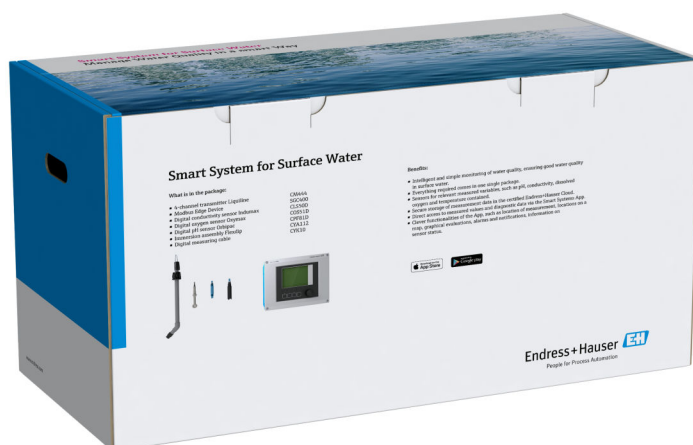


Technical Information

Smart System for Surface Water

SSP100B

Package with smart sensors, for measuring the water quality of rivers or lakes



Application

The quality of water in rivers and lakes can quickly destabilize. Environmental, seasonal and human influences are frequently the reason. A reliable system to monitor water quality is therefore imperative. The Smart System for Surface Water combines high-end sensors with smart technology for data processing. This allows users to check important quality parameters, such as dissolved oxygen, pH value, conductivity or temperature, on their smartphone. Data export supported, e.g. for Smart City applications.

Your benefits

- Smart and simple monitoring of surface water quality, ensure good quality of water in rivers and lakes.
- Sensors for important quality parameters, such as dissolved oxygen, pH value, conductivity 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. The subscription costs depend on the frequency of data transmission and are incurred additionally.

About this document

Symbols used

Safety symbols

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

Symbols for certain types of information

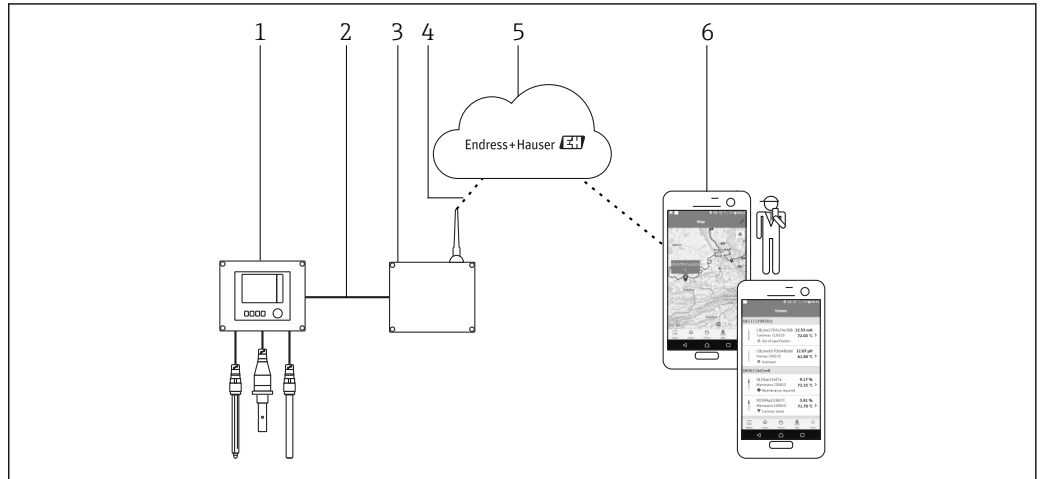
Symbol	Meaning
	Permitted Procedures, processes or actions that are permitted.
	Preferred Procedures, processes or actions that are preferred.
	Forbidden Procedures, processes or actions that are forbidden.
	Tip Indicates additional information.
	Reference to documentation.
	Reference to page.
	Reference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

Function and system design

Function

The Smart System for Surface Water SSP100B monitors surface water. The package contains all the necessary components for this purpose, such as sensors to monitor the temperature, oxygen, conductivity and 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

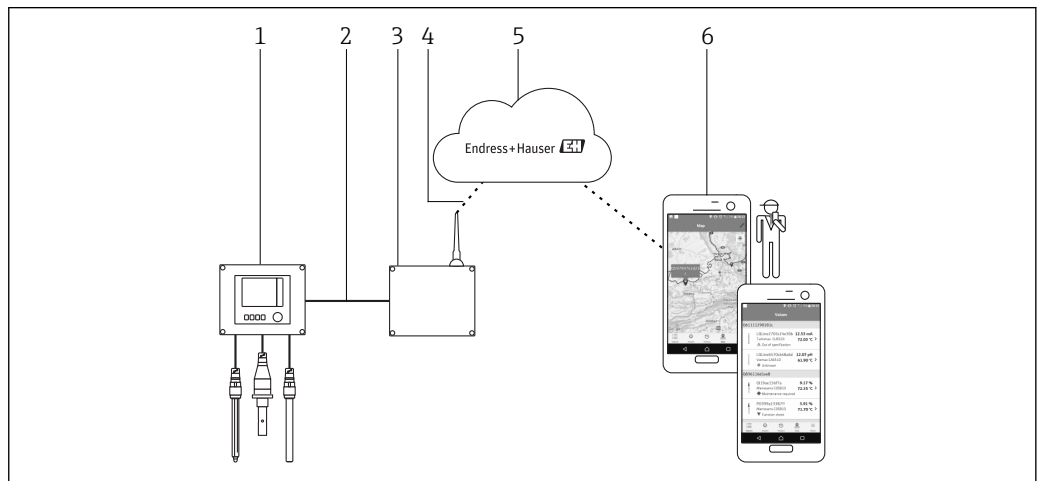
- 1 Field device e.g. Liquiline CM444
- 2 Modbus TCP connection
- 3 Modbus Edge Device SGC400
- 4 LTE connection
- 5 Netilion Cloud
- 6 User application on smartphone

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

CPF81D function and system design

Measuring principle

pH measurement

The pH value is used as a unit of measurement for the acidity or alkalinity of a liquid medium. The membrane glass of the electrode supplies an electrochemical potential which is dependent upon the pH value of the medium. This potential is generated by the selective penetration of H^+ ions through the outer layer of the membrane. An electrochemical boundary layer with an electric potential forms at this point. An integrated Ag/AgCl reference system serves as the required reference electrode. The transmitter converts the measured voltage into the corresponding pH value using the Nernst equation.

