

# Multi Parameter Sensor

## *MultiSens C600 R*

**Immersion Sensor for Conductivity, Temperature, Oxygen, pH and Redox Measurement**



### **Application**

MultiSens C600 R is a multi parameter sensor for conductivity, temperature, oxygen, pH and redox measurement. The sensor is specifically suitable for the following applications:

- River monitoring
- Lake monitoring
- Monitoring of fish farming
- Drinking water and groundwater monitoring
- Industrial monitoring
- Monitoring of wastewater treatment plants

### **Your benefits**

- Simultaneous monitoring of up to 6 parameters
- Measurement in fresh water as well as in salt water, brackish water or sewage water
- Measurement up to a depth of 60m / 196.9 ft
- 2 selectable measuring units for oxygen measurement (mg/l; % Sat)
- Internal data logger



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## Function and system design

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### Measuring principles

The Multi Parameter Sensor C600 R uses the following measuring principles:

#### **Conductive conductivity measurement**

The conductivity of liquids is measured with a 4-pole measuring system.

The electric resistance or its reciprocal value, the conductance  $G$ , is measured according to Ohm's law. The specific conductivity  $\kappa$  is determined using the cell constant  $k$  which is dependent on the sensor geometry.

#### **Temperature measurement**

Temperature in liquids is determined by an integrated NTC sensor (NTC = negative temperature coefficient, i.e. the sensor resistance decreases with rising temperature). NTC sensors are therefore used mainly for temperature measurement in ambient temperature ranges between 0 ... 65 °C / 32 ... 149 °F.

#### **Oxygen measurement**

Dissolved oxygen is determined using the amperometric principle acc. to Clark. A PTFE membrane encloses the electrolyte solution with the immersed electrodes in the so called Clark cell. The oxygen molecules of the medium diffuse through the sensor membrane and are reduced to hydroxide ions ( $\text{OH}^-$ ) on the gold cathode. On the silver anode, silver is oxidised to silver ions ( $\text{Ag}^+$ ) and forms a silver ion layer. The electron release from the gold cathode and the electron acceptance at the silver anode result in a current flow, which is proportional to the concentration of dissolved oxygen in the medium under constant conditions.

The transmitter transforms the current signal into the measuring units concentration in mg/l and saturation index in % sat.

#### **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  $\text{H}^+$  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 reference electrode.

The transmitter converts the measured voltage into the corresponding pH value using the Nernst equation.

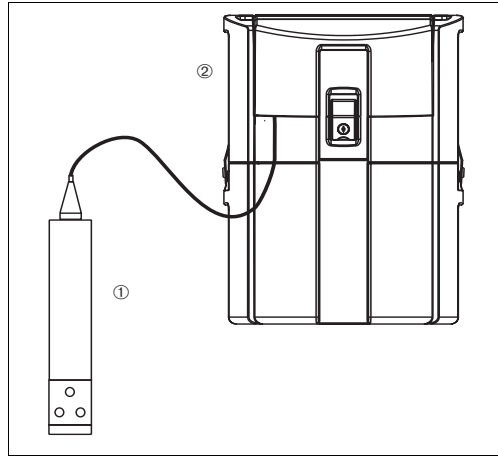
#### **Redox measurement**

The redox potential is a unit of measurement for the state of equilibria between oxidising and reducing components of a medium. Redox potential is measured similarly to the pH value.

A platinum or gold electrode is used instead of pH-sensitive membrane glass. Analog to the pH measurement, an integrated Ag/AgCl reference system is used as a reference electrode.

**Measuring system**

- A complete measuring system comprises:
- Multi parameter sensor MultiSens C600 R
  - Sampler LiquiPort 2000 (version RPT 20-xG)
  - Flow vessel (optional)



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Example for a measuring system C600 R with LiquiPort 2000

- 1 MultiSens C600 R
- 2 LiquiPort 2000

**Input**

**Measured variables**

- Conductivity
- Temperature
- Dissolved oxygen (optional)
- pH (optional)
- Redox (optional)
- Salinity (calculated from conductivity and temperature)

**Measuring ranges**

Conductivity	0 ... 100 mS/cm
Temperature	-5 ... +45 °C / 23 ... 113 °F
Dissolved oxygen	0 ... 50 mg/l (ppm)
	0 ... 500 % saturation
pH	0 ... 14 pH
Redox	-999 ... +999 mV
Salinity	0 ... 70 µg/l (ppt)

