

6.3 DULCOTEST® Amperometric Sensors

6.3 Amperometric Sensors for Chlorine, Bromine, Chlorine Dioxide, Chlorite, Ozone, Dissolved Oxygen and Peracetic Acid

For optimum functioning of chlorine, bromine, chlorine dioxide and ozone measuring cells please note the following guidelines:

- Use DULCOMETER® measurement and control systems.
- Install only in ProMinent® DGM or DLGA in-line probe housings.
- Defined flow between 30 and 60 l/h.
- Chlorine measurement must only take place when pH is stable (CLE 3).
- Regular calibration with a Photometer (e.g. Type DT 1).

Important:

Amperometric probes are **NOT electrically isolated**.

When installing in external appliances (e.g. PLC), you should electrically isolate the supply voltage and the analogue input signal.

- Summary of features:
- High zero point stability
- Compact design
- Integrated temperature correction
- Simple to install
- Simple to maintain
- Short warm up period time
- Measurement signal virtually unaffected by flow

Chlorine dissolved in water is present in different forms:

Free (active) chlorine: Cl_2 , HOCl (hypochlorous acid), OCl^- (hypochlorite) recommended sensors: CLE (analysis: DPD 1).

Combined chlorine: mono, di, trichloramine (analysis: DPD 4 - DPD 1).

Organic combined chlorine: Of isocyanuric acid / isocyanurate bound chlorine (total available chlorine) and the resulting free (effective) chlorine; recommended sensor: CGE (analysis: DPD 1).

Total chlorine: Sum of free and combined chlorine; recommended sensor: CTE (analysis: DPD 4).

Applications: Chlorine measurement in drinking, swimming pool, process, industrial water and water of similar quality e.g. seawater/brine with up to 15 % chloride content.

We recommend the CGE, CTE chlorine sensors for measuring chlorine if pH value is high (8...9.5).

Guidelines for device usage:

The measuring cells type CLE cannot be used in the presence of iso-cyanuric acid/chlorine stabilisers!

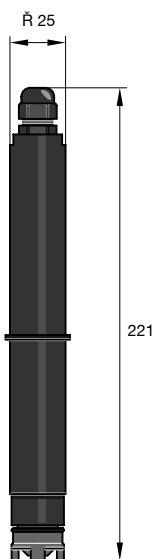
The sensors with the suffix -mA are used with the measurement and control devices D1C, D2C and DULCOMARIN®. The sensors with the suffix -4P are used with the earlier WS controllers and for metering pumps with integrated chlorine controllers. DMT-type sensors are used for the DMT transducer. CAN-type sensors are used with the DULCOMARIN® II swimming pool controller.

Note

CLE sensors: The CLE type sensors cannot be used in liquids containing isocyanuric acid/chlorine stabilisers.

6.3 DULCOTEST® Sensors for Chlorine

6.3.1 DULCOTEST® Sensors for free chlorine - CLE 3-mA and CLE 3.1-mA



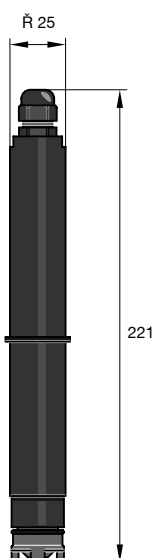
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Measurement of free chlorine

CLE 3-mA

Measured variable: **Free chlorine (hypochlorous acid HOCl)**
 Analysis: DPD 1
 Measurement range: 0.01... 50 mg/l
 pH range: 5.5...8.0 (up to pH 8.5 for pH correction in the D1C)
 Temperature range: 5...45 °C (temperature compensated)
 Max. pressure: 1 bar
 Flow: 30...60 l/h (in DGM or DLGA)
 Power supply: 16...24 VDC (two-wire technology)
 Output signal: 4...20 mA † measurement range (un-calibrated)
Warning: no electrical isolation!
 Typical applications: CLE 3-mA-0.5 ppm, potable water
 CLE 3-mA-2.0/10 ppm, swimming pool, potable, industrial, process water (surfactant free)
 Measurement and control devices: D1C, D2C, DULCOMARIN® (2/10 ppm only)
 In-line probe housing: DGM, DLGA

CLE 3-mA-0.5 ppm set, with 100 ml electrolyte *** not stocked***	792927.
CLE 3-mA-2 ppm set, with 100 ml electrolyte *** not stocked***	792920.
CLE 3-mA-5 ppm set, with 100 ml electrolyte	1033392.
CLE 3-mA-10 ppm set, with 100 ml electrolyte	792919.
CLE 3-mA-20 ppm set, with 100 ml electrolyte	1002964.
CLE 3-mA-50 ppm set, with 100 ml electrolyte	1020531.
CLE 3-mA-100 ppm set, with 100 ml electrolyte	1022786.



