this tab for the product in the shopping cart.
 - ↳ The link to the CAD drawing is displayed. If selected, the 3D display format is displayed along with the option to download various formats.

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.

Device-specific accessories

Assemblies

Flexdip CYA112

- Immersion assembly for water and wastewater
- Modular assembly system for sensors in open basins, channels and tanks
- Material: PVC or stainless steel
- Product Configurator on the product page: www.endress.com/cya112



Technical Information TI00432C

Flowfit CYA251

- Connection: See product structure
- Material: PVC-U
- Product Configurator on the product page: www.endress.com/cya251



Technical Information TI00495C

CAV01

- Flow assembly
- Material: POM-C

Holder

Flexdip CYH112

- Modular holder system for sensors and assemblies in open basins, channels and tanks
- For Flexdip CYA112 water and wastewater assemblies
- Can be affixed anywhere: on the ground, on the coping stone, on the wall or directly onto railings.
- Stainless steel version
- Product Configurator on the product page: www.endress.com/cyh112



Technical Information TI00430C

Cleaning

Cleaning brushes

- Cleaning brushes to clean the measurement gap (for all gap sizes)
- Order number: 71485097

Compressed air cleaning for CAS80E

- Connection: 6 mm (0.24 in) or 8 mm (0.31 in) (metric) or 6.35 mm (0.25 in)
- Measurement gap 2 mm (0.08 in) or 10 mm (0.4 in):
 - 6 mm (0.24 in) (with 300 mm (11.81 in) hose and 8 mm (0.31) adapter)
Order number: 71485094
 - 6.35 mm (0.25 in)
Order number: 71485096
- Measurement gap 50 mm (1.97 in):
 - 6 mm (0.24 in) (with 300 mm (11.81 in) hose and 8 mm (0.31) adapter)
Order number: 71485091
 - 6.35 mm (0.25 in)
Order number: 71485093

Compressor

- For compressed air cleaning
- 230 V AC, order number: 71072583
- 115 V AC, order number: 71194623

Additional accessories

Sensor adapter CYA251 for CAS80E

Order number: 71475982

Spray nozzle for CAS80E with measurement gap length 2 mm (0.08 in) or 10 mm (0.4 in)

- Material: stainless steel
- Order number: 71144328

Spray nozzle for CAS80E with measurement gap length 50 mm (1.97 in)

- Material: PVC
- Order number: 71144330

32GB SD card

Order number: 71467522



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