



QuickTOC_{purity}

TOC-ANALYSIS

Online TOC for pure water.
For optimized process control.

Precise. Fast. Reliable.



THE MEASURING SYSTEM FOR ULTRA PURE WATER.

Organic loads in pure water such as boiler feed water are very low. However, they may cause enormous damage to the systems. Thus, their monitoring requires the highest precision and promptness.



— A CO-generator consists of a desalination plant and a boiler. Smallest organic impurities result in production of carbonic acid, which increases the risk of corrosion considerably. It is important to detect impurities quickly and reliably.

The quality requirements for ultra pure water are very high. At high boiler pressure the total organic carbon (TOC) content of boiler feed water shall not exceed the limit of 0.1 to 0.5 mg/l C (100..500 ppb). Otherwise corrosion, scaling, and biological fouling may damage the pipes or even result in a system failure.

— **Pure water.**

Water quality with high demands.

Pure water is required as process water in industrial plants or for the manufacture of products. The pretreatment of water to process water is very expensive. However, it is necessary in order to guarantee the high requirements of boiler feed water for example. Therefore, the monitoring of the smallest contamination is of great importance.

Organic contaminants in process water caused by leaks or product spills may result in devastating

consequences in the plant, especially at boilers or heat exchangers. Corrosion, deposits and coatings are the consequences. In the case of contamination, expensive pure water is drained off, and the water circuit has to be back-fed with costly treated make-up water. If the contamination is too serious, the plant will be shut down.

The fast and reliable detection of smallest impurities by TOC analysers provides an efficient solution within process monitoring.

— **What TOC means and how it is measured.**

A whole variety of organic matter can be present in water, which cannot be determined individually. At least not without considerable analytical effort and within a short time. This is why the so-called sum parameter TOC (total organic carbon) is used. It measures a samples organic loads and is thus an important indicator for water quality.

At 1,200 °C,
water samples
are completely
and precisely
analysed.

The TOC measurement. You have the choice.

The TOC content may be detected by using the difference method, whereby all organic and inorganic carbon bonds are oxidised resulting in the total carbon (TC, Σ Fig. 1). From this TC value the separately analysed inorganic carbon (TIC) is subtracted. The result is the TRUE TOC.

Alternatively, the TOC may be detected 'directly' by stripping out the TIC using acidification prior to the thermal oxidation. Since during this process the VOC and POC is stripped out too, in general the result is the NPOC.

TC measurement. Quickly and beneficial.

Within the boiler the inorganic carbon (carbonate) reacts forming carbonic acid that causes corrosion in boilers, pipes, and heat exchangers. Monitoring the TC content includes the TIC and minimizes the risk of damages.

Exact Analysis.

At 1,200 °C, the TRUE TOC is determined.

Vital to this method: For an exact TOC measurement all carbon bonds must be reliably combusted. Using a temperature of 1,200 °C, LAR AG have developed a high temperature method which makes this possible!

This temperature was chosen due to the proven fact that a complete oxidation of a sample cannot occur at temperatures below it: For example, carbon bonds of carbonates only break fully when reaching a combustion temperature of 1,200 °C. Basically, the lower temperatures deliver less exact measurement results.

For this reason, to distinguish ourselves from these other methods, we at LAR talk of the TRUE TOC.