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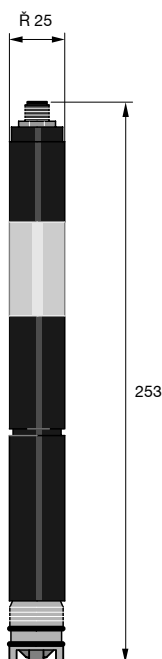
CLE 3.1-mA

Measured variable: **Free chlorine (hypochlorous acid HOCl) where there is a high rate of combined chlorine and/or in the case of pH values up to 8.5 (with D1C pH correction).**
 Analysis: DPD 1
 Measurement range: 0.02...2.00 mg/l (CLE 3.1-mA-2 ppm)
 0.01...5.0 mg/l (CLE 3.1-mA-5 ppm)
 0.1...10.0 mg/l (CLE 3.1-mA-10 ppm)
 pH range: 5.5...8.0 (up to pH 8.5 for pH correction in the D1C)
 Temperature range: 5...45 °C (temperature compensated)
 Max. pressure: 1 bar
 Flow: 30...60 l/h (in DGM or DLGA)
 Power supply: 16...24 VDC (two-wire technology)
 Output signal: 4...20 mA † measurement range (un-calibrated)
Warning: no electrical isolation!
 Typical applications: CLE 3-mA-2.0/10 ppm, swimming pool, potable, industrial, process water (surfactant free)
 Measurement and control devices: D1C, D2C, DULCOMARIN®
 In-line probe housing: DGM, DLGA

CLE 3.1-mA-0.5 ppm set, with 100 ml electrolyte	1020530.
CLE 3.1-mA-2 ppm set, with 100 ml electrolyte	1018369.
CLE 3.1-mA-5 ppm set, with 100 ml electrolyte	1019398.
CLE 3.1-mA-10 ppm set, with 100 ml electrolyte	1018368.

6.3 DULCOTEST® Sensors for Chlorine

6.3.2 DULCOTEST® Sensors for free chlorine - CLE 3-mA and CLE 3.1-mA



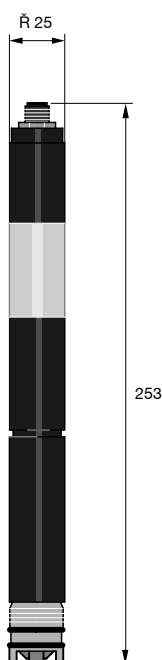
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CLE 3-CAN

Measured variable:	Free chlorine (hypochlorous acid HOCl)
Analysis:	DPD 1
pH range:	5.5...8.0
Temperature range:	5...45 °C (temperature compensated)
Max. pressure:	1 bar
Flow:	30...60 l/h (in DGM or DLGA)
Power supply:	Via CAN interface(11-30V)
Output signal:	un-calibrated, temperature compensated, electrically isolated
Typical applications:	swimming pool, potable water (surfactant free)
Measurement and control devices:	DULCOMARIN®
In-line probe housing:	DGM, DLGA

CLE 3-CAN-10 ppm 0.01 ... 10.0 mg/l 1023425.

