Level | Pressure | Flow | Temperature | Liquid Analysis | Registration | Systems Components | Services | Solutions

Technical Information

Stamolys CA71CL

Free and Total Chlorine analyzer
Compact photometric analysis system for the chlorine measurement in water plants and in industrial water treatment

Application

- Drinking water treatment
- Monitoring of wastewater outlets
- Monitoring of swimming pool water
- Process water treatment

Your benefits

- Stainless steel or glass-fibre reinforced carbon housing available
- Two channel version available
- Measured value storage using integrated data logger
- Automatic calibration and self-cleaning
- Free selectable measuring, cleaning and calibration intervals

TI354C/07/en/04.05
51512288

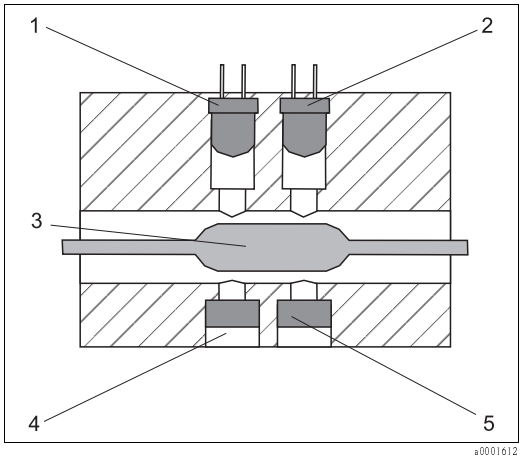
Endress+Hauser

People for Process Automation

Function and system design

Measuring principle upper measuring range

After sample conditioning, the analyzer sample pump conveys a part of the filtrate to a mixing vessel. The reagent pump adds reagent at a specific ratio. As a result of the reaction, the sample turns a characteristic colour. The photometer determines the sample's absorption of an emitted light at a specific wavelength (s. Fig., Pos. 2). The wavelength is parameter specific. The absorbance is proportional to the concentration of the specified parameter in the sample (Pos. 3). Additionally, the absorption of a reference light is determined to receive a genuine measuring result. The reference signal is subtracted from the measuring signal to prevent any effects due to turbidity, contamination and ageing of the LEDs.
The temperature in the photometer is controlled thermostatically so that the reaction is reproducible and takes place within a short period of time.

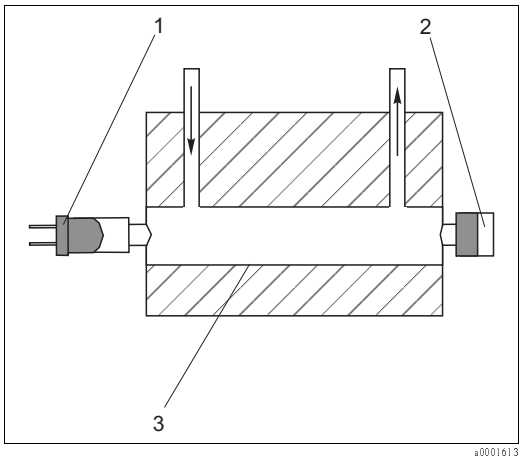


1 Reference LED
2 Emitter LED
3 Sample
4 Reference detector
5 Measuring detector

Photometric principle

Measuring principle lower measuring range

The LED sends light at a defined wavelength through the sample. The intensity of the received light is measured by the detector and converted to an electrical signal. In the analyzer, the respective concentration is calculated from the proportion of light absorbed by the sample.



1 LED
2 Detector
3 Sample

Photometric measuring principle

Free and total chlorine

Since the early 18th century, chlorine has been the disinfectant most used in water and waste water treatment. In addition to this, chlorine is used for bleaching paper.
If chlorine is added to water, hydrogen chloride and hypochlorous acid form. This causes the disinfecting and bleaching effect:

$$Cl_2 + 2\,H_2O \rightleftharpoons H_3O^+ + Cl^- + HOCl$$

Depending on the pH value, temperature or nitrogen content (organic or ammonia), chlorine can also occur in water as hypochlorite ions (OCl^-) or in the form of chloramines.
Free, active chlorine in water is referred to as hypochlorous acid and hypochlorite anions. Chloramines (NH_2Cl – monochloramine, $NHCl_2$ – dichloramine, NCl_3 – nitrogen trichloride) are called **combined, active chlorine.** The sum of free and combined chlorine forms the **total chlorine**.

Free chlorine detection

DPD method as per DIN 38408 - Part 4
DPD (N,N -diethyl-p-phenylendiamine) together with hypochlorous acid and hypochlorite ions forms a magenta dye. Here, the pH value is kept constant by an acetate buffer.
The absorption is measured at a wavelength of 555 nm. The absorption strength of the light is proportional to the concentration of the free chlorine in the sample.
The reference measurement (only measuring range C, see product structure) is performed at a wavelength of 880 nm.

