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

Technical Information

Stamolys CA71AL

Aluminium analyser
Compact photometric analysis system for the aluminium measurement in drinking water and wastewater

Application

- Phosphate elimination in sewage treatment plants
- Precipitant monitoring in wastewater and drinking water applications

Your benefits

- Trace measurements from 10 µg/l possible
- 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

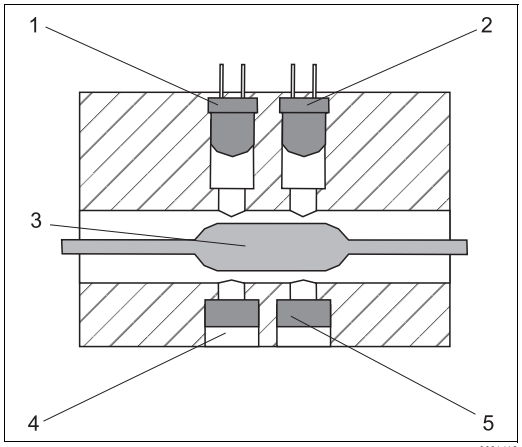
TI357C/07/en/10.04
51512294

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

After sample conditioning, the analyser 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.



Photometric principle

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

Aluminium

Due to its good mechanical properties (ductility), aluminium is one of the most used light metals. Major users are car construction and packaging industry.
In the environment, aluminium mainly occurs in the soil, in many ores (felspar, mica). There is a low concentration of aluminium as natural content in surface water and groundwater.
Due to acid rain, aluminium bound in the soil can be set free, it penetrates into the groundwater and finally into the food chain.
For humans, aluminium is harmful to health. Aluminium is supposed to be one of the factors causing illnesses such as Alzheimer or Parkinson. Higher contents in drinking water are toxic.
The limit value acc. to the German drinking water regulations is: 0.2 mg/l Al.

Photometric determination

Pyrocatechol violet method for aluminium determination
In a pH 5.8 to 6.0 buffered solution catechol violet and Al (III) ions form a blue dye.
The absorption is determined at a wavelength of 565 nm. The absorbance is proportional to the aluminium concentration in the sample.
The reference wavelength is 880 nm.

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 minimised 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.

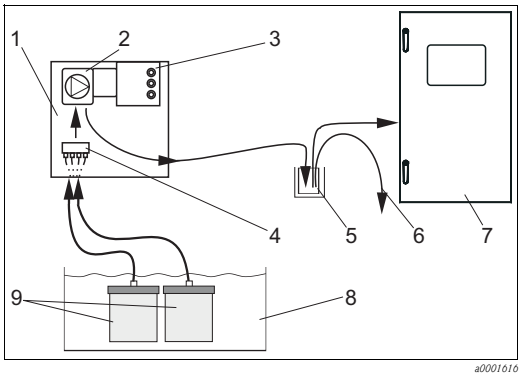
Customer specific solution

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

Measuring system

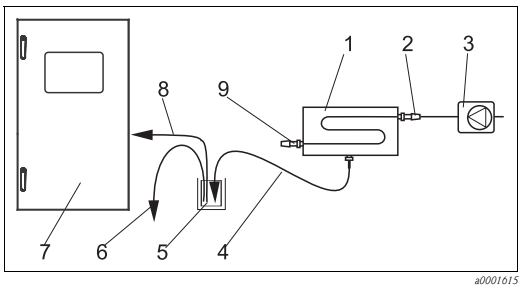
A complete measuring system comprises:
- An analyser
- A sample conditioning system (optionally):
  - Micro filtration / ultra filtration Stamoclean CAT430 or Stamoclean CAT411
  - Backwash filter Stamoclean CAT221
  - Customer specific solution
- Collecting vessel (see product structure)

