



Level



Pressure



Flow



Temperature

Liquid
Analysis

Registration

Systems
Components

Services



Solutions

Technical Information

CCS140 and CCS141

Sensors for free chlorine

Amperometric, membrane-covered sensors for installation in the CCA250 assembly



Application

Oxidising agents such as chlorine or anorganic chlorine compounds are used for disinfection of water. Their dosing must be carefully controlled to suit the application. Too low a concentration makes the degree of disinfection questionable. Too high a concentration can result in corrosion effects, impairment of taste or skin irritation.

The CCS140 and CCS141 chlorine sensors are applied for measurement of free active chlorine in the following fields:

- Drinking water treatment
- Pool water treatment
- Industrial water treatment

Your benefits

- Minimum flow rate for installation in the CCA250 flow assembly: 30 l/h
- Measurement almost independent of flow rate in the range above 30 l/h
- No zero point calibration necessary. This means complicated installation of an active carbon filter, as in open chlorine sensors, is not necessary.
- Measured values are not affected by conductivity fluctuation.
- The CCS140 sensor is ready for measurement after a polarisation time of approx. 30 ... 60 minutes. The CCS141 sensor requires 45 ... 90 min.
- Easy membrane replacement thanks to ready-made membrane head
- Recalibration intervals approx. 1 ... 4 months under constant operating conditions
- Back pressure up to 1 bar / 14.5 psi allowed at the outlet

Function and system design

Measuring principle

The concentration of free chlorine is determined according to the amperometric measuring principle. The hypochlorous acid (HOCl) contained in the medium diffuses through the sensor membrane and is reduced to chloride ions (Cl⁻) on the gold cathode. On the silver anode, silver is oxidised to silver chloride. The electron release of the gold cathode and electron acceptance on the silver anode result in a current flow which is proportional to the free chlorine concentration in the medium under constant conditions. The concentration of hypochlorous acid in the medium depends on the pH value. This dependence can be compensated by measuring the pH value in the flow assembly.

The transmitter transforms the current signal into the measuring unit concentration in mg/l.

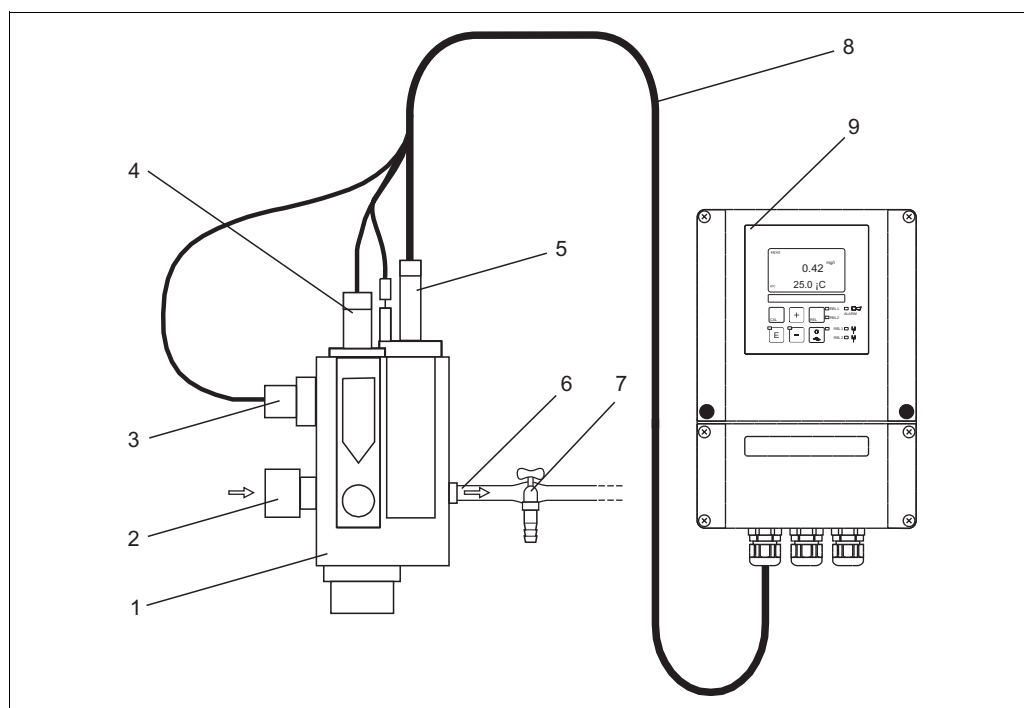
Function

The membrane-capped CCS140 / CCS141 sensors consist of a cathode serving as the working electrode and an anode acting as the counter electrode. These electrodes are immersed in an electrolyte. Electrodes and electrolyte are separated from the medium by a membrane. The membrane prevents the loss of electrolyte and the penetration of contaminants. The CCS140 and CCS141 sensors are used for measurement of free chlorine. To calibrate the measuring system, determine the content of free chlorine using the DPD method. You need a photometer with the pertaining reagents. The determined value is the calibration value for the transmitter.

