Technical Information
Smart System for Aquacultures SSP200B

Package with smart sensors, for monitoring water quality in aquacultures

Application

In aquaculture, good water quality is central to achieving a high stock output. Good water quality can reduce fish mortality in aquaculture systems by up to 40%. The Smart System for Aquacultures allows users to check important water parameters on their smartphone, i.e. dissolved oxygen, ammonium, nitrate and temperature. By setting up an alert system, the user is notified directly as soon as the water quality reaches a critical level, and can take immediate action.

Your benefits

- Smart and simple monitoring of water quality in aquacultures, ensure good water quality to increase stock output.
- Sensors for important quality parameters, such as dissolved oxygen, ammonium, nitrate and temperature.
- Direct access to measured values and diagnostic data using smartphone app.
- Secure storage of measured data in the certified Netilion Cloud.
- Intelligent functions of the Smart Systems App, such as visualization of measuring locations on a map, graphic analysis, alerts and notifications, sensor status information, notification if servicing is required.
- To use the Smart System, users must register online and select a subscription plan. Subscription costs depend on the frequency of data transmission and are incurred additionally.

Endress+Hauser
People for Process Automation

About this document

Symbols used

Safety symbols

Symbol	Meaning
DANGER	**DANGER!** This symbol alerts you to a dangerous situation. Failure to avoid this situation will result in serious or fatal injury.
WARNING	**WARNING!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in serious or fatal injury.
CAUTION	**CAUTION!** This symbol alerts you to a dangerous situation. Failure to avoid this situation can result in minor or medium injury.
NOTICE	**NOTE!** This symbol contains information on procedures and other facts which do not result in personal injury.

Symbols for certain types of information

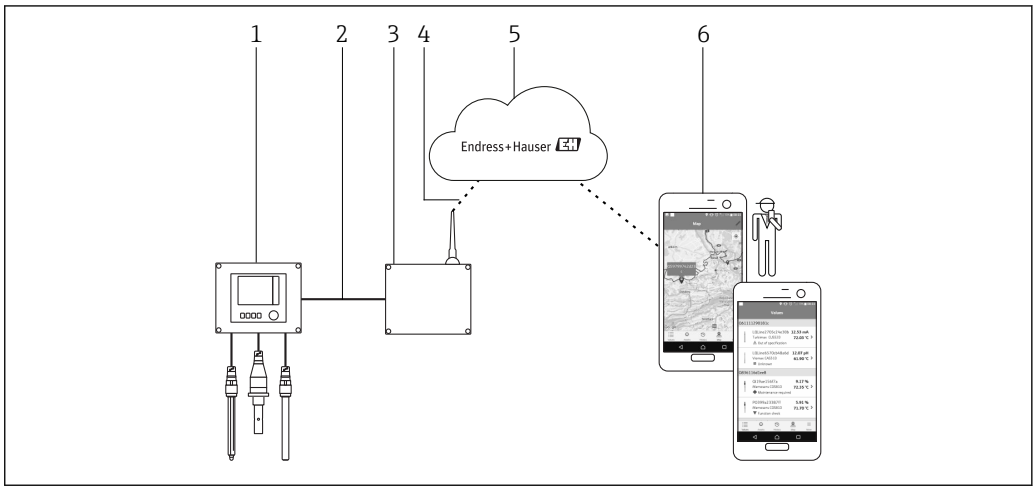
Symbol	Meaning
	**Permitted** Procedures, processes or actions that are permitted.
	**Preferred** Procedures, processes or actions that are preferred.
	**Forbidden** Procedures, processes or actions that are forbidden.
	**Tip** Indicates additional information.
	Reference to documentation.
	Reference to page.
	Reference to graphic.
	Visual inspection.

Function and system design

Function

The Smart System for Aquacultures SSP200B monitors aquaculture systems. The package contains all the components, including sensors, that are required for this. The following parameters can be measured depending on the scope of delivery: oxygen, temperature, ammonium, nitrate or pH value. Other components include the transmitter for measurement data processing and the Modbus Edge Device SGC400 to connect to the Netilion Cloud. Fastening fixtures and connecting cables are also supplied. The Edge Device transmits the device ID data, measured values and status information to the Netilion Cloud. The data sent to the cloud can be either queried directly via a REST JSON API or used in a smartphone application.

System design



1 *Network architecture*

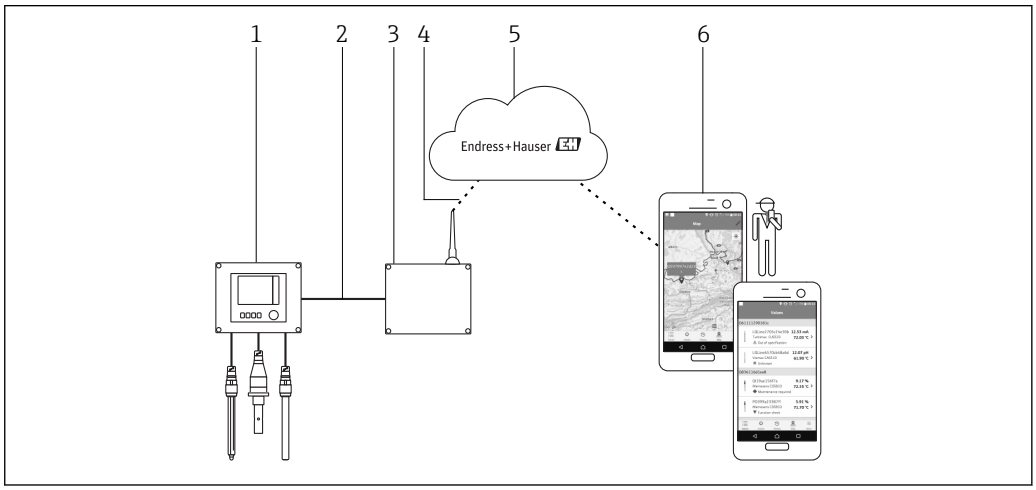
1 *Field device e.g. Liquiline CM444*
2 *Modbus TCP connection*
3 *Modbus Edge Device SGC400*
4 *LTE connection*
5 *Netilion Cloud*
6 *User application on smartphone*

SGC400 function and system design

Function

Endress+Hauser devices with Modbus TCP communication can be connected to the Netilion Cloud with the Modbus Edge Device SGC400. Point-to-point connections are supported. The Edge Device transmits the device ID data, measured values and status information to the Netilion Cloud. Connection to the web is via an integrated LTE modem with a global SIM card. The data sent to the Netilion Cloud can be either queried directly via a REST JSON API or used in a smartphone application.

System design



2 *Network architecture*

1 *Field device e.g. Liquiline CM444*
2 *Modbus TCP connection*
3 *Modbus Edge Device SGC400*
4 *LTE connection*
5 *Netilion Cloud*
6 *User application on smartphone*

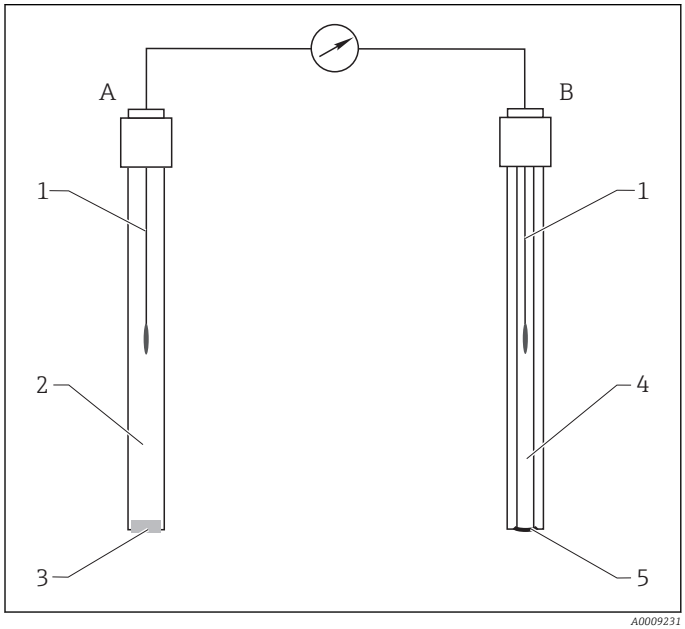
Communication and data processing

Modbus TCP (Ethernet)	2x LAN port, 10/100 Mbps, comply with IEEE 802.3, IEEE 802.3u standards
Wireless LAN	IEEE 802.11b/g/n, Access Point (AP), Station (STA)
Mobile	4G (LTE) CAT4 up to 150 Mbps 3G up to 42 Mbps

CAS40D function and system design

Measuring principle

At the heart of the ion-selective electrode (ISE) is a membrane that is selective for the ion to be measured. An ionophore is integrated into the membrane which facilitates the selective "migration" of a specific type of ion (e.g. ammonium or nitrate) to the electrode. As a result of ion migration, a change in the charge occurs, causing the creation of a potential that is proportional to the ion concentration logarithm. The potential is measured against a reference electrode with a constant potential and converted to a concentration using the Nernst equation. With the potentiometric measuring principle, the color and turbidity do not affect the measurement result.



A *Reference electrode* [1)]
B *Ion-selective electrode*
1 *Inner metal lead*
2 *Inner electrolyte (reference)*
3 *Junction*
4 *Inner electrolyte (ISE)*
5 *Ion-selective membrane*

3 General measuring principle of an ion-selective electrode

1) When using a pH single-rod measuring cell, such as the CPS11, its reference is also the reference electrode for the overall sensor and for the pH electrode itself.

