

# TOCMETER ANALYZER



## TOTAL ORGANIC CARBON (TOC)

### **Organic compounds – present in almost all types of water ...**

Organic compounds are found in almost all types of water – from natural and treated drinking water to process water, cooling water, and water used in pharmaceuticals and food production.



#### **Industry sectors**

- Chemicals
- Pharmaceuticals
- Food & beverage
- Automotive
- Oil & gas
- Power & energy
- Petrochemicals
- Pulp & paper
- Airports
- Environmental monitoring

#### **Sample types**

- Drinking water
- Surface water
- Process control
- Boiler feed water/condensate
- Cooling water
- Run-off/storm water
- Wastewater

### **... and a challenge in many industrial processes**

Too much organic contamination in the water interferes with many industrial processes. For example, an excess of organic matter can foster microbiological growth or, when disinfecting drinking water, encourage the presence of undesirable byproducts. On the other hand, there are numerous processes in the chemical and galvanic industries

in which water is mixed with organic additives. In order to control and monitor these processes, it is important to measure the amount of organic substances in the water.

#### **TOC – an important sum parameter**

Given the huge numbers of organic compounds in water, it is practically impossible to identify and measure each one individually. Instead of analyzing individual substances, a fast and precise way to rate water quality is to measure sum

parameters – this is especially helpful in the case of online monitoring. Measuring the total organic carbon (TOC) is particularly important for the evaluation of the total organic

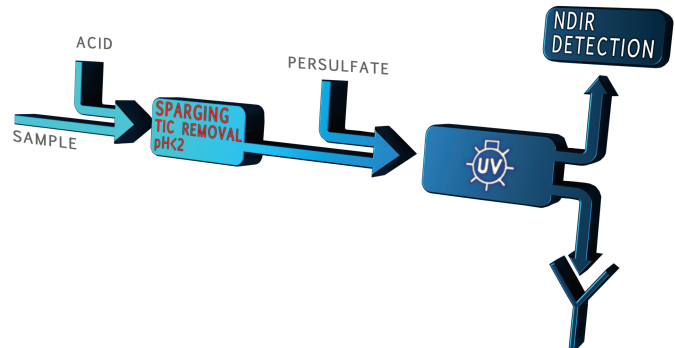
contents. The advantages of TOC analysis include the high levels of accuracy and precision that can be achieved, even with small sample amounts, plus the ease with which the process can be automated.



## SAFE AND RELIABLE ONLINE TOC MEASUREMENTS

Measuring TOC continuously online is the perfect solution for monitoring contamination and discharges. The TOC Analyzer measures total organic carbon in liquid samples using the method of UV persulfate oxidation with subsequent carbon dioxide detection by nondispersive infrared absorption (NDIR). The analyzer can measure TOC in liquid samples ranging from 0–5 mg/L to 20,000 mg/L. The method conforms to EPA, DIN, CE, ASTM, and NAMUR regulations as well as meeting the requirements of ISO and EN directives.

Flow diagram of CO<sub>2</sub> measurement using NDIR detection



### Safe operation in case of sample loss

The fast loop reservoir has a floating level sensor. If no sample reaches the reservoir for more than a preset time, the analyzer switches automatically to standby mode. As soon as the sample flow restarts, the analyzer switches back to the analysis cycle automatically. Air bubbles are removed in the reservoir before the sample enters the analyzer.

### Digital flowmeter

Unlike traditional analyzers where the flow is controlled by a glass tube rotameter, the carrier gas flow is controlled digitally and is displayed in cm<sup>3</sup>/min. The flow is monitored and in the case of an abnormal value such as a line blockage, the analyzer stops automatically and displays a «low carrier flow» message.

### Dual compartment enclosure

The analyzer consists of two separate housing compartments in order to separate the electronics from the wet part.

### Valve-free sample line

Samples are taken and reagents are added via the peristaltic pumps eliminating valves which risk being blocked. The autoclean, autocalibration, and autovalidation functions guarantee correct, reliable values that can be reproduced at any time without the need for manual intervention.

### Analysis process

The sample first is acidified and then sparged to remove inorganic carbon. The remaining liquid is mixed with sodium persulfate and digested by two high-performance reactors. The resulting CO<sub>2</sub> is then stripped from the liquid and, after drying, its concentration is measured by a NDIR analyzer.



**Integrated carrier gas**

An internal air compressor produces the carrier gas for the oxidation and detection stages. The air is purified using an internal soda lime filter which means that there is no need for external air treatment or a compressed air supply, as in traditional analyzers.

