TOC/TNb Analyzer

vario TOC cube

Operating instructions

Status of the operating instructions	The status of the operating instructions is: 31.08.2009
Identification number	The operating instructions identification number is: 38.00-5002
Validity	The operating instructions are valid for all instruments as from serial number: 38091036
Instrument manufacturer	The instrument manufacturer is: Elementar Analysensysteme GmbH, Donaustraße 7, D-63452 Hanau Germany Tel.:+49 6181 9100 - 0, Fax: +49 6181 9100 - 10 E-Mail: info@elementar.de

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1 Introduction to the operating instructions

Target group

The target group of this section is the personnel working with the instrument.

Purpose

This section provides general information about the operating instructions.

Overview

"Introduction to the operating instructions" is divided into the following sections:

Section	Page
The operating instructions	15
Display conventions	16
Using the help	17

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The operating instructions

Pictures

The instruments of Elementar underlie a permanent development and adjustment regarding the optimum parameter settings. This may lead to deviations in terms of picture display of the manual and the current instrument status which are not relevant for the understanding of the instrument operation.

The valid numbers of the parameter settings and/or variables can be found in the current text part. Therefore, numbers in the pictures of software dialogs are mainly replaced by spaces or only reflect examples. They do not reflect the proper, recommended set values.

Reading aids

Keywords are displayed in the left margin as reading aids. The keywords sum up the content of the particular section and are useful for quick navigation.

Index

An index is given at the end of the operating instructions that helps you locate certain topics more easily. Index entries always refer to the first page of the section in which the index term is found. Therefore, don't be confused if the index term does not appear on the first page but rather on one of the following pages.

Display conventions

Italicized text	Italicized text indicates cross-references. For example *Installation site requirements* on page 169.
Bold text	▪ Bold text indicates menus and software commands. For example **System > Sample Position**. ▪ Bold text indicates button labels. For example **OK**. ▪ Bold text also indicates keywords displayed in the left margin. The keyword for this section, for example, is **Bold Text**.
Text in quotation marks	Text in quotation marks indicates the names of certain dialogs in the software. For example the "Replace part" dialog.

Using the help

Purpose of the help

The help contains instructions, background information and descriptions of the software dialogs. You can display these descriptions depending on the specific context, i.e. you can display the appropriate description for the specific dialog.

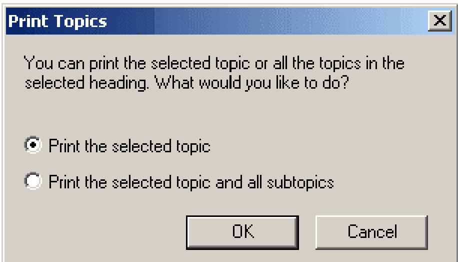
Displaying context-sensitive help

There are different ways of displaying the context-sensitive help:

- If the dialog is already open, press **F1** for a description of the dialog.
- If no dialog is open, press **Shift** and **F1** to display a description of the command. Alternatively, press the  button on the operating software toolbar for a description.

Printing out the complete help

Proceed as follows to print out the complete help:

Step	Procedure
1	Select the "Contents" tab in the help.
2	Right-click on "Contents". The context menu is displayed.
3	Select the **Print** command from the context menu. The "Print topics" dialog is displayed: 
4	Select the "Print selected topic and all sub-topics" radiobutton.
5	Click **OK**. The "Print" dialog is displayed in which you can define the desired print settings.

Printing a single topic

Proceed as follows to print a single topic:

Step	Procedure
1	Select the "Contents" tab in the help.
2	Right-click on desired topic. The context menu is displayed.

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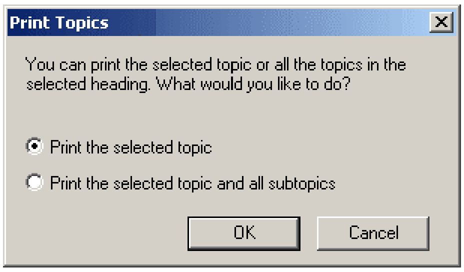
3	Select the **Print** command from the context menu. The "Print topics" dialog is displayed: 
4	Select the "Print selected topic" radiobutton.
5	Click **OK**. The "Print" dialog is displayed in which you can define the desired print settings.

1.1 Product description

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This section provides general information about the instrument.

Overview

"Product description" is divided into the following sections:

Topic	Page
Analytical characteristics and technical specifications	20
Instrument design	24

1.1.1 Analytical characteristics and technical specifications

Target group

The target group is all personnel working with the instrument.

Purpose

This section lists the analytical characteristics and technical specifications.

Overview

"Analytical characteristics and technical specifications" is divided into the following topics:

Topic	Page
Analytical characteristics	21
Technical specifications	22

Analytical characteristics

Analytical characteri-stics

The following table explains the analytical characteristics:

Analytical characteristic	**Comments**
Analysis method	Elemental analysis of TIC, TC, TOC, NPOC, POC, DOC. It is additionally possible to determine TN_b by using the $_{TNb}$ determination kit. Catalytic high temperature oxidation of the samples, infrared detection.
Detector	C: NDIR N: (optional) EC, NDIR or CLD
Sample volume	50 - 2,000 µl, depending on the concentration range
Working ranges	0 - 60,000 mg/l C
Precision / standard deviation	TOC/NPOC/TC/TIC 1 % at > 5 mg/L
Duration of analysis (depending on operating mode, parameter to be determined, sample volume and content)	3 - 15 minutes
Calibration	linear optional 1 or multipoint calibration fully automatic and/or user specific
Sample digestion	catalytic combustion at 850°C (liquid mode) catalytic combustion at 950°C (solid mode) acidic digestion of TIC with phosphorous acid (1%)
Data storage and data output	Storage on hard disk, floppy disk or CD. LIMS transfer possible. Data output to screen and printer.

Technical specifications

Standardization

The instrument conforms to CE standards in accordance with EC Directives:

- EMC 89/336/EEC
- LVD 73/23/EEC

Control and data processing

The following table contains the technical specifications of the control and data processing system:

Reference value	Technical specifications
Control and evaluation unit	PC with operating system ▪ Windows XP Professional or ▪ Windows Vista Business Printer
Software	▪ German or English ▪ Menu-driven ▪ Status display during analysis ▪ Real-time graphics
Interfaces	RS 232 /V24, Safety low voltage as per DIN IEC 380/VDE 0806/08.81

Dimensions and weights

The following table contains dimensions and weight of the instrument:

Reference value	Technical specifications
Base instrument dimensions	480 mm x 550 mm x 570 mm (without autosampler) Width x Depth x Height
Weight	60 kg

Electrical and gas supply

The following table contains the technical specifications of the electrical and gas supply:

Reference value	Technical specifications	
Mains voltage	100–230 Volt AC ± 10 %; 50–60 Hz	
Energy consumption	0,35 kW	
Connected load	800 VA	
Connected electrical loads and frequency of the complete analysis unit	Connected electrical load: Voltage: Frequency:	16 A 100V AC ± 10 % 120V AC ± 10 % 230V AC ± 10 % 50–60 Hz
Supply gases	synthetic air: Oxygen:	Purity 99.996 %, 1000 mbar Purity 99.995 %, 1000 mbar

Ambient conditions

The following table contains the technical specifications of the ambient conditions:

Reference value	Technical specifications
Protection class	Protection class I, protective conductor connection
Mode of protection	IP 20, installation in dry rooms only

Permissible ambient temperature	Maximum: Minimum:	+ 35 °C + 15 °C

1.2 Instrument design

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes the design of the instrument.

Overview

"Instrument design" is divided into the following topics:

Topic	Page
Front view of the instrument	25
Furnace section	26
Rear view of the instrument	27
Right side view of the instrument	28
Left side view of the instrument	29
Top view of the instrument	31
Peripherals and their function	32

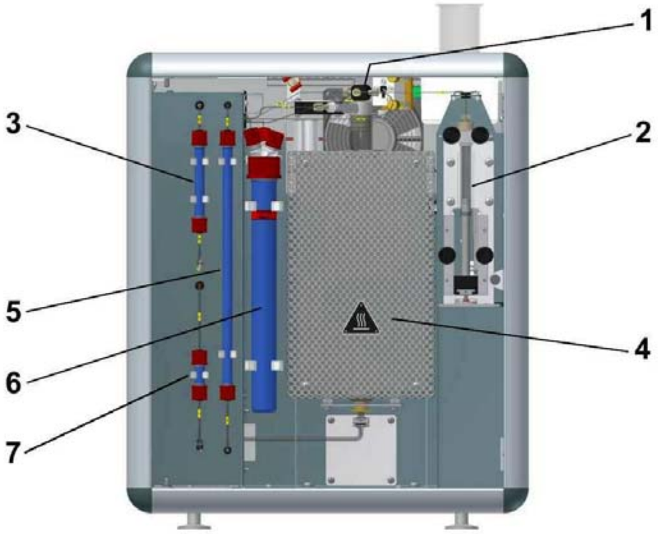
Front view of the instrument

Front view, closed

The following picture shows the front view of the instrument with the front door closed:

Front view, open

The following picture shows the front view of the instrument in lliquid mode with the front door open:



The following table describes the individual components of the analyzer:

1 multiway valve

2 Syringe

3 Halogen absorber

4 Furnace with heat protection cover

5 Drying tube

6 Acid container

7 Control tube

Furnace section

Location of the furnace section

The furnace section is located behind the front door of the instrument.

What is inside the furnace section?

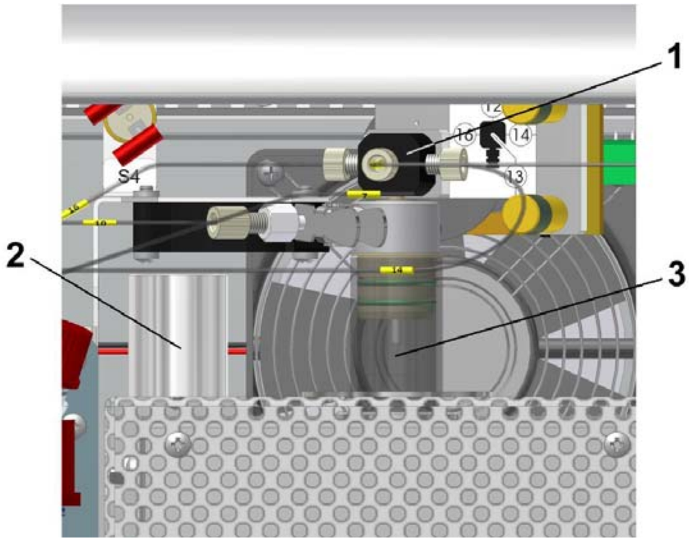
In the furnace area there is a furnace with one heater. The temperatures of the heater is pre-selected from the PC. The heater is temperature-monitored by the software and can be shut down in the event of a malfunction.

Where is the reaction tube in the furnace section?

The reaction tube is located in the middle of the furnace area (centered).

Furnace section

The following picture shows the furnace section of the instrument:



The following table describes the individual components in the furnace section:

1	multiway valve
2	Park position multiway valve
3	Combustion tube (reactor)

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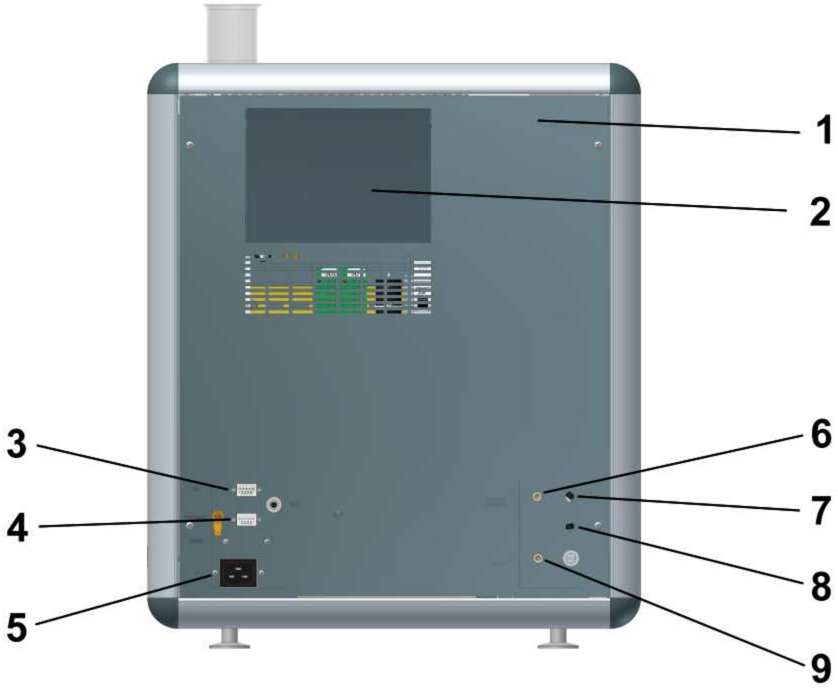
Rear view of the instrument

Rear view

The following picture shows the rear view of the analyzer:



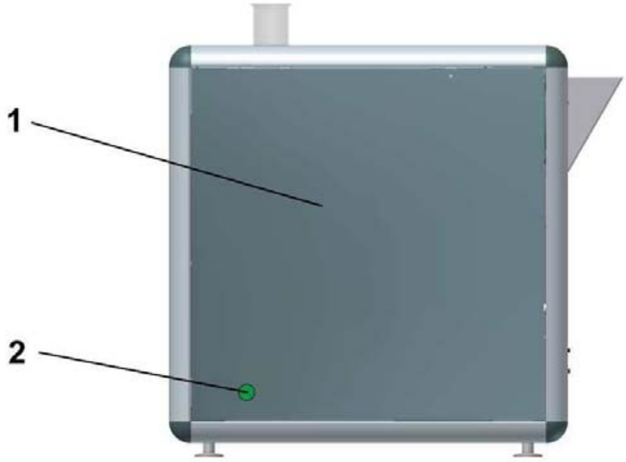
The following table describes the individual components of the analyzer:

Part	Name
1	Rear wall
2	Air baffle
3	PC connector, USB interface (not yet available)
4	PC connector, serial interface
5	Mains connector
6	Carrier gas inlet
7	Measuring gas outlet
8	Gas drying outlet measuring outlet
9	Waste outlet

Right side view of the instrument

Right side view, closed

The following picture shows the right side of the analyzer with the side door closed, as seen from the front:



The following table describes the individual components of the analyzer:

Part	Name
1	Right side door
2	Main switch

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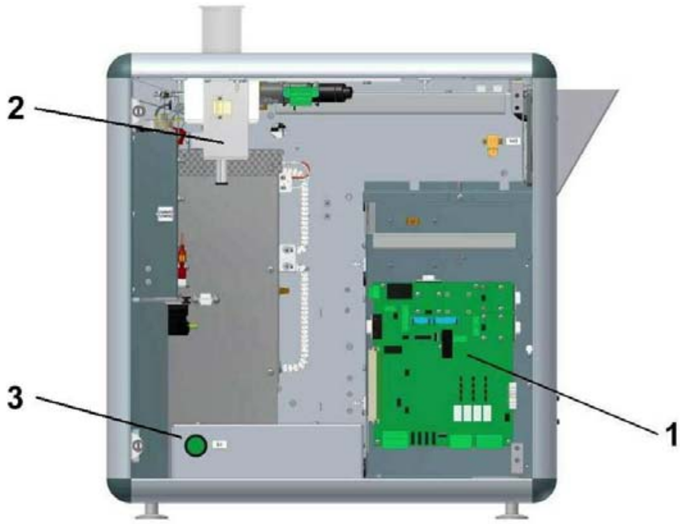
Right side view, open

The following picture shows the right side of the analyzer with the side door open, as seen from the front:



The following table describes the individual components of the analyzer:

Part	Name
1	Mainboard
2	Stirring motor
3	Main switch

Left side view of the instrument

Left side view, closed

The following picture shows the left side of the analyzer with the side door clo-sed, as seen from the front:

The following table describes the individual components of the analyzer:

Part	Name
1	Fan

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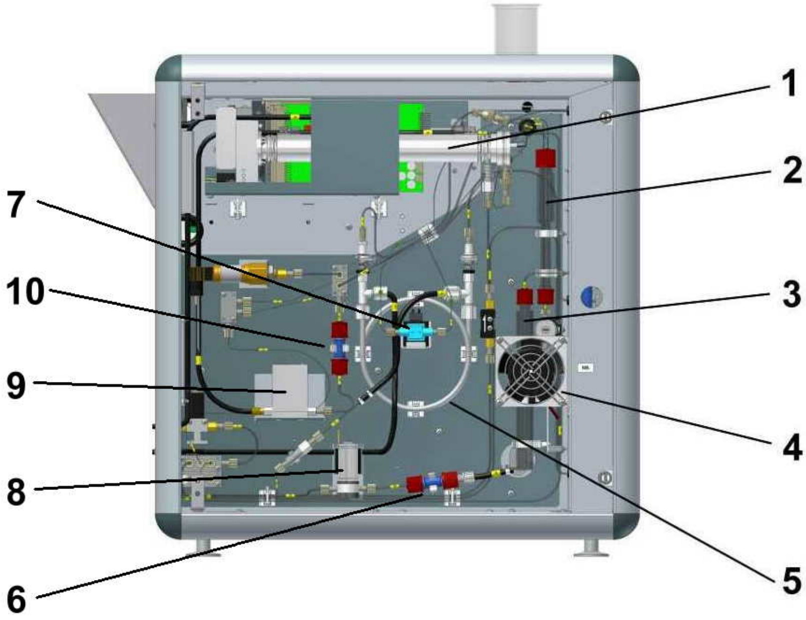
Left side view, open

The following picture shows the left side of the analyzer with the side door open, as seen from the front:



The following table describes the individual components of the analyzer:

Part	Name
1	IR detector
2	Sparger
3	Condenser
4	Fan
5	Measuring gas drying
6	Filter
7	Acid pump
8	Waste drain valve
9	MFC
10	Filter

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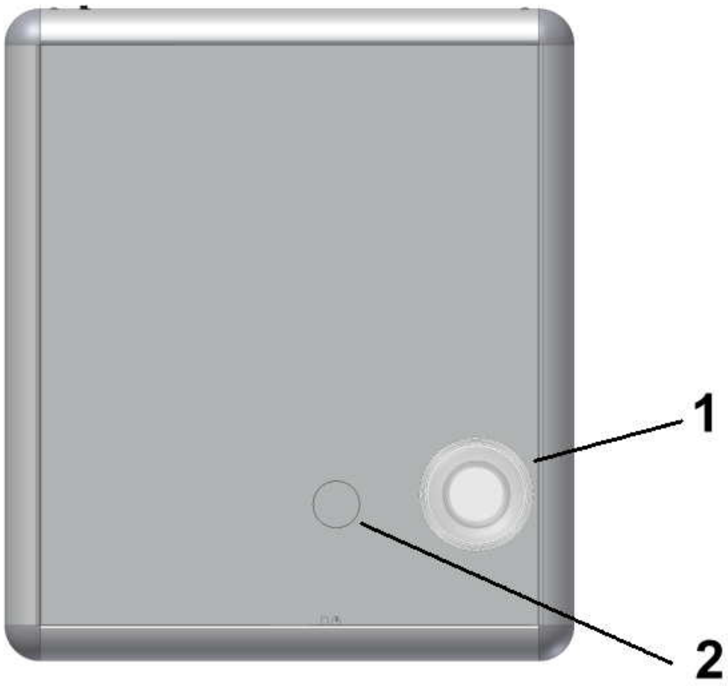
Top view of the instrument

Top view of the instrument

The following picture shows a top view of the analyzer:



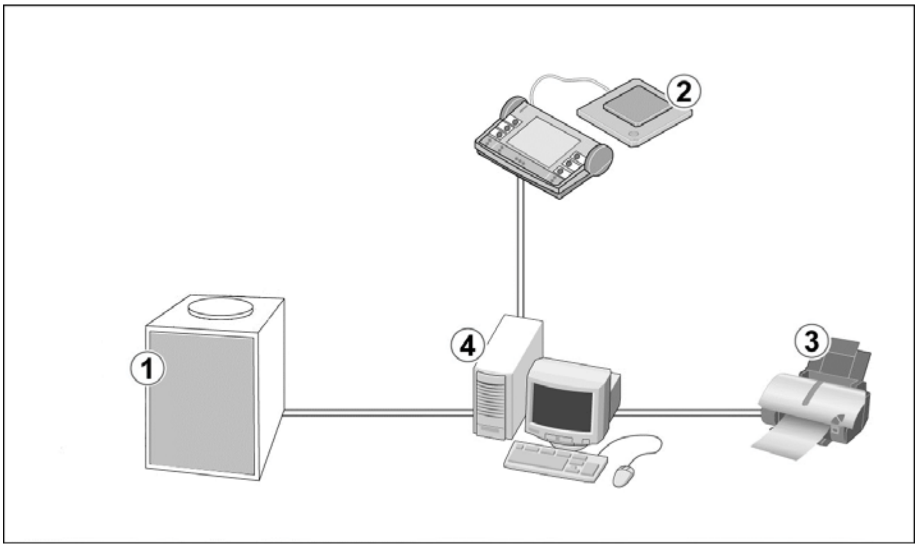
The following table describes the individual components of the analyzer:

Part	Name
1	Sample container liquids
2	Insertion hole solid samples

Peripherals and their function

Types of peripherals

The following picture shows the analyzer and its peripherals



The following list designates the devices illustrated in the picture:

1 Analyzer
2 Balance
3 Printer
4 PC

Functions of the peripherals

The following tables lists the functions of peripherals:

Peripheral	Function	Requirement
PC	Operation of the instrument with operating software	required
Printer	Print out measuring results, etc.	recommended
Balance	Transmit sample weight.	recommended

1.3 Basic security settings

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This section describes basic safety rules required to avoid risks for the user of the analyzer.

Overview

"Basic safety rules" is divided into the following topics:

Topic	Page
Working with the operating instructions	34
Intended use of the analyzer	35
Instructions for disposal of consumables	36
Warning: residual risks	37
Safety devices in the analyzer	38
Warning signs on the analyzer	40
Warning: changes to the analyzer	42
Warning: unsuitable spare parts and consumables	43
Required user knowledge and skills	44
Required personal safety equipment	45
Indication of safety instructions in the instructions	46

Working with the operating instructions

Operating the analyzer	Read the operating instructions thoroughly before performing work with the analyzer.
Storing the operating instructions	Store the operating instructions carefully and make sure the instructions are accessible for all relevant personnel.
Passing on the operating instructions	If you pass on the analyzer, always pass on the operating instructions, too.

Intended use of the analyzer

Intended use of the analyzer

This section describes what the analyzer is suitable for and what substances may be analyzed with it.

Description of the instrument

The analyzer is an instrument for the analysis of TC, TIC, TOC, NPOC, POC, DOC.

What does the instrument do?

Depending on the operating mode and kit, the instrument can simultaneously determine the quantity of the following parameters from one weighed sample:

- TC / TIC / TOC / DOC
- NPOC
- TC
- POC
- TN_b

Critical sample matrices

The following substances may impact negatively on the results of analysis or the service life of the instrument:

- Substances containing fluorine
- substances containing phosphate
- substances containing heavy metals
- substances containing salts.

Siutable sample matrices

Samples that can be decomposed in a controlled manner under the mode-dependent combustion conditions are suitable for analysis.

Advice on difficult applications

You have three ways of getting advice on difficult applications:

- You will find useful tips in the "Application notes" on the www.elementar.de website.
- The application laboratory of Elementar will provide advice:

Application laboratory
Mail: application@elementar.de

- The service department will provide advice:

Service
Mail: service@elementar.de

Instructions for disposal of consumables

Rules

Observe the following rules for disposal of consumables:

- Dispose of the consumables according to the relevant disposal categories.
- Read the instructions on the individual chemicals in the safety data sheets. The risk notes for individual chemicals can be found in the R sets. Safety advice can be found in the S sets.

Warning: residual risks

Hot components inside the instrument	During operation, the furnaces inside the instrument heat certain components to very high temperatures (in excess of 1000 °C). Even after switching off the instrument, these components stay so hot for long periods of time that you can suffer serious burns if working inappropriately inside the instrument. Observe the relevant instructions exactly in order to avoid burns.
Live components inside the instrument	There are live parts (up to 230 V) inside the instrument. When you are working on the electrical components, you may suffer electrocution if you do not work properly. Never bring liquids or leak-test spray in the vicinity of live components. Observe the relevant instructions exactly in order to avoid injuries caused by electrocution.
Unsuitable consumables	If you use consumables of an unsuitable type and quality, you risk: ▪ injuries to the operating personnel ▪ damage to the instrument ▪ distortion of analysis results ▪ loss of warranty. Only use original consumables that you have purchased from Elementar Analysensysteme GmbH or authorized dealers.
Samples with potential risks	Samples to be analyzed may pose the following risks: ▪ Contact with the substances may lead to chemical burns or poisoning. ▪ Combustion analysis of larger quantities of the substance may lead to explosions. These sample substances include: ▪ Aggressive chemicals such as acids or alkaline solutions ▪ Organic solvents ▪ Explosives ▪ Substances that develop toxic or explosive gas mixtures. You are obliged to protect yourself prior to contact with hazardous substances and to reduce the quantity of the substance to a safe amount. You are also obliged to observe the safety instructions of the chemical manufacturer on the label of the bottle or in the safety data sheets. The safety data sheets contain risk information about a chemical in the R sets and safety information in the S sets.
Filling the sample vials with attached carousel	Fill the samples to be analyzed as follows: ▪ Unscrew the carousel and fill the sample vials on a working plat. In case of an improper use, you may be faced with: ▪ damages to the instrument (electronics) ▪ loss of warranty.
Working with the solids autosampler	Prior to change the carousel or to perform a reference run, always empty the carousel.

Safety devices in the analyzer

Note

The analyzer may only be operated if all of the safety devices indicated in this section are in place and in working order.

Gas supply

Gas supply is only possible if the mains switch is switched on and the software is running.

Temperature monitoring

A temperature limiter automatically switches off the instrument in the event of excess temperature inside the instrument. All heating is monitored by an integrated microprocessor controller. The furnace is automatically shut down in the event of the following malfunctions:

- The heating fails to reach setpoint temperature within the set time.
- A thermocouple is defective or displays an illegal value.
- The set threshold temperature is exceeded.

Instrument casing

The instrument casing comprises the following, as seen from the top left in the picture:

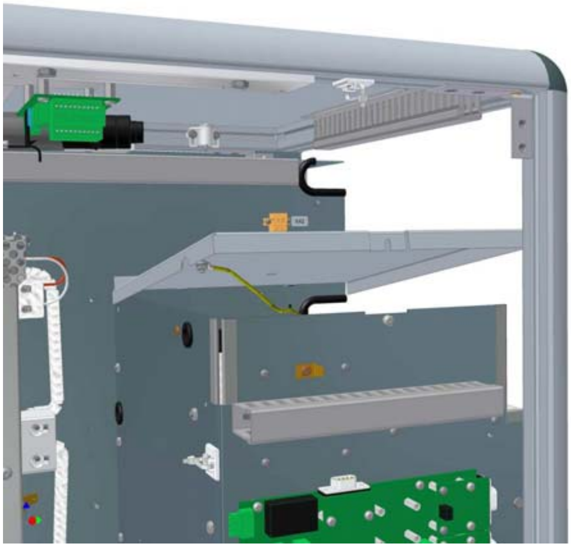
- right side door
- front door
- left side door
- Rear wall
- top cover of the instrument

The casing separates hot, live parts from the surroundings.

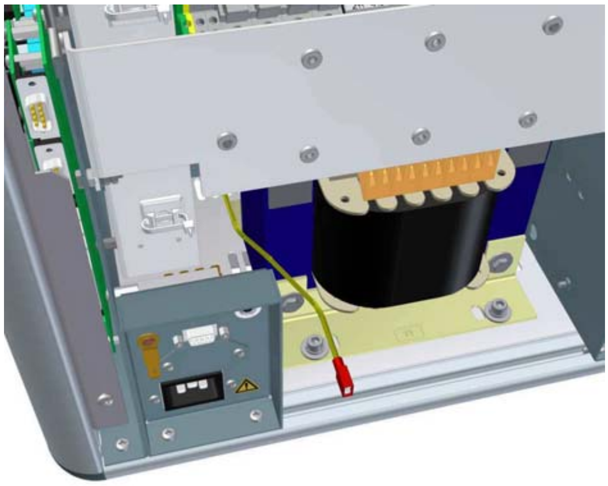
Protective earth conductor

The electrical components of the analyzer are grounded by a protective earth conductor:

- The first protective earth conductor is located on the rear wall of the analyzer.



- The second protective earth conductor is located above the electrical section.



If the protective earth conductor connections need to be detached, they must be re-connected correctly when re-assembling.

Waste gas lines

Toxic gases (e.g. SO_2) may escape from the instrument in operation.

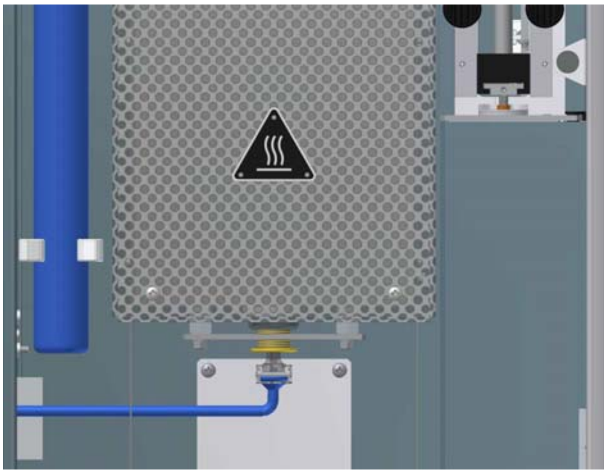
The operator is obliged to connect waste gas lines if the national limits for toxic gases in workplace air are exceeded. The waste gas lines must discharge into the open or into an exhaust hood. The end of the waste gas lines must discharge into the open at a location protected from the wind as pressure fluctuations, e.g. caused by wind, cause detector instabilities.