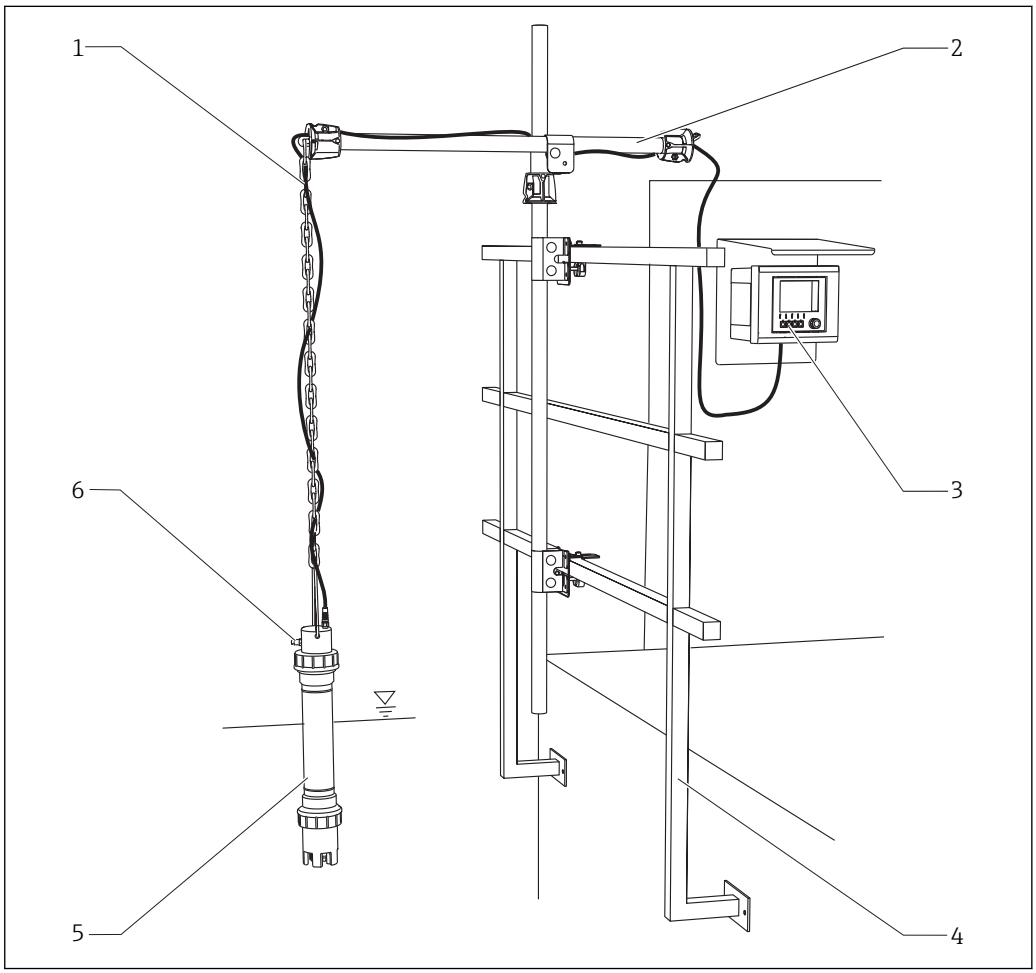
Interference

Depending on the selectivity of the ion-selective electrode vis-à-vis other ions (interference ions), and the concentration of these ions, such ions could also be interpreted as part of the measuring signal and thus cause measuring errors. When measuring in wastewater, the potassium ion which is chemically similar to the ammonium ion can cause higher measured values. The measured values for nitrate can be too high due to high concentrations of chloride. To reduce measuring errors resulting from such cross-interference, the concentration of the potassium or chloride interference ion can be measured and compensated for with a suitable additional electrode.

Measuring system

A complete measuring system comprises:
- Sensor CAS40D
  - Ion-selective electrode(s) for ammonium, nitrate, potassium or chloride
  - pH glass electrode, Orbisint CPS11-1AT2GSA
  - Temperature sensor, CTS1
- Liquiline CM44x transmitter

Optional:
- Assembly holder, e.g. CYH112
- Weather protection cover - absolutely essential if mounting the transmitter outdoors!
- Compressed air generator (if no compressed air available on site)



4 *Example: measuring system on basin rim*

1 Wastewater assembly holder, secure to rail, with transverse pipe and chain
2 Liquiline CM44x transmitter (in graphic: wall-mounted with weather protection cover)
3 Rail
4 Sensor CAS40D with ion-selective electrodes
5 Connection for optional compressed air cleaning (not in graphic)
6 Sensor cable

COS61D function and system design

Measuring principle

The oxygen molecules that diffuse through the membrane are reduced at the cathode to hydroxide ions (OH-). At the anode, silver is oxidized to silver ions (Ag+) (this forms a silver halide layer). A current flows due to the electron donation at the cathode and the electron acceptance at the anode. Under constant conditions, this flow is proportional to the oxygen content of the medium. This current is converted in the transmitter and indicated on the display as an oxygen concentration in mg/l, µg/l, ppm, ppb or Vol%, as a saturation index in % SAT or as an oxygen partial pressure in hPa.

Sensor structure
Oxygen-sensitive molecules (markers) are integrated into an optically active layer (fluorescence layer).
The fluorescence layer, an optical insulating layer and a cover layer are applied on top of one another on a carrier. The cover layer is in direct contact with the medium.
The sensor optics are directed at the rear of the carrier and therefore at the fluorescence layer.

Measurement process (principle of quenching)

If the sensor is immersed in the medium, an equilibrium is very quickly established between the oxygen partial pressure in both the medium and the fluorescence layer.

1. The sensor optics send green light pulses to the fluorescence layer.
2. The markers "respond" (fluoresce) with red light pulses.
   ↳ The duration and intensity of the response signals are directly dependent on the oxygen contents and oxygen partial pressure.

If the medium is free from oxygen, the response signals are long and very intense.

Oxygen molecules mask the marker molecules. As a result, the response signals are shorter and less intense.

Measurement result

► The sensor returns a signal that is proportional to the oxygen concentration in the medium.

The medium temperature and air pressure are already taken into account to calculate the oxygen concentration in the sensor.

The sensor provides measured values for temperature and partial pressure as well as a raw measured value. This value corresponds to the fluorescence decay time and is approx. 20 µs in air and approx. 60 µs in oxygen-free media.

For optimum measurement results

1. During calibration, enter the current air pressure at the transmitter.
2. In the case of saline media:
   Enter the salinity.
3. For measurements in the units %Vol or %SAT:
   Also enter the current operating pressure in the measuring mode.

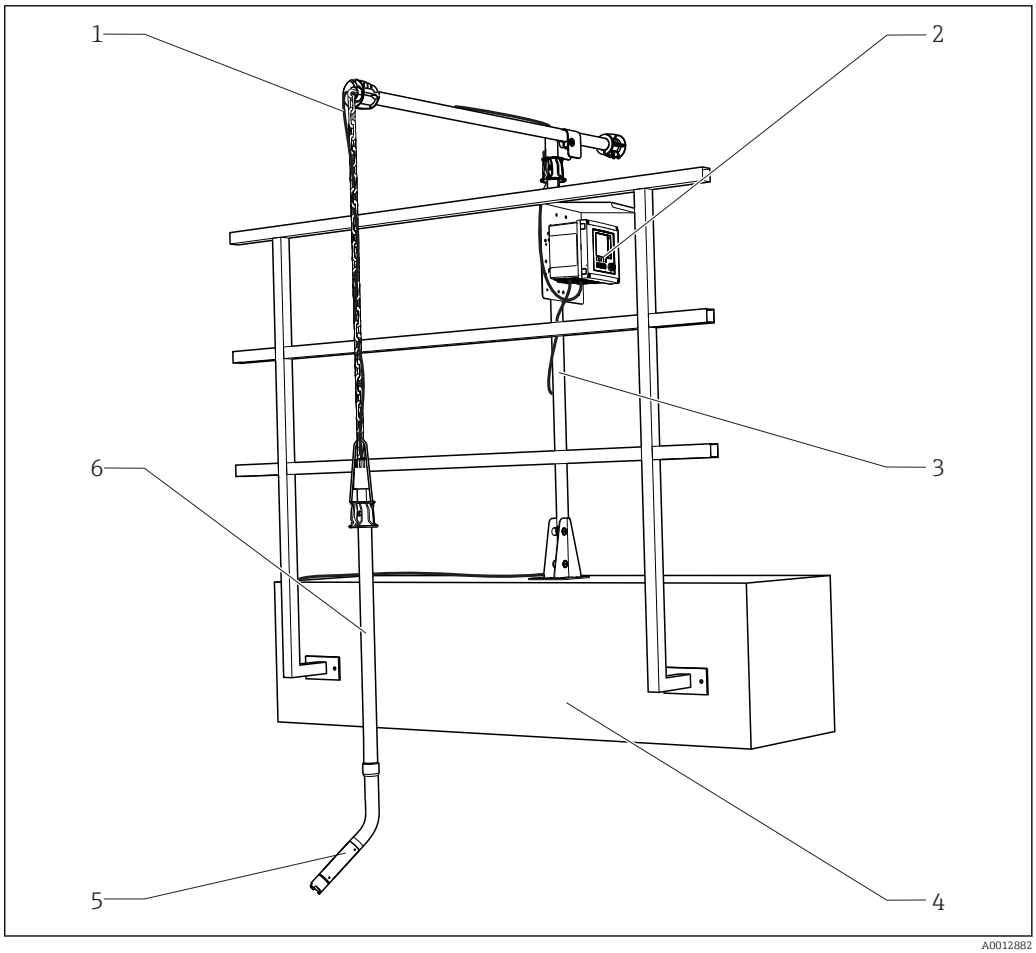
- Operating Instructions for Memosens, BA01245C
  For all transmitters, analyzers and samplers in the Liquiline CM44x/P/R, Liquiline System CA80XX and Liquistation CSFxx product families
- Operating Instructions for Liquiline CM42, BA00381C and BA00382C

Measuring system

COS61D

A complete measuring system consists of the following components at least:
- Oxymax COS61D oxygen sensor
- Liquiline CM44x multi-channel transmitter
- Sensor cable, optionally available with M12 connector
- Assembly, e.g. flow assembly COA250, immersion assembly CYA112 or retractable assembly COA451

