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

Technical Information

Stamolys CA71AM

Ammonium analyzer

Compact photometric analysis system for the ammonium measurement in sewage treatment plants, in drinking water and in industrial water treatments

Application

- Monitoring and optimising the cleaning capacity of sewage treatment plants
- Monitoring activated sludge basins
- Monitoring sewage treatment plant outlets
- Monitoring of drinking water inlets
- Monitoring of industrial water treatments

Your benefits

- Trace measurement from 1 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

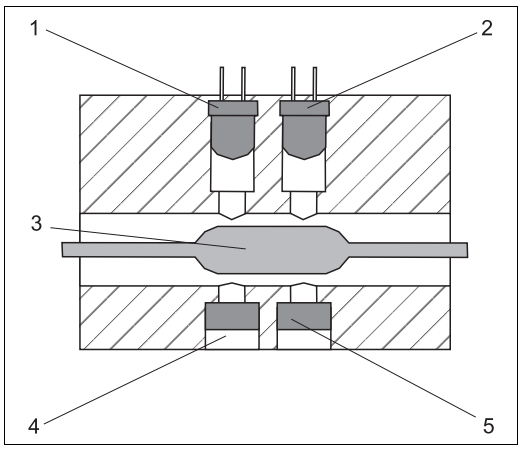
TI353C/07/EN/14.12
71162870

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle AM-A/ B/C

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.

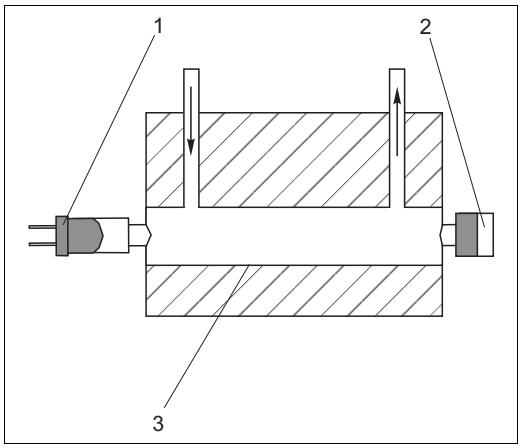


Photometric principle

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

Measuring principle AM-D

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.



Photometric measuring principle

1 LED
2 Detector
3 Sample

Ammonium and ammonia

Ammonium occurs in a number of ways including biological decomposition of organic nitrogen compounds. The chemical balance in water shifts with an increasing pH value from ammonium to poisonous ammonia. Natural bodies of water do not normally contain any ammonia. The higher concentrations occurring in drinking water indicate the influence of waste water and landfill leachate. Ammonium is therefore an important parameter for water quality.
Bacteria use oxygen to convert ammonium to nitrites which are then further oxidised to create nitrates (nitrification). The oxygen balance of a body of water is therefore negatively effected in a powerful way.

Photometric ammonium determination

Indophenole blue method acc. to ISO 11732

Sodium dichloric isocyanurate and sodium salicylate form a blue dye in conjunction with ammonium. The absorption is determined at a wavelength of 660 nm (AM-A/B/D) resp. of 565 nm (AM C). The absorption intensity is proportional to the ammonium concentration in the sample.
The reference wavelength is 880 nm.

Interferences

No interferences up to the given concentration:

Concentration [mg/l (ppm)]	Interference
2,500	Ca^{2+} (as $CaCO_3$ hardness equivalent[1])
1,500	Mg^{2+} (as $CaCO_3$ hardness equivalent[1])
300	SO_4^{2-}
250	NO_3^- -N, PO_4^{3-}
30	NO_2^- -N

1) The total hardness must not exceed 125 mmol/l.

The pH value should be between 5 and 9. Strong acid or strong alkaline samples may result in false measuring values.

Sample conditioning

Micro/ultrafiltration (Stamoclean CAT430, optional)

A membrane filter element is suspended directly into the wastewater basin or channel. A membrane 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 (0.26 gal/hr).
The membrane pump pressure transports the sample to a collecting vessel near the analyzer over a distance of 20 m (66 ft). For distances up to 100 m (330 ft) 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 (3.5 to 8 gal/min) 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 (4.4 to 11 gal/min) 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.

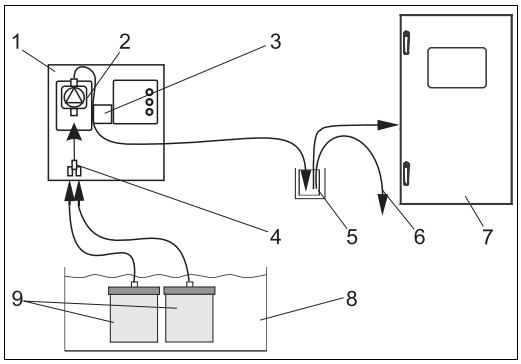
Customer specific solution

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

Measuring system

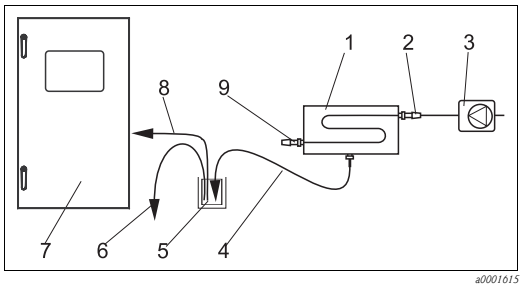
A complete measuring system comprises:
- An analyzer
- A sample conditioning system (optionally):
  - Micro filtration / ultra filtration Stamoclean CAT430 or Stamoclean CAT411
  - Backwash filter Stamoclean CAT221
  - Customer specific solution
- Collecting vessel (see product structure)