**Autoclean**

This function uses a dedicated peristaltic pump to clean the liquid lines of the analyzer, the sample line, and the external reservoir.

**Separate lines for stripping gas and carrier gas**

There are two separate gas lines, each with its own compressor. One is intended for the stripping gas for the TIC (total inorganic carbon) and one for the carrier gas (automatically monitored by a digital flowmeter).

**Automatic ZEROGAS checks**

The ZEROGAS value is expressed in ppm and specifies the residual CO<sub>2</sub> concentration value in the carrier gas (ambient air filtered through a soda lime filter). During a ZEROGAS cycle, the pumps and UV lamps are switched off and the carrier gas passes through all the wet cells to the IR detector. The detected CO<sub>2</sub> concentration is stored in the analyzer as the ZEROGAS value. A ZEROGAS cycle can be started manually or automatically at a time and interval selected by the operator. If the ZEROGAS value exceeds a certain preset limit, the alarm «ZEROGAS too high» will be activated and the analyzer will stop.



**Materials used in the analyzer**

All materials used are chosen for their long life and reliability. The design uses the minimum number of fittings. All of the materials used are resistant to the corrosive liquids used during operation.

**TOC or TC**

The Analyzer is also available as a total carbon (TC) analyzer. Here the step of sparging the acidified sample is omitted. Along with a high volume external pump, this offers faster response times when the total inorganic carbon (TIC) in the sample is considered insignificant.

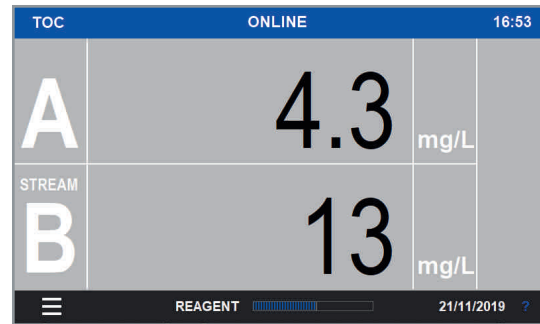
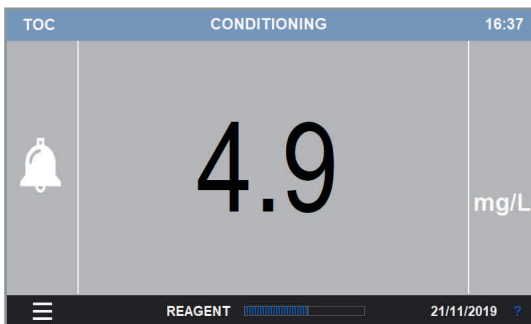


## SIMPLE OPERATION - FULL CONTROL

The user interface is a touchscreen located on the front of the analyzer. All output/input data, status information, alarms, and fault conditions are shown. Simply pressing the touchscreen buttons gives access to commands and settings; access to the system configuration and timings is protected by a password.

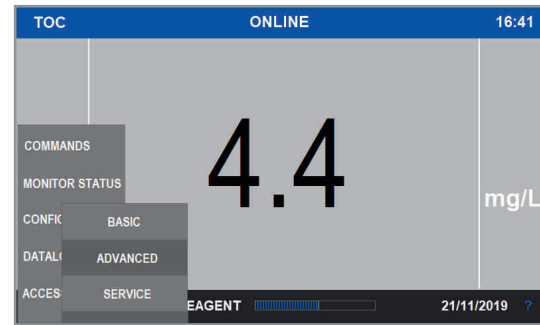
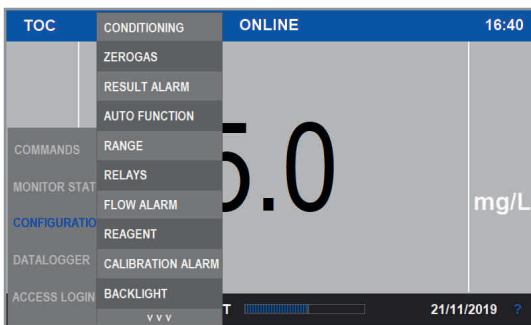
• **Main screen**

A large display shows the measured concentrations in addition to any alarm signals occurring, like the loss of sample, low level of the reagents or a validation out of the tolerance. Dual streams analysis is performed by alternating two different sample to the analyzer according to a frequency programmed by the user. The two results are always displayed, as well as the corresponding analog output.



