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

Technical Information

Stamolys CA71HA

Total Hardness Analyser
Compact photometric analysis system for total hardness measurement in drinking water systems



Application

- Total hardness monitoring in reverse osmosis systems inlets
- Total hardness monitoring after ion exchange systems
- Monitoring of precipitant addition in drinking water treatment plants

Your benefits

- Direct reaction in photometer at constant temperature
- Fast response time due to low system volume and short distances
- Low reagent requirement
- Low sample requirement
- Two selectable measuring ranges
- User-friendly interface
- Sample stream monitoring and plain text error menu
- Measured value storage using integrated data logger
- Automatic self-cleaning
- Automatic calibration
- With two channel version: measurement sequences programmable
- Two housing versions and an open version available

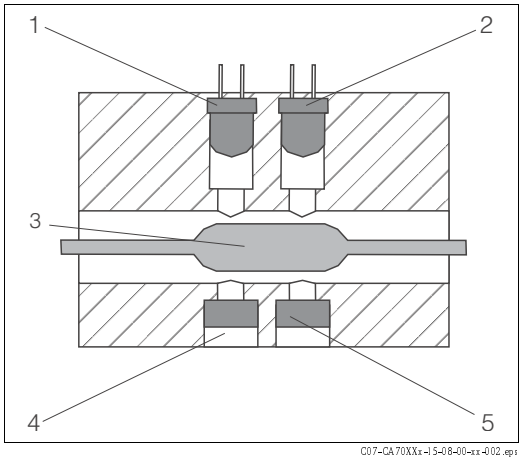
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Endress+Hauser
People for Process Automation

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 absorption intensity 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

Photometric determination

Complexometric method for total hardness determination

By adding MgEDTA to the sample, calcium is equivalently replaced by magnesium.
At pH 10 calcium, magnesium and eriochrome black T form a ruby dye.
The absorption is determined at a wavelength of 525 nm (HA-A) resp. 880 nm (HA-B). The absorption intensity is proportional to the total hardness in the sample.
The reference wavelength is 660 nm (HA-A) resp. 740 nm (HA-B).

Interferences

No interferences up to the given concentration:

Concentration [mg/l]	Ion
2.00	Fe^{3+}
1.40	Fe^{2+}
0.75	Cu^{2+}
0.25	Cr^{3+}
0.20	Mn^{2+}
0.05	Zn^{2+}

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 analyser 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 analysers 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 a pressure pipe. The filtrate passes through the wedge wire sieve and is then transported to the measuring device.
Clogging is minimised by the tangential flow of the wedge wire sieve. Automatic backwashing results in a filter operating time of several weeks.
The automatic backwashing and a small compressor guarantee low-maintenance and low-energy operation.

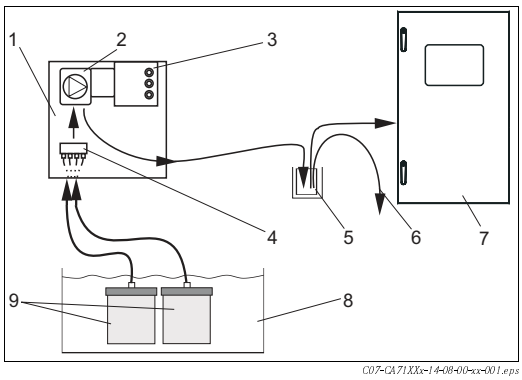
Customer specific solution

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

Measuring system

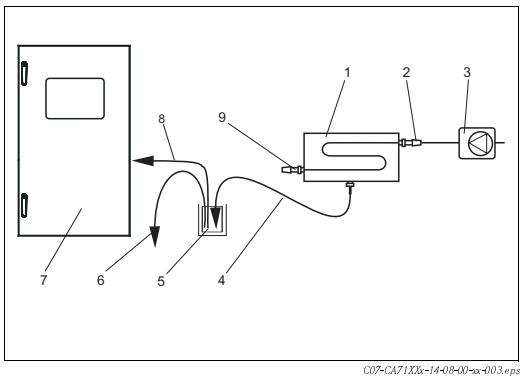
A complete measuring system comprises:
- An analyser
- A sample conditioning system (optionally):
  - Micro filtration / ultra filtration Stamoclean CAT430 or Stamoclean CAT411
  - Backwash filter Stamoclean CAT221
  - Customer specific solution
- Collecting vessel (see product structure)