Optionally:
- Assembly holder Flexdip CYH112 for immersion operation
- Extension cable CYK11
- Cleaning system

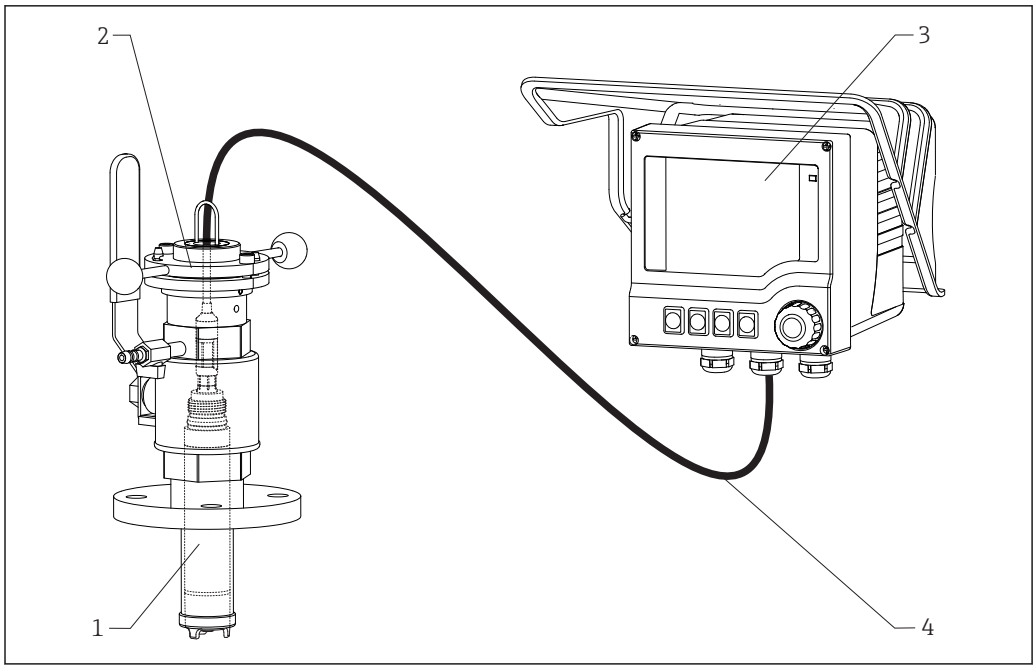


5 Example of a measuring system with COS61D

1	*Sensor cable*	*4*	*Basin rim with railing*
2	*Liquiline CM44x*	*5*	*Oxymax COS61D*
3	*Flexdip CYH112*	*6*	*FlexdipCYA112*

A complete measuring system consists of the following components at least:
- Oxygen sensor Oxymax COS51D OOS51D
- Transmitter, e.g. Liquiline CM42
- Sensor cable CYK10, M12 connector optional
- Assembly, e.g. flow assembly COA250, immersion assembly CYA112 or retractable assembly COA451

Optional:
- Assembly holder Flexdip CYH112 for immersion operation
- Extension cable CYK11
- Cleaning system



6 Example of a measuring system

1 Sensor Oxymax COS51D OOS51D
2 Assembly Cleanfit COA451
3 Transmitter Liquiline CM42
4 Sensor cable CYK10

COS51D function and system design

Measuring principle

The oxygen molecules that diffuse through the membrane are reduced at the cathode to hydroxide ions (OH-). At the anode, silver is oxidized into silver ions (Ag+) (this forms a silver halide layer). A current flows due to the electron donation at the cathode and the electron acceptance at the anode. Under constant conditions, this flow is proportional to the oxygen content of the medium. This current is converted in the transmitter and indicated on the display as an oxygen concentration in mg/l, µg/l, ppm, ppb or Vol%, as a saturation index in % SAT or as an oxygen partial pressure in hPa.

Potentiostatic-amperometric three-electrode system

The high-impedance, current-free reference electrode plays an important role. The formation of a silver bromide or silver chloride coating on the anode uses up the bromide or chloride ions dissolved in the electrolyte. In the case of conventional membrane-covered sensors working with the two-electrode system, this causes an increase in signal drift. This is not the case with the three-electrode system: The change in bromide or chloride concentration is registered by the reference electrode and an internal control circuit keeps the working electrode potential constant. The advantages of this principle are significantly higher signal accuracy and considerably longer calibration intervals.

Memosens technology

Maximum process safety

With inductive transmission of the measured value using a non-contact connection, Memosens guarantees maximum process safety and offers the following benefits:
- All problems caused by moisture are eliminated:
  - Plug-in connection free from corrosion
  - Measured values cannot be distorted by moisture
  - Can even be connected under water
- Transmitter is galvanically decoupled from the medium
- EMC safety guaranteed by screening measures in digital measured value transmission
- Intrinsically safe electronics mean operation in hazardous areas is not a problem

Data security thanks to digital data transmission

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter via a non-contact connection that is free from potential interference. The result:
- Automatic error message if sensor fails or connection between sensor and transmitter is interrupted
- Immediate error detection increases measuring point availability

Easy to use

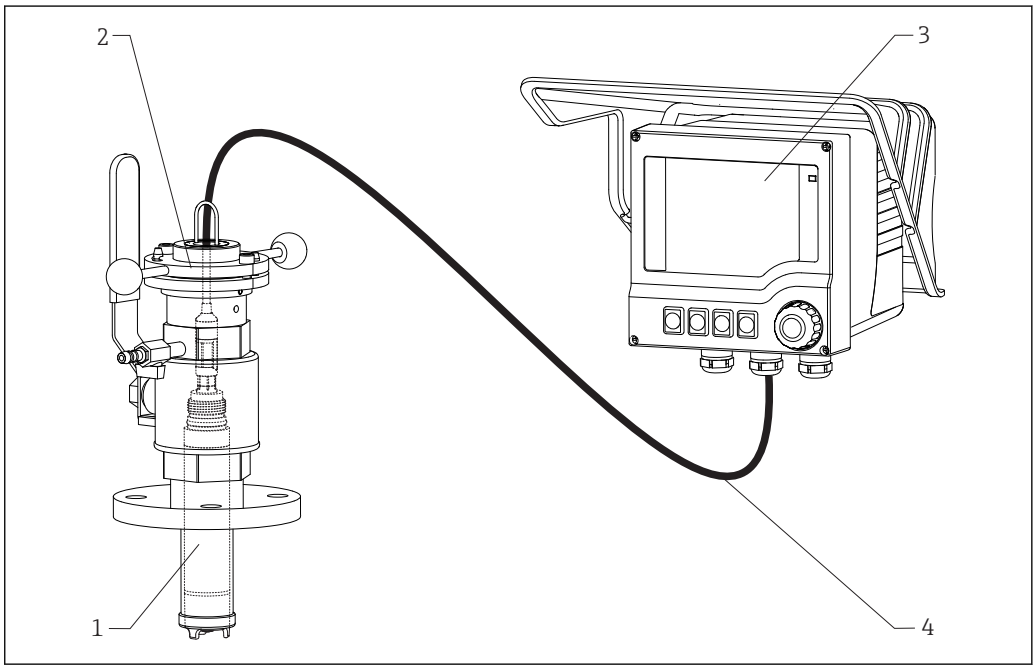
Sensors with Memosens technology have an integrated electronics unit that stores calibration data and other information (such as total operating hours, operating hours under extreme measuring conditions). When the sensor is installed, the sensor data are transferred automatically to the transmitter and used to calculate the current measured value.

As the calibration data are stored in the sensor, the sensor can be calibrated 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 measuring point availability
- Installation of the transmitter in the measuring container with integrated measuring devices reduces the cabling work and fastening fixtures required
- Thanks to the availability of the sensor data, maintenance intervals can be accurately defined and predictive maintenance is possible
- Sensor history can be documented on external data carriers and in evaluation programs
- The application of the sensor can be determined based on its previous history

Measuring system

A complete measuring system comprises:
- Digital oxygen sensor Oxymax COS51D
- Transmitter, e.g. Liquiline CM42
- Measuring cable CYK10
- Assembly, e.g. immersion assembly CYA112 or retractable assembly COA451

Optional (see Accessories):
- Assembly holder CYH1112 for immersion operation
- RM junction box (for cable extension)
- Automatic cleaning system Chemoclean with spray head



7 Example of a measuring system

1 Digital oxygen sensor Oxymax COS51D
2 Retractable assembly COA451
3 Liquiline CM42
4 Measuring cable CYK10

CYA112 function and system design

For detailed information on the "function and system design of Flexdip CYA112", see the Technical Information

Power supply

SGC400 power supply

Supply voltage

Version 100 to 240 V_{AC}

Voltage	100 to 240 V_{AC}, 50/60 Hz
Current consumption	0.07 A
Power consumption	Max. 72.1 VA
Electrical connection	Terminal X1 (green/yellow): PE Terminal X2 (blue): N Terminal X3 (gray): L
Integrated overvoltage protection	Varistor surge arrester for transient overvoltage protection

Version 24 V_{DC}

Voltage	24 V_{DC}
Current consumption	0.07 A
Power consumption	Max. 15 W
Electrical connection	Terminal X1 (green/yellow): PE Terminal X2 (blue): 0 V Terminal X3 (gray): 24 V_{DC}
Integrated overvoltage protection	ESD protection according to IEC 61000

CM444 power supply

Supply voltage

NOTICE

The device does not have a power switch!

- Provide a protected circuit breaker in the vicinity of the device at the place of installation.
- The circuit breaker must be a switch or power switch, and must be labeled as the circuit breaker for the device.
- At the supply point, the power supply must be isolated from dangerous live cables by double or reinforced insulation in the case of devices with a 24 V power supply.