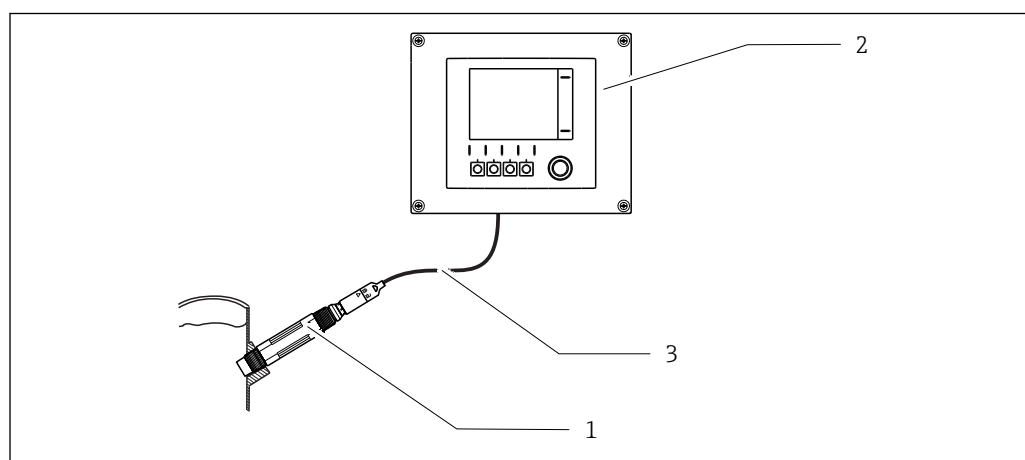
ORP measurement

The ORP potential is a unit of measurement for the state of equilibria between oxidizing and reducing components of a medium. The ORP is measured using a platinum or gold electrode instead of the pH-sensitive glass membrane. Analog to the pH measurement, an integrated Ag/AgCl reference system is used as a reference electrode.

Measuring system

A complete measuring system comprises:

- Sensor CPF81D, CPF81, CPF82D or CPF82
- Transmitter, e.g. Liquiline CM44x/R or Liquiline M CM42
- Measuring cable, e.g. CYK10 or sensor's fixed cable



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3 Example of a measuring system

- 1 Sensor CPF81D
- 2 Liquiline CM44x transmitter
- 3 Measuring cable CYK10

Communication and data transmission

Communication with the transmitter

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

The digital sensors are able to store the following system data in the sensor.

- Manufacturing data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Calibrated slope at 25 °C (77 °F) (CPF81D)
 - Calibrated zero point at 25 °C (77 °F) (CPF81D)
 - Calibrated offset (ORP mV measuring mode)
 - Slope as % (ORP % measuring mode)
 - Temperature offset
 - Number of calibrations
 - Serial number of the transmitter used for the last calibration
 - Calibration database (stores the last 8 calibrations in the Memosens head)
- Application data
 - Temperature application range
 - pH application range (CPF81D)
 - ORP application range
 - Date of first commissioning
 - Maximum temperature value
 - Operating hours at temperatures above 80 °C (176 °F) and 100 °C (212 °F)
 - Operating hours at very low and very high pH values (Nernst voltage below -300 mV, above +300 mV)

Dependability

Reliability

Easy handling

Sensors with Memosens technology have integrated electronics that allow for saving calibration data and further information such as total hours of operation and 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 .
- Maintenance intervals can be defined based on all stored sensor load and calibration data and predictive maintenance is possible.
- The sensor history can be documented on external data carriers and evaluation programs at any time. Thus, the current application of the sensors can be made to depend on their previous history.

Integrity

Data security thanks to digital data transmission

Memosens technology digitizes the measured values in the sensor and transmits the data to the transmitter using 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

Safety

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:

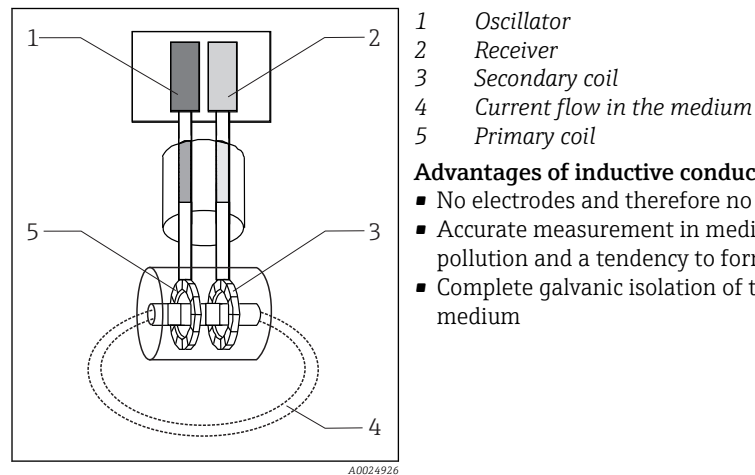
- All problems caused by moisture are eliminated.
 - Plug-in connection free from corrosion
 - Measured value distortion from moisture is not possible.
 - The plug-in system can even be connected under water.
- The transmitter is galvanically decoupled from the medium. Issues concerning "symmetrical high-impedance" or "asymmetry" or an impedance converter are a thing of the past.
- EMC safety is guaranteed by screening measures for the digital transmission of measured values.

CLS50D function and system design

Measuring principle

Inductive conductivity measurement

An oscillator (1) generates an alternating magnetic field in the primary coil (5), which induces a current flow (4) in the medium. The strength of the current depends on the conductivity and thus on the ion concentration in the medium. The current flow in the medium, in turn, generates a magnetic field in the secondary coil (3). The resulting induced current is measured by the receiver (2) and used to determine the conductivity.



