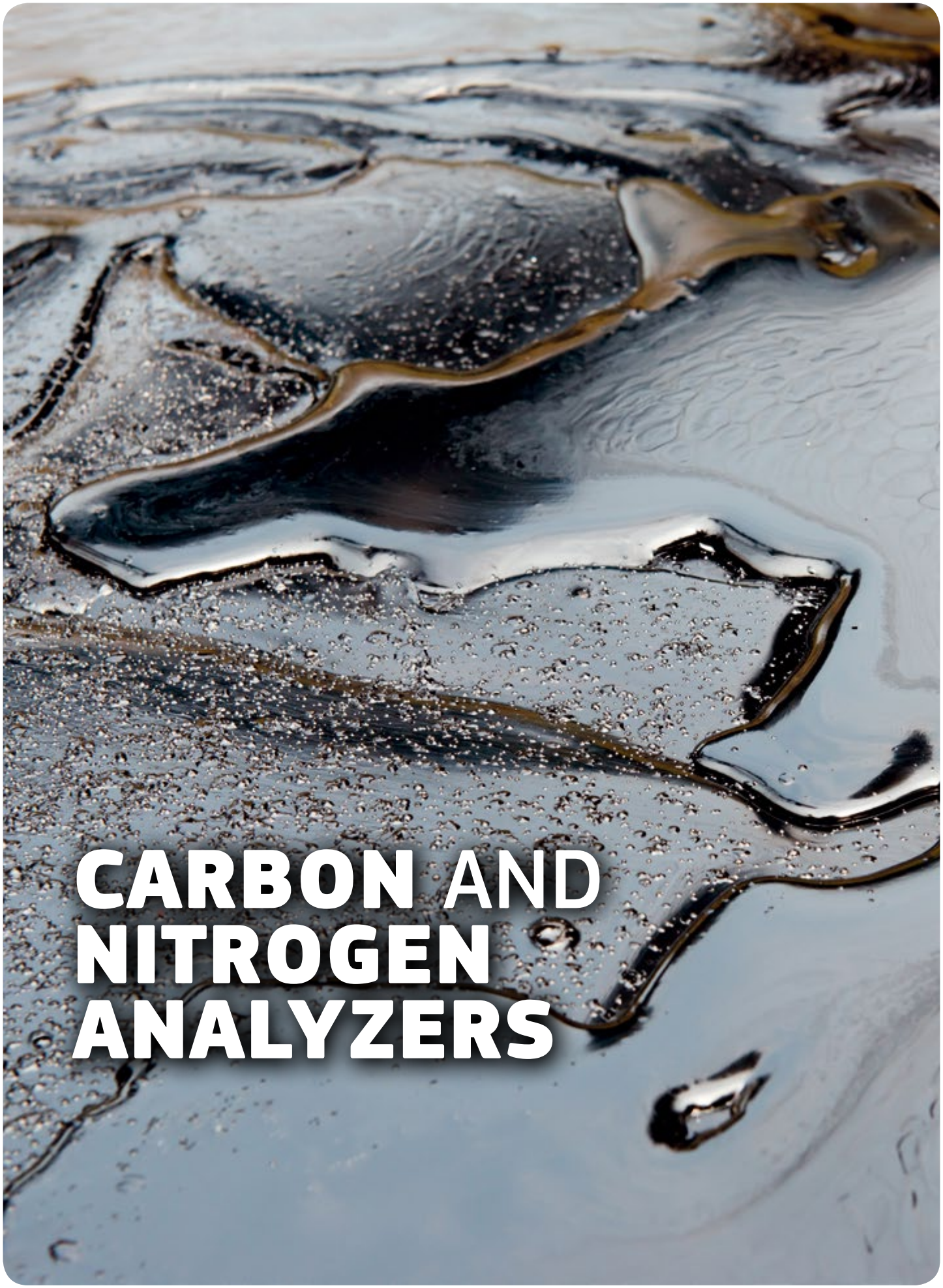


CARBON AND NITROGEN ANALYZERS

TRL INSTRUMENTS

Analyzers for every application

We offer carbon and nitrogen analyzers that capable of TC, TOC, TIC, NPOC, POC, DOC, Surface Carbon (SC), Residual organic carbon (ROC) and TNb analysis in many applications areas.

Modular design for solid and liquid sample analysis

Our carbon and nitrogen analyzers have modular design allowing stepwise building up from simple basic unit up to a complete C/N workstation for all kinds of samples and full automation. The carbon and nitrogen analyzers can be adjusted to customer demands based on the basic unit to provide best solution for your analytical task.