Version 100 to 230 V_{AC}

Voltage	100 to 230 V_{AC}, 50/60 Hz Max. permitted fluctuation in power supply: ± 15 % of nominal voltage
Power consumption	Max. 73 VA

Version 24 V_{DC}

Voltage	24 V_{DC} Max. permitted fluctuation in power supply: – 20 % to + 15 % of nominal voltage
Power consumption	Max. 68 W

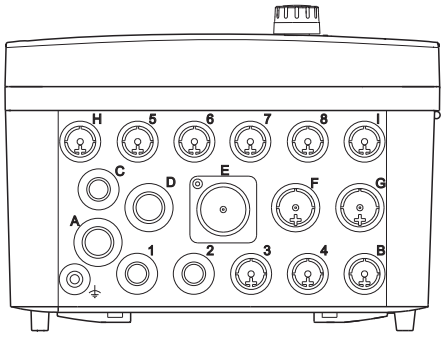
Fuse

Fuse not exchangeable

Overvoltage protection

Integrated overvoltage/lightning protection as per EN 61326
Protection category 1 and 3

Cable entries

Identification of the cable entry on housing base	Suitable gland
B, C, H, I, 1-8	M16x1.5 mm/NPT3/8"/G3/8
A, D, F, G	M20x1.5 mm/NPT1/2"/G1/2
E	-
⏚	M12x1.5 mm
 A0018025	**Recommended assignment** 1-8 Sensors 1-8 A Power supply B RS485 In or M12 DP/RS485 C Can be used freely D,F,G Current outputs and inputs, relays H Can be used freely I RS485 Out or M12 Ethernet E Do not use

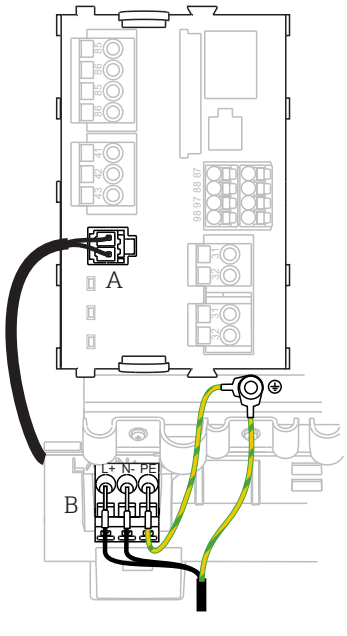
Cable specification

Cable gland	Permitted cable diameter
M16x1.5 mm	4 to 8 mm (0.16 to 0.32")
M12x1.5 mm	2 to 5 mm (0.08 to 0.20")
M20x1.5 mm	6 to 12 mm (0.24 to 0.48")
NPT3/8"	4 to 8 mm (0.16 to 0.32")
G3/8	4 to 8 mm (0.16 to 0.32")
NPT1/2"	6 to 12 mm (0.24 to 0.48")
G1/2	7 to 12 mm (0.28 to 0.48")

Cable glands mounted at the factory are tightened with 2 Nm.

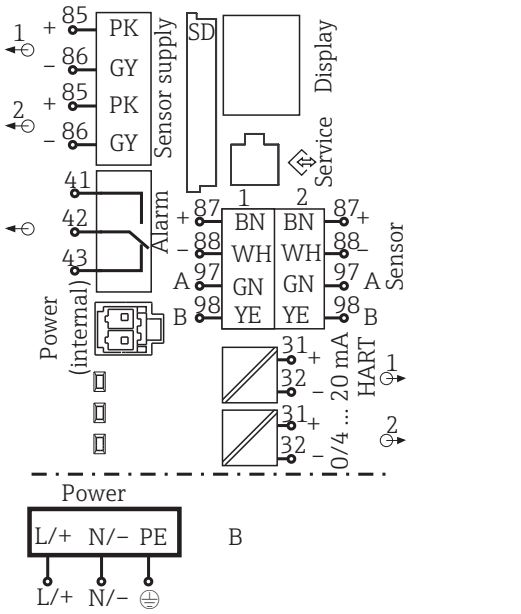
Electrical connection Liquiline CM444

Connection of Liquiline CM444 to supply voltage



8 *Power supply connection on BASE-E*

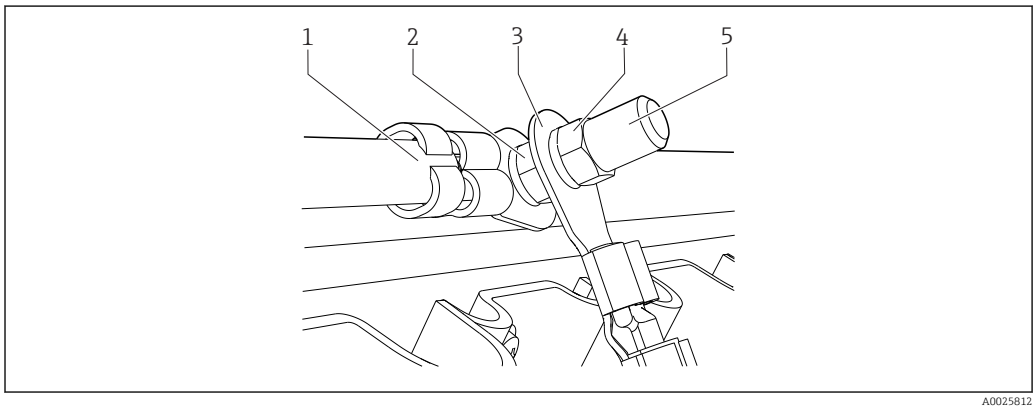
A Internal power supply cable
B Extension power unit



9 *Overall wiring diagram for BASE-E and extension power unit (B)*

Requirements for protective ground / ground cable

- Onsite fuse 10 A: wire cross-section min. 0.75 mm² (18 AWG)
- Onsite fuse 16 A: wire cross-section min. 1.5 mm² (14 AWG)



10 *Protective ground or grounding connection*

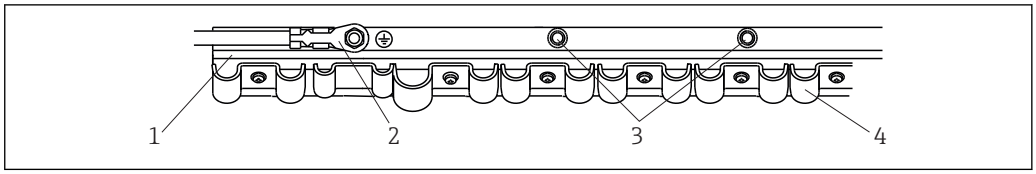
NOTICE

Protective ground or ground cable with wire ferrule or open cable lug

The cable can become loose. Loss of the protective function!

- ► To connect the protective ground or ground cable to the threaded bolt, only use a cable with a closed cable lug as per DIN 46211, 46225, form A.
- ► Never connect the protective ground or ground cable to the threaded bolt with a wire ferrule or an open cable lug.

Cable mounting rail



11 Cable mounting rail and associated function

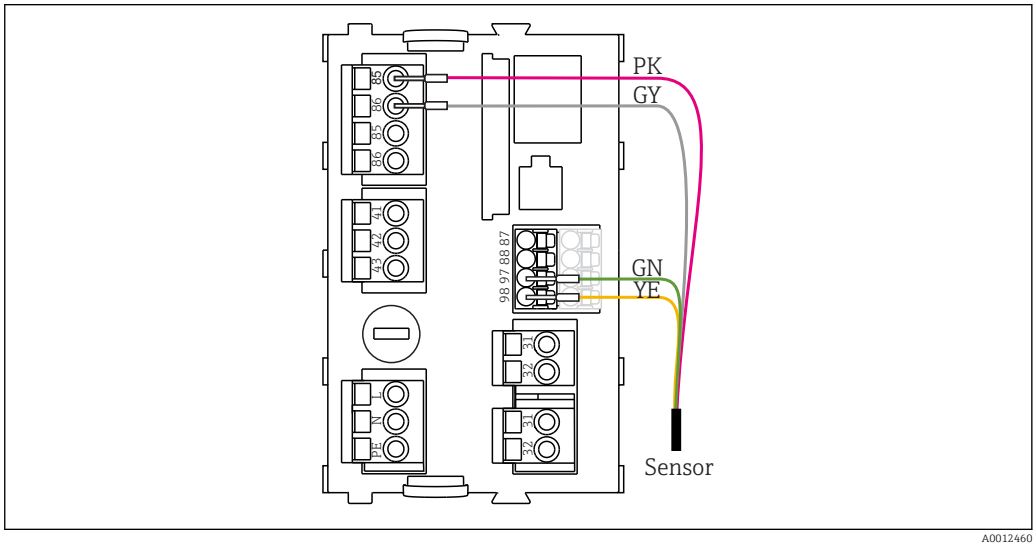
1 *Cable mounting rail*
2 *Threaded bolt as protective ground connection, central grounding point*
3 *Additional threaded bolts for ground connections*
4 *Cable clamps for fixing and grounding the sensor cables*

CAS40D power supply

Electrical connection

Options for connecting to Liquiline CM44x transmitter

- M12 connector (version: fixed cable, M12 connector)
- Fixed cable at the terminal blocks (version: fixed cable, ferrules)



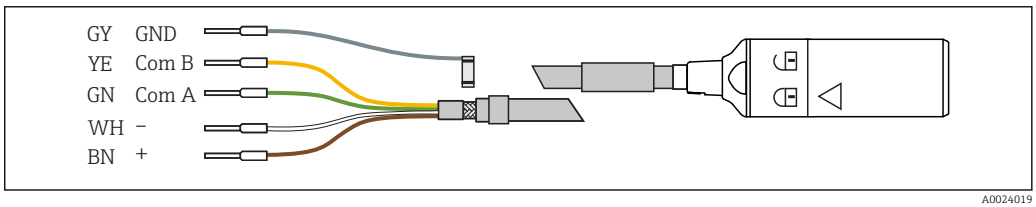
12 Sensor connection

The maximum cable length is 100 m (328 ft).

COS61D power supply

Electrical connection

The electrical connection simulator to the transmitter is established using measuring cable O CYK10.