Micro / ultra filtration



Measuring system with Stamoclean CAT430

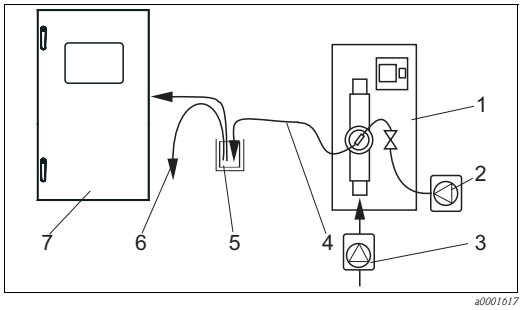
1 *Control box*
2 *Pump*
3 *Control unit*
4 *Collecting unit (optional)*
5 *Collecting vessel*
6 *Overflow*
7 *Analyser*
8 *Aeration basin*
9 *Membrane filter*



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 *Analyser*
8 *Analyser 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 Analyser

Input

Measured variable	Al [µg/l]
Measuring ranges	10 ... 1000 µg/l
Wavelength	565 nm
Reference wavelength	880 nm

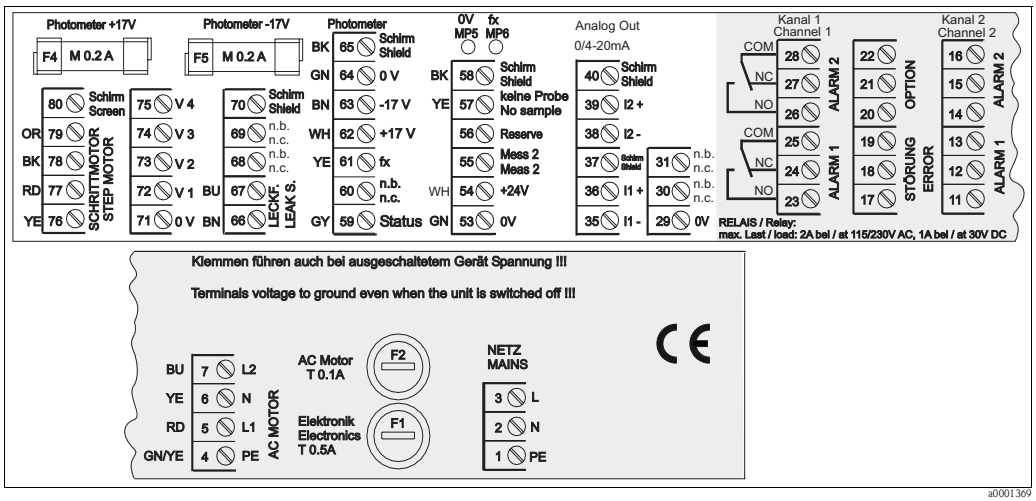
Output

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 (Fig.) shows the connection department sticker as an example. Terminal assignment and cable core colours can be different to the originals.
For connecting your analyser only use the terminal assignment of the connection department sticker **in the device** (Fig.)!



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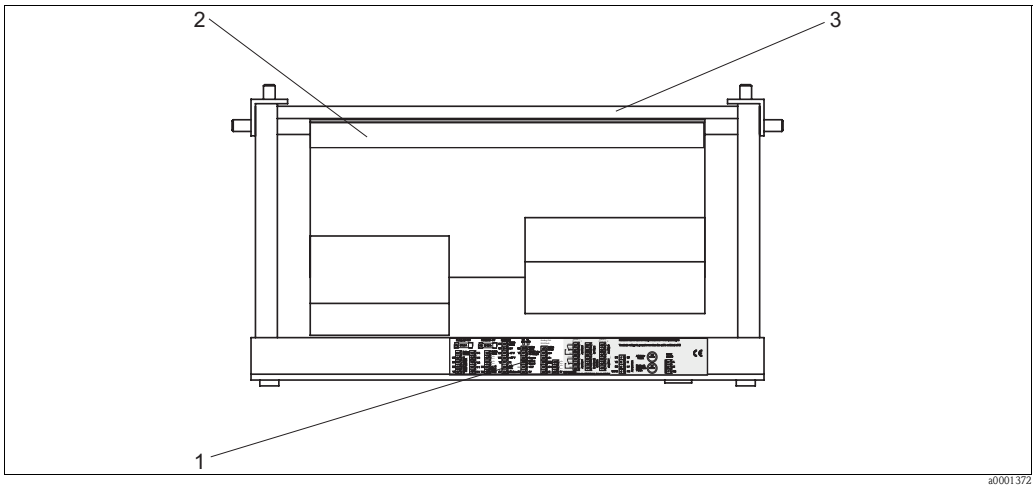
Example of the connection sticker



