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

Technical Information

Stamolys CA71CODcr

COD analyzer

Photometric analytical system for determining the chemical oxygen demand following the DIN dichromate method

Application

- Monitoring sewage treatment plant inlets and outlets
- Monitoring of industrial wastewater discharges
- Monitoring of industrial wastewaters

Your benefits

- Thermal digestion acc. to DIN38409 H41 and GB 11914-89
- Measuring ranges 5 to 200 mg/l O_2 or 50 to 5000 mg/l O_2
- Mercury-free chloride elimination
- Low reagent requirement
- Variable digest times (from 10 to 180 min, in steps of one minute)
- High accuracy

TI00458C/07/EN/14.12
71148151

Endress+Hauser
People for Process Automation

Function and system design

Measuring principle

After sample preparation, the sample pump of the analyzer pumps some of the filtrate into the combined reactor. Chloride ions in the sample would distort (increase) the COD measured value since they would be oxidized to chlorine. Sulfuric acid is added to remove interfering chloride ions in the sample and the resulting hydrochloric acid is stripped from the sample.
The dichromate reagent subsequently dosed converts the organic load of the sample. With the aid of a silver sulfate catalyst, dichromate oxidizes organic substances to carbon dioxide:

$$(\text{-}CH_2\text{-})_n + nCr_2O_7^{2-} + 8nH^+ \xrightarrow{Ag^+,\ 150°C} nCO_2 + 2nCr^{3+} + 5nH_2O$$

The inherent color of the dichromate reagent changes. The change is determined photometrically and reagent consumption, and thus the COD, is calculated.
The COD dichromate method covers both biodegradable and nonbiodegradable organic substances, but also some inorganic substances.

Chemical oxygen demand

As a sum parameter, the COD is a measure of the sum of all the substances present in the water which are oxidizable under certain conditions. It indicates the amount of oxygen (in mg/l) that would be needed to oxidize the substances if oxygen were the oxidizing agent.
The chemical oxygen demand can be used to quantify the organic load in wastewater. In addition, the COD can also be used to describe the concentration of organic carbon compounds at sewage treatment plants (COD balance).
The organic materials entering the environment cause a change in the oxygen balance of a body of water due to the oxidation that takes place during their decomposition. In addition, the organic material has an effect on the nutrition base of the body of water and this can result in a change in the ecological community. For this reason, the COD is also an indicator of the quality of water and is used as a basis for calculating wastewater levies.

Photometric determination

With the CA71COD-A, the decrease in the inherent color of the Cr(VI) reagent is determined photometrically. The reagent consumption, and thus the COD, is calculated from this.
With the CA71COD-B, the increase in the inherent color of the resulting Cr(III) is determined and used for analysis purposes.

Interferences

Certain inorganic compounds can be oxidized under reaction conditions and cause excess levels of COD:
- Bromide and iodide
- Hydrogen peroxide and its adducts
- Certain sulfur compounds, e.g. sulfite ions
- Nitrite ions
- Certain metal compounds, e.g. Fe(II) compounds

Volatile hydrophobic substances can escape analysis through vaporization.
Aromatic hydrocarbons and pyridines are not recorded.

Sample conditioning

Backwash filter (Stamoclean CAT221, optional) and agitated collecting vessel with level measurement

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.

Sample pump with backwash function and agitated collecting vessel with level measurement

The sample is transported to the agitated collecting vessel. The backwash function avoids the choking of the suction side.

