



QuickTOC_{NPO}

TN_b/TP-ANALYSIS

TOC, TN_b, TP and COD – combined in one analyser.
Cost efficient monitoring of WWTP's effluent.

Fast. Precise. Reliable.



FOUR PARAMETERS. ONE ANALYSER.

The sum parameters TOC, COD, TN_b and TP are the most important ones within the field of waste water. Their combination in one analyser is worth it.



— An over-fertilization (eutrophication) of water with nitrogen and phosphorus leads to an ecological imbalance that causes harmful vegetation: The QuickTOC_{NPO} is optimally suitable for the monitoring of waste water effluent in order to avoid the discharge of contaminated water into rivers and lakes.

The effluent control of industrial and municipal waste water treatment plants is of special importance – either in ecological and economic point of view. By continuous measurements the treatment performance may be monitored. The effluent finally is discharged into river water and/ or lakes which can be better protected.

— **TOC, TN_b, TP and COD. Monitoring of regulated waste water parameters.**

The monitoring of the effluent of waste water treatment plants (WWTP) is regulated by local authorities. The effluent levels of TOC, TN_b, TP and COD into public waters vary depending on the country and/ or municipality. Each may have an own defined waste water regulation. However, the aim of such legal frameworks for water management is to protect water as a meaningful part of ecosystems, as natural basis of life for human kind as well as for flora and fauna.

Generally, four different analysers are needed in order to monitor the four sum parameters. With the help of combined measurement systems, a more cost efficient monitoring can be established.

— **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.

The TOC content is best detected by using the thermal combustion at 1,200°C. It ensures that all organic carbon bonds are oxidised, producing CO₂ which can then be detected, quantitatively measured and calculated – and reported as TOC.

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

What TN_b means and how it is measured.

The TN_b (total nitrogen bound) shows the pollution of water caused by nitrogen compounds. Nitrogen may be present as ammonia, ammonium salts, nitrites, nitrates and organic nitrogen compounds. In contrast to single measurements of the above-mentioned components, the TN_b determination contains all these substances in a single analysis process.

The accumulation of nitrogen compounds in water leads to an unwanted increase of nutrients (eutrophication). Such an exceeding leads to a harmful plant growth. Certain plants such as algae for instance spread rampantly and disturb the ecological balance massively. Hence, the TN_b is an important parameter for the assessment of waste water.

The most common method for the determination of TN_b is the combustion of nitrogen oxides. Subsequently, by use of an electrochemical cell (EC cell) or a chemiluminescence detector (CLD) the TN_b content will be detected.

What TP means and how it is measured.

The TP (total phosphorus) is a sum parameter that measures the organic and inorganic phosphorus compounds in water. Phosphorus is an essential nutrient for humans as well as flora and fauna. However, the substance – depending on its concentration – may cause serious damage. Generally, phosphorus is a naturally limited substance. Its sources are for instance soil and stones, waste water, animal waste and decay of organic substances.

Increased phosphorus concentration affect the quality of water and lead to algal blooms, an increased growth of plants and a decreased con-

centration of dissolved oxygen due to the additional vegetation. Hence, the TP is an important parameter when it comes to direct discharge of waste water into public water bodies.

The TP content is determined by orthophosphate (PO₄³⁻). During the wet chemical oxidation there is a reducing agent added to the sample. Subsequently, the sample mixture is led through an UV reactor. The ultra violet light oxidises dissolved and bound phosphorus compounds to phosphate (PO₄³⁻). On leaving the reactor the TP content is quantitatively determined by use of molybdenum blue.

What COD means and how it is measured.

The COD (chemical oxygen demand) stands for the amount of oxygen that is needed for the oxidation of all organic and inorganic ingredients contained in the water sample. It is also considered when it comes to planning and controlling of waste water treatment plants as is shows the treatment efficiency of a WWTP. Furthermore, it is basis for the calculation of discharge fees. Hence, it is an important parameter.

The COD is determined by use of the oxidizability of the organic carbons.