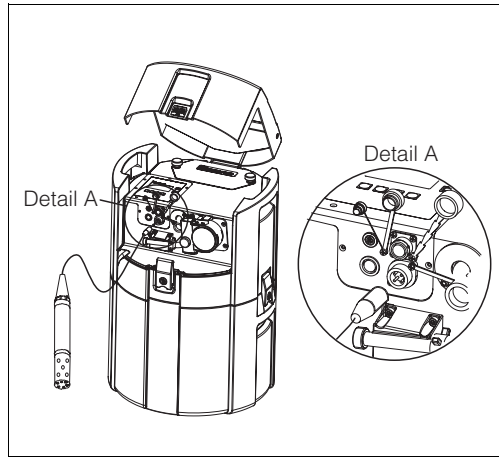
## Performance characteristics

<b>Reference conditions</b>	25 °C / 77 °F	
<b>Measured value resolution</b>	Conductivity	0.001 mS/cm or 0.1 mS/cm (dependent on meas. range)
	Temperature	0.01 °C / 0.01K
	Dissolved oxygen	0.01 mg/l (ppm)
		0.1% saturation
	pH	0.01 pH
	Redox	0.1 mV
	Salinity	0.01 µg/l (ppt)
<b>Measured error</b>	Conductivity	±0.5% of measured value + 0.001 mS/cm
	Temperature	±0.15 °C / 0.15K
	Dissolved oxygen	Measuring range 0 ... 20 mg/l (ppm): ±2% of measured value
		Measuring range 20 ... 50 mg/l (ppm): ±6% of measured value
		Measuring range 0 ... 200%: ±2% of measured value
		Measuring range 200 ... 500%: ±6% of measured value
	pH	±0.2 pH
	Redox	±20 mV
	Salinity	±1% of measured value

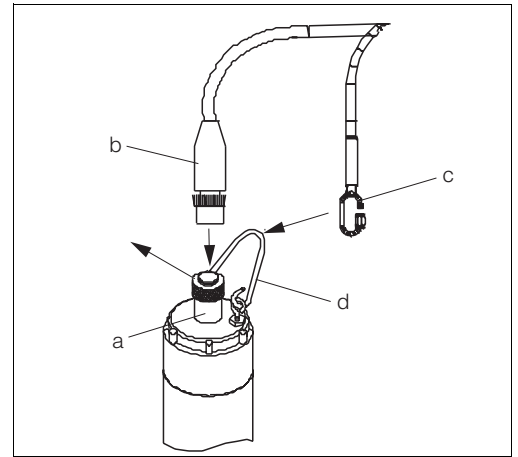
## Electrical connection

### Cable connection

The sensor C600 R is connected to the displaying instrument by the sensor cable with plug. Simply plug the cable plug into the socket of the LiquiPort 2000.



Cable connection of C600 R to LiquiPort 2000



Installation of the cable strain release  
(for sensors with detachable cable)

- a Sensor bulkhead connector
- b Cable plug
- c Release hook
- d Bail

Installing the cable strain release:

1. Remove the waterproof protection cover of the sensor bulkhead connector.
2. Plug the cable plug onto the sensor bulkhead connector.
3. Hook the release hook into the bail and tighten it.

### Cable lengths

- 7.5m / 25 ft
- 15m / 50 ft
- 30m / 100 ft
- max. cable length: 60m / 196.9 ft

### Supply voltage

12 V DC (supply via LiquiPort 2000)

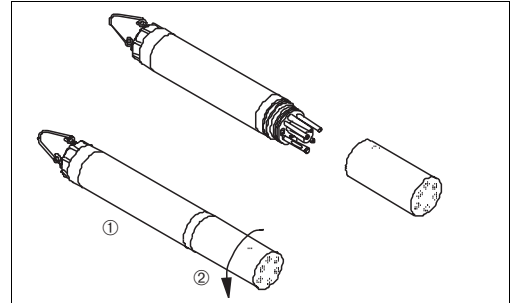
## Installation

### Sensor installation

To prepare the sensor for operation, first take the following steps:

#### Remove the sensor cap:

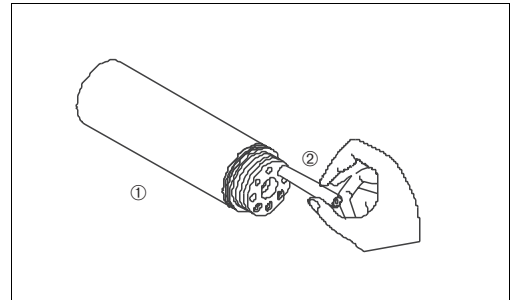
- 1 MultiSens sensor
- 2 Unscrew the sensor cap counterclockwise.