Micro / ultra filtration



Measuring system with Stamoclean CAT430

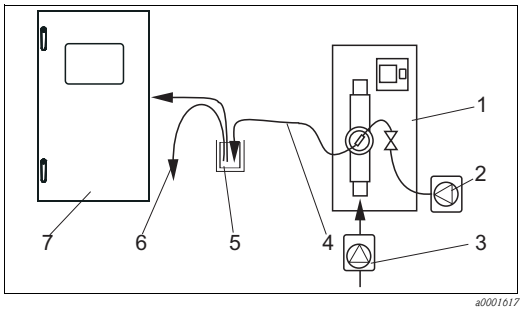
1 Control box
2 Membrane pump
3 Timer
4 T-piece
5 Collecting vessel
6 Overflow
7 Analyzer
8 Aeration basin
9 Membrane filter



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 analyzer in measuring station:
- Backwash filter Stamoclean CAT221 (order no. CAT221-Axxx)
- Compressor for CAT221 (order no. 51511143)
- Analyzer with collecting vessel, Stamolys CA71AM-A1xB2A1

Sampling from open channel

Local filtration and analyzer in measuring station (up to 20 m distance):
- Ultra filtration Stamoclean CAT430, plate filter with hose heating for max. 20 m distance to the analyzer (order no. CAT 430-A1F0A3A)
- Filter element holder with horizontal slide (order no. 51511374)
- Analyzer with collecting vessel, Stamolys CA71AM-A1xB2A1

Ammonium content monitoring in the biology

Local filtration and analyzer in measuring station (up to 100 m distance):
- Ultra filtration Stamoclean CAT430, plate filter with hose heating over 18 m, remaining distance freeze free installed, sample transportation up to 100 m (order no. CAT 430-A4F0A3A)
- Filter element holder with vertical slide (order no. 51511354)
- Analyzer with collecting vessel, Stamolys CA71AM-B1xB2A1

Ammonium content monitoring in the biology

Local filtration and analyzer in measuring station (up to 20 m distance):
- Ultra filtration Stamoclean CAT430, plate filter with hose heating over max. 20 m distance to the analyzer (order no. CAT430-A1F0A3A)
- Filter element holder with vertical slide (order no. 51511354)
- Analyzer with collecting vessel, Stamolys CA71AM-B1xB2A1

Monitoring of the drinking water quality before the net inlet or of well water to avoid an expensive water treatment

Sampling from hydraulic main resp. from well and analyser in the measuring station:
- No filtration needed
- Analyzer with collecting vessel Stamolys CA71AM-D1xB2A1

Input

Measured variable

NH_4-N [mg/l or µg/l]

Measuring range

AM-A
0.02 to 5 mg/l (0.02 to 5 ppm)

AM-B
0.2 to 15 mg/l (0.2 to 15 ppm)

AM-C
0.2 to 100 mg/l (0.2 to 100 ppm)

AM-D
1 to 500 µg/l (1 to 500 ppb)

Wavelength

AM-A/B/D
660 nm

AM-C
565 nm

Reference wavelength

AM-A/B
880 nm

AM-C
810 nm

Output

Output signal

0/4 to 20 mA

Modbus RS485 (optional)

Signal coding	EIA/TIA-485
Data transmission rate	9600 Baud
Galvanic isolation	Yes
Connectors	Top-hat rail clamp
Bus termination	-

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
max. 300 Ω (with optional Modbus module)

Load capacity

230 V / 115 V AC max. 2 A, 30 V DC max. 1 A

Data interface

RS232-C
Modbus RS485 (optional)

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)

Protocol specific data

Modbus RS485

Protocol	RTU
Function codes	03 (Read holding registers)
Broadcast support for function codes	-
Output data	1 main measured value at address 40008 (2 bytes)
Data format	16 bits
Input data	-
Supported features	Slave address, data format, check sum and baudrate can be configured using Advantech ADAM Utility Software at re-boot with set init switch

Power supply

Supply voltage	115 V AC / 230 V AC ±10%, 50/60 Hz
Power consumption	approx. 150 VA
Current consumption	approx. 0.2 A at 230 V approx. 0.5 A at 115 V
Fuses	1 x slow-blow 0.5 A for electronics 2 x semi-delay 0.2 A for photometer 1 x slow-blow 0.1 A for motors 1 x slow-blow 1 A for fan

Electrical connection

⚠ CAUTION

Shown diagram (→ 1) is an example

The terminal assignment and cable colors can deviate from the actual assignment and colors!

► Only use the terminal assignment of the sticker **in the device** (→ 2) to connect your analyzer!

