



On-line low-level TC/TOC analyser Model Quick-TOC-condensate including gas validation feature

TC-analyser or TOC-analyser model Quick-TOC-condensate

The on-line Quick-TOC-condensate analyser, manufactured by LAR Process Analysers AG Berlin, is a robust industrial TC-analyser or TOC-analyser which is very suitable to measure the contamination of clean water such as: steam condensate, return condensate, make-up water, surplus water, boiler feed water, drinking water, demineralisation water etc. Model Quick-TOC-condensate operates with a closed sample loop injection system in combination with 1200 °C. thermal combustion and sensitive auto-zero NDIR CO₂-detection. The loop volume is exactly 400 micro litre. The TOC-analyser is capable of measuring in a wide range from ppb up to ppm TOC levels. At high ranges the loop content is injected only once. At low ranges the loop content is injected up to 10 times. At 1200 °C. all organic hydrocarbons are completely oxidised resulting in a rapid response and a recovery of 100%. This sophisticated design results in superior features such as: long term stability, repeatable analyses and no carry over & memory effects.

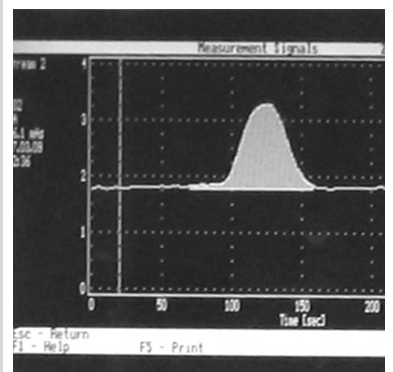
The analyser cabinet has two compartments, a "wet" compartment for the analytical analyser parts and a dry compartment for the electrical components, electronics and microprocessor. Accessibility to all analyser parts to maintain the analyser or exchange service parts is easy.

Main features of the Quick-TOC-condensate analyser are:

- Continuous sample flow:**
 The sample to the analyser inlet flows continuously. All wetted parts are constructed of inert material such as Teflon and glass. The design results in minimum absorption, adsorption and memory effects and a very fast response and cycle time 3 minutes.
- Loop injection technique:**
 The Quick-TOC-condensate uses a closed loop injection technique. A Teflon tube, the so called sample loop, is flushed and filled with a fresh sample. Then, simultaneously, four solenoid valves are activated. A fixed volume of sample is blocked into this loop. Then carrier gas will flush the loop content into the ceramic reactor where the sample is combusted at 1200 °C. The volume of the injection loop is precisely 400 micro litres. The injected volume is constant resulting in repeatable measuring results.
- Multiple Loop Injection System:**
 The multiple loop injection technique is used at low ranges e.g. 100 ppb to 1 ppm C. (milligrams/litre C.). In this case the loop content is filled and injected a few times fast after each other (3 seconds). The NDIR analyser measures the CO₂ concentration and the total peak area is calculated.
- No contamination by carbon dioxide from ambient air:**
 The complete carrier gas system, loop injection system and reactor is regulated at an overpressure of 0,4 bar. It prevents contamination by the high CO₂ content in the ambient air (350 to 400 ppm CO₂). This analyser will measure low TOC-values precisely, even when it is installed in an industrial area such as a boiler house.
- Thermal oxidation principle:**
 All injected hydrocarbons, even hard to oxidise complex organics, will be completely oxidised at 1200 °C. We guarantee a recovery of 100%, even for components that "survive in the environment of a high pressure boiler and can harm/attack/corrode the metals of the boiler and piping.
- Auto zero:**
 The injection of hydrocarbons in the hot zone reaction area (1200 degree C.) results in a CO₂-peak. A Non Dispersive Infra Red CO₂ gas analyser (NDIR) measures this CO₂-peak. The microprocessor of the Quick-TOC-loop calculates the peak area. Via this superior method, all drift effects are eliminated. We guarantee a zero drift of 0 ppm/year and 0 ppm/°C.. The NDIR CO₂-analyser operates via an alternating IR-source and has no moving parts.



