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

Technical Information

Stamolys CA71SI

Silicate Analyser

Compact photometric analysis system for the silicate measurement in ultrapure water and boiler feedwater

Application

- Ultrapure water
- Boiler feedwater
- Steam and condensate analysis
- Reversed osmosis
- Demineralisers

Industries:
- Pharmaceutical industry
- Power stations

Your benefits

Stamolys CA71SI measures the silicate content quasi-continuously to assure a constant optimum water quality. This is of special advantage in the performance monitoring of ion exchange and reversed osmosis systems. The analyser replaces frequent manual sampling and exactly determines the silicate break through of the system.

- 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

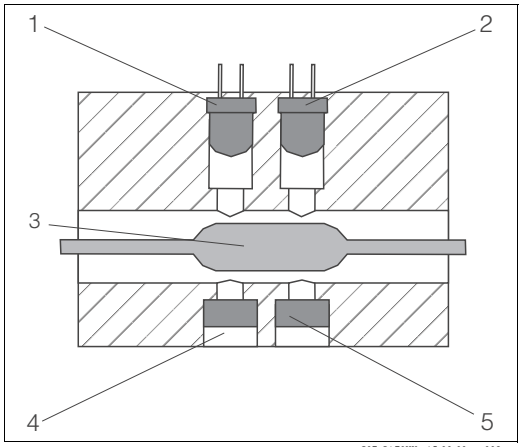
TI364C/07/en/07.04
51512308

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle upper measuring range (SI-B)

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.

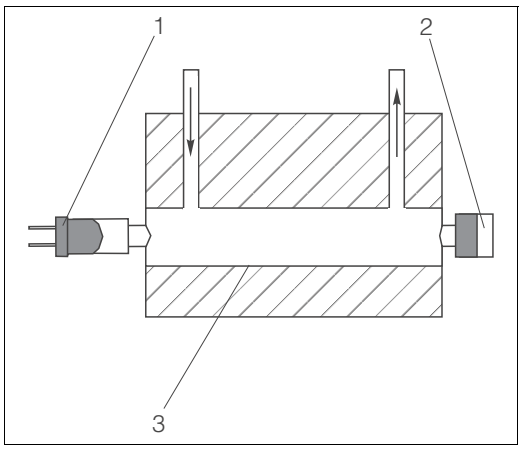


Photometric principle

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

Measuring principle lower measuring range (SI-A)

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 analyser, the respective concentration is calculated from the proportion of light absorbed by the sample.



Photometric measuring principle

1 LED
2 Detector
3 Sample

Silicate

With 18% silicon is the second most frequent element of the earth crust. It occurs chemically bonded as silicate or silicon dioxide in a variety of minerals. From these minerals silicate or silicic acid is washed out in low quantities to waters.
There are no standard limits for drinking water since silicate is not known to be harmful to health.
But in boiler feed water and boiler water, there may be only low silicate concentrations. Under thermal charge or under high pressure insoluble silicon dioxide is formed. It solidifies in boilers, heat exchangers and turbine blades and thus reduces the heat exchanger's efficiency or causes overheating.
The standard limit for boiler feed water is 0.02 ppm silicic acid (SiO_2). For injection and boiler water the standard limits are pressure dependent. For example, at an operational pressure of 68 bar (986 psi), the concentration of silicic acid in boiler water must not exceed 10 ppb.

Photometric detection

Heteropoly blue method for silicate determination

Under acidic conditions silicate and phosphate react with molybdate to form yellow silicomolybdic and phosphomolybdic acid complexes. Addition of citric acid destroys the phosphate complexes. Last step is the addition of an amino acid. It reduces the yellow silicomolybdic complex to intensively blue silicomolybdic blue. The absorption is determined at a wave length of 810 nm. The absorption intensity is proportional to the silicate concentration in the sample.