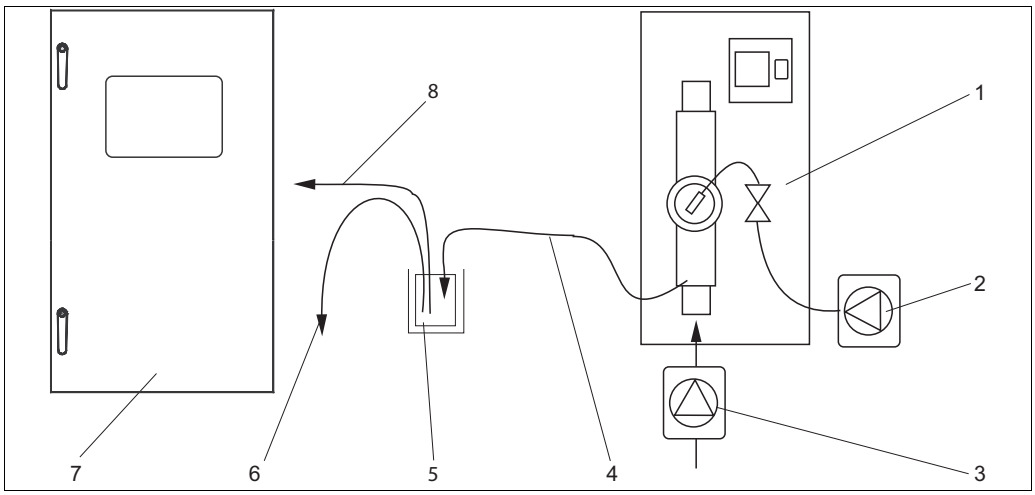
Customer specific solution

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

Measuring system

Backwash filter

A complete measuring system comprises:
- a CAT221 filter system
- an agitated collecting vessel
- a CA71COD analyzer
- a sample pump or sample pressure line
- a compressor resp. compressed air supply

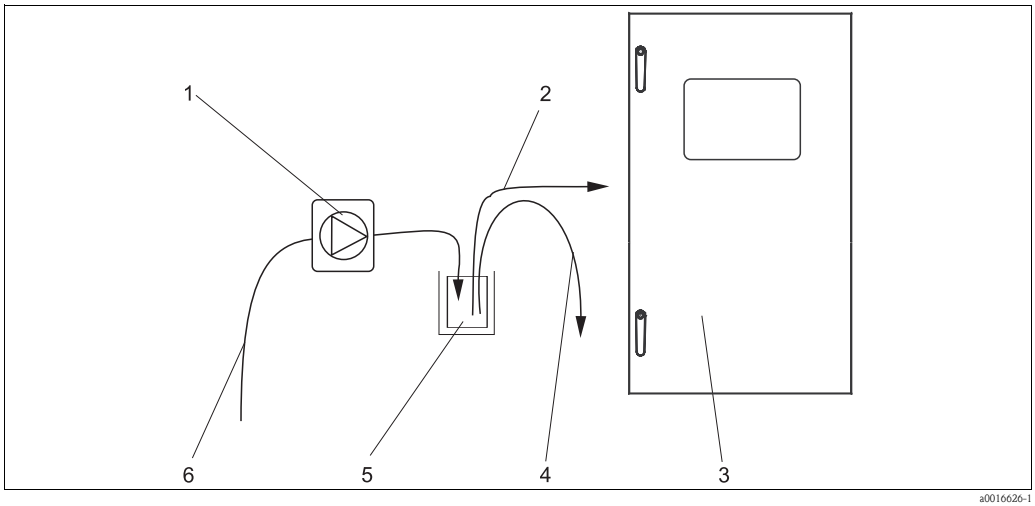


Complete measuring system

1	*Backwash filter*	*5*	*Collecting vessel (optional)*
2	*Compressor or compressed air*	*6*	*Overflow*
3	*Sampling pump or sample pressure line*	*7*	*Analyzer*
4	*Sample outlet*	*8*	*Sample line to the analyzer*

Without filter

A complete measuring system comprises:
- a sample pump with backwash function
- an agitated collecting vessel
- a CA71CODcr analyzer



Complete measuring system

1	*Pump with backwash function*	*4*	*Overflow*
2	*Sample line to the analyzer*	*5*	*Agitated collecting vessel*
3	*Analyzer*	*6*	*Sample*

Input

Measured variable

COD [mg/l O_2]

Measuring range

CA71COD-A
5 to 200 mg/l O_2

CA71COD-B
50 to 5000 mg/l O_2

Wavelength

CA71COD-A
465 nm and 625 nm

CA71COD-B
589 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

Load

max. 300 Ω

Load capacity

230 V AC max. 2 A

Data interface

RS232-C
Modbus RS485 (optional)

Data logger

1024 data pairs 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

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!