Quick-TOC-condensate
Return Condensate TOC analyzer



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- Wet validation/calibration and grab sample input:**
 The Quick-TOC-condensate is supplied with an internal connection for a bottle containing a standard. Via the menu the operator can select the calibration routine or the validation routine. The same inlet can be used to analyse grab samples.
- Gas validation:**
 The Quick-TOC-condensate is specifically designed for boiler, steam and condensate applications. It is supplied with the unique gas validation input. Via a CO₂ or methane calibration gas the analyser can be checked very easy at any moment.
- Remote control:**
 The analyser is standard supplied with remote control inlet(s). One inlet can be used to switch the TOC-analyser from stand-by into the on-line mode. The other input can be used to switch on the gas validation routine.
- Software Menu:**
 The Quick-TOC-condensate is a modern analyser that is equipped with a microprocessor, battery backup, internal clock, data logger, memory buffers and a USB-port. (upload data settings). Via the menu of the HMI several screens can be selected such as: information screen, historical data, menu settings, parameters, alarms, diagnostic data, actual measuring data and parameters. The operation is done easily via a membrane keyboard. The information is presented on a large black/white back lighted LCD-display. Concentration readings are clearly and easy to read, even standing at distance. After a main power shut-off the analyser automatically starts up, waits till all necessary conditions are reached (flow and temperatures) and resumes the analysis.
- Diagnostics:**
 The Quick-TOC-condensate software, in combination with several types of sensors, precisely and accurately checks the correct operation of the analyser and its utilities. For example: The carrier gas inlet flow and out flow are measured via a mass flow sensor. By comparing these signals a leak or blockage in the carrier gas circuit is detected. Also the combustion furnace (1200 °C.) and the gas dryer/cooler (5 °C.) is monitored. A mass flow controller, mounted in the carrier gas outlet, controls a stable and precise carrier gas flow. A sample injection results in pressure pulses in the carrier gas circuit. Due to this effect the mass flow controller is instable for a few seconds. The microprocessor measures the MFC-signal. If no sample injection takes place this will be noticed. A humidity sensor (relative humidity) measures and checks the correct operation of the gas liquid circuit (cooler). Via the software the user can configure the alarm criteria, which types of levels and signals result in a hard alarm / activated contact or only in a message alarm.



Status Scr					
Day	Time	TC ng/l	TIC ng/l	TOC ng/l	TMB ng/l
Mo	13:22	0.39			
Mo	13:28	0.41			
Mo	13:34	0.35			
Mo	13:40	0.38			
Mo	13:46	0.44			
Mo	13:54	0.35			
Mo	14:00	0.35			
Mo	14:06	0.34			
Mo	14:12	0.38			
Mo	14:18	0.35			
Mo	14:24	0.33			
Mo	14:30	0.35			
Mo	14:36	0.39			
Mo	14:42	0.34			
Mo	14:50	0.33			
Mo	14:56	0.31			
Mo	15:02	0.31			

Total Carbon (TC):

Air, free of CO₂, is used as carrier gas. It flows through: the reactor (1200 °C), a gas/liquid separator (peltier cooler technique), a set of scrubbers and the NDIR CO₂ gas analyser.

The CO₂ base line is measured. The sample loop is flushed and fills with exactly 400 micro litre of fresh sample. Then four solenoids switch on and the sample is blocked into the loop.

Immediately the loop content is injected into the 1200 °C reactor where all organic carbons are completely oxidized to CO₂. The CO₂ gas peak is measured via the NDIR CO₂ gas analyser and the surface of the peak (mAs) is calculated.

The peak surface is linear proportional to the TOC-concentration in the sample.

Total Organic Carbon direct method (TOC-direct):

Actually the TOC-direct method is almost identical to the TC-technique (as described in the left column).

In addition the sample is first acidified to a pH < 2. The sample is mixed with a 1-% HCl acid solution. All inorganic carbon (carbonates / bi-carbonates) will react to CO₂ gas.

During a certain period the acidified sample is purged with carrier gas. In this way all inorganic carbon is removed from the sample.

Then the sample loop is filled and the content is injected into the reactor etc.

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OPTIONS

Analyser mounting rack:

Mounting rack for free standing of the Quick-analyser.
Black coated welded steel frame.

Cabinets options:

- **NEMA 4X:**
The cabinet of the Quick analyser is hermetically closed avoiding corrosive gasses and vapour to enter the analyser. The analyser is cooled via an integrated fan with air heat exchanger. Suitable for indoor use and an ambient air temperature between 0 and maximum 35 °C. To avoid build-up of acidified air or corrosive gases from the sample/acid inside the analyser we flush the analyser cabinet by use of clean and dry instrument air. To avoid corrosive gases and/or vapours to enter the analyser inside via the drain tubes, we advise to place the tube ends in a water lock which is connected to the drain header.
- **Ex p ATEX zone 2 or Ex p ATEX zone 1:**
The cabinet of the Quick analyser is hermetically sealed avoiding explosive gasses and vapour to enter the analyser. The analyser is cooled via an integrated Ex certified fan in combination with a heat exchanger. It is suitable for indoor use with an ambient air temperature of maximum 35 °C. An instrument air supply is required. The analyser Ex p control system starts flushing the analyser compartments. After a fixed period it stops flushing and keeps the cabinet at a certain slight overpressure.
We advise to place the drain tube outlets in a water lock connected to the drain header. ODS has supplied many complete TOC-systems for use in the ATEX zone 2 or ATEX Zone 1. An external Ex keyboard is part of the delivery.