Total chlorine detection

As well as the DPD reagent, additional potassium iodide is added to the acetate-buffered sample. Chloramines in the sample oxidise iodide to hypoiodite or hypoiodite acid, which together with DPD form the magenta dye.
The absorption is measured at a wavelength of 555 nm. The absorption strength of the light is proportional to the concentration of the total chlorine in the sample.
The reference measurement (only measuring range D, see product structure) is performed at a wavelength of 880 nm.

Interferences

Interfering substance	Interference
Alkalinity	> 250 mg/l $CaCO_3$: Colour development can be incomplete or colour fades instantly
Acidity	> 150 mg/l $CaCO_3$: Colour development can be incomplete or colour fades instantly
Bromine	interferes in every concentration
Organic chloramines	can interfere
Chlorine dioxide	interferes in every concentration
Hardness	no interference up to 1000 mg/l $CaCO_3$
Iodine	interferes in every concentration
Manganese dioxide	> 0.03 mg/l
Chromate	> 0.03 mg/l
Monochloramine	causes gradual drifting to higher measured values
Ozone	interferes in every concentration
Peroxides	can interfere
Extreme pH values	pH 0 to 2 and 12 to 14
heavily buffered sample	

Sample conditioning

Micro/ultrafiltration (Stamoclean CAT430, optional)

A membrane filter element is suspended directly into the wastewater basin or channel. A hose pump is located in a pump box on the basin rim.The pump creates a vacuum between the membrane and the carrier plate of the filter element. This vacuum makes the filtrate pass through the filter membrane. Suspended materials, particles, algae and bacteria are collected on the surface of the membrane.
Due to alternating pumping and pause, intervals of more than one month are achieved between cleaning cycles. Parallel connection of two or four filter elements increases the sampling quantity up to approx. 1 l/h. The hose pump pressure transports the sample to a collecting vessel near the analyzer over a distance of 20 m. For distances up to 100 m the sample is transported to the collecting vessel by means of compressed air. The analyzers suck the needed sample volume from the collecting vessel.

Membrane filtration (Stamoclean CAT411, optional)

A sample flow of 0.8 to 1.8 m^3/h is continuously conducted through the micro filter via a pressure pipe. A part of the sample passes the filter membrane and is then conveyed to the measuring device as filtrate.
Sampling is based on the cross flow filtration principle. The PTFE filter membrane separates particles with sizes > 0.45 µm from the filtrate. These particles are collected in front of the membrane and are washed away with the sample flow.
The medium is conducted in a meander-like channel through the filter element. This results in a constantly high flow rate. The high flow rate generates the self cleaning effect. Therefore, mechanical drives for the generation of a flow at the filter surface are not necessary.

Backwash filter (Stamoclean CAT221, optional)

A sample flow of 1 to 2.5 m^3/h is permanently conveyed through the backwash filter by means of a sampling pump or compressed air or rinse water. The filtrate passes through the wedge wire sieve and is then transported to the measuring device.
Clogging is minimized by the flow at the wedge wire sieve. Automatic backwashing results in a filter operating time of several weeks.
The automatic backwashing and a small compressor or compressed air resp. rinse water supply guarantee low-maintenance and low-energy operation.

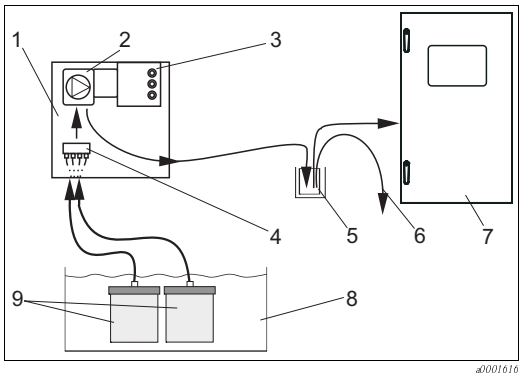
Customer specific solution

Before analysis, the sample has to be conditioned and to be transported to an external or to the delivered collecting vessel.

