LFE TOC-810
On-line TOC Analyzer

Continuous TOC analysis with High-temperature oxidation method

Key Features
- ⇨ Continuous real time analysis
- ⇨ Continuous fast sample conditioning
- ⇨ Quick response to changes in TOC level
- ⇨ High-temperature oxidation
- ⇨ Extraordinarily stable measuring characteristics
- ⇨ Reliable system calibration
- ⇨ Highest operational reliability
- ⇨ Intelligent self-monitoring
- ⇨ Designed from the ground up for process analysis

Typical Applications
- ⇨ Pure water monitoring (e.g. boiler feed water, condensate)
- ⇨ Production facility monitoring
- ⇨ Drinking water monitoring
- ⇨ Mixed drainage water monitoring
- ⇨ Influent and effluent wastewater treatment monitoring
- ⇨ Airport de-icing water treatment monitoring

Description

The TOC-810 represents the newest generation of LFE's on-line TOC analyzers. These have proven themselves with considerable success in use at many chemical plants as well as other important industrial companies since the beginning of the '80s.

The LFE TOC-810 has evolved out of real-world applications as an on-line analyzer for the continuous TOC registration of highly as well as low contaminated water. The demands placed on every component of such an on-line TOC analyzer require special design solutions.

Options

- ⇨ **Acidifier/ Sparger/ Multiplexer-unit** (ASM-unit; wall mounted)
  The basic TOC-810 instrument functions as a TC analyzer. The ASM-unit facilitates the removal of inorganically bound carbon (TIC).
  This unit can be equipped with further options:
  - Automatic calibration for 3 test solutions
  - Multiplex capability (3 sample streams)
  - Sample dilution stage
- ⇨ **Simultaneous, selective VOC or TIC analysis**
  in conjunction with 2nd NDIR measuring channel and the Acidifier/ Sparger/ Multiplexer-unit
- ⇨ **Analog expansion module**
  expands the system from 2 up to 6 configurable 0(4)-20mA analog outputs
- ⇨ **Digital expansion module**
  8 digital inputs plus expansion of system from 3 up to 10 digital outputs
- ⇨ **RS-232 serial interface**
- ⇨ **Built-in paperless recorder**

Features

Continuous analysis with nearly 100% carbon conversion

- ⇨ High temperature oxidation for the complete conversion of all organic carbon compounds
- ⇨ Continuous analysis with short sample injection cycles (typ. < 10 sec)
- ⇨ Continuous sample conditioning for improved real time analysis

Analytical precision

- ⇨ Highly selective CO_2 analysis without water vapor interference
- ⇨ Instrument specific linearization
- ⇨ Reliable full system calibration with calibration solutions

Special detail solutions for highest operational reliability

All components meet the highest requirements for long term operational reliability.

- ⇨ 100% process design - NOT a modified laboratory instrument
- ⇨ Purgable cabinet section for NDIR photometer and main electronics as well as encapsulation of peripheral electronics
- ⇨ Spatial separation of water bearing components
- ⇨ Consistent use corrosion resistant materials

Comprehensive intelligent self-monitoring

- ⇨ Distinction between operational and maintenance-related impairments
- ⇨ Output of alarm conditions via analog and digital outputs as well as a plain text description on the LC display

Outstanding reactor service-life

- ⇨ The dimensioning of the analytical parameters allows maximum possible reactor service life in combination with the fastest possible response time.
- ⇨ "Quick reactor change" design for high operational availability

Simple operation

- ⇨ All relevant instrument functions shown in plain text on the LC display
- ⇨ Intuitive user interface
- ⇨ Optimized instrument design for ease of maintenance

Extraordinarily stable measuring characteristics

LFE develops and manufactures key components in order to attain exceptionally stable measuring characteristics.

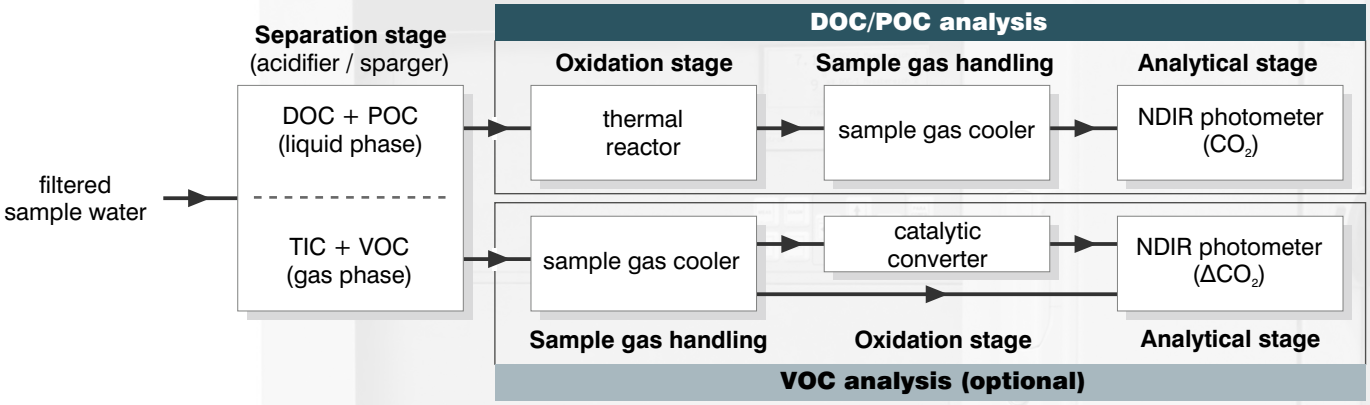
- ⇨ Low maintenance, high precision metering pump
- ⇨ Especially high quality NDIR photometer system with a corrosion resistant analysis cell specially developed by LFE
- ⇨ Self-adapting gain control for long term span stability

Signal & status outputs

- ⇨ Optional digital chart recorder with data storage function
- ⇨ Up to 6 analog outputs (0(4)-20mA) for measured values as well as peripheral system values
- ⇨ Up to 8 digital inputs and 10 digital outputs
- ⇨ RS-232 interface

All inputs and outputs are individually configurable.