Carrier gas preparation units:

Carrier gas can either be supplied via a gas make up unit or via a zero air generator.

- **Gas make up unit:**
Ambient air is compressed via a pump. The air is then flushed through an activated carbon scrubber and a soda lime scrubber. Hydrocarbons and carbon dioxide are removed. An automatic water trap, mounted in the outlet of the compressor pump, removed condensate. This system requires maintenance and 3-monthly refilling of the scrubbers.
- **Zero air generator (recommended):**
The zero air generator needs an instrument air supply of at least 4,5 bar(g). Automatically, free of maintenance, the CO₂ is removed by molecular sieve. An internal timer/valve set switches two columns from adsorption to flushing. This unit comes with an additional external column with an activated charcoal/soda lime filling. Traces of hydrocarbons (C_xH_y) and CO₂ are removed. Two-yearly maintenance is required. The power consumption of this zero air supply is only ~ 10 Watts.

Reagent cabinet:

Wall mount cabinet with glass window. To store an acid solution safely.
The reagent cabinet is recommended when ordering a Quick-TOC-condensate TOC-direct analyser.



Factory end-test of two each Quick NEMA 4X analysers



Quick TOC-condensate analyser in Ex p ATEX zone 1 enclosure



Zero air supply based on pressure swing absorption



Reagent cabinet with acid solution

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ODS APPLICATION SOLUTIONS

Multi stream TC/TOC-analyser:

The Quick-TOC-condensate can be delivered as a 2-stream to 8-stream analyser with a completely integrated stream selector. The Quick-TOC-condensate analyser uses inert wetted parts, loop injection with auto flush and thermal combustion. This results in extremely well multi channel performance. All wetted parts of the stream selector are made from inert materials such as PEEK, Teflon and Viton. Every next stream is pre-flushed with sample. The manifold and solenoids are selected and designed in such a way that the wetted surface is minimal and dead volumes are avoided. In this way memory effects and carry over effects are eliminated (*).

All TOC-outputs are available via 4-20 mA signals, isolated and active. The TOC-value is frozen until it is updated via a new TOC-measurement. This is achieved via "sample & hold technique". or skipped. A full colour HMI display shows the specific streams and the belonging TOC values.

**) Carry over is a phenomenon where the TOC-measurement of a specific stream is influenced by the previously analysed stream. A stream with a high TOC-level influences a stream with a low TOC-level (and visa versa). It is especially caused by the absorption and adsorption effects from "sticky hydrocarbons" on all wetted parts.*

Sample flow alarm:

It is common practice that the sample flow, from the process pipe to the analyser inlet, tends to fluctuate. This is the reason that it is not recommended to use standard flow alarms (such as rotameters). ODS designed a special overflow cup, equipped with an adjustable level alarm, that is not sensitive to flow fluctuations. It can be adjusted in such a way that it will generate a flow alarm after 1 to 5 analyser cycles.

Sample probe at sample take of point:

Sample probe with flange (lengths to be specified). Option: retractable with isolation valve.

Primary filter Panel:

Block valve, manometer, high pressure primary filter 50 microns, signs/labels with warnings (T&P). All components are suitable for safe high temperature and high pressure operation and maintenance. *Note: To be mounted close to sample take-off point.*

Sample conditioning panel:

ODS offers custom made sample conditioning systems (Ex if required). We supply systems based on:

- Water cooling; with tap water inlet and outlet
- Air cooling (reduced capacity)

Functions:

- Reduces pressure and temperature via pressure reducer and heat exchanger,
- Takes out particles via fine filters,
- Indicates temperature and pressure and flow,
- Controls pressure and temperature via high temperature shut-off valve and relief valve.

Note: To be mounted directly at right side of the Quick-TOC-condensate analyser

Spare parts kits:

ODS offers dedicated spare parts kits. Per analyser type (TC or TOC) the content is carefully selected. All parts are packed and labelled separately and packed in a box with compartments. All components are traceable via exploded views, drawings and photo's in the maintenance manual.

- Basic spare parts kit:
Consumables needed in the first year of operation including some extra main parts (just in case).
- Every year spare parts kit:
Consumables for the next year of operation.