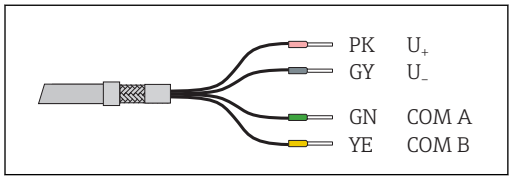


13 Measuring cable O CYK10

COS61D

Connection data

- Sensor cable connected directly to the terminal connector of the basic module
- Optional: sensor cable plug connected to the M12 sensor socket of the transmitter
  With this type of connection, the transmitter is already wired at the factory.



14 Sensor fixed cable with terminated cable cores

Performance characteristics

SGC400 performance characteristics

Hardware

CPU	BCM2837, 1.2 GHz, quad-core
Ports	2x Ethernet Modbus TCP

Software

Operating system	Raspbian version Jessie incl. RT patch
Standard software	Endress+Hauser-specific runtime environment

CM444 performance characteristics

Response time

Current outputs
t_{90} = max. 500 ms for an increase from 0 to 20 mA

Current inputs
t_{90} = max. 330 ms for an increase from 0 to 20 mA

Digital inputs and outputs
t_{90} = max. 330 ms for an increase from low to high

Reference temperature

25 °C (77 °F)

Measured error for sensor inputs

→ Documentation of the connected sensor

Measured error for current inputs and outputs

Typical measured errors:
< 20 µA (with current values < 4 mA)
< 50 µA (with current values 4 to 20 mA)
at 25 °C (77 ° F) each

Additional measured error depending on the temperature:
< 1.5 µA/K

Frequency tolerance of digital inputs and outputs

≤ 1%

Resolution of current inputs and outputs

< 5 µA

Repeatability

→ Documentation of the connected sensor

CAS40D performance characteristics

Response time t_{90} of the ion-selective sensors

< 2 min.

For a change between 0.5 and 1 mmol/l in both directions, at 25 °C (77 °F).

Maximum measured error

± 5 % of the measured value ± 0.2 mg/l

Repeatability

±3 % of the display value

Compensation

Sensor	Temperature	pH	Potassium [1) 2)]	Chloride [3) 4)]
Ammonium	2 to 40 °C (36 to 100 °F)	pH 8.3 to 10	1 to 1000 mg/l (ppm)	-
Nitrate		-	-	10 to 1000 mg/l (ppm)
Potassium		-	-	-
Chloride		-	-	-

1) The concentration fluctuations, not the absolute value, are decisive
2) Recommendation: Use as compensation electrode for potassium concentrations > 40 mg/l in the case of simultaneously fluctuating values of ± 20 mg/l, or apply an offset in the case of non-fluctuating values.
3) The concentration fluctuations, not the absolute value, are decisive
4) Recommendation: Use as compensation electrode for chloride concentrations > 500 mg/l in the case of simultaneously fluctuating values of ± 100 mg/l, or apply an offset in the case of non-fluctuating values.

Max. operating life

Membrane and electrolyte
- Use:
  approx. 0.5 years
- Storage:
  2 years

Automatic cleaning

- Cleaning medium:
  Air
- Pressure:
  3 to 3.5 bar (45 to 50 psi)
- Volume of air required per cleaning cycle:
  3 to 4 l (0.8 to 1 US gal)
- Cleaning duration:
  4 to 15 s
- Cleaning intervals (at T > 10 °C (50 °F)):
  Sludge activation inlet: 15 s cleaning, 30 min pause
  Sludge activation: 15 s cleaning, 1 hr pause

COS61D performance characteristics

Response time

From air to nitrogen at reference operating conditions:
t_{90} : 60 s

At 20 °C (68 °F):
- C OOS51D-***0* (black membrane cap for standard response time):
  - t_{90} : 3 minutes
  - t_{98} : 8 minutes
- C OOS51D-***1* (white membrane cap for fast response time):
  - t_{90} : 30 s
  - t98 : 90 s

Reference operating conditions

Reference temperature:	25 °C (77 °F)
Reference pressure:	1013 hPa (15 psi)
Reference application:	Air-saturated water

Signal current in air

- C OOS51D-***0* (black membrane cap):
  Approx. 300 nA
- C OOS51D-***1* (white membrane cap):
  Approx. 1100 nA

Zero current

< 0.1 % of the signal current in air

Measured value resolution

- C OOS51D-***0* (black membrane cap):
  0.01 mg/l (0.01 ppm)
- C OOS51D-***1* (white membrane cap):
  0.001 mg/l (0.001 ppm)

Maximum measured error [1)]

COS61D

Measuring range	Maximum measured error
< 12 mg/l	0.01 mg/l or ±1 % of reading
12 mg/l to 20 mg/l 1% of reading	±2% of reading

Repeatability

±0.5 % of end of measuring range

1% of reading

Long-term drift

Zero-point drift:	< 0.1 % per week at 30 °C (86 °F) [1)]
Measuring range drift:	< 0.1 % per week at 30 °C (86 °F) [1)]

1) under constant conditions

Influence of the medium pressure

Pressure compensation not required

Polarization time

< 60 minutes

Intrinsic oxygen consumption

- C OOS51D-***0*:
  Approx. 90 ng/h in air at 25 °C (77 °F)
- C OOS51D-***1*:
  Approx. 270 ng/h in air at 25 °C (77 °F)

Operating life of sensor cap

>2 years (under reference operating conditions, protect against direct sunlight)

1) In accordance with IEC 60746-1 at rated operating conditions

COS51D performance characteristics

Response time

COS51D-***0* (black membrane cap for standard response time):
- t_{90}: 3 minutes
- t_{98}: 8 minutes (at 20 °C (68 °F) in each case)

COS51D-***1* (white membrane cap for fast response time):
- t_{90}: 0.5 minutes
- t98: 1.5 minutes (at 20 °C (68 °F) in each case)

Reference operating conditions

Reference temperature: 25 °C (77 °F))

Reference pressure: 1013 hPa (15 psi)

Signal current in air [2)]

- COS51D-***0* (black membrane cap): approx. 300 nA
- COS51D-***1* (white membrane cap): approx. 1100 nA

Zero current

< 0.1 % of the current in air

Measured value resolution

0.01 mg/l (0.01 ppm)

0.001 mg/l (0.001 ppm)

Maximum measured error

±1 % of the measured value [3)]

Repeatability

±1% of reading

Long-term drift

Zero-point drift: < 0.1 % per week at 30 °C (86 °F)

Measuring range drift: < 0.1 % per week at 30 °C (86 °F) [4)]

Influence of the medium pressure

Pressure compensation not required

Polarization time

< 60 minutes

Intrinsic oxygen consumption

COS51D-***0*: approx. 90 ng/h in air at 25 °C (77 °F)

COS51D-***1*: approx. 270 ng/h in air at 25 °C (77 °F)

Installation

For detailed information on the "Smart System for Aqualcultures SSP200B", see the Operating Instructions → 30

2) At the specified reference operating conditions
3) In accordance with IEC 60746-1 at rated operating conditions
4) Under constant conditions in each case

Environment

SGC400 environment

Ambient temperature range

−25 to 55 °C (−13 to 131 °F)

Storage temperature

−40 to 80 °C (−40 to 176 °F)

Humidity

10 to 90 % (non-condensing)

Degree of protection

IP54

Shock resistance

LTE modem Teltonika RUT240 (IEC 60950-1:2005, EN 60950-1:2006)

Kunbus RevPi 3 (EN 61131-2)

Phoenix Contact UNO-PS (IEC 60068-2-27, IEC 60068-2-6)

Electromagnetic compatibility (EMC)

Complies with EMC Directive 2014/30/EU

LTE modem Teltonika RUT240 (EN61000-4)

Kunbus RevPi Core 3 (EN 61131-2, IEC 61000-6-2)

Phoenix Contact UNO-PS (EN 61000-4)

CM444 environment

Ambient temperature

−20 to 55 °C (0 to 100 °F)

Storage temperature

-40 to +80 °C (-40 to 175 °F)

Humidity

10 to 95 %, non-condensating

Degree of protection

IP 66/67, impermeability and corrosion resistance in accordance with NEMA TYPE 4X

Vibration resistance

Environmental tests
Vibration test based on DIN EN 60068-2, October 2008
Vibration test based on DIN EN 60654-3, August 1998

Post or pipe mounting

Frequency range	10 to 500 Hz (sinusoidal)	
Amplitude	10 to 57.5 Hz:	0.15 mm
	57.5 to 500 Hz:	2 g [1]
Test duration	10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)	

Wall mounting

Frequency range	10 to 150 Hz (sinusoidal)	
Amplitude	10 to 12.9 Hz:	0.75 mm
	12.9 to 150 Hz:	0.5 g [1]
Test duration	10 frequency cycles/ spatial axis, in 3 spatial axes (1 oct./min)	

1) g ... gravitational acceleration (1 g ≈ 9.81 m/s^2)

Electromagnetic compatibility

Interference emission and interference immunity as per EN 61326-1:2013, Class A for Industry

Electrical safety

IEC 61010-1, Class I equipment
Low voltage: overvoltage category II
Environment < 3000 m (< 9840 ft) above MSL

Degree of contamination

The product is suitable for pollution degree 4.

Pressure compensation to environment

Filter made of GORE-TEX used as pressure compensation element
Ensures pressure compensation to environment and guarantees IP protection.