Measuring system

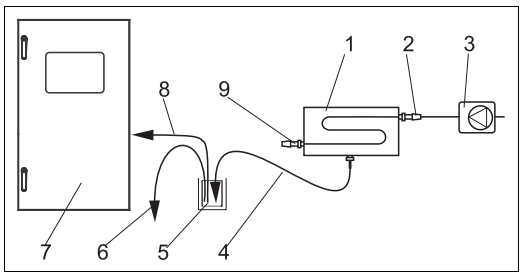
A complete measuring system comprises:
- An analyzer
- A sample conditioning system (optionally):
  - Micro filtration / ultra filtration Stamoclean CAT430 or Stamoclean CAT411
  - Backwash filter Stamoclean CAT221
  - Customer specific solution
- Collecting vessel (see product structure)

Micro / ultra filtration



Measuring system with Stamoclean CAT430

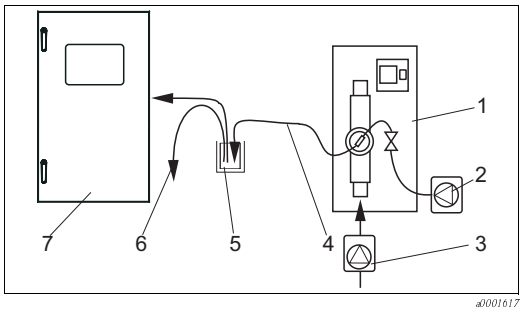
1 *Control box*
2 *Pump*
3 *Control unit*
4 *Collecting unit (optional)*
5 *Collecting vessel*
6 *Overflow*
7 *Analyzer*
8 *Aeration basin*
9 *Membrane filter*



Measuring system with Stamoclean CAT411

1 *Stamoclean CAT411*
2 *Inlet*
3 *Sample pump or hydraulic main*
4 *Filtrate line*
5 *Collecting vessel*
6 *Overflow*
7 *Analyzer*
8 *Analyzer sample line*
9 *Outlet*

Backwash filter



Measuring system with Stamoclean CAT221

1 *Stamoclean CAT221*
2 *Compressor or compressed air*
3 *Sample pump or hydraulic main*
4 *Sample outlet*
5 *Collecting vessel*
6 *Overflow*
7 *Analyzer*

Standard applications

Sewage treatment plant outlet monitoring

Sampling from hydraulic main and analyser in measuring station:
- Backwash filter Stamoclean CAT221 (order no. CAT221-Axxx)
- Compressor for CAT221 (order no. 51511143)
- Analyser with collecting vessel, Stamolys CA71CL-C1xB2A1

Sampling from open channel

Local filtration and analyser in measuring station (up to 20 m distance):
- Ultra filtration Stamoclean CAT430, plate filter with hose heating for max. 20 m distance to the analyser (order no. CAT430-A1F0A3A)
- Filter element holder with horizontal slide (order no. 51511374)
- Analyser with collecting vessel, Stamolys CA71CL-A1xB2A1

Monitoring of the chlorination in water plants resp. in swimming pools

- Filtration is not necessary
- Analyser with collecting vessel Stamolys CA71CL-A1xB2A1

Input

Measured variable	Free or total Cl_2 [mg/l]
Measuring ranges	0.01 ... 1.00 mg/l (CL-A+B) 0.10 ... 10.00 mg/l (CL-C+D)
Wavelength	555 nm
Reference wavelength	880 nm (CL-C+D only)

Output

Output signal	0/4 ... 20 mA
Signal on alarm	Contacts: 2 limit contacts (per channel), 1 system alarm contact optional: end of measurement (with two channel version display of channel no. available)
Load	max. 500 Ω
Data interface	RS 232 C
Data logger	1024 data pairs per channel with date, time and measured value 100 data pairs with date, time and measured value for calibration factor determination (diagnostic tool)
Load capacity	230 V / 115 V AC max. 2 A, 30 V DC max. 1 A

Power supply

Electrical connection

Caution!
The following figure (→ 1) shows the connection department sticker as an example. Terminal assignment and cable core colors can be different to the originals.
For connecting your analyzer only use the terminal assignment of the connection department sticker **in the device** (→ 2)**!**