Micro / ultra filtration



Measuring system with Stamoclean CAT430

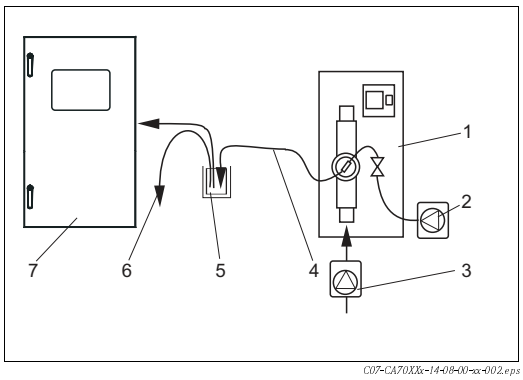
1 *Hose pump box*
2 *Hose pump*
3 *Control unit*
4 *Collecting unit (optional)*
5 *Collecting vessel*
6 *Overflow*
7 *Analyser*
8 *Aeration basin*
9 *Membrane filter*



Measuring system with Stamoclean CAT 411

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 CAT 221

1 *StamoClean CAT 221*
2 *Compressor or compressed air*
3 *Sample pump or hydraulic main*
4 *Sample outlet*
5 *Collecting vessel*
6 *Overflow*
7 *Analyser*

Input

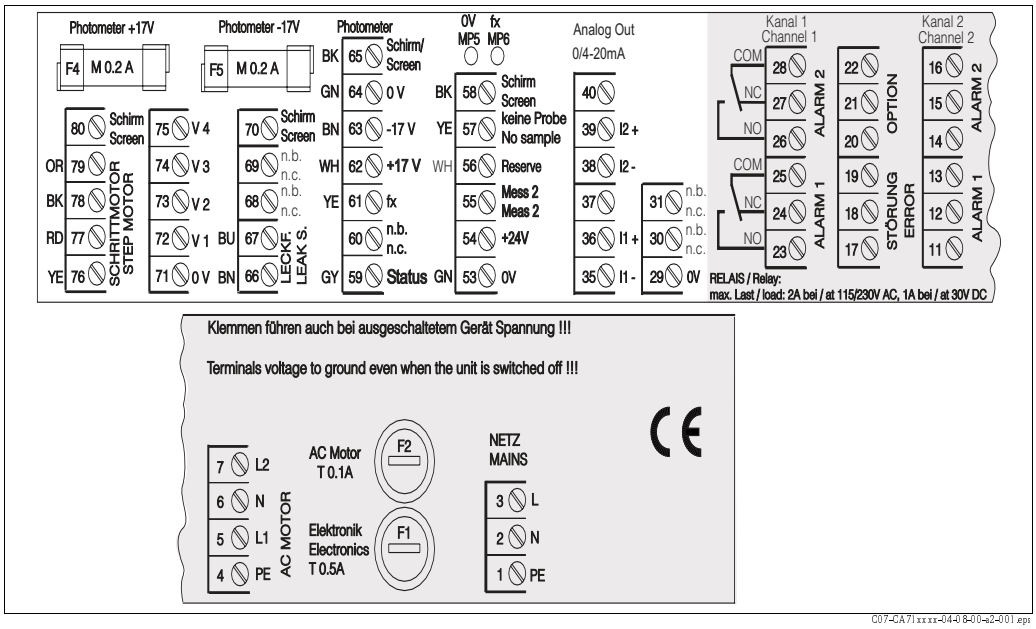
Measured variable	$CaCO_3$ [mg/l, °fH, °dH, mmol/l, ppm]
Measuring ranges	0.1 ... 10 mg/l $CaCO_3$ (HA-A) 0.8 ... 80 mg/l $CaCO_3$ (HA-B)
Wavelength	525 nm (HA-A) 880 nm (HA-B)
Reference wavelength	660 nm (HA-A) 740 nm (HA-B)