In addition, the installation room should be well ventilated.

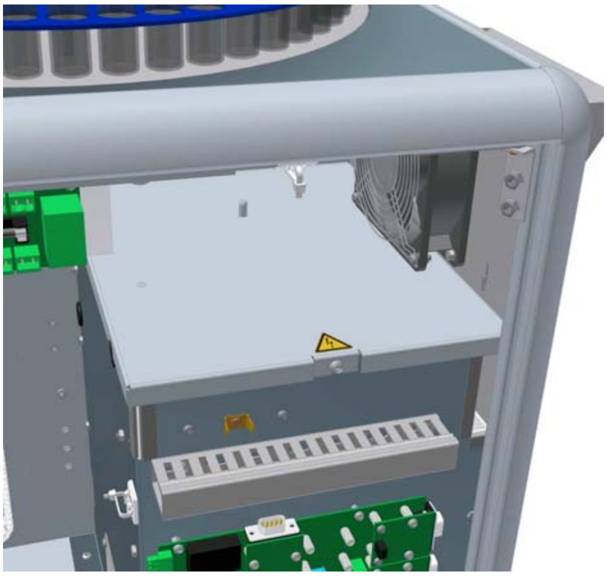
Warning signs on the analyzer

Warning signs on the analyzer

The following picture shows the warning sign on the furnace heat protection cladding:



The following picture shows the warning sign on the electrical section cover:



Meaning of the warning signs

The following table explains the meaning of the warning signs:

Warning sign	Meaning
	Warning: hot surfaces
	Electric current hazard
	Warning of injuries of the hand caused by the autosamp-ler

	Warning of automatic start-up caused by the autosamp-ler

Note

You are obliged to keep the warning signs on the instrument complete and in a legible condition.

Warning: changes to the analyzer

Safe instrument	The analyzer is designed and delivered in such a way to ensure safe working if you observe the instructions in the operating instructions.
Warning: changes to the instrument	If you make any changes to the instrument, you risk rendering the instrument unsafe. The consequences would be: ▪ injuries to the operating personnel ▪ damage to the instrument ▪ loss of warranty. Therefore, never make any unauthorized additions/conversions to the instrument.

Warning: unsuitable spare parts and consumables

Warning

If you use spare parts and consumables of an unsuitable type and quality, you risk:

- injuries to the operating personnel
- damage to the instrument
- distortion of analysis results
- loss of warranty.

Only use original spare parts and original consumables that you have purchased from Elementar Analysensysteme GmbH or authorized dealers.

Required user knowledge and skills

Required knowledge and skills

Depending on the specific task, the user must have different knowledge and skills. The following tables indicates which sections of the operating instructions require what knowledge and skills:

Section	Required knowledge and skills
Work performed by the system administrator	Personnel with good knowledge of the operating system and administrative settings.
Starting up or shutting down the instrument	Personnel authorized by Elementar and having undergone training.
Using the instrument	Personnel with basic knowledge of chemistry and experience with laboratory work (e.g. laboratory worker).
Maintaining the instrument	Personnel authorized by Elementar.
Repairing the instrument	Personnel authorized by Elementar and having undergone training.

Required personal safety equipment

Protective glasses	You require protective glasses for many activities. Make sure that protective glasses are always available nearby the analyzer.
Protective gloves	Elementar provides two kinds of protective gloves with the instrument: ▪ The protective leather gloves for protection against cuts on broken glass from cold quartz components. ▪ The heat protection gloves for protection against burns on hot components. Always keep the protective gloves nearby the analyzer. Replace the protective gloves immediately if required.
Laboratory clothing	For work on and with the instrument you need: ▪ Sturdy shoes ▪ Cotton apron ▪ Hair tie to tie back long hair ▪ Obedience of general rules for safe work in the laboratory

Indication of safety instructions in the instructions

This is the safety sign. Instructions with this sign contain warnings about risks of injury and even death. These instructions must always be observed in order to avoid risks.

Risk levels

The safety instructions are categorized according to the following risk levels:

Risk level	Consequences	Probability
Risk	Death / serious injury (irreversible)	high
Warning	Death / serious injury (irreversible)	medium
Caution	Minor injury (reversible)	medium
Caution	Damage to property	possibly

2

Understanding the instrument and planning its use

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

This section helps you to assess the applications of the instrument and subsequently plan the use of the instrument.

Overview

"Understanding the instrument and planning its use" is divided into the following sections:

Section	Page
Layout and mode of functioning	48
Processes in the instrument during a measurement	53
Basic facts about working with the instrument	61
Database working environment	89
Understanding the operating software	93
Data administration and data security	105

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2.1 Layout and mode of functioning

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

This section describes what the instrument does, what the analysis parameters mean, and what happens in the instrument during an analysis.

Overview

"Layout and mode of functioning" is divided into the following topics:

Topic	Page
Functional units of the analyzer	49

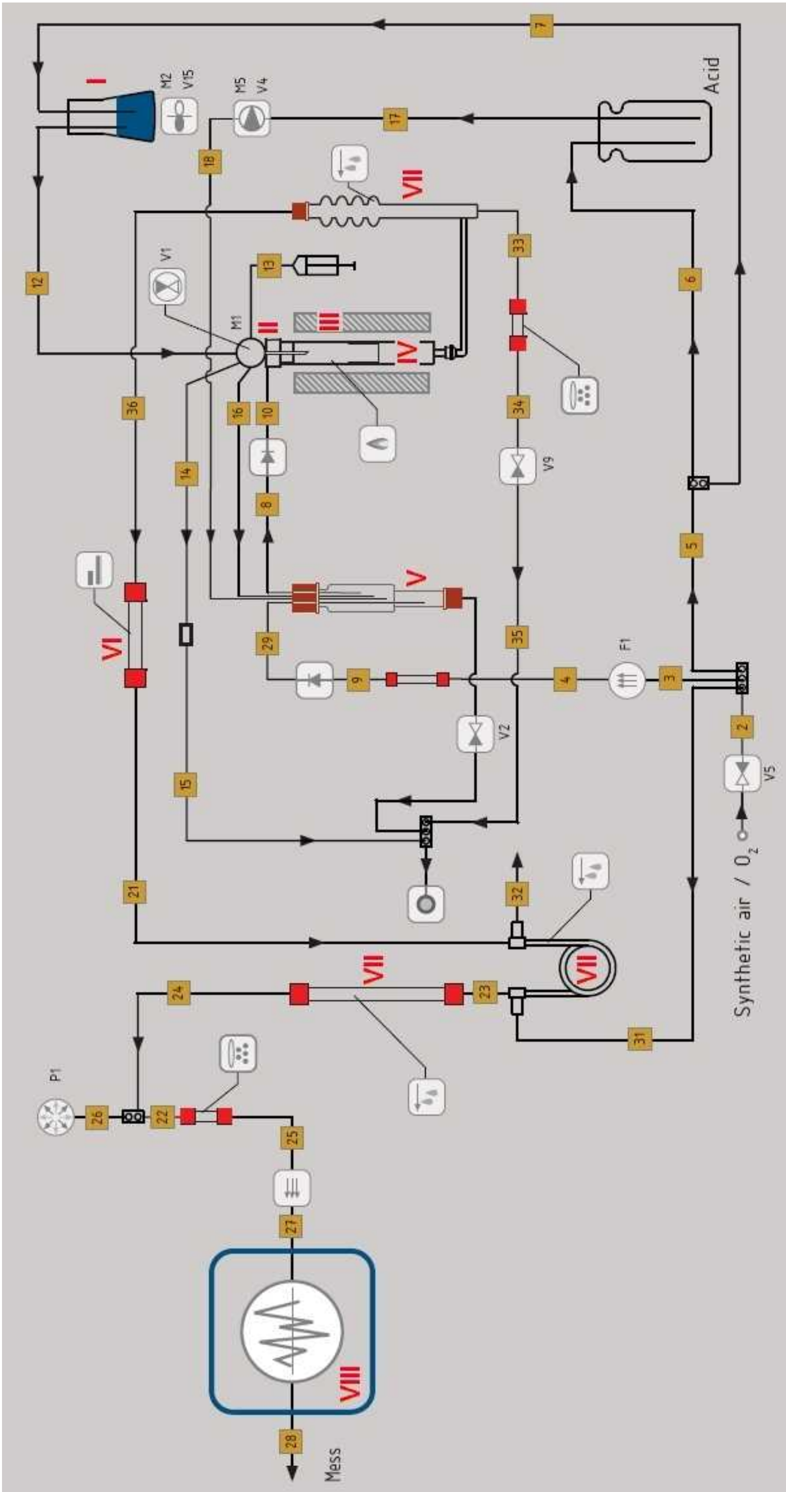
Functional units of the analyzer

Introduction

The following section describes what units comprise the vario TOC elemental analyzer and what functions the individual units perform in the analysis procedure.

Functional diagram

The following diagram shows the basic make-up of the elemental analyzer and its division into functional units.

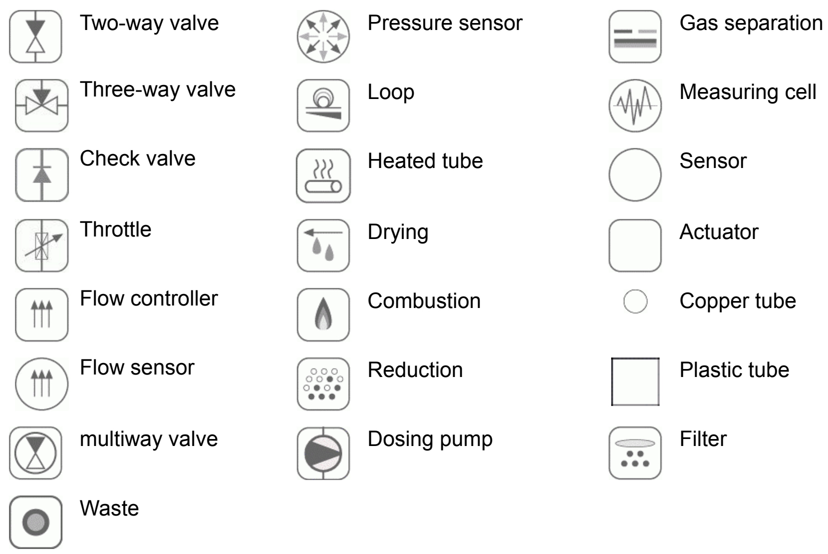


The functional units are referred as follows:

- Sample insertion mechanics
- Furnace area and reaction zone
- Separator

- Cooling and drying unit
- Detector

The following list names the functional and basic symbols:



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Sample insertion mechanics

The following table describes the components of the mechanics of the sample feeding and their functions:

Part	Name	Function
I	Sample vial	▪ holds all samples in a series ▪ carries the current sample to the multiway valve
II	multiway valve	▪ holds the current sample ▪ transports the current sample into the combustion tube

For details on sample insertion, cf. *Sample insertion and initiating measurement* "Sample insertion and initiation of measurement" on page 54.

Furnace area and reaction zone

The following table describes the components of the furnace area and reaction zone and their functions:

Part	Name	Function
III	furnace	▪ holds the combustion tube at a constant temperature depending on the particular operating mode and thereby ensures reproducible analysis results.
IV	Combustion tube with tube filling	▪ Room for complete combustion of the sample including combustion catalyst

For details on the processes in the furnace area, cf. *Substance digestion and preparation of the reaction gas mixture* on page 56.

Separator

The following table desginates the components of the separator and their functi-on:

Part	Name	Function
V	Sparger	▪ Separation of TIC from TC by acidifying with H_3PO_4 and purging with synthetic air (and/or O_2)
VI	Silver wool	▪ Absorption of halogens

For details on separation of the measuring components, cf. *Separating the measuring components*.

Cooling and drying unit

The following table desginates the components of the separator and their functi-on:

Part	Name	Function
VII	Condenser, PermaPure, magnesiumperchlorate	▪ Separation of the water from the measuring gas

Detector

The following table describes the components of the detector and their function:

Part	Name	Function
VIII	IR detector	▪ converts an optical signal (concentration fluctuations) into an electrical signal.

For details on the working principle of the detector, cf. *Detecting measuring components and evaluating the measuring signal* "Detection of measuring components and evaluation of the measuring signal" on page 58.

31.08.2009

2.2 Processes in the instrument during a measurement

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

The following section is designed to help you understand the processes that take place during a measurement and emphasize common features and differences of the various operating modes.

Overview

"Processes in the instrument during a measurement" is divided into the following topics:

Topic	Page
Sample insertion and initiation of measurement	54
Substance digestion and preparation of the reaction gas mixture	56
Measuring different parameters	57
Detection of measuring components and evaluation of the measuring signal	58
Formula for determining element concentration of analysis samples	59
Formula for determining element concentration percentage of analysis samples (solids)	60

31.08.2009

Sample insertion and initiation of measurement

Introduction

The following section explains how to insert the analysis samples into the combustion tube and how to initiate measurement of the reaction products.

Notes

The item numbers used below refer to the picture in *Functional units of the elemental analyzer*.

Sample insertion processes and initiation of measurement

Sample insertion in direct mode (TC, NPOC, TOC) and initiation of measurement is divided into the following steps:

Step	Description
1	The IR detector performs autozero alignment of the measuring signal.
2	Meanwhile the measuring system is flushed with the corresponding sample. The multiway vale goes to two different positions a) suction of the sample b) waste
3	Subsequently, the syringe is filled the corresponding injection volume.
4	The IR detector determines the baseline.
5	The multiway valve goes to the 3rd position. - Injection of the samples into the combustion tube
6	A pressure drop takes place and the sample is injected into the combustion tube.

Sample insertion in difference mode (TIC/TC method) and initiation of measurement is divided into the following steps:

Step	Description
1	The acid for purging the TIC is injected into the sparger.
2	The IR detector performs autozero alignment of the measuring signal.
3	Meanwhile the measuring system is flushed with the corresponding sample. The multiway vale goes to two different positions a) suction of the sample b) waste
4	Subsequently, the syringe is filled the corresponding injection volume.
5	The IR detector determines the baseline.
6	The multiway valve goes to the 4th position. - Injection of the samples into the sparger
7	A pressure drop takes place and the sample is injected into the sparger.
8	The multiway valve goes to the 3rd position. - Injection of the samples into the reactor

9	A pressure drop takes place and the sample is injected into the combustion tube.

Sample insertion in direct procedure (TIC) and initiation of measurement is divided into the following steps:

Step	Description
1	The acid for purging the TIC is injected into the sparger.
2	The IR detector performs autozero alignment of the measuring signal.
3	Meanwhile the measuring system is flushed with the corresponding sample. The multiway vale goes to two different positions a) suction of the sample b) waste
4	Subsequently, the syringe is filled the corresponding injection volume.
5	The IR detector determines the baseline.
6	The multiway valve goes to the 4th position. - Injection of the samples into the sparger
7	A pressure drop takes place and the sample is injected into the sparger.

Sample insertion in direct procedure (POC) and initiation of measurement is divided into the following steps:

Step	Description
1	The IR detector performs autozero alignment of the measuring signal.
2	Meanwhile the measuring system is flushed with the corresponding sample. The multiway vale goes to two different positions a) suction of the sample b) waste
3	Subsequently, the syringe is filled the corresponding injection volume.
4	The IR detector determines the baseline.
5	The multiway valve goes to the 4th position. - Injection of the samples into the sparger
6	A pressure drop takes place and the sample is injected into the sparger.

Substance digestion and preparation of the reaction gas mixture

Introduction

The following section describes:

- which procedures in the combustion tube of the furnace are processed

Processes during substance digestion and preparation of the reaction gas mixture

Substance digestion and preparation of the reaction gas mixture is divided into the following steps:

Step	Procedure	
1	The atmosphere in the combustion tube is enriched with synthetic air (O_2). The organically bound carbon in the sample burns to form the gaseous reaction product CO_2.	
2	**In the "liquid" mode ...**	**In the "solid" mode ...**
	the combustion tube filling is ▪ Pt catalyst which serves as an additional catalyst to oxygen.	the combustion tube filling is ▪ Copper oxid which promotes the oxidation of heavily combu-stible sample
3	The carrier gas flow transfers the gaseous combustion products into the separation unit, where the following processes take place: ▪ Volatile halogen compounds are bound on silver wool. ▪ containing water is separated by a condenser, by a measuring gas drying and by an absorption tube filled with magnesium perchlora-te. ▪ the corresponding sum parameters will be quantified.	

Measuring different parameters

Introduction

The following section explains how the individual parameters are measured.

Processes during the measurement of individual parameters

Parameter	Process
TC	The sample will be given directly into the combustion tube.
NPOC	The sample will be externally acidified and given into the combustion tube (acidification to pH = 2 with HCl or another suitable acid).
TIC / TC	The sample will be injected into the sparger. Acid (1% H_3PO_4) is in the sparger. The TIC is purged by oxygen and determined. Subsequently, the TC will be directly injected into the combustion tube and determined. Thus the difference from TC and TIC is TOC.
TIC	The sample will be injected into the sparger. Acid (1% H_3PO_4) is in the sparger. The TIC is purged by oxygen and determined.
POC	The sample will be injected into the sparger. Volatile organic carbon compounds are determined. Volatile inorganic carbon compounds are absorbed.
TN_b	The sample is determined simultaneously by injection into the combustion tube.

Detection of measuring components and evaluation of the measuring signal

Introduction

The following section explains how the measuring components are detected in the reaction gas mixture and how the measuring signal is evaluated.

Procedure

Detection of the measuring components and evaluation of the measuring signal take place in the following steps:

Step	Procedure
1	After the complete oxidation the CO_2 gets into the IR detector with the carrier gas stream.
2	Depending on the concentration the measuring component the IR detector provides an electrical measuring signal. This will be digitalized and integrated.
3	In the PC the measuring signal ▪ is recorded dependent on time ▪ and displayed as an integral.
4	Depending on the selected operating mode and the set parameters, the integration display is reset to zero by the integrator reset and a measurement may begin.
5	The absolute element content of the current sample is computed from the integrals of the individual measuring peaks and the calibration factors of the elements represented by them; this content is then allocated to the sample. (Cf. *Background knowledge required for calibration* on page 73) Any blank values are factored into this calcula-tion.
6	The concentrations of the sample are determined from the computed absolute element contents and the injection volume. The concentration is computed according to this formula: $c = \frac{a + b \cdot I_K}{I_V}$ The formula consists of the following variables:

Variable	Meaning
c	Element concentration in [mg/l]
a	Axis section
b	slope of the straight line
I_K	blank corrected area
I_V	Injection volume [l]

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Formula for determining element concentration of analysis samples

Procedure

During an analysis, the system first measures the absolute element content of the sample:

- The peak area values of the sample elements are computed.
- The blank value is factored in.
- The absolute element content of the sample is computed on the basis of the calibration coefficients of the corresponding element.

The element concentration of the sample are calculated from the computed absolute element contents and the sample weight.

Element concentration

The element concentration is computed according to this formula:

$$c = \frac{a + b \cdot I_K}{I_V}$$

The formula consists of the following variables:

Variable	Meaning
c	Element concentration in [mg/l]
a	Axis section
b	slope of the straight line
I_K	blank corrected area
I_V	Injection volume [l]

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Formula for determining element concentration percentage of analysis samples (solids)

Procedure

During an analysis, the system first measures the absolute element content of the sample.

- The peak area values of the sample elements are computed.
- The blank value is factored in.
- The absolute element content of the sample is computed on the basis of the calibration coefficients of the corresponding elements.
- The daily factor is factored in.

The percentage element contents of the sample are computed from the computed absolute element contents and the sample weight.

Percentage element concentration

The percentage element concentration is computed according to this formula:

$$c = \frac{a \cdot 100 \cdot f}{w}$$

The formula consists of the following variables:

Variable	Meaning
c	Element concentration in [%]
a	Absolute element content in [mg]
f	Daily factor
w	Sample weight in [mg]

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2.3 Basic facts about working with the instrument

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

The following section provides basic facts about working rationally and appropriately with the instrument.

Overview

"Basic facts about working with the instrument" is divided into the following topics:

Topic	Page
Setting instrument parameters	62
Instrument equipment	69
Background knowledge required for calibration	73
Calibration curve calculation method criteria	76
Calibration formulae	79
Calibration wizard	82
Routine measuring work	85
Formulae for blank value determination and compensation	86
Formula for determining the daily factor	88

Setting instrument parameters

About instrument parameters

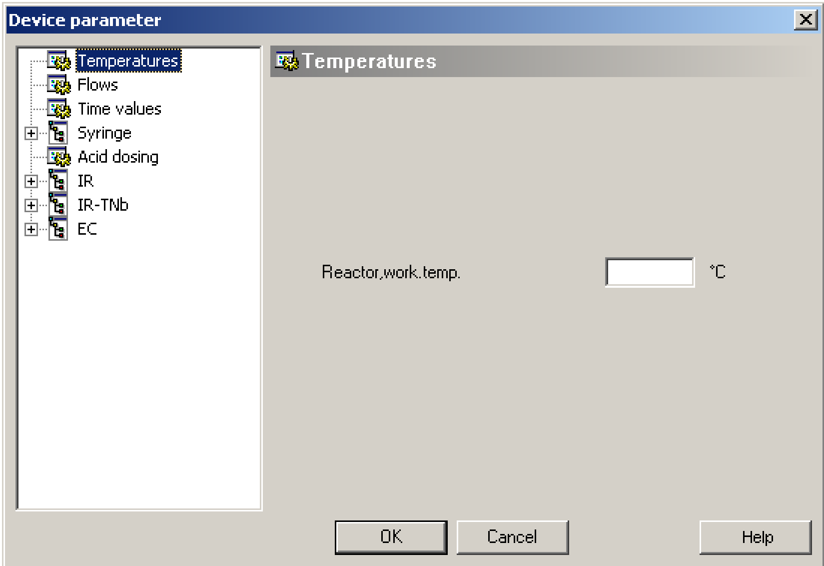
You need to know the following about instrument parameters:

- The mode-dependent instrument parameters listed here are average values.
- The optimized instrument parameters from initial start-up are stored on the enclosed installation disk or CD. The user can optimize them for special applications or extraordinary demands.
- In every operating mode, the instrument parameters required for the analysis process are saved under **Options> Settings > Parameters**.

Factory-set temperatures

The factory-set furnace temperatures are optimized for best possible sample combustion and separation of the measuring components.

The following illustration shows the parameter dialog with the adjustable temperatures:



The following table explains the meaning of the parameters:

Parameter	Meaning	Temperature °C
Furnace liquid mode	Temperature of the combustion tube	850
Furnace solids mode	Temperature of the combustion tube	950

Factory-set time parameters

The factory-set time parameters of the analyzer are selected in order to provide optimum evaluation of the measuring signal under normal application conditions.

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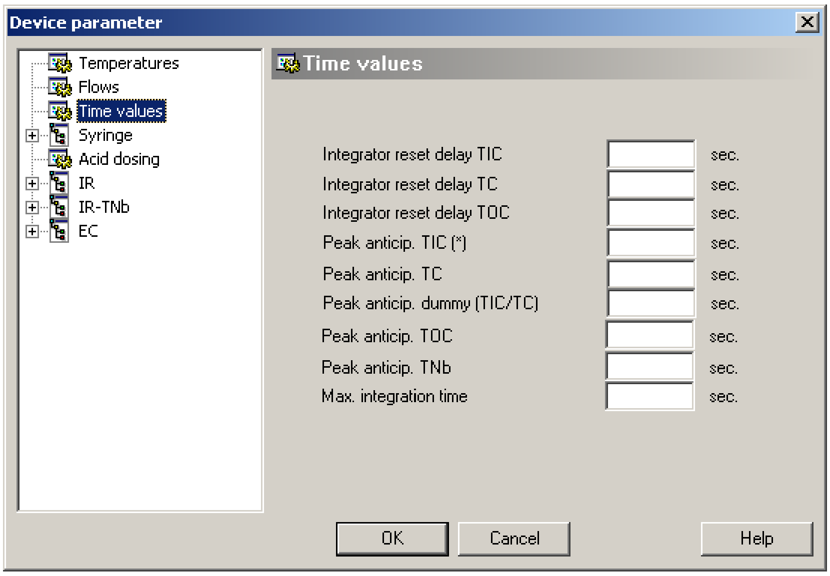
The following illustration shows the parameter dialog with the adjustable times for the liquid mode (TIC, TC, TOC, TN_b):



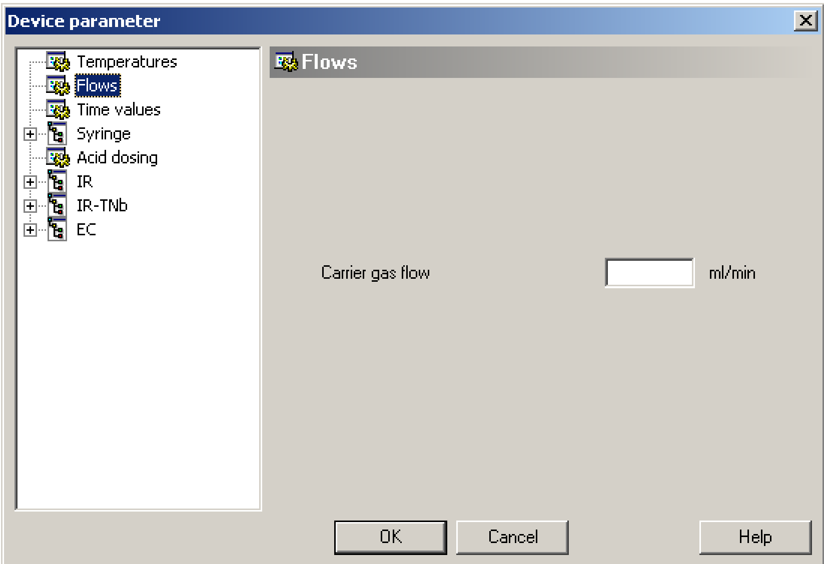
The following table explains the meaning of the parameters:

Parameter	Meaning
Integrator reset delay	Defines the time after which the integrator is reset to zero before beginning actual integration.
Peak anticipation	Defines the time to wait for a peak after a reset.
Maximum integration time	Defines the time which shall be max. integrated when no peak integration is valid (peak anticipation tibe, peak end threshold).

Factory set volume flow rates

The factory-set volume flow rates are selected in order to provide optimum evaluation of the measuring signal under normal application conditions.

The following illustration shows the parameter dialog with the adjustable volume flow rates:



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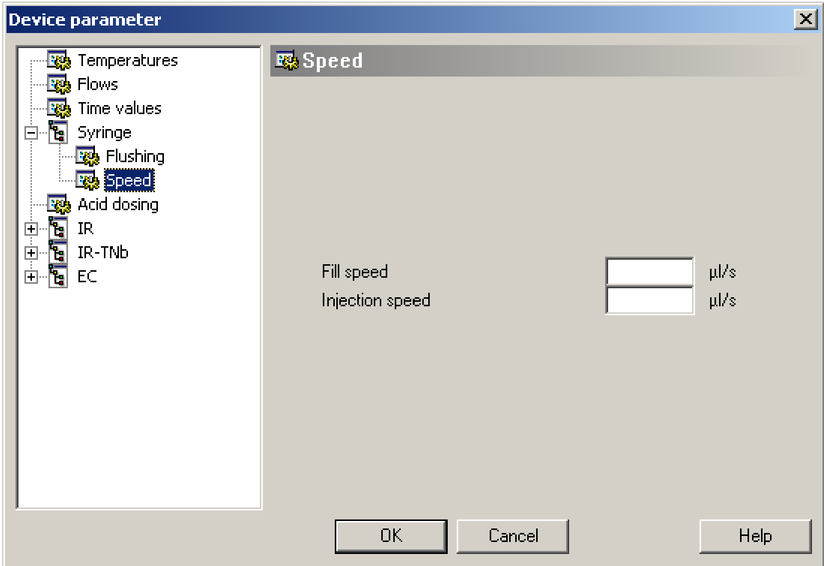
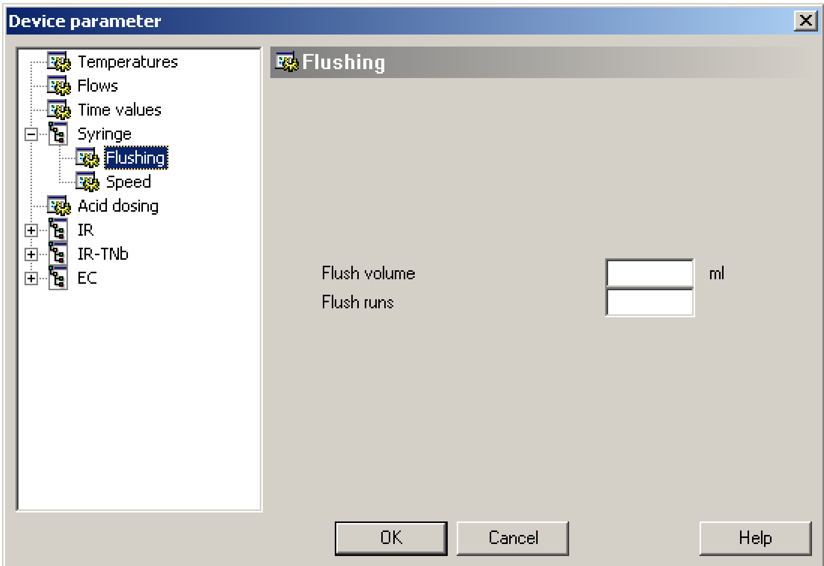
Factory set syringe parameters

The factory-set syringe parameters are selected in order to provide optimum evaluation of the measuring signal under normal application conditions.