ODS multi-stream TOC-analyser for return condensate



Multi-stream sample conditioning panel



Detail of a custom-made ODS sample conditioning component



Spare parts kit, ready for use



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Guidelines and regulations regarding TOC limits of industrial feed water

Several guidelines and regulations are describing the limits of components in return condensate and boiler feed water. Boilers and Co-generators operating at high pressures have significantly more restrictive water purity requirements than most host plants. Because return condensate may make up a large portion of the total boiler feed water, its purity must also increase as boiler pressure increases. Nowadays it is common practice that ODS delivers a return condensate water analyser with an alarm level of e.g. 100 ppb or 500 ppb TOC and a range of e.g. 5 ppm TOC. The outstanding performance of the Quick-TOC-condensate makes this analyser pre-eminently suitable to monitor return condensate streams. Its results are very repeatable and the reproducibility is outstanding. This results in the capability to monitor ultra pure water with low TOC-levels and alarm precisely at exceeding a TOC-limitation. If requested the operator can right away validate the analyser using certified calibration gas.

Total carbon or total organic carbon:

Under boiler pressure and temperature conditions carbonates (inorganic carbons) are transferred into carbon acids which will attack the boiler and cause e.g. pit corrosion. Carbonates should not be present in feed water. With the TC-method the sum of TIC and TOC (inorganic + organic carbon) is analysed. So a TC-analyser will monitor the concentration of total inorganic carbon plus total organic carbon. For many users this is the reason they prefer to use a TC-analyser. Its advantage is that its cycle time is faster and it uses no acid solution. Other users prefer the TOC-method because that is mentioned in the guidelines and regulations. ODS offers both types, the Quick-TOC-condensate as TC-only or as TOC-direct. Some guidelines mention that only non-volatile-TOC should be measured. This is based on the fact that volatile organic carbons are removed in the boilers de-aerator anyhow. Volatiles are automatically removed in the stripping vessel of the Quick-TOC-direct.

Note: We refer to the Quick-TOC-purity TOC-differential when you need a closed loop analyser with separate TC, TOC and TC outputs.

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25 May 2005

Table 3-11. ASME Feedwater Limits for Industrial Water Tube Boilers

Feedwater Property	0 - 300 KPa (0 - 300 psig)	307.5-403 KPa (301-450 psig)	411.0 - 4137 KPa (451 - 600 psig)	4144 - 5171 KPa (601 - 750 psig)	5178 - 6205 KPa (751 - 900 psig)	6212 - 6895 KPa (901 - 1000 psig)	6902-10,342 KPa (1001 - 1500 psig)	10,345-13,790 KPa (1501 - 2000 psig)
Dissolved oxygen (ppm O ₂) before adding chemical oxygen scavenger	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007	< 0.007
Total iron ppm Fe (as Fe)	≤ 0.1	≤ 0.05	≤ 0.03	≤ 0.025	≤ 0.02	≤ 0.02	≤ 0.01	≤ 0.01
Total copper ppm Cu (as Cu)	≤ 0.05	≤ 0.025	≤ 0.02	≤ 0.02	≤ 0.015	≤ 0.01	≤ 0.001	≤ 0.001
Total Hardness ppm (as CaCO ₃)	≤ 0.03	≤ 0.03	≤ 0.02	≤ 0.02	≤ 0.1	≤ 0.05	ND	ND
pH at 25 °C (77 °F)	8.3-10.0	8.3-10.0	8.3-10.0	8.3-10.0	8.3-10.0	8.3-9.6	8.3-9.6	8.3-9.6
Chemicals for pre-boiler system	NS	NS	NS	NS	NS	VAM	VAM	VAM
Non-volatile TOC ppm (as O ₂)	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.2	< 0.2	< 0.2
Oily matter ppm	< 1	< 1	< 0.5	< 0.5	< 0.5	< 0.2	< 0.2	< 0.2

- NOTES:
1. Makeup water percentage: Up to 100% of feedwater.
 2. Assumes existence of deaerator.
 3. Conditions: Includes superheater, turbine drives, or process restriction on steam purity.
 4. Saturated steam purity target as shown.
 5. NS = not specified.
 6. ND = not detectable.
 7. VAM = Use only volatile alkaline materials upstream of a temporary water source.