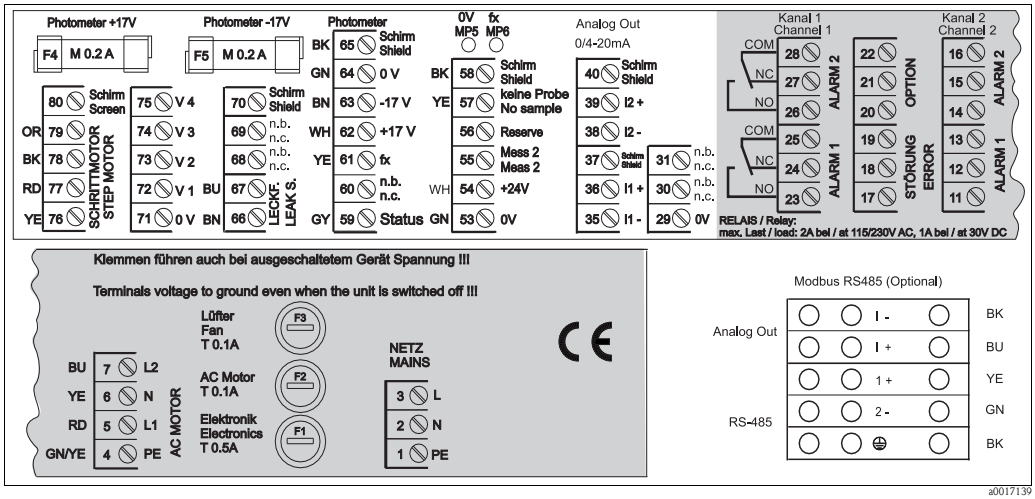


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Fig. 1: Example of the connection sticker

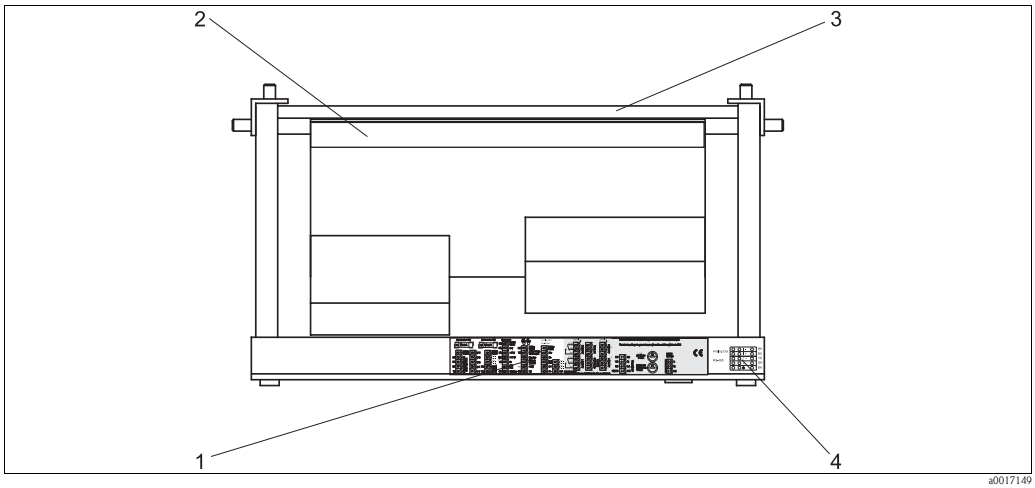

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Fig. 2: Analyzer from top (open version resp. folded out)

1 Connection department sticker
2 Printed circuit board with terminal strip
3 Backside of the analyzer
3 Connection department sticker for Modbus RS485 (optional)

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	**AM-A:** up to 2 mg/l: ± 0.03 mg/l (± 0.03 ppm) > 2 mg/l: ± 0.1 mg/l (± 0.1 ppm) **AM-B:** up to 5 mg/l: ± 0.05 mg/l (± 0.05 ppm) > 5 mg/l: ± 0.1 mg/l (± 0.1 ppm) **AM-C:** up to 40 mg/l: ± 0.5 mg/l (± 0.5 ppm) > 40 mg/l: ± 2 mg/l (± 2 ppm) **AM-D:** ± 2 µg/l (± 2 ppb)
Measuring interval	t_{meas} to 120 min
Reaction time	**AM-A/B:** 180 s **AM-C:** 110 s **AM-D:** 600 s
Sample requirement	20 ml (0.68 fl.oz.) per measurement
Reagent requirement	**AM-A/B/C:** 2 x 0.5 ml (0.017 fl.oz.) 2.59 l (0.68 US.gal) per reagent per month with 10 minute measuring interval **AM-D:** 2 x 0.4 ml (0.014 fl.oz.) 0.88 l (0.23 US.gal) per reagent per month with 20 minute measuring interval
Calibration interval	0 to 720 h at ambient temperatures < 30 °C (86 °F) max. 6 h at ambient temperatures > 30 °C (86 °F)
Rinse interval	0 to 720 h
Rinse time	selectable from 20 to 300 s (standard = 60 s)
Rinse again time	30 s
Filling time	**AM-A/B:** 15 s **AM-C:** 18 s **AM-D:** 40 s
Empty optical cell	**AM-A/B/C** $t_{refusal}$ = 0 s **AM-D** $t_{refusal}$ = 30 s