complete with 100 ml electrolyte



pk_6_096

CLE 3.1-CAN

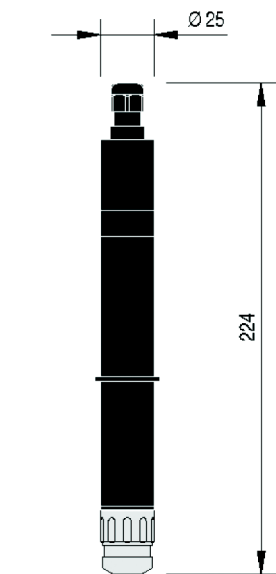
Measured variable:	Free chlorine (hypochlorous acid HOCl) with large proportions of bound chlorine; to detect bound chlorine using DULCOMARIN® II and Sensor for Total Chlorine type CTE 1-CAN
Reference Method:	DPD 1
pH range:	5.5...8.0 (up to pH 8.5 for pH correction in the D1C)
Temperature range:	5...45 °C (temperature compensated)
Max. pressure:	1 bar
Flow:	30...60 l/h (in DGM or DLGA)
Power supply:	Via CAN interface (11-30V)
Output signal:	un-calibrated, temperature compensated, electrically isolated
Typical applications:	swimming pool, potable water with a high percentage of bound chlorine (surfactant free)
Measurement and control devices:	DULCOMARIN® II
In-line probe housing:	DGM, DLGA

CLE 3.1-CAN-10 ppm 0.01 ... 10.0 mg/l 1023426.

complete with 100 ml electrolyte

6.3 DULCOTEST® Sensors for Chlorine

6.3.3 DULCOTEST® Sensors for Free Chlorine

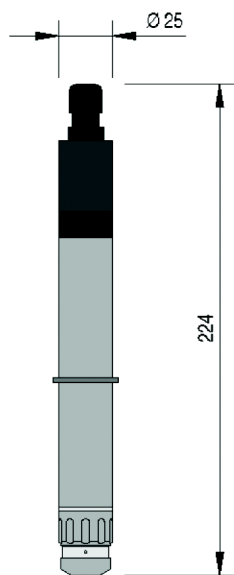


P_DT_0072_SW1

CLO 1-mA

Measured variable	free chlorine (hypochlorous acid HOCl)
Reference method	DPD1
pH range	5,0 ... 9,0
Temperature range	5 ... 45 °C
Max. pressure	8,0 bar
Intake flow	30...60 l/h (in DGM or DLG III), constant flow as flow-dependent signal
Power supply	16...24 V DC (2-wire)
Output signal	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
Typical applications	swimming pool, uncontaminated drinking water and industrial service water, and can also be used together with diaphragm-free electrolysis processes
Measurement and control equipment	D1C, D2C, DULCOMARIN®
In-line probe housing	DGM, DLG III to 60 °C, special fitting for 60 °C-70 °C (on request)
Measuring principle	amperometric, 3 electrodes, no diaphragm

CLO 1-mA-2 ppm	0,02...2,0 mg/l	1033871
CLO 1-mA-10 ppm	0,10...10,0 mg/l	1033870

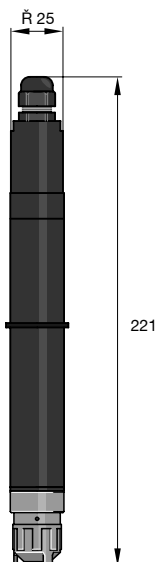


P_DT_0073_SW1

CLO 2-mA

Measured variable	free chlorine (hypochlorous acid HOCl)
Reference method	DPD1
pH range	5,0 ... 9,0
Temperature range	5 ... 70 °C
Max. pressure	8,0 bar
Intake flow	30...60 l/h (in DGM oder DLG III), constant flow as flow-dependent signal
Power supply	16...24 V DC (two-wire system)
Output signal	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
Typical applications	Hot water up to 70°C, combating legionella uncontaminated drinking water and industrial service water, and can also be used together with diaphragm-free electrolysis processes
Measurement and control equipment	D1C, D2C, DULCOMARIN®
In-line probe housing	DGM, DLG III to 60°C, special fitting for 60°C-70°C (on request)
Measuring principle	amperometric, 3 electrodes, no diaphragm

CLO 2-mA-2 ppm	0,02...2,0 mg/l	1033878
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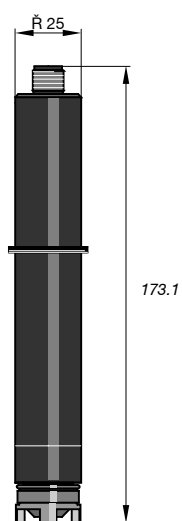
CLR 1-mA-200ppm