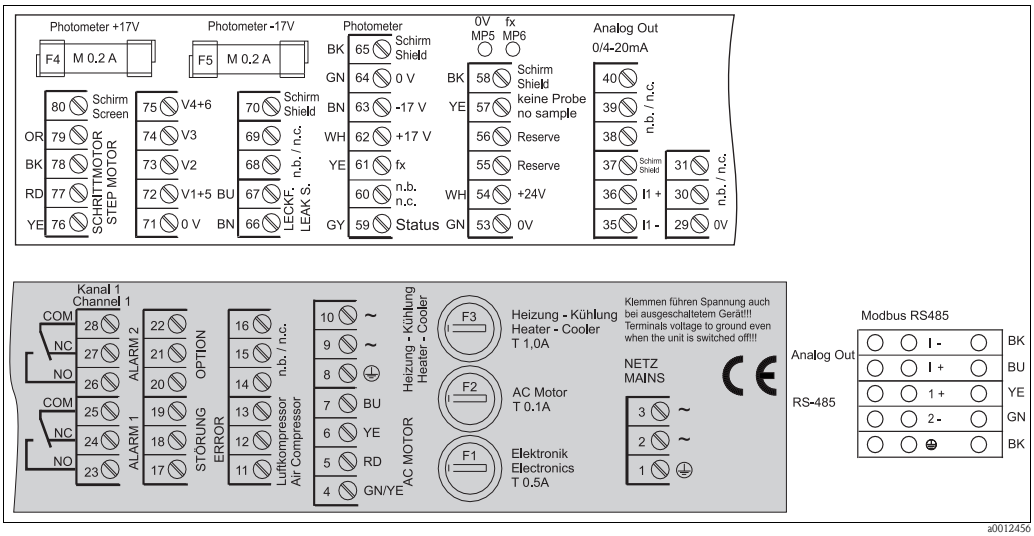


Fig. 1: Example of the connection sticker

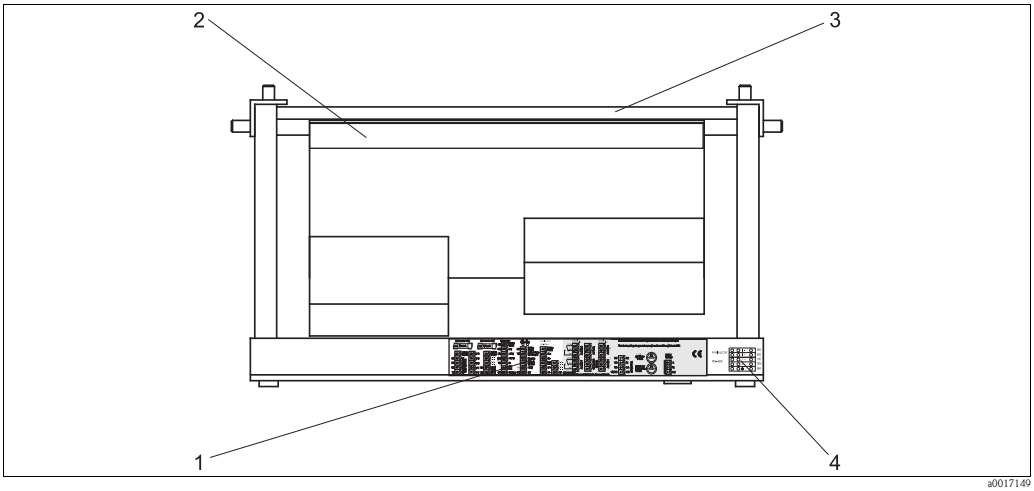


Fig. 2: Analyzer from top (open version resp. folded out)

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

Supply voltage	230 V AC, 50/60 Hz
Power consumption	ca. 210 VA
Current consumption	approx. 0.9 A
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 heating and cooling