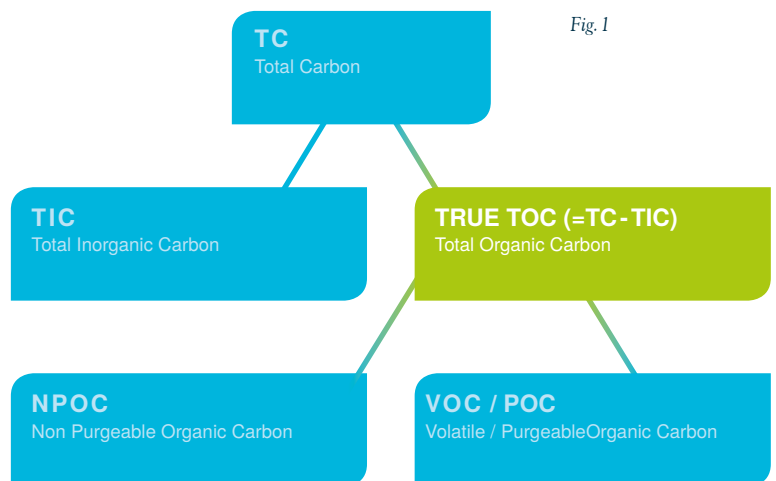
Catalysts.

For our analysers simply not necessary.

Because of their high temperatures our analysers do not need any catalysts. Catalysts are only necessary for the low temperature catalytic "high temperature" oxidation (680 – 1,100 °C) to support the oxidation of the carbon bonds. However, the performance of the catalysts is lowered over time. This affects the measurement results making continually new calibrations necessary and eventually requires the replacement of the catalysts. We want to save you the trouble: With the QuickTOC_{purity}.

What is the TRUE TOC derived from?

And what is it composed of?



AT A GLANCE

- The TOC value is the measure for the organic load in a water sample.
- The TRUE TOC value can only be determined using the difference method at 1,200 °C.
- A reliable measurement system must be able to analyse the course material in water.
- The TC value is detected fast and reliably.
- At 1,200 °C, a complete oxidation is guaranteed which is why catalysts are unnecessary.

THE ANALYSER.

A hot oven: Where temperature makes the difference.

Warm, warmer, hot.

Tracking pollution at 1,200°C.

The catalyst-free ceramic oven is the centre piece of the QuickTOC_{purity}. At 1,200°C, it reliably dissolves all carbon bonds and thus enables a complete analysis of samples. Despite the high temperatures used, absolute safety is guaranteed in all settings. For this end, the QuickTOC_{purity} can be delivered with a number of different housings, depending on the intended location. That way the analyser itself can be safely at high corrosive places as well as in potentially explosive areas.

The determination is in accordance with DIN EN 1484:1997-08, ISO 8245:1999-03 and EPA 415.1.

The building blocks principle for a tailor made measurement instrument.

The modular system offers high flexibility. When your application demands it, you can measure up

to six different sample streams with one machine for example. Each sample stream is individually lead into the analyser in order to avoid cross contamination and carry-over effects. Furthermore, you may build in additional detectors to determine further parameters such as the TN_b.

The QuickTOC_{purity}.

Ultra quick measurements and maintenance.

The TRUE TOC measurement takes place in less than 3 minutes. The TC is measured even in one minute.

The TC is particularly advantageous if a high proportion of TIC is present. This speed guarantees that very short peaks can be determined very well during a daily cycle. The maintenance service is also fast: Less than half an hour per month. The analyser's availability is over 98%.

Calibration and validation.

Ready at any time.

With the patented calibration and validation technique QuickCalibration LAR offers the opportunity to check the analyser automatically and remotely at any time.

Another benefit: No need of liquid standards, that must be produced or purchased expensively. In combination with the 1,200 °C oxidation LAR uses a defined gas. Such a test gas is stable for a long time and cost efficient. Thus, you can find out easily whether your analyser works correctly.

Who is allowed to do what?

It's up to you to decide.

Through separately programmable user-access levels, you can assign access rights to individual operators. With a 10.4 inch touchscreen, the QuickTOC_{purity} is easy to operate.

Another option would be to control the analyser via remote control using a PC, which is connected to your network.

With the QuickTOC_{purity} the analytical area is isolated from the electronics.

All areas are easily accessible.