Unique two-zone patented furnace design

By the reason of unique two-zone patented furnace design, the carbon and nitrogen analyzers ensure to customers long-life reaction tube, large detection range from 0.5 µg C to 50 mg C, long-life catalyst up to 2000 analysis, large sample size up to 7 gram solid and 7 mL liquid.

Sample nature doesn't matter

The design of the analyzers provides to analyze solid and liquid samples with high accuracy and reproducibility with a single instrument. Moreover, the unique design of carbon and nitrogen analyzers allows the analysis of liquid samples with high dissolved and/or suspended solids content.

Simultaneous TC/TNb measurement

The analysis method high temperature catalytic oxidation (HTCO) and furnace design allows simultaneous measurement of TC and TNb parameters in solid and liquid samples with same catalyst.

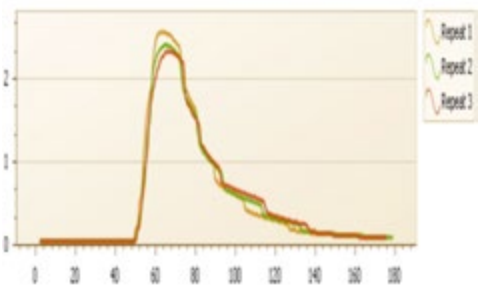
Ease of Use and Maintenance

The design of our analyzers simplifies the daily routine operation of the users. Maintenance and adjustment requirements are gathered on a panel for easily accessible system components. Another panel which is left side of the instrument is designed to significantly minimize the effort for the catalyst replacement.

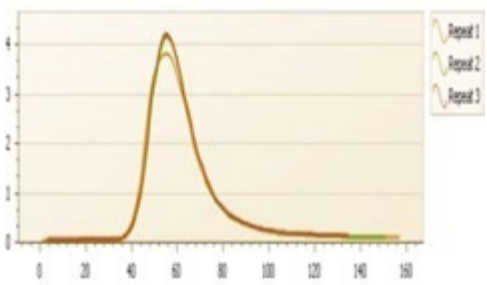
Choose Right Analyzer For Your Applications

Elemental Analysis

Carbon and Nitrogen content of the samples such as soil, fertilizer, compost, leaves etc. is very important parameter for characterization of the compounds for different topics such as C/N ratio in soil. TRL-CN analyzer can be best solution for you to determine carbon and nitrogen content in both solid and liquid samples.



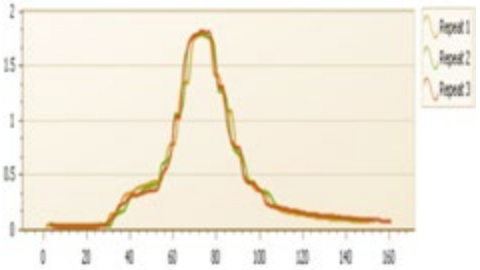
Example of TC determination in Compost
Instrument: TRL-CN
Measurement method: NDIR detection just after HTCO
Sample size: 100 mg
Measurement results: % 42.56
% RSD= 0.947



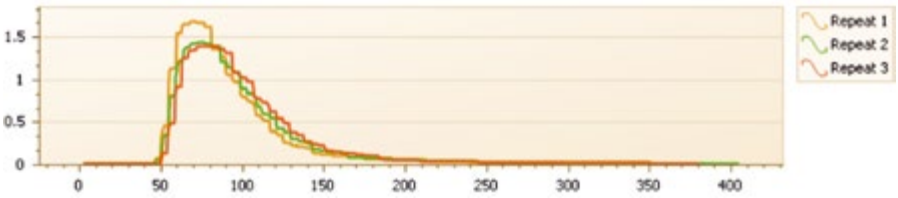
Example of TN determination in Sediment
Instrument: TRL-CN
Measurement method: CLD just after HTCO
Sample size: 300 mg
Measurement results: % 1.28
% RSD= 1.420

Environmental Analysis

For many environmental applications, total organic carbon (TOC) is one of the most important sum parameter which provide assesment of organic pollution in waste water, surface water, solid waste. Morever, TOC content of the soil, fertilizer and compost has importance in many respects such as fertility in agriculture. We propose several solutions for these applications with our two basic analyzers which are TRL-TOC-L, TRl-TOC-S. TRL-TOC-L is for the analysis of TOC parameter in liquid samples, TRL-TOC-S is for the solid sample TOC analysis. While this modularity offers flexibility, it also provides customer to choose the right analyzer for the application.