VGBvTÜV, All Pressure Levels

Table 8.1.1
VGB Table 1

Parameter		Normal Operating Limit	Remarks
pH (25 °C)	-	9-10	1)
Cation Conductivity (25 °C)	µS/cm	< 0.2	2)
Iron (Fe)	mg/l	< 0.02	
Copper (Cu)	mg/l	< 0.003	
Silica (SiO ₂)	mg/l	< 0.02	
Sodium (Na)	mg/l	< 0.01	
Oxygen (O ₂)	mg/l	< 0.10	3)
Total Organic Carbon (TOC)	mg/l	< 0.2	4)

Remarks

- 1) The pH in feedwater shall be achieved by dosing volatile alkalinizing agents (Ammonia, NH₃), since feedwater will be used as desuperheater spray water. See also General Remark 3.
- 2) Continuous Measurement
- 3) When the cation conductivity of the feedwater is > 0.2 µS/cm for several days, oxygen concentration shall be < 0.02 mg/l
- 4) TOC shall be as low as practically possible.

EPRI, All Pressure Levels

Note:

In case the flow for the IP and/or HP system originates directly from the LP drum, table 4.1.2 is not valid. In stead reference is made to paragraph 5.2.

Table 4.1.2
EPRI figure 3.1

Parameter		Normal Operating Limit	Remarks
pH (25 °C)	-	9.2 - 9.6	1), 4)
Cation Conductivity (25 °C)	µS/cm	< 0.2	2)
Silica (SiO ₂)	ppb	< 10	5)
Sodium (Na)	ppb	< 5	
Oxygen (O ₂)	ppb	< 10	6)
Iron (Fe)	ppb	< 5	
Total Organic Carbon (TOC)	ppb	< 200	3)

Remarks

- 1) The pH in feedwater shall be by volatile alkalinizing agents (Ammonia, NH₃), since feed water will be used as desuperheater spray water (see also General Remark 3).
- 2) Continuous Measurement
- 3) TOC shall be as low as practically possible.
- 4) NEM recommends a pH range of 9 - 10.
- 5) For HRSG's without reheat SiO₂ < 20 ppb is allowed.
- 6) NEM strongly recommends an oxygen concentration of > 5 ppb and allows an upper limit of 20 ppb.

Table 2
Feed Water Guidelines

Drum Pressure, psig	15-300	301-600	601-900	901-1000	15-1000 (AVT)	1000-1500	>1500
pH, all ferrous heaters	9.3 - 10.0	9.3 - 10.0	9.3 - 10.0	9.3 - 9.6	9.3 - 9.6	9.3 - 9.6	9.3 - 9.6
pH, copper - bearing heaters	8.8 - 9.2	8.8 - 9.2	8.8 - 9.2	8.8 - 9.2	8.8 - 9.2 (a)	8.8 - 9.2	8.8 - 9.2
Total hardness, as ppm CaCO ₃ , max	0.3	0.2	0.1	0.05	0.003	ND	ND
Oxygen, ppm max (b)	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Iron, ppm max	0.1	0.03	0.02	0.02	0.01	0.01	0.01
Copper, ppm max	0.05	0.02	0.01	0.01	0.005	0.005	0.002
Organic, ppm TOC max (c)	1	1	0.5	0.2	0.1	0.2	0.2
Cat. Conductivity, µS/cm max	-	-	-	-	0.2	0.5 / 0.2 (d)	0.2 (e)
Hydrazine, ppm	-	-	-	-	0.02	0.02	0.02
Silica, ppm SiO ₂ (f)	-	-	-	-	-	0.2	0.1
Oily Matter (mg/l), max	1.0	0.5	0.5	ND	ND	ND	ND

- (a) AVT not recommended for copper-bearing cycles and associated low feedwater pH where the drum pressure is less than 400 psig
 (b) 0.002 ppm of oxygen should be retained in the boiler feedwater as a minimum.
 (c) TOC - Total Organic Compound
 (d) Cation conductivity - A phosphate treatment is first number / the second number is for an AVT program
 (e) AVT program / phosphate programs not recommended above 1500 psig
 (f) Because of its volatility, the feedwater silica concentration cannot significantly exceed the maximum concentration permitted in the steam. When the steam goes to a turbine, this limit is often between 0.020 and 0.010 ppm.
 (g) All values represent maximum allowable



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Gas validation, wet sample calibration and grab sample analyses

Validation with a certified gas:

The Quick-TOC-condensate is standard equipped with the "gas validation feature". The analyser can be checked very rapidly and easily using a certified calibration gas. This is a great and important feature especially when the measuring TOC-range is low. Imagine that return condensate is drained because the analyser measures a too high TOC-level and the operator wants that the analyser will be checked right away. The preparation of a low level wet TOC-standard is time consuming and needs to be done by a well equipped laboratory. Typical problems are the availability of: a blanc water supply (< 10 ppb TOC, TIC, organics), super clean mixing glass bottles, an uncontaminated base standard, balances, pipettes, a sample bottle filled to the top avoiding CO₂ out of the air entering the fresh solution. Furthermore a low TOC level wet standard cannot be stored, not even in a refrigerator. The gas validation procedure on the Quick-TOC-condensate takes about 15 minutes. It can be done by any operator at any time. In this way one or more reproducible reference points in the measurement curve are found.