Performance characteristics

Digestion time	10 to 180 min, selectable
Maximum measured error	**CA71COD-A** < 110 mg/l O_2: ± 11 mg/l O_2 > 110 mg/l O_2: ± 10 % **CA71COD-B** < 500 mg/l O_2: ± 50 mg/l O_2 > 500 mg/l O_2: ± 10 %
Measuring interval	t_{mes} = 150 min (factory setting, shorter digestion times can be set) t_{mes} = sample dosage + reagent dosage + chloride stripping + reagent dosage + digestion + measured value calculation + sample discarding + measuring break + rinse time
Sample requirement	54 ml (1.82 fl.oz.) per measurement
Reagent requirement	250 ml (8.45 fl.oz.) of dichromate solution 4 l (1.06 US gal.) of H_2SO_4 for 60 days with a digestion time of 2 h
Calibration interval[1)]	0 to 720 h
Maintenance interval	1 week (typical)
Servicing requirement	15 minutes per week (typical)

Installation

Installation instructions	Installation on a vibration-free wall

Environment

Ambient temperature	10 to 35 °C (50 to 95 °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

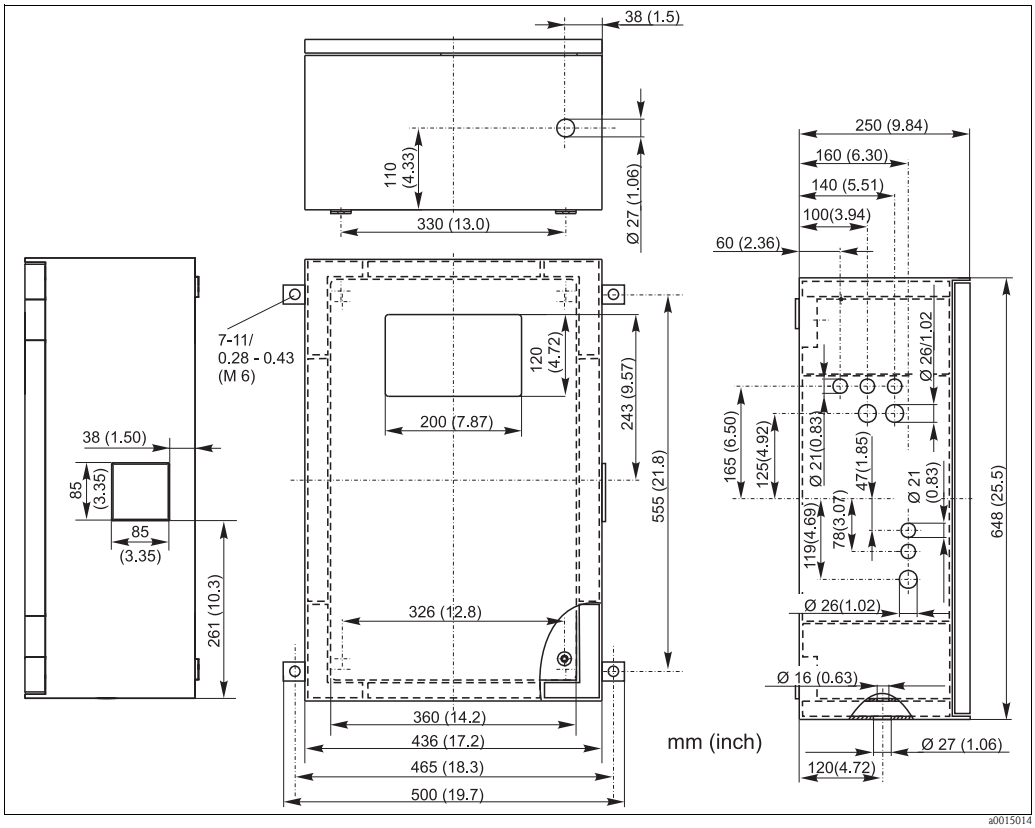
Process

Sample temperature	5 to 40 °C (40 to 100 °F)
Sample flow rate	min. 5 ml (0.17 fl.oz.) per min
Consistence of the sample	aqueous and homogenized
Sample inlet	Unpressurized

