

# DULCOTEST® Sensors for Bromine

Reliable online measurement of bromine – with DULCOTEST® sensors



## Graduated measuring ranges 0.01 – 10 mg/l

Bromine compounds are an increasingly popular alternative to chlorine compounds in water disinfection in spite of the higher costs of the reagents.

Bromine has a number of advantages over chlorine compounds when it comes to disinfection:

- Greater disinfectant effect at higher pH values
- Lower volatility at higher temperatures
- Less tendency to corrosion
- Bromine compounds that have finished reacting (combined bromine) produce less odour and irritation of the mucous membranes

## Your benefits

- Precise, real-time amperometric measurement for efficient process control (short response time)
- Suitable for wide range of water qualities (contamination, pH, salinity, temperature)
- Amperometric measuring means no clouding or discolouration
- Stable zero point means no drift
- Integrated temperature compensation eliminates faults caused by influence of temperature
- Diaphragm-covered electrodes for reduced dependence on flow, substances in water and film-forming media

## Field of application

- Water disinfection in cooling towers
- Water disinfection in swimming pools and hot tubs
- Disinfection of seawater

Our product line of DULCOTEST® bromine sensors provides three types of sensor for your measurement tasks.

**Sensor types CBR1-mA and BCR 1-mA are resistant to contaminated water and are designed for the treatment of cooling water. Type CBR1 is specifically designed for free bromine from inorganic bromination processes, e.g. sodium bromide + sodium-calcium hypochlorite, or the use of BrCl.**

**Sensor type BCR-mA is optimised for the measurement of organic bromination agents (e.g. BCDMH).**

**Sensor type BRE3-CAN is available for the treatment of swimming pool water with BCDMH**

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## Technical Data

### Sensor for Total Available Bromine BCR 1-mA (Replaces Earlier Type BRE 1)

Sensor for the disinfectant BCDMH and other oxidative-acting bromine-organic disinfectants and total chlorine even in contaminated water and/or for high pH values of up to 9.5. For use on controllers with mA input

#### Your benefits

- Measured variable: total available bromine from BCDMH (1-bromo-3-chloro-5,5-dimethylhydantoin)
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water, N-bromamide sulfonate
- Resistance to blocking is achieved by the use of an electrolyte with an antimicrobial effect (less blocking by biofilms) and by a large-pored diaphragm (less blocking by solid particles/dirt)
- Use with high pH values by optimisation of the electrolyte diaphragm system

<b>Measured variable</b>	Total available bromine from BCDMH (1-bromo-3-chloro-5,5-dimethylhydantoin) and N-bromamido-sulphonate, total chlorine
<b>Reference method</b>	DPD4
<b>pH range</b>	5.0 ... 9.5
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG III)
<b>Supply voltage</b>	16...24 V DC (two wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Non-selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), N-bromamide sulfonate
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, DAC, AEGIS II
<b>Typical applications</b>	Cooling water, process water, waste water, swimming pool water, water with higher pH values (stable pH).
<b>Resistance to</b>	Dirt films, biofilms, surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>BCR 1-mA-0.5 ppm</b>	0.01...0.5 mg/l	1041697
<b>BCR 1-mA-2 ppm</b>	0.02...2.0 mg/l	1040115
<b>BCR 1-mA-10 ppm</b>	0.10...10.0 mg/l	1041698

# DULCOTEST® Sensors for Bromine

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## Sensor for Total Available Bromine BRE 3-CAN-P

Sensor for free and combined bromine, also for use with slightly contaminated water. For use on controllers with CAN-bus connection

### Your benefits

- Measured variable: total available bromine from BCDMH and other oxidative-acting bromine organic disinfectants
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Use with high pH values by optimisation of the electrolyte diaphragm system
- Operation on the CAN-bus with all the associated benefits

<b>Measured variable</b>	Total available bromine
<b>Reference method</b>	For DBDMH, free bromine: DPD1. For BCDMH: DPD4
<b>pH dependence</b>	If the pH changes from pH 7 to pH 8, the sensor sensitivity is reduced a) in the case of DBDMH and free bromine by approx. 10% b) in the case of BCDMH by approx. 25%
<b>Temperature</b>	5 ... 45 °C
<b>Max. pressure</b>	3.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM or DLG III)
<b>Supply voltage</b>	Via CAN interface (11 – 30 V)
<b>Output signal</b>	Uncalibrated, temperature-compensated, electrically isolated
<b>Selectivity</b>	Non-selective, cross-sensitive towards many oxidation agents
<b>Disinfection process</b>	DBDMH (1,3-dibromo-5,5-dimethyl-hydantoin), BCDMH (1-bromo-3-chloro-5,5-dimethyl-hydantoin), free bromine (HOBr, OBr)
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN®
<b>Typical applications</b>	swimming pools/whirlpools.
<b>Resistance to</b>	surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	<b>Measuring range</b>	<b>Order no.</b>
<b>BRE 3-CAN-10 ppm</b>	0.02...10.0 mg/l	1083573