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



Connection sticker CA 71

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 0.1 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	5 % of measuring range end (HA-A) 3 % of measuring range end (HA-B)
Measuring interval	t_{mes} to 120 min
Reaction time	2 minutes
Sample requirement	20 ml (0.0053 US.gal.) per measurement
Reagent requirement	2 x 0.1 ml (0.00026 US.gal) 1.0 l (0.264 US.gal) per reagent per 90 days (HA-A) resp. per 21 days (HA-B) with a 10 minute measuring interval
Calibration interval	0 to 72 h
Rinse interval	0 to 72 h
Rinse time	selectable from 20 to 300 s (standard = 80 s)
Rinse again time	60 s
Filling time	15 s (HA-A) 10 s (HA-B)
Sampling time	$t_{sampling}$ = 80 s
Reagent refusal time	$t_{refusal}$ = 20 s (HA-A) $t_{refusal}$ = 10 s (HA-B)
Maintenance interval	6 months (typical)
Servicing requirement	15 minutes per week (typical)

Environment

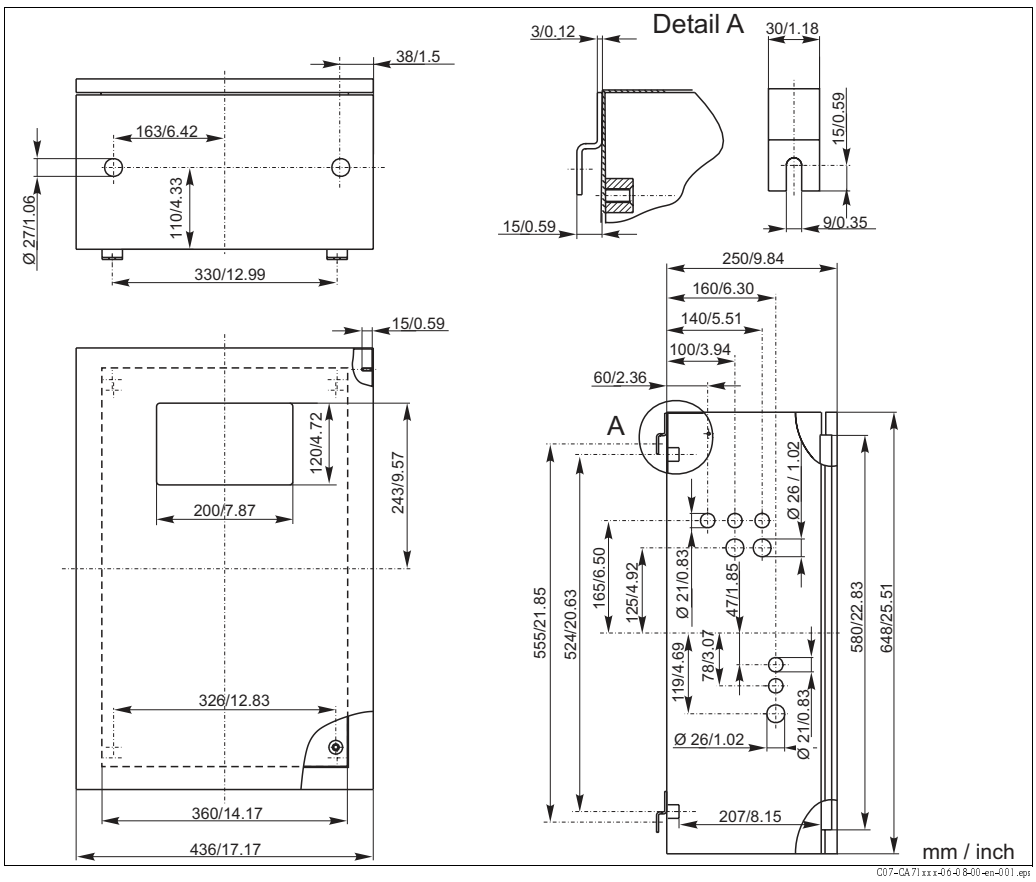
Ambient temperature	5 ... 40 °C (41... 104 °F), avoid strong fluctuations
Humidity	below the condensation limit, installation in usual, clean rooms outdoor installation only possible with protective devices (customer supplied)
Ingress protection	IP 43