The following illustrations show the parameter dialog (liquid mode) with the adjustable parameters of the syringe:

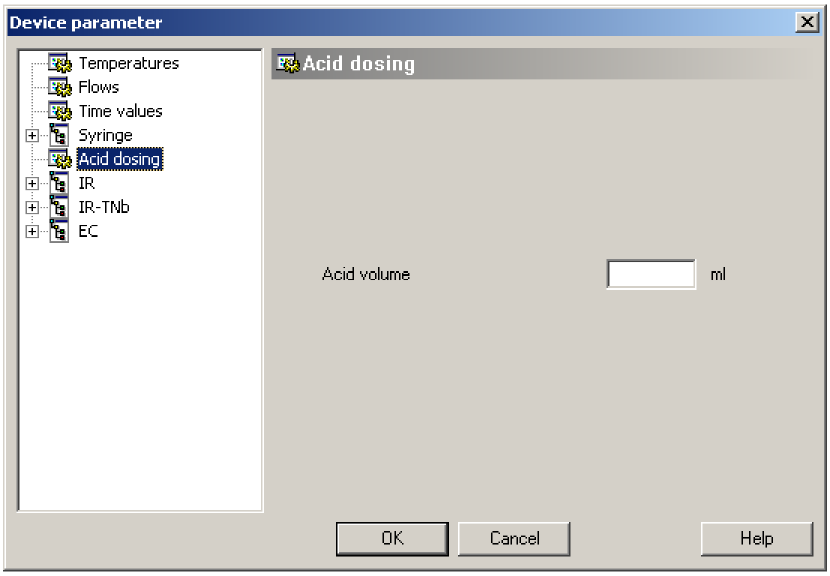




Factory set acid dosing sparger

The factory-set acid volume is selected in order to provide optimum evaluation of the measuring signal under normal application conditions.

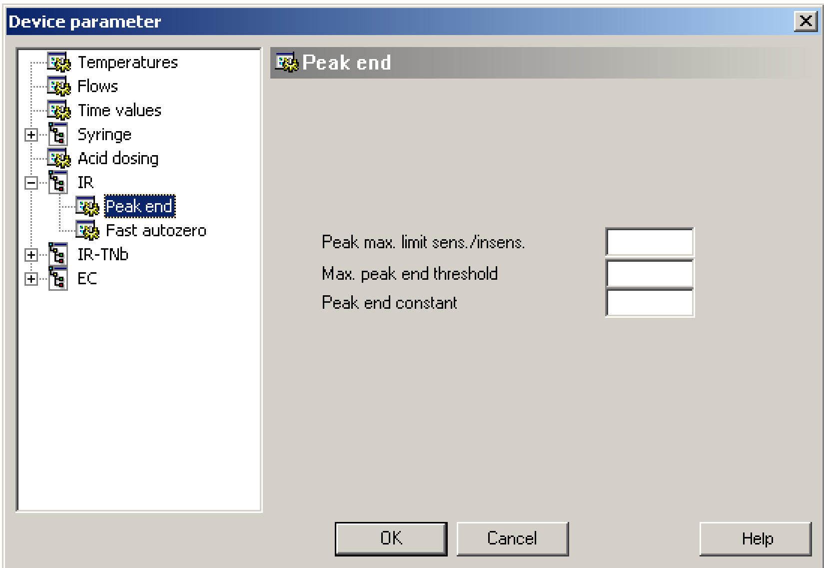
The following illustrations show the parameter dialog (liquid mode) with the adjustable parameters of the acid dosing:



Factory set IR parameters

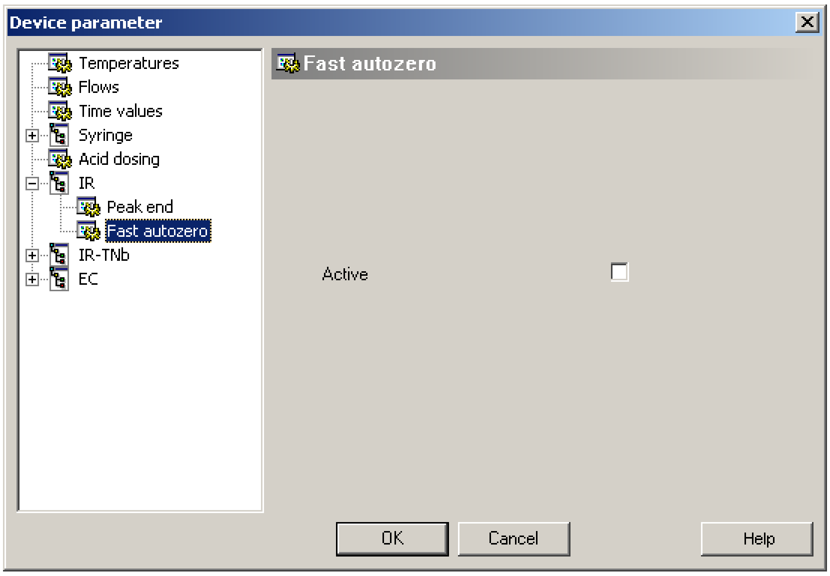
The factory-set IR parameters are selected in order to provide optimum evaluation of the measuring signal under normal application conditions.

The following illustrations show the parameter dialog (liquid mode) with the adjustable parameters:



The following table explains the meaning of the parameters:

Parameter	Meaning
Peakmax. limit sensitive/non sensitive	Defines the value between the integration type non-sensitive and sensitive.
Peak non-sensitive End threshold	Defines the way where the integration end is reached.
Peak sensitive end threshold	Defines the way where the integration end is reached.



The following table explains the meaning of the parameters:

Parameter	Meaning
active	The software automatically decides auto zero performa-ce according to different criteria.

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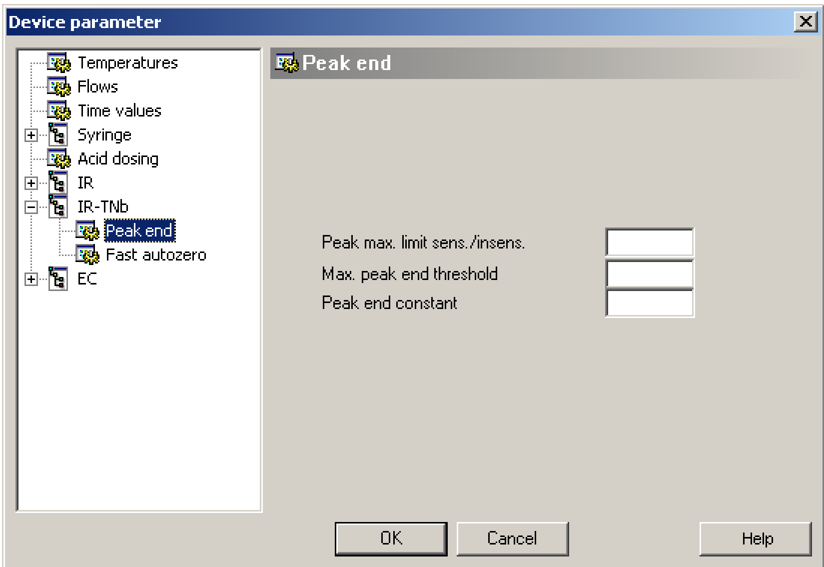
Factory set IR-TN$_b$ parameters

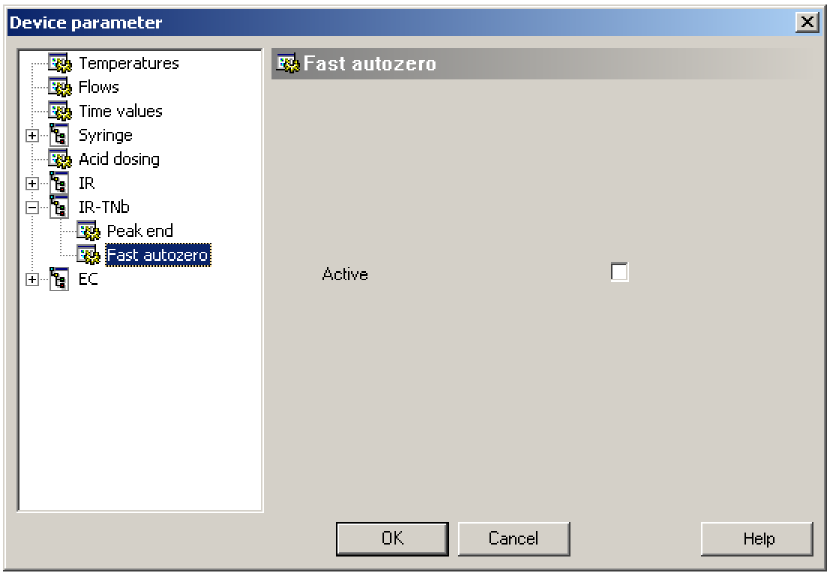
The factory-set IR parameters are selected in order to provide optimum evaluati-on of the measuring signal under normal application conditions.

The following illustrations show the parameter dialog (liquid mode) with the adjustable parameters:



The following table explains the meaning of the parameters:

Parameter	Meaning
Peakmax. limit sensitive/non sensitive	Defines the value between the integration type non-sensitive and sensitive.
Peak non-sensitive End threshold	Defines the way where the integration end is reached.
Peak sensitive end threshold	Defines the way where the integration end is reached.



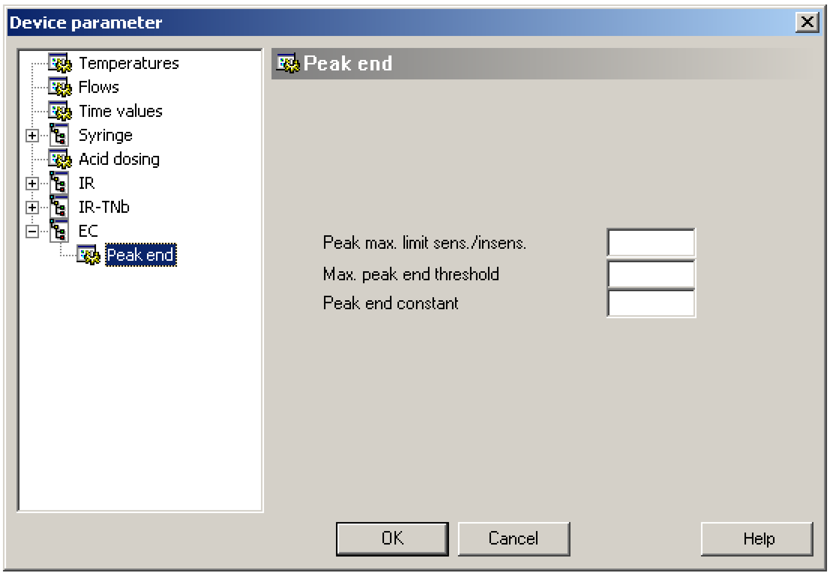
The following table explains the meaning of the parameters:

Parameter	Meaning
active	The software automatically decides auto zero performace according to different criteria.

Factory-set EC parameters

The factory-set EC parameters are selected in order to provide optimum evaluation of the measuring signal under normal application conditions.

The following illustrations show the parameter dialog (liquid mode) with the adjustable parameters:



The following table explains the meaning of the parameters:

Parameter	Meaning
Peakmax. limit sensiti-ve/non sensitive	Defines the value between the integration type non-sensitive and sensitive.
Peak non-sensitive End threshold	Defines the way where the integration end is reached.
Peak sensitive end thres-hold	Defines the way where the integration end is reached.

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Instrument equipment

Overview drying tubes/absorption tubes

Halogen absorber
(Silver wool)

Drying tube
(Magnesuim perchlorate)

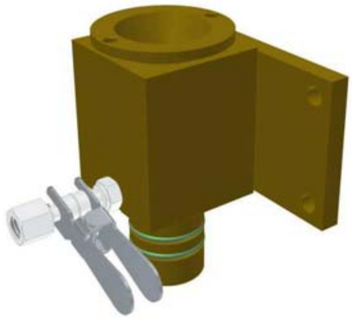
Filter tube
(Filter pad)

Sparger

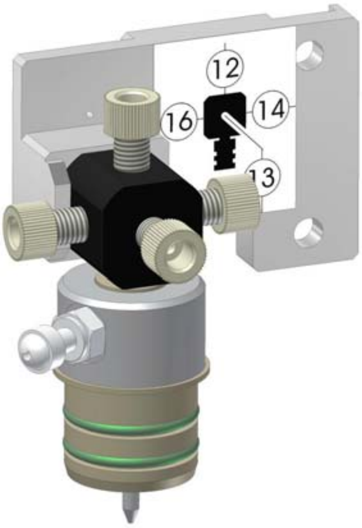
Acid container (125 ml)

1% phosphoric acid (H_3PO_4)

Ball valve with gas connection
(Solid mode)

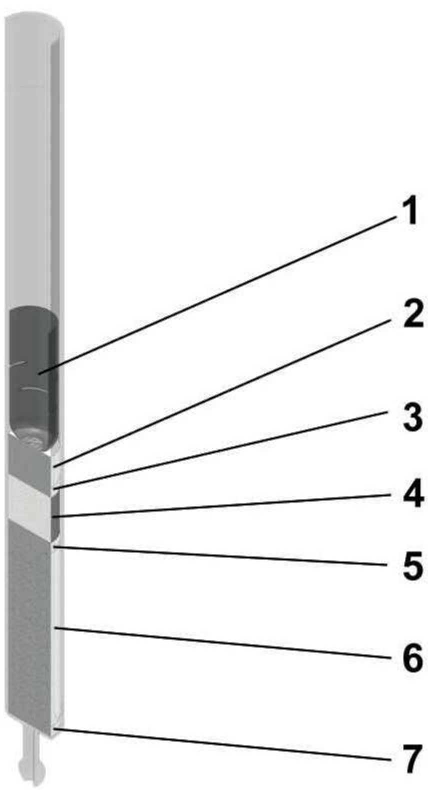
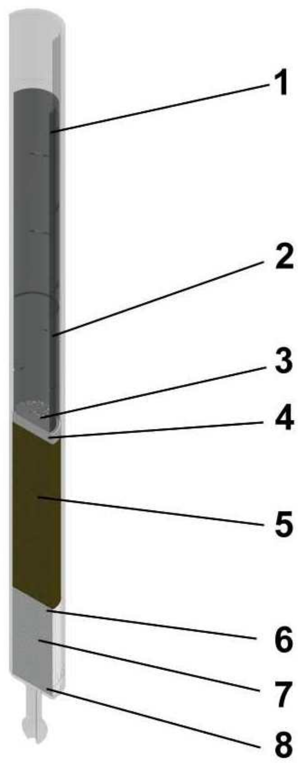


multiway valve, injection plug with cannula
(Liquid mode)



Standard combustion tube filling

The filling of the combustion tube depends on the selected operating mode.
The following table shows how to fill the combustion tube in the various modes:

Mode	
(Liquid mode)	**(Solid mode)**
	
The following list indicates the fillings to use: **1** Sheath tube	The following list indicates the fillings to use: **1** Sheath tube

2	Ash crucible	**2, 3**	Ash finger with bottom of Al_2O_3 wool
3	Quartz chips, coarse, 15 mm	**4**	Corundum balls 5mm
4	Quartz wool 5mm	**5**	Copper oxide catalyst 85 mm
5	Pt catalyst 25 mm	**6**	Corundum balls 5mm
6	Quartz wool 5mm	**7**	Quartz chips, coarse, 40 mm
7	Quartz chips, coarse, 85 mm	**8**	Quartz wool 5mm
8	Quartz wool 5mm		

Absorption tube

The absorption tube is filled with

- Magnesuim perchlorate
- Silver wool

Background knowledge required for calibration

Important calibration principles

Perfect calibration of the instrument is a key condition for achieving correct analysis results. Calibration must be performed as follows:

- separately for each operating mode,
- for each measuring component to be determined,
- over the whole measuring range in each case.

For successful calibration the user must be familiar with the analyzer and the operating instructions. The personnel performing calibration must therefore be authorized by the customer and must have undergone appropriate training.

Purpose of instrument calibration

The calibration established a relationship between the detector signal (in relative units) and the carbon and/or nitrogen contents in the sample. Within the specified measuring ranges this relation for carbon is linear. The measuring signal is represented by the x-axis, the absolute C and /or N content by the y-axis. This has the advantage opposed to "measuring signal on x-axis and concentration on y-axis" that a calibration can be used for different injection volumes.

Conditions for perfect calibration

In order to be able to calibrate the instrument perfectly, the following conditions must be met:

- The instrument must not have a leak.
- The water blank values must be low and roughly constant.
- Only use suitable substances of at least p.a. quality as calibration samples.
- The calibration must be performed separately for every operating mode.
- The sample weights of the calibration samples must cover the whole measuring range for every element.

Note: For the determination of N It is sensible to perform a calibration with different concentrations.

When to calibrate the instrument

It is always necessary to calibrate the instrument when one of the following is true:

- You have removed components that influence analysis results, e.g. the detector.
- The daily factor for a measuring component is clearly outside of the range of 0.9 to 1.1. Also, it displays fast changes in time from day to day.

For the stability of the calibration one can say that due to the mass flow controller the carbon can be run over a very long period of time without a new calibration. Even an exchange of the reactor does not necessarily mean a new calibration. For TNb, however, a new calibration is necessary more often, if necessary every working day.

Calibration formulae

The formulae used for calibration can be found in *Calibration formulae*.

Calibration curve calculation method

Details for the calibration curve calculation method criteria can be found under *Calibration curve calculation method criteria*.

Notes on performing calibration

For details on practical implementation of calibration, refer to

- the *Performing calibration* "Performing the calibration" on page 317 section and
- the *calibration tables* on page 325, "Kalibration table difference method (TIC/TC)" on page 327, "Calibration table direct method (TC, TOC, NPOC)" on page 326 for the respective mode.

Stock solution

It is recommended to prepare a higher concentrated stock solution (500 mg/l TIC + 500 mg/l TOC) and to dilute this stock solution accordingly. As a TOC standard potassium phthalate (KHP) shall be used; as a TIC standard sodium carbonate (Na_2CO_3). We strongly advise against using sodium hydrogen carbonate ($NaHCO_3$) as a TIC standard as part of a mixed standard since hydrocarbons may be decomposed in the mix due to the slightly acid character of KHP.

As TNb standard sodium nitrate ($NaNO_3$) and ammonium chloride (NH_4Cl) shall be used.

The stock solution is stable for approx. 4 weeks, stronger dilutions over 1-2 days. The composition of the above described stock solution, related to 1 l is as follows:

1,062.5 mg KHP
4,412.2 mg Na_2CO_3
1,517.9 mg $NaNO_3$
955.4 mg NH_4Cl

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Calibration types

- **Single point calibration**
  The single point calibration is the fastest way to calibrate the analyzer. However, the following shall be considered:
  - The ordinate section will be automatically set to 0. For low concentrations this may lead to strong falsifications in measuring results. Therefore, it is recommended to perform a blank value determination for the methods drinking water, ultra pure water and sea water when using a single point calibration.
  - An outlier identification for a single point calibration is only possible in nature with a triple determination. Therefore, a single point calibration shall not be performed with a double or a single determination.
  - A verification of the linearity of a calibration function is not possible with a single or double calibration.

- **Multiple point calibration**
  - Multiple point calibration from one standard solution

    The user is able to perform the calibration from one standard solution.

    Via the calibration wizard any number of calibration points with any injection volumes can be selected. The system automatically selects the different injection volumes over one order of magnitude (from 0.1-2 ml). This is possible because the sample volume has no influence on the signal size due to the use of a massflow controller. It only depends on the content of C and/or N.
  - Multiple point calibration from multiple standard solutions

    This is the most flexible but also the most costly possibility of a calibration. Via the calibration wizard any number of calibration points with any injection volumes can be selected. However, this may lead to extend the concentration range over the admissible range. It is not at all sufficient to mind the linearity of the calibration straight line. Moreover the requirements for variant homogeneity according to DIN ISO 8466-2 have to be fulfilled.

TN_b

Basically, TNb can be calibrated similar to TIC or TOC. Since the TNb analysis can be influenced more easily by outside influences than the TOC analysis which has to do with the different thermodynamic stability of the measuring species (here CO2, there NO), some specialities have to be considered.

Among others, the NO yield depends on the chemical bond and the oxidation stage of the nitrogen. Nitrate for instance has a recovery rate of approx. 100%, whereas ammonium of about 90%. When knowing the approximate sample composition, this should be considered when selecting the calibration standard. For unknown samples a mixed calibration of 50% ammonium-N and 50% nitrate-N is recommended. Such a standard for 500 mg/l TNb has the following composition:

955 mg/l NH_4Cl

1,517.9 mg $NaNO_3$

It is possible to calibrate TNb and TIC/TOC from one and the same standard solution. In this case, the above quantities of NH_4Cl and $NaNO_3$ shall be added to the TIC/TOC stock solution. The advantage of this procedure is an immense time saving. However, it shall be considered that due to high TOC contents (> 200 mg/l) the N recovery may be impaired.

Furthermore, you should notice that the TN_b calibration often can be non linear. For real sample measurements you should ensure that the calculated peak area is within the calibrated range. This also applies for small TN_b concentrations. We recommend to calibrate additionally a low TNb concentration (e.g. 1 mg/l), at least when calibrating a high measuring range.

The calibration of the TNb should be preferentially performed with different concentrations and one injection volume. A calibration of 2nd order is often recommended.

Calibration curve calculation method criteria

Calibration curve configuration options

In the individual operating modes, the user can specify the calibration curve calculation method for every measuring component according to the following criteria:

- Calibration can be performed over the whole range of sample weights or in two ranges.
- For a specific element content you can set a dividing line for two calibration ranges.
- For each range, you select a polynomial degree according to which to compute the calibration curve (linear to 4th degree).

calculation criteria

Refer to the calibration view of the combi view for calibration curve calculation method criteria. You get to the calibration view after performing or loading a series of defined calibration samples by selecting **Math > Calibrate...** and then the "Configuration calibration" dialog.

Ideal calculation method

If possible, try to compute calibration curves so that they

- are uniform over the whole range of sample weights
- and can be displayed in linear form or on the basis of a polynomial of the lowest order.

To facilitate selecting a calculation method, four typical calibration graphs are shown below along with the suitable calculation method.

Note: For better understanding the calibration graphics are shown in a simplyfied way.

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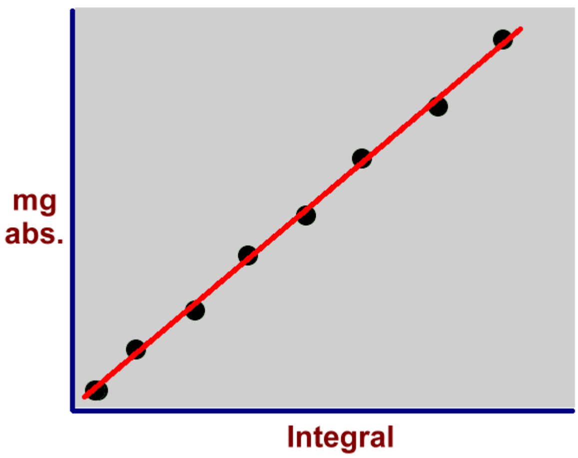
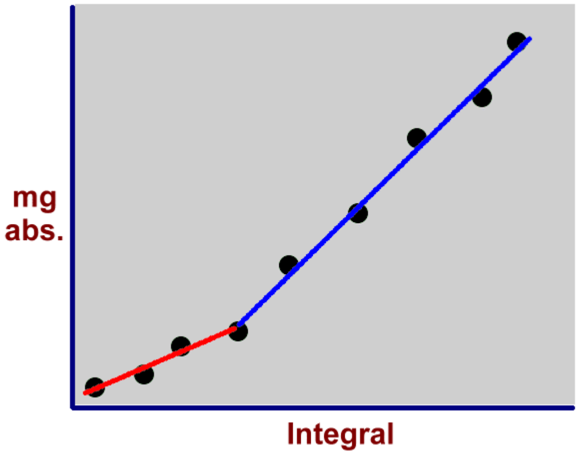
Linear calculation over the whole range

The following picture shows an example in which a linear calculation over the whole range achieves acceptable calibration curve quality.



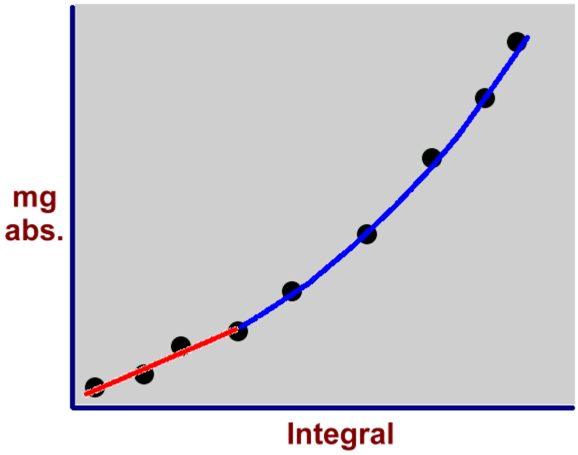
Linear calculation over two ranges

The following picture shows an example in which a linear calculation over two ranges achieves acceptable calibration curve quality.



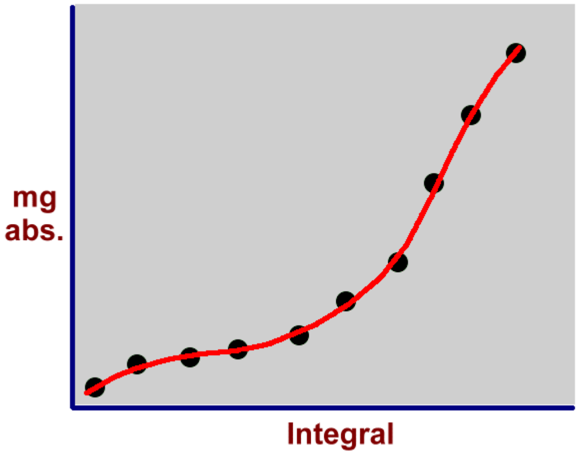
Linear and polynomial calculation

The following picture shows an example in which the calibration curve exhibits acceptable quality by means of a linear calculation in the low concentration range and a polynomial calculation in the higher concentration range.



Polynomial calculation over the whole range

The following picture shows an example in which a polynomial calculation over the whole range achieves acceptable calibration curve quality.



Achievable calibration curve quality

Process standard deviation "Proc-SD" and correlation coefficient "r" serve as a measure of achievable calibration curve quality.

With linear calibration functions the correlation coefficient should tend to 1 and with polynomial calibration functions it should be between 2 and 4.

The process standard deviation should be as low as possible.

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Calibration formulae

calculation of absolute element content

Calibration is performed by analyzing samples with known concentrations (standard samples) in which the measured peak areas are correlated with the corresponding absolute element content.

In a standard sample, the following parameters are known:

- Element concentration (percentage content)
- Weight, injection volume

Absolute element content is computed according to this formula:

$$c = a + b \cdot I_K$$

The formula consists of the following variables:

Variable	Meaning
a	Axis section
b	slope of the straight line
I_K	blank corrected area

calculation of the element concentration

First of all the blank value rates are computed, then you receive a picture of the calibration straight line with the calibration coefficients in the calibration view.

a is the axis section and b is the gradient of the straight line. From these coefficients the concentrations are computed according to:

$$c = \frac{a + b \cdot I_K}{I_V}$$

I_V represents the injection volume in l and I_k represents the peak area corrected by the blank value of the flush volume.

Furthermore you receive the correlation coefficient r as an information. This value r should be higher than 0.9900. In case r < 0.9900, look for outliers in the calibration graph. Outliers can be marked with a left mouse click and eliminated from the calibration with a right mouse click and the menu command "Exclude".

In general, special attention shall be paid when eliminating outliers. Calibration points shall only be eliminated in case of obvious outliers.

Calibration in the measuring range < 0.5 mg/l

Special care for the calibration shall be taken when measuring in the trace and ultra trace range. In general, at least a 5-point calibration with a triple determination per calibration point shall be used.

Furthermore, it has be proven to be advantageous to force the calibration straight line through the coordinate origin. For this purpose set the coefficient "a" = 0 manually after completion of the calibration evaluation.

Computing calibration coefficients

Once the absolute element contents have been computed and the peak areas have been measured for the respective sample, the pairs of values (absolute content / peak area) are transferred into a coordinate system where they form the calibration curve. By means of an algorithm, the calibration coefficients a - e are computed which, entered in a polynomial, constitute the calibration curve.

Absolute element content is computed according to this formula:

$$\boxed{y = a + b \cdot x + c \cdot x^2 + d \cdot x^3 + e \cdot x^4}$$

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The formula consists of the following variables:

Variable	Meaning
y	Absolute element content in [mg]
x	Peak area units
a...e	Calibration coefficients

Computing the quality factor for polynomials of the 1st degree

In order to assess how well the calibration curve described by the polynomial follows the actual development of the pairs of values, the softare computes a quality factor for each calibration process. For a polynomial of the 1st degree (linear equation), this quality factor corresponds to the correlation coefficient. The closer the correlation coefficient tends to 1, the better the fit.