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Analyser from top (open version resp. swung out)

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

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
Repeatability	±10 µg/l (up to 300 µg/l) ±20 µg/l (300 to 1000 µg/l)
Measuring interval	t_{mes} to 120 min
Reaction time	195 s
Sample requirement	20 ml (0.0053 US.gal.) per measurement
Reagent requirement	3 x 0.285 ml (0.075 US.gal.) 0.82 l (0.216 US.gal.) per reagent per month with 15 minute measuring interval
Calibration interval	0 to 720 h
Rinse interval	0 to 720 h
Rinse time	selectable from 20 to 300 s (standard = 60 s)
Rinse again time	30 s
Filling time	32 s
Sampling	$t_{sampling}$ = 80 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

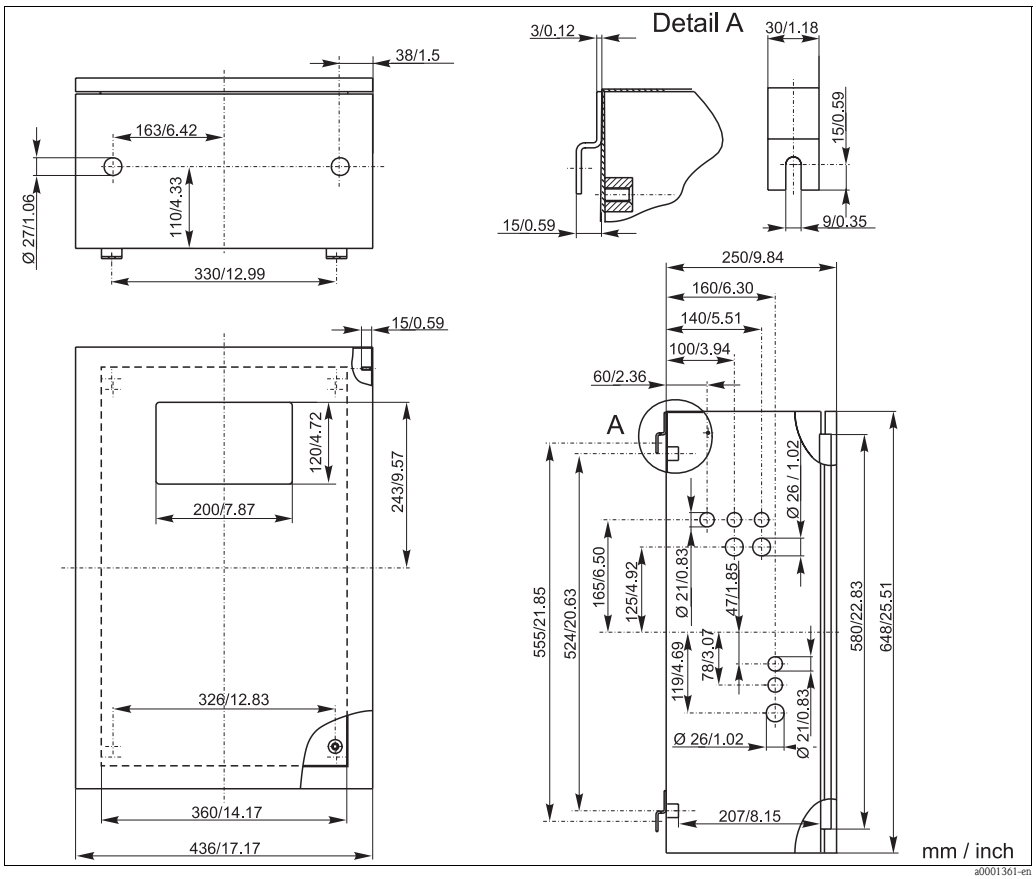
Process

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