AT A GLANCE

- The parameters TOC, TN_b, TP and COD are important for discharge control.
- The combination of these parameters minimizes costs of investment, maintenance and service.
- At 1,200°C no catalyst is necessary.
- Complete combustion of organic and inorganic nitrogen compounds.
- LAR is the only supplier offering an analyser that combines TN_b and TP with TOC and COD in one unit.

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_{NPO}. At 1,200°C, it reliably dissolves all organic 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_{NPO} 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 Ex-Zones.

Due to the fact that the thermal oxidation is complete as well as the close relation between TOC and COD it is very easy to correlate both parameters. In addition, all parameters are determined in accordance to international standards.

With QuickTOC_{NPO} the electronic compartment is separated from the analytical compartment.

The separated compartments are easily accessible.



TP: Automated thermal wet-chemical molybdenum blue method.

With LAR's automated molybdenum blue method the sample is first mixed with an oxidizing agent and then cooked under UV-light at 120°C. This combined thermal and wet-chemical procedure oxidises phosphorous bonds reliably to orthophosphate (PO_4^{3-}). On leaving the reactor, the sample mixture is added a reducing agent, which effects the blue color of the orthophosphates. The intensity of the blue color is detected photometrically and corresponds to the TP content of the sample.

Tailor-made measurement instruments.

The modular system offers highest flexibility. When your application demands it, you can measure the parameters in combination or for example TP_{only}. Furthermore, you can decide whether to build in additional detectors to determine the TN_b and COD parameters alongside measuring the TOC.

Fast measurements. Easy maintenance.

The TN_b measurement takes place in less than 3 minutes - as prompt at the TOC value. Thereby, even short measurement value peaks can also be reliably shown. The maintenance service is also fast: Less than half an hour per week. The analyser's availability is over 98%. Moreover, all areas of the analyser have been designed for easy maintenance: From the generously measured and blockage-free tubes to the catalyst-free high temperature oven.

Sample taking. Matrix-matched.

Depending on the composition of the sample the sample taking may differ. Under normal circumstances the outlet/ effluent of a sewage plant is free of particles – or at least there are only a few. In this case a centrifugal separator or overflow vessel is sufficient for the sample extraction.