The correlation coefficient is computed according to this formula:

$$r^2=\frac{\left[\sum_{i=1\ldots n}(x_i\cdot y_i)-\frac{\sum_{i=1\ldots n}x_i\cdot\sum_{i=1\ldots n}y_i}{n}\right]^2}{\left[\sum_{i=1\ldots n}x_i^2-\frac{\left(\sum_{i=1\ldots n}x_i\right)^2}{n}\right]\cdot\left[\sum_{i=1\ldots n}y_i^2-\frac{\left(\sum_{i=1\ldots n}y_i\right)^2}{n}\right]}$$

The formula consists of the following variables:

Variable	Meaning
r^2	Correlation coefficient
x_i	Peak areas of the respective sample
y_i	Absolute content of the respective sample
n	Number of samples

Computing the quality factor for polynomials of a higher degree

In order to assess how well the calibration curve described by the polynomial follows the actual development of the pairs of values, the softare computes a quality factor for each calibration process. For a polynomial of a higher degree, this quality factor corresponds to the sum of the error squares. The closer the sum of error squares tends to 0, the better the fit.

The sum of error squares is computed with these formulae:

$$q=\sqrt{\frac{ssq}{(n-1)}}$$

$$ssq=\sum_{i=1\ldots n}\left[\frac{(act_i-theo_i)\cdot 100}{theo_i}\right]^2$$

The formulae consist of the following variables:

Variable	Meaning
q	Quality
ssq	Sum of error squares
act_i	Actual computed absolute content of the respective sample
$theo_i$	Theoretical absolute content of the respective sample

n	Number of calibration samples

Calibration wizard

Definitions

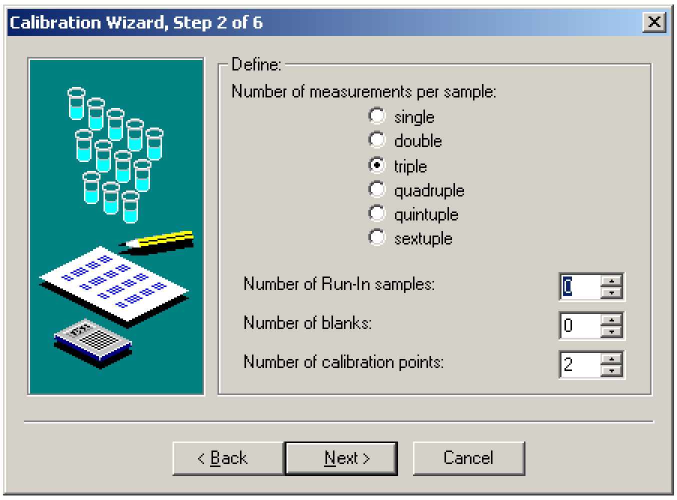
The calibration wizard allows the user to easily create a calibration via the software.

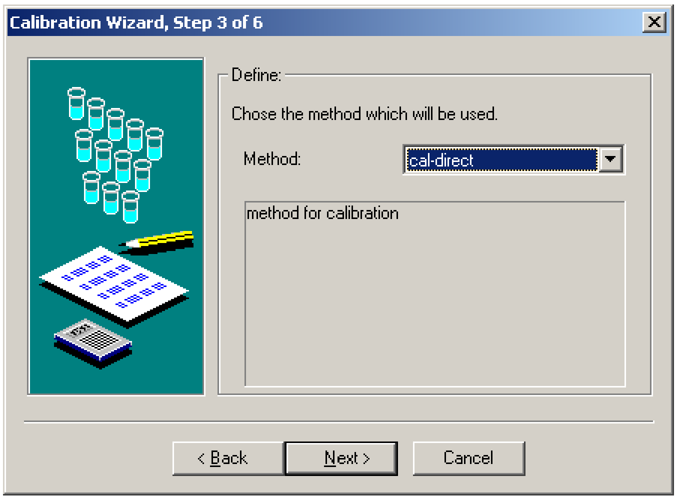
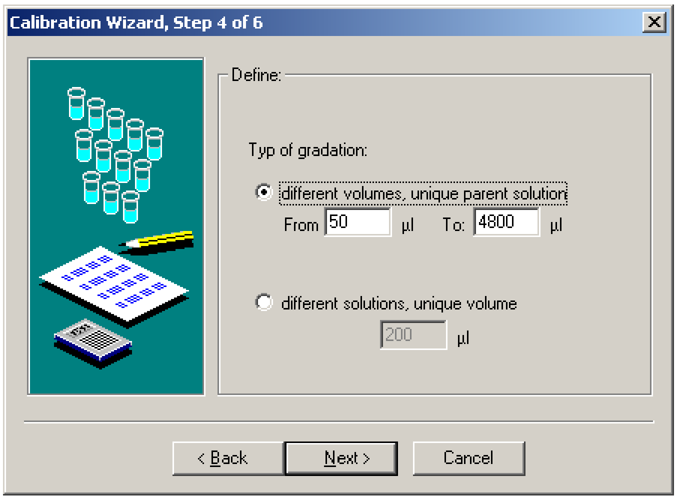
Calibration wizard

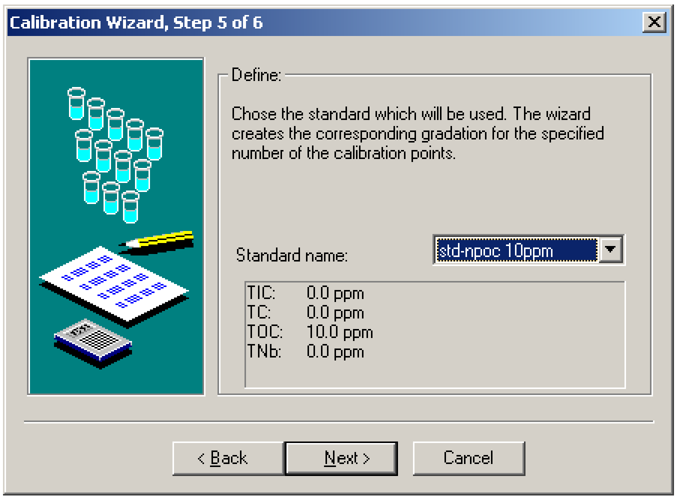
The vario TOC software offers two different calibration types:

1. different injection volumes, equal concentration
2. different concentrations, equal injection volume.

Proceed as follows to use the calibration wizard:

Step	Procedure
1	Open the dialog vario TOC in the instrument software via **Wizard > Calibration**. The calibration wizard welcomes you. The dialog "**Step 1 of 6**" appears.
2	The dialog "**Step 2 of 6**" appears.  Select the requested number of measurements per sample. Enter the number of run-in and blank value samples. Enter the number of calibration samples.

3	Click **Next**. The dialog "**Step 3 of 6**" appears.  Enter a measuring method, e.g. "cal-direct".
4	Click **Next**. The dialog "**Step 4 of 6**" appears.  Select the gradation type: ▪ different volumes (one stock solution) Select the injection volume range, if it is not preset in the method. The calibration is automatically computed by the preset calibration points. It is recommended to coordinate the calibration points with the injection volumne range in order to gain a reasonable injection volumume for the calibration. ▪ different solutions (fixed volume) Select the injection volume, if it is not preset in the method. The calibration is automatically computed by the preset calibration points, based on the highest standard substance.

5	Click **Next**. The dialog "**Step 5 of 6**" appears.  Select the standard name with which shall be calibrationed, e.g. the given standard std-npoc 10 ppm. The previously defined standards and the corresponding calibration points will be automatically carried over into the table of results. Prepare one (or multiple) stock solutions according to the selected calibration.
6	Click "**Finish**". The dialog "**Step 6 of 6**" appears. The calibration appears in the sample view.

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Routine measuring work

Definitions

Routine measuring work comprises the following activities:

- Determination of instrument blank values.
- Instrument conditioning with conditioning samples.
- Determination of daily factors.

Routine measuring work is performed at set intervals or on defined occasions before, during or after a series of measurements with real samples.

Instrument blank values

Determination of instrument blank values is depend on your needs. The following table provides a break-down of the types and purposes of the various determinations.

Purpose	Sample	Blank value(s)	Occasion
Checking gas-tightness	Distilled water	C	after maintenance work
Blank value determination of water	Distilled water	C	Evaluation of a measuring series
Blank value determination of sample additives and packing materials	▪ Sample additive ▪ Packing material	C	to allow for sample additives or packing material

Conditioning samples

Conditioning samples are measured with standard substances at the start of every series of analyses. They are used to check

- the correct course of the analysis,
- the proper condition of the instrument,
- flow and pressure behavior of the gases.

Daily factor determinations

Determination of the daily factor serves

- to fine-tune instrument calibration to room conditions at the time of analysis
- to assess the condition of the instrument by observing daily factor fluctuations and drift trends.

When to perform routine measuring work

Perform routine measuring work

- at least once a day
- additionally when measuring breaks last longer than 2 hours.

If a series of analyses exceeds a duration of 12 hours, it is advisable to determine blanks or the daily factor additionally in the middle and at the end of the series.

Formulae for blank value determination and compensation

Blank samples and blank values

Blank samples are samples

- that do not contain sample substance and
- that have a key word for identification by the software as blind samples.

Despite the lack of sample substance, a peak area value is computed on the basis of various factors when analyzing blank samples. This peak area value is referred to as a blank value. In order to compensate for this, the averaged blank value is set off against the measured peak area value of every individual analysis sample.

Blank value determination

The type of blank determination depends on the selected analysis mode. Basically, we decide between two determination modes:

- Blank determination in the solids modes
- Blank determination in the liquid modes

Blank determination in the solids modes

In blank value determination in the solids modes, the peak area values of the blank samples are averaged. The blank value is computed according to this formula:

$$\bar{b} = \frac{\sum_{i=1..n} b_i}{n}$$

The formula consists of the following variables:

Variable	Meaning
$\bar{b}$	Blank value
b_i	Peak areas of the individual blank samples
n	Number of blank samples

Blank determination in the liquid modes

For blank value determination in the liquid modes the peak areas of the blank samples are averaged and divided by the injection volume. By this, you will obain a blank value rate. This is necessary to compensate blank values of samples with different injection volumes The blank value rate is computed according to this formula:

$$\bar{r} = \frac{\sum_{i=1..n} b_i}{n \cdot v}$$

The formula consists of the following variables:

Variable	Meaning
$\bar{r}$	Bland value rate
b_i	Peak areas of the individual blank samples
n	Number of blank samples
v	Injection volume

Note: The injection volume is the same for all blank samples!

Blank value compensation

Also the type of compensation for solids and liquid samples is different.

Compensation of the blank value into the solids modes

The peak areas of the other samples are compensated with the aid of this formula:

$$a_{comp} = a - \bar{b}$$

The formula consists of the following variables:

Variable	Meaning
a_{comp}	Compensated peak area
a	Measured peak area of the sample
$\bar{b}$	Blank value

Compensation of the blank value in the liquid modes

The peak areas of the other samples are compensated with the aid of this formula:

$$a_{comp} = a - \bar{r} \cdot v$$

The formula consists of the following variables:

Variable	Meaning
a_{comp}	Compensated peak area
a	Measured peak area of the sample
$\bar{r}$	Blank value
v	Injection volume

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Formula for determining the daily factor

Determining the daily factor

Standard samples are analyzed to determine the daily factor. The known element concentration of the standard samples is correlated with the actual element concentration computed.

Daily factor

The daily factor is computed according to this formula:

$$f = \frac{c_{theo}}{c_{act}}$$

The formula consists of the following variables:

Variable	Meaning
f	Daily factor
c_{theo}	Theoretical element concentration
c_{act}	Actual element concentration computed

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2.4 Database working environment

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

The following section is designed to help you understand and get to know the database working environment.

Overview

"Database working environment" is divided into the following topics:

Topic	Page
Database	90
Administrative work on the database	91
Database backup	92

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Database

What is a database?

A database is characterized by the following:

- A database is an organized collection of data managed by a data management system.
- Different users can access shared data in a database.
- Databases allow the user to input, edit and delete data.
- Databases permit searching and selecting data with the aid of filters.
- Databases allow the user to create evaluations and statistics.
- Databases allow the user to output data in the form of reports.

Maximum database size

The maximum size of the database is limited to 2 gigabytes. The software displays a warning if the size of the database exceeds 1 gigabyte or if available disk space is less than 1 gigabyte. In this case the database should be reorganized. Cf. *Administrative work on the database* on page 91.

Database protection

If 21 CFR Part 11 functionality is enabled, the database protects you from:

- Data loss. The sample data can only be overwritten as long as these samples have not yet been analyzed. Afterwards, a new file version is created retaining the same file name and the previous version. This allows you to track all changes to the sample data.
- Data distortion. Authorized individuals can add an electronic signature to data documents; the authenticity of this signature can be verified. In addition, the activities of the indiviual users are recorded in a logbook for tracking purposes along with a timestamp and user name.
- Unauthorized access to data. There are various password-protected user levels. This allows you to restrict access to the various menu functions.

Cf. *21 CFR Part 11 functionality* on page 110.

Administrative work on the database

Reorganizing the database	The software always works with one and the same database. Because the size of the database is limited to 2 gigabytes, it is necessary to reorganize the database regularly. Database reorganization removes all sample data and the contents of the logbook from the database file, but retains the other data such as settings, coefficients, etc.
Datebase backup	"Backup" copies the complete existing database file to a certain directory under a different name, thereby "capturing" a certain state.
Export and import	It is not possible to load and save data from/to a database in the usual way. However, by using the **File > Export** and **File > Import** menu functions it is possible to transport documents "out of" the database and to transport external documents "into" the database.
Restoring the database	"Restore" reloads an old database file and irrevocably deletes the current data.

Database backup

What happens during backup?

Backup copies the complete existing database file to a certain directory under a different name, thereby "capturing" a certain state.

Backup settings

The following backup settings are available:

- Auto-start backup:
  - daily,
  - every X minutes,
  - every X hours,
  - once at a certain time.
- Start backup manually.

Auto-save

The document currently open is automatically saved to a temporary file every 3 minutes if it is changed.

Autoexport

Autoexport creates a backup of the current document as an mdb file after every save or sub-save process. The advantage of this is that you do not always have to save the whole database. However, autoexport is only performed if you have defined a directory for saving backups. You can set this directory in the Configuration menu. The file name is as follows: xxxxx.YYMMDDhhmmss.mdb.

The file name consists of the following components:

Variable	Meaning
xxxxx	Document name
YYMMDD	Current date (year, month, day)
hhmmss	Current time (hour, minute, second)

2.5 Understanding the operating software

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

This section describes

- the layout of the user interface,
- what instrument functions are controlled by the software,
- what current information is displayed during the analysis process,
- and how the raw analysis data are further processed, archived and managed.

Overview

"Understanding the operating software" is divided into the following topics:

Topic	Page
Basic functions of the operating software	94
Software user interface	95
Sample view	97
Combi view	99
Status view	102
Right mouse button function	104

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Basic functions of the operating software

Introduction

The following section describes the functions of the operating software and what instrument control and data processing operation are possible.

Instrument control and parametrization

Instrument control and parametrization functions:

- Starting a single analysis:
- Starting and stopping a series of analyses
- Entering parameters to prepare the instrument for measuring and for standby mode transitioning (wake-up and sleep functions)
- Determination of methods
- Specifying time and temperature parameters of the analyzer

Data input

Data input functions:

- Sample weight
- Name
- Blank values

Processing measuring data

Measuring data processing functions:

- Measurement and numerical output of element contents in absolute values and percentages
- Statistical evaluation of analysis data

Management of analysis data; data security

Analysis data management and data security functions

- Importing/exporting from and to Excel and Access
- Interfaces to LIMS and AQA software
- Security functions using digital signatures

Support for maintenance/repair

Maintenance and repair support functions:

- Definition of maintenance events and display when due
- calculation of calibration coefficients and assessment criteria for calibration quality
- System diagnostics functions

Display analysis values and instrument state

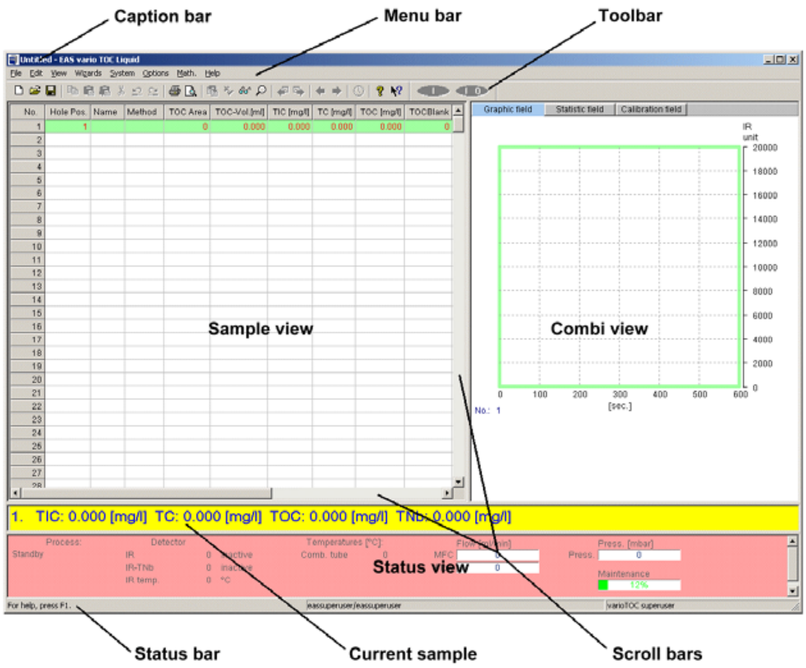
Display functions for current analysis value and current instrument state:

- Analysis progress
- Temperature of the reaction tube
- Gas flow
- pressure conditions in the instrument
- Due time/date of next maintenance event
- Current detector display
- Element content of current sample

Software user interface

The main window of the operating software

The following screenshot shows the main window of the operating software and designates the various areas and bars:



Titlebar

The titlebar displays the name of the file that you are currently processing. The titlebar has the usual functions for displaying the system menu and for minimizing, maximizing and closing the window.

Menubar

The menubar shows the top level of the menu tree. You can access dialogs and input windows, etc. from the menubar for the following

- Saving, editing and managing analysis data,
- Defining and entering sample data and instrument parameters,
- Specifying maintenance events,
- Configuring and performing statistical evaluations.

Details on the various dialogs and input windows accessible from the menubar can be found at *Menu and dialog descriptions* on page 555 and in the online help.

Toolbar

The toolbar allows you quick access to frequently required commands and functions. Via the toolbar you can

- Create or save analysis series in the form of a file and open existing analysis files,
- Cut, copy and paste sample data,
- Switch the sample view,
- Enable statistical and calibration functions,
- "Wake up" the "sleeping" instrument,
- Start and stop individual and continuous analyses,
- Display the online help.

	Details on the various buttons on teh toolbar can be found at *Toolbar* on page 612 and in the online help.
Sample view	The sample view displays a table of input, measuring and computed analysis data of all samples in a particular series. If an error occurs while measuring a sample, the table contains an appropriate message. For details on the sample view, cf. *The sample view* "Sample view" on page 97.
Combi view	The combi view contains different information depending on the selected display mode: ▪ In progression/graph view, it displays the time-dependent development of the detector signal or a diagram of various instrument parameters of the currently selected sample. ▪ In statistics view it displays statistical analysis data of the selected group of samples. ▪ In calibration window view it displays a diagram of the calibration factors for the series under review and the calibration curves of the individual elements. For details on the combi view and its various display modes please refer to *The combi view* "Combi view" on page 99.
"Current sample" field	This field displays a zoomed-in view of the data of the current sample. Here you can view the analysis results of the particular sample at a glance, even if you are not directly in front of the screen.
Status view	The status view contains information about the current operating states of the analyzer. For details on the status view, cf. *The status view* "Status view" on page 102.
Status bar	The status bar can contain the following information: ▪ If you hover the mouse over a menu command or toolbar button, a short help text on the command is displayed on the left of the status bar. ▪ The name of the current user logged in is displayed in the middle of the status bar. ▪ The name of the user group to which the currently logged in user belongs is displayed on the right.

Sample view

Introduction

The following section describes what you can input in the sample view and what information you can get from the sample view.

View

The sample view looks like a familiar calculation sheet in a spreadsheet program.

No.	Hole Pos.	Name	Method	TOC Area	TOC-Vol.[ml]	TOC [mg/l]	TOCBlank	Date Time
√ 16	6	Test	Direct 1ppm-100ppm	6 745	0.250	10.329	338	4.09.2007 17:2
√ 17	6	Test	Direct 1ppm-100ppm	6 667	0.250	10.200	338	4.09.2007 17:2
√ 18	6	Test	Direct 1ppm-100ppm	6 723	0.250	10.292	338	4.09.2007 17:3
√ 19	7	Test	Direct 1ppm-100ppm	6 668	0.250	10.201	338	4.09.2007 17:4
√ 20	7	Test	Direct 1ppm-100ppm	6 756	0.250	10.347	338	4.09.2007 17:4
√ 21	7	Test	Direct 1ppm-100ppm	6 748	0.250	10.334	338	4.09.2007 17:4
√ 22	8	Test	Direct 1ppm-100ppm	6 620	0.250	10.122	338	4.09.2007 17:5
√ 23	8	Test	Direct 1ppm-100ppm	6 427	0.250	9.803	338	4.09.2007 17:5
√ 24	8	Test	Direct 1ppm-100ppm	6 688	0.250	10.234	338	4.09.2007 18:0
√ 25	9	Test	Direct 1ppm-100ppm	6 436	0.250	9.817	338	4.09.2007 18:1
√ 26	9	Test	Direct 1ppm-100ppm	6 616	0.250	10.115	338	4.09.2007 18:1
√ 27	9	Test	Direct 1ppm-100ppm	6 608	0.250	10.102	338	4.09.2007 18:1
√ 28	10	Test	Direct 1ppm-100ppm	6 622	0.250	10.125	338	4.09.2007 18:2
√ 29	10	Test	Direct 1ppm-100ppm	6 635	0.250	10.147	338	4.09.2007 18:2
√ 30	10	Test	Direct 1ppm-100ppm	6 654	0.250	10.178	338	4.09.2007 18:3

Sample view input functions

In the sample view you define the sequence of your analysis samples. The sequence must match the sequence in which you arrange your samples on the carousel.

In order for the instrument to analyze and evaluate a sample correctly, you must have entered the appropriate information in the sample view columns:

Column	Explanation
TOC volume (ml) or weight [mg] (solids)	Sample weight in ml or mg (if the instrument is not connected to a balance that automatically transfers the sample weight to the computer).
Name	Sample name; for samples which serve for the performance of measuring routine work, the predefined keywords have to be used.
Method	Assignment of an analysis method, see direct methed, difference method.
Coefficients	Assignment of a coefficients set.

In the "Memo" column you can input any special features of the sample or the analysis procedure as free text.

Color coding

Some table lines in the sample view are highlighted by a colored background or colored text. The following table indicates the meaning of the various color codes:

Color code	Meaning
green background	Green background indicates the current sample.
yellow background	Yellow background indicates the current weighed sample.
red font	Red text indicates a sample with a stop marker set.
green font	Green text indicates samples with reserved names for routine measuring work or calibration samples.
black font	Black text indicates all other samples.

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Meaning of symbols in the "No." column

In the "No." column a symbol is displayed next to the serial number generated by the system; this symbol indicates the status of the individual samples. The following table lists the possible symbols and what they mean.

Icon	Meaning
	Sample not yet analyzed, but a measuring method has been set and a sample weight exists.
	Sample not yet analyzed, no measuring method has been set and/or no sample weight exists yet.
	Sample analyzed error-free with valid date information.
	Sample without valid date information.
	Sample which caused a non-critical error during measurement or which exceeded a calibration range. The error code is entered in the "Info" column, cf. *Interpreting PC error messages* on page 524.
STOP	Sample at which the series was stopped.

Measung of the column "Hole pos."

In the column "Hole pos." the position numbers appear, with an existing sampler, which shall be processed.

Further information in the sample view

Depending on the selected operating mode, the following values can be displayed in the appropriate columns for each analyzed sample:

- the integral of the individual measuring components
- the containing element concentrations of the samples
- the daily factors of the elements for the particular sample
- the blank values of the elements for the particular sample
- date and time of measuring the particular sample

By selecting the **View > Configuration** menu you can show/hide every table column and define the order as desired.

Note on data output

The selected sample view screen view also corresponds to the display in a printed report.

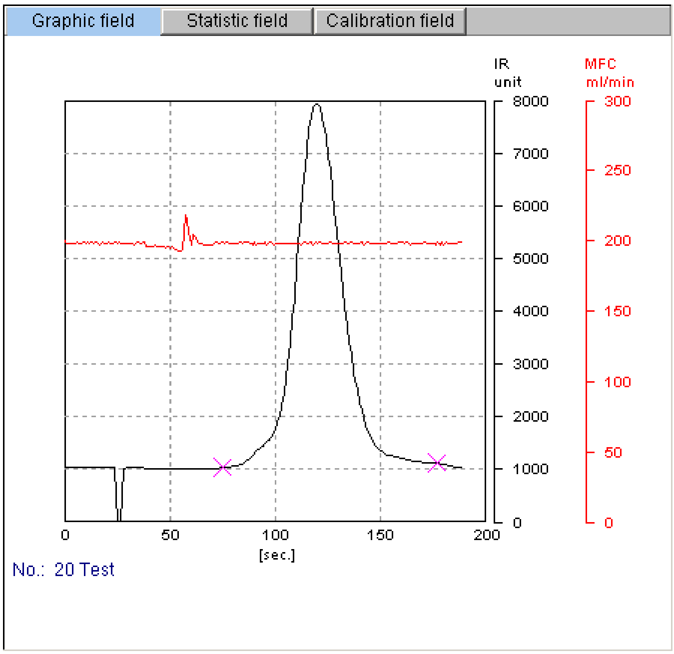
Combi view

Introduction

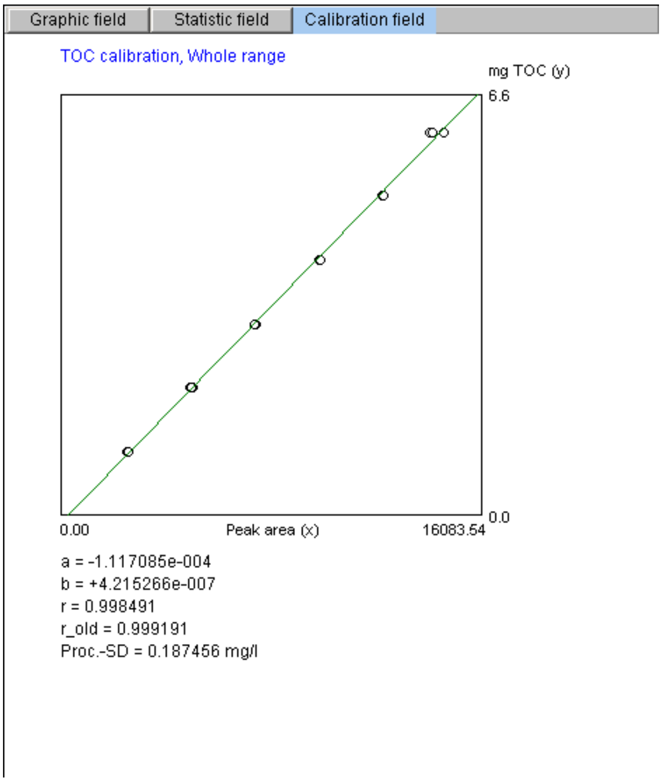
The following section describes the various views of the combi view and their information contents.

Views

By selecting the **View > Change** menu you can switch between the following combi views:

<table>
<tr><th>Name</th><th>View</th></tr>
<tr><td>Progression view
(Graph view)</td><td>
</td></tr>
<tr><td>Statistics view</td><td>Graphic field | Statistic field | Calibration field
<table>
<tr><th>No. Name</th><th>TOC [mg/l]</th></tr>
<tr><td>17 Test</td><td>10.200</td></tr>
<tr><td>19 Test</td><td>10.201</td></tr>
<tr><td>22 Test</td><td>10.122</td></tr>
<tr><td>24 Test</td><td>10.234</td></tr>
<tr><td>26 Test</td><td>10.115</td></tr>
<tr><td>27 Test</td><td>10.102</td></tr>
<tr><td>28 Test</td><td>10.125</td></tr>
<tr><td>29 Test</td><td>10.147</td></tr>
<tr><td>30 Test</td><td>10.178</td></tr>
<tr><td>Mean value</td><td>10.158</td></tr>
<tr><td>Deviation, abs.</td><td>0.047</td></tr>
<tr><td>Deviation, rel. [%]</td><td>0.458</td></tr>
<tr><td>Delta [%]</td><td>0.132</td></tr>
</table></td></tr>
</table>

Calibration view



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Progression view

Progression view displays a graph of the development over time of important instrument parameters and measured values during measurement of the sample selected in the sample view.

You can recognize the current sample by the green border around the graph display and the green background of the titlebar.

You can display the following individual parameters and measured values:

- the temperatures of
  - Combustion tube
- gas flow through the MFC-IR
- the carrier gas flow
- pressure in the instrument
- the detector output signal

For details on configuring the analysis progression view cf. *Data backup and printing* on page 270.

The statistics view

The statistics view displays the contents [mg/l] of all samples in a series, grouped by sample name.

For each group of samples, the following calculated statistical values are also displayed:

- percentage mean values of the element contents
- absolute standard deviation of the mean values
- relative standard deviation of the mean values
- the difference (Delta) of the highest and lowest element content of each group

You can exclude individual samples and/or values of a group from the computation of statistical values or include them again.