CAS40D environment

Ambient temperature range

-20 to 50 °C (-4 to 120 °F)

Storage temperature

2 to 40 °C (36 to 100 °F)

Degree of protection

IP68 (2 m water column, 25 °C, 48 h)

Electromagnetic compatibility

Interference emission and interference immunity as per EN 61 326, Namur NE21

COS61D environment

Ambient temperature range

−20 to 60 °C (−4 to 140 °F)

−5 to 50 °C (23 to 122 °F)

Storage temperature

−20 to 70 °C (−4 to 158 °F)

at 95% relative air humidity, not condensating

- Filled with electrolyte:
  −5 to 50 °C (20 to 120 °F)
- Without electrolyte:
  −20 to 60 °C (0 to 140 °F)

Degree of protection

COS61D
IP 68 (test conditions: 10 m (33 ft) water column, at 25 °C (77 °F) over 30 days)

IP68 (10 m (33 ft) water column at 25 °C (77 °F) over 30 days)

Electromagnetic compatibility

COS61D
Interference emission and interference immunity as per EN 61326: 2005, Namur NE 21:2007

COS51D environment

Ambient temperature range

−5 to 50 °C (20 to 120 °F)

Storage temperature

Filled with electrolyte: −5 to 50 °C (20 to 120 °F)

Without electrolyte: −20 to 60 °C (0 to 140 °F)

Degree of protection

IP 68 (testing conditions: 10 m (33 ft) water column at 25 °C (77 °F) over 30 days)

CYA112 environment

Air temperature

−20 to 60 °C (−4 to 140 °F)

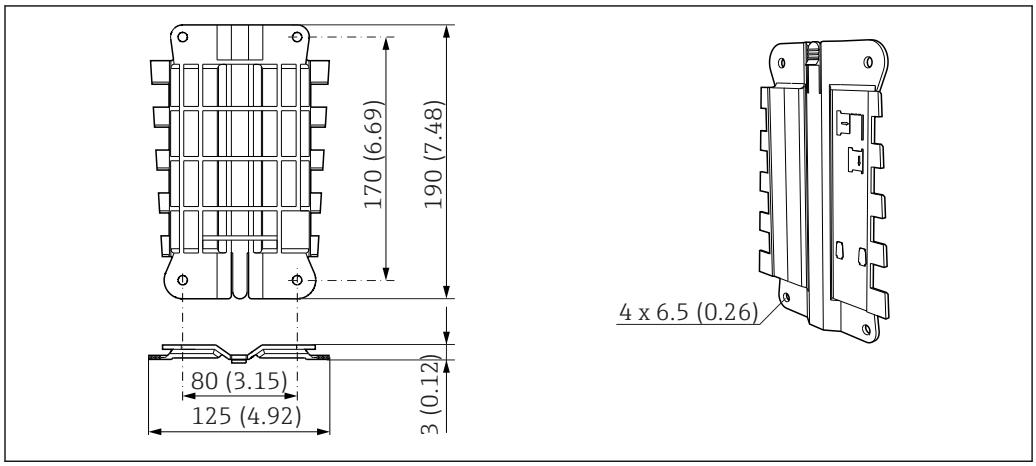
Mechanical construction

SGC400 mechanical construction

Design, dimensions

Mounting plate

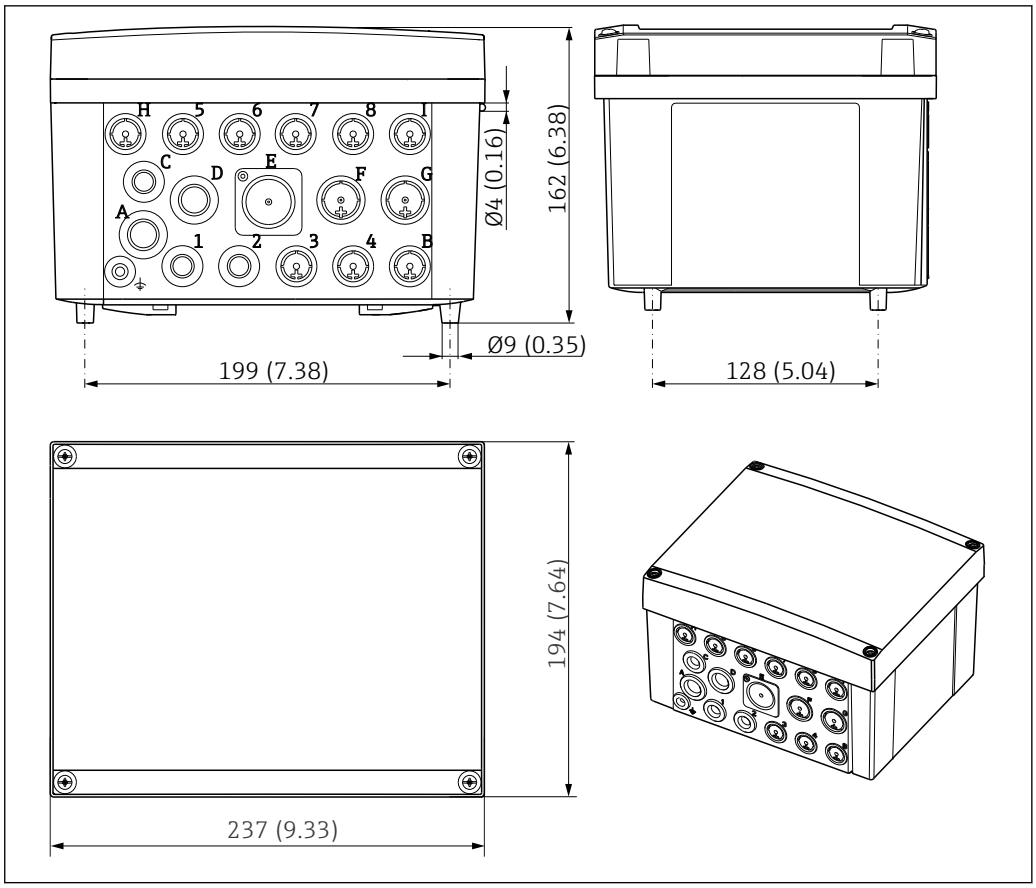
190 mm · 125 mm · 3 mm (7.48 in · 4.92 in · 0.12 in)



15 Dimensions of mounting plate

Modbus Edge Device SGC400

237 mm · 194 mm · 162 mm (9.33 in · 7.64 in · 6.38 in)



16 Modbus Edge Device SGC400 dimensions

Weight

2.3 kg (5.08 lb)

Materials

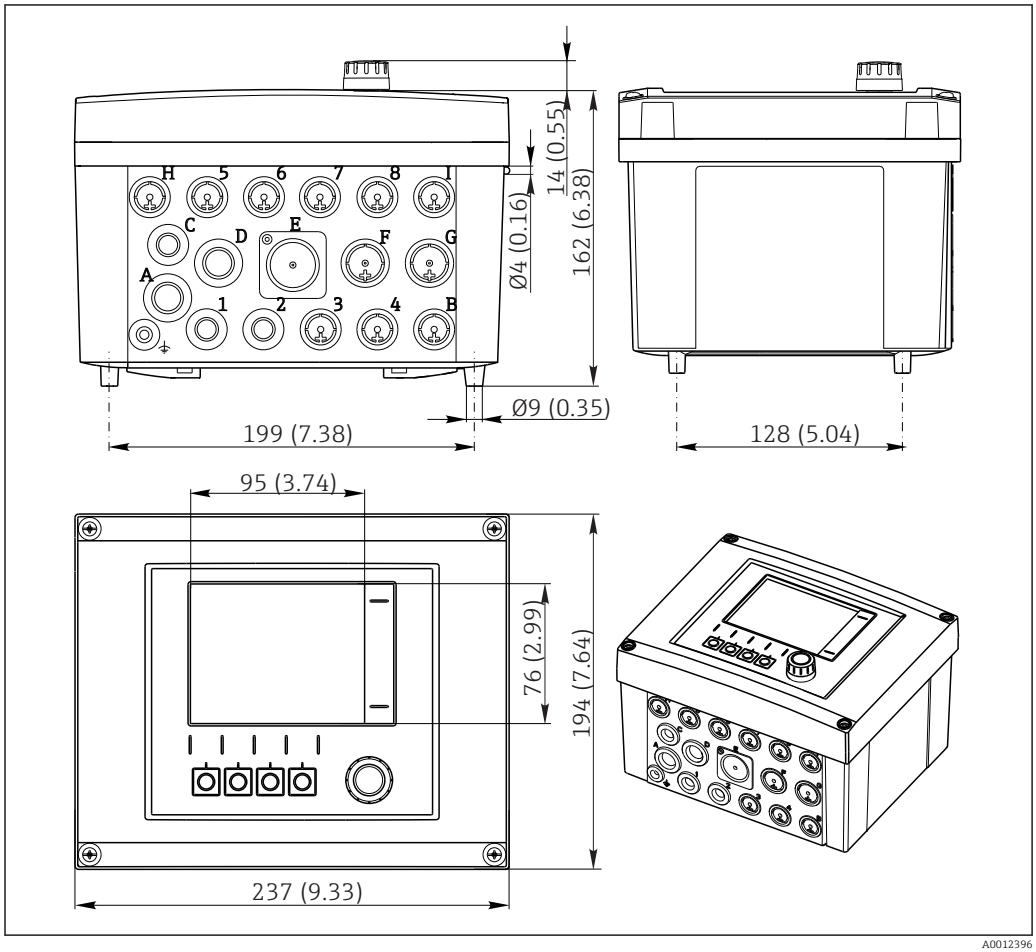
Housing	PC-FR
Seal	EPDM
Carrier board	Stainless steel 1.4301, AISI304
Cable entries	Polyamide V0 as per UL94