Advantages of inductive conductivity measurement:

- No electrodes and therefore no polarization effects
- Accurate measurement in media with a high degree of pollution and a tendency to form buildup
- Complete galvanic isolation of the measurement and the medium

Measuring system

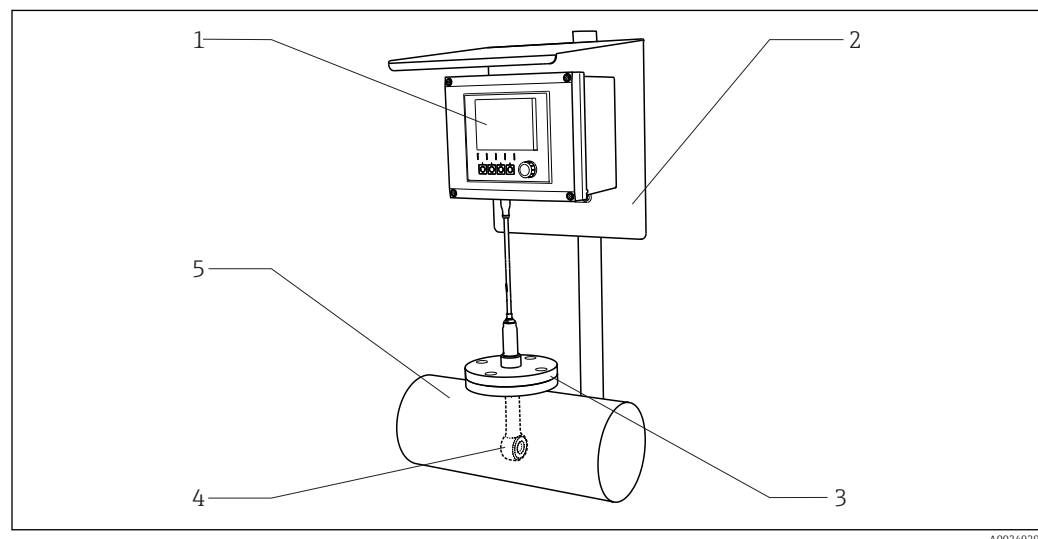
CLS50D

A complete measuring system comprises:

- A CLS50D inductively measuring conductivity sensor with fixed cable
- A transmitter, e.g. Liquiline CM44x

Optional:

- Weather protection for the field installation of the transmitter
- Assembly to install the sensor in vessels or pipes, e.g. CLA111



4 Example of a measuring system

- 1 Liquiline CM44x transmitter
2 Protective cover
3 Pipe nozzle with flange DN50 PN16
4 CLS50D sensor, version with flange DN50 PN16 and fixed cable with M12 connector
5 Pipe

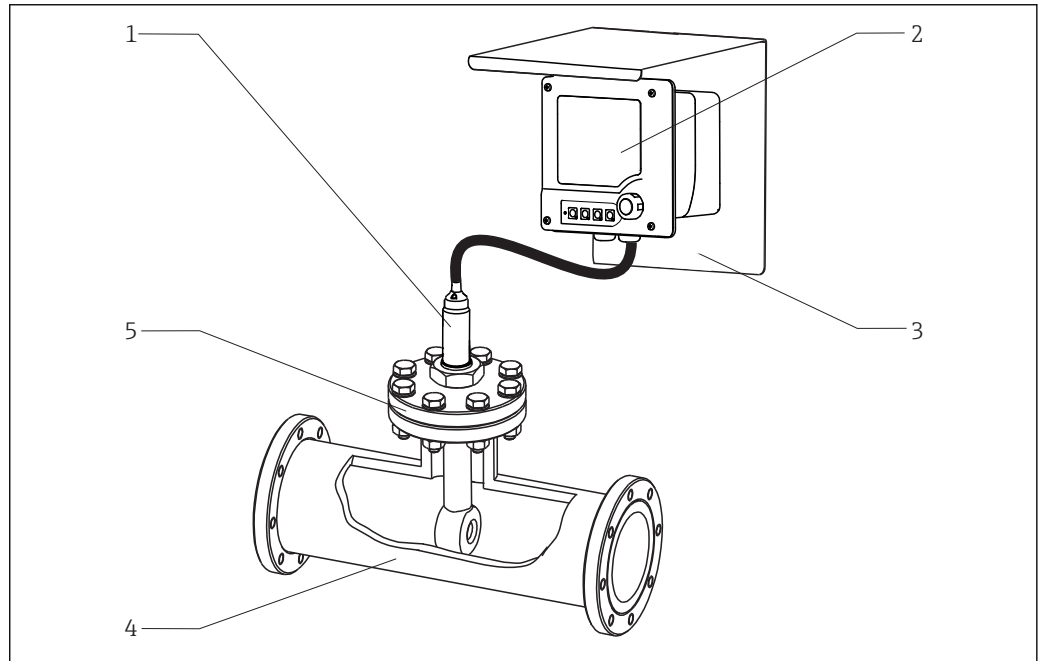
CLS50

A complete measuring system comprises:

- A CLS50 inductively measuring conductivity sensor with fixed cable
- A transmitter, e.g. Liquiline M CM42

Optional:

- Weather protection for the field installation of the transmitter
- Assembly to install the sensor in vessels or pipes, e.g. CLA111



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5 Example of a measuring system

- 1 CLS50 sensor, version with lap joint flange and fixed cable with ferrules
- 2 Liquiline CM42 transmitter
- 3 Protective cover
- 4 Pipe
- 5 Pipe nozzle with flange connection

Communication and data processing (CLS50D only)

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 are able to store the following system data in the sensor:

- Manufacturing data
 - Serial number
 - Order code
 - Date of manufacture
- Calibration data
 - Calibration date
 - Cell constant
 - Delta cell constant
 - Calibration values
 - Number of calibrations
 - Serial number of the transmitter used for the last calibration
- Application data
 - Temperature application range
 - Conductivity application range
 - Date of first commissioning
 - Maximum temperature value
 - Hours of operation under extreme conditions
 - Hours of operation at high temperatures