Interferences

Interferring substance	Interference
Colour	eliminated by calibration
Iron	interferences from 1 mg/l
Phosphate	interferences from 50 mg/l
Sulfide	interferences at high concentrations
Turbidity	eliminated by calibration
Extreme pH values	pH must be lower than 7

Sample conditioning

Analyser and membrane filtration (Stamoclean CAT411)

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.

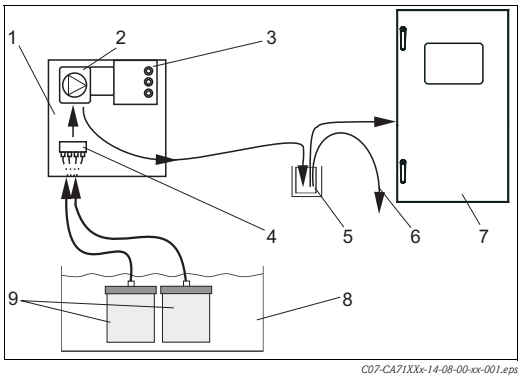
Analyser without Endress+Hauser sample conditioning

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

Measuring system

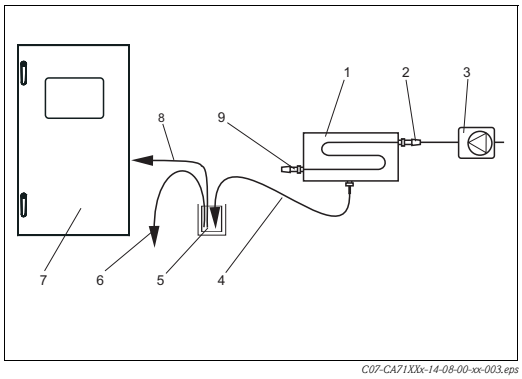
A complete measuring system comprises:
- An analyser
- A sample conditioning system (optionally):
  - Micro filtration / ultra filtration Stamoclean CAT430 or Stamoclean CAT411
  - Backwash filter Stamoclean CAT221
  - Customer specific solution
- Collecting vessel (see product structure)

Micro / ultra filtration



Measuring system with Stamoclean CAT430

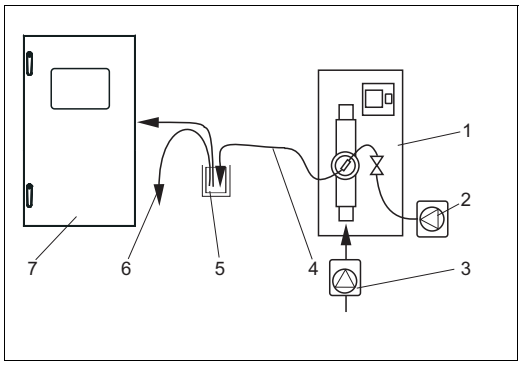
1 Hose pump box
2 Hose pump
3 Control unit
4 Collecting unit (optional)
5 Collecting vessel
6 Overflow
7 Analyser
8 Aeration basin
9 Membrane filter



Measuring system with Stamoclean 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*

Standard application

Reversed osmosis or demineraliser monitoring, steam and condensate analysis

Sampling from hydraulic main, measurement after cooling and pressure reduction:
- Analyser with collecting vessel, StamoLys CA 71 SI-Ax0A3A1
  Expansion up to a six channel system by means of a separate SPS possible (s. special accessories)

Input

Measured variable

SiO_2 [µg/l / mg/l]

Measuring ranges

1 ... 200 µg/l (SI-A)
0.05 ... 5.00 mg/l (SI-B)