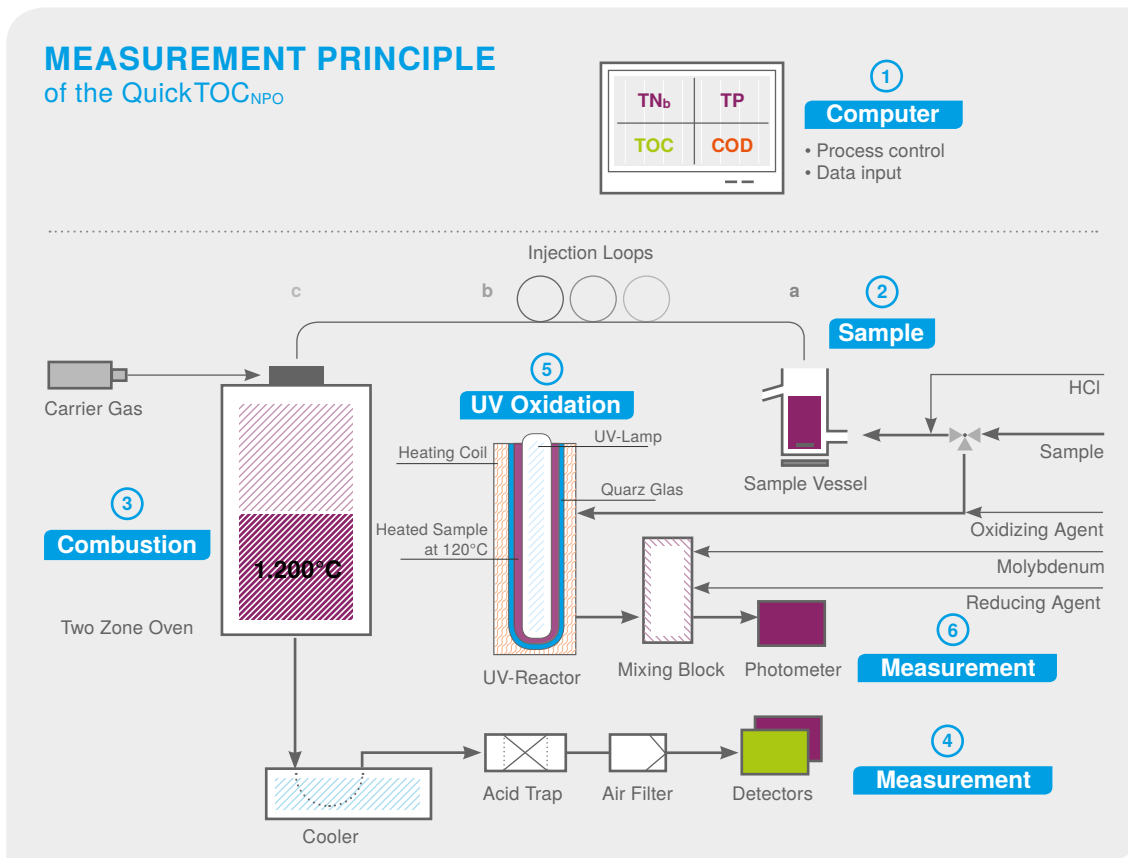


Fig.2

- 1) Process Control, display of measurement results, interfaces to the periphery.
- 2) Sample transportation via injection loop
 - a) Extraction of sample from sample stream
 - b) Definition of sample volume
 - c) Injection through lock valve
- 3) Combustion, oxidation to CO₂ and NO
- 4) Measurement of CO₂ and NO concentration
- 5) UV-Oxidation to PO₄³⁻
- 6) Measurement of TP concentration

THE PRINCIPLE.

The innovative complete solution for effluent monitoring at WWTPs.

The closed injection system.

Exact sample dosing.

Within the analyser at first the sample is kept homogenised in the sample vessel. Then an exactly dosed sample volume is being sucked through a closed tubing system and injected into the reactor passing the special lock valve.

Inert materials and a pump that is installed downstream make sure that no memory effects of previous measurements occur. Additionally, the special lock valve ensures that the oven is 100% closed against ambient air so that no contamination can happen.

Inside of the ceramic oven: We like it hot.

And it is that hot, that - without catalysts - the sample's content of Nitrogen and Carbon is completely converted into NO and CO₂. It is oxidised by use of a carrier gas that is supplied by filtered pressurized air. Optionally, the QuickTOC_{NPO} can prepare the gas itself requiring no extra external gas supply at all. Through the high temperature, the salts present can easily be discharged. They move through the oven in fluid form and are carried out of the oven by the condensate. Finally, they are deposited in a retaining device, from which they can easily and quickly be removed. That way, no salt deposits can accumulate in the oven.

The NO detection. It is your choice.

First the gas that is produced by the combustion condenses in the cooler. The remaining combustion gas is purified by a filter before its NO concentration is determined by an electrochemical cell (ECD) or, alternatively, a chemiluminescence detector (CLD).

The CO₂ detection. Reliable and simple.

Following the TN_b determination the gas mixture is transported using the carrier gas to a CO₂ detector which quantifies the carbon dioxide and detects the TOC content.