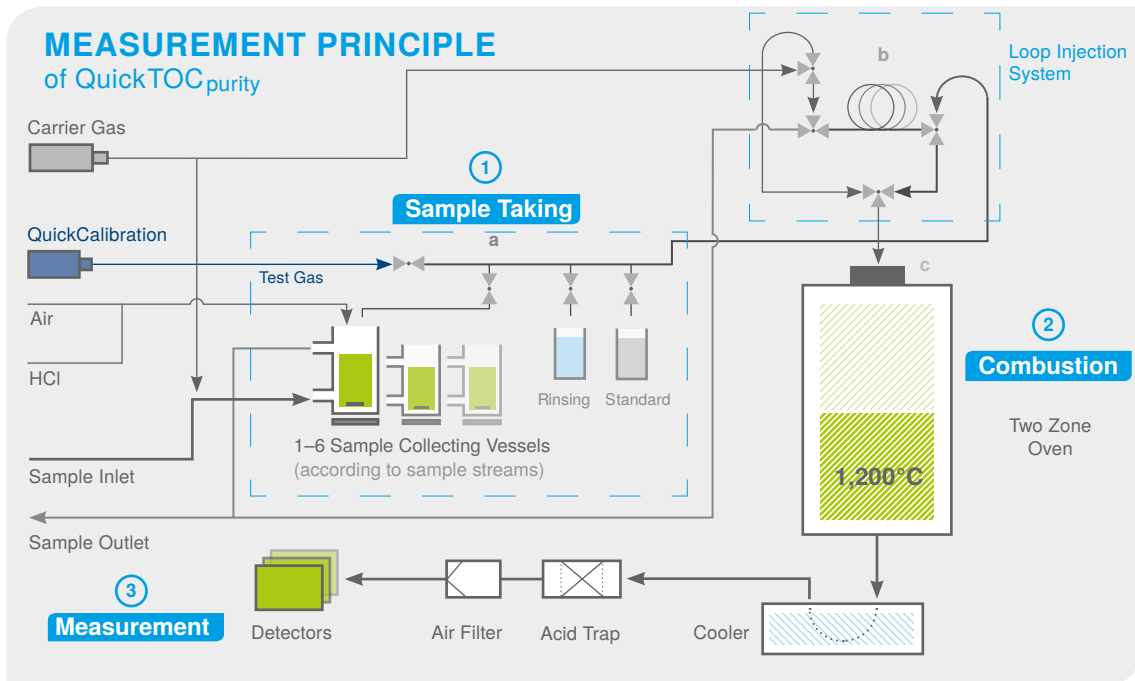


Fig.2

- 1) Sample transportation via injection loop
 - a) Extraction of sample from sample stream
 - b) Definition of sample volume
 - c) Injection through lock valve
- 2) Combustion, oxidation to CO₂
- 3) Measurement of CO₂ concentration

THE PRINCIPLE.

Precise, even in the purest water.

The loop injection.

For clean sample dosing.

The loop injection of the QuickTOC_{purity} is a closed system and hence, protected against environmental influences and other impurities. Small, defined sample volumes are injected to the carrier gas stream, that continuously flows through the high temperature oven.

Depending on the expected TOC or TC load of the respective application, various injection volumes between 100 and 400 µl are available. At a very low concentration the multi loop injection can be used, in which a defined sample volume is injected multiple times into the oven. Thus, the load is determined accurately even in the lowest µg-ranges (ppb).

Inside of the ceramic oven: We like it hot.

And it is that hot, that - without catalysts - the sample's content of organic and inorganic carbon is completely converted into CO₂. It is oxidised by use of a carrier gas that is supplied by filtered

pressurized air. Optionally, the QuickTOC_{purity} can prepare the gas itself requiring no extra external gas supply at all. With LAR's oxidation method lowest measurement ranges of TOC, TC and TN_b are reliably detected.

Difference or direct.

The measurement task defines the method.