The calibration view

If the series include samples previously defined as calibration samples, you can use them to calculate calibration coefficients.

In this case, the calibration view displays the following information:

- for each element and each defined calibration range a graph displays the calibration curve optimized for the respective calibration samples.
- the correlation coefficient for the depicted calibration curve that allows you to assess the quality of calibration.

In the graph display, the samples used to compute the calibration curves are displayed as small circles. You can click one of these circles to display further information on the particular sample, cf. *Background knowledge required for calibration* on page 73. This information allows you to assess whether the sample must be treated as an "outlier" and therefore excluded from the computation of the calibration coefficients.

If you have evaluated the calibration curves in this way for each element and browse on to the next view, the "calibration coefficient" dialog is displayed with the current computed values. When you confirm this dialog by clicking "OK", the calibration coefficients for the series are applied and the content of the calibration view is deleted (message: "No calibration or calibration finished").

Note on data output

The selected screen view of the combi view also corresponds to the display in a printed report.

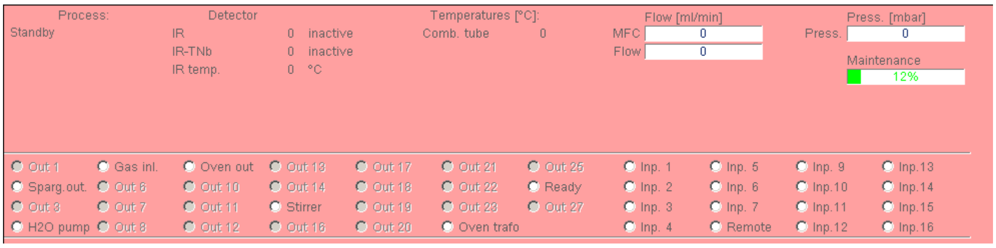
Status view

Introduction

The following section describes what information about the analysis procedure and the condition of the instrument is displayed in the status view.

View

The following screenshot shows the status view in offline status:



Meaning of the colored background

On the basis of the color of the status view background you can tell straight away whether the PC is properly connected to the analyzer.

The meaning of the colors is:

Area	Meaning
green	The analyzer is connected to the PC and switched on. With the aid of the PC you can ▪ enter analysis or instrument parameters ▪ start or abort analyses ▪ perform maintenance or diagnostics tasks.
pink	The analyzer is not connected to the PC or switched off. ▪ The operating software is running in offline status.

The areas of the status view and what they mean

The following table lists the individual areas of the status view and the information they contain:

Area	Meaning
Procedure	Displays a list of individual processes during the analysis procedure. The current process is highlighted with a colored background so that you can see the progress of the analysis of the current sample straight away. Displays "Idle mode" when the instrument is in idle mode.
IR detector	Displays the following current values of the detector unit: ▪ the current height of the current measuring peak
Temperatures	Displays the current temperatures of the following units: ▪ Combustion tube ▪ IR temperature
Flow	Displays the following current gas flows: ▪ through the MFC-IR ▪ Carrier gas flow through the analysis apparatus In addition to the numeric data, the gas flows are also displayed in bar chart form.
Pressure	Displays the current pressure in the apparatus numerically and as a bar chart.

<table>
<tr><td rowspan="5">Maintenance</td><td colspan="2">Maintenance intervals for the analyzer are defined on the basis of the maximum number of measured samples until a certain maintenance event occurs, cf. Defining maintenance intervals in the software "Defining maintenance intervals in the software." on page 302.
The maintenance section displays the current percentage of the specified number of samples until the next maintenance interval.

This figure is displayed numerically and as a bar chart. The colors of the chart indicates the progress of the the next due maintenance interval.</td></tr>
<tr><th>Chart colors</th><th>% measured samples until next maintenance event</th></tr>
<tr><td>green</td><td>less than 80%</td></tr>
<tr><td>yellow</td><td>80 to 99%</td></tr>
<tr><td>red</td><td>more than 99%</td></tr>
<tr><td></td><td colspan="2">When a maintenance interval is due, its name is displayed as text on the bar chart and a symbol flashes drawing the user's attention to this issue.</td></tr>
</table>

Right mouse button function

In the sample window.

Depending on what is selected, pressing the right mouse button in the sample view displays a selection or all of the following commands:

Commands	Meaning
Copy	Copies the contents of a selected line to the clipboard.
Delete	Deletes the contents of a selected line.
Paste	Inserts the contents of the clipboard in the selected line.
Set current sample	Opens the "Set current sample" dialog.
Set stop marker	Opens the "Set stop marker" dialog.
Set current weighed sample	Opens the "Set current weighed sample" dialog.

In the combi view

If the combi view is in statistics view you can press the right mouse button to display the **Configure view** and **Include/exclude sample** commands:

Commands	Meaning
Configure view	Opens the "Configure statistics view" dialog.
Include/exclude sample	Includes/excludes a sample from the statistical calculation.

If the combi view is in graph view, you can right-click to display the "Configure graph view" dialog.

In dialogs

In dialogs you can also press the right mouse button to display certain commands. In the "Configure view" dialog, right click to display the **Properties** command, that opens the "Column properties" dialog.

The dialog enables you to configure the text view. Thus, you can define column names, units and decimal places.

2.6 Data administration and data security

Target group

The target group of this section is personnel with basic chemical knowledge and basic computer knowledge.

Purpose

This section describes what options the vario TOC system offers with regard to data administration and data security.

Overview

"Data administration and data security" is divided into the following topics:

Topic	Page
Laboratory information and management system (LIMS)	106
Requirements for operation of the laboratory information and management system (LIMS)	107
Analytical quality assurance (AQA)	108
User settings for analytical quality assurance (AQA)	109
21 CFR Part 11 functionality	110
Versioning	112
Linking the analyzer and software	113

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Laboratory information and management system (LIMS)

What does LIMS do?

The laboratory information and management system LIMS collects and manages data from different systems and thereby facilitates laboratory operation and documentation.

Interaction between the software and LIMS

The following features characterise the interaction between the analyzer software and LIMS:

- the flow of data is unidirectional, i.e. it only goes in one direction, from the analyzer to LIMS.
- Data transfer is either via the serial interface or through the network.
- The data to be transferred can be selected.
- The data are transferred as ASCII files.
- The names of the ASCII files are formed from a time/date stamp and a freely definable file extension.
- Every data transfer includes a freely definable user name and a freely definable instrument identifier.
- Data can be sent automatically after every analysis or manually by selecting the appropriate menu command.

File name structure

The file name generated for LIMS has the following format: dddsssss.xxx, consisting of the following elements:

File name elements	Meaning
ddd	Days since January 1
sssss	Seconds since midnight.
xxx	File extension defined by the user.

Sequence of data transferred.

The sequence of the data transferred corresponds to the list of data in the "LIMS settings" dialog, "LIMS data" tab, from top to bottom. Cf. *LIMS settings* on page 680.

Requirements for operation of the laboratory information and management system (LIMS)

Data transfer via the serial interface	Normally, data transfer to LIMS is performed through a network. However, if you want to transfer data via the serial interface, you must make sure that the LIMS port name is not identical to the port name between the PC and the analyzer. This could lead to a system crash.
Identical LIMS and instrument software settings	When transferring data to LIMS, observe the following: ▪ The LIMS program receving the data must be set to the same data volume as the sender Elementar program. If you change the LIMS settings, you must therefore adjust the LIMS program appropriately. ▪ The data sent to LIMS are tab-separated. The LIMS program must be able to interpret this correctly.

Analytical quality assurance (AQA)

What is AQA?

Elementar Analysensysteme GmbH offers an AQA software with which you can evaluate analysis data for the purpose of quality assurance. A menu command sends the data to the AQA program running in the background where they are saved and interpolated on an appropriate control card depending on the purpose.

AQA software operations

The following operations can be performed with the AQA software:

- Generation and administration of
  - mean value control cards
  - recovery control cards
  - span control cards
  - difference control cards
- Evaluation of
  - calibration tests / determination of detection limit
  - system suitability tests

Meaning of the operations

The various operations have the following meanings:

Type of operation	Meaning
Mean value	Verifying the precision of an analysis method
Recovery	Monitoring the recovery rate of standard substances
Span	Monitoring of the distribution of individual analysis results within and between subgroups.
Difference	Monitoring of differences between repeat-determined samples.
Calibration test / detection limit	Verifying the calibration of the system and computing its detection limit (only relevant when analyzing liquid samples).
System suitability test	Check how well suited the analysis system is for analyzing substances that are easy and difficult to decompose.

User settings for analytical quality assurance (AQA)

User settings

The user makes the following settings:

- The user selects the samples whose data he wants to send to the AQA software.
- The user specifies how the AQA software is to interpret the data it receives. The software has to know what control card it has to save and interpret the data.
- If multiple analyzers are connected to the PC, the user must enter the identifier of the appropriate analyzer so that the AQA data can be allocated to the correct analyzer.

Further information

Further information can be found in:

- *Define AQA export* on page 572
- and in the description of the AQA software.

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21 CFR Part 11 functionality

What is 21 CFR Part 11?

21 CFR Part 11 is a regulation that was published by the American Food and Drug Administration (FDA), under number 21 CFR part 11, at the end of the 1990s and that has legal force in the USA. It governs technical and organizational requirements to be fulfilled in order to use electronic data and documents instead of paper for development, approval and production.

Whom does 21 CFR Part 11 apply to?

21 CFR Part 11 applies to:

- All sectors of the pharmaceutical and medical technology industry in the USA working in FDA-regulated areas. They are obliged to keep their electronic data and computer systems in conformance with 21 CFR Part 11.
- Also, all companies outside of the USA that manufacture products for the American market or develop products with regard to having them subsequently approved for the US market.

Requirements of 21 CFR Part 11

The vario TOC system conforms to 21 CFR Part 11 and therefore meets the following requirements:

- Generation of exact electronic analysis data.
- Protection of the generated analysis data from intentional and unintentional modification.
- Possibility of performing audit trails.
- Signing of electronic documents with electronic signatures.
- Access control to menu functions by password-protected user levels.

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Generation of exact analytical analysis data.

The data recorded during the analysis process are converted into the respective element contents with the aid of algorithms and reliably saved. Generation of exact results is therefore ensured.

Protection of analysis data

The recorded and computed data are stored in a database. The sample data can only be overwritten as long as these samples have not yet been analyzed. Afterwards, a new file version is created retaining the same file name and the previous version. This allows end-to-end tracking of changes in the series of samples, whereas unauthorized manipulating of the data is not possible as they are encapsulated in the database. Cf. *Versioning* on page 112.

Performing audit trails

Every user action is recorded and permanently stored in a logfile - the logbook. All actions are given a timestamp and the name of the user currently logged in. Some actions must be justified by the respective user and this justification is also saved to the logfile. The logbook records can be viewed when performing audit trails. This makes it possible to evidence appropriate procedure in generating the data and operating the analyzer.

Signing documents

Every document can be "signed" up to three times by authorized individuals. This is done on the following occasions:

- When the document is created,
- When the document is reviewed,
- In order to release the document.

When signing, the signee enters a password only known to him. With the aid of this password and a key, it is possible to check the correct document signature at other points (for example after sending the document by e-mail). It is thus possible to ascertain whether the data contained are authentic.

Restricted access to menu functions

The software restricts access to the menu functions on the basis of three user groups:

- the lowest user group may only perform actions required in routine operation.
- The middle user group may also perform actions requiring experience, e.g. calibration.
- The top user group may also perform actions requiring a great deal of experience, e.g. changes to the system configuration.

The software also prevents unauthorized individuals from interfering with the system when the authorized user is not present. If the user has not performed an action for some time, the software prompts him to log in again.

Versioning

Versioning	If 21 CFR Part 11 functionality is enabled, a new version of the document is created as soon as an analyzed sample is changed.
Version identification	Every version is identified as follows: ▪ with an index number, ▪ with the date of creation, ▪ and with the name of the user who made the change. The current version is number 0, the previous versions are indexed -1, -2, etc.
Protection of previous versions	Previous versions are write-protected, i.e. they cannot be edited but only viewed or printed out.

Linking the analyzer and software

Linking the analyzer and software

It is important that the analysis data can be unambiguously allocated to the analyzer with which they were generated. This allocation is performed via a serial number. In every vario TOC system, the individual serial number is stored in a memory module and queried by the software when you launch the program. The program can only be operated in combination with the analyzer if the serial number matches the software licence number. This ensures that the analyzer is always operated together with the same software and the settings recorded in the logbook.

3

Work performed by the system administrator

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to perform typical system administrator tasks.

Overview

"Tasks performed by the system administrator" is divided into the following sections:

Section **Page**

Installing and updating the software 115
Configure analyzer 116
Defining export settings for AQA and LIMS 122
Setting up user administration 125
Defining interfaces 130
Editing analysis data 136
Performing checks 140
Working with the database 145
Ways of optimizing the use of the analyzer 156
Performing other administrator tasks 161

3.1 Installing and updating the software.

Requirements for installing the software

In order to install the software correctly, administrator rights for the PC must be available.

Conditions for operating the software

Do the following to be able to operate the software without any problems:

- On the PC where the software is installed, check power management settings under **Control Panel > Power Management** or under **Control Panel > Power Options**.
  The following options must be set to "Never":
  - "Turn off monitor"
  - "Turn off hard disks"
  - "System stand by"
  - "System hibernates"
- Power management must also be disabled in the PC's BIOS.
- The PC on which the software is installed must not be overloaded with other software. This could cause unstable operation of the software.

Installing and updating the software.

Proceed as follows to install or update the software:

Step	Procedure
1	Insert the enclosed CD in the CD-ROM drive. The CD usually starts automatically.
2	If the CD does not start automatically, start it by running "setup.exe" on the CD.
3	Select the desired language.
4	The installation wizard is displayed. Click **Next** and follow the steps of the installation wizard.

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3.2 Configure analyzer

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to configure the analyzer as system administrator.

Overview

"Configuring the analyzer" is divided into the following sections:

Topic	Page
What can you modify in the configuration?	117
Defining logon timeout	118
Creating new sections	120

What can you modify in the configuration?

Where are changes allowed?

Caution	Improper changes Improper changes impair proper operation of the system and may destroy system components. Only configure the instrument if you are authorized to do so and observe the operating instructions.

The entries that may be changed in the configuration are located on the following tabs:

- DEVICE.INI
- LEAKTEST.INI

What can you set?

You can set the following in the configuration:

- Interface properties
- Weighing data properties
- Signature program properties
- Instrument parameters

Cf. *Configuring vario TOC* "Configure vario TOC" on page 695.

Defining logon timeout

What is the logon timeout?

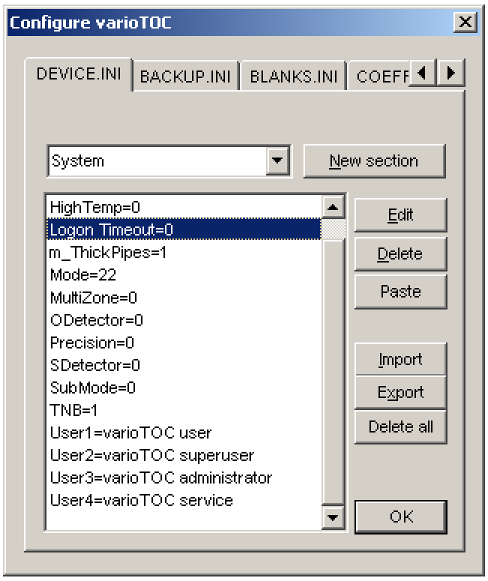
The logon timeout defines the time to wait in which the user does not perform any action before the operating software displays a dialog to log in again.

Defining logon timeout

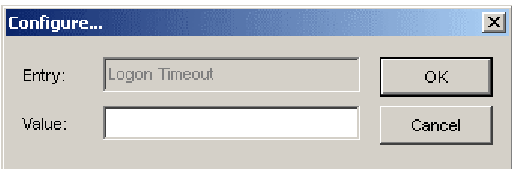
Caution	Improper changes Improper changes impair proper operation of the system and may destroy system components. Only configure the instrument if you are authorized to do so and observe the operating instructions.

Proceed as follows to define a logon timeout:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Configure vario TOC" dialog by selecting Options > Configuration.</td></tr>
<tr><td>2</td><td>Select the "DEVICE.INI" tab. Select the "System" section by clicking the arrow next to the dropdown listbox.



</td></tr>
<tr><td>3</td><td>Select "Logon Timeout" and click Edit.
The "Configure key value" dialog is displayed:



</td></tr>
</table>

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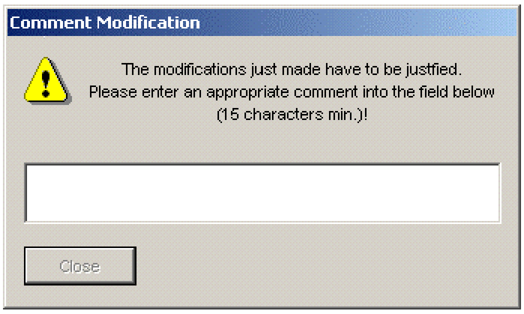
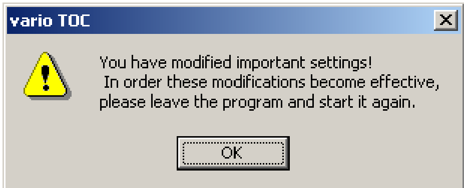
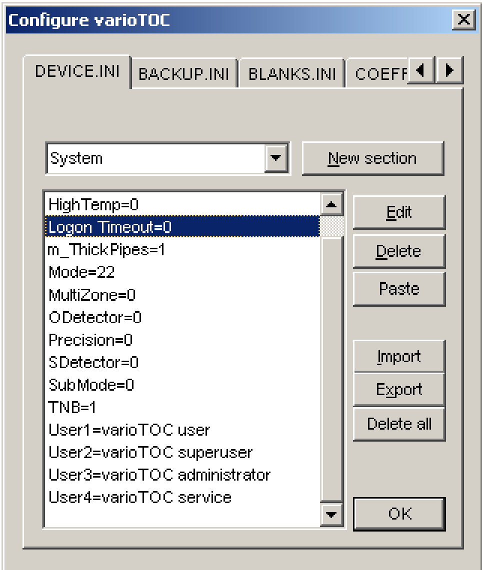
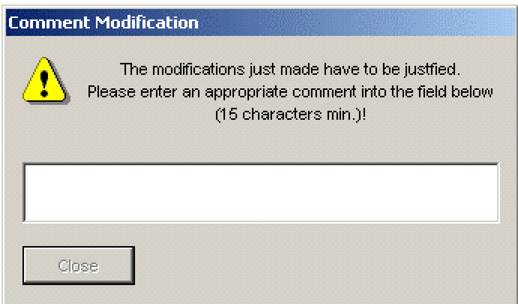
4	Enter the number of seconds to wait before displaying the login dialog again in the "Value" field and click **OK**. The "Comment change" dialog is displayed: 
5	Enter a justification in the "Comment changes" dialog and click **Close**.
6	Click **OK** in the "Configure vario TOC" dialog. Your settings are saved and the dialog is closed. The following dialog is displayed: 
7	Click **OK** and quit the operating software.
8	Restart the operating software as required.

Creating new sections

Creating new sections

Caution	Improper changes Improper changes impair proper operation of the system and may destroy system components. Only configure the instrument if you are authorized to do so and observe the operating instructions.

Proceed as follows to create new sections:

Step	Procedure
1	Open the "Configure vario TOC" dialog by selecting **Options > Configuration**. 
2	Select the tab for which you want to create a new section.
3	Enter the name of the new section in the dropdown listbox and click **New Section** to the right of it. The "Comment changes" dialog is displayed: 
4	Enter a justification in the "Comment changes" dialog and click **Close**.

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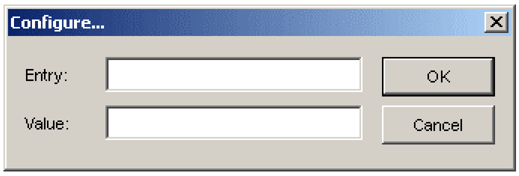
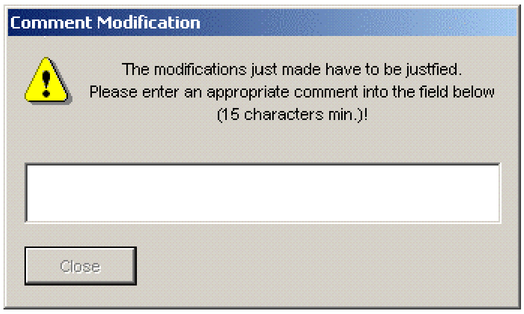
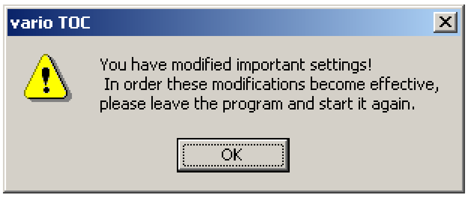
5	Click **Insert** in the "Configure vario TOC" dialog. The "Configure key value" dialog is displayed: 
6	Enter your values in the "Key" and "Value" fields and click **OK**. The "Comment change" dialog is displayed. 
7	Enter a justification in the "Comment changes" dialog and click **Close**. The new section and its entry are entered in the "Configure vario TOC" dialog.
8	Click **OK** in the "Configure vario TOC" dialog. Your settings are saved and the dialog is closed. The following dialog is displayed: 
9	Click **OK** and quit the operating software.
10	Restart the operating software as required.

3.3 Defining export settings for AQA and LIMS

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to define export settings for AQA and LIMS as system administrator.

Overview

"Defining export settings for AQA and LIMS" is divided into the following sections:

Topic	Page
Export settings for analytical quality assurance (AQA)	123
Export settings for the laboratory information and management system (LIMS)	124

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Export settings for analytical quality assurance (AQA)

What is set?

The following are set for AQA:

- What data to send.
- How AQA interprets the data.
- What instrument the data belong to.

Cf. *Define AQA export* on page 572.

Export settings for the laboratory information and management system (LIMS)

What is set?

The following are set for LIMS:

- What data to send.
- Whether the data is transferred via interface or network.
- The interface settings.
- What instrument the data belong to.

Cf. *LIMS settings* on page 680.

3.4 Setting up user administration

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to set up the user administration as system administrator.

Overview

"Setting up user administration" is divided into the following sections:

Topic **Page**
User administration 126
Recommendations for user administration..127
Granting authorizations 128

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User administration

User groups

Access to menu functions is restricted on the basis of three user groups in the operating software. These groups are automatically set up when you install the software under Windows:

- The user group "vario TOC user" with the lowest authorizations.
- The user group "vario TOC superuser" with more authorizations.
- The user group "vario TOC administrator" with most authorizations.

Allocating users to user groups

The following standard users are automatically allocated to the user groups:

User group	Standard user
vario TOCuser	easuser
vario TOCsuperuser	eassuperuser
vario TOCadministrator	easadmin

The system administrator must allocate additional individual users via the Windows control panel. Refer to the Windows help for further information.

Users belonging to multiple user groups

When you log in, the software searches the user groups for the user, starting with the administrator group. If a user belongs to multiple user groups, he is therefore always offered the higher user group when he logs in.

Passwords

User passwords must correspond to the usual conventions in Windows. Windows has requirements regarding:

- the minimum number of characters
- the use of letters, numbers and special characters.

Refer to the Windows help for further information on passwords.

Recommendations for user administration

Recommendations

The following is recommended for user administration:

- In the operating software you should define individual users in addition to the standard users. Standard users are easuser, eassuperuser and easadmin.
- If you are working with a server, you should not work on one domain only. You should set up an emergency group on a local computer so that you can also work if the server crashes.

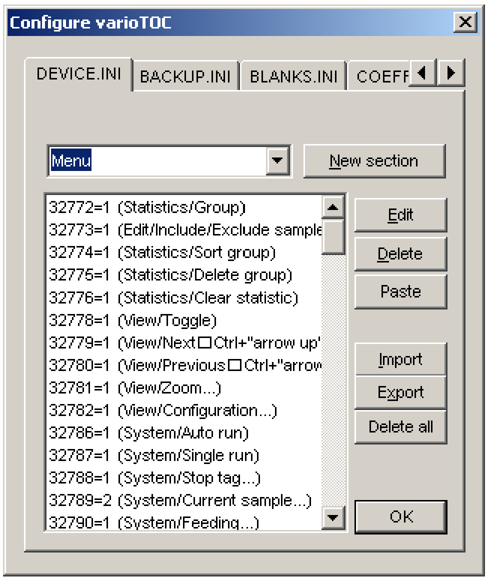
Granting authorizations

Granting authorizations

Caution	Improper changes Improper changes impair proper operation of the system and may destroy system components. Only configure the instrument if you are authorized to do so and observe the operating instructions.

Proceed as follows to grant authorizations:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Configure vario TOC" dialog by selecting Options > Confi-guration.</td></tr>
<tr><td>2</td><td>Select the "DEVICE.INI" tab. Select the "Menu" section by clicking the arrow next to the dropdown listbox.



</td></tr>
<tr><td>3</td><td>The numbers of the menu commands have the following meaning:</td></tr>
</table>

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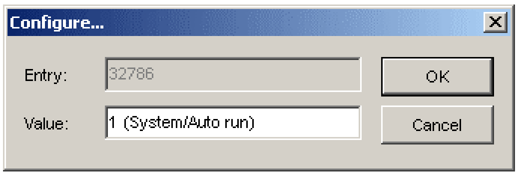
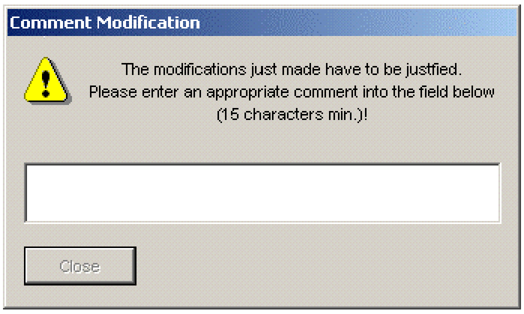
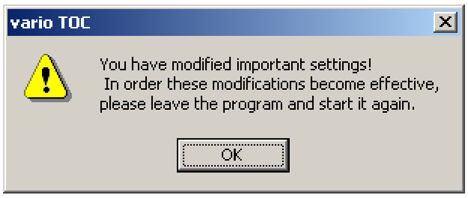
<table>
<tr><td></td><td>
<table>
<tr><th>Number</th><th>Meaning</th></tr>
<tr><td>1</td><td>User, superuser and administrator are authorized to execute the command.</td></tr>
<tr><td>2</td><td>Only superuser and administrator are authorized to execute the command.</td></tr>
<tr><td>3</td><td>Only the administrator is authorized to execute the command.</td></tr>
</table>
Select the command whose authorization you want to change and click Edit.
The "Configure key value" dialog is displayed:


</td></tr>
<tr><td>4</td><td>Enter the desired value in the "Value" field and click OK.
The "Comment change" dialog is displayed.


</td></tr>
<tr><td>5</td><td>Enter a justification in the "Comment changes" dialog and click Close.</td></tr>
<tr><td>6</td><td>Click OK in the "Configure vario TOC" dialog.
Your settings are saved and the dialog is closed. The following dialog is displayed:


</td></tr>
<tr><td>7</td><td>Click OK and quit the operating software.</td></tr>
<tr><td>8</td><td>Restart the operating software as required.</td></tr>
</table>

3.5 Defining interfaces

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to define various interfaces as system administrator.

Overview

"Defining interfaces" is divided into the following sections:

Topic	Page
Defining the analyzer / PC interface	131
Defining the LIMS / PC interface	133
Defining the balance / PC interface	134

Defining the analyzer / PC interface

Note

The operating software can only be operated in combination with the analyzer if the serial number of the instrument matches the software licence number. This ensures that the analyzer is always operated together with the same software and the settings recorded in the logbook.

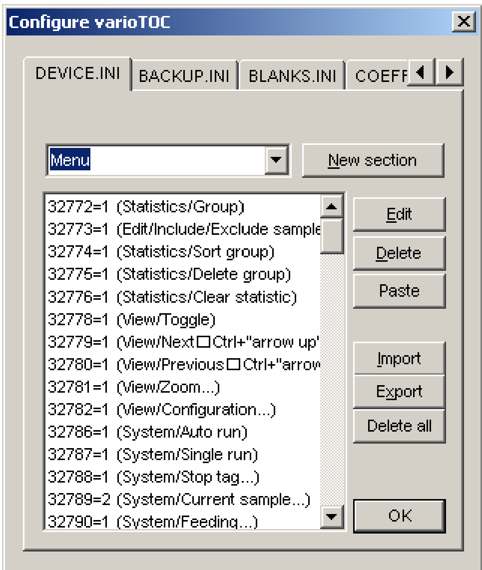
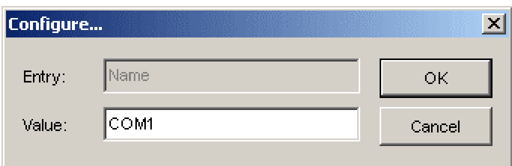
Defining the analyzer / PC interface

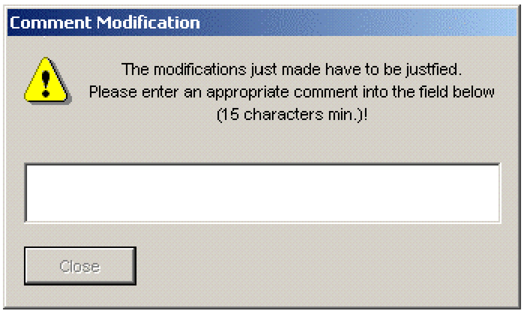
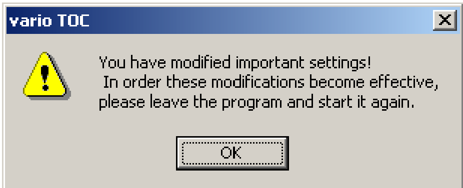
Caution Improper changes

Improper changes impair proper operation of the system and may destroy system components.