Wavelength

810 nm

Reference wavelength

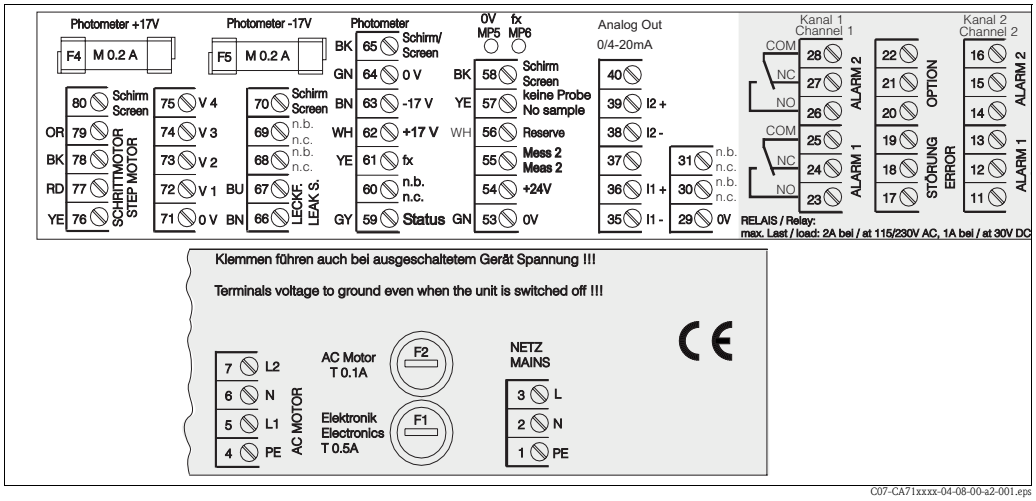
565 nm (SI-B only)

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



Connection sticker

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

Performance characteristics

Time between two measurements	t_{mes} = reaction time + sampling + waiting time + rinse again time + 2x filling 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	SI-A: 90 s SI-B: 120 s
Sample requirement	20 ml (0.0053 US.gal.) per measurement
Reagent requirement	SI-A: 3 x 0.288 ml 0.86 l (0.227 US.gal) per reagent per month with 15 minute measuring interval SI-A: 3 x 0.288 ml 0.52 l (0.137 US.gal) per reagent per month with 15 minute measuring interval
Calibration interval	0 to 72 h
Rinse interval (SI-B only)	0 to 72 h
Sampling time	selectable from 20 to 300 s (standard = 160 s for SI-A, 120 s for SI-B)
Rinse again time SI-A	60 s
Rinse again time SI-B	30 s
Filling time SI-A	24 s
Filling time SI-B	15 s
Sample refusal	$t_{refusal}$ = 30 s (SI-A) $t_{refusal}$ = 0 s (SI-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

