



Level



Pressure



Flow



Temperature



Liquid
Analysis



Registration



Systems
Components



Services



Solutions

Technical Information

TOCII CA72TOC

Analyzer for online-determination of TOC in aqueous media using thermic catalytic combustion



Application

- Industrial wastewater monitoring
- Control of process wastewater
- Monitoring of industrial surface water
- Municipal wastewater monitoring
- Recording of the carbon load to control the nutrient dosage

Your benefits

- Optimized for industrial applications with varying pH values and high salt loads
- Fast and easy maintenance thanks to good accessibility of all components
- Heatable salt trap significantly increases the service life
- Exchangeable furnace concept significantly decreases service time thanks to prepared furnace
- pH-controlled acid dosage for TIC stripping minimizes acid consumption
- Adjustable measuring range: 0.25 mg/l to 12,000 mg/l TOC expandable to 240 000 mg/l by predilution of factor 20
- Measurement proceeds as "Double Batch"
- One and two-channel measurement available
- External triggered self testing with TOC standard (e.g. for limit violation)

Function and system design

Measuring principle

The analyzer determines the TOC (total organic carbon) content of an aqueous sample. It uses thermic catalytic combustion with subsequent NDIR (non-dispersive infrared) detection of the produced CO₂. TOC indicates the total organic load of water. It is used to assess the water quality and can serve as a basis for calculation of wastewater charges.

The analyzer works with two interconnected circuits, a liquid and a gas circuit, to determine TOC by the direct method. In the liquid circuit, the sample is pumped into the analyzer where it can be diluted in case of high salt loads or TOC values. The sample is acidified and the inorganic carbon is eliminated (Stripping). Then the sample is transferred through a rotation slit filter in which the particles are separated according to DIN standards. After that, it is dosed into the furnace.

The sample is combusted at a temperature of approx. 850 °C (1550 °F). Then, the combustion gas is cooled down and the CO₂ content is determined by the NDIR detector.

The double-batch operation makes sure that the reactor and gas circuit are flushed with CO₂-free carrier gas and the basic trace is determined while the next sample is prepared in the liquid circuit.

Measurement; calibration and adjustment of the system

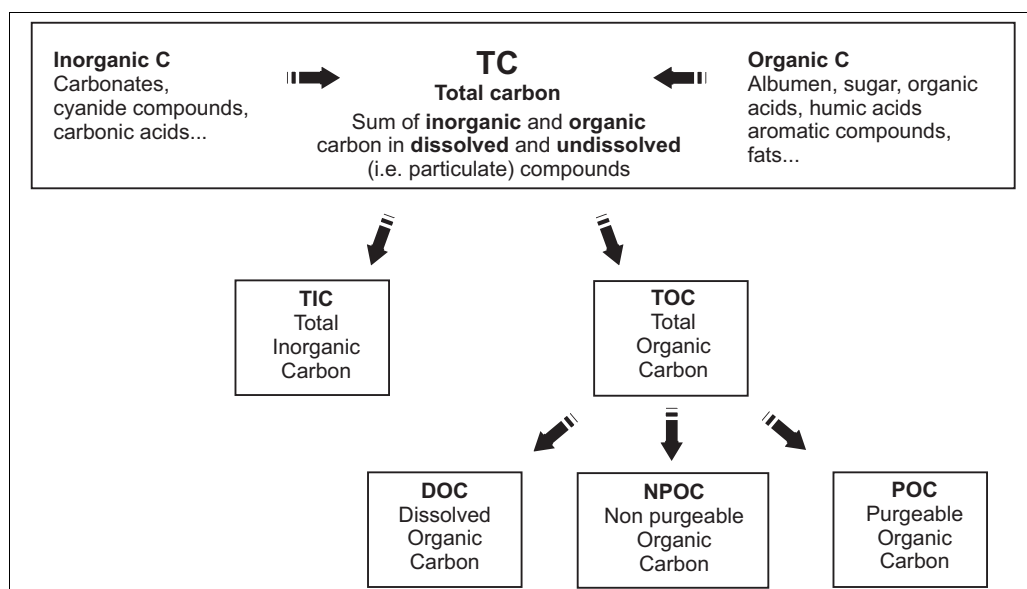
The double-batch operation links and matches two different batch procedures. On the one hand, the sample is batch-wise fed into the furnace. On the other hand, the reactor is batch-wise flushed with CO₂-free carrier gas after each measurement. To monitor the measurement, a 1-point calibration can be triggered externally or by a timer. The 2-point adjustment allows to adapt the analyzer to system changes.