Functional Scheme



Unique VOC Analysis Package (Optional)

Background

Aside from the intentional removal of inorganically bound carbon (TIC) the sparger air can also inadvertently expel volatile organic carbon (VOC) compounds which escape detection.

The TOC-810 can be fitted with an optional package in conjunction with a 2nd photometer channel which **simultaneously and continuously** measures the VOC level independent of the TOC (or DOC) analysis.

Functional Principle

The potentially VOC-enriched sparger air is split into two parallel gas streams each containing the CO_2 background level representative of the TIC level of the water sample as well as possible VOC.

- ⇨ The 1st gas stream is passed unaltered through the reference cell of the differential CO_2 photometer channel.
- ⇨ The 2nd gas stream is passed through a catalytic converter stage in which any VOC is oxidized to CO_2 and added to the background CO_2 level. This stream is sent to the sample side of the differential CO_2 photometer.

The difference in IR radiation absorption in the photometer channel corresponds to the VOC concentration of the water sample.

The inherent response of a differential NDIR photometer to varying background levels is dynamically corrected for by the implementation of **LFE's patented gain stabilization** / **common mode rejection algorithm**.

First introduced by LFE in 1989, this unique method **totally eliminates** the need for a CO_2 scrubber. The resultant maintenance requirements for the VOC analysis are minimal.

Technical Data

General technical data

	TOC-Analyzer (main instrument cabinet)
Cabinet	2-section 19" cabinet on lockable rollers; active ventilation via filtered fans, electronics section purgeable
Dimensions	height: 169 cm width: 65 cm depth: 65 cm
Power	220/230VAC - 50/60Hz (other line voltages on request) continuous operation: 550 VA (Warm-up phase: 800 VA)
	Acidifier / Sparger / Multiplexer unit (option)
Construction	Components on polypropylene panel for wall mounting
Available options	acidifier/sparger stage, automatic calibration, stream multiplex, supplemental peristaltic bypass feed pumps
Dimensions (h x w)	Basic unit: 500 x 500mm Extended unit: 500 x 665mm (provides room for additional optional peristaltic pumps)

Analytical-/Operational data

Measured quantity	Basic instrument: TC with optional sparger-unit: TOC or DOC & VOC (as further option)	
	DOC measurement principle	**VOC measurement principle (option)**
Measurement principle	High temperature combustion (typically 950°C) of water sample with subsequent photometric CO_2 analysis in the dried reactor exhaust	Sparger air analyzed for volatile organic carbon components utilizing catalytic conversion with subsequent photometric CO_2 analysis in a dedicated channel. The differential operation of this channel alleviates the need for a CO_2-scrubber.
Ranges	lowest range : 0 - 5 mg C/l (lower ranges on request) highest range : 0 - 5000 mg C/l	lowest range : 0 - 10 mg VOC/l highest range : 0 - 300 mg VOC/l
Response time (τ_{90})	typically 5 min (continuous measurement)	typically 2 min (continuous measurement)
Precision	< ±1% of FSO (full scale output)	< ±1% of FSO (full scale output)
Accuracy	< ±1% of FSO	< ±2.5% of FSO
	Range specifications are given using standard instrument parameters; without optional sample dilution Other specifications are dependent on instrument configuration.	

Inputs and outputs

Read-out	LC-display (40 characters x 16 lines) and user interface based on NAMUR recommendation Language switchable between English and German
Instrument Status	Plain text description on the LC-display as well as categorization into one of the following states (NAMUR NE 107 compliant): FAILURE, FUNCTION CHECK & MAINTENANCE REQUIRED
Analog signal output	2 current outputs (standard; optionally expandable to a total of 6 outputs) 0(4) - 20 mA (R_{Load} = 600Ω max.; all outputs isolated and individually configurable) • 0-20 mA or 4-20mA • 4-20mA with superimposed instrument status (NAMUR NE43 compliant) • Test signal levels
Digital outputs (standard)	3 digital outputs for instrument status (NAMUR NE107 compliant) FAILURE, FUNCTION CHECK & MAINTENANCE REQUIRED (relay contacts 28V max.; 350mA max.)
Digital I/O (optional)	Digital inputs • 8 configurable inputs (6 – 24VDC; 10mA max.) • Sample stream selection, calibration solution selection, initiation and cancellation of AutoCal Digital outputs • 7 configurable outputs (relay contacts 28V max.; 350mA max.) • thresholds, feedback as to sample stream, calibration solution and AutoCal etc.

Note:

We reserve the right to make technical changes or modify the contents of this document without prior notice. With regard to purchase orders, the agreed particulars shall prevail.

LFE does not accept responsibility for potential errors or possible lack of information in this document.

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