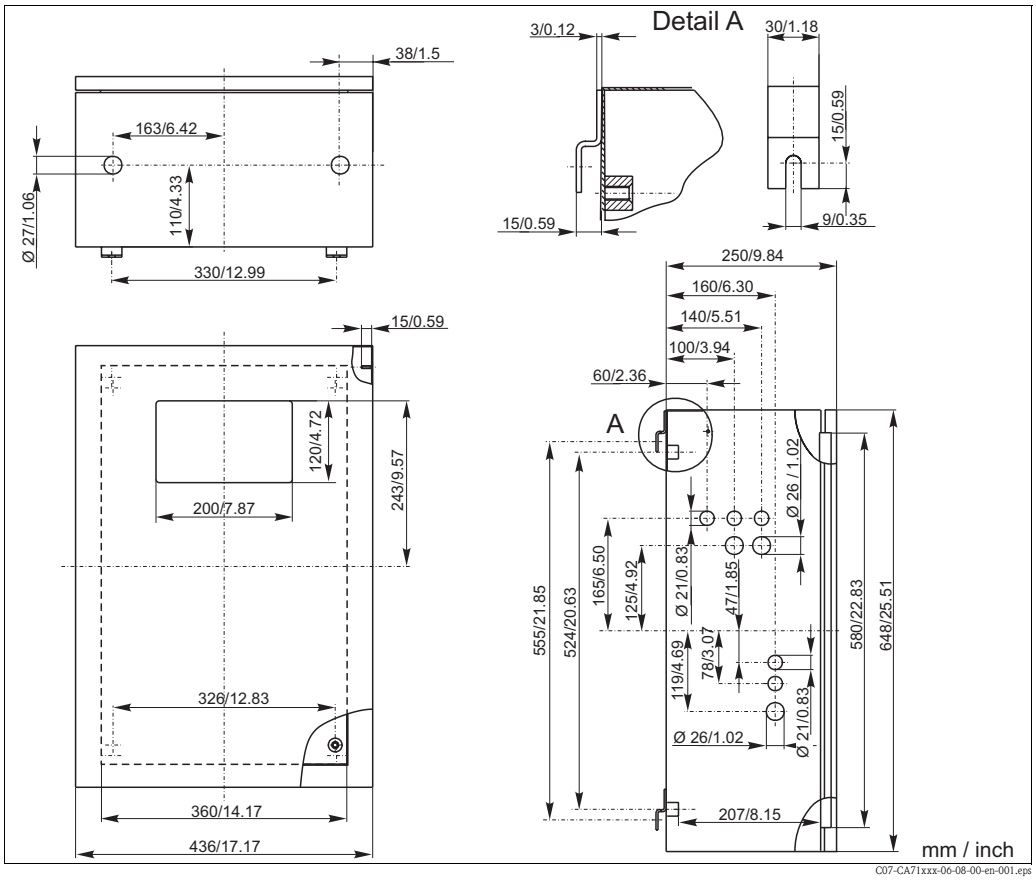
Process

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

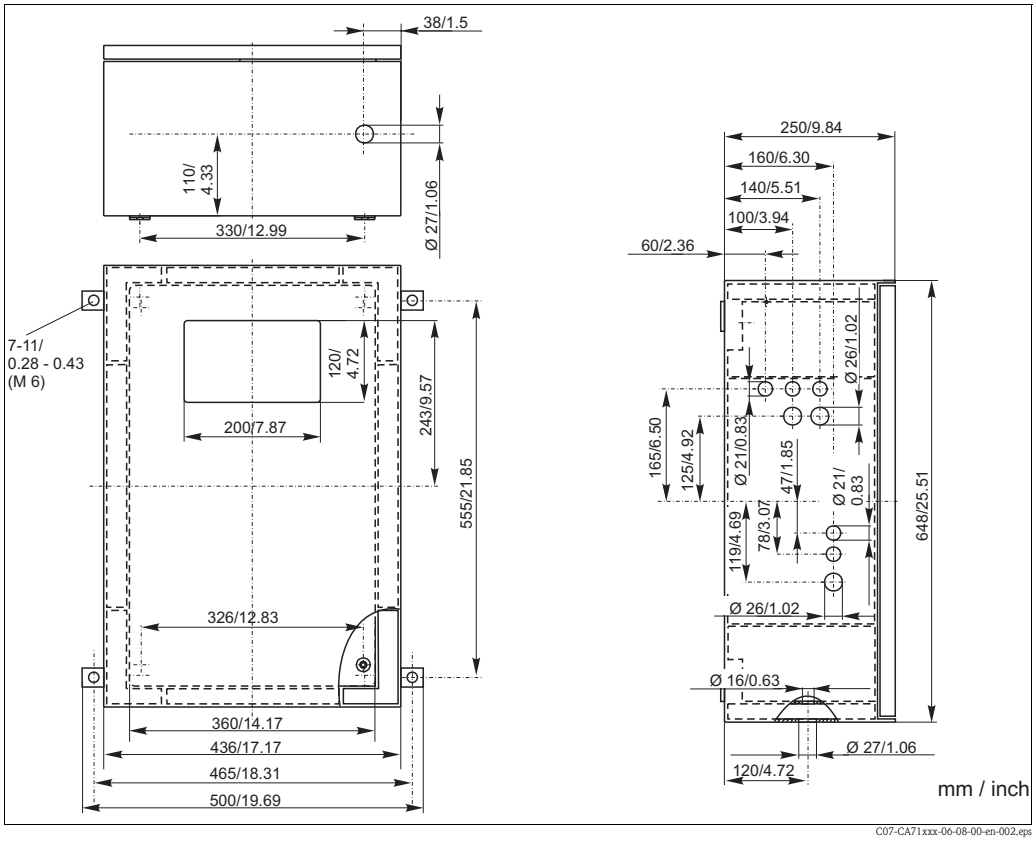
Design, dimensions

Analyser, stainless steel version, SI-A and SI-B



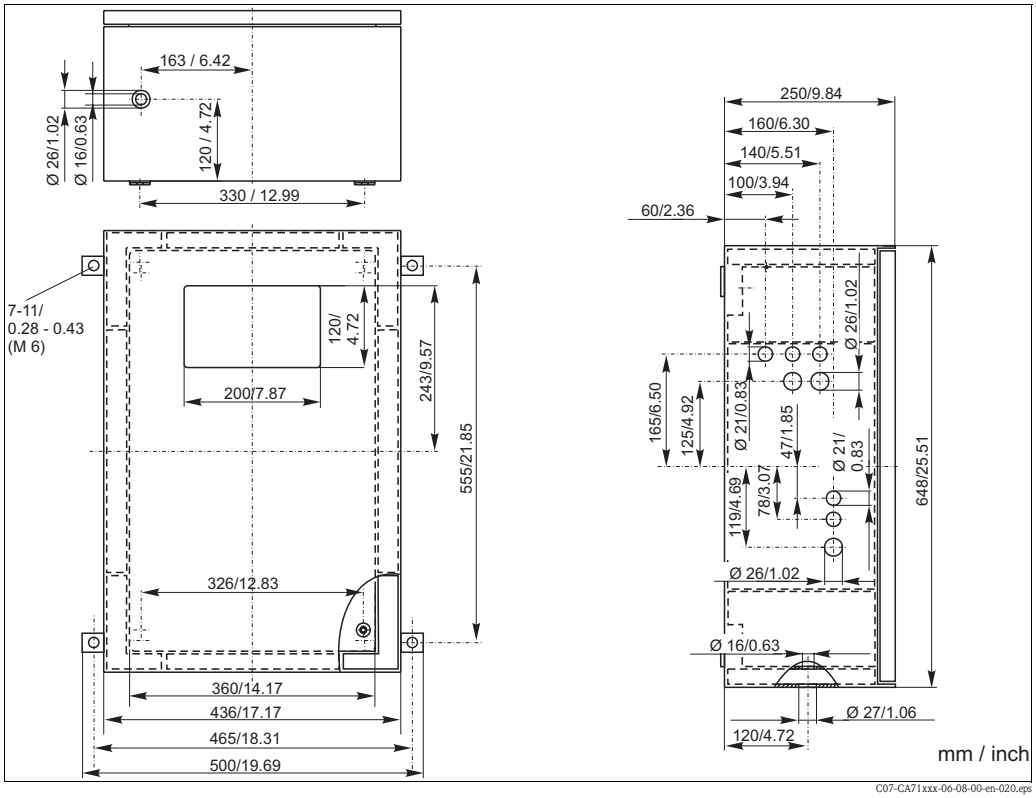
Stainless steel version

Analyser, GFK version, SI-A



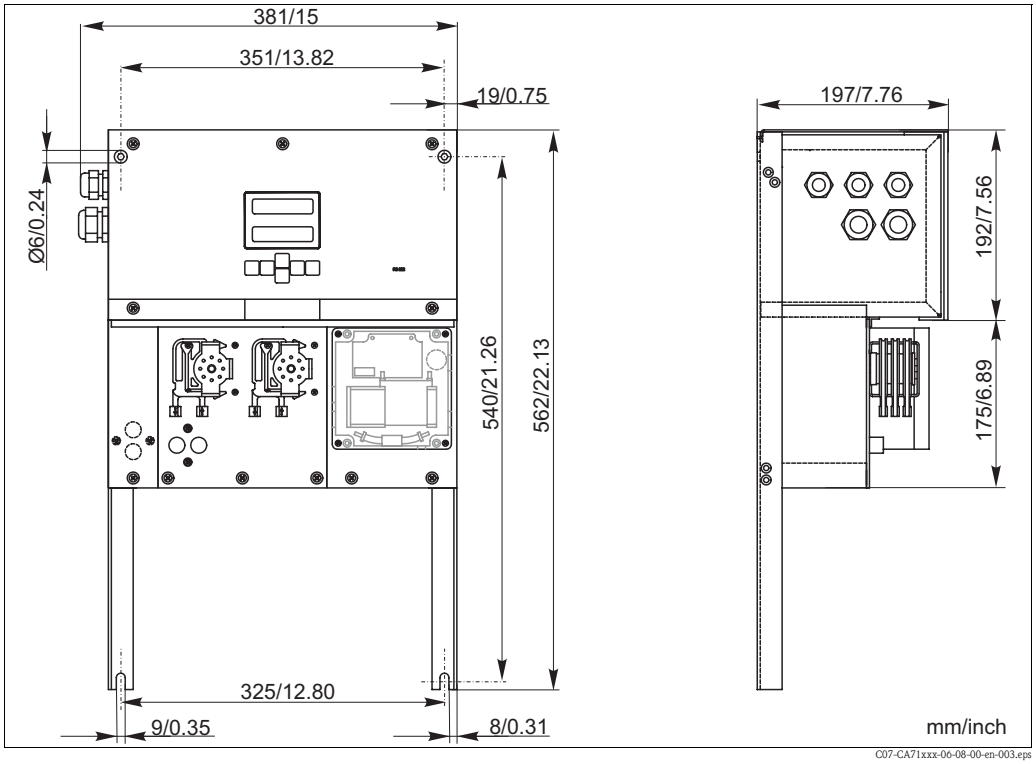
GFK version