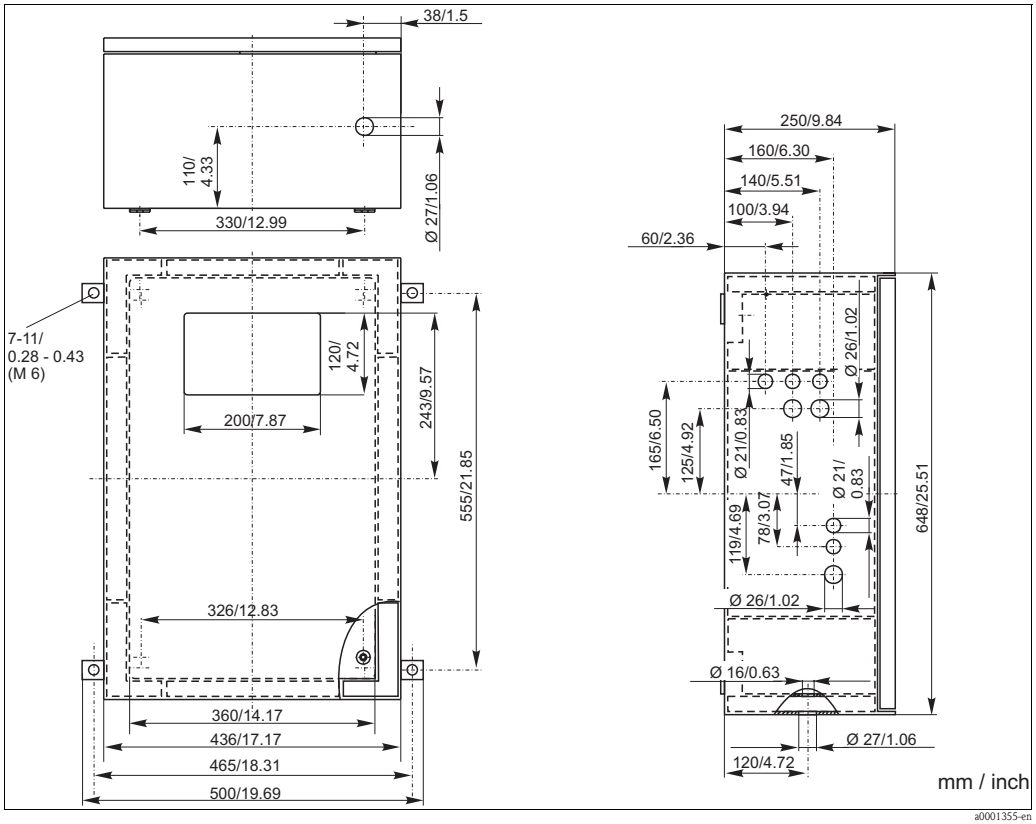
Design, dimensions

Analyser, stainless steel version



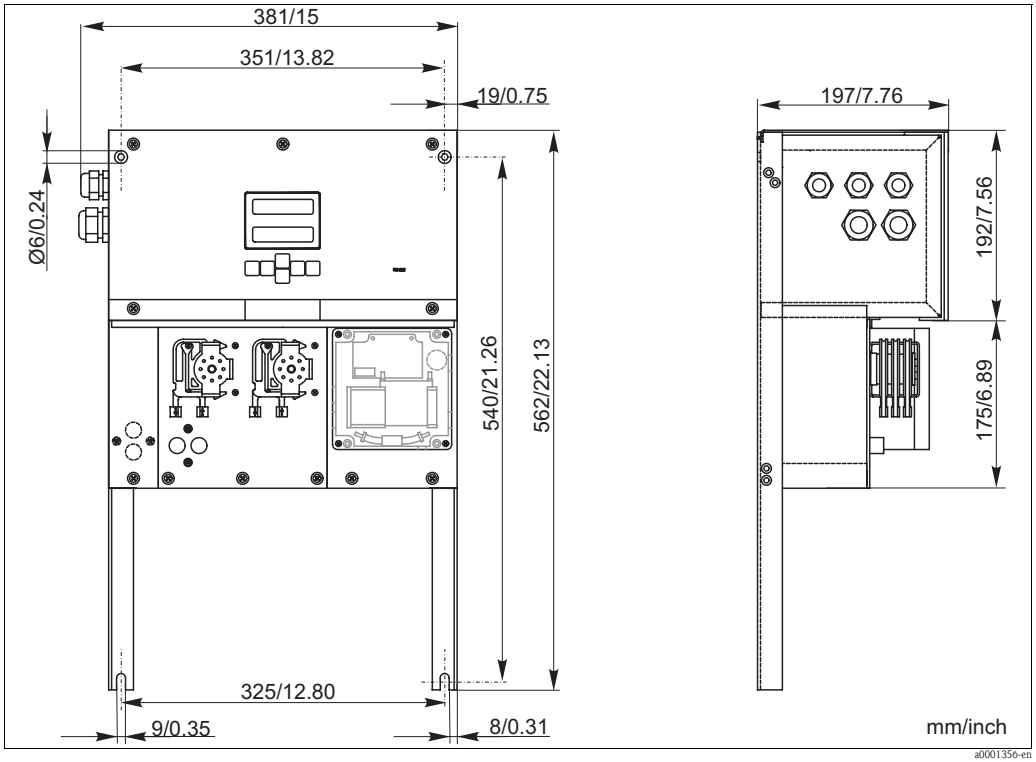
Stainless steel version

Analyser, GFR version



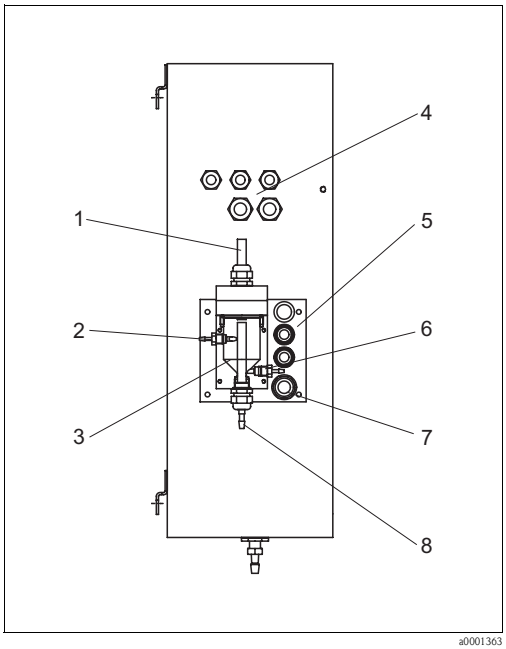
GFR version

Analyser, open version



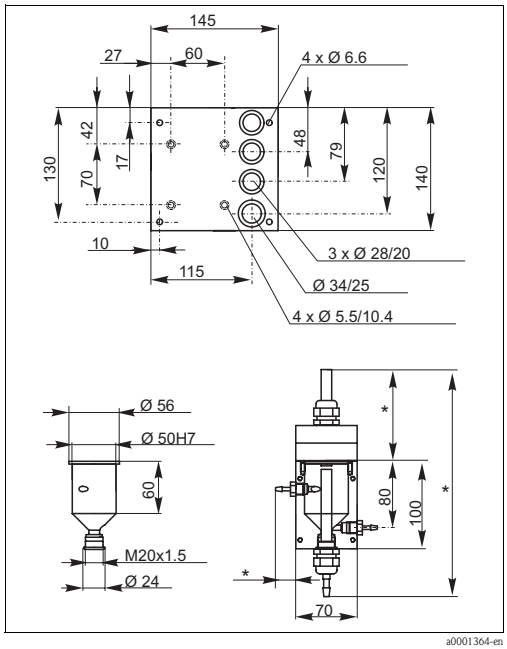
Open version (without housing)

Collecting vessel



Collecting vessel at analyser (optional)