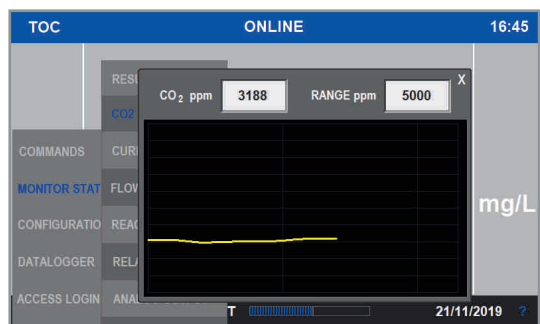
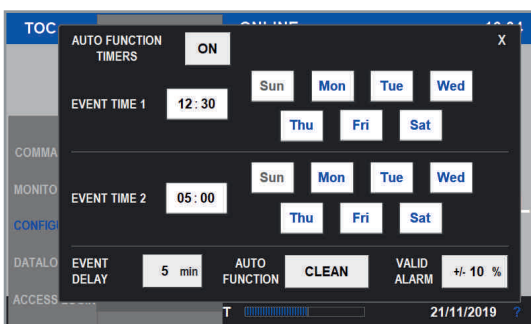
• **Easy user interface**

The user can easily scroll through the various menus to perform a calibration, check the process values, modify the settings and view the historical saved data. Different password access maintain the security of the settings.



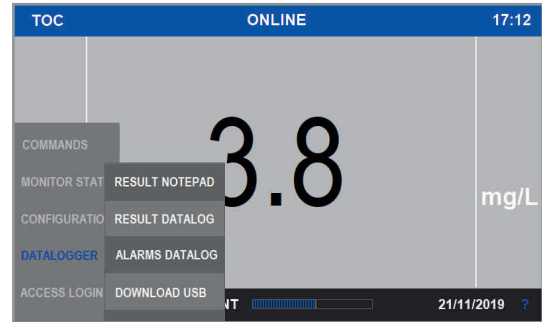
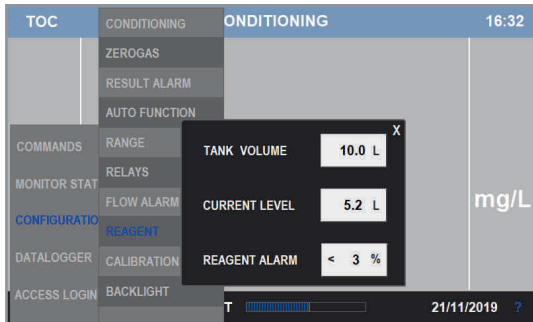
• **Auto function programming based on a weekly schedule**

The frequency of Zerogas calibration and the Auto function (cleaning, calibration or validation) can be scheduled by the user. In addition to automatic calibrations, a manual calibration can be launched at any time.