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

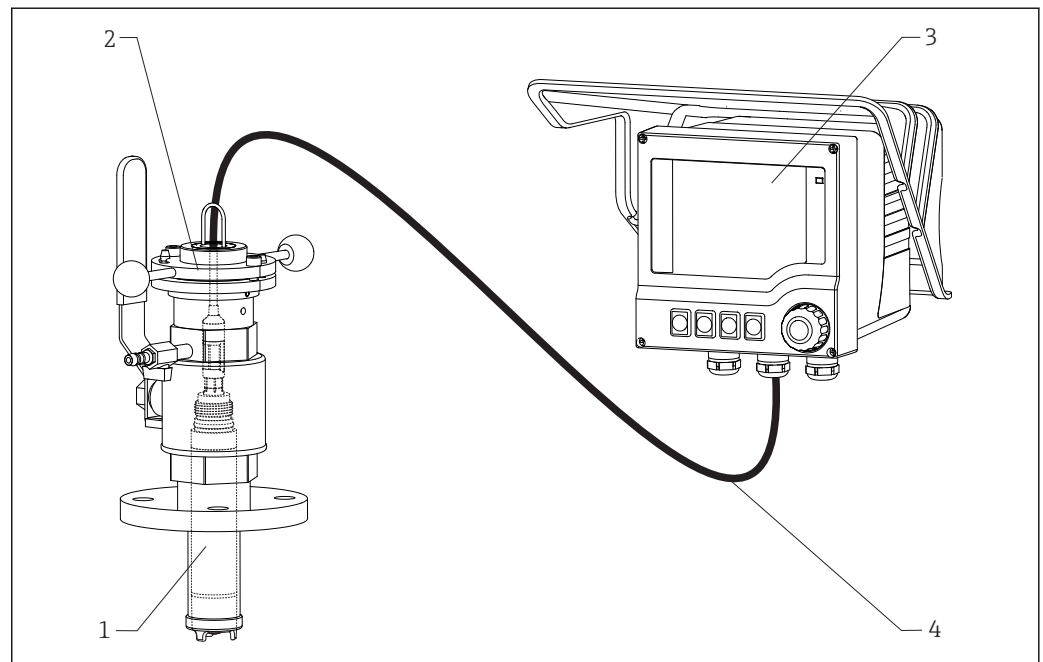
Measuring system

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



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6 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 → 27

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

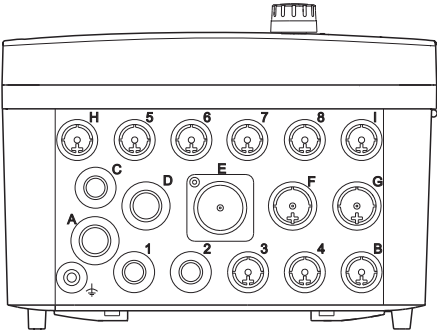
Fuse not exchangeable

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
	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

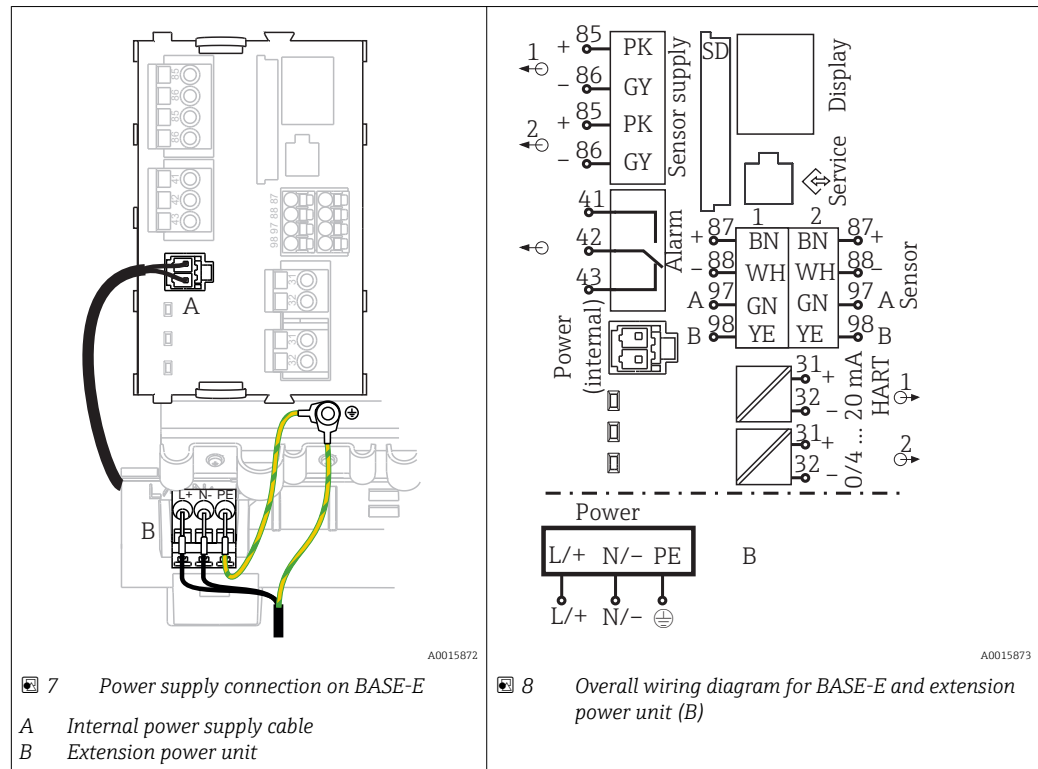
Cable specification

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.

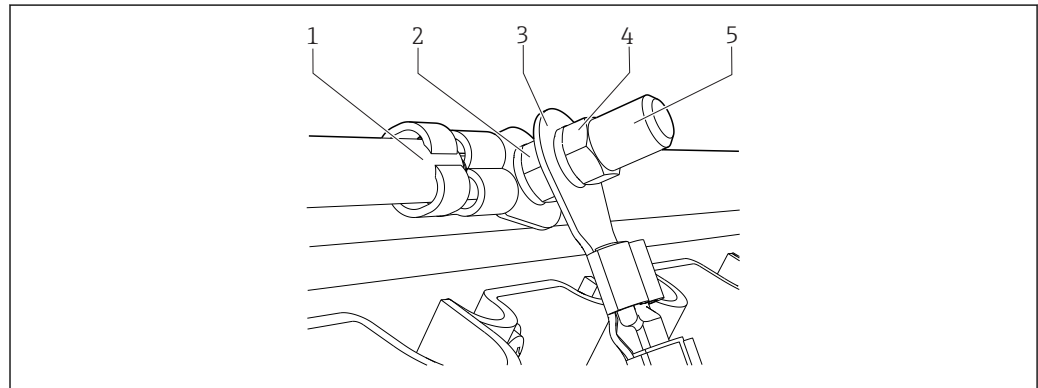
Electrical connection Liquiline CM444

Connection of Liquiline CM444 to supply voltage



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)