Analyser, GFK version, SI-B



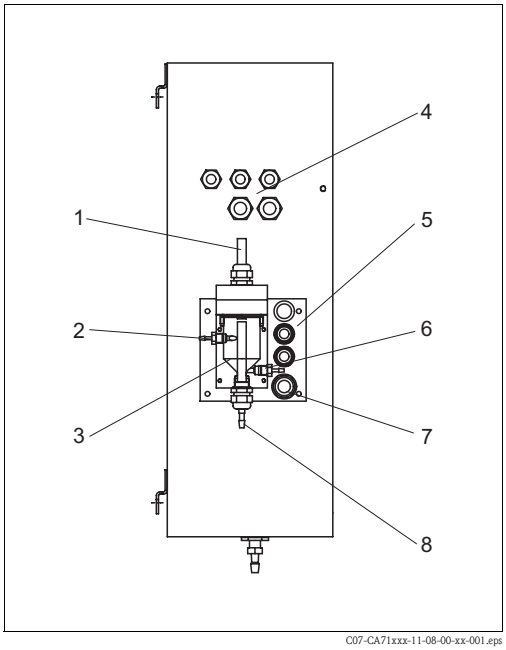
GFK version

Analyser, open version, SI-A and SI-B

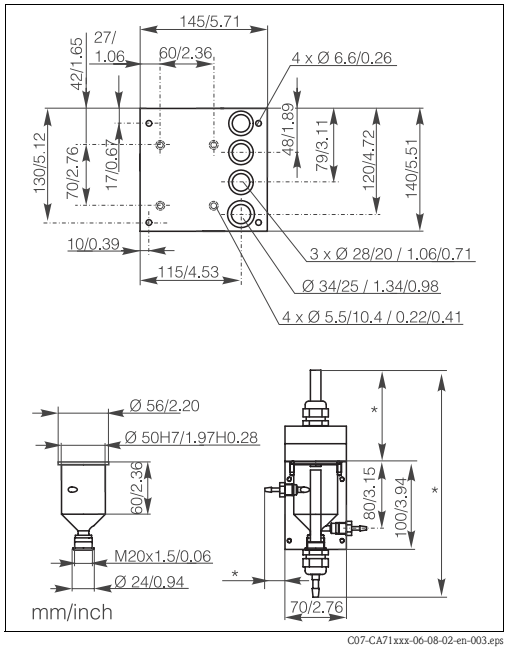


Open version (without housing)

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

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

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:	Polycarbonate®
Endless hose:	C-Flex®, Norprene®
Pump hose:	Tygon®, Viton®
Valves:	Tygon®, silicone

Sample line connection

One channel version

Collecting vessel (at analyser, 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 (without level measurement) are included in the scope of delivery.
- Only one collecting vessel can be mounted at the housing. The second is to be placed nearby the analyser.