1) Standards have a limited durability due to biological activity

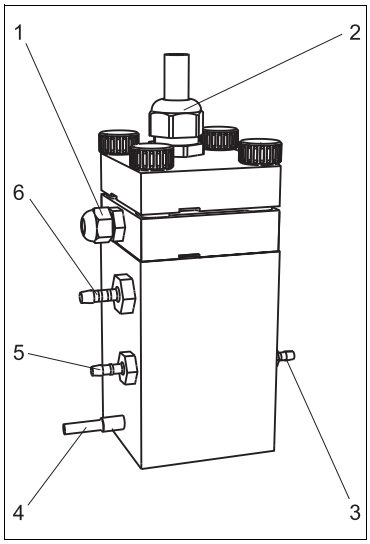
Mechanical construction

Design, dimensions



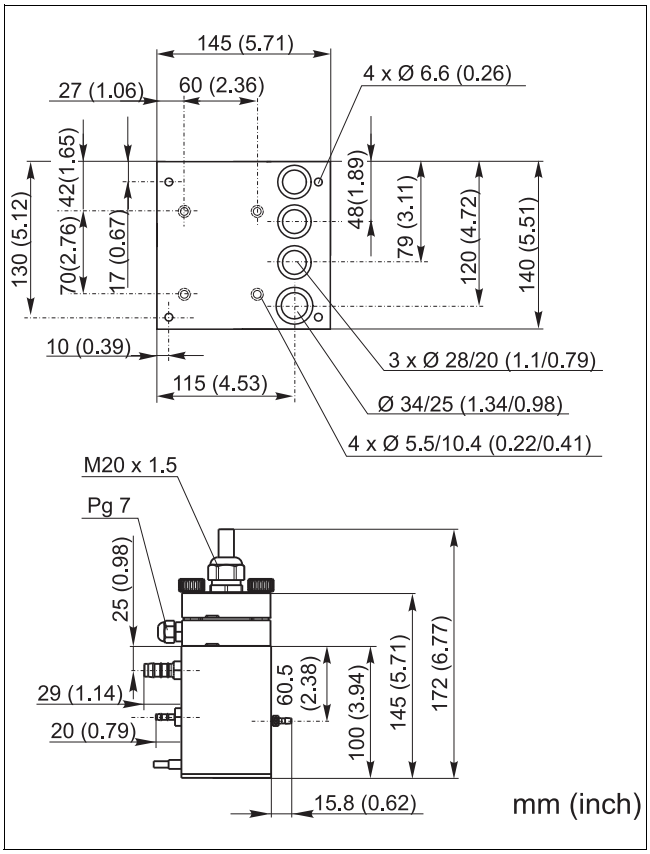
Dimensions

Collecting vessel



Collecting vessel

1 Connection for level measurement
2 Ventilation
3 Sample supply to analyzer, connection for hose with ID3.2mm(0.13")
4 Connecting cable of electric agitator
5 Sample supply, connection for hose with ID3.2mm (0.13")
6 Sample overflow, connection for hose with ID10mm (0.39")



Dimensions: collecting vessel and base plate

Weight

approx. 32 kg (71 lbs)

Material

Housing:	Glass-fibre reinforced carbon (GFR)
Front windows:	Polycarbonate
Endless hose:	C-FLEX, NORPRENE, PTFE, PFA
Pump hose:	TYGON
Valves:	C-FLEX, PVDF, FFKM

Connecting the sample line

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)

Sample outlet

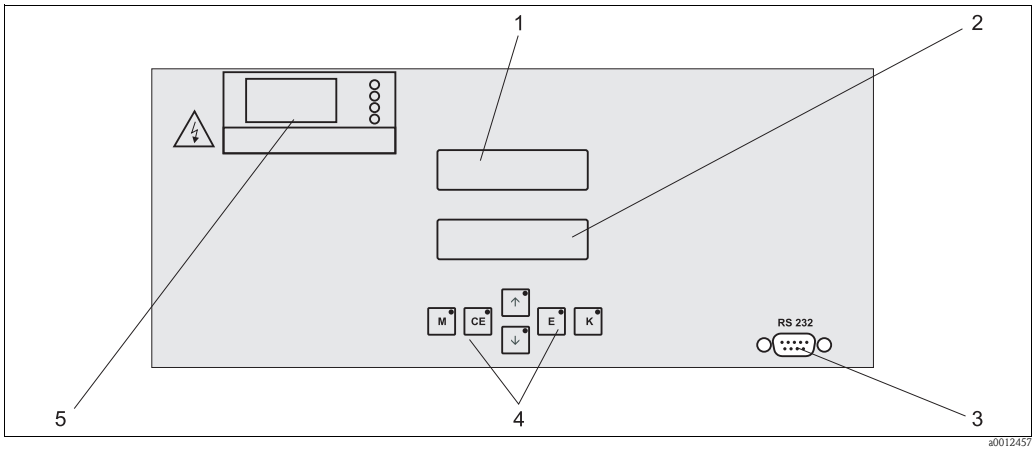
Connection: Hose ID 4 mm (0.16 inch)
- Max. length of closed loop: 1 m (3.3 ft)
- Open outlet downgrade installed
- No combination of several devices to a closed-loop system