Antenna

MIMO directional antenna

CM444 mechanical construction

Dimensions



17 Dimensions of field housing in mm (inch)

Weight

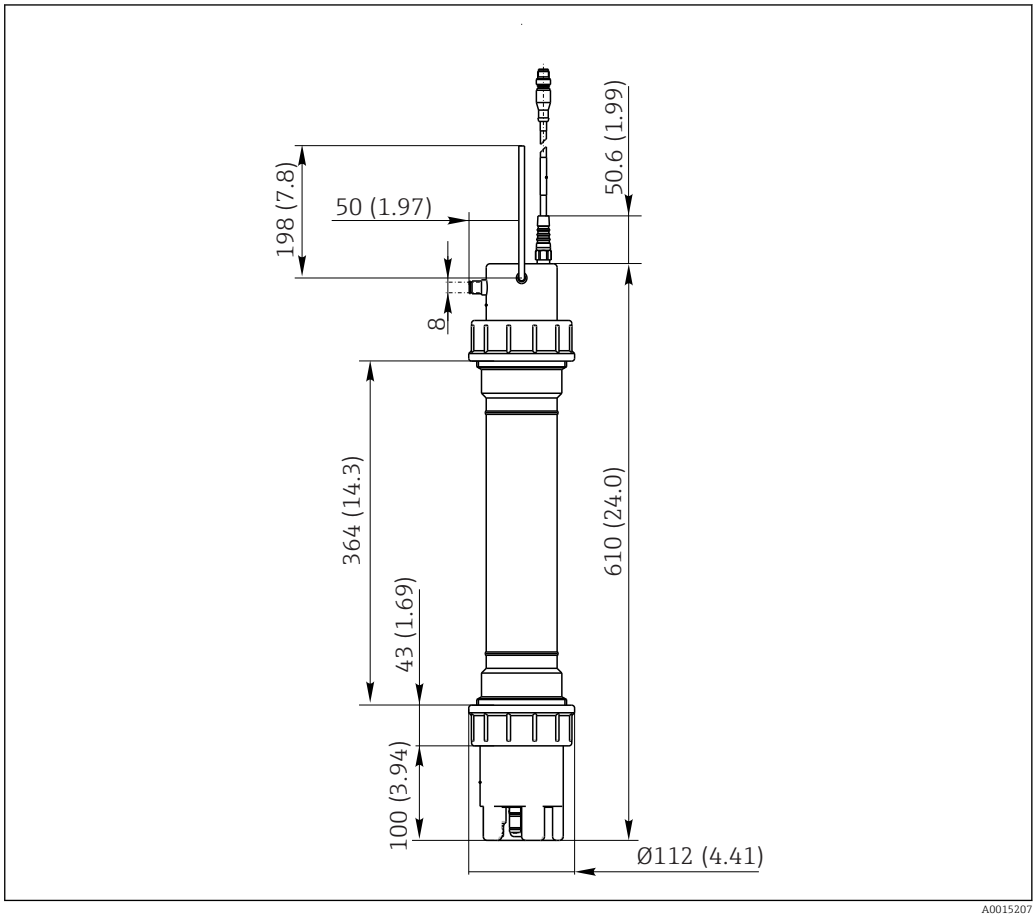
Complete device	Approx. 2.1 kg (4.63 lbs), depending on the version
Individual module	Approx. 0.06 kg (0.13 lbs)
SD card	Max. 5 g (0.17 oz)

Materials

Housing base	PC-FR
Display cover	PC-FR
Display foil and soft keys	PE
Housing seal	EPDM
Module side panels	PC-FR
Module covers	PBT GF30 FR
Cable mounting rail	PBT GF30 FR, stainless steel 1.4301 (AISI304)
Clamps	Stainless steel 1.4301 (AISI304)
Threaded fasteners	Stainless steel 1.4301 (AISI304)
Cable glands	Polyamide V0 as per UL94

CAS40D mechanical construction

Dimensions



18 Dimensions in mm (inch)

Weight

Approx. 3.5 kg (7.7 lbs)

Materials

Sensor:

Protective cage:	POM
Electrode holder:	POM
Radial seal for sensor head and electrode holder:	Silicone
O-rings in ISE holder:	EPDM
O-rings for air nozzle:	VITON
Sensor pipe with coupling nut:	PP
Retaining bracket:	Stainless steel
Sensor head:	POM
Temperature sensor:	Glass
pH single-rod measuring cell with reference electrode:	Glass, PTFE

Ion-selective electrodes

Membrane cap:	POM
Shaft:	POM
Color ring:	PP
Membrane:	PVC, plasticizer
O-rings:	EPDM

Electrode process connection

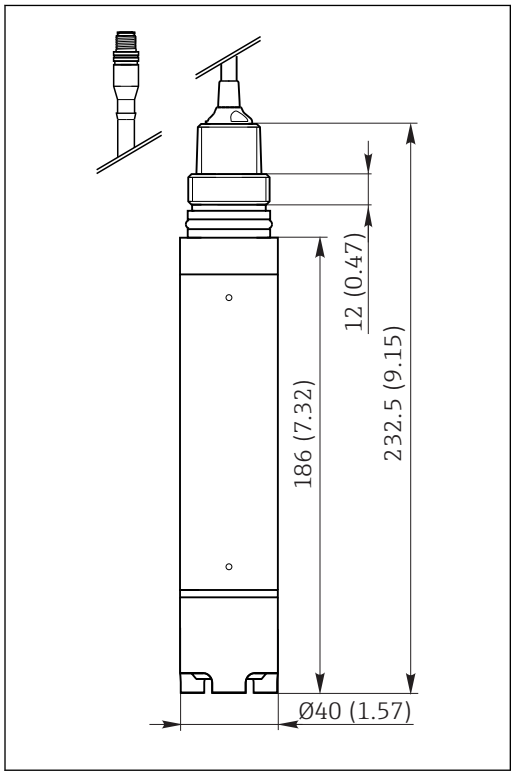
Pg 13.5

Compressed air connection

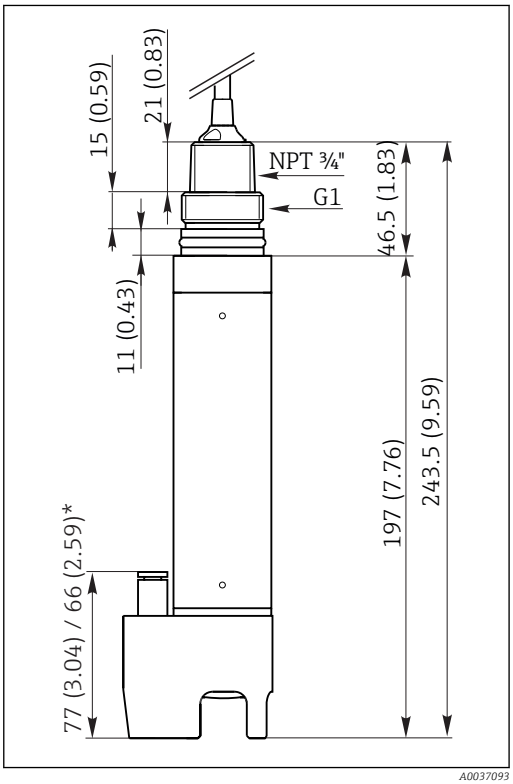
For hose, OD 8 mm

COS61D mechanical construction

Design, dimensions COS61D , dimensions



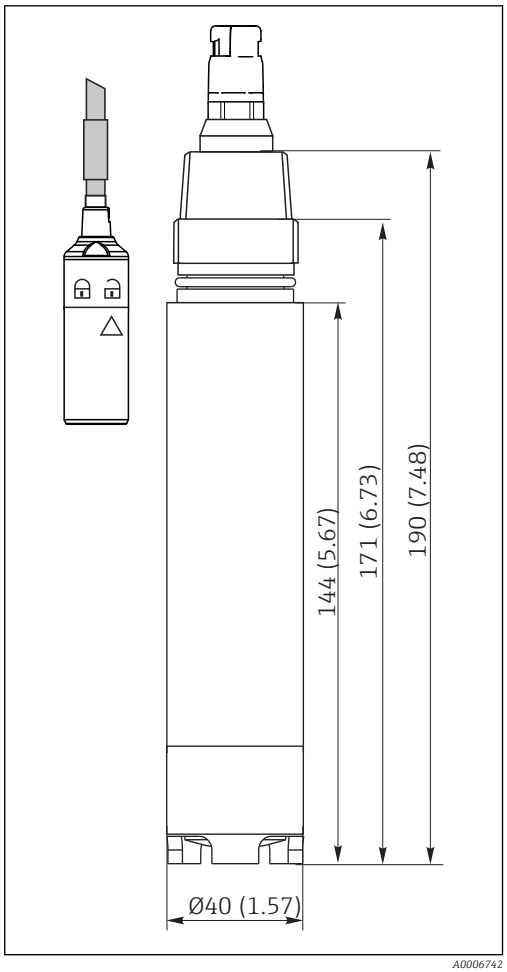
19 *With optional M12 connector*



20 *With optional cleaning unit*

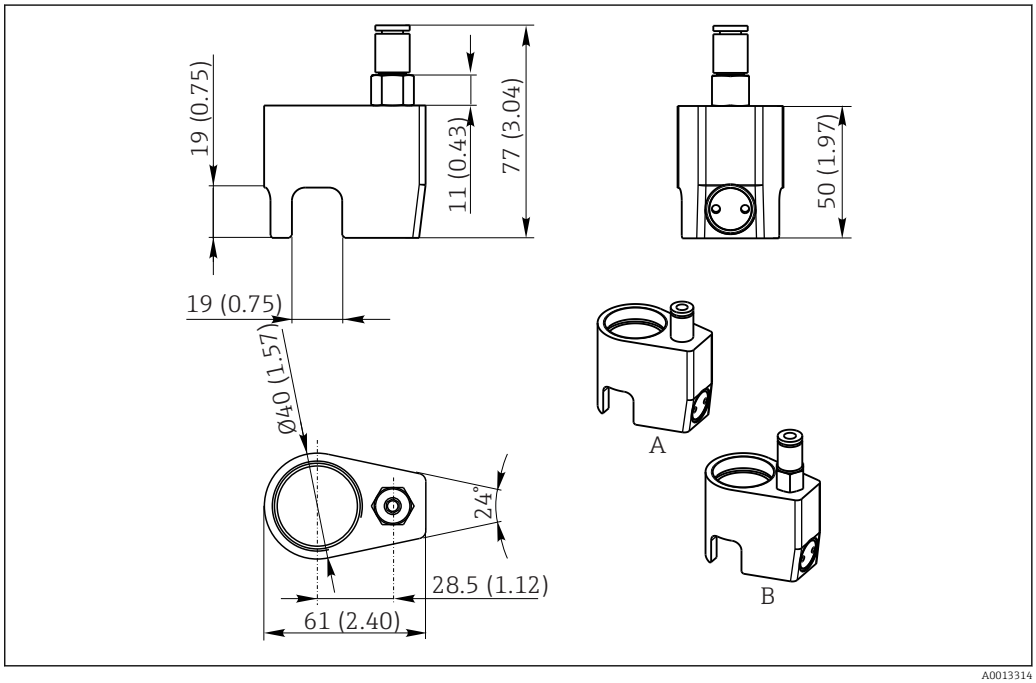
* *depending on version of cleaning unit*