Process

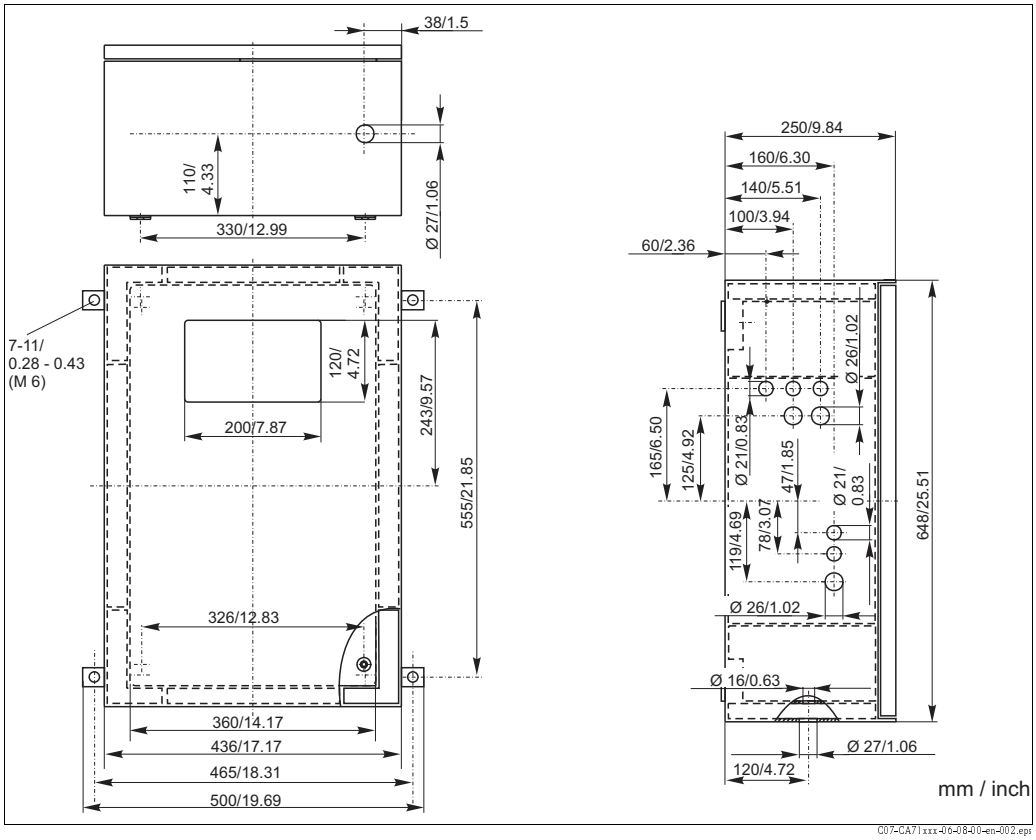
Sample temperature	5 to 40 °C (41 to 104 °F)
Sample flow rate	min. 5 ml (0.0013 US.gal.) per min
Consistence of the sample	low solid content (< 50 ppm)
Sample inlet	pressureless
Sample pH value	> pH 3 (not buffered)