Sample outlet SI-A

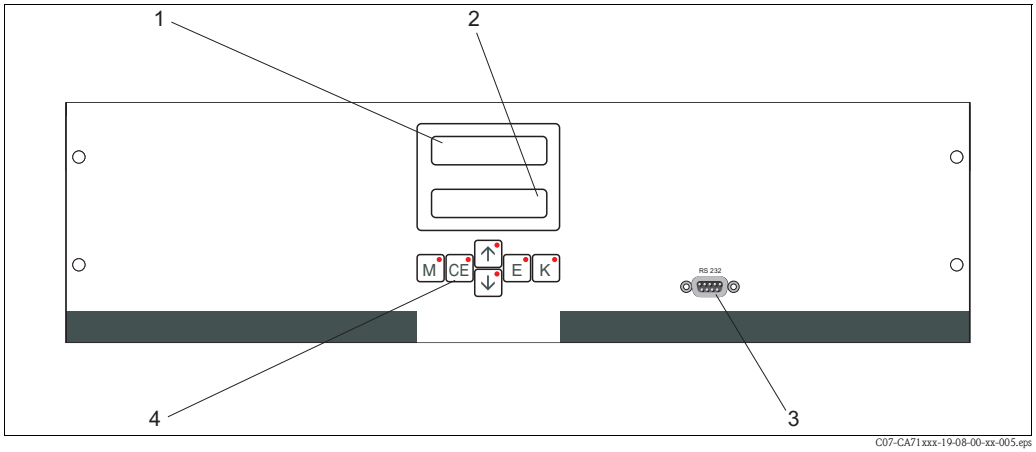
Connection	Hose ID 16 mm (0.63") – Max. length of closed loop: 1 m (3.28 ft) – Open outlet downgrade installed – No combination of several devices to a closed-loop system
Min. volume per measurement	20 ml

Sample outlet SI-B

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



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

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	Measuring range 1.0 ... 200 µg/l Si
B	Measuring range 50 ... 5000 µg/l Si
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
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
3	Quality certificate + three sets of inactive reagents

CA71SI -	**complete order code**

Scope of delivery SI-A

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).

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.

Scope of delivery SI-B

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 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 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.

Accessories

Reagents and standard solutions

- ❑ Reagent set active, 1 l SI1+SI2+SI3 each; order no. CAY643-V10AAE
- ❑ Reagent set, inactive, 1 l SI1+SI2+SI3 each; order no. CAY643-V10AAH
- ❑ Cleaning agent, 1 l; order no. CAY641-V10AAE
- ❑ Standard solution 0.1 mg/l SiO_2- Si; order no. CAY642-V10C01AAE
- ❑ Standard solution 0.5 mg/l SiO_2- Si; order no. CAY642-V10C05AAE
- ❑ Standard solution 1.0 mg/l SiO_2- Si; order no. CAY642-V10C10AAE

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

Maintenance kit

❑ Maintenance kit CAV 740 (SI-A):
- 1 set pump hoses violet/white
- 1 set pump hoses black/black
- C-Flex hose for valves 1+2, length 1.4 m
- Hose for outlet valve, length 0.2 m
- 1 set hose connectors per hose set

order no. CAV 740-5A

❑ Maintenance kit CAV 740 (SI-B):
- 1 set pump hoses violet/white
- 1 set pump hoses black/black
- 1 set hose connectors per hose set

order no. CAV 740-4A

❑ 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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People for Process Automation