Calibration or validation with a wet standard:

Of course it is also possible to calibrate or validate the analyser by use of a fresh wet chemical TOC-standard. This can be carefully organised and achieved at certain intervals.

Multi-loop injection technique with several validation points:

The injection volume is precisely 400 micro litres. The loop can be injected once to maximum 10 times. So the injection volume per analyses is selectable between 400 and 4000 micro litres. This so called multi-loop injection technique offers the advantage that a linear sequence of validation points on the curve can be generated (see curves below). This can be done either using a wet standard or a certified calibration gas.

Certified validation gas:

We advise the use of a CO₂/N₂ mixture (carbon dioxide/nitrogen) or a CH₄/N₂ mixture (methane/nitrogen). Such a certified calibration gas can be delivered by many specialised suppliers. The accuracy of the calibrated gas is within 2%. The gas is stable and can be stored in the standard cylinder for over many years. Per gas validation about 3 litres of gas is consumed. The content of a 10 litre gas cylinder at a pressure of 150 bar is 1500 litres. This is sufficient for up to at least 500 gas validations.

Validation / the single measurement procedure:

Via the menu the operator can select:

- Measurement repetitions; number of single measurements for one validation result (the default is 5);
- Outlier correction; number of accepted faulty measurements (>%CV). The outliers are replaced by an extra measurement. The default is 2;
- Coefficient of variation (CV %); the maximum CV will be considered for the calculation of the outlier values. The default is 3%.

The display shows the progress of the procedure and a table with the raw measured peak surface values, the calculated TC and/or TOC values, the marked outliers, mean values (results) and calculated coefficient of variation (standard deviation).

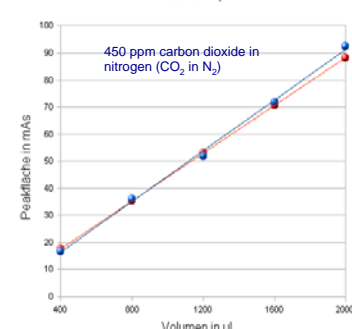
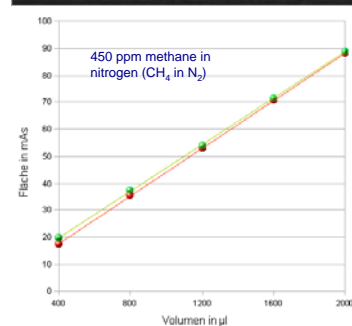


Single measurement stream 1

	TC nfs	TIC nfs	Ths nfs	TC ug/l	TIC ug/l
1	69.2			701	
2	64.6			658	
3	64.5			657	
4	61.3			625	
5	60.6			617	
6	62.4			636	
7					
8					
9					
10					
Mean	62.7			630	
CV	2.5%			2.9%	

0% 25% 50% 75% 100% Single measure

F10 - Back to Service Menu F3 - Measuring S
F1 - Help F4 - Calibrations F5 - Print



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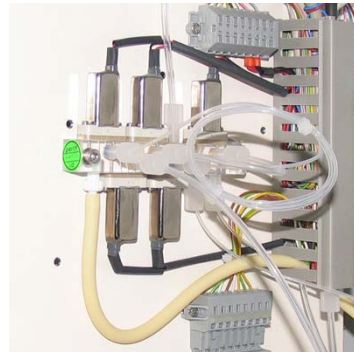
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We offer wet calibration, validation and grab sample analyses functionality



The injection loop and 4 each block & bleed valves



Instrument air is "cleaned" via a maintenance free zero air generator



ODS sample conditioning system with a heat exchanger with use of ambient air



ODS sample conditioning system with a heat exchanger via tap water supply



Sample filtration filter panel with primary particle filter, manometer, block valve



ODS analyser walk-in shelter



ODS offers hands-on trainings for maintenance and QMI engineers



High pressure boiler feed water pump



ODS designs and supplies custom made sample conditioning system



ODS analyser specialists on-site



Power plant with co-generators



The TOC-analyser mounted in a walk-in analyzer shelter



Co-generator; feed water monitored by the Quick-condensate TOC-analyser



5-stream TC-analyser installation with gas validation



Inspection of an ATEX zone 1 Quick-TOC-analyser



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ODS specialist in Samplers & Analytical Systems