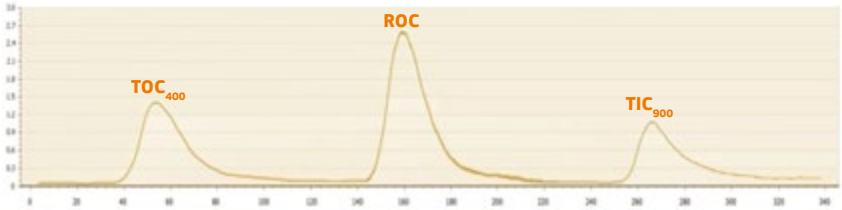
Example of TOC determination in solid waste
Instrument: TRL-TOC-S
Measurement method: TC-IC
Sample size: 200 mg
Measurement results: % 9.31
% RSD= 0.857



Example of TOC determination in waste water
Instrument: TRL-TOC-L
Measurement method: NPOC
Sample size: 0.5 mL
Measurement results: 780.57 mg/L
% RSD= 0.626

Material Characterization

In addition to TOC content elemental carbon (EC) (residual organic carbon (ROC)) is of great importance for the soil characterization. Therefore, Differentiation of carbon species in soil and solid wastes is very crucial parameter for the environmental waste management studies. TRL-ROC analyzer can make these differenatiations as total organic carbon (TOC_{400}), Residual organic Carbon (ROC) and total inorganic carbon (TIC_{900}) according to DIN 19539.



Example of carbon differantiation in soil
Instrument: TRL-TOC/ROC/TIC
Measurement method:
High Temprature catalytic combustion by ramping temperature
Sample size: 300 mg
Measurement results:
TOC_{400}: %1.8, % RSD = 1.420
ROC: 2.5% RSD = 1.850
TIC_{900}: %1.2 % RSD = 0.620

Total Carbon (TC) Measuring Principle

The measuring principle for the carbon analysis is based on the high temperature catalytic oxidation (HTCO) of sample in the presence of air / O_2 between temperatures 800-1100 ºC. Total bound carbon is completely converted to CO_2 which is quantitatively determined by means of a NDIR detector.

Total Nitrogen (TN_b) Measuring Priciple

The measurement principle of Total nitrogen analysis based on the same principle with carbon analysis which is catalytically conversion of total bound nitrogen sample to nitric oxide (NO) in the presence of air / O_2 at high temperatures and then quantitatively determination by means of chemiluminescence detector.

Total Organic Carbon (TOC), Dissolved Organic Carbon (DOC), Nonpurgeable organic carbon (NPOC) and Inorganic Carbon (IC) Measuring Principle

For total inorganic carbon analysis, sample acidifed automatically to convert inorganically bound carbon to CO_2 which is quantitatively determined by means of a NDIR detector. To determine TOC content of the sample, difference method (TOC=TC-IC) or NPOC (TC analysis of sample of which IC content is removed) can be easily applied with TRL-C/N analyzer.

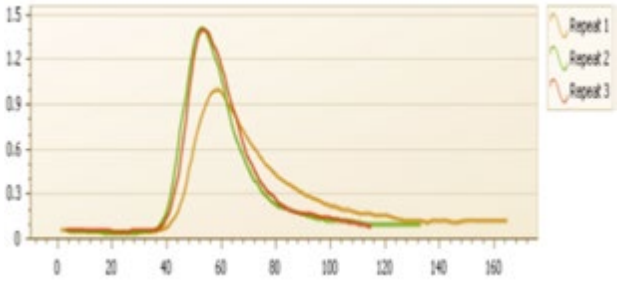
In NPOC analysis method, sample is acidified in the sparger to pH 2-3 to convert all of the inorganic carbon content of the sample to CO_2 and sparge gas bubbled through the solution to remove CO_2. Remaining carbon (NPOC) is completely converted to CO_2 by HTCO which is quantitatively determined by means of a NDIR detector. In this principle NPOC=TOC. If the sample is filtrated by 0.45 µm filter before the NPOC analysis, DOC content of the sample can be determined.

Differentiation Principle of Carbon as TOC_{400}, ROC and TIC_{900} according to DIN 19539.

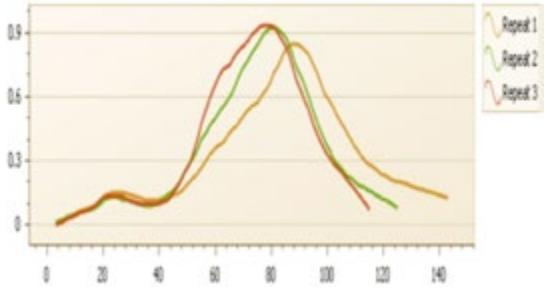
TRL-ROC analyzer measuring principle based on the high temperture catalytic combustion with a temperature ramping program up to 900 ºC. This method does not require any usage of acids and sample preparation. By ramping temperature of furnace from 150 ºC to 900 ºC in oxygen atmosphere, differantiation between carbon species can be done as TOC_{400}, ROC and TIC_{900} in soil, rubble, sludge and waste samples. Alternatively, easy gas switching between oxidizing and inert gases is possibble to differentiate these carbon species.