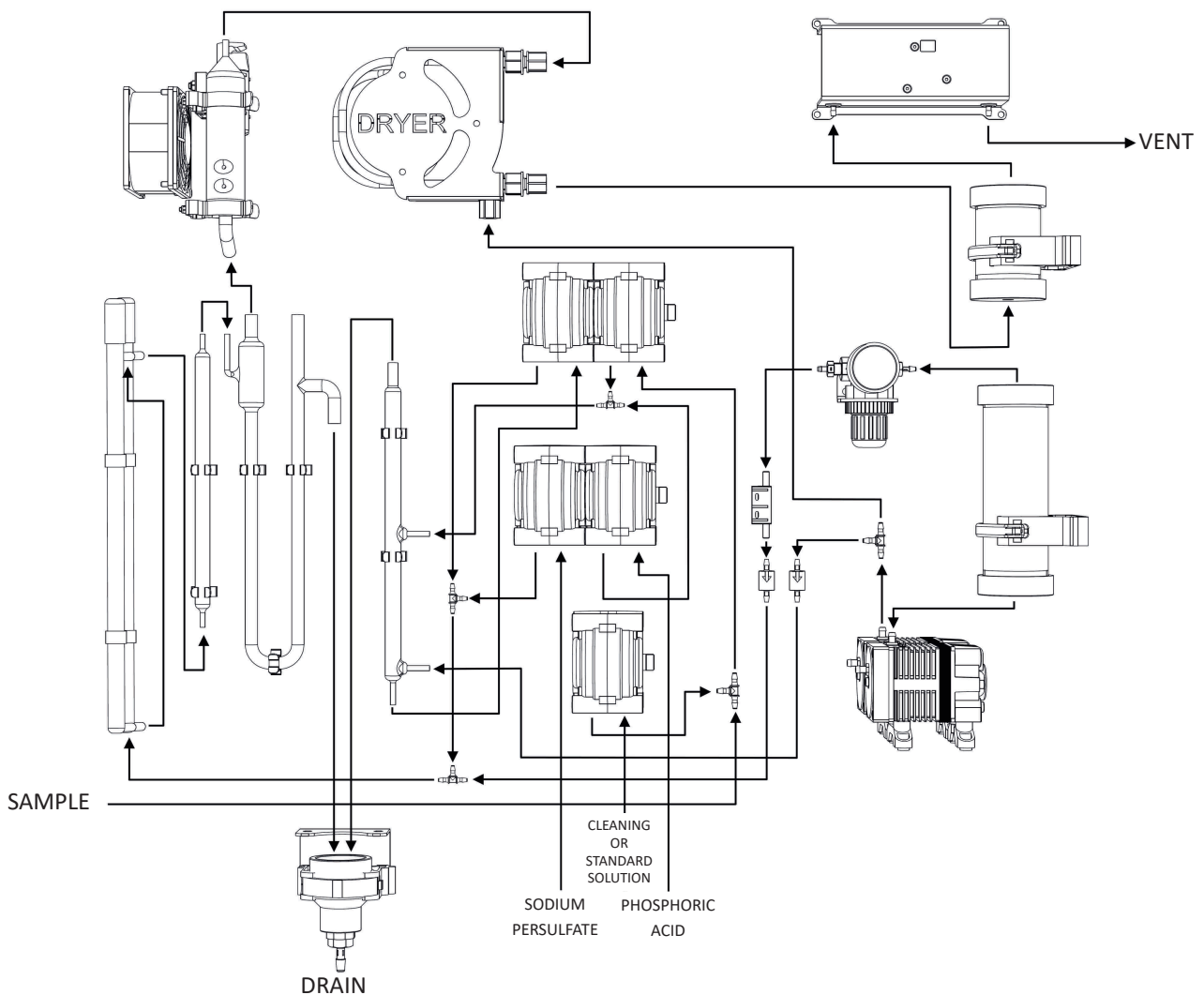


- The level of reagents in the tanks is automatically monitored. An alarm is triggered in case of low level of the reagents.

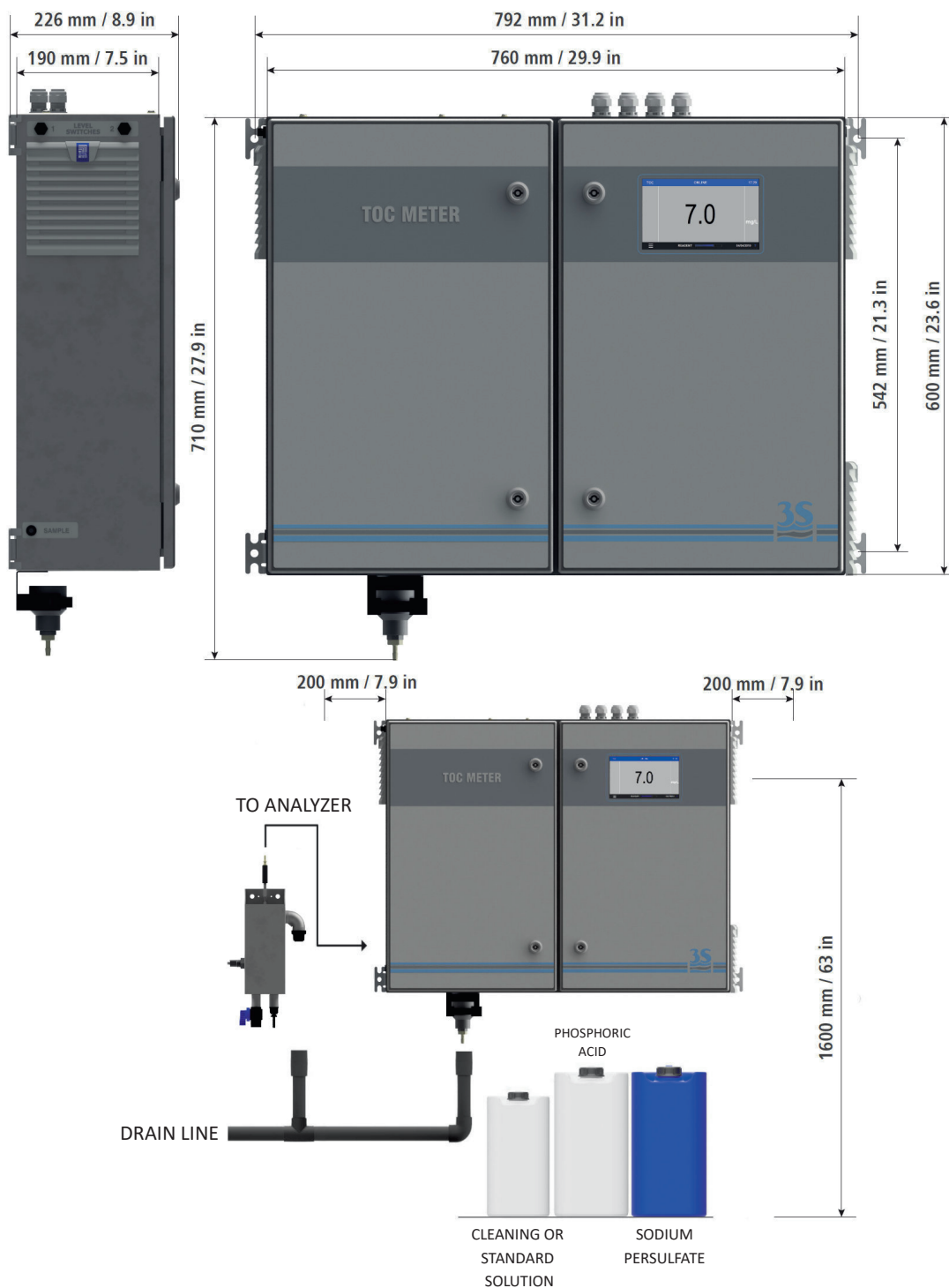
- All results, calibration and occurred alarms are stored in the datalogger, that can be downloaded onto a USB stick at any time for evaluation on a PC (.csv file).