9 Protective ground or grounding connection

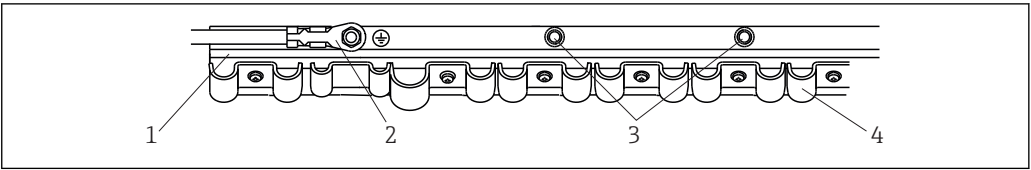
NOTICE

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



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10 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

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 μ A (with current values < 4 mA)

< 50 μ A (with current values 4 to 20 mA)

at 25 °C (77 °F) each

Additional measured error depending on the temperature:

< 1.5 μ A/K

Frequency tolerance of digital inputs and outputs

$\leq$ 1%

Resolution of current inputs and outputs

< 5 μ A

Repeatability

→ Documentation of the connected sensor

CLS50D performance characteristics**Conductivity response time** $t_{95} \leq 2 \text{ s}$ **Temperature response time**

PEEK version:

 $t_{90} \leq 7 \text{ min}$

PFA version:

 $t_{90} \leq 11 \text{ min}$ **Maximum measured error**

-20 to 100 °C (-4 to 212 °F):

 $\pm(5 \mu\text{S/cm} + 0.5 \% \text{ of reading})$

> 100 °C (212 °F):

 $\pm(10 \mu\text{S/cm} + 0.5 \% \text{ of reading})$ **Repeatability**

0.2% of reading

Linearity

1.9 % (only applies in the 1 to 20 mS/cm measuring range)

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■ t_{98} : 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 ¹⁾

■ 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 $\pm 1 \% \text{ of the measured value } ^{2)}$ **Repeatability** $\pm 1 \% \text{ of reading}$ **Long-term drift**

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

1) At the specified reference operating conditions

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

Measuring range drift: < 0.1 % per week at 30 °C (86 °F) ³⁾

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 Surface Water SSP100B", see the Operating Instructions →  26

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)

3) Under constant conditions in each case

CM444 environment**Ambient temperature range****CM444**

- Generally -20 to 55 °C (0 to 130 °F), with the exception of packages under the second point in the list
- -20 to 50 °C (0 to 120 °F) for the following packages:
 - CM444-**M40A7FI*****+...
 - CM444-**M40A7FK*****+...
 - CM444-**N40A7FI*****+...
 - CM444-**N40A7FK*****+...
 - CM444-**M4AA5F4*****+...
 - CM444-**M4AA5FF*****+...
 - CM444-**M4AA5FH*****+...
 - CM444-**M4AA5FI*****+...
 - CM444-**M4AA5FK*****+...
 - CM444-**M4AA5FM*****+...
 - CM444-**M4BA5F4*****+...
 - CM444-**M4BA5FF*****+...
 - CM444-**M4BA5FH*****+...
 - CM444-**M4BA5FI*****+...
 - CM444-**M4BA5FK*****+...
 - CM444-**M4BA5FM*****+...
 - CM444-**M4DA5F4*****+...
 - CM444-**M4DA5FF*****+...
 - CM444-**M4DA5FH*****+...
 - CM444-**M4DA5FI*****+...
 - CM444-**M4DA5FK*****+...
 - CM444-**M4DA5FM*****+...

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/s²)

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.

CPF81D environment

Ambient temperature range

NOTICE

Danger of frost damage

- The sensor must not be used at temperatures below 0 °C (32 °F).

Storage temperature

0 to 50 °C (32 to 120 °F)

Degree of protection

CPF81D, CPF82D

IP 68 (10 m (33 ft) head of water at 25 °C (77 °F) over 45 days, 1 mol/l KCl)

CPF81, CPF82 with TOP68 plug-in head

IP 68 (1 m (3.3 ft) water column, 50 °C (122 °F), 168 h)

CPF81, CPF82 with fixed cable

IP 67

Electromagnetic compatibility

Interference emission and interference immunity in accordance with EN 61326-1:2006, EN 61326-2-3:2006

Memosens versions
for ESD > 8 kV: reduced accuracy ±1.5 pH

CLS50D environment

Ambient temperature range

CLS50D

-10 to +60 °C (+10 to +140 °F)

Storage temperature

-20 to +80 °C (0 to 180 °F)

Degree of protection

IP 68 / NEMA type 6 (sensor in installed state with genuine seal)

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)