Maintenance interval	6 months (typical)
Servicing requirement	15 minutes per week (typical)

Environment

Ambient temperature	5 to 40 °C (40 to 100 °F), avoid strong fluctuations
Humidity	below the condensation limit, installation in usual, clean rooms outdoor installation only possible with protective devices (customer supplied)
Degree of protection	IP 43

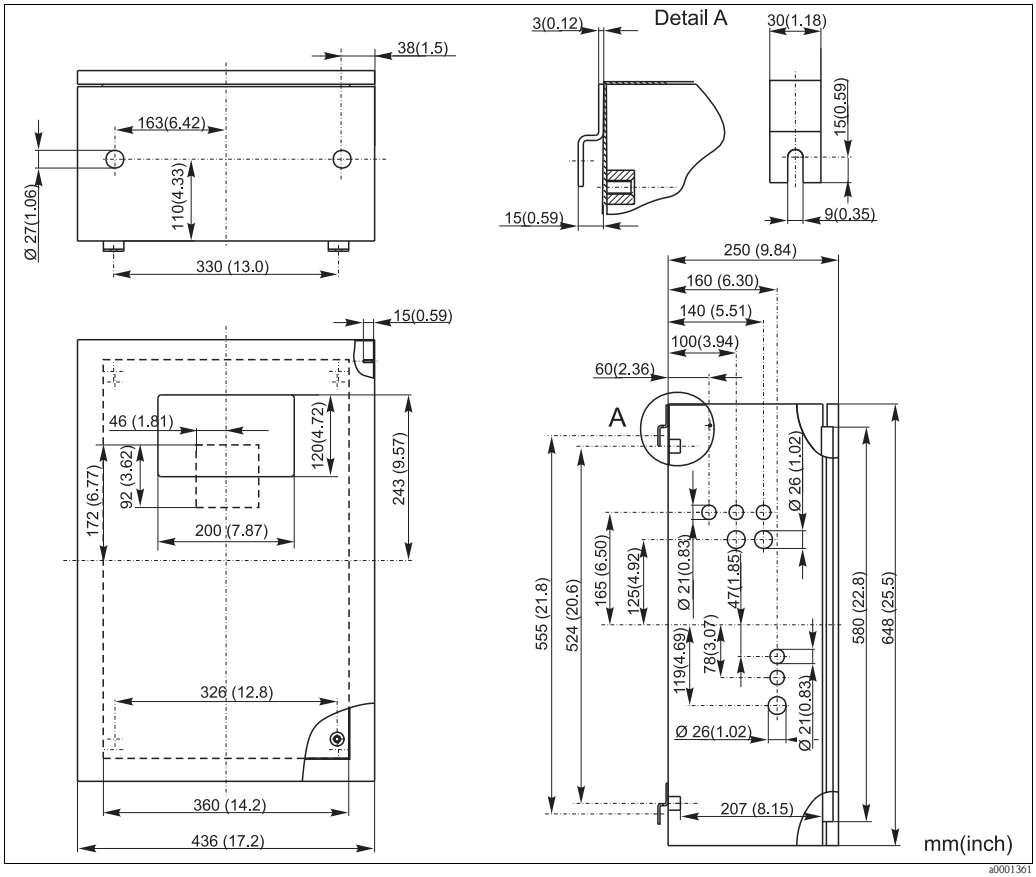
Process

Sample temperature	5 to 40 °C (40 to 100 °F)
Sample flow rate	min. 5 ml (0.17 fl.oz.) per min
Consistence of the sample	low solid content (< 50 ppm)
Sample inlet	Unpressurized
pH value of the sample	pH 5 to 9