Measuring system

A complete measuring system comprises at least:

- Chlorine sensor
- Liquisys M CCM223/253 transmitter
- Special measuring cable
- Flow assembly
- Reference measuring instrument for determination of free chlorine according to the DPD method



Measuring system in the flow mode (example)

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|---|--|---|-----------------------|
| 1 | CCA250 flow assembly | 6 | Medium outlet |
| 2 | Medium inlet | 7 | Sampling tap |
| 3 | Inductive proximity switch for flow monitoring | 8 | Fixed measuring cable |
| 4 | Mounting place for pH/redox sensors | 9 | Transmitter |
| 5 | Chlorine sensor | | |

Input

Measured variable	Free chlorine:	hypochlorous acid (HOCl)
Measuring range	CCS140 (for industrial water, pool water):	0.05 ... 20 mg Cl ₂ /l (25 °C / 77 °F, pH 7.2)
	CCS141 (for drinking water applications):	0.01 ... 5 mg Cl ₂ /l (25 °C / 77 °F, pH 7.2)
Depolarisation current	CCS140:	approx. 25 nA per mg Cl ₂ /l (25 °C / 77 °F, pH 7.2)
	CCS141:	approx. 80 nA per mg Cl ₂ /l (25 °C / 77 °F, pH 7.2)

Performance characteristics

Response time	T ₉₀ < 2 min T ₉₉ < 5 min in applications involving mainly active chlorination
Polarisation time	CCS140: First polarisation: 60 min Repolarisation: 30 min CCS141: First polarisation: 90 min Repolarisation: 45 min
Drift	< 1.5 % per month
Electrolyte service life	typically 12 months

Installation

Installation instructions	The flow assembly CCA250 is designed for on-site installation of the sensor. In addition to the chlorine or chlorine dioxide sensor, a pH and redox sensor can be installed. A needle valve regulates the flow within the range of 30 ... 120 l/h (7.92 ... 31.68 US.gal/h). When installing the sensor, note the following: ■ The flow must be at least 30 l/h. If the flow drops below this value or stops completely, this can be detected by an inductive proximity switch and an alarm signal plus locking of the dosage pumps can be triggered. ■ If the medium is fed back into a surge tank, pipeline or the like, ensure that the thus generated back pressure on the sensor does not exceed 1 bar (14.5 psi) and remains constant. ■ Negative pressure at the sensor, e.g. by feedback of medium to the suction side of a pump, must be avoided. For further installation instructions, see the operating instructions of the flow assembly.
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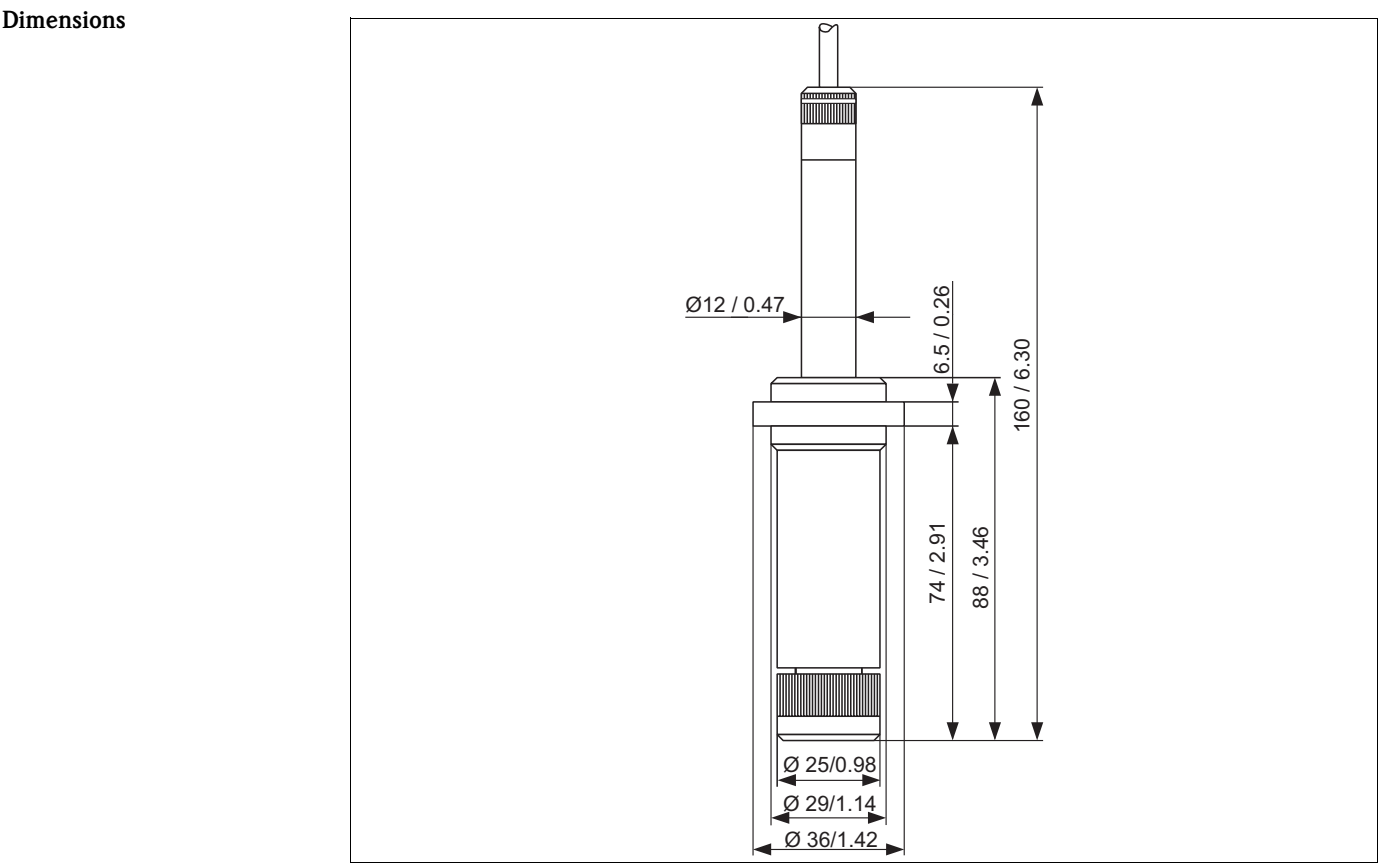
Environment