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#### Install or replace the pH reference sensor:

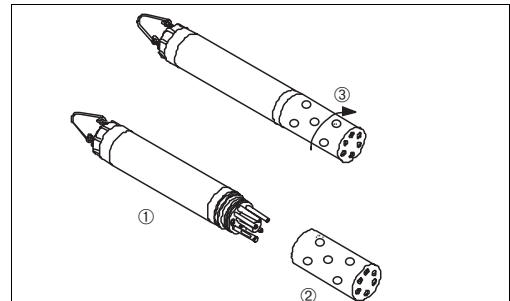
- 1 MultiSens sensor
- 2 pH reference sensor



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#### Install the sensor protection guard:

- 1 MultiSens sensor
- 2 Protection guard
- 3 Tighten the protection guard clockwise.



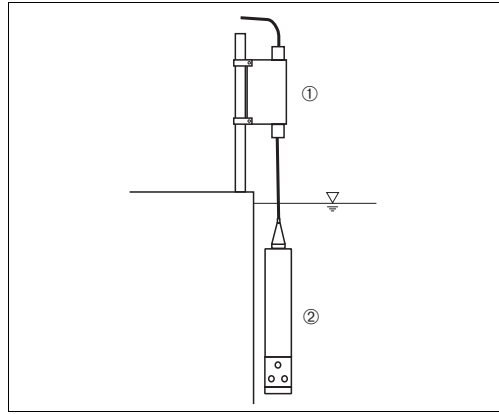
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### Installation instructions



Note!

- Install the sensor so that it is freely suspended in the water.
- When installing the sensor, make sure the sensor cannot be damaged (e.g. due to too little wall distance during strong flow).
- Make sure the sensor is completely immersed at changing water levels.



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Mounting example of the sensor with mooring kit

- 1 Mooring kit
- 2 Sensor

## Environment

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<b>Storage temperature</b>	-40 ... +60 °C / -40 ... 140 °F (without pH and oxygen sensors installed) -10 ... +60 °C / 14 ... 140 °F (with pH and oxygen sensors installed)
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<b>Relative humidity</b>	5 ... 95 %
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<b>Ingress protection</b>	IP 68 / NEMA 6
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## Process

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<b>Process temperature</b>	-5 ... +45 °C / 23 ... 113 °F
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<b>Immersion depth</b>	max. 60m / 196.9 ft
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<b>Process pressure</b>	non-pressurised
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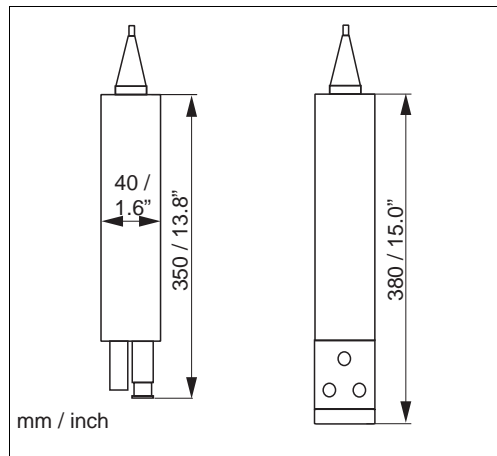
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<b>Flow</b>	no minimum flow required
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## Mechanical construction

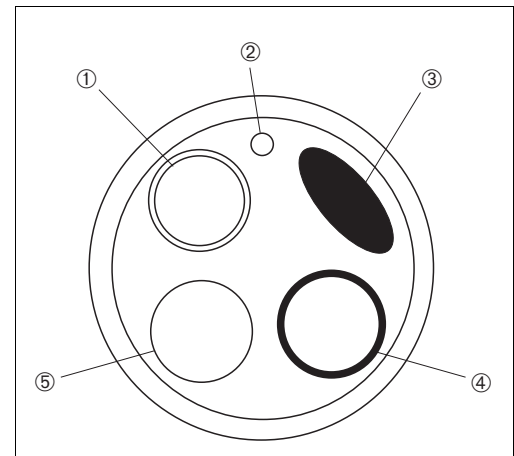
### Design, dimensions



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*Dimensions MultiSens C600 R*

left: without protection guard  
right: with protection guard



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*Design of sensor head MultiSens C600 R  
(full assembly)*

1 pH or pH/Redox  
2 Temperature  
3 Conductivity  
4 Dissolved oxygen  
5 pH reference



#### Note!

- Sensor head replacement may only be carried out by the manufacturer. In case of a defective sensor, please return the MultiSens to your supplier.
- The pH reference sensor can easily be replaced by unscrewing.