TOC as sum parameter

The total carbon of an aqueous sample is divided into total inorganic carbon (TIC) and total organic carbon (TOC). TOC can again be divided into three groups:

- Dissolved organic carbon (DOC)
- Non-purgeable organic carbon (NPOC)
- Purgeable organic carbon (POC).

For the classification of organic carbon, it is important to note the difference between POC and VOC (volatile organic carbon). POC is actively eliminated during online analysis of TOC (e.g. during stripping). VOC is a scientific term that describes the properties of volatile organic carbons. Volatilization of substances is a passive process strongly influenced by temperature and pressure.



Classification of carbon parameters

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Important features

Heatable salt trap

The heatable salt trap simplifies maintenance in applications with high salt loads. When samples with high salt loads are combusted, deposits form on the catalyst and the furnace which leads to inaccurate measurements and might result in congestion of the system. With the heatable salt trap, salts can be removed from the furnace quickly and efficiently. This increases the availability of the measuring point dramatically. It also reduces operating costs thanks to longer maintenance intervals and easy handling of the salt trap.

The salt trap can be removed from the furnace without having to switch the furnace off. The salts in the trap can easily be rinsed off and the trap can be screwed back into position.

Exchangeable furnace concept

The exchangeable furnace increases the availability of the measuring point by considerably shortening the maintenance process. A second furnace can be prepared in an optional separate preparation unit (burn out of catalyst, rinsing and preheating of furnace). This means that burn out and conditioning of the catalyst do not need to be done in the analyzer. The used furnace can simply be exchanged with a prepared fresh furnace and the system is back to operation within a short period of time.

pH-controlled acid dosing

pH-controlled acid dosing offers the advantage that the exact amount of acid is added to the sample that is necessary to reach a pH value of 2.5. Excess dosing is avoided which results in reduced acid consumption. At the same time, salt drag-in into the furnace due to excess acid is minimized.

In municipal wastewater treatment plants, acidification of the sample can lead to precipitation of humic acids which can mask the carbonate. This inorganic carbon ends up in the furnace and causes too high measured values.

Double-batch operation

The patented double-batch operation links the water and the gas circuits. The aqueous sample is continuously prepared in the analyzer and fed batch-wise into the furnace. During measurement, the CO₂-containing gas is circulated and accumulated in the gas circuit. This allows to record large sample volumes (1200 µl) which leads to a high sensitivity. After measurement, the gas circuit is flushed with CO₂-free carrier gas and the basic line for the next measurement is determined.

Two-channel measurement

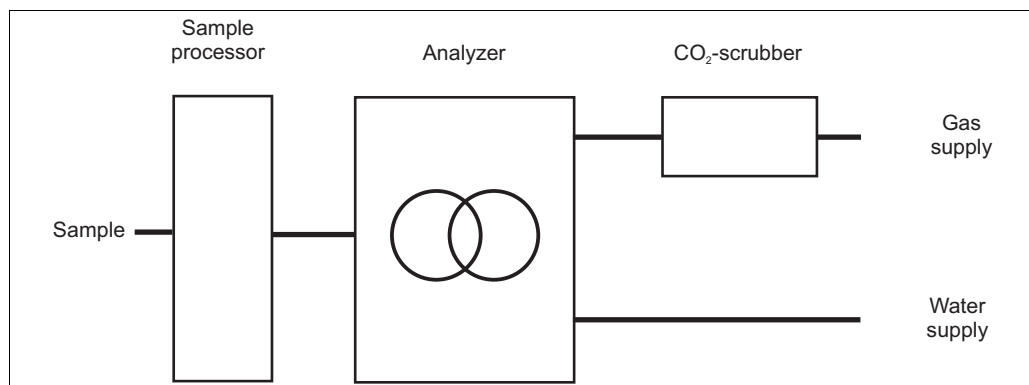
The two-channel measurement allows to measure two different sample streams, e.g. two inlets of a wastewater treatment plant, with one device. This option is suitable for sample streams with similar TOC values.