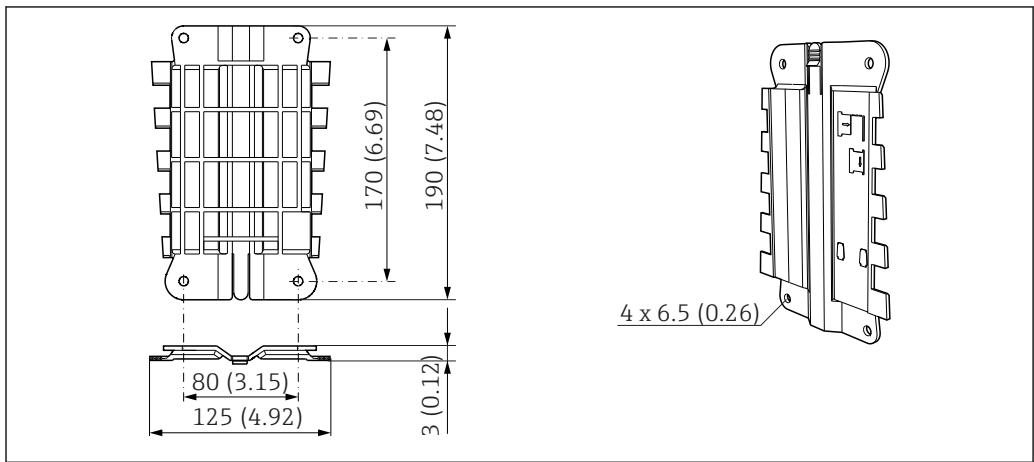
Mechanical construction

SGC400 mechanical construction

Design, dimensions

Mounting plate

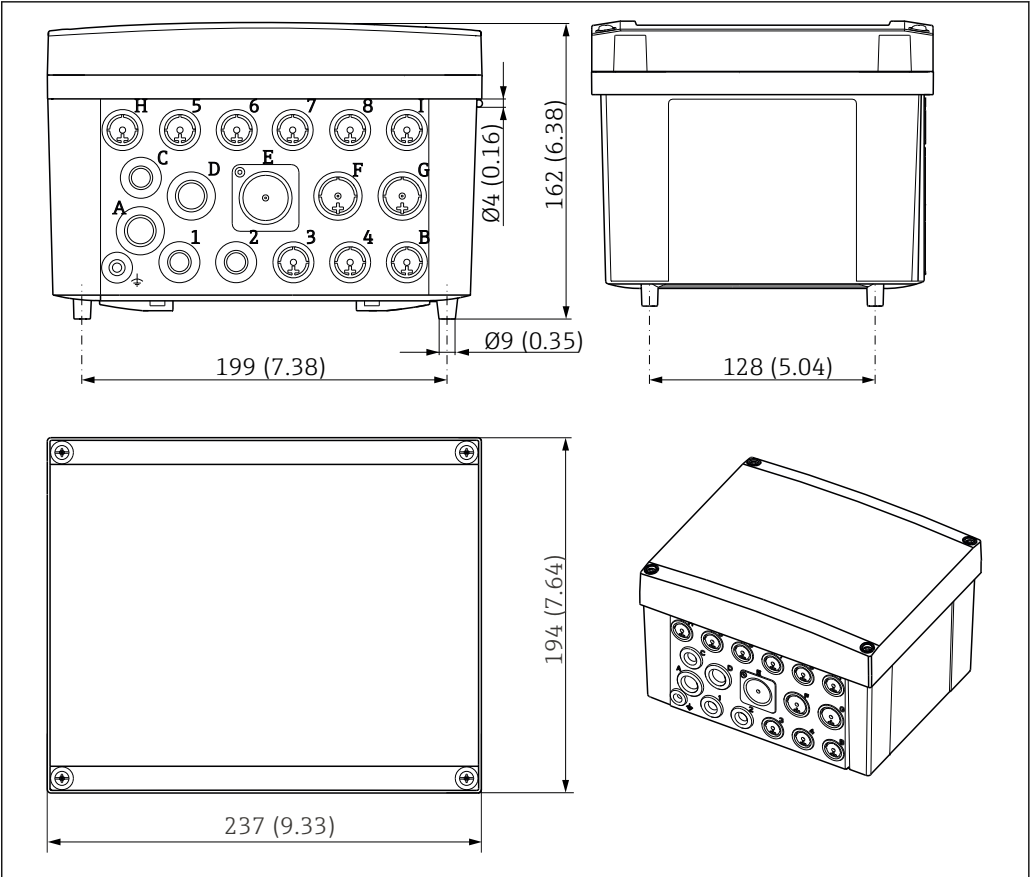
190 mm · 125 mm · 3 mm (7.48 in · 4.92 in · 0.12 in)



11 Dimensions of mounting plate

Modbus Edge Device SGC400

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



12 Modbus Edge Device SGC400 dimensions

Weight

2.3 kg (5.08 lb)

Materials

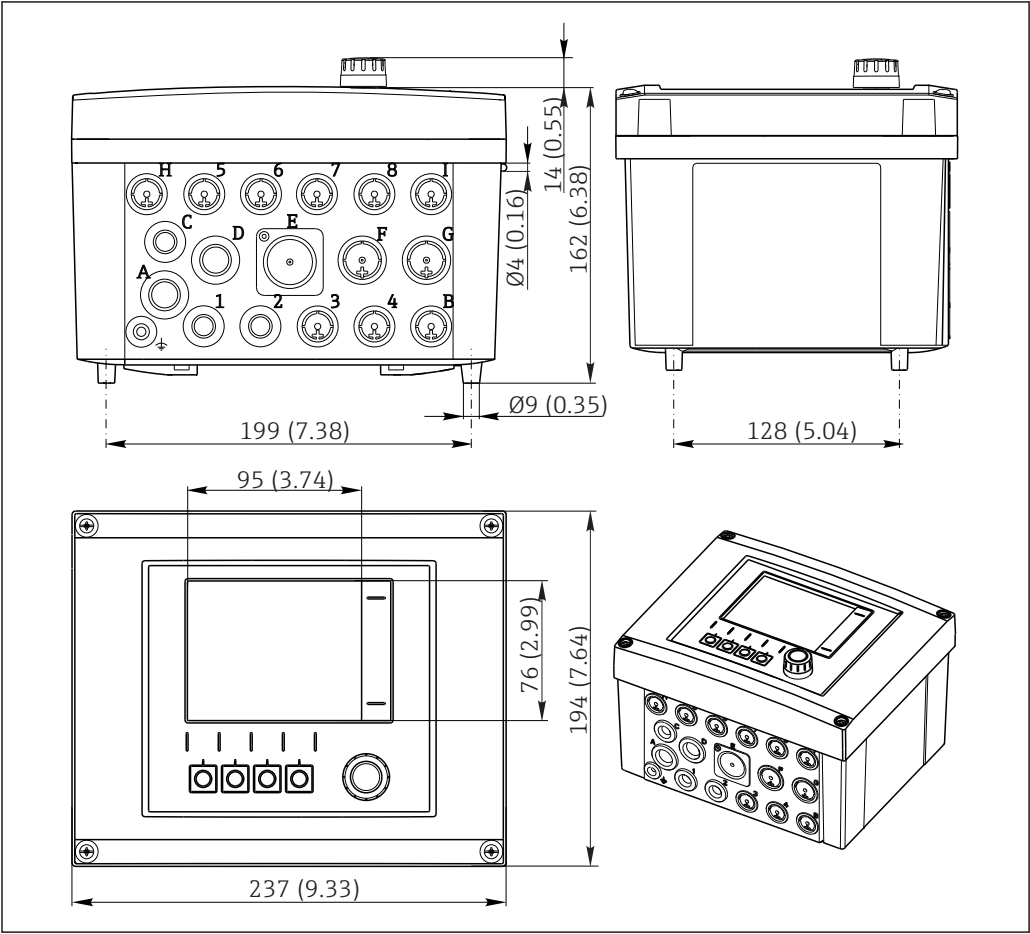
Housing	PC-FR
Seal	EPDM
Carrier board	Stainless steel 1.4301, AISI304
Cable entries	Polyamide V0 as per UL94