### FLOW DIAGRAM



## TOC DIMENSIONAL DRAWINGS



**TECHNICAL SPECIFICATIONS**

Analyte	Total Organic Carbon (TOC), Total Carbon (TC)
Method	For TOC measurements, inorganic carbon is removed by acidification and sparging; this is followed by UV-promoted persulfate oxidation. This process oxidizes the total organic carbon into carbon dioxide which is measured in a nondispersive infrared (NDIR) analyzer. For TC measurements, the sparging step is omitted.
Range	0–5 mg/L to 20,000 mg/L
Measurement type	Continuous
Lower determination limit	0.2 mg/L (for range 0-5 mg/L using nitrogen as carrier gas)
Accuracy	± 2% of full scale nondiluted, ± 4% of full scale diluted ranges
Response time	From 6 minutes, depending on range
Ambient temperature	5-40°C / 41 - 104°F
Sample temperature	2–70°C / 36 - 158°F
Sample inlet pressure	Pressureless from overflow vessel (Fast Loop Reservoir)
User interface	Color touchscreen
Data logger	Integrated, data download via USB flash drive (USB stick)
Size	760 × 600 × 210 mm / 29.9 x 23.6 x 8.3 in
Weight	37 kg / 81.57 lbs (approx. depending on range)
Power supply	115 or 230 VAC 50/60 Hz, 350 VA (115 VAC), 250 VA (230 VAC)
Carrier gas	Air purifier integrated, supplied by an internal compressor. N <sub>2</sub> or CO <sub>2</sub> free air supply can be used as an option
Reagents	Phosphoric acid and sodium persulfate (approximately 10 L/month for continuous operation)
Analog outputs	2 × 4–20 mA outputs for measured data
Alarms	2 SPDT contacts. Relay A is programmable – online, offline, loss of sample, result alarm, validation alarm, reagent alarm, calibration alarm. Relay B is for the instrument fault alarm
Extra relay	Programmable for external operations
Digital input	Remote start/stop
Autoclean, autocalibration, autovalidation functions	Can be selected using the dedicated peristaltic pump
Dual channel	Dual channel integrated
Dual range (low/high)	Switches sample to an external dilutor for a higher range once a set-point is passed
Factor	Result multiplication factor, e.g., for converting TOC to equivalent COD value
Protection class	IP54 - NEMA 3
Conformity	EN 610004-2, EN 610004-4, C 46-022, EN 55022, EN 61326 (electromagnetic compatibility)

**ACCESSORIES AVAILABLE**

Fast loop reservoir	Maintains a constant sample flow and switches analyzer to standby in case of insufficient flow. As soon as the sample flow restarts, the measurement is resumed.
External diluters	Options of 2× to 40× dilution of one or two sample streams using 1 motor with dual pump heads or 2 motors with single pump head.
Filtration unit	Self-cleaning, at user selectable intervals and cleaning period.