Sample preparation

The following models of sample preparation are available:

| Model | Flow | Material | Recommendation |
|-------|---|----------|---|
| PA-2 | 1 to 8 m ³ /h (260 to 2000 gal/hr) | PVC | Recommended for multiple analyzer systems in series (e.g. CA72TOC an CA72TP); for probe temperatures <55 °C (<130 °F) and diluted solutions |
| PA-3 | 0,1 to 1 m ³ /h (26 to 260 gal/hr) | PVC | Recommended for probe temperatures <55 °C (<130 °F) and diluted solutions |
| PA-9 | 0,1 to 1 m ³ /h (26 to 260 gal/hr) | PP | For problematic wastewater due to high chemical resistance (except oxidizing acids and halogens) for probe temperatures <55 °C (<130 °F) |

Measuring system



Schematics of measuring point

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Input

Measured variables TOC (TC possible without stripper)

Measuring range

| Version | Measuring range |
|---------|----------------------|
| A | 0.25 to 600 mg TOC/l |
| B | 1 to 2400 mg TOC/l |
| C | 2.5 to 6000 mg TOC/l |
| D | 5 to 12000 mg TOC/l |

With the optional pre-dilution the measuring range will expand by the factor of 20.

Signal inputs

8 signal inputs 24 V DC, active, load max. 500 Ω

| | |
|----------|---|
| Input #1 | Activation service calibration |
| Input #2 | Activation service adjustment |
| Input #3 | Activation service flush screen |
| Input #4 | Activation service power-flush |
| Input #5 | |
| Input #6 | |
| Input #7 | Activation standby |
| Input #8 | Activation channel switch over (optional) |

Output

Output signals

Channel 1: 0/4 to 20 mA, galvanically separated
 Channel 2 (two channel version only): 0/4 to 20 mA, galvanically separated
 Load: max. 500 Ω

Alarm signals

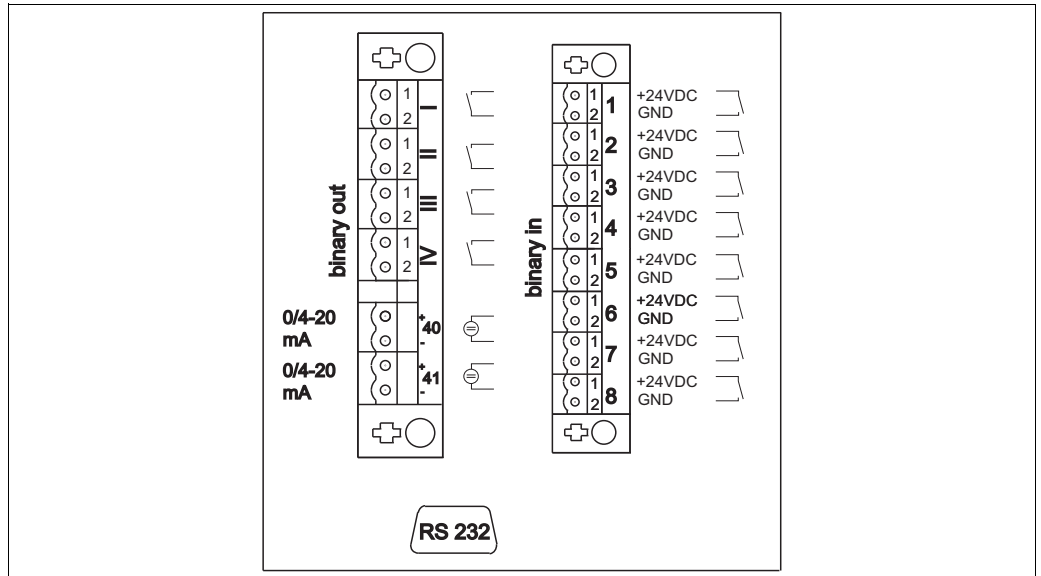
Limit alarm, malfunction message, standby message and operation control, potential free, normally closed
 (max. 0.25 A / 50 V)