Antenna

MIMO directional antenna

CM444 mechanical construction

Dimensions



13 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)

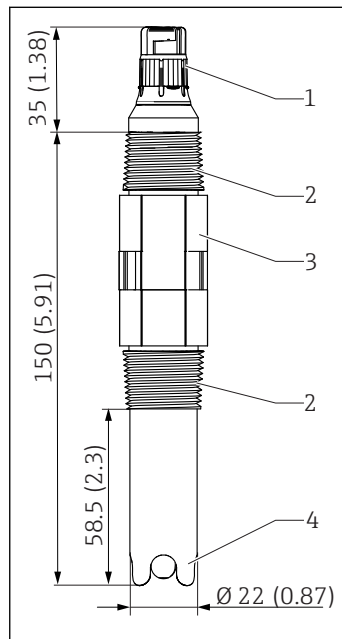
Materials

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

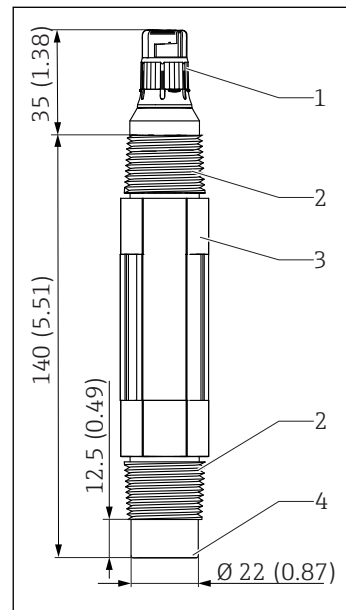
CPF81D mechanical construction

Design, dimensions

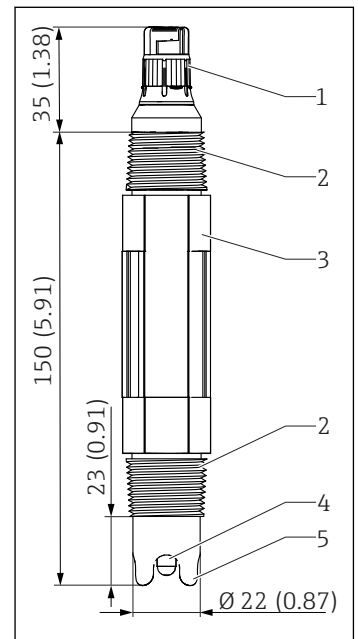
CPF81D, CPF82D



A0024672



A0024671



A0024673

14 CPF81D, long shaft, protection guard

- 1 Memosens plug-in head
- 2 NPT 3/4" thread
- 3 Across flats AF 26
- 4 Protection guard

15 CPF81D, flat membrane

- 1 Memosens plug-in head
- 2 NPT 3/4" thread
- 3 Across flats AF 26
- 4 Flat membrane

16 CPF82D, short shaft, protection guard

- 1 Memosens plug-in head
- 2 NPT 3/4" thread
- 3 Across flats AF 26
- 4 Platinum ring
- 5 Protection guard

Dimensions in mm (inch)

Weight

0.12 to 0.15 kg (0.26 to 0.33 lbs, depending on version and without cable)

Materials

Housing, electrode shaft

PPS

pH electrode (in contact with medium)

Lead-free membrane glass, suitable for process applications

ORP electrode (in contact with medium):

Platinum ring

Double chamber reference system:

KNO₃ and KCl/AgCl

Process connection

NPT 3/4"

Integrated preamplifier (optional)

Structure

cast in sensor body

Power supply

via integrated coin cells

Reference potential:

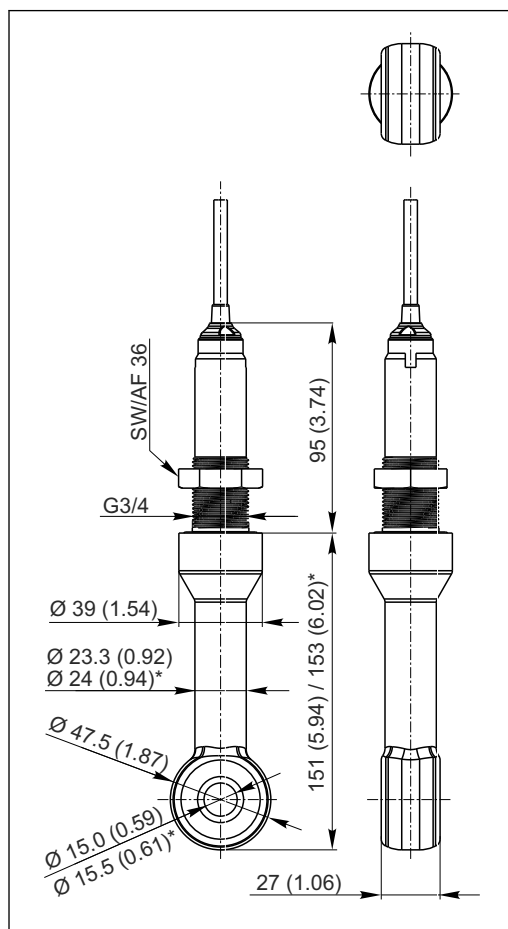
reference electrode



With preamplifier versions, the sensor check function (SCS) of the transmitter is ineffective and should be turned off.