Mechanical construction

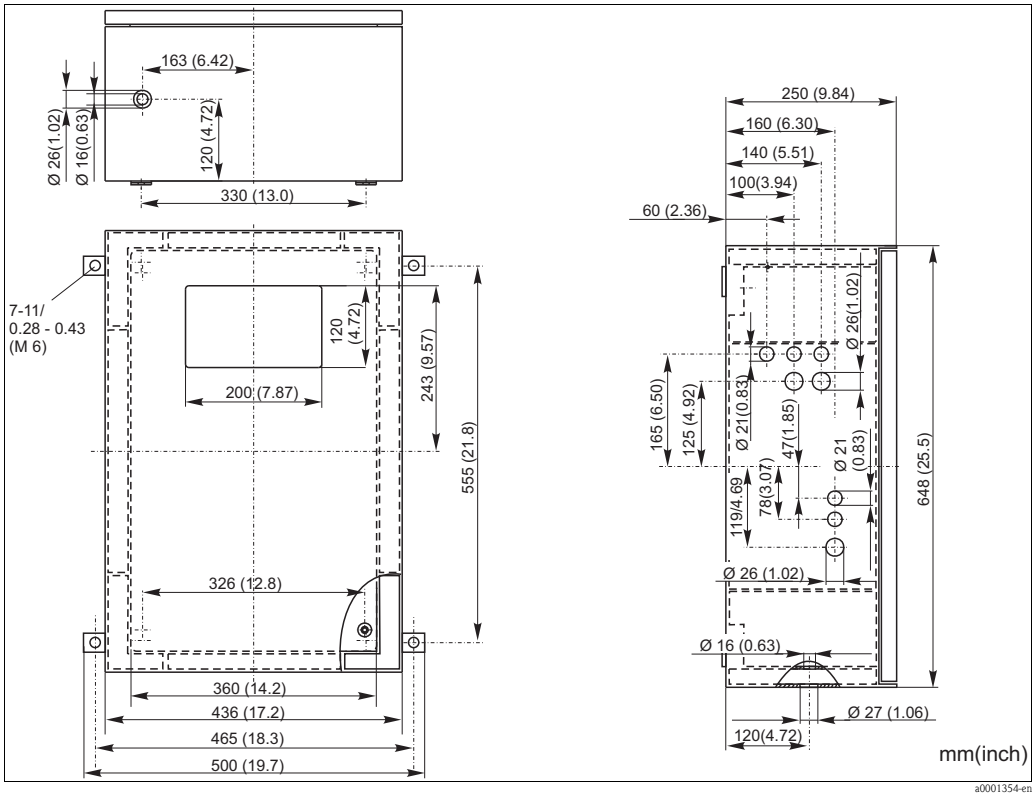
Design, dimensions

Analyzer, stainless steel, AM-A/B/C/D



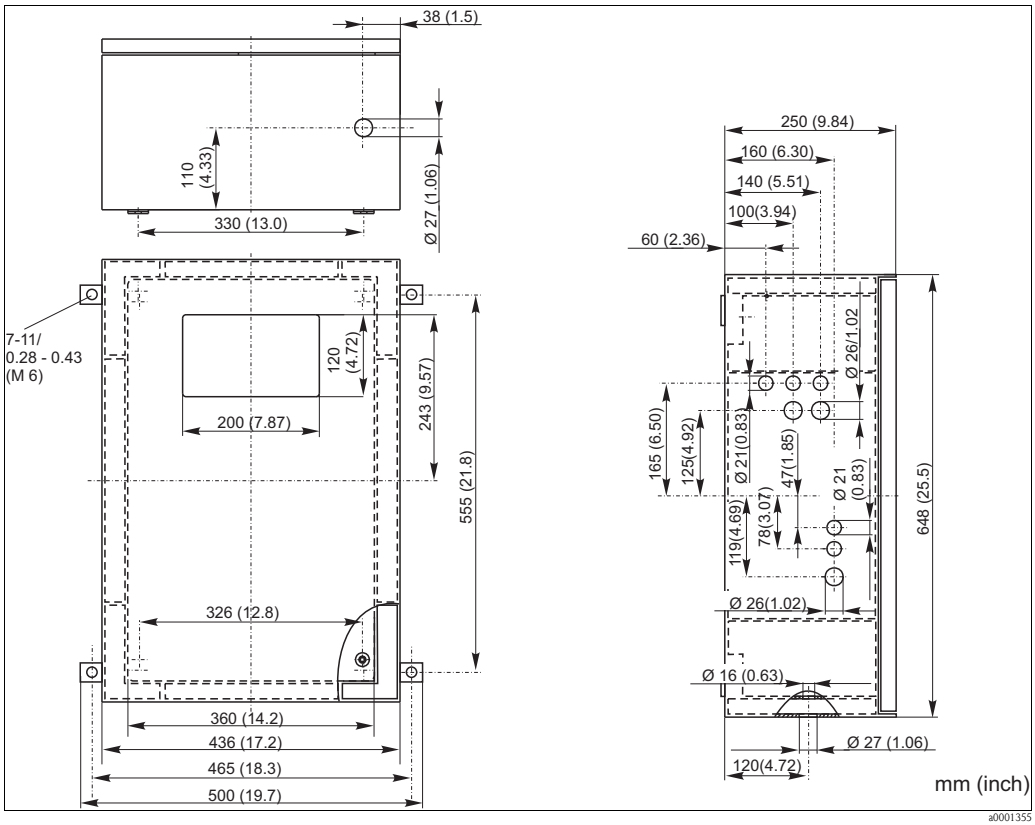
Stainless steel version

Analyzer, GFR version, AM-A/B/C



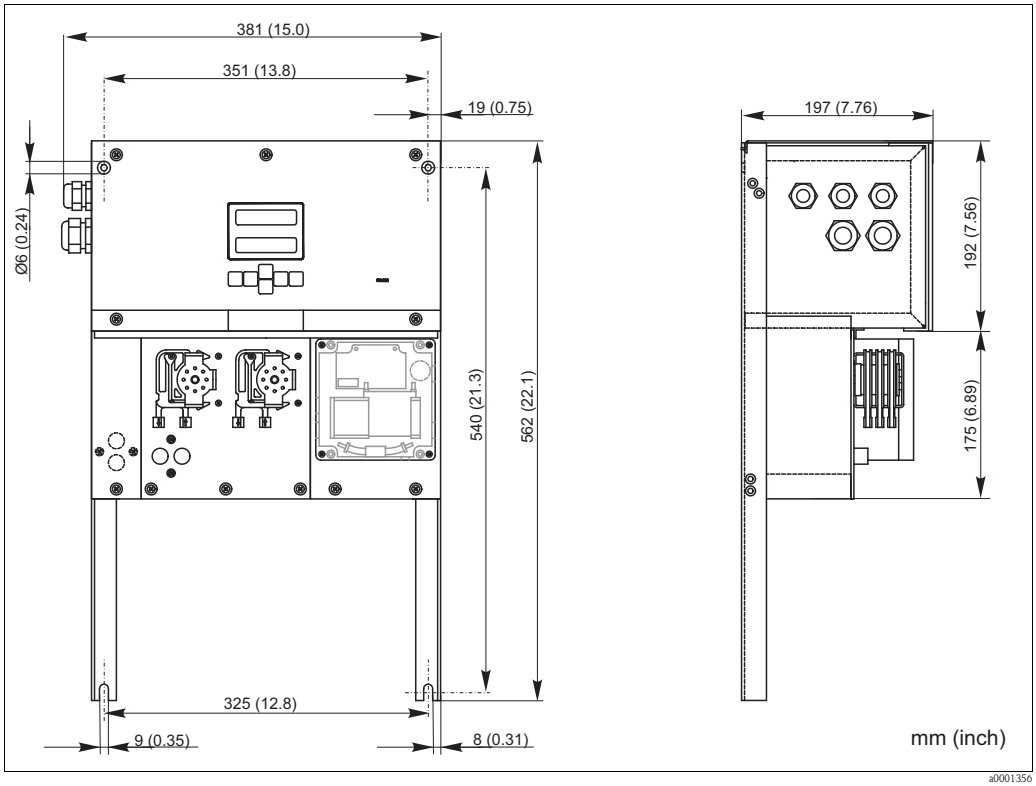
GFR version

Analyzer, GFR version, AM-D



GFR version

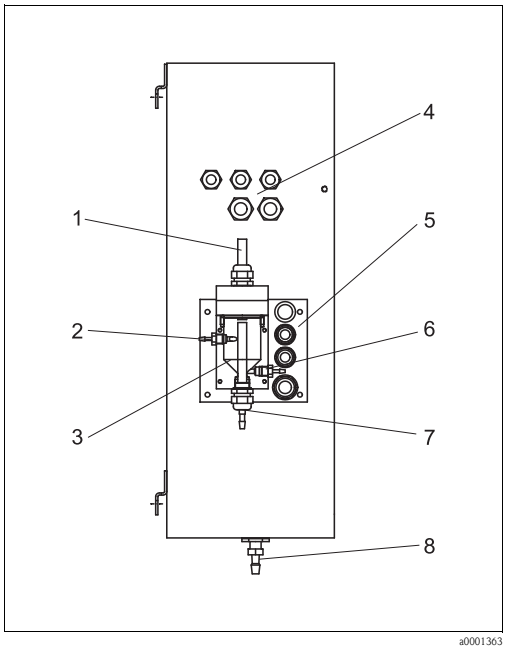
Analyzer, open version, AM-A/B/C/D



Open version (without housing)

With the open version, you need an additional platform for the reagents. Mount this platform max. 35 cm (13.8 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 these versions, the outlet pipe must be installed right of the analyzer.
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



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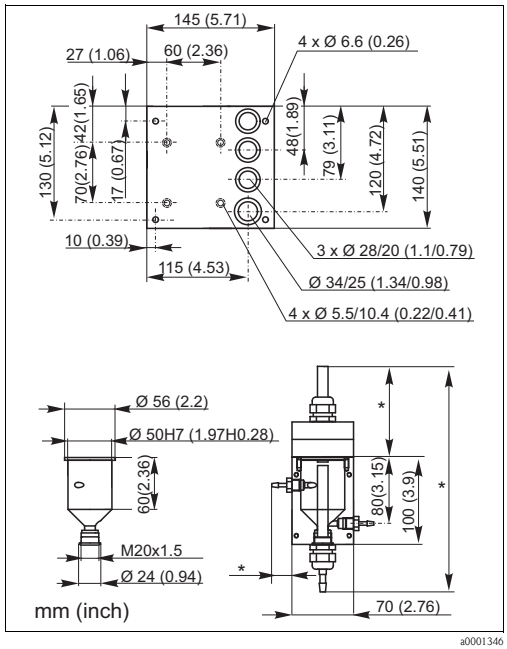
Collecting vessel at analyzer (optional)

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



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Collecting vessel dimensions

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

Weight

GFR housing	approx. 28 kg (62 lbs)
Stainless steel housing	approx. 33 kg (73 lbs)
Without housing	approx. 25 kg (55 lbs)

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 analyzer, with or without level measurement)

Connection	hose ID 3.2 mm (1/8 inch)

Customer collecting vessel

Connection	hose ID 1.6 mm (1/16 inch)
Max. distance from collecting vessel to analyzer	1 m (3.3 ft)
Max. height difference from collecting vessel to analyzer	0.5 m (1.6 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 AM-A/B/C