Interface

RS 232 C, proprietary, for data output and remote control (optional)

Power supply

Signal connection



Signal connection

- | | | | |
|-----|------------------------------------|---|---|
| I | Alert | 1 | External activation of calibration |
| II | Alarm for limits | 2 | External activation of adjustment |
| III | Standby | 3 | External activation of flush screen |
| IV | Operating control | 4 | External activation of power flush |
| 40 | Signal output channel 1 | 5 | |
| 41 | Signal output channel 2 (optional) | 6 | |
| | | 7 | External activation of standby |
| | | 8 | External activation of channel switch over (optional) |

| | |
|------------------------|--|
| Message I to IV | Relay contact (max. 0.2 A and 50 V), normally closed |
| Signal output 40 to 41 | 0 to 20 mA or 4 to 20 mA switchable, galvanically separated, load max. 500 Ω |
| Signal input 1 to 8 | 24 V DC active, load max. 500 Ω |

Note!

TOCII CA72TOC is suitable for connection to industrial mains support according to EN 61326-1, class A.

Electrical connection

| Version | Average power consumption | Maximum power consumption |
|----------------|---------------------------|---------------------------|
| 115 V AC 50 Hz | 490 VA | 650 VA |
| 115 V AC 60 Hz | 490 VA | 650 VA |
| 230 V AC 50 Hz | 490 VA | 650 VA |
| 230 V AC 60 Hz | 490 VA | 650 VA |

Fuses

| Modules | Fuses |
|--------------------|--|
| Power distribution | 16 A, slow blow |
| Relays | per relay 4 A, slow blow, type: TR5 |
| Power supply | 2 A, slow blow, type: microfuse 5 x 20 |

Performance characteristic

According to ISO 15839

According to ISO 15839

The performance characteristics are determined according to ISO 15839 appendix B. 300 µl sample per measurement are dosed at TOCII (CA72TOC-A1A0B1) resulting in a measuring range of 4 to 800 mg/l. The following data correspond to this system.

It is assumed that the performance characteristics can be transferred to additional measuring ranges with minor deviations.

| Performance characteristics according to ISO 15839 chapter 5 | Value |
|--|----------------------|
| Limit of detection LOD | 0.75 % of full scale |
| Limit of quantitation LOQ | 2.5 % of full scale |
| Short term drift | 0.5 %/day |
| Repeatability for 20 % of full scale | 0.4 % |
| Limit of resolution for 20 % of full scale(LDC) | 1.1 % |
| Systematic measured error for 20 % of full scale (BIAS) | 0.4 % |
| Repeatability for 80 % of full scale | 1.6 % |
| Limit of resolution for 80 % of full scale(LDC) | 4.6 % |
| Systematic measured error for 80 % of full scale (BIAS) | 2.4 % |

Inorganic carbon removal > 95 % using a pH controlled TIC scrubber

Installation conditions

Water connection

Pressure 2 to 4 bar (29 to 58 psi)
Connection 6/8 mm DN or G3/8 threaded connection

Drain

Drain underneath the analyzer. Use drain 6/8 mm made of PTFE. Do not install the drain with any restrictions or back pressure.