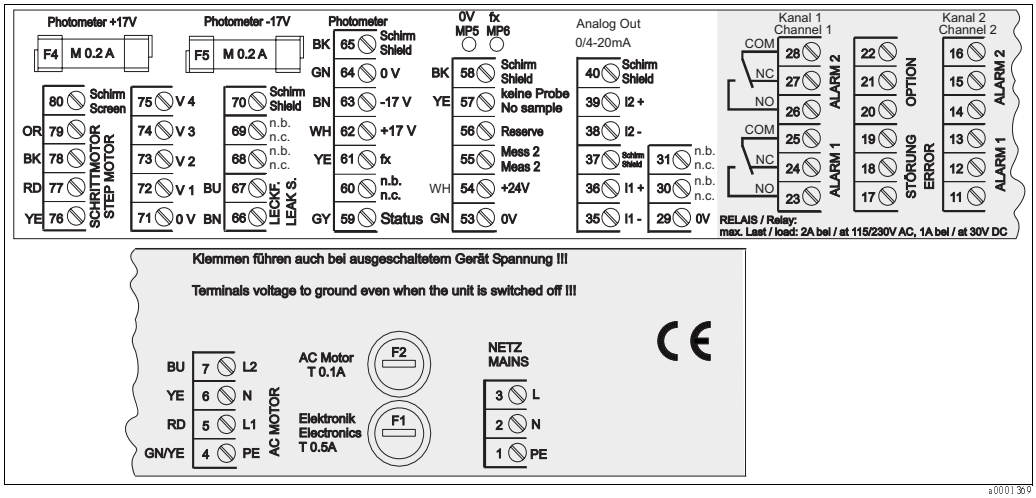


Fig. 1: Example of the connection sticker

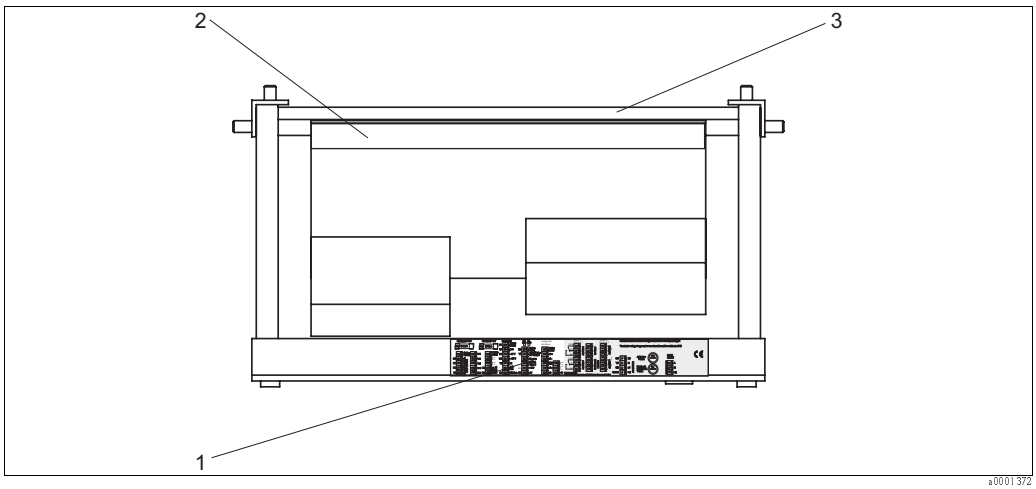


Fig. 2: Analyzer from top (open version resp. swung out)

1 Connection department sticker
2 Printed circuit board with terminal strip
3 Backside of the analyzer

Supply voltage	115 V AC / 230 V AC ±10%, 50/60 Hz
Power consumption	approx. 50 VA
Current consumption	approx. 0.2 A at 230 V approx. 0.5 A at 115 V
Fuses	1 x time-lag 0.5 A for electronics 2 x medium time-lag 0.2 A for photometer 1 x time-lag 0.5 A for motors

Performance characteristics

Time between two measurements	t_{mes} = reaction time + rinse time + waiting time + rinse again time + filling time + sampling time + reagent refusal time (min. waiting time = 0 min)
Maximum measured error	±2 % of measuring range end
Measuring interval	t_{mes} to 120 min
Reaction time	1 minute
Sample requirement	15 ml (0.004 US.gal.) per measurement
Reagent requirement	CL-A+B: 2 x 0.56 ml (0.00015 US.gal.) CL-C+D: 2 x 0.3 ml (0.000079 US.gal.) 2 x 2.6 l (0.687 US.gal.) (CL-A+B) resp. 2 x 1.3 l (0.343 US.gal.) (CL-C+D) reagents per month
Calibration interval	No automatic calibration because the standard can only be held for a few hours.
Rinse interval	0 to 720 h
Rinse time	selectable from 20 to 300 s (standard = 60 s)
Rinse again time	30 s
Filling time	20 s
Maintenance interval	6 months (typical)
Servicing requirement	15 minutes per week (typical)

Environment

Ambient temperature	5 ... 40 °C (41... 104 °F), avoid strong fluctuations
Humidity	below the condensation limit, installation in usual, clean rooms outdoor installation only possible with protective devices (customer supplied)
Ingress protection	IP 43