Generally, in low TOC ranges the direct method is the preferred analyses method. Here, the sample is transferred to a sample vessel, in which an acid is added as required. As a result, the demand for acid of the QuickTOC_{purity} has been minimized. The sample mixture is stripped with air, and the inorganics are removed from the sample. Finally, the stripped sample is fed into the oven through the injection loop and the organic content of the sample is oxidized and detected.

If volatile organic carbons (VOC) have to be considered, then the TOC difference method can be used - even in low concentrations. The decisive advantage of the QuickTOC_{purity}: Due to the closed loop system the VOC and POC (purgeable organic carbon) will be determined reliably.

The CO₂ detection. Reliable and simple.

First the gas that is produced by the combustion condenses in the cooler. The remaining combustion gas is purified by a filter before its CO₂ concentration is determined by the NDIR-detector.

QuickCalibration.

No expensive standards anymore.

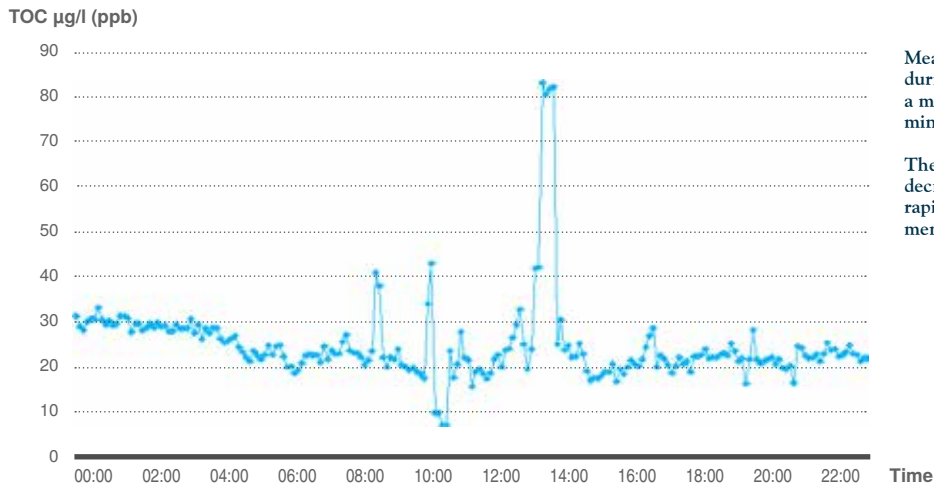
Common calibration and validation methods requires liquid standards whose concentration ranges are lower than those of conventional drinking water. Therefore, they are only short-term durable

and can be produced or purchased only with great effort.

Alternatively to the use of liquid standards, the innovative calibration and validation method is standard feature of the QuickTOC_{purity}. A contamination of the sample within the loop system is technically impossible.

The internationally patented QuickCalibration provides a fully automatic and ready at any time validation of the system using a defined gas (for example Methane). Such a test gas is stable for a long time and is ideal for automated use.

Fig. 3



Measurement peaks during a daily cycle with a measurement cycle of 3 minutes.

The rapid increases and decreases of loads are rapidly detected - without memory effects.

ALL cLEAR?

LAR Process Analysers AG: Water is our Element.
We do everything for its protection.

We are the leading provider for water analysis instruments for industrial and communal waste water technology, process monitoring, as well as for pure water analysis. Further products in the areas of industrial process and environmental technology complete our product range.

LAR offers application specific analysers developed by our research and development team. Maintenance is carried out globally by our own technicians or by our local qualified service partners. Technical support per telephone or e-mail is available at all times.

TOC-ANALYSIS

From complex industry waste water to pharmaceutical pure water, our TOC analysers determine parameters quickly and precisely.

COD-ANALYSIS

With our analysers the chemical oxygen demand is cleanly and safely determined online, without using chemicals.

BOD/TOXICITY

We detect the BOD with the plant's own biomass and determine the toxicity with highly sensitive bacteria. Fast and reliably.

TN_b/TP-ANALYSIS

TN_b and TP are important parameters for waste water treatment. We are the only ones who offer them in combination with TOC and COD in one system.