Min. volume per measurement: 68 ml (2.30 fl.oz.)

Separated outlets
- Chromate containing waste (12 ml (0.41 fl.oz.) per measurement)
- Spill and aqueous waste (56 ml (1.89 fl.oz.) per measurement)

Operability

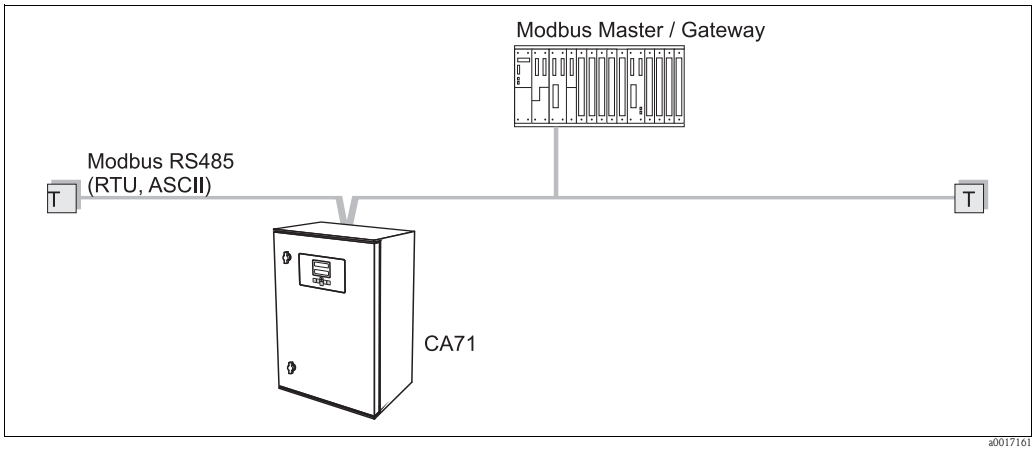
Local operation



Display and operating elements

1 LED (measured value)
2 LC display (status)
3 Serial interface RS 232
4 Operating keys and control LEDs
5 Display of the heating element

Modbus installation



Installation of Modbus RS485

Ordering information

Product page

www.products.endress.com/ca71cod

Configurator

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

Product page function
:: Add to product list
:: Price & order information
:: Compare this product
:: Configure this product

2. Click "Configure this product".
3. The configurator opens in a separate window.
   Use the radio buttons to configure the order code from the nameplate of your device.
4. Afterwards, you can 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 represents the status of printing. You can create a complete and valid order code on the Internet using the configurator tool.

	Measuring range							
	A	5 to 200 mg/l O_2						
	B	50 to 5000 mg/l O_2						
	Y	Special version acc. to customer's specification						
		Sample transfer						
		1	From one measuring point					
			Power supply					
			0	230 V AC / 50 Hz				
			3	230 V AC / 60 Hz				
				Collecting vessel (for up to 3 analyzers)				
				A	Not selected (without collecting vessel)			
				C	Collecting vessel with level measurement			
					Housing			
					2	GFR housing		
						Output		
						A	0/4 ... 20 mA, RS 232	
						C	Modbus RS485	
							Reagents	
							1	To order separately
							2	1 set, active, measuring range A
							3	2 sets, active, measuring range A
							4	1 set, active, measuring range B
							5	2 sets, active, measuring range B
CA71COD-								**complete order code**