Only configure the instrument if you are authorized to do so and observe the operating instructions.

Proceed as follows to define the interface between the analyzer and the PC:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Configure vario TOC" dialog by selecting Options > Configuration.</td></tr>
<tr><td>2</td><td>Select the "DEVICE.INI" tab. Then select the "Analyzer Port" section by clicking the arrow next to the dropdown listbox.

</td></tr>
<tr><td>3</td><td>Select the entry that you want to change and click Edit.
The "Configure key value" dialog is displayed:

</td></tr>
</table>

4	Enter the desired value in the "Value" field and click **OK**. The "Comment change" dialog is displayed. 
5	Enter a justification in the "Comment changes" dialog and click **Close**.
6	Click **OK** in the "Configure vario TOC" dialog. Your settings are saved and the dialog is closed. The following dialog is displayed: 
7	Click **OK** and quit the operating software.
8	Restart the operating software as required.

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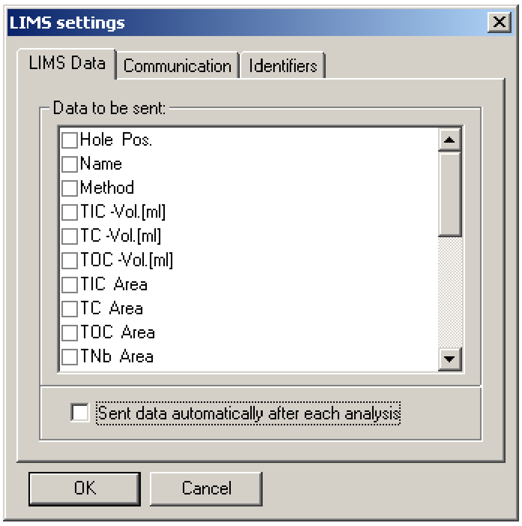
Dialog details

For details on the "Configure vario TOC" dialog, refer to *Configuring vario TOC* "Configure vario TOC" on page 695.

Defining the LIMS / PC interface

Defining the LIMS / PC interface

Proceed as follows to define the interface between LIMS and the PC:

Step	Procedure
1	Open the "LIMS settings" dialog by selecting **Options > Settings> LIMS**. 
2	Select the "Communication" tab. Define your settings.
3	Click **OK** in the "LIMS settings" dialog. Your settings are saved and the dialog is closed.

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Dialog details

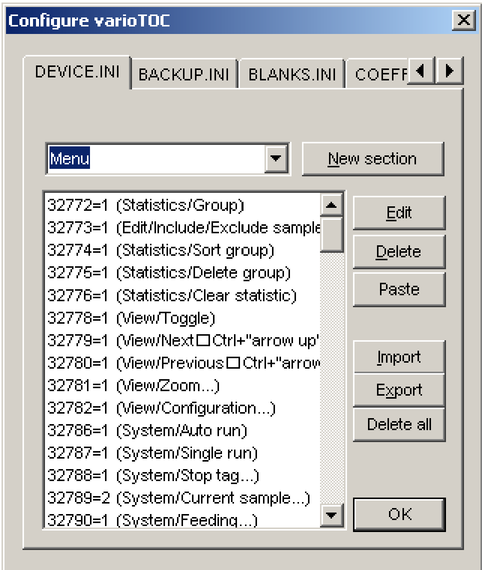
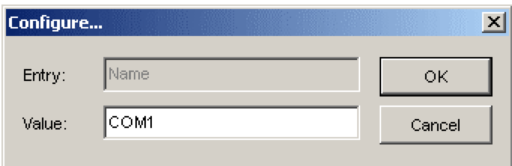
Details on the "LIMS settings" dialog can be found in *LIMS settings* on page 680.

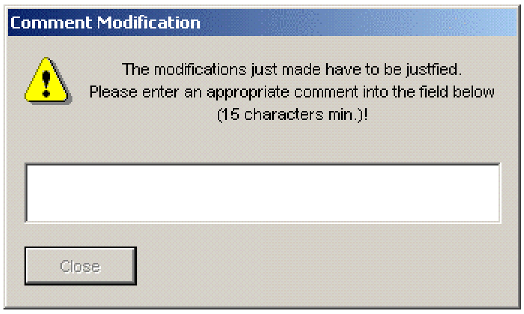
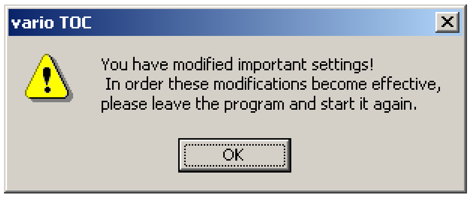
Defining the balance / PC interface

Defining the balance / PC interface

Caution	Improper changes Improper changes impair proper operation of the system and may destroy system components. Only configure the instrument if you are authorized to do so and observe the operating instructions.

Proceed as follows to define the interface between the balance and the PC:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Configure vario TOC" dialog by selecting Options > Configuration.</td></tr>
<tr><td>2</td><td>Select the "DEVICE.INI" tab. Then select the "Balance Port" section by clicking the arrow next to the dropdown listbox.

</td></tr>
<tr><td>3</td><td>Select the entry that you want to change and click Edit.
The "Configure key value" dialog is displayed:

</td></tr>
</table>

4	Enter the desired value in the "Value" field and click **OK**. The "Comment change" dialog is displayed. 
5	Enter a justification in the "Comment changes" dialog and click **Close**.
6	Click **OK** in the "Configure vario TOC" dialog. Your settings are saved and the dialog is closed. The following dialog is displayed: 
7	Click **OK** and quit the operating software.
8	Restart the operating software as required.

Dialog details

For details on the "Configure vario TOC" dialog, refer to *Configuring vario TOC* "Configure vario TOC" on page 695.

3.6 Editing analysis data

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section describes when it makes sense to edit analysis data and to what extent this is possible.

Overview

"Editing analysis data" is divided into the following sections:

Topic	Page
When does it make sense to edit analysis data?	137
Limits for modifying analysis data	138
Consequences of modifying analysis data	139

When does it make sense to edit analysis data?

Reasons for modifying analysis data

The following reasons exist to edit analysis data:

- If old calibration coefficients only exist as a hardcopy and you want to load them, you can manually input the calibration coefficients.
- If you have created a template of the sample data for the measurements in the various operating modes and you need to enter the samples still to be measured in the template.
- If you input blank values manually because, for example, the blank value of the sample packing is already known.

Limits for modifying analysis data

Inserting and deleting lines	You cannot insert lines or delete lines between finished samples.
Editing sample data	You cannot edit the data of finished samples by simply clicking on the respective fields. You can recognize finished samples by the fact that they are above the current sample, which is highlighted by a green bar in the sample view. You can only edit finished samples by selecting **Edit > Change**; if 21 CFR Part 11 functionality is enabled, this creates a new version.

Consequences of modifying analysis data

Commenting changes	If 21 CFR Part 11 functionality is enabled, the user must comment on certain changes.
Versioning	If 21 CFR Part 11 functionality is enabled, a new version of the document is created as soon as an analyzed sample is changed. The original version of the document is then write-protected.
Recomputing	After performing certain changes, you must update the calculations of the samples by selecting **Math > Recalculate**. The changes include: ▪ Manual blank value input. ▪ Subsequent review of calibration, specifying that standard samples should be displayed as monitor samples and no longer as calibration samples. ▪ Changing the sample name.

3.7 Performing checks

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to perform various checks as system administrator.

Overview

"Performing checks" is divided into the following sections:

Topic	Page
Checking documents for authenticity	141
Signing documents	142
Viewing the logbook	144

Checking documents for authenticity

What signature is checked?

Only those signatures can be checked that are enabled in the dialog and if their radiobutton is checked; for example the "created" signature in the screenshot below. If the document already has multiple signatures, the user must select one to check.

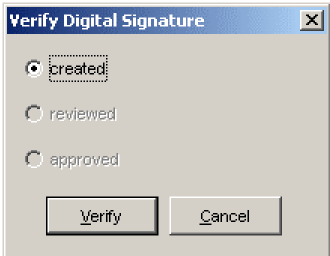
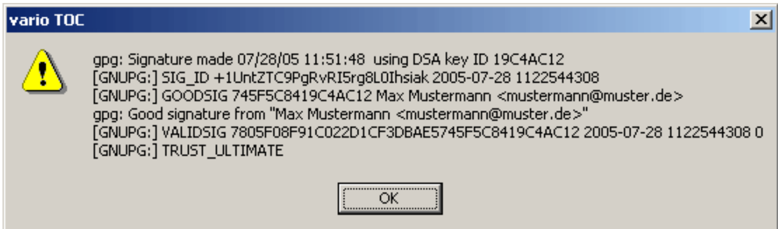
Note

Note the following:

- The signature program must be installed.
- Signatures can only be checked or created if 21 CFR Part 11 functionality is enabled.

Checking a signature

Proceed as follows to check signatures:

Step	Procedure
1	Open the document to check.
2	Open the "Verify digital signature" dialog in the operating software by selecting **File > Verify**. 
3	Check the radiobutton next to the signature you want to check.
4	Click **Verify**. The programs begins to check. The result is displayed in a new dialog and indicates whether the signature is authentic or not.  "Good signature from" indicates that the signature is authentic.

Signing documents

What signature is allocated?

The signature that is enabled in the document and whose radio button is chekked is allocated; in the screenshot below, for example, the "created" signature is allocated. The following rules apply:

- The "created" signature is assigned to a document first.
- The "checked" signature is assigned to a document if it already has a "created" signature.
- The "released" signature is only assigned to a document if it already has a "created" and a "checked" signature.

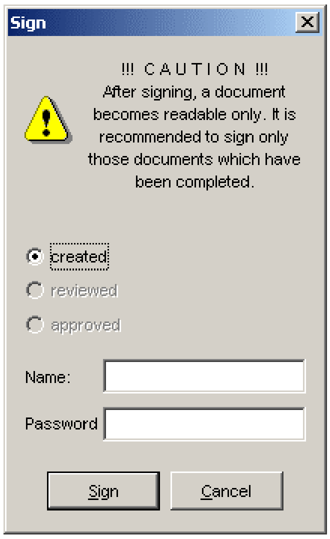
Note

Note the following:

- The signature program must be installed.
- Documents can only be signed if 21 CFR Part 11 functionality is enabled.
- Only sign finished documents. After signing, the document is read-only.

Signing documents

Proceed as follows to sign documents:

Step	Procedure
1	Open the "Sign" dialog in the operating software by selecting **File > Sign**. 
2	Enter your name set up in the signature program in the "Name" field.
3	Enter your password set up in the signature program in the "Password" field.

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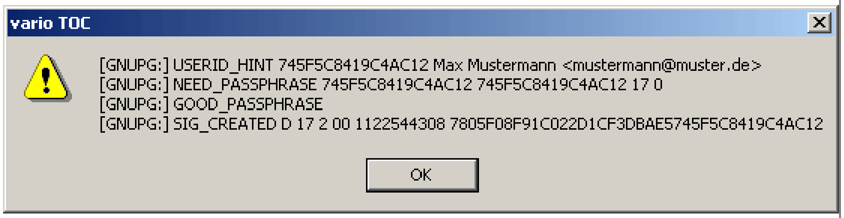
4	Click **Sign**. The program checks whether you are authorized to sign the document. The result is displayed in another dialog:  "GOOD_PASSPHRASE" indicates that you are authorized to create the signature. The signature has been created.

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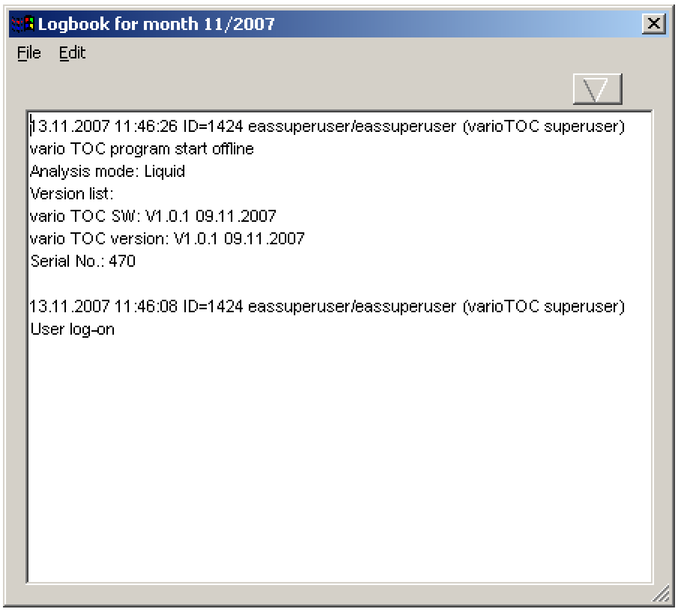
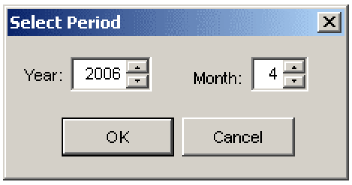
Viewing the logbook

Viewing the logbook

Proceed as follows to view the logbook:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the logbook by selecting Options > Logbook.

</td></tr>
<tr><td>2</td><td>Select the period for which to view the logbook.
Open the "Select period" dialog by selecting File > Load.

</td></tr>
<tr><td>3</td><td>In the "Select period" dialog, use the arrows to set the year and month and then click OK.</td></tr>
<tr><td>4</td><td>The desired period is displayed in the logbook.</td></tr>
</table>

3.8 Working with the database

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to perform various database tasks as system administrator.

Overview

"Working with the database" is divided into the following sections:

Topic	Page
Administrative work on the database	146
Defining the autoexport directory	147
Starting the database backup	149
Reorganize database	151
Reloading an old database file	153

Administrative work on the database

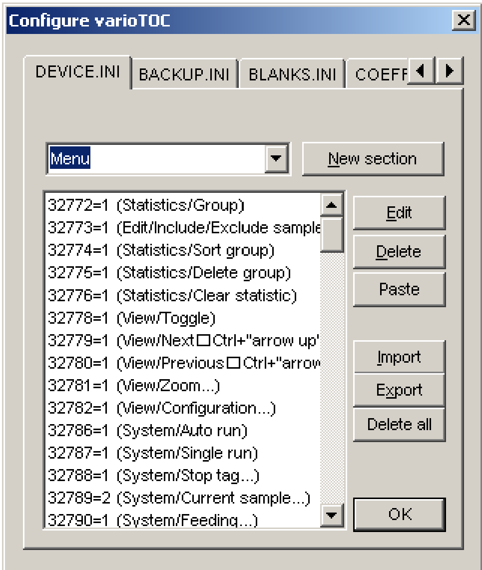
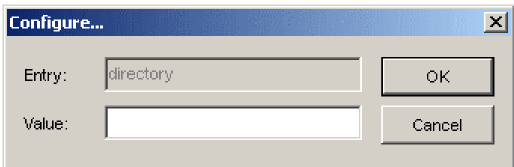
Reorganizing the database	The software always works with one and the same database. Because the size of the database is limited to 2 gigabytes, it is necessary to reorganize the database regularly. Database reorganization removes all sample data and the contents of the logbook from the database file, but retains the other data such as settings, coefficients, etc.
Datebase backup	"Backup" copies the complete existing database file to a certain directory under a different name, thereby "capturing" a certain state.
Export and import	It is not possible to load and save data from/to a database in the usual way. However, by using the **File > Export** and **File > Import** menu functions it is possible to transport documents "out of" the database and to transport external documents "into" the database.
Restoring the database	"Restore" reloads an old database file and irrevocably deletes the current data.

Defining the autoexport directory

Selecting a directory

Caution	Improper changes Improper changes impair proper operation of the system and may destroy system components. Only configure the instrument if you are authorized to do so and observe the operating instructions.

Proceed as follows to define the autoexport directory:

Step	Procedure
1	Open the "Configure vario TOC" dialog by selecting **Options > Configuration**.
2	Select the "DEVICE.INI" tab. Select the "AutoExport" section by clikking the arrow next to the dropdown listbox. 
3	Select "directory" and click **Edit**. The "Configure key value" dialog is displayed: 

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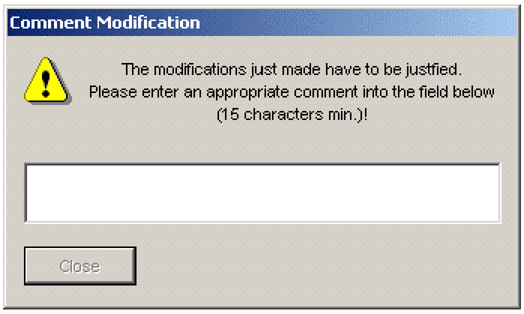
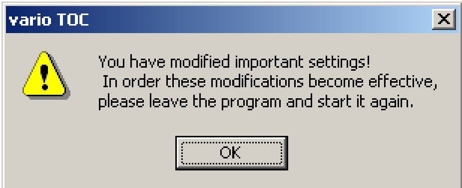
4	Enter the desired dirctory in the "Value" field and click **OK**. The "Comment change" dialog is displayed. 
5	Enter a justification in the "Comment changes" dialog and click **Close**.
6	Click **OK** in the "Configure vario TOC" dialog. Your settings are saved and the dialog is closed. The following dialog is displayed: 
7	Click **OK** and quit the operating software.
8	Restart the operating software as required.

Further information

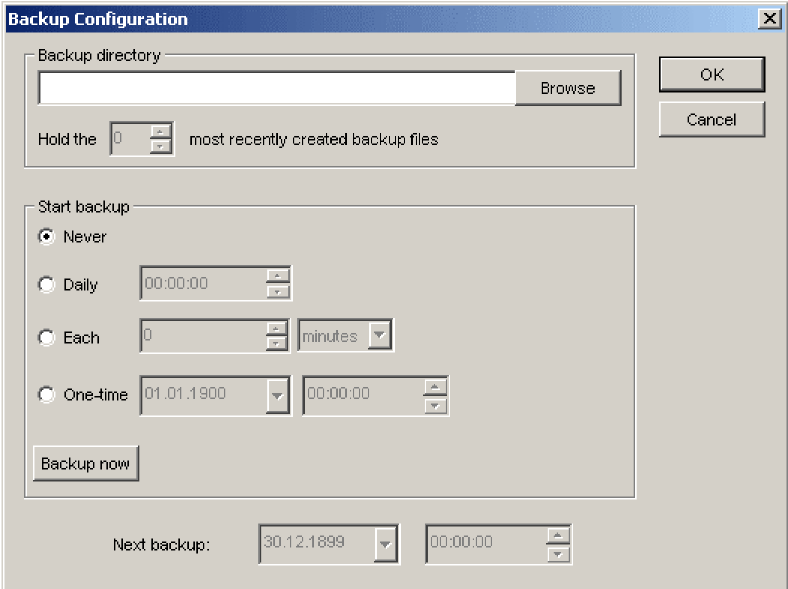
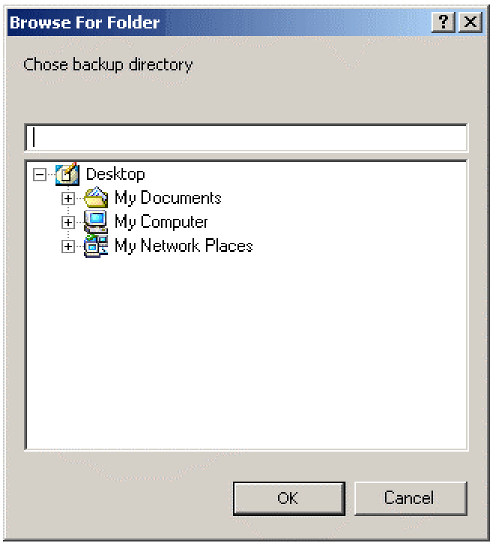
Further information can be found in:

- *Database backup* on page 92

Starting the database backup

Starting the database backup

Proceed as follows to backup the database:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Configure backup" dialog by selecting File > Database > Backup.

</td></tr>
<tr><td>2</td><td>Click Select to specify the directory to save to.
This displays the "Find folder" dialog:

</td></tr>
<tr><td>3</td><td>Select the desired directory and click OK.</td></tr>
<tr><td>4</td><td>Click Backup now in the "Configure backup" dialog.
The backup is performed.</td></tr>
<tr><td>5</td><td>Click OK in the "Configure backup" dialog to close the dialog.
The backup was successful.</td></tr>
</table>

Further information

Further information can be found in:

- *Database backup* on page 92
- *Configure backup* on page 584

Reorganize database

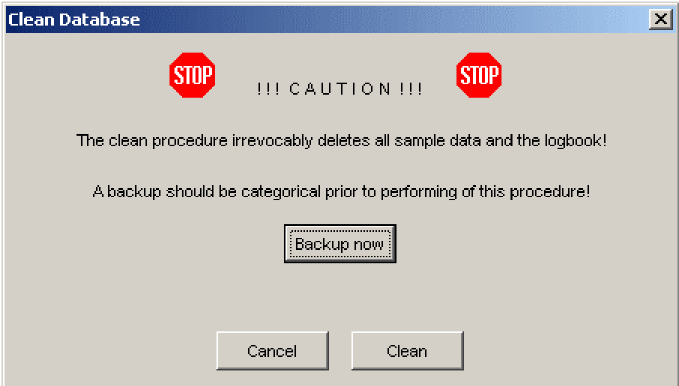
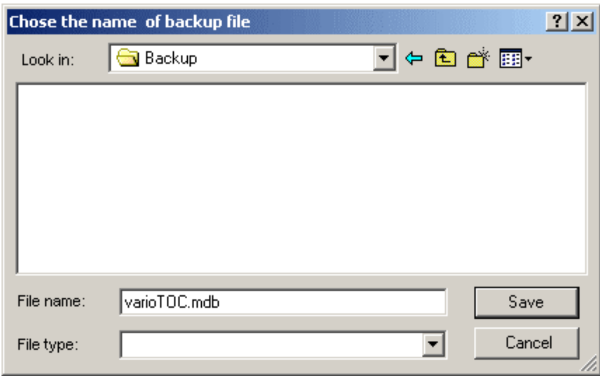
What does reorganize mean?

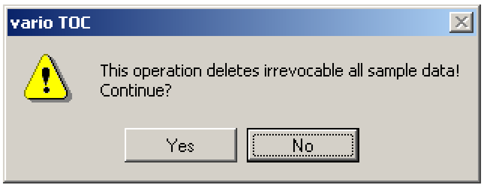
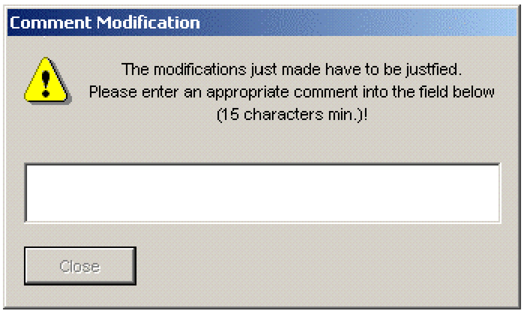
Reorganization removes all sample data and the contents of the logbook from the database file, but retains the other data such as settings, coefficients, etc.

Reorganize database

Caution	Data loss Reorganizing the database irrevocably deletes all sample data and the contents of the database logbook. Always backup your data before reorganizing the database.

Proceed as follows to reorganize the database:

Step	Procedure
1	Open the "Reorganize database" dialog by selecting **File > Database > Clean up**. 
2	Click **Backup now**. You cannot reorganize the database without backing up. This displays the "Select backup file name" dialog: 
3	Enter a file name in the "File name" field and click **Save**. The database is saved.

4	Click **Clean** in the "Clean database" dialog. This displays the "vario TOC" dialog: 
5	Click **Yes** to continue. The database is reorganized and the "Comment changes" dialog is displayed. 
6	Enter a justification in the "Comment changes" dialog and click **Close**. You have now reorganized the databsse.

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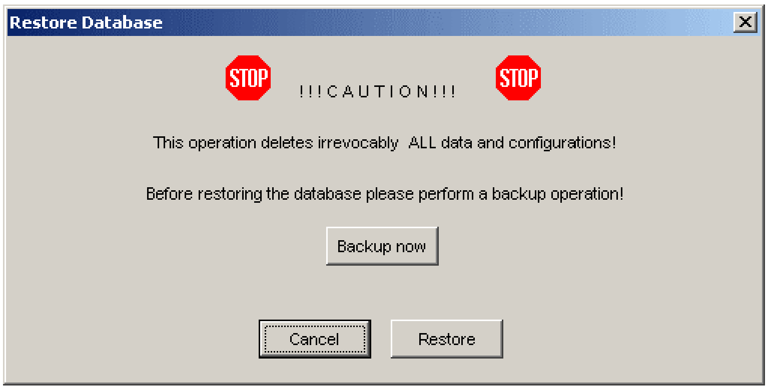
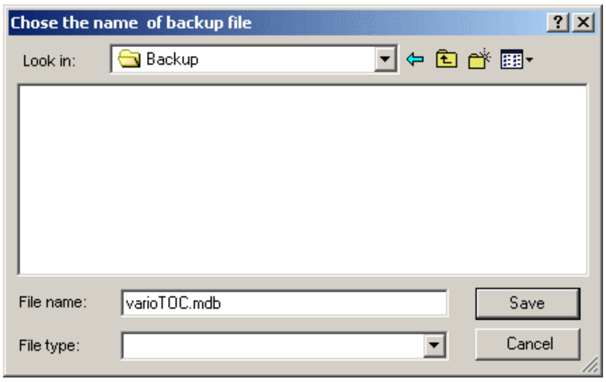
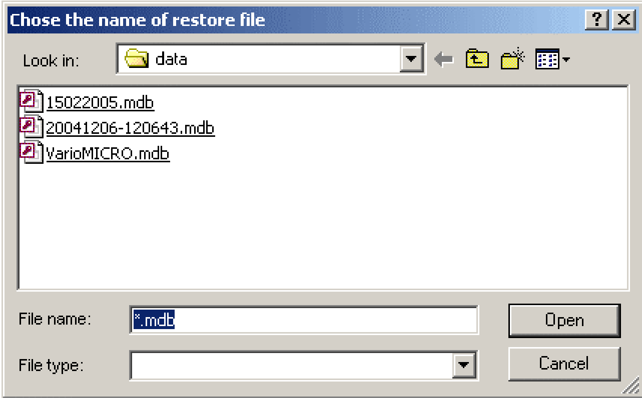
Reloading an old database file

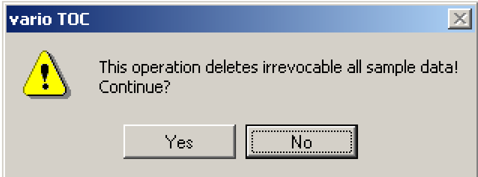
Reloading an old data-base file

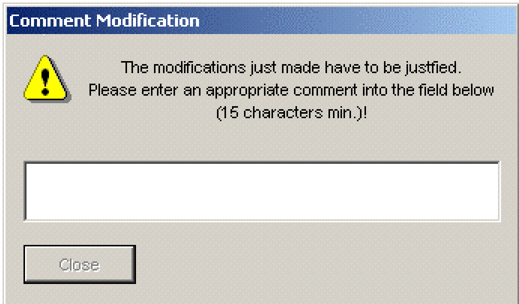
Caution	Data loss Restoring the database via **Restore** irrevocably overwrites all sample data, the contents of the logbook and the database configfuration parameters Always backup your data before restoring the database via **Restore**.

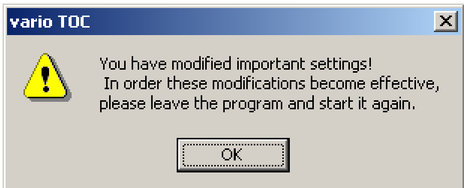
Proceed as follows to reload an old database file:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Restore Database" dialog by selecting File> Database > Restore.

</td></tr>
<tr><td>2</td><td>Perform a backup. To do so, click Backup now.
This displays the "Select backup file name" dialog:

</td></tr>
<tr><td>3</td><td>Enter a file name in the "File name" field and click Save.
The database is saved.</td></tr>
</table>

<table>
<tr><td>4</td><td>Click Restore in the "Restore Database" dialog.
This displays the "Select backup file name to restore" dialog:


</td></tr>
<tr><td>5</td><td>Select the desired database file and click Open.
This displays the "vario TOC" dialog:


</td></tr>
<tr><td>6</td><td>Click Yes to continue.
The database is restored and the "Comment changes" dialog is displayed.


</td></tr>
<tr><td>7</td><td>Enter a justification in the "Comment changes" dialog and click Close.
The following dialog is displayed:


</td></tr>
<tr><td>9</td><td>Click OK.
This closes the operating software.</td></tr>
<tr><td>10</td><td>Restart the operating software as required.</td></tr>
</table>

Dialog details

Details on the "Restore Database" dialog can be found in *Restore Database* on page 588.

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3.9 Ways of optimizing the use of the analyzer

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section gives an overview of the ways in which you can optimize the use of the analyzer for your own particular application.

Overview

"Ways of optimizing the use of the analyzer" is divided into the following topics:

Topic	Page
Optimizing basic instrument settings	157
Optimizing sample data editing	158
"Balance" weighing data input program	159
Optimizing data evaluation	160

Optimizing basic instrument settings

Analyzer configuration

You can optimize the following by means of configuration:

- Interface properties
- Weighing data properties
- Signature program properties
- Instrument parameters.