Compressed air

The compressed air must be dry and must meet the following specifications:

- < 3 ppm CO₂
- < 3 ppm hydrocarbon
- Constant pressure 2 bar (29 psi)
- Pressure tolerance ±5 %
- Consumption 650 to 750 cm³/min (1.37 to 1.6 ft³/hr)
- The in-house compressed air supply must be equipped with a CO₂ scrubber (input pressure 4.0 to 10 bar (58 to 145 psi)) and a pressure reducing valve.

Connection: 4/6 mm

Exhaust

Inside of buildings an exhaust is required. No accumulation of halogens or other vapors is allowed in this area. In the exhaust hose (4/6 mm) no back pressure is allowed.

Environment

Ambient temperature 5 to 35 °C (41 to 95 °F)

Humidity 10 to 90 %, non-condensing

Ingress protection IP 54

Process

Sample temperature 0 to 40 °C (32 to 104 °F)

Sample flow rate 20 ml/min (0.32 US gal/hr)

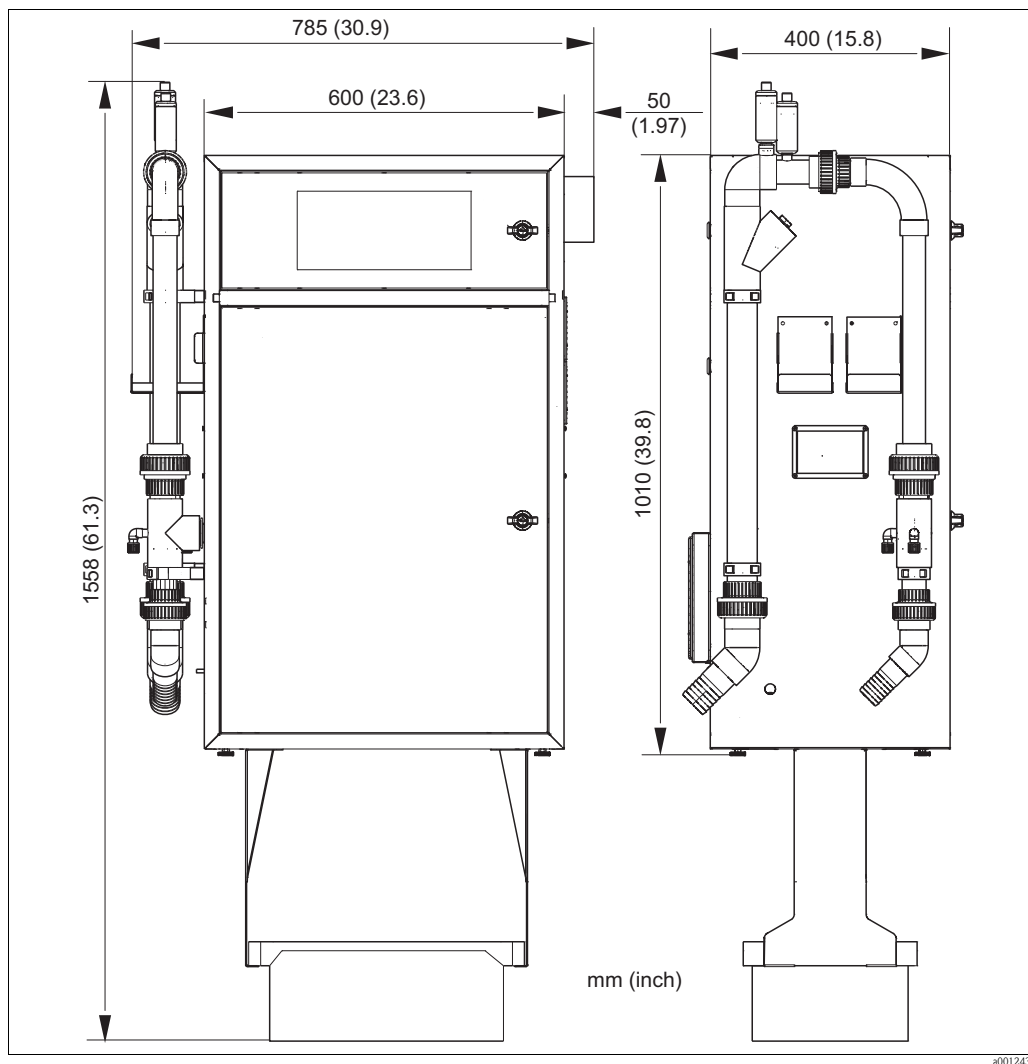
Sample volume 90 ml (3 fl.oz)
Sample preparations PA-2, PA-3 and PA-9 are available.