Mechanical construction

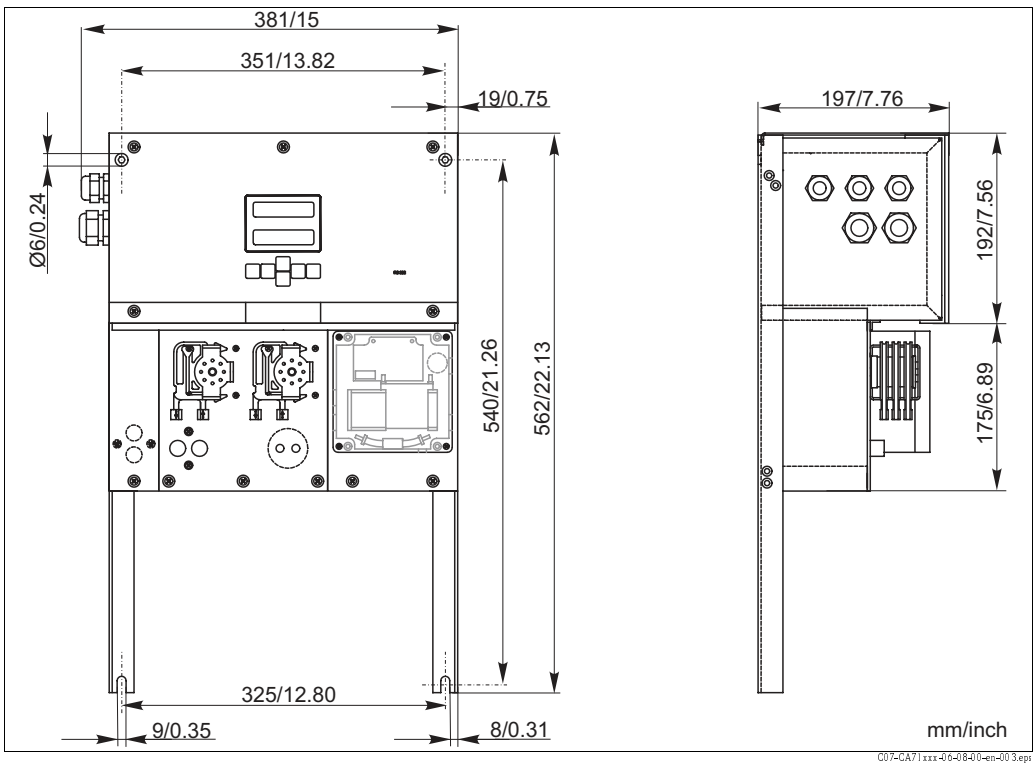
Design, dimensions **Analyser**



Stainless steel version

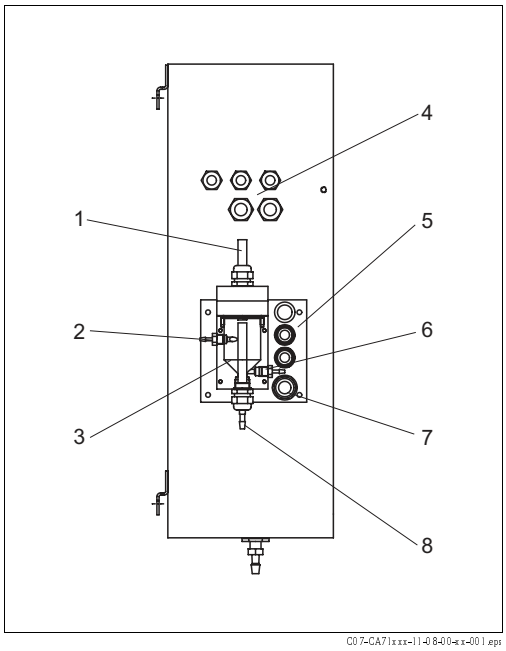


GFK version

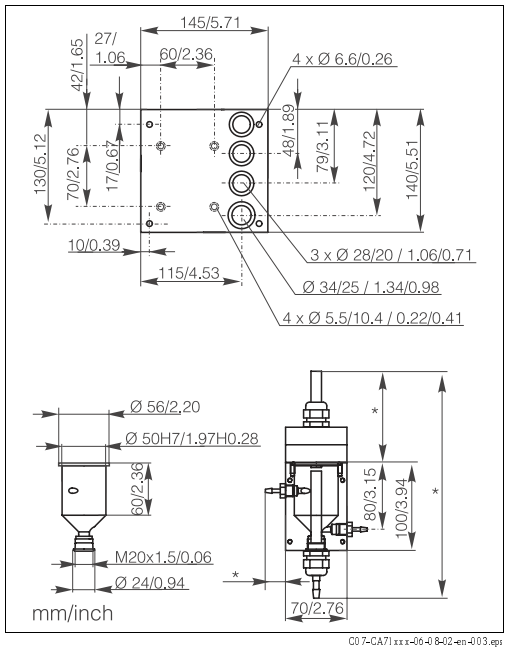


Open version (without housing)

Collecting vessel



Collecting vessel at analyser (optional)