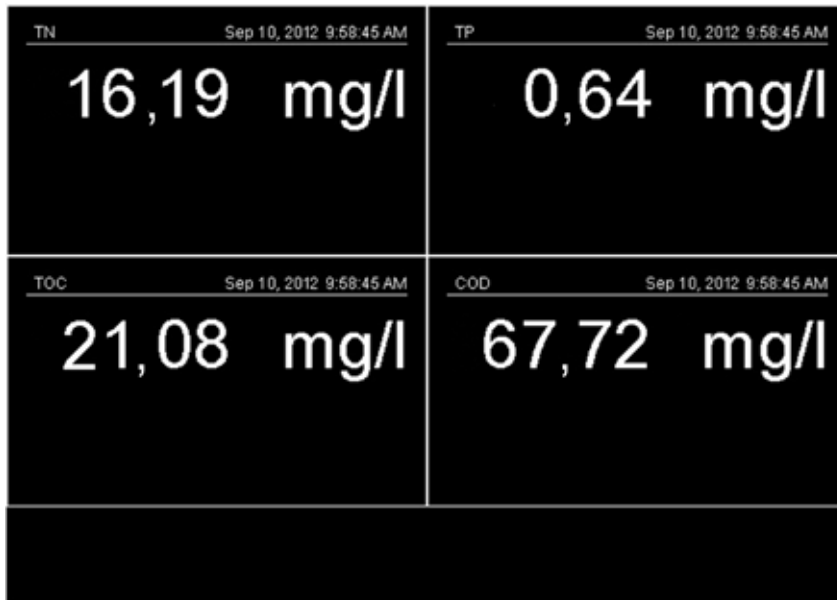
The molybdenum blue method. Combined thermal and wet-chemical analysis.

In order to measure the total phosphorus the sample is mixed with the oxidising agent persulfate. Subsequently, the sample mixture is led into

the heated UV reactor, where the sample together with the persulfate is oxidised at 120°C to orthophosphate (PO₄³⁻). The produced PO₄³⁻ reacts with ammonium molybdate to a molybdenum phosphoric acid which forms molybdenum blue with added reducing agents. This molybdenum blue is measured by a photometer and displayed as TP.

The molybdenum blue method is more accurate than other methods and allows the detection of low TP concentrations.

Fig. 3



The figure gives an example of the QuickTOC_{NPO}'s display showing all four parameters while monitoring the effluent stream of a waste water treatment plant.

You can individually decide how the parameter values should be displayed.

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_{NPO} AN OVERVIEW

The online monitoring of TOC, TN_b, TP and COD - in one analyser.

The QuickTOC_{NPO} monitors continually the effluent streams of waste water treatment plants in order to determine the most important parameters fast. The sum parameters may be selected and adjusted in accordance to the requirements of the application.

TECHNICAL DATA

Measurement Technique and Sample Preparation

Measurement Ranges TP: 0.01 – 3 mg/l, max. 30 mg/l
 TN_b: 0.1 – 50 mg/l
 TOC: 0.1 – 50 mg/l
 COD: 1 – 150 mg/l

Response Time TOC/ COD: 2 – 3 minutes
 TN_b: 1 – 3 minutes
 TP: 10 – 15 minutes

Sample Preparation Centrifugal separator

Dimensions and Weight

Housing Steel IP 54, powdercoated
 Options Stainless steel, IP 65 (further on request)
 Dimensions W 600 x H 1,062 x D 585 mm
 Weight 115 kg (Standard)

Electric and Hydraulic Specifications

Inflow and Outflow Tube 3.2 mm ID,
 Tube 12 mm 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
 Remote Control option: via TCP/IP protocol (Internet)

Equipment Devices and Data Output

LC-Display, 230 x 100 mm (W x H), back lit
 Autostart function
 Self explanatory software
 Standard data interfaces to office PC (USB)



Fast and precise –
 the QuickTOC_{NPO}
 is reliable!

ADVANTAGES & FEATURES

- ✓ exact determination of four parameters: TOC, TN_b, TP and COD
- ✓ selectable parameter combination
- ✓ highest combustion temperature available (1,200°C)
- ✓ detection of TN_b by cost effective ECD (CLD optional)
- ✓ molybdenum blue method for the determination of TP
- ✓ no filtration of sample necessary
- ✓ analyser availability minim. 98%
- ✓ maintenance and service max. 30 min per week
- ✓ exceptionally low maintenance and operational costs

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TÜV certified company

TN_b/ TP/ TOC/ COD-ANALYSIS

QuickTOC_{NPO}

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 /
OIL-IN-WATER / HIGH SALT CONCENTRATION / COOLING WATER /
PURE WATER / BOILER FEED WATER / CONDENSATE RETURN /
PHARMA HPW / PHARMA WFI / SEMICONDUCTOR UPW**