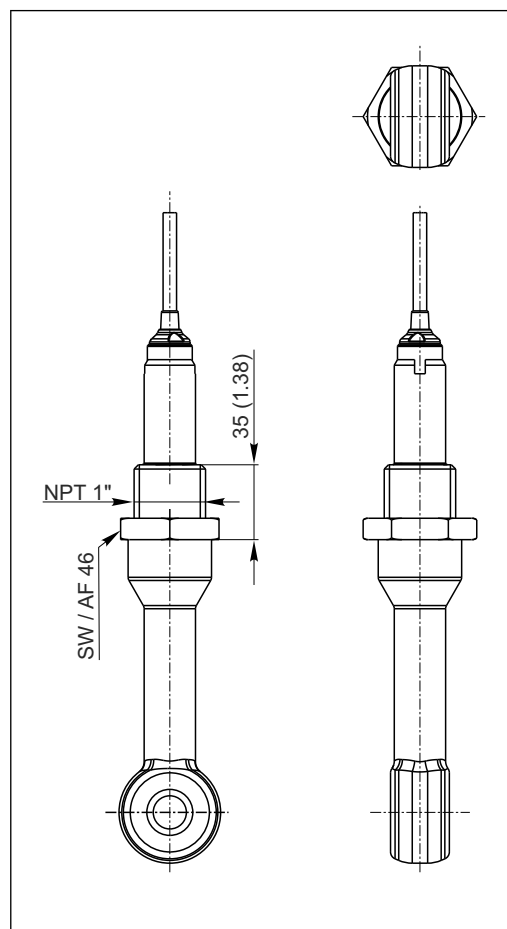
CLS50D mechanical construction

Dimensions



17 Version with G $\frac{3}{4}$ thread, dimensions in mm (inch)

* Dimension for PEEK version



18 Version with NPT 1" thread, dimensions in mm (inch)

Weight

Approx. 0.65 kg (1.43 lbs)

Materials

Sensor	PEEK, PFA (depending on version)
Sensor seal	VITON, CHEMRAZ (depending on version)
Process connections	
G $\frac{3}{4}$	CLS50-**A: stainless steel 1.4571 (AISI 316Ti) CLS50-**B/C: PEEK GF30 CLS50D-**D: stainless steel 1.4571 (AISI 316Ti) CLS50D-**B/C: PEEK GF30
NPT 1"	PEEK
Fixed flange	Stainless steel 1.4404 (AISI 316L)
Sealing disk	GYLON (PTFE ceramic-filled)
Lap joint flange	PP-GF
Flange combined with lap joint flange	PVDF

Process connections

- G $\frac{3}{4}$ thread
- NPT 1" thread
- Lap joint flange EN 1092 DN50 PN10
- Lap joint flange ANSI 2" 150 lbs
- Lap joint flange JIS 10K 50A
- Flange EN 1092-1 DN50 PN16
- Flange ANSI 2" 300 lbs
- Flange JIS 10K 50A

Chemical resistance

Medium	Concentration	PEEK	PFA	CHEMRAZ	VITON
Sodium hydroxide solution NaOH	0 to 50 %	20 to 100 °C (68 to 212 °F)	Not suitable	0 to 150 °C (32 to 302 °F)	Not suitable
Nitric acid HNO ₃	0 to 10 %	20 to 100 °C (68 to 212 °F)	20 to 80 °C (68 to 176 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
	0 to 40 %	20 °C (68 °F)	20 to 60 °C (68 to 140 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
Phosphoric acid H ₃ PO ₄	0 to 80 %	20 to 100 °C (68 to 212 °F)	20 to 60 °C (68 to 140 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
Sulfuric acid H ₂ SO ₄	0 to 2.5 %	20 to 80 °C (68 to 176 °F)	20 to 100 °C (68 to 212 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
	0 to 30 %	20 °C (68 °F)	20 to 100 °C (68 to 212 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
Hydrochloric acid HCl	0 to 5 %	20 to 100 °C (68 to 212 °F)	20 to 80 °C (68 to 176 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)
	0 to 10 %	20 to 100 °C (68 to 212 °F)	20 to 80 °C (68 to 176 °F)	0 to 150 °C (32 to 302 °F)	0 to 120 °C (32 to 248 °F)

COS51D mechanical construction**Design, dimensions**

For detailed information on "Oxymax COS51D", see the Technical Information → 27

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 $\frac{3}{4}$ "

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 → 27

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

CPF81D certificates and approvals

Ex approval (optional)

FM IS NI Cl. I Div.1&2, Groups A-D

CLS50D 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.

Ex approvals

CLS50D-BA and CLS50-G

ATEX II 1G Ex ia IIC T4/T6 Ga

CLS50D-BV

ATEX II 3G Ex ic IIC T4/T6

CLS50D-IA

IECEx ia IIC T4/T6 Ga

CLS50-V

ATEX II 3G Ex ic IIC T4/T6 Gc + NEPSI Ex ic IIC T4/T6 Gc

CLS50D-NA and CLS50-H

NEPSI Ex ia IIC T4/T6 Ga

CLS50D-FB and CLS50-O

FM IS NI Cl.I Div.1&2, Group A-D

CLS50D-C2 and CLS50-S

CSA IS NI Cl.I, II, III Div.1&2, Group A-G

CLS50-T

TIIS Ex ia IIC T4

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/ssp100b>

Scope of delivery

The scope of delivery comprises:

- Modbus Edge Device SCG400
- LTE antenna
- Cable grommet to connect the Ethernet cable for the Modbus TCP connection
- 4-channel transmitter Liquiline CM444 as 230 V or 24 V version
 - Liquiline 230 V: CM444-AAN4AA0F010BCB
 - Liquiline 24 V: CM444-AAN4AA0F060BCB
- Digital pH sensor Orbipac: CPF81D-7NN11
- Digital conductivity sensor Indumax: CLS50D-AA1B22
- Digital oxygen sensor Oxymax COS51D-AS800
- Digital measuring cable: CYK10-A102
- Immersion assembly Flexdip (thread G3/4): CYA112-AB11A1BC
- Immersion assembly Flexdip (thread NPT3/4): CYA112-AB11A1BB

Supplementary documentation

Water Quality Smart System for Surface Water SSP100B

Operating Instructions BA02044S/04/EN

Water Quality Smart System for Aquaculture SSP200B

- Technical Information TI01551S/04/EN
- Operating Instructions BA02045S/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
Orbipac CPF81D	■ Technical Information TI00191C/07/EN ■ Operating Instructions BA01572C/07/A2
Indumax CLS50D	■ Technical Information TI00182C/07/EN ■ Operating Instructions BA00182C/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

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