Surface Carbon on Metals

Concentration of surface carbon on metals directly affects performance of coating process on metals surface. Source of carbon on the surface might be contamination or lubrication during the process of production. Carbon on the surface of metal sheets, to be coated by any material like paint, enamels, primers, etc is very critical quality control parameter. Therefore, surface carbon needs to be determined and controlled to achieve successful coating. The same is applicable from hygiene point of view on aluminum sheet materials to be used in food industry for packaging. Source of carbon on the surface might be the same however control requirement is not for coating but health and safety this time. TRL Instruments offers TRL-SC analyzer, which is based on the TRL-TOC-M main unit, for the applications described above.



Example of SC determination on metal sheets
Instrument: TRL-TOC-SC
Measurement method: HTCO
Sample size: 9 x 15 cm metal sheet
Measurement results: 24.8 mg/m²
% RSD= 4.15



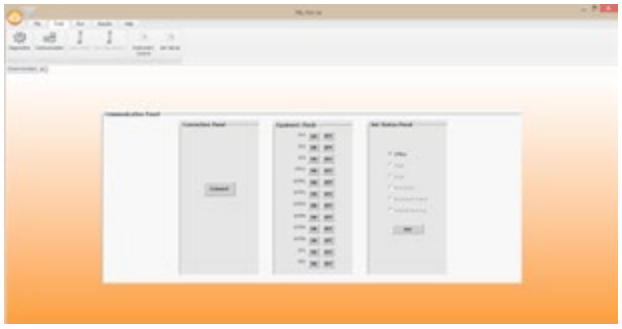
Example of SC determination on aluminum foil
Instrument: TRL-TOC-SC
Measurement method: HTCO
Sample size: 40 mg aluminum foils parts
Measurement results: 5.5 mg/m²
% RSD= 5.15

Surface Carbon (SC) Measuring Principle on Metals

Surface carbon (SC) on metals identifies surface organic carbon (SOC) and amorphous carbon (AC) except carbon within body of metals. HTCO method is applied to determine SOC with 450 oC and SC with 600 ºC and difference of SC and SCO is defined as AC (SC=SOC+AC).

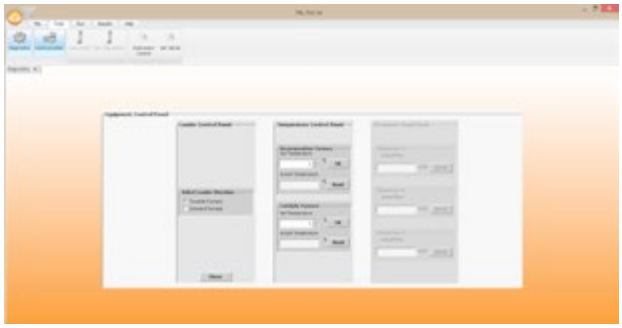
User Friendly and Wealthy Software Functions

Laboratory manager can create hierarchy of users and distribution of authorities. All events are logged and permanently saved. Communaication with computer is diagnosed.



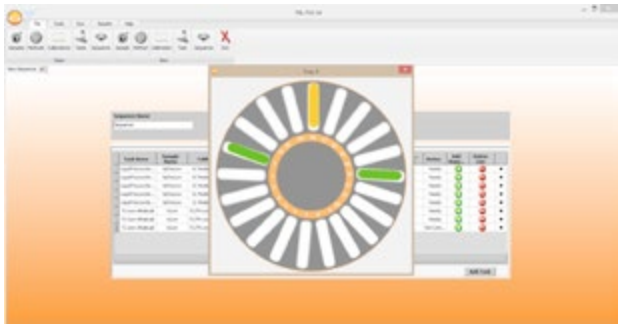
Communication Panel

Diagnostics through software allows checking functionality of all the components of the whole system.

