



## QuickTOC<sub>condensate</sub>

TOC-ANALYSIS

Online TOC for steam and condensate circuits.  
Analysing hot samples accurately.

Precise. Fast. Reliable.



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# THE MEASUREMENT SYSTEM FOR HOT WATER.

Organic loads in hot water like condensate return may - under pressure - convert to carbonic acid or other acidic substances, which in turn may cause corrosion and deposits. Hence, the TOC should be as low as possible.

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— An analyser shelter with three heat exchangers. Mainly, the TOC is monitored directly downstream to the heat exchangers in order to detect promptly any product spills or leakages.

**Acidic substances such as carbonic acid cause corrosion and sedimentation within boiler systems. Additionally, foaming and layers have to be avoided or kept as small as possible as they will disturb the efficient operation of the boiler. The continuous monitoring of any organic impurities is essential for the economic and safe operation. At high boiler pressure the TOC content may be between 10 to 500 ppb.**

— **Letting off steam may be expensive. It is pure energy.**

In power plants and related industries water-steam cycles are used to generate electricity. The water or steam that is used for that, is very hot and, therefore, additionally can be reused for other processes. Using this thermal energy further is an enormous advantage as it saves the costs for the warming up process. Hence, the medium pressure steam as well as the low pressure steam flows through many heat exchangers where all

kinds of liquids such as oils and chemicals are heated up. In the case of contamination caused by leakage or product spills, organic substances will enter the system. The polluted condensate has to be drained off and the backfeed of costly treated make-up water into the circuit will be necessary. If the contamination is too serious, the plant will be shut down.

In the event of any contamination the operators need to act fast. By using quick online analysers that deliver accurate and reliable measurement results, expensive hot water and steam losses will be minimized.

— **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

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

measures a samples organic loads and is thus an important indicator for water quality.

#### 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, → 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.

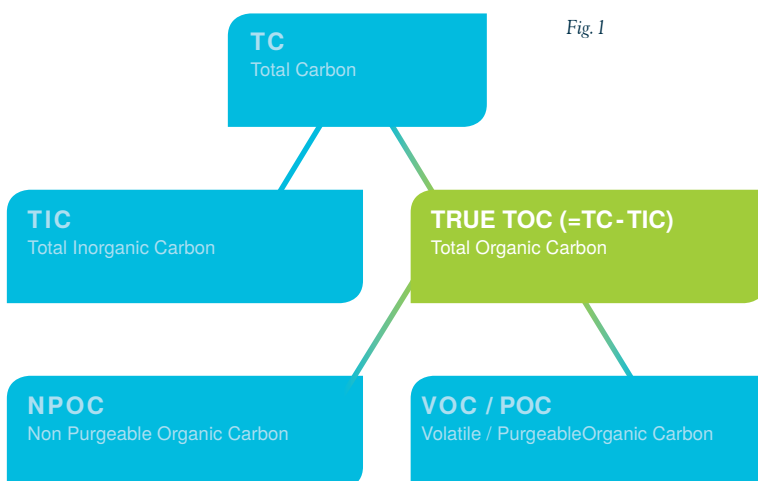
#### Catalysts.

##### For our analysers simply not necessary.

Because of their high temperatures our analysers do not need any catalysts. These 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, necessitates continual new calibration and eventually requires that the catalysts are replaced. We want to save you the trouble: With the QuickTOC<sub>condensate</sub>.

#### What is the TRUE TOC derived from?

##### And what is it composed of?



#### AT A GLANCE

- Organic contamination may cause corrosion, deposits, and coatings in water-steam circuits.
- Steam is an effective heat energy carrier that is reused in many industrial processes.
- A TOC analyser has to determine smallest impurities fast and reliably.
- Samples should be analysed with temperatures up to 90°C without any cooling processes.
- Losses of heat and energy should be reduced considerably.



# 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<sub>condensate</sub>. 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<sub>condensate</sub> 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<sub>b</sub>.

## The QuickTOC<sub>condensate</sub>.

### 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<sub>condensate</sub> 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<sub>condensate</sub> the analytical area is isolated from the electronics.

All areas are easily accessible.

The analyser may be delivered in a special EXp housing.