FURTHER PRODUCTS

LAR offers a specific solution for nearly all applications. With our protective housings, you are always on the safer side. Find out more: www.lar.com

QuickTOC_{purity} AN OVERVIEW

Online TOC for pure water – especially for boiler feed water.

QuickTOC_{purity} continually checks the TOC content of pure water with lowest concentrations. Even the smallest impurities are detected. At 1,200 °C, samples are completely oxidized and within 3 minutes the TRUE TOC is determined.

TECHNICAL DATA

Measurement Technique

| | |
|-------------------------|---|
| Measurement Method | Thermal oxidation |
| Measurement Ranges | 0.1–20 mg/l (ppm); 1-2,000 µg/l (ppb) further options on request |
| Parameter | TOC, combinable with TN _b , COD |
| Response Time TC | 1 minute |
| Calibration Type | Multi point calibration |
| Calibration/ Validation | QuickCalibration |

Dimensions and Weight

| | |
|------------|--|
| Housing | Steel IP 54, powder coated |
| Options | Stainless steel, IP 65, EXp Zone 1 and 2 for T3 and T4 classes (ATEX, IECex) |
| Dimensions | W 600/812 x H 1,062 x D 585 mm |
| Weight | from 120 kg (Standard) |

Electric and Hydraulic Specifications

| | |
|--------------------|------------------------------------|
| Inflow and Outflow | Tube 4,8mm ID |
| Power Supply | 230/115 V~, 50/60 Hz |
| Analogue Output | 0/4–20 mA |
| Serial Interface | RS 232 |
| Safety | 10 A intern, 16 A extern |
| Option | Remote control via TCP/IP protocol |

Equipment Devices and Data Output

TFT Touchscreen-Graphic-Display, 10,4", high resolution, back lit

Autostart function

Self explanatory software

Standard data interfaces to office PC (USB)



Fast, precise and safe –
the QuickTOC_{purity}
is reliable even in
hazardous areas!



ADVANTAGES & FEATURES

- ✓ exact determination of TC, TOC (TRUE TOC), TIC, TN_b
- ✓ highest combustion temperature available (1,200°C)
- ✓ catalyst-free
- ✓ calibration and validation at any time
- ✓ fast response time of 1 minute (TC)
- ✓ multi-stream measurement (optional)
- ✓ certified housings for EX zones (EX p) (options for ATEX, IEC, etc.)
- ✓ analyser availability minim. 98%
- ✓ maintenance and service max. 30 minutes/ month
- ✓ exceptionally low maintenance and operational costs

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TÜV certified company

TOC-ANALYSIS

QuickTOC_{purity}

AREAS OF APPLICATION

ENVIRONMENT / MUNICIPAL FACILITIES / INDUSTRY

INDUSTRIES

ENVIRONMENTAL MONITORING / WASTE WATER TREATMENT /
WASTE PROCESSING / PHARMACEUTICAL / **LABORATORY** / **PETRO-
CHEMICAL** / **REFINERIES** / **CHEMICAL** / COAL AND STEEL / **POWER** /
AIRPORTS / AUTOMOBILE / PAPER MANUFACTURE / BREWERIES /
FOOD MANUFACTURE / DRINK MANUFACTURE / MILK PROCESSING /
SEMICONDUCTOR MANUFACTURE

TYPES OF WATER

GROUNDWATER / SURFACE WATER / DRINKING WATER /
WATER INFLUENT / WATER EFFLUENT / DISCHARGE CONTROL /
INDUSTRIAL WASTE WATER / DE-ICING WATER / **PROCESS
WATER** / HIGH SALT CONCENTRATION / OIL-IN-WATER / **COOLING
WATER** / **PURE WATER** / **BOILER FEED WATER** / **CONDENSATE
RETURN** / PHARMA HPW / PHARMA WFI / SEMICONDUCTOR UPW