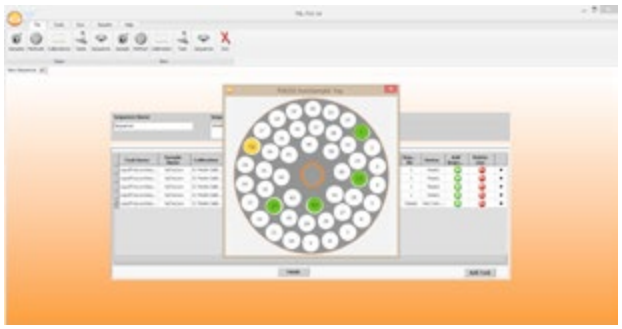


Equipment Control Panel

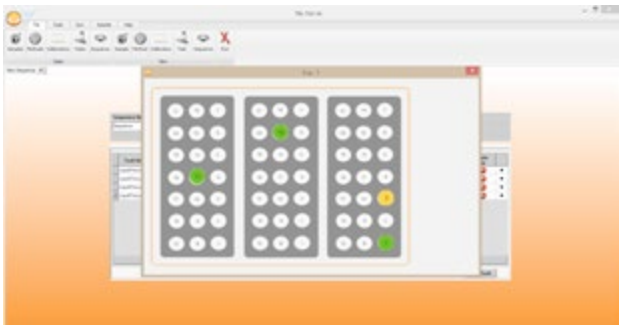
User, sample, method, calibration, task, sequence and report definitions are developed through user friendly software screens.



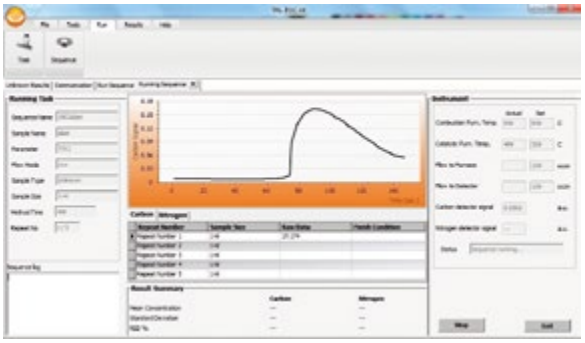
Example of Sequence development screen for Solid Sample Autosampler



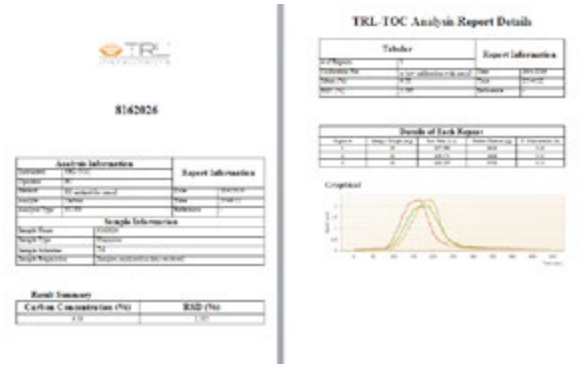
Example of sequence development screen for Liquid Sample Autosampler with 46 vial positions



Example of Sequence development screen for Liquid Sample Autosampler with 63 vial positions



Example of Running TOC Analysis



Example of Analysis Report

Calibration Files can be created by choosing calibration sample analysis results.

Example of Calibration File Description

Application Areas of Our Products

Bioreaction Systems / Fermenters

Pilot and lab scale bioprocess/fermantation systems that are customized according to customer needs to provide best solutions for customers' applications such as cell culture, biofuel, microbial fermentation, waste treatment, biopolymers, biogas.

Reaction / Sorption Systems

Pilot and lab scale reaction systems, which can contain upstream and downstream conditioning, reaction/sorbtion and analysis units with regard to customer needs, for catalyst research/ development, sorption studies and reaction kinetics.

Carbon and Nitrogen Analyzers

Excellent and unique analyzers for analysis of soil, sludge, biomass, fertilizer, foodstuff, sheet metals, water, coal and minerals for total carbon, total organic carbon, residual organic carbon, surface carbon, inorganic carbon and total nitrogen parameters.

Online TOC-Monitoring Analyzers

Analyzers with very low drift, for quality control and monitoring of total organic carbon in process water, tap water, river water, lakes, drinking water, municipal and industrial waste water.

We:

develop

design

manufacture

processes and equipment, for:

research

production

analysis

in the field of:

reaction engineering, sorption studies and catalysis research

environmental monitoring

bioprocesses

for:

development of future energy resources and processes

protection of environment

TRL INSTRUMENTS

www.trlinstruments.com

Üniversiteler Mahallesi İhsan Doğramacı Bulvarı
Bina No: 29 Gümüş Bloklar BK-5 ODTÜ 06800 Teknokent
Ankara/Turkey

T: +90 312 210 01 20
F: +90 312 472 73 98
E: info@trlinstruments.com

/trlinstruments

/TRLInstruments

/company/trl-instruments