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



Collecting vessel dimensions

** variable, freely adjustable dimensions*
6 Sampling for analyser
7 analyser 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)

Materials

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

Sample line connection

One channel version

Collecting vessel (at analyser, 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 analyser	1 m (3.28 ft)
Max. height difference from collecting vessel to analyser	0.5 m (1.64 ft)

Two channel version

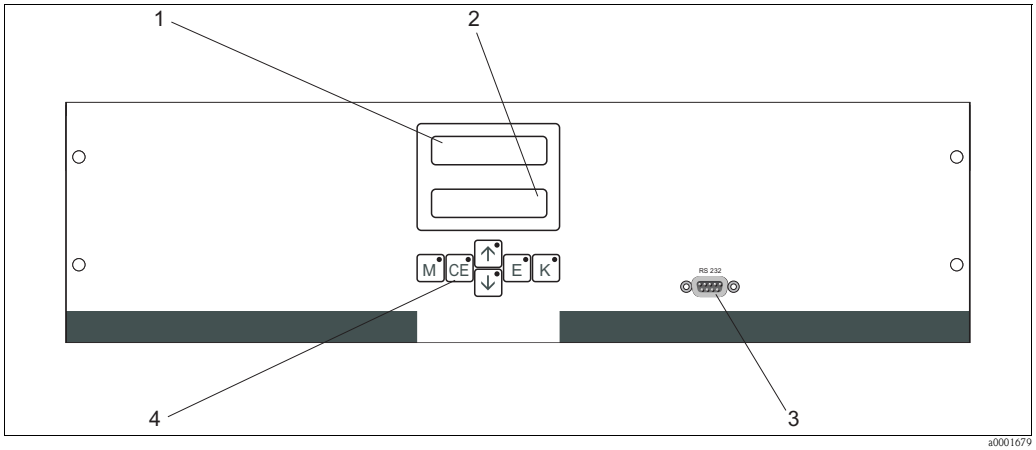
- Depending on the ordered version, one or two collecting vessels (with or without level measurement) are included in the scope of delivery.
- Level measurement is only possible for one channel.
- Only one collecting vessel can be mounted at the housing. The second is to be placed nearby the analyser.

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

Ordering information

Product structure

	Measuring range							
	A	Measuring range 10 ... 1000 µg/l Al						
	Y	Special version acc. to customer;s specification						
		Sample transfer						
		1	Sample transfer from one measuring point (one-channel version)					
		2	Sample transfer from two measuring points (two-channel version)					
			Power supply					
			0	Power supply 230 V AC / 50 Hz				
			1	Power supply 115 V AC / 60 Hz				
				Collecting vessel for up to 3 analysers				
				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
CA71AL -								**complete order code**

Scope of delivery

Note!
Please, order reagents separately with analyser 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.

The scope of delivery comprises:
- an analyser 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 Grifflex hose, length 2.0 m (6.56 ft), ID 19 mm (0.75")
- 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")
- 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
- a screwed socket for the outlet pipe
- 4 edge covers
- a quality certificate
- Operating Instructions (English).

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.

Accessories

Reagents and standard solutions

- ❑ Reagent set, active, 1 l reagents AL1+AL2+AL3 each; order no. CAY939-V10AAE
- ❑ Reagent set, inactive, 1 l reagents AL1+AL2+AL3 each; order no. CAY939-V10AAH
- ❑ Standard solution 0.10 mg/l Al; order no. CAY942-V10C10AAE
- ❑ Standard solution 0.25 mg/l Al; order no. CAY942-V10C25AAE
- ❑ Standard solution 0.50 mg/l Al; order no. CAY942-V10C50AAE

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

- ❑ 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 740-5A
- ❑ 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

- ❑ Technical Information Stamoclean CAT430, TI 338C/07/en (order no. 51508729)
- ❑ Technical Information Stamoclean CAT411, TI 349C/07/en (order no. 51508785)
- ❑ Technical Information Stamoclean CAT221, TI 384C/07/en (order no. 51515899)

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