Collecting vessel dimensions

1 Ventilation
2 Sample inlet from sampling
3 Collecting vessel
4 Electrical connections
5 Analyser sample inlet
6 Sampling for analyser
7 Analyser outlet
8 Sample overflow
** variable, freely adjustable dimensions*

Weight

GFK 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 GFK
Front windows:	Plexiglass®
Endless hose:	C-Flex®, Norprene®
Pump hose:	Tygon®, Viton®
Valves:	Tygon®

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

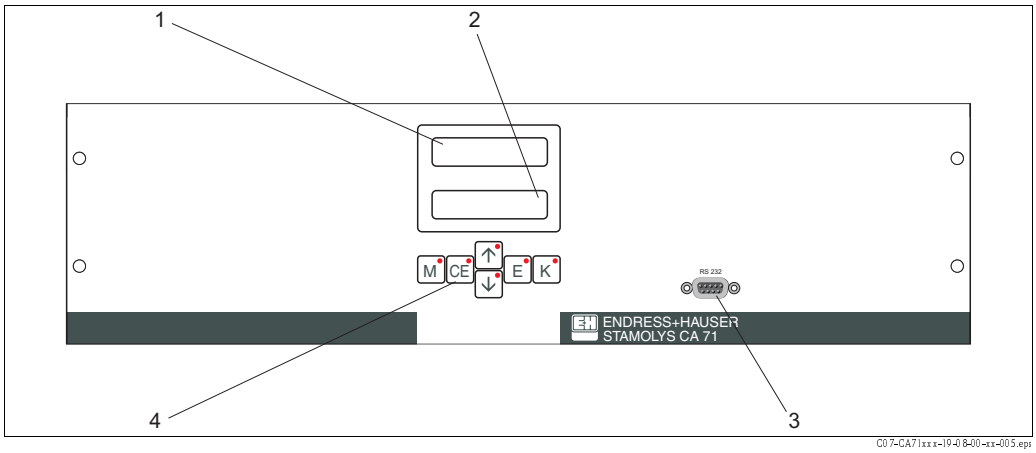
- Depending on the ordered version, one or two collecting vessels (with or without level measurement) are included in the scope of delivery.
- Level measurement is only possible for one channel.
- Only one collecting vessel can be mounted at the housing. The second is to be placed nearby the analyser.

Sample outlet

Connection	Hose ID 16 mm (0.63") – 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

Human Interface

Display and operating elements



CA 71 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 0.1 ... 10 mg/l $CaCO_3$							
B	Measuring range 0.8 ... 80 mg/l $CaCO_3$							
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 GFK 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 HA-A	
						3	Quality certificate + three sets of inactive reagents HA-A	
						4	Quality certificate + set of inactive reagents HA-B	
						5	Quality certificate + three sets of inactive reagents HA-B	
CA 71 HA -								**complete order code**

Scope of delivery

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
- 4 edge covers
- a quality certificate
- Operating Instructions (English).



Note!
Please, order reagents separately with analyser version CA 71 XX-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 mixing instructions attached to the reagents.

Certificates and approvals

CE approval

Declaration of conformity
The product meets the legal requirements of the harmonised European standards.
Endress+Hauser 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, 1 l active reagents HA-A1+HA-A2 each; order no. CAY748-V10AAE
- ❑ Reagent set, 1 l inactive reagents HA-A1+HA-A2 each; order no. CAY748-V10AAH
- ❑ Reagent set, 1 l active reagents HA-B1+HA-B2 each; order no. CAY749-V10AAE
- ❑ Reagent set, 1 l inactive reagents HA-B1+HA-B2 each; order no. CAY749-V10AAH
- ❑ Standard solution 5 mg/l $CaCO_3$; order no. CAY750-V10C05AAE
- ❑ Standard solution 10 mg/l $CaCO_3$; order no. CAY750-V10C10AAE
- ❑ Standard solution 20 mg/l $CaCO_3$; order no. CAY750-V10C20AAE
- ❑ Standard solution 50 mg/l $CaCO_3$; order no. CAY750-V10C550AAE
- ❑ Standard solution 180 mg/l $CaCO_3$; order no. CAY750-V10C88AAE

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 740-5C
- ❑ 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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