Measured variable	Free chlorine (hypochlorous acid HOCl)
Reference method	DPD1pH range 5.5 ... 8.0
Temperature	5 ... 45 °C
Max. pressure	1.0 bar
Intake flow	30...60 l/h (in DGM, DLG II)
Power supply	16...24 V DC (2-wire)
Output signal	4...20 mA = Measuring range, temperature-compensated, uncalibrated, not electrically isolated
Typical applications	Salad, vegetable and poultry washing water, contaminated process and waste water
Measurement and control equipment	D1Cb, DAC, delta® solenoid diaphragm metering pump
In-line probe fitting	DGM, DLG III
Measuring principle	amperometric, 2 electrodes, diaphragm-covered

CLR 1-mA-200 ppm	20.00 ... 200,0 mg/l	1047978
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6.3 DULCOTEST® Sensors for DMT

6.3.4 DULCOTEST® Sensors for free Chlorine - CLE3-DMT and CTE1-DMT



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CLE 3-DMT

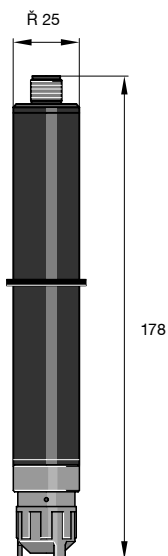
Measuring cell for use with the DMT "chlorine" measurement transducer.

Measured variable:	Free chlorine (hypochlorous acid HOCl)
Reference method:	DPD1
Measurement range:	0.01...5.0 mg/l 0.05...50 mg/l
Supply:	From the DMT measurement transducer (3.3 VDC)
Output signal:	Un-calibrated, not temperature compensated
Temperature	5...45 °C
Max. pressure:	1 bar
Flow:	30...60 l/h (in DGM or DLGA)
measurement:	Via integrated Pt 1000: compensation carried out in DMT
Measuring cell output:	5-pin plug
Other data as for CLE-3 mA.	

CLE 3-DMT-5 ppm set with 100 ml electrolyte	1005511.
CLE 3-DMT-50 ppm set with 100 ml electrolyte	1005512.

See section 3.21

Universal control cable, 5-pole round connector, 5-wire, 2 m	1001300.
Universal control cable, 5-pole round connector, 5-wire, 5 m	1001301.
Universal control cable, 5-pole round connector, 5-wire, 10 m	1001302.



pk_5_022

CTE 1-DMT

Measuring cell for use with the DMT "chlorine" measurement transducer.

Measured variable:	Total Chlorine
Reference method:	DPD4
Measurement range:	0.01...10 mg/l
Supply:	From the DMT measurement transducer (3.3 VDC)
Output signal:	Un-calibrated, not temperature compensated
Temperature	5...45 °C
Max. pressure:	1 bar
Flow:	30...60 l/h (in DGM or DLGA)
measurement:	Via integrated Pt 1000: compensation carried out in DMT
Measuring cell output:	5-pin plug
Other data as for CLE-3 mA.	

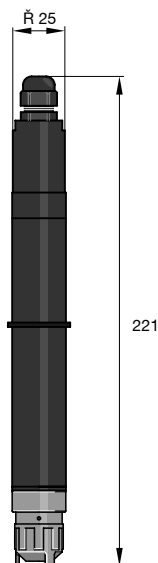
CTE 1-DMT-10 ppm set with 50 ml electrolyte	1007540.
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See section 3.21

Universal control cable, 5-pole round connector, 5-wire, 2 m	1001300.
Universal control cable, 5-pole round connector, 5-wire, 5 m	1001301.
Universal control cable, 5-pole round connector, 5-wire, 10 m	1001302.

6.3 DULCOTEST® Sensors for Total Chlorine

6.3.5 DULCOTEST® Sensors for Total Chlorine



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Measured variable of total chlorine

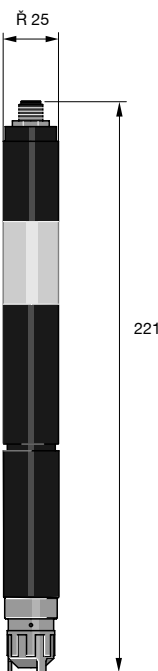
CTE 1-mA

Measured variable:	total chlorine
Analysis:	DPD 4
Measurement range:	0.01...0.50 mg/l (CTE 1-mA-0.5 ppm) 0.02... 2.00 mg/l (CTE 1-mA-2 ppm) 0.05... 5.00 mg/l (CTE 1-mA-5 ppm) 0.1...10.0 mg/l (CTE 1-mA-10 ppm)
pH range:	5.5...9.5
Temperature range:	5...45 °C
Max. pressure:	3 bar
Flow:	30...60 l/h (in DGM or DLGA)
Power supply:	16...24 V DC (two-wire technology)
Output signal:	4...20 mA † measurement range (un-calibrated) Warning: no electrical isolation!
Typical applications:	CTE 1-mA-0.5 ppm, potable water CTE 1-mA-2/5/10 ppm, potable, industrial, process water, In swimming pool in combination with CLE3.1 for determining combined chlorine.
Measurement and control devices:	D1C, DULCOMARIN® (2/10 ppm only)
In-line probe housing:	DGM, DLGA

.....Part-No.