Storage temperature	Filled with electrolyte:	5 ... 50 °C / 41 ... 122 °F
	Without electrolyte:	-20 ... 60 °C / -4 ... 140 °F
Ingress protection	IP 68 (up to the mounting collar Ø 36 mm / 1.42")	

Process

Temperature range	CCS140:	10 ... 45 °C / 50 ... 113 °F
	CCS141:	2 ... 45 °C / 36 ... 113 °F
pH range	CCS140:	4 ... 8 pH
	CCS141:	4 ... 8.2 pH
Pressure	Medium in the CCA250 assembly: max. 1 bar (14.5 psi)	
Flow	in the CCA250 assembly: min. 30 l/h / 7.92 US.gal./h	
Flow velocity	min. 15 cm/s / 0.5 ft/s	

Mechanical construction



Weight	approx. 0.5 kg / 1.1 lb.	
Material	Sensor shaft:	PVC
	Membrane:	PTFE
	Membrane cap:	PBT (GF 30), PVDF
	Cathode:	Gold
	Anode:	Silver / silver chloride
Cable connection	Fixed cable (3 m / 9.84 ft), four cores, double-screened, low noise	
Cable length	max. 30 m / 98.43 ft (cable extension included)	
Temperature sensor	NTC, 10 kΩ at 25 °C / 77 °F	

Ordering information

CCS140 sensor		Version
	A	without temperature sensor
	N	with NTC temperature sensor
	CCS140-	complete order code
CCS141 sensor		Version
	N	with NTC temperature sensor
	CCS141-	complete order code

Scope of delivery	The scope of delivery comprises: ■ 1 chlorine sensor ■ 1 bottle filled with electrolyte (50 ml) plus nozzle ■ 1 membrane cap for protection and storage ■ 1 replacement cartridge with pretensioned membrane ■ Operating Instructions, English
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Accessories

Installation accessories

- Flow assembly CCA250
for chlorine, chlorine dioxide, pH and redox;
Ordering acc. to product structure, see Technical Information (TI 062C/07/en)
- Compact chlorine system CCE1
Factory-assembled and wired panel for transmitter with flow assembly CCA250-A1; see also Technical Information TI 014C/07/en

Connection accessories

- Junction box VBC
Metallic junction box for cable extension,
dimensions (W x D x H): 125 x 80 x 54 mm / 4.92 x 3.15 x 2.13 inches
Order no. 50005181
- CMK special measuring cable
for cable extension between junction box and transmitter, non terminated, sold by the metre
Order no. 50005374

Transmitter

- Liquisys M CCM223/253
Transmitter for chlorine, field or panel-mounted housing,
Hart® or PROFIBUS available,
Ordering acc. to product structure, see Technical Information (TI 214C/07/en)

Maintenance /calibration

- Photometer CCM182; microprocessor-controlled photometer for chlorine, pH value, cyanuric acid;
Chlorine measuring range: 0.05 - 6 mg/l
pH measuring range: 6.5 - 8.4
- CCY14-F
Electrolyte for CCS140 / CCS141 chlorine sensors, 50 ml
Order no. 50005256
- CCY14-WP
2 replacement cartridges ready-made for CCS140/141/240/241 chlorine and chlorine dioxide sensors
Order no. 50005255

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