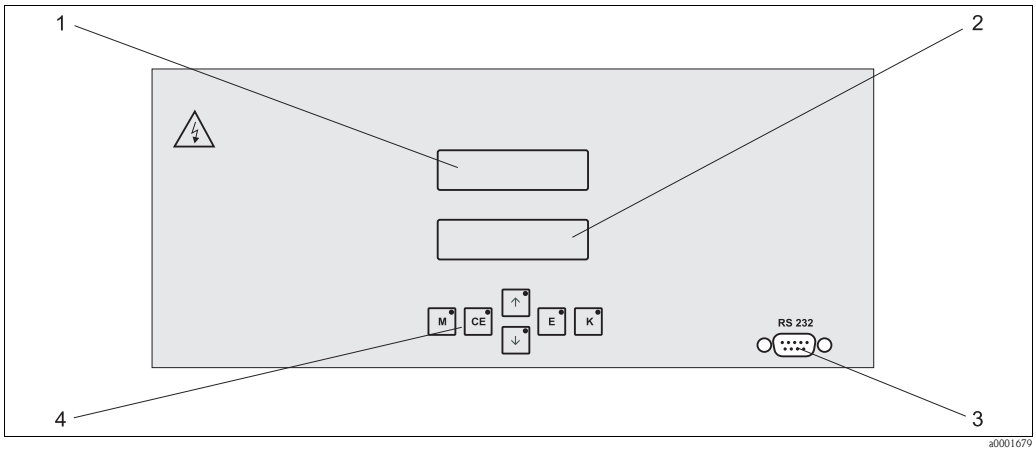
Connection	Hose ID 4 mm (0.16 inch) – Max. length of closed loop: 1 m (3.3 ft) – Open outlet downgrade installed – No combination of several devices to a closed-loop system
Min. volume per measurement	20 ml (0.68 fl.oz.)

Sample outlet AM-D

Connection	Hose ID 16 mm (0.63 inch) – Max. length of closed loop: 1 m (3.3 ft) – Open outlet downgrade installed – No combination of several devices to a closed-loop system
Min. volume per measurement	20 ml (0.68 fl.oz.)

Operability

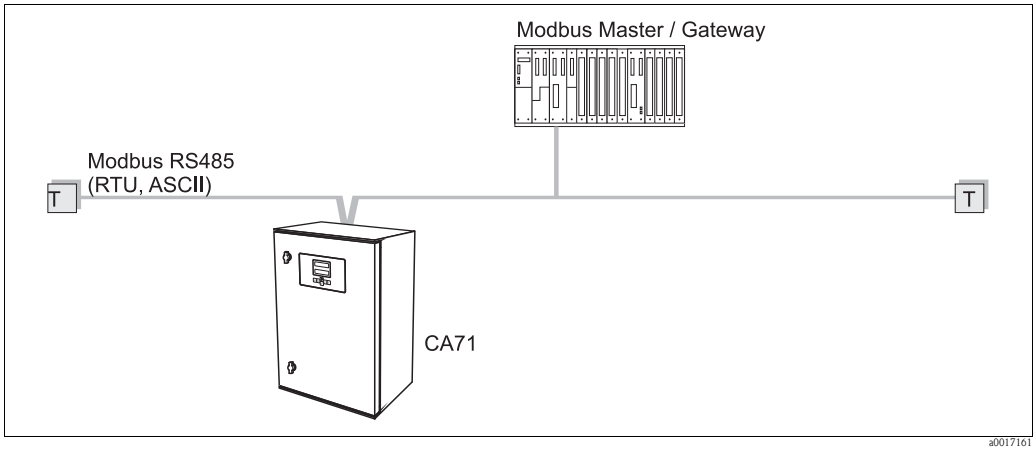
Local operation



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

Modbus installation



Installation of Modbus RS485

Ordering information

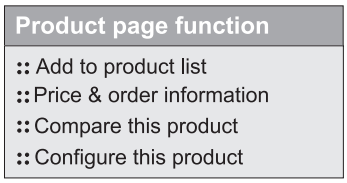
Product page

You can create a complete and valid order code by using the configurator on the internet product page.

Enter the following address to access the product page:
www.products.endress.com/ca71am

Product configurator

1. You can choose from the following options on the product page located on the right:



2. Click "Configure this product".
3. The configurator opens in a separate window. You can now configure your device and receive the complete order code that applies for the device.
4. Afterwards, export the order code as a PDF or Excel file. To do so, click the appropriate button at the top of the page.

Product structure

The following product structure is effective on the date of print only. You can create an up-to-date and complete order code with the help of the configurator on the internet product page.

	Measuring range							
	A	0.02 ... 5 mg/l NH_4-N						
	B	0.2 ... 15 mg/l NH_4-N						
	C	0.2 ... 100 mg/l NH_4-N						
	D	1 ... 500 µg/l NH_4-N						
	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		
					2	GFK housing		
					3	Stainless steel with purge		
					8	Stainless steel without purge		
						Output		
						A	0/4 ... 20 mA	
						C	Modbus RS485	
							Chemicals	
							1	To be ordered separately
							2	One set of inactive reagents
							3	Three sets of inactive reagents
CA71AM-								**complete order code**

Scope of delivery

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.