Sample consistency Aqueous
Flammable substances are not allowed in ignitable concentrations - in such cases a sample dilution is required.

Sample inlet Unpressurized outlet of the sample processor to the analyzer

Mechanical construction

Dimensions



Dimensions

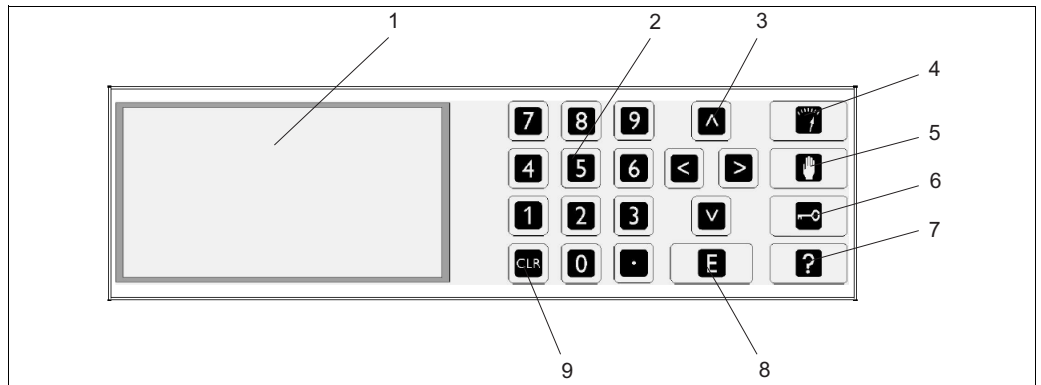
Weight approx. 75 kg (165 lbs)

Materials

| | |
|----------------------------|------------------------------------|
| Housing | Aluminium, powder coated (RAL7035) |
| Window | Glass, conductive coated |
| Valve seals | EPDM, FPM, FFKM |
| Pump hoses | Ismapren |
| Pumps and pump seals | PTFE, FFKM |
| Reagents- und sample hoses | PTFE, PE |
| Exhaust hoses | PTFE, PE |
| Drain hoses | PTFE |

Human interface

Display and operating elements



Display and operating elements

- 1 Display, 16 rows a 40 characters
- 2 Keyboard
- 3 Arrow keys (cursors)
- 4 Function key "Measuring"
- 5 Function key "Service"
- 6 Function key "Programming"
- 7 Function key "Help"
- 8 Key "Enter"
- 9 Key "Clear"

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Certificates and approvals

CE symbol

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.