On-line low-level TC/TOC analyser Model Quick-TOC-condensate including gas validation feature

TOC/TC analyser model Quick-TOC-condensate Specifications

Supplier	ODS BV Barendrecht, Netherlands
Model	Quick-TOC-condensate
Manufacturer	LAR Process Analysers AG, Germany, Berlin.
Description	Process on-line analyser
Applications	Return condensate, steam condensate, boiler feed water, ultra pure water, tap water, closed water loops, monitoring of heat exchanger leakage.

Analytical methods DIN EN 1484, ISO 8254 and EPA 415.1

Analytical method: Total Carbon (TC) total carbon content	Measurement of the Total Carbon content via thermal oxidation of the carbons in the sample, at a temperature of 1200 °C. and without the use of a catalyst, where organic and inorganic carbons are oxidised to CO ₂ . A carrier gas flows through the reactor up to a NDIR CO ₂ gas analyser. By use of peak surface calculation, the measured CO ₂ gas concentration is calculated and presented as the Total Carbon content.
Analytical method: Total Organic Carbon (TOC) total organic carbon content (Non Purgable Organic Carbon)	The analytical TOC-direct method is almost identical to the TC-method. First the sample is acidified to a pH < 2 by mixing it with a 1% HCl acid solution. At this pH<2 inorganic carbons react to CO ₂ gas. By stripping the sample via carrier gas, this CO ₂ gas is flushed out. The sample now contains only organic carbons. It is injected, oxidised and measured in the same way as the TC-method (as described above).

specifications

Measuring range (milligram C./liter or ppm)	0 to 2 or 0 to 10 (free programmable within limitations)
Accuracy (CV in % of the measured TC/TOC-concentration between 25 to 100% of the full scale):	<ul style="list-style-type: none"> • 2 • 1
Sensitivity (mg/l)	+/- 0,05 or 0,5 % measured value (whichever is greater)
Zero drift (mg/liter C. per year)	0; auto zero at each measurement
Cycle time (minutes):	<ul style="list-style-type: none"> • 3 to 4 (depends on type of hydrocarbons and the measuring range) • 5,5 to 6 (depends on type of hydrocarbons and the measuring range)
Type detector	Non Dispersive Infrared CO ₂ analyser (NDIR)
Sample conditions:	<ul style="list-style-type: none"> • Atmospheric or a slightly overpressure (0,05 tot 0,1) • 60 (optional 95) • Filtration of particles is needed when they are bigger then 50 micrometer or when they are rock solid (metals). Secondly organic particles could result in high TC/TOC-readings. Filtration smoothes the analytical results.
Injection method and injection volume	Multi-loop injection. The loop is filled with exactly 400 micro litre of sample and then injected into the reactor. It can be injected between 1 and 10 times for one analytical result.
Calibration/validation/grab samples:	<ul style="list-style-type: none"> • Wet standards • Grab samples • Gas <ul style="list-style-type: none"> • Input for wet standard (benchmark); functionality for automatic time-based calibration or manual evaluation via validation procedure. • The same input can be used to measure grab samples; fast and easy • Input for the unique patented gas validation routine. Via a certified calibration gas (CO₂ or methane in N₂) the analyser can easily and rapidly be checked.
Cabinet:	<ul style="list-style-type: none"> • Type, material; surface • Dimensions; outer; h x w x d (mm) • IP protection classification • Area <ul style="list-style-type: none"> • Wall mount, steel, coated cabinet. Front and back compartments • 1020 x 600 x 500 • IP 54 (normally placed inside a building or shelter) • Non Hazardous / optional: ATEX zone 1 and zone 2 cabinets
Weight (kg)	• 115
Ambient conditions:	<ul style="list-style-type: none"> • Temperature; Minimum & Maximum (°C.) • Relative humidity • Corrosive gases <ul style="list-style-type: none"> • Non freezing to +35 • Maximum 95%, non condensing • Non corrosive gases; optional closed stainless steel cabinet available
Electrical;	<ul style="list-style-type: none"> • Voltage / frequency (V, Hz); rating of the fuse in power line (A) • Power dissipation; maximum (VA/Watt) <ul style="list-style-type: none"> • 230/50 or 115/60 (to be specified); 16A advisable • +/- 1100 ; after it's reactor reaches 1200 degrees C. +/- 900 Watts
Diagnostic sensors and functionality	Carrier gas flow inlet and carrier gas flow outlet, relative humidity, reactor temperature, cooler temperature, injection of sample etc.