CTE 1-mA-0.5 ppm set, with 50 ml electrolyte	740686.
CTE 1-mA-2 ppm set, with 50 ml electrolyte	740685.
CTE 1-mA-5 ppm set, with 50 ml electrolyte	1003203.
CTE 1-mA-10 ppm set, with 50 ml electrolyte	740684.

CTE 1-CAN



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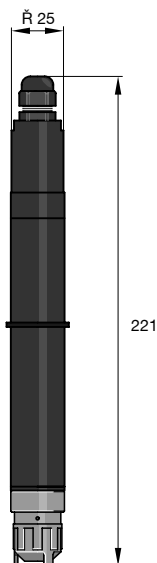
Measured variable:	total chlorine
Analysis:	DPD 4
pH range:	5.5...9.5
Temperature range:	5...45 °C
Max. pressure:	3 bar
Flow:	30...60 l/h (in DGM or DLGA)
Power supply:	Via CAN interface (11-30V)
Output signal:	un-calibrated, temperature compensated, electrically isolated
Typical applications:	In swimming pool in combination with CLE3.1 for determining combined chlorine.
Measurement and control devices:	DULCOMARIN® II
In-line probe housing:	DGM, DLGA

.....Part-No.

CTE 1-mA-10 ppm	0.01 ... 10.0 mg/l	1023427.
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6.3 DULCOTEST® Sensors for Total Chlorine

6.3.6 DULCOTEST® Sensors for total Chlorine



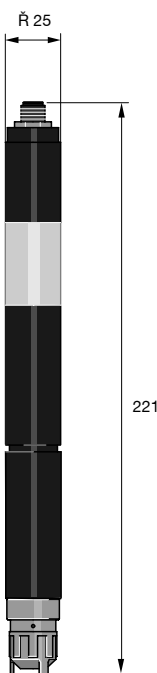
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Measured variable of organic combined chlorine and free chlorine (total available chlorine)

CGE 2-mA

Measured variable:	Organic combined chlorine and free chlorine (e.g. trichloroisocyanuric acid)
Analysis:	DPD 1
Measurement range:	0.02...2.00 mg/l (CGE 2-mA-2 ppm) 0.1...10.0 mg/l (CGE 2-mA-10 ppm)
pH range:	5.5...9.5
Temperature range:	5...45 °C (temperature compensated)
Max. pressure:	3 bar
Flow:	30...60 l/h (in DGM or DLGA)
Power supply:	16...24 V DC (two-wire technology)
Output signal:	4...20 mA I measurement range (un-calibrated) Warning: no electrical isolation!
Typical applications:	Swimming pool, potable, industrial, process water, cooling water and water with a high pH value
Measurement and control devices:	D1C, D2C, DULCOMARIN®
In-line probe housing:	DGM, DLGA

	Part No.
CGE 2-mA-2 ppm set, with 50 ml electrolyte	792843.
CGE 2-mA-10 ppm set, with 50 ml electrolyte	792842.



pk_6_084

CGE 2-CAN

Measured variable:	Organic combined chlorine and free chlorine (e.g. trichloroisocyanuric acid)
Analysis:	DPD 1
pH range:	5.5...9.5
Temperature range:	5...45 °C (temperature compensated)
Max. pressure:	3 bar
Flow:	30...60 l/h (in DGM or DLGA)
Power supply:	Via CAN interface (11-30V)
Output signal:	un-calibrated, temperature compensated, electrically isolated
Typical applications:	Swimming pool water
Measurement and control devices:	DULCOMARIN® II
In-line probe housing:	DGM, DLGA

		Part No.
CGE 2-CAN-10 ppm	0.01 ... 10.0 mg/l	1024420.

with 50 ml electrolyte