# DULCOTEST® Sensors for Bromine

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## Sensor for Free and Combined Bromine CBR 1-mA (Replaces Earlier Type BRE 2)

Sensor for free chlorine and bromine in contaminated water, also suitable for high pH values of up to 9.5. For use with controllers with 4-20 mA input

### Your benefits

- Measured variable: free chlorine as well as free and combined bromine (bromamines)
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt and biofilms by electrolyte with antimicrobial effect and large-pore diaphragm
- Use at high pH value of up to 9.5 by optimisation of the electrolyte diaphragm system

<b>Measured variable</b>	free chlorine, free bromine, combined bromine, DBDMH (1,3-dibrom-5,5-dimethyl-hydantoin)
<b>Reference method</b>	DPD1
<b>pH-range</b>	5 ... 9.5
<b>Temperature</b>	1 ... 40 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG II)
<b>Supply voltage</b>	16...24 V DC (2-wire)
<b>Output signal</b>	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm, bromide + hypochlorite, DBDMH
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	D1C, DAC, AEGIS II
<b>Typical applications</b>	Cooling water, process water, waste water, water with higher pH values (stable pH), contaminated swimming pool water. Contaminated swimming pool water. In swimming pools to determine the combined chlorine from the difference: Total chlorine minus free chlorine. Raw water for drinking water treatment.
<b>Resistance to</b>	Salts, acids, alkalis, surfactants, dirt films
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
<b>CBR 1-mA-0,5 ppm</b>	0.01...0.5 mg/l*	1038016
<b>CBR 1-mA-2 ppm</b>	0.02...2.0 mg/l*	1038015
<b>CBR 1-mA-5 ppm</b>	0.05...5.0 mg/l*	1052138
<b>CBR 1-mA-10 ppm</b>	0.10...10.0 mg/l*	1038014

\* Measuring range based on chlorine. When measuring bromine, the lower and upper limit of the measuring range are increased by the factor 2.25, therefore for example CBR 1-mA-0.5ppm: 0.02 ...1.1 ppm.

# DULCOTEST® Sensors for Bromine

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## Sensor for Free and Combined Bromine CBR 1-CAN-P

Sensor for free chlorine and bromine in contaminated water, also suitable for high pH values of up to 9.5. For use on controllers with CAN-bus connection.

### Your benefits

- Measured variable: free chlorine as well as free and combined bromine (bromamines)
- Diaphragm-covered sensor minimises faults caused by changing flow or ingredients in the water
- Resistance to films of dirt and biofilms by electrolyte with antimicrobial effect and large-pore diaphragm
- Use at high pH value of up to 9.5 by optimisation of the electrolyte diaphragm system

<b>Measured variable</b>	free chlorine, free bromine, combined bromine, DBDMH (1,3-dibrom-5,5-dimethyl-hydantoin)
<b>Reference method</b>	DPD1
<b>pH range</b>	5 ... 9.5
<b>Temperature</b>	1 ... 40 °C
<b>Max. pressure</b>	1.0 bar
<b>Intake flow</b>	30...60 l/h (in DGM, DLG II)
<b>Supply voltage</b>	11...30 V DC (via CAN interface)
<b>Output signal</b>	digital (CANopen), uncalibrated, temperature-compensated, galvanically isolated
<b>Selectivity</b>	Free chlorine as against combined chlorine
<b>Disinfection process</b>	Chlorine gas, hypochlorite, electrolysis with diaphragm, bromide + hypochlorite, DBDMH
<b>Installation</b>	Bypass: open sample water outlet
<b>Sensor fitting</b>	DGM, DLG III
<b>Measuring and control equipment</b>	DULCOMARIN® 3, DULCOMARIN® II only with hardware after 06.02.2014 from software version 3035 or later
<b>Typical applications</b>	Cooling water, process water, waste water, water with higher pH values (stable pH). Contaminated swimming pool water. In swimming pools to determine the combined chlorine from the difference: Total chlorine minus free chlorine. Raw water for drinking water treatment.
<b>Resistance to</b>	Dirt films, biofilms, surfactants
<b>Measuring principle, technology</b>	Amperometric, 2 electrodes, membrane-covered

	Measuring range	Order no.
CBR 1-CAN-P-10ppm	0.01...10.0 mg/l	1083135