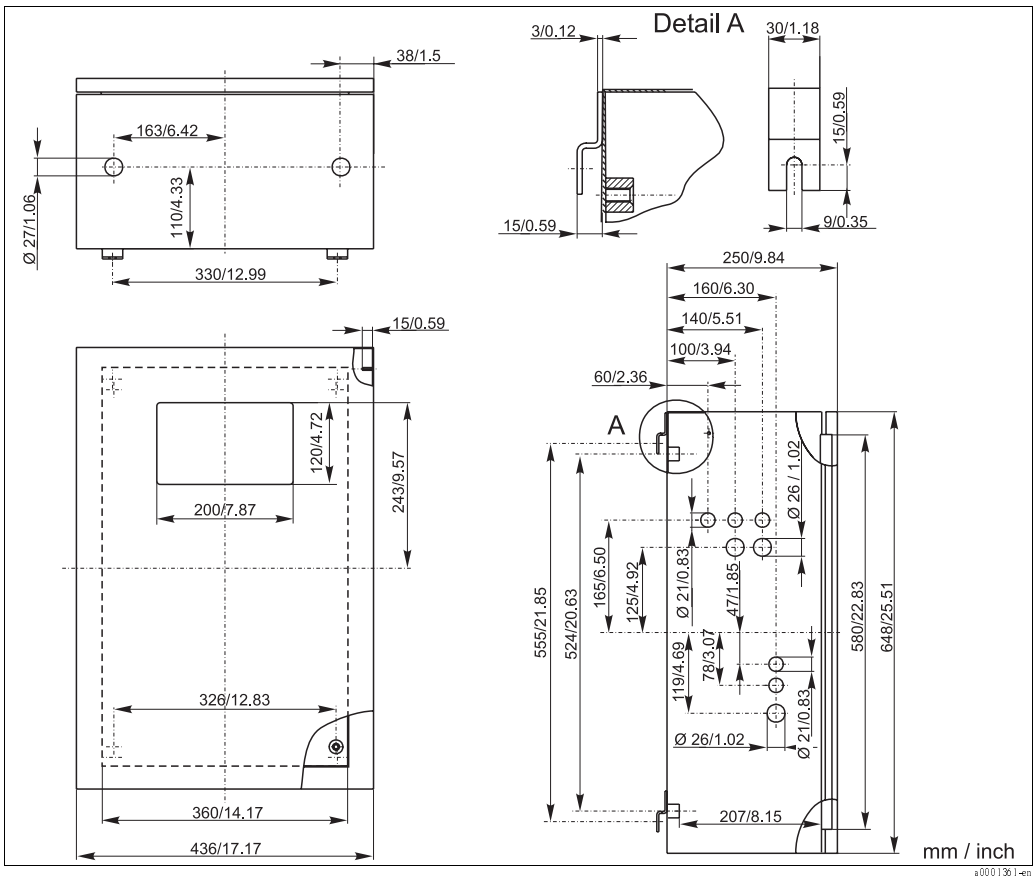
Process

Sample temperature	5 to 40 °C (41 to 104 °F)
Sample flow rate	min. 5 ml (0.0013 US.gal.) per min
Consistence of the sample	low solid content (< 50 ppm)
Sample inlet	pressureless