Ordering information

Product structure

| Measuring range | |
|------------------------------------|---|
| A | 0.25 to 600 mg/1 TOC |
| B | 1 to 2400 mg/1 TOC |
| C | 2.5 to 6000 mg/1 TOC |
| D | 5 to 12000 mg/1 TOC |
| Y | Special version according to customer specification |
| Sample transfer | |
| 1 | 1 measuring point |
| 2 | 2 measuring points; time controlled |
| 3 | 2 measuring points; external controlled |
| Operation mode | |
| A | Batch mode |
| Power supply | |
| 0 | 230 VAC, 50 Hz |
| 1 | 115 VAC, 60 Hz |
| 2 | 115 VAC, 50 Hz |
| 3 | 230 VAC, 60 Hz |
| 9 | Special version according to customer specification |
| Sample preparation | |
| A | 1 x PA-2 PVC, 1 to 8 m ³ /h (4.4 to 35 gpm) wastewater (not with CA72TOC-*2*****) |
| B | 1 x PA-3 PVC, 0.1 to 1.0 m ³ /h (0.4 to 4.4 gpm) wastewater (not with CA72TOC-*2*****) |
| C | 1 x PA-9 PP, 0.1 to 1.0 m ³ /h (0.4 to 4.4 gpm) wastewater (not with CA72TOC-*2*****) |
| D | 2 x PA-2 PVC, 1 to 8 m ³ /h (4.4 to 35 gpm) wastewater (not with CA72TOC-*1*****) |
| E | 2 x PA-3 PVC, 0.1 to 1.0 m ³ /h (0.4 to 4.4 gpm) wastewater (not with CA72TOC-*1*****) |
| F | 2 x PA-9 PVC, 0.1 to 1.0 m ³ /h (0.4 to 4.4 gpm) wastewater (not with CA72TOC-*1*****) |
| Y | Special version according to customer specification |
| Language instrument, documentation | |
| 1 | German |
| 2 | English |
| Order code | |
| CA72TOC- | |

| Carrying gas (optinal, select one option only) | |
|--|--|
| E1 | CO ₂ -scrubber |
| E2 | CO ₂ -scrubber + compressor |

| Analyzer mounting (optinal, select one option only) | |
|---|--------------|
| F1 | Wall mounted |
| F2 | Stand |

| Accessory mounted (optinal, multiple selection possible) | |
|--|-----------------------------------|
| G1 | Sample predilution |
| G4 | Heated salt trap |
| G5 | Pipe back flushing |
| G6 | Standby mode PA-2/-3 failure |
| G7 | sample valve for aggressive media |

| Accessory enclosed (optinal, multiple selection possible) | |
|---|--|
| H1 | 230 VAC furnace conditioning station (not with CA72TOC-***1***** and not with CA72TOC-***2*****) |
| H2 | 115 VAC furnace conditioning station (not with CA72TOC-***0***** and not with CA72TOC-***3*****) |
| H3 | Standard furnace (not with CA72TOC-*****G4**) |
| H4 | Furnace for heated salt trap |

Note!

To complete your order code, simply add the optional features to the end of order code. If you have any questions, please contact your local sales office.

Scope of delivery

The scope of delivery comprises:

- 1 analyzer CA72TOC
- Tool kit for leak check
- Tool kit to remove the glass ball and the media
- Acid filter kit
- Kit for commissioning of stripper and separation chamber
- Maintenance kit for furnace
- Hose kit for inlet and outlet
- 1 canister 5 liter
- 2 canisters 2 liter
- 3 covers for canisters
- Key for door lock
- Connection box EMV
- Measuring glass 10 ml
- Sponge
- Safety glasses
- Gloves, acid-proof and base proof
- Silicone
- Operating Instructions

Accessories

Reagents

- CAY450-V10AAE, 1000 ml stripper reagent für CA72TOC
- CAY451-V10C01AAH, 1000 ml parent solution 10 000 mg/l TOC
- CAY451-V10C10AAH, 1000 ml parent solution 100 000 mg/l TOC

Furnace conditioning station

- 230 V AC 50/60 Hz order number: 71103492
- 115 V AC 50/60 Hz order number: 71103493

Standard furnace

- As additional furnace or als replacement
- Not for heated salt trap
- Order number: 71091188

Furnace for heated salt trap

- As additional furnace or as replacement
- Order number: 71103888

Kit CA72TOC heated salt trap

- As replacement for maintenance (decreases the maintenance time) or as replacement
- Order number: 71101532

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