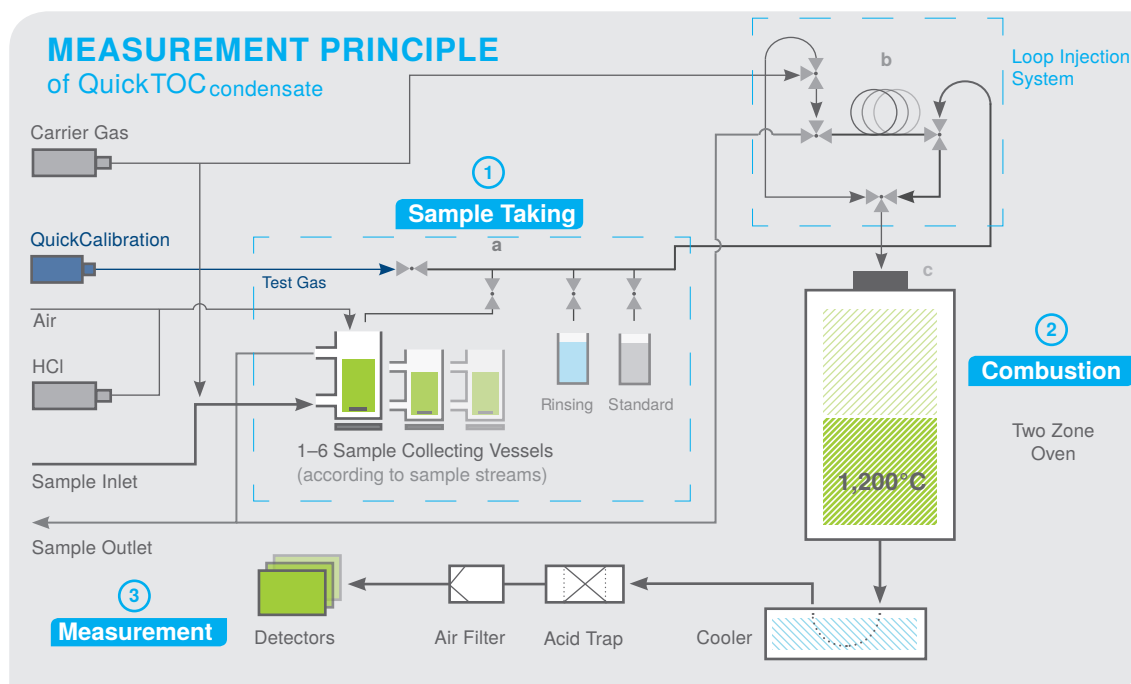


Fig. 2

- 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 CO<sub>2</sub>
- 3) Measurement of CO<sub>2</sub> concentration

## THE PRINCIPLE.

The measurement is precise-even in the purest water.

### The loop injection.

#### For clean sample dosing.

The loop injection of the QuickTOC<sub>condensate</sub> 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. 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 CO<sub>2</sub>. It is oxidised by use of a carrier gas that is supplied by filtered pres-

surized air. Optionally, the QuickTOC<sub>condensate</sub> 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<sub>b</sub> 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<sub>condensate</sub> 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<sub>condensate</sub>: Due to the closed loop system the VOC and POC (purgeable organic carbon) will be determined reliably.

**The CO<sub>2</sub> 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 CO<sub>2</sub> concentration is determined by the NDIR-detector.

**QuickCalibration.****No expensive standards anymore.**

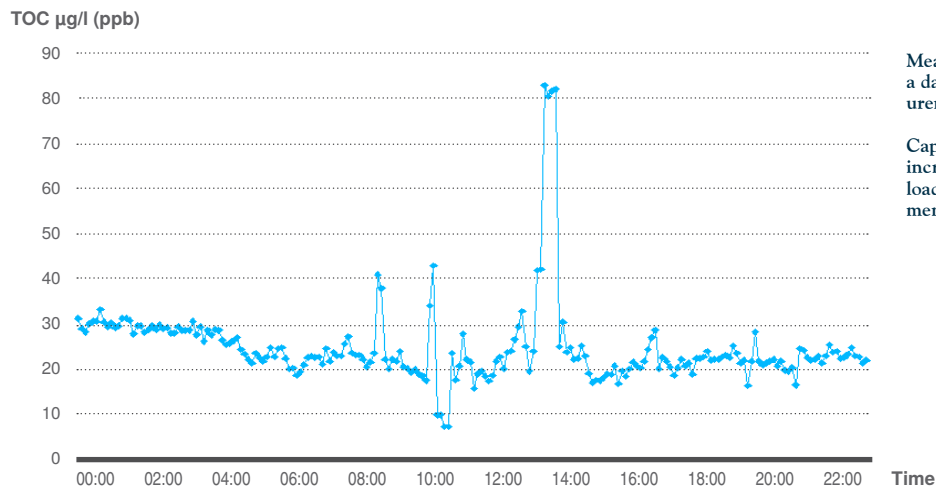
Common calibration and validation methods requires liquid standards whose concentration ranges are lower than those of conventional drinking water. Therefore, they are only short-term durable

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<sub>condensate</sub>. 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.

Capturing the rapid increases and decreases of load accurately and 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<sub>b</sub>/TP-ANALYSIS**

TN<sub>b</sub> 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](http://www.lar.com)

# QuickTOC<sub>condensate</sub> AN OVERVIEW

## Online TOC for pure water – especially for hot water circuits.

QuickTOC<sub>condensate</sub> continually checks the TOC content of pure water with lowest concentrations, whereby the sample temperature may be up to 90°C. At 1,200 °C, samples are completely oxidised and within only a few minutes the TRUE TOC is determined.

## TECHNICAL DATA

### Measurement Technique and Sample Preparation

Measurement Method	Thermal oxidation
Measurement Ranges	0.1–20 mg/l (ppm); 1–2,000 µg/l (ppb) further options available
Parameter	Combinable with TN <sub>b</sub> , 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 586 mm
Weight	115 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 external
Remote Control	option: via TCP/IP protocol (Internet)

### 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<sub>condensate</sub>  
is reliable even in  
hazardous areas!



## ADVANTAGES & FEATURES

- ✓ exact determination of TC, TOC (TRUE TOC), TIC, TN<sub>b</sub>
- ✓ highest combustion temperature available (1,200°C)
- ✓ catalyst-free
- ✓ calibration and validation at any time
- ✓ samples with up to 90°C possible
- ✓ 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 min/ month
- ✓ exceptionally low maintenance and operational costs

## LAR Process Analysers AG

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TÜV certified company

## TOC-ANALYSIS

# QuickTOC<sub>condensate</sub>

### 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

### 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