Mechanical construction

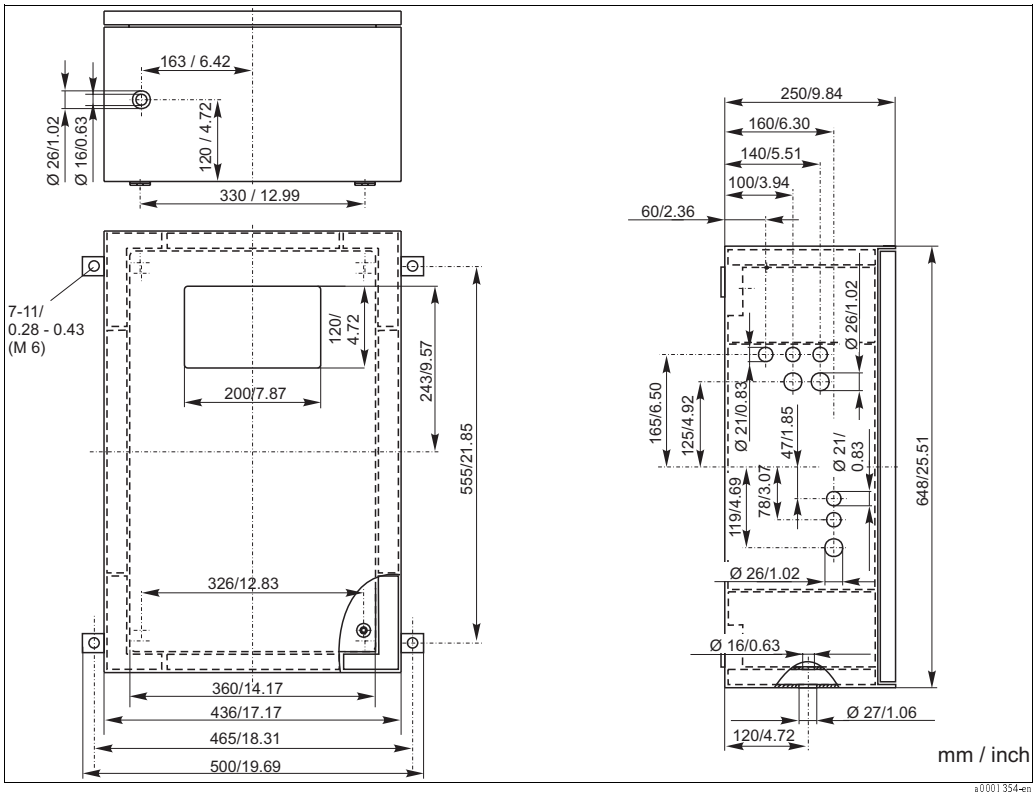
Design, dimensions

Stainless steel housing



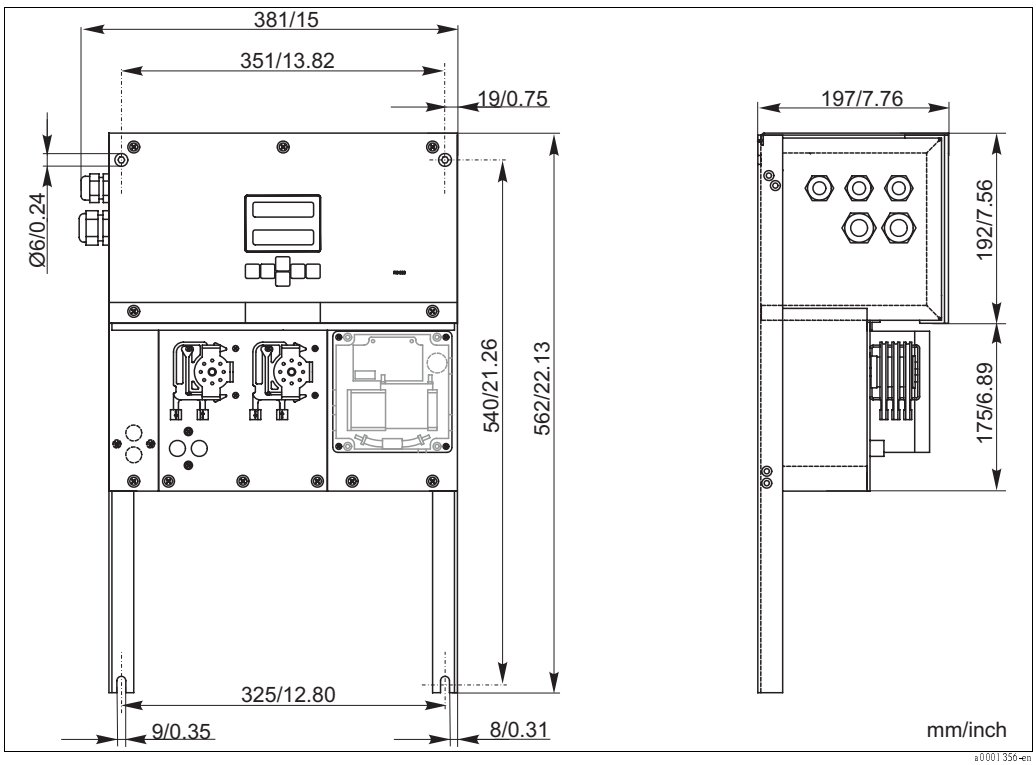
Stainless steel version

GFR housing



GFR version

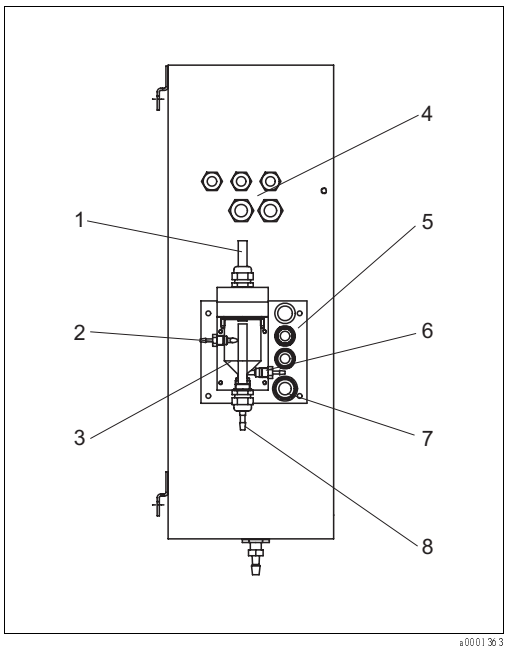
Open version



Open version (without housing)