Scope of delivery

The scope of delivery comprises:
- an analyzer with mains plug
- 4 fastening clips
- a cleaning injector
- a tube of silicone grease
- a NORPREN hose, length 2.5 m (8.2 ft), ID 1.6 mm (1/16 inch)
- a C-FLEX hose, length 2.5 m (8.2 ft), ID 3.2 mm (1/8 inch)
- a PVC hose, length 2.5 m (8.2 ft), ID 10 mm (0.39 inch)
- two hose fittings of each size:
  - 1.6 mm x 1.6 mm (1/16 inch x 1/16 inch)
  - 3.2 mm x 1.6 mm (1/8 inch x 1/16 inch)
- a hose fitting 3.2 mm x 1.6 mm (1/8 inch x 1/16 inch) for TYGON hose
- two T-hose fittings of each size:
  - 1.6 mm x 1.6 mm x 1.6 mm (1/16 inch x 1/16 inch x 1/16 inch)
  - 3.2 mm x 3.2 mm x 3.2 mm (1/8 inch x 1/8 inch x 1/8 inch)
- an interference suppressor for the current output
- 4 edge covers
- protective cloves
- protective glasses
- a lab coat
- a hose 4/6 mm (0.16/0.24 inch), PTFE, length 4.5 m (14.7 ft)
- a 5 l (1,32 US gal.) container for chromate containing waste
- a cover for the container, with hose connector
- a quality certificate
- an 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 for CA71COD-A
- Order no. CAY440-V10AAE
  - 250 ml (8.45 fl.oz.) dichromate solution
  - 4 x 1 l (34 fl.oz.) H_2SO_4
  - Dichromate decontamination reagent
- Order no. CAY440-V20AAE
  - 250 ml (8.45 fl.oz.) dichromate solution
  - 2 x 2.5 l (85 fl.oz.) H_2SO_4
  - Dichromate decontamination reagent

Reagent set for CA71COD-B
- Order no. CAY441-V10AAE
  - 250 ml (8.45 fl.oz.) dichromate solution
  - 4 x 1 l (34 fl.oz.) H_2SO_4
  - Dichromate decontamination reagent
- Order no. CAY441-V20AAE
  - 250 ml (8.45 fl.oz.) dichromate solution
  - 2 x 2.5 l (85 fl.oz.) H_2SO_4
  - Dichromate decontamination reagent

Standard solutions, 1 l (34 fl.oz.) each
- 0 mg/l O_2, Order no. CAY442-V10C00AAE
- 30 mg/l O_2, Order no. CAY442-V10C03AAE
- 100 mg/l O_2, Order no. CAY442-V10C01AAE
- 2500 mg/l O_2, Order no. CAY442-V10C25AAE

Collecting vessel

Agitated collecting vessel with level measurement
- Prevents particles from settling in the collecting vessel
- Order no. 71154317

Maintenance kit

Kit CA71COD: Wear parts
- a set of pump hoses TYGON yellow/blue
- a set of pump hoses TYGON orange/white
- a C-FLEX hose ID 1.6 mm (1/16")
- a NORPRENE hose ID 1.6 mm (1/16")
- 3 hose fittings, 1.6 x 1.6 mm (1/16" x 1/16")
- 2 reduction fittings, PP
- 4 glands with nozzle, PTFE
- 2 hose cases
- a hose extension tool
- a tube of silicone grease, 2 g
- a cleaning injector, 20 ml
- Order no. 71102950

Additional accessories

- Interference suppressor for control, power and signal lines
  order no. 51512800
- Silicon grease, tube, 2 g
  order no. 71079930
- Kit CA71COD hose set
  order no. 71103284
- Kit CA71COD hose connectors
  order no. 71103286
- Kit CA71COD composite container for chromate waste
  order no. 71103287

Instruments International

Endress+Hauser
Instruments International AG
Kaegenstrasse 2
4153 Reinach
Switzerland

Tel.+41 61 715 81 00
Fax+41 61 715 25 00
www.endress.com
info@ii.endress.com

Endress+Hauser

People for Process Automation

TI00458C/07/EN/14.12
71148151
FM9