AM-A/B/C

The scope of delivery comprises:
- An analyzer with mains plug
- A cleaning injector
- A tube of silicone grease
- A NORPRENE hose, length 2.5 m (8.2 ft), ID 1.6 mm (0.06 inch)
- A C-FLEX hose, length 2.5 m (8.2 ft), ID 6.4 mm (0.25 inch)
- A C-FLEX hose, length 2.5 m (8.2 ft), ID 3.2 mm (0.13 inch)
- Two hose fittings of each size:
  - 1.6 mm x 1.6 mm (0.06 inch x 0.06 inch)
  - 1.6 mm x 3.2 mm (0.06 inch x 0.13 inch)
  - 6.4 mm x 3.2 mm (0.25 inch x 0.13 inch)
- Two T-hose fittings of each size:
  - 1.6 mm x 1.6 mm x 1.6 mm (0.06 inch x 0.06 inch x 0.06 inch)
  - 3.2 mm x 3.2 mm x 3.2 mm (0.13 inch x 0.13 inch x 0.13 inch)
  - 6.4 mm x 6.4 mm x 6.4 mm (0.25 inch x 0.25 inch x 0.25 inch)
- An interference suppressor for the current output
- Four edge covers (version with GFR housing only)
- A roll of PTFE strip
- A quality certificate
- Operating Instructions (English).

AM-D

The scope of delivery comprises:
- An analyzer with mains plug
- A cleaning injector
- A tube of silicone grease
- A NORPRENE hose, length 2.5 m (8.2 ft), ID 1.6 mm (0.06 inch)
- A Grifflex hose, length 2.0 m (6.6 ft), ID 19 mm (0.75 inch)
- A C-FLEX hose, length 2.5 m (8.2 ft), ID 3.2 mm (0.13 inch)
- A C-FLEX hose, length 2.5 m (8.2 ft), ID 6.4 mm (0.25 inch)
- Two hose fittings of each size:
  - 1.6 mm x 1.6 mm (0.06 inch x 0.06 inch)
  - 1.6 mm x 3.2 mm (0.06 inch x 0.13 inch)
  - 6.4 mm x 6.4 mm (0.25 inch x 0.25 inch, version without housing only)
- Two T-hose fittings of each size:
  - 1.6 mm x 1.6 mm x 1.6 mm (0.06 inch x 0.06 inch x 0.06 inch)
  - 3.2 mm x 3.2 mm x 3.2 mm (0.13 inch x 0.13 inch x 0.13 inch)
- An interference suppressor for the current output
- A nozzle for outlet pipe, ID 16 mm (0.63 inch)
- A hose clamp
- Two pipe clamps (version without housing only)
- A screwed socket for the outlet pipe
- Four edge covers
- A roll of PTFE strip
- A quality certificate
- Operating Instructions (English).

Certificates and approvals

CE approval

Declaration of conformity
The product meets the requirements of the harmonized European standards. It thus complies with the legal requirements of the EC directives.
The manufacturer confirms successful testing of the product 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 reagent AM1+AM2 each; order no. CAY140-V10AAE
- Reagent set inactive, for l reagent AM1+AM2 each; order no. CAY140-V10AAH
- Cleaning agent, 1l; order no. CAY141-V10AAE
- Standard solution 100 µg/l NH_4-N; order no.CAY142-V10C01AAE
- Standard solution 500 µg/l NH_4-N; order no.CAY142-V10C02AAE
- Standard solution 5 mg/l NH_4-N; order no.CAY142-V10C05AAE
- Standard solution 10 mg/l NH_4-N; order no.CAY142-V10C10AAE
- Standard solution 15 mg/l NH_4-N; order no.CAY142-V10C15AAE
- Standard solution 20 mg/l NH_4-N; order no.CAY142-V10C20AAE
- Standard solution 30 mg/l NH_4-N; order no.CAY142-V10C30AAE
- Standard solution 50 mg/l NH_4-N; order no.CAY142-V10C50AAE
- Standard solution 100 mg/l NH_4-N; order no.CAY142-V10C88AAE

Cleaner for hoses

- Cleaning agent, alkaline, 250 ml (8.5 fl.oz.); order no. CAY746-V02AAE
- Cleaning agent, acidic, 250 ml (8.5 fl.oz.); order no. CAY747-V02AAE

Collecting vessel

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

- Collecting vessel without level measurement; order no. 51512088
- Collecting vessel with level monitoring (conductive); Order no. 51512089
- Level monitoring retrofit kit; Order no. 71023419

Maintenance kit

CAV740, maintenance kit for CA71

- Pump hoses
- Valve hoses
- Hose connectors
- Ordering acc. to product structure

	For CA71 parameter		
	2	AM-A/B/C	
	5	HA, AL, AM-D, FE-D, NO-D	
		Inlet and outlet hoses	
		A	not selected
		B	selected, for CA71AM-A/B/C
		C	selected, for CA71AM-D
CAV740-			**complete order code**

Additional accessories

- Interference suppressor for control, power and signal lines
  order no. 51512800
- Silicon grease, tube, 35 g
  order no. 71017654
- 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

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