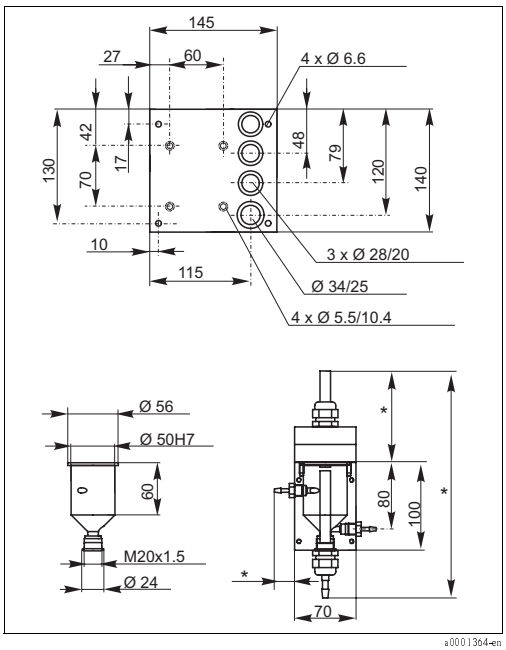
Note!
With the open version, you need an additional platform for the reagents. Mount this platform max. 35 cm (14 inch) below the pumps. The reagent bottels have the following dimensions: 90 x 90 x 215 mm (3.54 x 5.54 x 8.46 inch). The number of bottles varies from 2 to 5 depending on the analyzer version.
For some versions, the outlet pipe must be installed right of the analyzer. See the supplement to the Operating Instructions.
The outlet pipe must be mounted to a wall so that the sample outlet hoses from the photometer have a gradient of 5 to 10 %. If neccessary, extend the hoses.

Collecting vessel



Collecting vessel at analyzer (optional)

1 Ventilation
2 Sample inlet from sampling
3 Collecting vessel
4 Electrical connections
5 Analyzer sample inlet



Collecting vessel dimensions

** variable, freely adjustable dimensions*
6 Sampling for analyzer
7 Analyzer outlet
8 Sample overflow

Weight

GFR housing	approx. 28 kg (61.7 lb)
Stainless steel housing	approx. 33 kg (72.8 lb)
Without housing	approx. 23 kg (50.6 lb)

Material

Housing:	Stainless steel 1.4301 (AISI 304) or glass-fibre reinforced carbon(GFR)
Front windows:	Polycarbonate®
Endless hose:	C-Flex®, Norprene®
Pump hose:	Tygon®, Viton®
Valves:	Tygon®, silicone

Connecting the sample line

One channel version

Collecting vessel (at analyzer, with or without level measurement)

Connection	hose ID 3.2 mm (0.13")

Customer collecting vessel

Connection	hose ID 1.6 mm (0.06")
Max. distance from collecting vessel to analyzer	1 m (3.28 ft)
Max. height difference from collecting vessel to analyzer	0.5 m (1.64 ft)

Two channel version

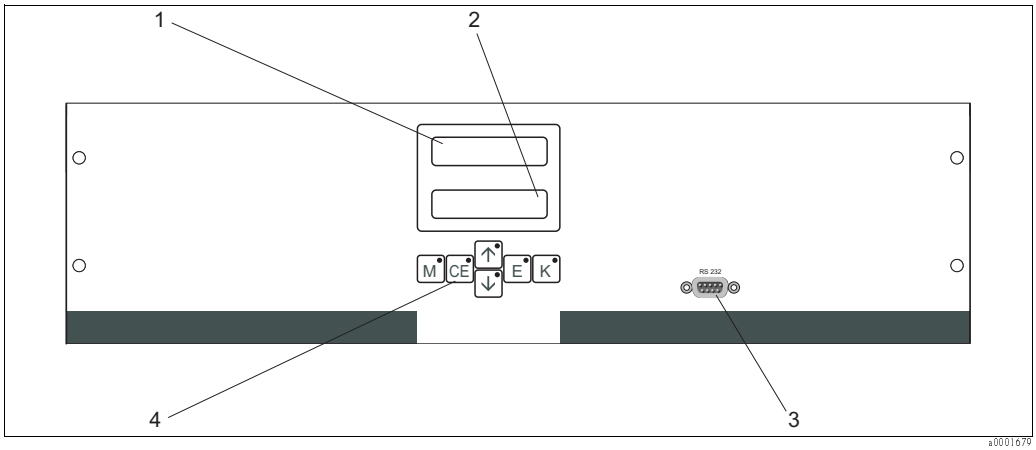
- Depending on the ordered version, one or two collecting vessels (with or without level measurement) are included in the scope of delivery.
- Level measurement is only possible for one channel.
- Only one collecting vessel can be mounted at the housing. The second is to be placed nearby the analyzer.

Sample outlet

Connection	Hose ID 6.4 mm (0.25") – Max. length of closed loop: 1 m (3.28 ft) – Open outlet downgrade installed – No combination of several devices to a closed-loop system
Min. volume per measurement	20 ml (0.005 US.gal.)

Human Interface

Display and operating elements



Display and operating elements

1 LED (measured value)
2 LC display (measured value and status)
3 Serial interface RS 232
4 Operating keys and control LEDs

Certificates and approvals

CE approval

Declaration of conformity
The product meets the legal requirements of the harmonised European standards.
The manufacturer confirms compliance with the standards by affixing the CE symbol.