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Carrier gas conditions:	<ul style="list-style-type: none"> Free of CO₂, CO, C_xH_y (< 1 ppm) Free of water vapour, oil mist and particles <p><i>Note: We offer several methods to clean and scrub ambient air or preferable instrument air such as a zero air generator via Pressure Swing Absorption (PSA); low maintenance</i></p>
Connections:	<ul style="list-style-type: none"> 2 each PVC tube; 12 mm OD, slope down 4/6 mm; 3 metre, nylon, directly connected to the zero air generator 4/6 mm; nylon bulkhead connector 4/6 mm; gland or nylon bulkhead connector (TOC or TC) 2/3 mm; tube via gland; 2 metre; directly to container with acid
<ul style="list-style-type: none"> Drains, surplus sample and condensate (~50 cc per minute) Carrier gas Exhaust/vent; carrier gas / air Sample inlet Acid solution (only when TOC) 	
Calibration standard:	The Quick-TOC-condensate analyser is very reliable and stable. A monthly check with a fresh calibration standard is sufficient. 50 ml/month maximum; preferable 80% of analyser TOC-scale
Acid solution (only needed for TOC!)	<ul style="list-style-type: none"> Consumption (litres/week) / Concentration / Type of acid
<ul style="list-style-type: none"> Depends on measuring cycle time and sample pH; ~ 2 litres/week; 1% HCl 	
Certification	CE
Throughputs; electrical	Via several glands / sizes; location top of analyser cabinet
Display	Graphical, LCD, high resolution, back-lit; 230 x 100 mm
Operation	Auto start function; after power fail. Fully controlled Menu driven, sub menu screens, help screens, operation parameters, service parameters, diagnostics, data logger, graphical and tables
Data logger	Intern data logger; 1 month of data, all parameters, calibration information, errors (consult ODS)
Signals, inputs and outputs:	<ul style="list-style-type: none"> 2 each; 4-20; free programmable; isolated, active; 750 ohm max. 2 each; remote control; 0 or 12/24 VDC; isolated via opto coupler 4 each; potential free contact; 30VDC 1A.; free programmable function; e.g. analyser status, errors, limits, strings, fail safe.
All wetted parts (parts in contact with sample):	<ul style="list-style-type: none"> Teflon, Viton, PEEK Quartz glass, Marprene pump tube
<ul style="list-style-type: none"> TC TOC 	
Mounting :	<ul style="list-style-type: none"> Wall mount, vertical, solid, concrete or comparable, mounting frame or rack or uni strut. 4 each screws M8
<ul style="list-style-type: none"> Type, method 	
Guarantee period (years)	1; consumable parts are excluded
Documentation:	<ul style="list-style-type: none"> Installation and operating manual includes flow schematics, installation instructions, dimension drawings, electrical hook up and wiring drawings, maintenance schedules etc. The English language
<ul style="list-style-type: none"> Manual / drawings / instructions 	
Maintenance schedules:	(depends of application and sample)
<ul style="list-style-type: none"> Calibration / validation Acid solution Tubes condensate pump / tube of sample pump Reactor ceramic filling material 	<ul style="list-style-type: none"> Once per month 5 litre once per week; only for TOC 2 each every 3 month / 1 each every 3 month Once per year or per 2 years
Analyser options	
<ul style="list-style-type: none"> Corrosive or hazardous environment Multi-stream; 2 to 8 streams 	<ul style="list-style-type: none"> Stainless steel analyser cabinet; Nema 4X or/and ATEX zone 1 or zone 2. Ex p with heat exchanger/cooler via a fan and air. Internally PLC control, manifold with stream selector solenoids, HMI display; remote control inputs; all integrated. Optional: flow alarms
Options; externally mounted	
<ul style="list-style-type: none"> Sample extraction Primary sample filtration Sample conditioning panel Zero Air Supply Reagent cabinet 	<ul style="list-style-type: none"> Sample probe with flange Panel with filter high pressure/temperature housing with sintered SS filter element; manometer, block valve Custom made; with water or air cooler, filters, pressure controller, relief valve, hi temperature shut off valve, manometer, temperature indicator, etc. Several methods using ambient air or instrument air; we refer to our zero air supply brochure Wall mount cabinet with window to store maximum 2 each containers; for safe storage of the acid solution (TOC)

Specifications are subject to change by manufacturer or ODS without notice due to modifications or improvements revision:

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