**Weight** approx. 0.5 kg / 1.1 lb (without cable)

**Materials (in contact with medium)** Sensor PVC, stainless steel SS 316  
O-rings Viton



## Ordering information

### Product structure MultiSens C600 R

Multi parameter immersion sensor with integrated sensor heads for online measurement of water quality. Standard version with temperature sensor and conductivity sensor (4-contact nickel sensor). Communication protocol RS 232 for data transfer and software update. Inclusive sensor protection guard, calibration vessel and maintenance kit.

Parameter	
A	Standard version without additional sensors
B	with additional pH sensor
C	with additional pH/redox sensor
D	with additional oxygen sensor
E	with additional pH and oxygen sensor
F	with additional pH/redox and oxygen sensor
Y	Special version acc. to customer specification
Cable length	
0	no cable
1	7.5m / 25 ft cable
2	15m / 50 ft cable
3	30m / 100 ft cable
9	Special version acc. to customer specification
Cable connection	
F	Fixed cable
S	Plug
Y	Special version acc. to customer specification
Additional equipment	
0	no additional equipment
9	Special version acc. to customer specification
C600R-	complete order code

## Scope of delivery

### Scope of delivery

The scope of delivery comprises:

- 1 multi parameter sensor MultiSens C600 R with cable (cable length depending on version)
- 1 sensor cap for storage and calibration
- 1 sensor protection guard
- 1 maintenance kit for MultiSens C600 R
- 1 membrane kit for oxygen sensor (with versions -D, -E, -F)
- 1 reconditioning kit for oxygen sensor (with versions -D, -E, -F)
- 1 Technical Information TI 371C/07/en

## Accessories

### Connection accessories

#### Mains supply unit with adapter cable

- Mains supply unit (wide range) + adapter cable for PC  
Order no.: 51513215

#### Measuring cable with plug

- Measuring cable 7.5m / 25 ft  
Order no.: 51513212
- Measuring cable 15m / 50 ft  
Order no.: 51513213
- Measuring cable 30m / 100 ft  
Order no.: 51513214

### Sensor accessories

#### Flow vessel

- Flow vessel for hose connection  
Order no.: 51513521

#### Mooring kit

- Mooring kit for sensor guidance in flowing media  
Order no.: 51513217

### Maintenance kits

- Maintenance kit  
(brush, lubricant, O-ring set, dummy plug pH)  
Order no.: 51513206
- Calibration and transport kit  
(Calibration and transport box with cover and moistening sponge)  
Order no.: 51513209
- Membrane kit for oxygen sensor  
(Electrolyte solution, membrane foil set, instructions for membrane replacement)  
Order no.: 51513210
- Reconditioning kit for oxygen sensor  
(Abrasive foil, instructions for sensor reconditioning)  
Order no.: 51513211

### Sensor heads

- pH reference sensor  
Order no.: 51513208

### Calibration solutions

#### pH

Technical buffer solutions for pH, accuracy 0.02 pH, traceable to NIST/DIN

- pH 4.0 red, 100 ml, Order no. CPY 2-0
- pH 4.0 red, 1000 ml, Order no. CPY 2-1
- pH 7.0 green, 100 ml, Order no. CPY 2-2
- pH 7.0 green, 1000 ml, Order no. CPY 2-3
- pH 9.2 blue, 100 ml, Order no. CPY 2-4
- pH 9.2 blue, 1000 ml, Order no. CPY 2-5

#### Conductivity

Precision solution for conductivity, accuracy  $\pm 0.5\%$ , traceable to SRM (Standard Reference Material) by NIST for qualified calibration of conductivity measuring systems acc. to ISO, with temperature table

- CLY 11-C, 1.406 mS/cm (reference temperature 25 °C / 77 °F), 500 ml, Order no. 50081904

## Supplementary documentation

- LiquiPort 2000, Technical Information TI 084R/09/en, Order no. 51002730
- LiquiPort 2000, Operating Instructions BA 116R/09/en, Order no. 51002780

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