Reacting to irregularities

If irregularities occur during the analysis, it is important for the user to quickly identify any errors. In the "Error handling" dialog the user defines how the analyzer is to react to incidents.

Incident	Consequences
During analysis, the computed element contents exceed the defined tolerances.	If standard tolerance monitoring is enabled, the analysis is aborted. "Tol" is displayed in the information column of the particular sample.
A critical error occurs.	The analyzer is stopped after the analysis.
A non-critical error occurs.	If you have set the analyzer to stop after a set number of non-critical errors and this number has been reached, the analyzer is stopped after the analysis.

Cf. *Troubleshooting* "Error handling" on page 689.

Defining custom methods

Depending on what sample substances you want to analyze, it may be necessary to define custom methods in addition to the default methods.

Controlling methods:

- Measuring parameters
- Injection volume

Cf. *Defining custom methods* on page 212.

Sleep/wake-up behavior

For sleep/wake-up behavior, you can specify that conditioning samples in a series are measured before the first user starts work on the instrument in the morning. Cf. *Sleep/wake-up functions* "Sleep / wake-up functions" on page 690 and *Optimizing sleep/wake-up behavior* "Optimizing sleep and wake-up behavior" on page 283.

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Optimizing sample data editing

Facilitating input of samples

In the "Input options" dialog you can define settings that facilitate sample data input in the following cases:

- An identical sample name is used several times.
- You need to increment or decrement a figure in the sample names.
- One method is used for numerous samples.
- You need to input a daily factor for numerous samples.
- You need to input a blank value for numerous samples.

Cf. *Input options* on page 673.

Showing the weighing window

Via **View > Weighing Window** you can show and hide the weighing window. The weighing window displays the last five sample weights input and the names of the associated samples. The current sample weight is displayed in a larger font. The weighing window makes it easier for you to check whether the values were correctly transferred, particularly when automatically transferring weighing data.

Weighing in samples during the analysis

While one analysis is running, you want to weigh in further samples for another document. However, this is not possible as long as the analysis is running and the current document is open. However, you can generate the weighing data on another PC with the aid of the "Balance" program. Weighing data generated and saved with the "Balance" program can then be imported to the control PC via **File > Import**. The condition is that the analyzer is back in standby mode or "sleeping".

Prioritizing urgent samples

Via **Edit > Swap** you can prioritize urgent samples and analyze them earlier than scheduled. However, the samples are only swapped in sample memory, and you have to swap the samples on the carousel by hand.

Cf. *Swapping samples* "Swap samples" on page 600.

"Balance" weighing data input program

Ways of capturing weighing data

You can capture weighing data in the following ways:

- Manually.
- Automatically if the balance is connected to the control PC of the analyzer.
- With the "Balance" weighing data program from Elementar Analysensysteme GmbH.

Purpose of the program

The "Balance" program is used to capture weighing data in the following cases:

- the balance is located in a different place to the analyzer and control PC.
- While one analysis is running, you want to weigh in samples for another document. This is only possible, however, when the analyzer is "sleeping" or when no analysis is running. However, you can capture the weighing data with the aid of the "Balance" program and, if necessary, generate them on a different PC.

Weighing data format

The weighing data are in *dat format. Files with this extension created with the "Balance" program can be imported to the control PC. It is not, however, possible to import other files with the *dat extension.

Importing weighing data

Weighing data generated and saved with the "Balance" program can then be imported to the control PC via **File > Import**. One of the following conditions must be met for import:

- The analyzer is in standby mode, i.e. no analysis is currently running
- or the analyzer is "sleeping".

The following import options are available:

- Import into an empty sample memory.
- Import into a sample memory that is not empty.

Importing into an empty sample memory

After importing into an empty sample memory, the weighing data and any sample names are now in the sample memory. The weighing data are input starting from sample No. 1.

Importing into a sample memory that is not empty

Before importing into a sample memory that is not empty, a dialog is displayed in which the user must choose between two options:

- The weighing data can be appended after the current weighed sample. This allows you to import multiple weighing data records.
- The weighing data can be saved in a new document. The weighing data are saved there starting from sample No. 1. The current open document must be saved and then closed.

Optimizing data evaluation

Optimizing the view

The user can customize the view to his own needs:

Type of view	Cross-reference
View of the sample view	Cf: ▪ *Configuring the sample view* on page 245 ▪ *Specifying the number of decimal places* ▪ *Saving the sample view* on page 249
Combi view in graph view	Cf: ▪ *Configuring the graph view* on page 264 ▪ *Setting the size of the graph* on page 266.
Combi view in calibration view	Cf. *Setting the size of the graph* on page 266.
Combi view in statistics view	Cf. *Configuring the statistics view* on page 251.

Optimizing print settings

The user can customize print settings to his own needs:

possibilities of customization	Cross-reference
Designing an analysis log	Cf. *Configuring a report* "Configure report" on page 575.
Printer setup	Cf. *Printer setup* on page 580.
Defining printer settings	Cf. *Printing* "Print" on page 577.
Assessing the print view	Cf. *Page view* on page 579.

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3.10 Performing other administrator tasks

Target group

The target group of this section is personnel with good knowledge of the operating system and administrative settings.

Purpose

This section enables you to perform various tasks as system administrator.

Overview

"Performing other adminisitrator tasks" is divided into the following sections:

Topic **Page**

Modifying the registration 162

Printer setup 164

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Modifying the registration

Dialog: "Product registration"

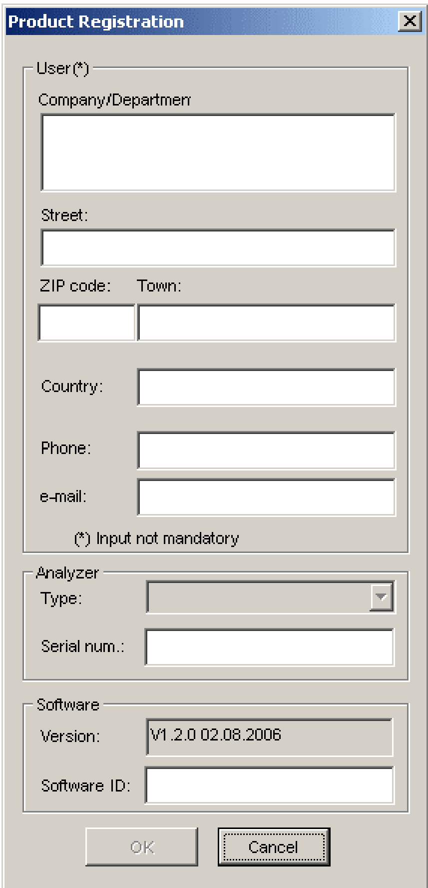
When you start the operating software for the first time, the "Product Registration" dialog is displayed. Once you have registered, the dialog is no longer displayed when you launch the program.

Changing the registration

You must have administrator rights to modify the registration.

Modifying

Proceed as follows to modify the registration at a later point:

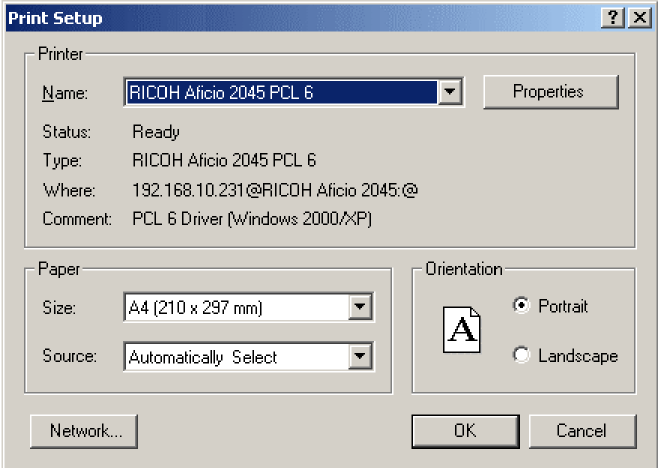
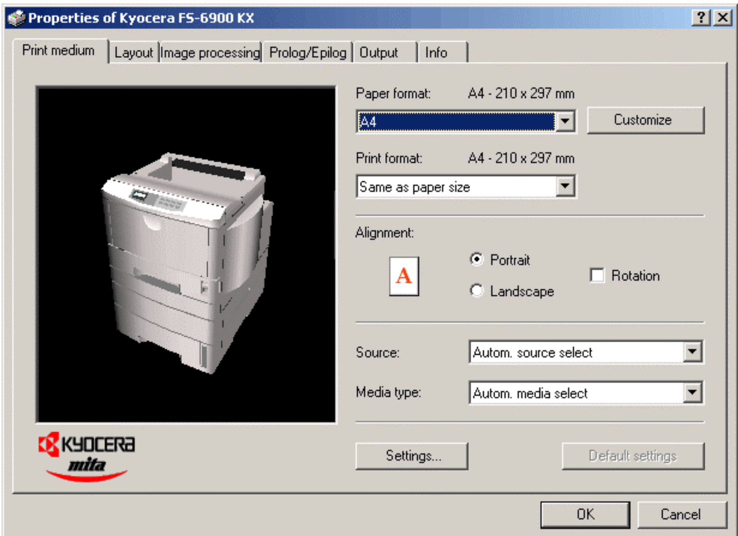
Step	Procedure
1	Launch the operating software.
2	Open the "Product registration" dialog by selecting **Help > Registration**. 
3	If you want, enter your address data in the "User" section.
4	Enter the serial number in the "Instrument" section if you have not already done so. The serial number is found on the type plate on the back of the analyzer. This number should match the serial number of the installation CD cover when installing for the first time.

5	Enter the software ID in the "Software" section. If installing for the first time, this number is found on the installation CD cover. If installing and upgrading, you must send the registration details in this dialog to Elementar. You will then receive an identification code to be entered here.
6	Click **OK**. This closes the dialog and saves the settings.

Printer setup

Printer setup

Proceed as follows to setup the printer:

Step	Procedure
1	Open the "Printer setup" dialog by selecting **File > Printer Setup**. 
2	Click **Properties**. A dialog is displayed that varies depending on the type of printer connected. It could look like this, for example: 
3	Define your settings and then click **OK**. Your settings are saved and the dialog is closed.
4	Click **OK** in the "Printer setup" dialog. Your settings are saved and the dialog is closed. You have successfully setup the printer.

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Starting up and shutting down the instrument

4

Target group

The target group of this section is personnel authorized by Elementar Analysen-systeme GmbH and that has taken part in training.

Purpose

This section enables you to start up or shut down the instrument according to instructions.

Overview

"Starting up, shutting down" is divided into the following sections:

Section	Page
Setting up and starting up the instrument	166
Shutting down the instrument	182

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4.1 Setting up and starting up the instrument

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH and that has taken part in training.

Purpose

This section enables you to set up and commission the instrument according to instructions.

Overview

"Setting up and starting up the instrument" is divided into the following topics:

Topic	Page
Rules for first-time start-up	167
Instructions for operating the furnace	168
Installation site requirements	169
Gases and chemicals to be provided	171
Start-up	172
Connecting peripherals	174
Connecting supply lines and waste gas lines	176
Switching on	178
Default instrument settings	179
Heating up the furnace / checking parameters	180

Rules for first-time start-up

Rules for first-time start-up

Observe the following rules for first-time start-up.

- First-time start-up is performed by a trained service technician. Only the service technician may open the transport packaging. If the customer opens the transport packaging, this results in loss of warranty.
- Make sure that the user is completely available for instruction and hand-over of the equipment at the time of first-time start-up. If additional instruction by our service technician is required, this must be billed separately.
- If you do not order the PC and balance from Elementar, Elementar reserves the right to perform start-up with their own equipment. Any modifications of the analyzer must be performed by the customer.
- The instrument is installed by a trained service technician, demonstrating performance with analyses of max. 10 standard measurments.
- For special analysis problems, Elementar's application laboratory will draw up specific work instructions at the customers request and against payment.

Requirements for installing the instrument software

In order to install the instrument software correctly, administrator rights for the PC must be available.

Conditions for operating the instrument software

Do the following to be able to operate the instrument software without any problems:

- On the PC where the instrument software is installed, check power management settings under **Control Panel > Power Management** or under **Control Panel > Power Options**. The following options must be set to "Never":
  - "Turn off monitor"
  - "Turn off hard disks"
  - "System stand by"
  - "System hibernates"
- Power management must also be disabled in the PC's BIOS.
- Only standard Windows screensavers may be used.
- The PC on which the instrument software is installed must not be overloaded with other software. This could cause unstable operation of the instrument software.

Instructions for operating the furnace

Instructions for operating the furnace

Observe the following instructions for using the furnace so that the warranty is upheld.

- The user must ensure that the furnace is operated according to the instructions.
- The furnace must not be heated in excess of the maximum temperature indicated in the operating instructions.
- The furnace must not be operated with a voltage higher than that indicated on the type plate.
- In the event of longer breaks lasting several days (as of 5 days) the furnace must be shut down (set temperature control to 0 °C).
- The furnace must be protected against penetration of liquids.
- Short-circuits in connection with the heating spirals and/or the thermocouples must be avoided.
- Inner and outer damage to the heating spirals, thermocouples and supply lines must be avoided.
- Only use original parts from Elementar for operation (e.g. combustion tubes, fillings, seals, etc.).

In the event of furnace failure, the furnace must be sent into the manufacturers works at the following address for fault identification:

Elementar Analysensysteme GmbH,
Donaustraße 7,
D-63452 Hanau
Germany

If this analysis reveals that the furnace became defective due to improper use, all warranty claims shall be forfeited.

Installation site requirements

General requirements

Observe the general installation site requirements:

- Room temperature should be constant.
- Analyzer and peripherals must be protected from drafts and direct heat.
- An air-conditioned room is advantageous as the analyzer emits heat.
- Take suitable action to avoid electrostatic discharge. Electrical discharges can lead to malfunctions of the instrument.

Specific requirements

The following table lists specific requirements to be met by the installation site:

Factors	Specific requirements
Room	▪ Mode of protection IP 20 ▪ Dry room ▪ Well aired
Instrument setup	▪ Only on heat-resistant surface ▪ A stable lab table is suitable
Space required including PC and printer	▪ Width: 1,30 m ▪ Depth: 0,55 m
	▪ At least 20 cm clearance all round so that the fans will work
Space required by instrument alone	▪ Width: 0,55 m ▪ Depth: 0,48 m ▪ Height: 0,57 m
Clearance from instrument to wall	▪ At least 20 cm clearance all round so that the fans will work
Ambient temperature	▪ Minimum: + 15 °C ▪ Maximum: + 35 °C
Mains voltage	▪ 100–230 Volt AC ± 10 %; 50–60 Hz ▪ Connection 800 VA ▪ Mains voltage and frequency must match the specifications on the instrument's type plate
Power connections	▪ 2 power sockets and socket strip with 4 sockets to connect peripherals or 5 sockets ▪ Protection class I, protective conductor connection ▪ Fusing 16 A delay action
Gas supply	▪ Gas supply must be available nearby the instrument ▪ Connection to device by means of a pressure reducer ▪ Necessary gas connection downstream of pressure reducers: 2 x clamp ring screw connection for 6 mm tube diameter ▪ The complete gas intake line must use gas-loss-free components (copper, stainless steel, etc.)
Waste gas lines	▪ Waste gas line must discharge into the open or into a vent at atmospheric pressure because particularly when burning fluorine-containing or sulfur-containing samples, toxic gases may escape from the instrument. ▪ The end of the waste gas line must discharge into the open at a location protected from the wind or into a vent.

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Gases and chemicals to be provided

Gases and chemicals to be provided

The following table lists the gases and chemicals required:

Category	Type of gas / chemical	Part of initial equipment
Carrier gas	synthetic air or oxygen: ▪ Purity 99.996 % ▪ Consumption approx. 350-450 ml/ min ▪ Adjust the pressure at the delivery point until the pressure display on the PC reads 1000 mbar.	No
Reagents	Various chemicals for filling the reaction tubes	Yes You need a consumables set for further analyses.
Calibration stan-dards	▪ Potassium hydrogen phthalate ▪ Sodium carbonate ▪ Sodium nitrate ▪ Ammoniun chloride	Yes

Start-up

Who performs first-time start-up?

First-time start-up is performed by a trained service technician, not the customer.

Note

In order to ensure proper working order of the instrument:

- the work processes described in this section must be performed precisely.
- the basic instrument and the peripherals must be switched on in the sequence described here.

Procedure

Start-up is divided into the following steps:

Step	Description
1	Preparing instrument for switching on
2	Instrument must be ready to measure
3	Performing instrument checks

Preparing instrument for switching on

Proceed as follows to prepare the instrument for switching on:

Step	Procedure
1	Set up the instrument. Observe the instructions concerning the installation site. Cf. *Installation site requirements* on page 169.
2	Connect the peripherals. See *Connecting peripherals* on page 174.
3	Connect supply lines and waste gas lines. Cf. *Connecting supply lines and waste gas lines* on page 176.
4	Remove the transport lock. Cf. *Removing the transport lock*.
5	Check the fillings of the required glass and quartz components. Replace filling if necessary: Cf. *:* ▪ *Filling, removing and installing drying, absorption and filter tubes* on page 408 ▪ *Filling the combustion tube, liquid mode* "Fill standard reaction tube, liquid mode" on page 395 ▪ *Filling the combustion tube, solid mode* "Fill standard combustion tube, solids mode" on page 398 ▪ *Filling the acid container* on page 419
6	Install the required glass and quartz components. Leave the tube outlets open for subsequent conditioning. Used tubes also need to be conditioned. Cf: ▪ *Installing reaction tubes in the furnace and conditioning* ▪ *Removing and installing the drying tube and the absorption tube* "Removing and installing drying, absorption and filter tubes" on page 414

7	The instrument is now ready for switching on.

Instrument must be ready to measure

Proceed as follows to make the instrument ready for measuring:

Step	Procedure
1	Perform all steps of the switching on process. Cf. *Performing switching on process* "Switching on" on page 178.
2	Switch on the operating gas. See *Standard instrument settings* "Default instrument settings" on page 179 for recommended gas pressure.
3	Launch the operating software. The standard operating parameters are factory-set and do not have to be optimized by the user. Cf. *Starting the operating software* on page 205.
4	Select the desired operating mode from the **Mode** menu. Selecting the operating mode
5	Heat up the furnace and check parameter settings. Cf. *Heating up the furnace and checking parameters* "Heating up the furnace / checking parameters" on page 180.
6	Define the main settings for measurement. Measurement settings The instrument is then ready to measure.

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Performing instrument checks

Proceed as follows to perform instrument checks:

Step	Procedure
1	Perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528.
2	If the leak test reveals any leaks, eliminate them.
3	Conditioning newly installed and used tubes For used tubes, humidity must be eliminated by baking them out for at least two hours. Cf: ▪ *Installing reaction tubes in the furnace and conditioning*
4	Check proper working order of the instrument by means of ▪ Blank value determination, ▪ Conditioning measurement, ▪ and standard measurement. Oberserve the gas flow and the pressure. Cf. *Performing measuring routine work* "Performing routine measuring work" on page 227.
5	After routine measuring work you can measure real samples. Cf. *Performing measurements*.

Further information

Further information can be found in:

- *Setting mode-dependent instrument parameters* "Setting instrument parameters" on page 62

Connecting peripherals

Note

The following section is part of initial start-up. All steps described in initial startup before connecting peripherals must have already been performed. Cf. *Performing initial operation* "Start-up" on page 172.

Peripherals

- A PC must be connected. It is essential for operation.
- A printer should be connected so that you can print out measuring results.
- A balance should be connected, so you do not need to enter the sample weight by hand.

Connecting peripherals

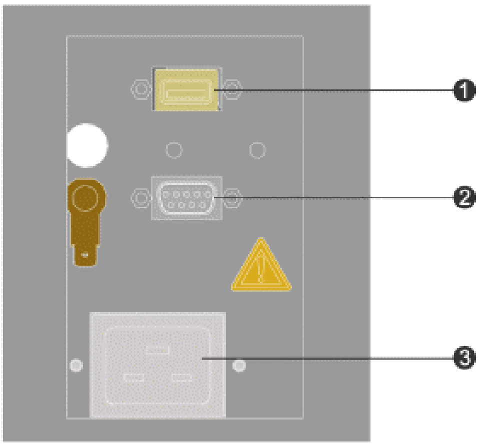
Proceed as follows to connect peripherals to the analyzer:

Step	Procedure
1	Connect the PC to the appropriate connector (1) on the back of the analyzer using the correct cable.
2	If you wish, connect a balance to the PC.
3	If you wish, connect a printer to the PC.

Observe the labels on the instrument and the following diagram.

Rear view

The following picture shows a detail of the rear view of the analyzer with the associated connections:



The following table describes the relevant components in this section:

Part	Name
1	PC connector, serial interface RS 232 or USB
2	Reserve interface
3	Mains connector

Configuring the balance

The serial interface parameters of a connected balance must match the parameters of the PC's serial interface.

If you have not entered anything different, the operating software configuration file sets the PC's serial interface as follows:

Parameter	Setting
Baud	2400
Data bit	7
Stop bit	1
Parity	odd

Select **Options > Configuration** to edit the parameters of the PC's serial interface if your balance requires different settings.

Connecting supply lines and waste gas lines

Note

The following section is part of initial start-up. All steps described in initial startup before connecting supply lines and waste gas lines must have already been performed. Cf. *Performing initial operation* "Start-up" on page 172.

Connecting supply lines

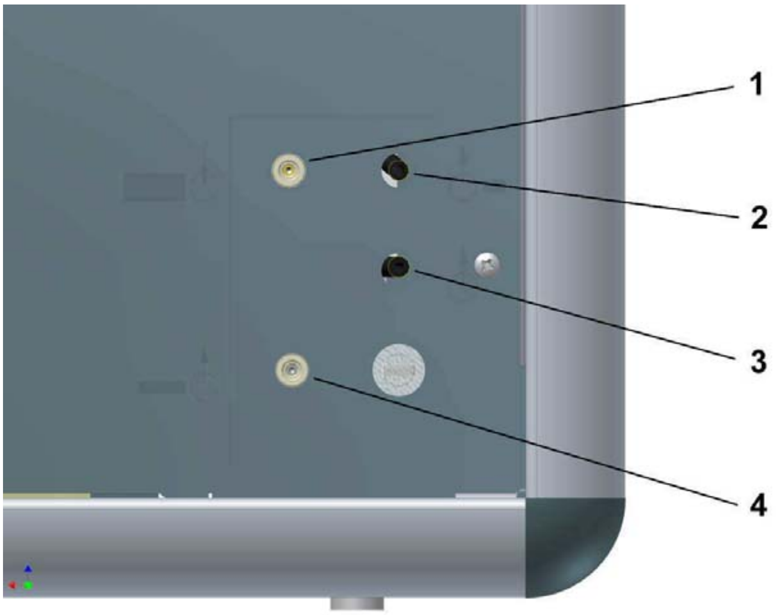
Caution	Mixing up gas inlets A mix-up may lead to destruction of the instrument. Connect the supply lines carefully and observe the diagram.

Proceed as follows to connect supply lines:

Step	Procedure
1	Connect the carrier gas supply line to the carrier gas inlet (1).

Detail of rear view

The following picture shows a detail of the rear view of the analyzer:



The following table describes the relevant components in this section:

Part	Name
1	Carrier gas inlet
2	Measuring gas outlet IR
3	Gas drying outlet
4	H_2O waste

Connecting waste gas lines

Proceed as follows to connect waste gas lines:

Step	Procedure
1	Connect the waste gas line to the measuring gas outlet (2).

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2	Install the waste gas line (2, 3) so that it discharges into the open or into a vent.
3	Lead the H_2O waste line (4) into an empty container.
4	If the waste gas line discharges into the open, make sure that the waste gas line discharges into the open at a location protected from the wind. Otherwise detector instabilities may occur.

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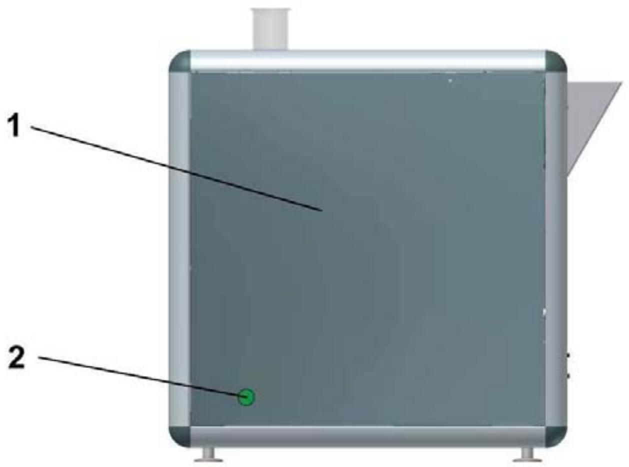
Switching on

Note

The following section is part of initial start-up. All steps described in initial startup before switching on must have already been performed. Cf. *Performing initial operation* "Start-up" on page 172.

Switching on

Proceed as follows to perform the switching on process:

Step	Procedure
1	Plug the power supply plug of the analyzer into the socket.
2	Switch ▪ PC, ▪ monitor ▪ and printer on. Wait until the boot process is complete.
3	Install the operating software if you have not already done so. Cf. *Installing and updating the software* "Installing and updating the software." on page 115.
4	Switch the main instrument switch (2) on.  The instrument performs a reference run of the multiway valve/ball valve and carousel. You have now switched on the instrument.

Default instrument settings

Default instrument settings	The default gas pressure and mass flow settings are listed below. The settings require the analyzer to be leak-free.
Intake pressure carrier gas	The carrier gas intake pressure is set at the delivery point so that the following values are displayed on screen: ▪ The "Pressure" display shows 1000 mbar. ▪ The "MFC" display shows approx. 200ml/min. ▪ The "Flow" display shows approx. 200ml/min.
Flow rate	The following flow rate settings are typical: ▪ The "MFC" display shows approx. 200ml/min for the measuring gas outlet.

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Heating up the furnace / checking parameters

Note

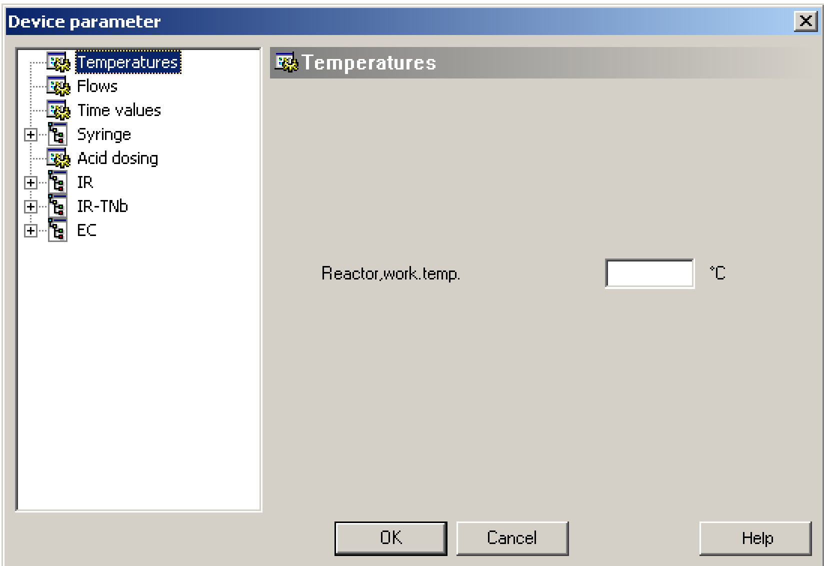
Note the following:

- The following section is part of initial start-up. All steps described in initial start-up before "Heating up the furnace / checking parameters" must have already been performed. Cf. *Performing initial operation* "Start-up" on page 172.

Heating up the furnace / checking parameters

Caution	Overheating if tube fillings are not appropriate for the operating mode Overheated tube fillings melt, run into the furnace area and destroy the furnace. Make sure that the tube fillings correspond to the selected operating mode.

Proceed as follows to heat up the furnace and check the parameters:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Instrument parameters" dialog in the operating software by selecting Options > Settings > Parameters.


</td></tr>
<tr><td>2</td><td>Check furnace working temperatures in the "Temperatures" selection and change them if necessary.
Setting mode-dependent instrument parameters</td></tr>
<tr><td>3</td><td>Check the other parameters in the "Flow" selection and change them if necessary.
Setting mode-dependent instrument parameters</td></tr>
<tr><td>4</td><td>Check the other parameters in the "Times" selection and change them if necessary.
Setting mode-dependent instrument parameters</td></tr>
<tr><td>5</td><td>Check the other parameters in the "Syringe" selection and change them if necessary.
Setting mode-dependent instrument parameters</td></tr>
</table>

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6	Click **OK** to confirm your settings. The settings are applied.

Note

The entered furnace temperature is crucial for the start of the measurement. The furnace temperature has to be reached in order to perform a measurement!

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4.2 Shutting down the instrument

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH and that has taken part in training.

Purpose

This section enables you to shut down the instrument according to instructions.

Overview

"Shutting down the instrument" is divided into the following topics:

Topic	Page
Shutting the instrument down for short measuring breaks (standby).............	183
Shutting the instrument down for long measuring breaks (switching off).......	185

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Shutting the instrument down for short measuring breaks (standby)

What are short measuring breaks?