Test reports

Quality certificate
Depending on the order code, you receive a quality certificate.
With the certificate the manufacturer confirms compliance with all technical regulations and the successful individual testing of your product.

Ordering information

Product structure

Measuring range								
A	0.01 ... 1.00 ppm free chlorine							
B	0.01 ... 1.00 ppm total chlorine							
C	0.10 ... 10.00 ppm free chlorine							
D	0.10 ... 10.00 ppm total chlorine							
Y	Special version acc. to customer's specification							
		Sample transfer						
		1	From one measuring point (one-channel version)					
		2	From two measuring points (two-channel version)					
			Power supply					
			0	230 V AC / 50 Hz				
			1	115 V AC / 60 Hz				
			2	115 V AC / 50 Hz				
			3	230 V AC / 60 Hz				
				Collecting vessel for up to 3 analyzers				
				A	Without collecting vessel			
				B	With collecting vessel without level measurement			
				C	With collecting vessel with level measurement (one-channel version only)			
				D	With two collecting vessels without level measurement (two-channel version)			
					Housing version			
					1	Without housing		
					2	With GFR housing		
					3	With stainless steel 1.4301 (AISI 304) housing		
						Communication		
						A	0/4 ... 20 mA, RS 232	
							Additional equipment	
							1	Quality certificate
							2	Quality certificate + set of inactive reagents
							3	Quality certificate + three sets of inactive reagents
CA71CL-								**complete order code**

Scope of delivery

The scope of delivery comprises:
- an analyzer with mains plug
- a cleaning injector
- a tin of silicone spray
- a Norprene hose, length 2.5 m (8.2 ft), ID 1.6 mm (0.06")
- a C-flex hose, length 2.5 m (8.2 ft), ID 6.4 mm (0.25")
- a C-flex hose, length 2.5 m (8.2 ft), ID 3.2 mm (0.12")
- two hose fittings of each size:
  - 1.6 mm x 1.6 mm (0.06" x 0.06")
  - 1.6 mm x 3.2 mm (0.06" x 0.12")
  - 6.4 mm x 3.2 mm (0.25" x 0.12")
- two T-hose fittings of each size:
  - 1.6 mm x 1.6 mm x 1.6 mm (0.06" x 0.06" x 0.06")
  - 3.2 mm x 3.2 mm x 3.2 mm (0.12" x 0.12" x 0.12")
- an interference suppressor for the current output
- 4 edge covers
- a quality certificate
- Operating Instructions (English).

Note!
Please, order reagents separately with analyzer version CA71XX-XXXXXX1.
With all other versions, inactive reagents are included in the scope of delivery. You have to mix the reagents before using them. Please, read the instructions attached to the reagents.

Accessories

Reagents and standard solutions

- Reagent set active, free chlorine, 1 l CL1+CL2 each; order no. CAY543-V10AAE
- Reagent set, inactive, free chlorine, 1 l CL1+CL2 each; order no. CAY543-V10AAH
- Reagent set active, total chlorine, 1 l CL1+CL2 each; order no. CAY546-V10AAE
- Reagent set, inactive, total chlorine, 1 l CL1+CL2 each; order no. CAY546-V10AAH
- Cleaning agent, 1 l; order no. CAY544-V10AAE

Cleaner for hoses

- Cleaning agent, alkaline, 100 ml; order no. CAY746-V01AAE
- Cleaning agent, acidic, 100 ml; order no. CAY747-V01AAE

Collecting vessel

– for sampling from pressurised systems
– results in an unpressurised continuous sample stream

- Collecting vessel without level measurement; order no. 51512088
- Collecting vessel with level measurement (conductive); order no. 51512089

Maintenance kit

CL-A/B

- Maintenance kit CAV 740:
  – 1 set pump hoses violet/white
  – 1 set pump hoses black/black
  – 1 set hose connectors per hose set
  order no. CAV 740-4A

CL-C/D

- Maintenance kit CAV 740:
  – 1 set pump hoses yellow/blue
  – 1 set pump hoses black/black
  – 1 set hose connectors per hose set
  order no. CAV 740-1A

Additional accessories

- Interference suppressor for control, power and signal lines
  order no. 51512800
- Silicon spray
  order no. 51504155
- Valve set, 2 pieces, for two-channel version
  order no. 51512234
- Upgrade kit for upgrading from one-channel to two-channel version
  order no. 51512640

Documentation

Sample conditioning

- Technical Information Stamoclean CAT430, TI 338C/07/en
- Technical Information Stamoclean CAT411, TI 349C/07/en
- Technical Information Stamoclean CAT221, TI 384C/07/en

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