Dimensions in mm (inch)



21 *Dimensions in mm (inch)*

Optional cleaning unit



22 *Dimensions in mm (inch)*

Weight

with cable length 7 m (23 ft):	0.7 kg (1.5 lbs)
with cable length 15 m (49 ft):	1.1 kg (2.4 lbs)
0.3 kg (0.7 lbs)	

Materials

Parts in contact with medium

Sensor shaft	Stainless steel 1.4435 (AISI 316L)
Cap with fluorescence layer	POM
Fluorescence layer	Silicone

Parts in contact with medium

Sensor shaft:	POM
Membrane cap:	POM
Cathode:	Gold
Anode/reference electrode:	Silver/silver bromide

Process connection

COS61D
G1, NPT 3/4"

G1 and NPT 3/4"

Membrane thickness

- C OOS51D-***0*:
  Approx. 50 µm
- C OOS51D-***1*:
  Approx. 25 µm

Temperature sensor

NTC 22 kΩ

Electrolyte

Alkaline saline solution

Sensor cable

COS61D
Shielded 4-core fixed cable

Cable connection at transmitter

COS61D
- Terminal connection, end ferrules
- Optional: M12 connector

Maximum cable length

max. 100 m (330 ft), incl. Cable extension

Temperature compensation

Internal

Interface

COS61D
Memosens protocol

COS51D mechanical construction

Design, dimensions

For detailed information on "Oxymax COS51D ", see the Technical Information

Weight

0.3 kg (0.7 lb)

Materials

Sensor shaft: POM

Membrane cap: POM

Cathode: gold

Anode/reference electrode: silver/silver bromide

Process connection

G1 and NPT ¾"

Membrane thickness

COS51D-***0*: approx. 50 µm

Temperature compensation

Internal

Electrolyte

Alkaline saline solution

CYA112 mechanical construction

Dimensions

Immersion tube (PVC): Ø 40 mm (1.57 in), length: 600 mm (23.6")

Weight

Immersion tube (PVC) (length 1): 0.3 kg (0.7 lb)

Multifunctional clamp ring: 0.15 kg (0.33 lb)

Weight for PVC immersion tube: 0.32 kg (0.71 lb)

Materials

Sensor adaption: POM - GF

Quick release fastener: POM - GF

Multifunctional clamp ring: POM - GF

Cap for tube end: PE

Chain bracket: stainless steel 1.4571 (AISI 316 Ti) or 1.4404 (AISI 316 L)

O-rings: EPDM

Sensors

Sensors from Endress+Hauser

Sensor	Preferred assembly material [1)]	Connection angle	Connection thread	Suitable for quick release fastener
CPF8x/8xD	PVC	0°	NPT ¾"	Yes
COS51D	PVC	0°	G1	Yes
CLS50/50D	PVC, stainless steel	0°	G¾	Yes

1) Use stainless steel for the hazardous area

Sensors by connection thread

Sensor with connection thread	Preferred assembly material	Connection angle	Adapter	Suitable for quick release fastener
NPT ¾"	PVC	0°/45°	NPT ¾"	Yes
G1	PVC, stainless steel	0°/ 45°/90°	G1	Yes
G¾	PVC, stainless steel	0°	G¾	Yes

Sensor adapter

For detailed information on the "Flexdip CYA112 sensor adapter", see the Technical Information

Certificates and approvals

SGC400 certificates and approvals

CE mark

The Modbus Edge Device SGC400 meets the legal requirements of the relevant EU Directives. The manufacturer has affixed the CE mark as confirmation that the Modbus Edge Device SGC400 has been successfully tested.

UL mark

The Modbus Edge Device SGC400 meets the legal requirements of the relevant UL directives. The manufacturer has affixed the UL mark as confirmation that the Modbus Edge Device SGC400 has been successfully tested.

Radio approval

CE/ RED, EAC, FCC

Other standards and guidelines

Electrical safety IEC61010-1

In compliance with 2014/35/EU

CM444 certificates and approvals

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

CE mark

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

EAC

The product has been certified according to guidelines TP TC 004/2011 and TP TC 020/2011 which apply in the European Economic Area (EEA). The EAC conformity mark is affixed to the product.

cCSAus

The device has been certified with regard to its electrical safety and for NI Class I Div. 2 cCSAus explosion-proof environments. It meets the requirements in accordance with:
- CLASS 2252 06 - Process Control Equipment
- CLASS 2252 86 - Process Control Equipment - Certified to US Standards
- CLASS 2258 03 - Process Control Equipment - Intrinsically Safe and Non-incendive Systems - For Hazardous Locations
- CLASS 2258 83 - Process Control Equipment - Intrinsically Safe and Non-incendive Systems - For Hazardous Locations - Certified to US Standards
- FM3600
- FM3611
- FM3810
- ANSI/ISA NEMA250
- IEC 60529
- CAN/CSA-C22.2 No. 0
- CAN/CSA C22.2 No. 94
- CSA Std. C22.2 No. 213
- CAN/CSA-C22.2 No. 61010-1
- CAN/CSA-C22.2 No. 60529
- UL/ANSI/ISA 61010-1
- ANSI - ISA 12 12 01

CAS40D certificates and approvals

CE mark

Declaration of Conformity

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EC directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

COS61D certificates and approvals

Declaration of Conformity

The product meets the requirements of the harmonized European standards. As such, it complies with the legal specifications of the EU directives. The manufacturer confirms successful testing of the product by affixing to it the CE mark.

Ex approvals

Version COS51D-G*8*0
ATEX II 1G / IECEx Ex ia IIC T6 Ga

Version COS51D-O*8*0
FM/CSA IS/NI Cl.1 Div.1 GP: A-D

Version COS51D-K*8*0
The product has been certified in accordance with Directive TR CU 012/2011 which applies in the European Economic Area (EEA). The EAC conformity mark has been affixed to the product.
- EAC Ex, 0Ex ia IIC T6 Ga X
- Zone 0
- Certificate number: TC RU C-DE.AA87.B.00088

COS51D certificates and approvals

Ex approval

Version COS51D-G**

ATEX II 1G/IECEx Ex ia IIC T6 Ga

Version COS51D-O**

FM/CSA IS/NI CL I DIV 1&2 GP A-D

CYA112 certificates and approvals

Explosion protection

The stainless steel version of the CYA112 assembly (CYA112-**21*2**) may also be used in the hazardous area in Zone 1 and 2.

It does not have special Ex identification labeling, as the assembly does not have a potential ignition source of its own and ATEX Directive 94/9/EC therefore does not apply. Potential equalization must be implemented as described in the "Installation conditions" section.

In the case of sensors with accessible metal surfaces, these surfaces must be included in the potential equalization system as indicated in the Operating Instructions for the sensor in question.

Ordering information

For detailed information on the product structure, contact the Sales Center at:
www.addresses.endress.com or http://www.endress.com/ssp200b

Scope of delivery

Included in the delivery depending on the version ordered:
- Modbus Edge Device SCG400
- LTE antenna
- Cable grommet to connect the Ethernet cable for the Modbus TCP connection
- Ethernet connecting cable
- 4-channel transmitter Liquiline CM444 as 230 V or 24 V version
  - Liquiline 230 V: CM444-AAN4AA0F010BCB
  - Liquiline 24 V: CM444-AAN4AA0F060BCB
- Sensors for SSB200B-xxFA:
  - Digital ammonium and nitrate sensor ISEmax: CAS40D-AA1A1B2+F2(G3/G4)
  - Digital oxygen sensor Oxymax: COS61D-AAA1B3
- Sensors for SSB200B-xxFB:
  - Digital oxygen sensor Oxymax: COS51D-AS800
  - Digital measuring cable: CYK10-A102
- Sensors for SSB200B-xxFC:
  - Digital oxygen sensor Oxymax: COS51D-AS800
  - Digital measuring cable: CYK10-A102
- Immersion assembly Flexdip (thread G1) CYA112-AB11A1BA

Supplementary documentation

Water Quality Smart System for Aquaculture SSP200B

Operating Instructions BA02045S/04/EN

Water Quality Smart System for Surface Water SSP100B

- Technical Information TI01550S/04/EN
- Operating Instructions BA02044S/04/EN

Modbus Edge Device SGC400

Technical Information TI01422S/04/EN

Liquiline CM444

- Technical Information TI00444C/07/EN
- Brief Operating Instructions KA01159C/07/EN
- Operating Instructions BA00444C/07/EN
- Installation Instructions EA00009C/07/A2

ISEmax CAS40D

- Technical Information TI00491C/07/EN
- Operating Instructions BA00491C/07/EN

Oxymax COS61D

- Technical Information TI00387C/07/EN
- Brief Operating Instructions KA01133C/07/EN
- Operating Instructions BA00460C/07/EN

Oxymax COS51D	▪ Technical Information TI00413C/07/EN ▪ Brief Operating Instructions KA00413C/07/EN ▪ Operating Instructions BA00413C/07/EN
Measuring cable CYK10	▪ Technical Information TI00118C/07/EN ▪ Operating Instructions BA00118C/07/A2
Flexdip CYA112	▪ Technical Information TI00432C/07/EN ▪ Operating Instructions BA00432C/07/EN

Registered trademarks

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RUT240 is a product of Teltonika Ltd., 08105 Vilnius/Lithuania.

RevPi Core 3 is a product of Kunbus GmbH, 73770 Denkendorf/Germany.

UNO PS is a product of Phoenix CONTACT GmbH & Co. KG, 32825 Blomberg/Germany.

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