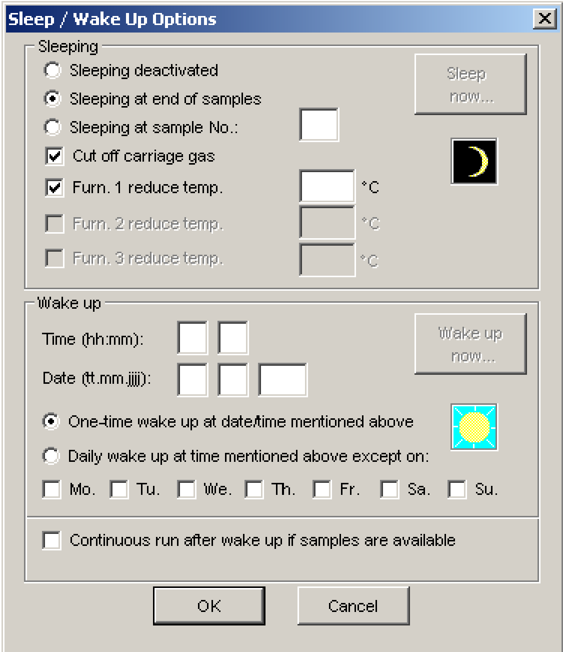
Short measuring breaks are breaks that last overnight or for 2-5 days.

Procedure

The analyzer and the PC stay online during short measuring breaks. Only the sleep function is activated for the instrument.

Setting the analyzer sleep function.

Proceed as follows to set the analyzer sleep function:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Sleep/wake-up functions" dialog in the operating software by selecting Options > Settings > Sleep/Wake-up.

</td></tr>
<tr><td>2</td><td>Define when to enable the sleep function. Select one of the following options:
<table>
<tr><th>Option</th><th>Meaning</th></tr>
<tr><td>"Sleep now..."

</td><td>The instrument is shut down immediately.</td></tr>
<tr><td>"Sleep after end of sample"</td><td>The instrument is shut down after finishing the last weighed sample.</td></tr>
<tr><td>"Sleep at sample No.:"</td><td>The instrument is shut down prior to the appropriate sample.</td></tr>
</table></td></tr>
<tr><td>3</td><td>Check "Shut off carrier gas".</td></tr>
<tr><td>4</td><td>Check "Reduce furnace 1 temp".</td></tr>
<tr><td>5</td><td>Enter 100 °C in the box next to "Reduce furnace 1 temp".</td></tr>
</table>

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6	Specify when to "wake up" the instrument again. The working temperatures are increased again and the instrument is flushed with gas. Choose one of the following options: ▪ Enter the "Date" and "Time" at which to "wake up" the instrument and select the box next to "One-time wake-up at above time/date". ▪ Enter a "Time", select the box next to "Daily wake-up at above time, except:" and select the weekdays on which you do not want to wake up the instrument.
7	If you shut down the instrument in the middle of a series, you can continue this series after "wake-up". To do so, check "Continue after wake-up if there are samples".
8	Click **OK** to close the window and save your settings. The instrument is shut down and woken up again according to your settings.

Shutting the instrument down for long measuring breaks (switching off)

What are long measuring breaks?

Long measuring breaks are breaks that last longer than 5 days.

Preparing the instrument for long measuring breaks.

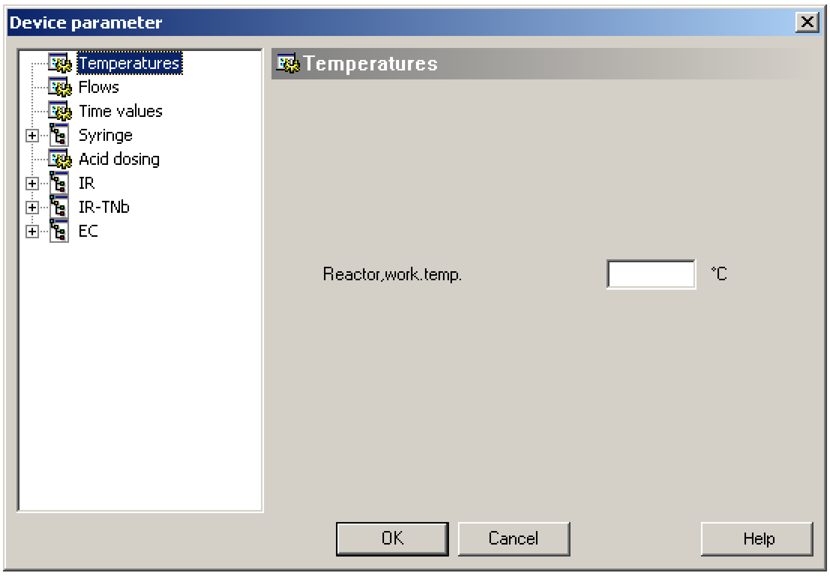
Caution Lack of ventilation of the analyzer

A lack of ventilation leads to overheating of the analyzer.

Before switching off the instrument:

- Set furnace setpoint temperature to 0 °C.
- Allow the furnace to cool down until the temperature displayed is 100 °C.

Proceed as follows to prepare the instrument for long measuring breaks:

Step	Procedure
1	Shut off the gas supply.
2	Set the setpoint temperature of the furnace to 0 °C in the operating software. Open the "Instrument parameters" dialog by selecting **Options > Settings > Parameters**. 
3	Wait 2–3 hours until the instrument has cooled down to at least 100 °C.
4	Quit the operating software. Execute the following command: **File > Exit**.
5	Switch the analyzer and its peripherals off.
6	Disconnect the analyzer from the mains. Disconnect the power supply plug. The instrument is ready for long measuring breaks.

Using the instrument

5

Target group

The target group of this section is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to perform measurements with the instrument.

Overview

"Using the instrument" is divided into the following sections:

Section	**Page**
Measurement settings	187
Preparing samples	198
Preparing measurement work	203
Performing measurement work	219
Preparing measuring data for evaluation	244
Shutting down the instrument temporarily	279
Working with documents	284

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5.1 Measurement settings

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to define the necessary settings for measurements.

Overview

"Measurement settings" is divided into the following topics:

Topic	Page
Defining key names for blank and conditioning samples	188
Viewing list of defined factor, monitor and standard samples	189
Defining standard substances as measuring samples	190
Defining standard substances as calibration samples	191
Specifying the computation method for blank value and daily factor	194
Enabling/disabling acoustic signals	196
Configuring error handling	197

Defining key names for blank and conditioning samples

Key names

Names of blank samples (solids, liquid) and conditioning samples must be defined as keywords so that the software recognizes and handles the samples as blank or conditioning samples.

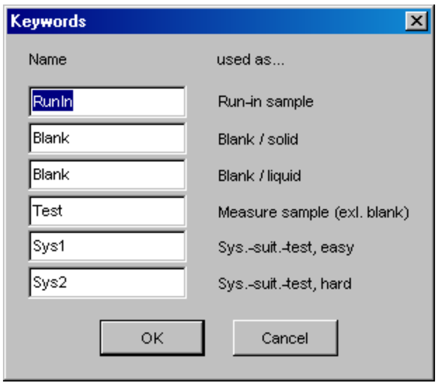
Factory-set key names

The following key names are factory-set:

- For blank samples: Blnk, Blank
- For conditioning samples: Run In
- For measuring sample: test (measuring sample with blank compensation)

Defining custom key names

Proceed as follows to define custom keywords:

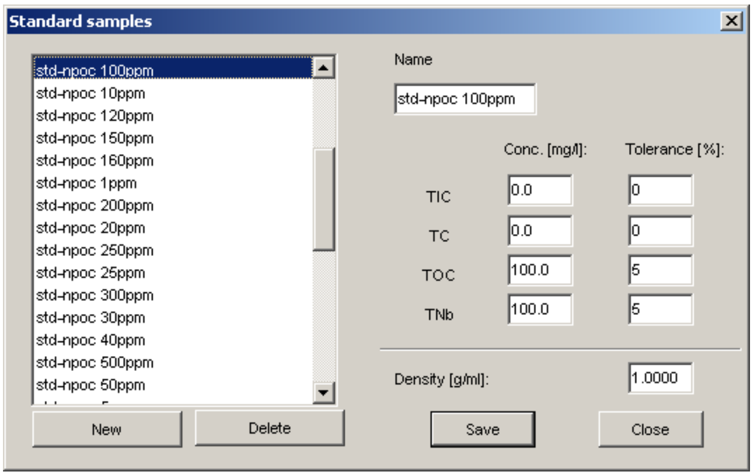
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Key names" dialog in the operating software by selecting Options > Settings > Key Words.

</td></tr>
<tr><td>2</td><td>Enter the desired keywords in the appropriate boxes.</td></tr>
<tr><td>3</td><td>Click OK.
This closes the dialog and saves the settings.</td></tr>
</table>

Viewing list of defined factor, monitor and standard samples

Viewing the list

Proceed as follows to view the list:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Standard samples" dialog in the operating software by selecting Options > Settings > Standard Samples.



The list box displays all currently defined standards. By checking the requested standard sample the setting in the right area of the dialog are displayed.</td></tr>
</table>

Defining standard substances as measuring samples

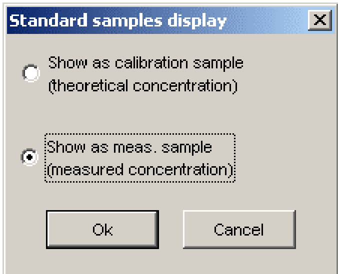
Background

In order to compute standard samples correctly and to display them with their computed element contents in the sample view, it is necessary to define the standard substances as measuring samples. This means that a standard sample is calculated on the actual calibration coefficients and that it represents the actual value.

No daily factor will be calculated or transferred to other measuring values.

Defining standard substances as factor and monitor samples

Proceed as follows to define factor and monitor samples:

Step	Procedure
1	Open the "Standard samples display" dialog in the operating software by selecting **View > Standard samples**. 
2	Select the option "Show as measuring sample (measured concentrati-on)".
3	Click **OK**. This closes the dialog and saves the settings.

Defining standard substances as calibration samples

Background

These operating instructions contain specific rules in the respective operating mode, cf. Calibration tables. If you want to use these rules, you must define the standard substances used there as calibration samples. Of course, you can also use different substances but then you must develop the calibration rule yourself.

Defined calibration samples are displayed along with their theoretical contents in the sample view.

Required substances

If you want to perform calibration on the basis of the calibration tables, you must define certain standard substances depending on the operating mode for which you want to perform calibration.

The following table lists the standard substances required for calibration in the respective operating mode:

Calibration for operating mode	Potassium hydrogen phthalate	Sodium carbonate	Sodium nitrate	Ammonium chloride
TOC	X			
TC	X	X		
TIC		X		
NPOC	X			
TNb			X	X
POC	X)*			

)* Coefficients are transferred (from TOC to POC).

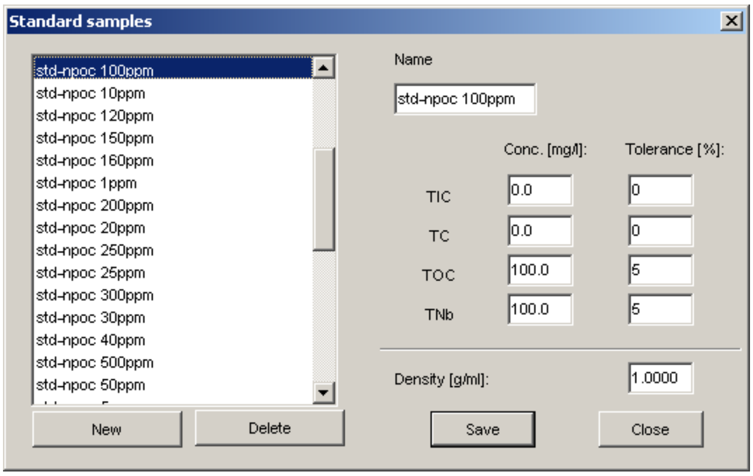
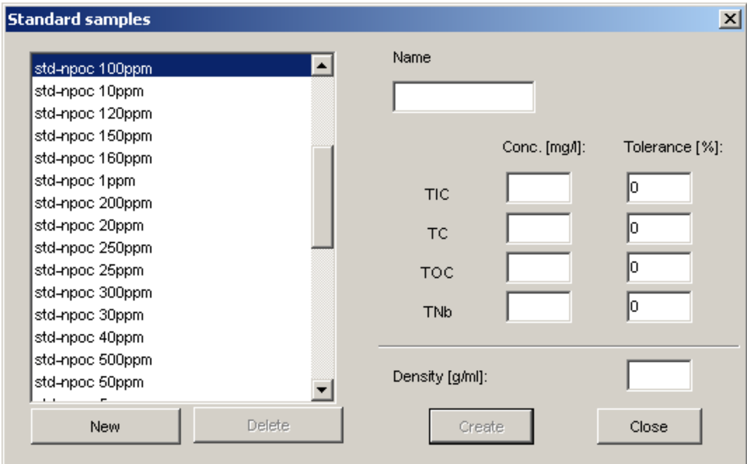
Theoretical element contents of standard substances

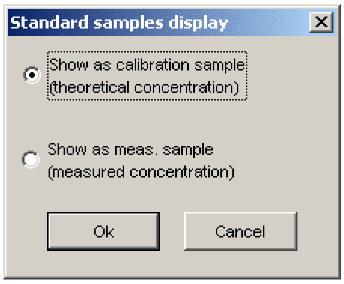
The following tables lists the theoretical element contents of the standard substances used in the calibration tables:

Standard substances	$C_{theor.}$ [%]	$N_{theor.}$ [%]
Potassium hydrogen phthalate	47,1	
Sodium carbonate	11,33	
Sodium nitrate		16,47
Ammoniun chloride		26,17

Defining calibration samples

Proceed as follows to define calibration samples:

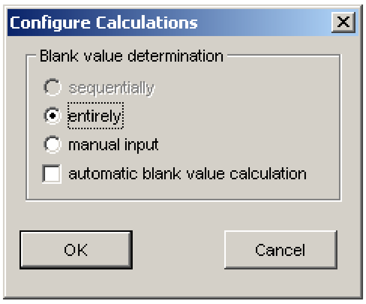
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Edit standard methods" dialog in the operating software by selecting Options > Settings > Standard Samples.

</td></tr>
<tr><td>2</td><td>Click New.
The input boxes on the right of the dialog are empty and ready for the input of a new standard.

</td></tr>
<tr><td>3</td><td>For the substance, enter:
the name of the substance in the "name" field.
the theoretical element content in the "Conc. [mg/l]" fields. If you enter the theoretical element content of a substance element as 0, the element is ignored in the calculation.
the permissible tolerance for each element, usually 5%, in the "Tolerance [%]" fields.</td></tr>
<tr><td>4</td><td>Click Close.
This closes the dialog and saves the settings.</td></tr>
</table>

5	Open the "Standard samples display" dialog in the operating software by selecting **View > Standard samples**.  Select the option "Show as calibration sample".
6	Click **OK**. This closes the dialog and saves the settings.

Specifying the computation method for blank value and daily factor

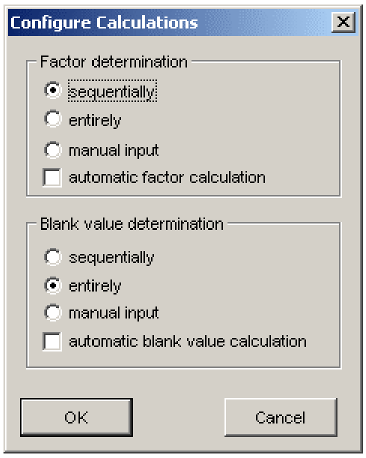
Defining the blank value calculation method (liquid mode)

Proceed as follows to define the blank value calculation method:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "calculation configuration" dialog in the operating software by selecting Options> Settings > calculations.

</td></tr>
<tr><td>2</td><td>Define the calculation method with the aid of the table:
<table>
<tr><th>If you select the following in "Blank value determination"</th><th>...then...</th></tr>
<tr><td>"sequential"</td><td>a separate blank value is computed for every element for every group of blank value samples; this value is entered in the respective blank value column until the next group of blank value samples.</td></tr>
<tr><td>"total"</td><td>all blank value samples in the series are used to compute the blank value for every element. This blank value is then applied to all samples in the series for every element.</td></tr>
<tr><td>"manual input"</td><td>the blank value can be entered manually, there will be no calculation of the blank value.</td></tr>
<tr><td>"autom. blank value calculation"</td><td>the blank value is automatically computed at the end of every analysis.</td></tr>
</table>
Then click OK to save your settings.</td></tr>
</table>

Defining the daily factor calculation method (solids mode)

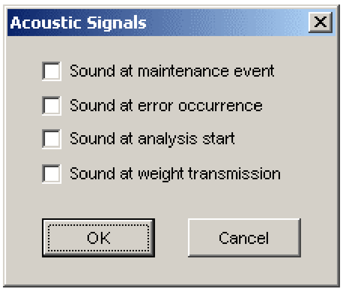
Proceed as follows to define the daily factor calculation method:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Open the "calculation configuration" dialog in the operating software by selecting Options> Settings > calculations.

</td></tr>
<tr><td rowspan="7">2</td><td colspan="2">Define the calculation method with the aid of the table:</td></tr>
<tr><td>If you select the following in "Factor determination"</td><td>...then...</td></tr>
<tr><td>"sequential"</td><td>the daily factor is computed group-by-group and changes throughout the day.</td></tr>
<tr><td>"total"</td><td>the daily factor is computed on the basis of all factor samples in the file. An average factor is computed.</td></tr>
<tr><td>"manual input"</td><td>the daily factor can be entered manually, there will be no calculation of the daily factor.</td></tr>
<tr><td>"autom. factor calculation</td><td>the daily factor is automatically computed at the end of every analysis.</td></tr>
<tr><td colspan="2">Then click OK to save your settings.</td></tr>
</table>

Enabling/disabling acoustic signals

Enabling/disabling acoustic signals

Proceed as follows to enable or disable acoustic signals:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Acoustic signals" dialog by selecting Options > Settings > Acoustic Signals.

</td></tr>
<tr><td>2</td><td>Proceed on the basis of the following decision table:
<table>
<tr><th>If you want to...</th><th>...then...</th></tr>
<tr><td>enable a signal</td><td>check the appropriate checkbox.</td></tr>
<tr><td>disable a signal</td><td>uncheck the appropriate checkbox.</td></tr>
</table></td></tr>
<tr><td>3</td><td>Click OK.
This closes the dialog and saves the settings.</td></tr>
</table>

Configuring error handling

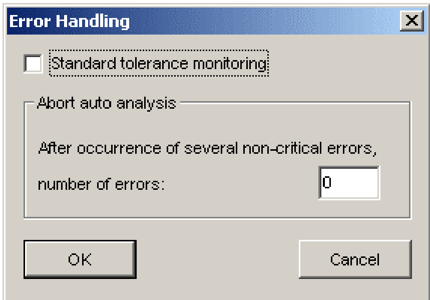
Reacting to irregularities

If irregularities occur during the analysis, it is important for the user to quickly identify any errors. In the "Error handling" dialog the user defines how the analyzer is to react to incidents.

Incident	Consequences
During analysis, the computed element contents exceed the defined tolerances.	If standard tolerance monitoring is enabled, the analysis is aborted. "Tol" is displayed in the information column of the particular sample.
A critical error occurs.	The analyzer is stopped after the analysis.
A non-critical error occurs.	If you have set the analyzer to stop after a set number of non-critical errors and this number has been reached, the analyzer is stopped after the analysis.

Configuring error handling

Proceed as follows to configure error handling:

Step	Procedure
1	Open the "Error handling" dialog in the operating software by selecting **Options > Settings > Error Handling**. 
2	If you want to enable standard tolerance monitoring, check the "Standard tolerance monitoring" checkbox.
3	If you want to abort the analysis after several non-critical errors, enter the number of errors in the appropriate textbox. Enter "0" to ignore non-critical errors.
4	Click **OK**. This closes the dialog and saves the settings.

5.2 Preparing samples

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to prepare samples properly.

Overview

"Preparing samples" is divided into the following topics:

Topic	Page
Sample preparation instructions	199
Injection volume determination (Liquid mode)	200
Sample packing (Solids mode)	201

Sample preparation instructions

Samples with potential risks

Various sample substances can pose a risk to the user during the analysis:

- Contact with the substances may lead to chemical burns or poisoning.
- Combustion analysis of larger quantities of the substance may lead to explosions.

These sample substances include:

- Aggressive chemicals such as acids or alkaline solutions
- Organic solvents
- Explosives
- Substances that develop toxic or explosive gas mixtures.

Users are obliged to protect themselves prior to contact with hazardous substances and to reduce the quantity of the substance to a safe amount. Users are also obliged to observe the safety instructions of the chemical manufacturer on the label of the bottle or in the safety data sheets. The safety data sheets contain risk information about a chemical in the R sets and safety information in the S sets.

Sampling and homogenization

Refer to the relevant literature concerning the problem of sampling and homogenization.

Sample crushing and drying

When crushing and drying samples you may lose highly volatile constituents.

Also, the sample may get contaminated with foreign substances.

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What influences analysis results?

The following influences analysis results:

- In nitrogen analysis, inclusions of air in the samples influence analysis results. Inclusions of air must therefore be avoided.
- In carbon analysis, contaminations due to touching the sample container and absorbtion of air humidity influence analysis results.

Filling the sample vials in the automatic liquid mode

Only fill the sample vials when the carousel has been taken off.

Unscrew the carousel and fill the sample vials up on a working plate.

Wait for the reference run after you have put the carousel back onto the analyzer.

Measuring NPOC

For NPOC measurement the sample has to be brought to a pH value of 2 with a suitable acid (e.g. HCl).

Injection volume determination (Liquid mode)

What is optimal injecti-on volume?

The optimal injection volume depends on
- the content of the elements to be measured, C and N.
- the valid calibration,
- the dynmaic working range of each element
- the exisiting sample volume.
- and that combustion of the sample is limited in time and controllable in terms of pressure.

Determining injection volume with known substances

- Requirements for the determination of the injection volume: Information on the dynamic working range of the elements.

Proceed as follows to determine the injection volume of known substances:

Step	Procedure
1	The possible injection range of the substance is computed ▪ from the highest injection required to achieve the lower limit of the work range ▪ and the lowest injection required to achieve the upper limit of the work range.

Determining injection volume with unknown substances

Proceed as follows to determine the injection volume of unknown substances:

Step	Procedure
1	Perform a test measurement with 0.15 ml of the substance.
2	Use the rough values to determine the optimum injection volume.

Sample packing (Solids mode)

Sample packing

- The following types of sample packing may be used depending on the type of sample:
  - Foil
  - Capsules.
- In solids mode, tin and silver are recommended as the sample packing material.
- WO_3 e.g. can be used as an additive.

Sample packing rules

Observe the following rules in order to achieve reliable measuring results:

- There must be no body fat or sweat on the packing material. Therefore, do not touch the boats or other packing material with your hands. Work with tweezers or with gloves. Capsules for low C determination must be washed with acetone and dried before analyzing.
- Avoid loss of substance after weighing. Therefore, wrap the substance exactly in the foil and close capsules gas-tight.

Packing solid samples

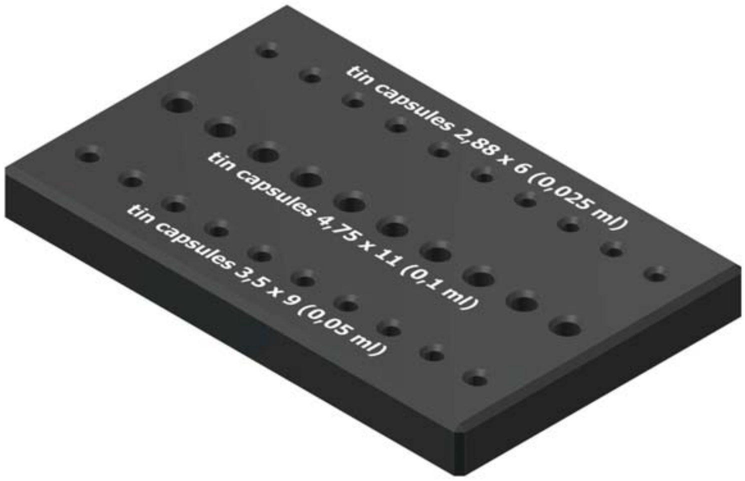
Examples of such samples include soil samples. Proceed as follows to pack solid samples in the high sample weight range:

Step	Procedure
1	Tare the foil to zero.
2	If necessary, weigh in a sample additive.
3	Tare the sample additive to zero.
4	Fill in the sample.
5	Close the foil over the sample as air-tight as possible with the aid of tweezers (folding technique).
6	Put the sample packet into a solid sample shaper or hand press.
7	Apply the press ram.
8	Press a sample tablet with the solid sample shaper or hand press. Make sure the sample has a height of at least 1 mm. If you have observed all of these steps, the sample is now properly packed and should be weighed once again for control purposes.

Packing pasty and liquid samples

Examples of such samples include sludges or plant extracts. Proceed as follows to pack pasty or liquid samples:

Step	Procedure
1	Tare a capsule to zero.

2	Put the capsule into the sample panel for capsules. 
3	Fill the sample into the capsule using a pipette or syringe.
4	Seal the capsule airtight with tweezers. If the sample contains volatile compounds, fill the capsule up to the edge and close it below the filling level.
5	Wash any sample residue on the outside with a suitable solvent (e.g. acetone). If you have observed all of these steps, the sample is now properly packed and should be weighed once again for control purposes.

5.3 Preparing measurement work

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to prepare measurement work.

Overview

"Preparing measurement work" is divided into the following topics:

Topic	Page
Software usage rules	204
Starting the operating software	205
Showing or hiding the toolbar	206
Waking up the instrument	207
Selecting the operating mode	208
Viewing method settings	210
Defining custom methods	212
Settings for sample input	214
Importing weighing data	216
Prioritizing urgent samples	218

Software usage rules

Software usage rules

Observe th following rules in order to avoid disruptions during analysis:

- The control PC must not be used simultaneously as an office workstation as this may lead to software instability.
- Observe the following if using the operating software and other software at the same time:

  Programs that require a lot of computer processing capacity or access disk drives for long periods (e.g. disk formatting) may cause disruptions. Programs that access the same serial interface as the analyzer operating software cause the analyzer to crash totally! Therefore, avoid running multiple programs simultaneously if you are not sure about how they work.
- Only standard Windows screensavers may be used.

Starting the operating software

Starting the operating software

Proceed as follows to start the operating software:

Step	Procedure
1	Launch the operating software: ▪ by double-clicking the appropriate icon on your screen or ▪ by launching the program via **Start > Programs** or ▪ by executing the program via the appropriate path.
2	Enter the following in the "Log in as" dialog: <table><tr><th>In the field...</th><th>...enter...</th></tr><tr><td>User</td><td>Your user name.</td></tr><tr><td>Password</td><td>Your password.</td></tr><tr><td>Domain</td><td>Normally nothing. This field is only required for corporate networks.</td></tr></table>
3	Click **OK** in the "Log in as" dialog. The user interface is displayed.

Showing or hiding the toolbar

Showing or hiding the toolbar

Select **View > Toolbar** to show or hide the toolbar:

- If "Toolbar" is checked, the toolbar is displayed.
- If "Toolbar" is not checked, the toolbar is hidden.

Waking up the instrument

Waking up the instrument

Proceed as follows to wake up the instrument:

Step	Procedure
1	Wake up the analyzer by selecting **System > Wake Up**. The carrier gas is reactivated and the furnace is heated back up to their working temperatures.

Selecting the operating mode

Essential condition

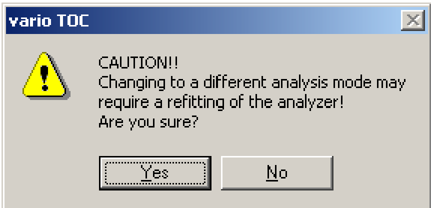
Before switching operating modes, you must have performed all refitting work required for the new operating mode.

Selecting the operating mode

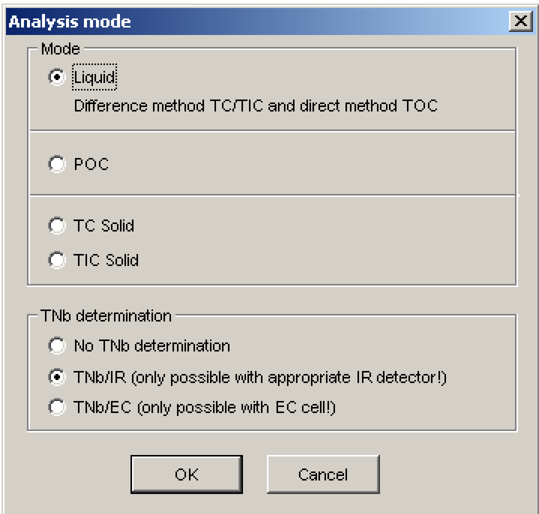
Caution	Overheating if tube fillings are not appropriate for the operating mode Overheated tube fillings melt, run into the furnace area and destroy the furnace. Make sure that the tube fillings correspond to the selected opera-ting mode.

Proceed as follows to select the operating mode:

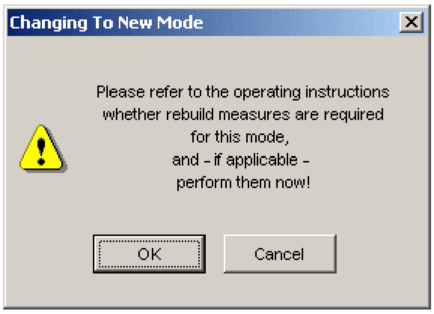
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Perform all refitting work required for the new operating mode.</td></tr>
<tr><td>2</td><td>Open the "vario TOC" dialog in the operating software by selecting System > Mode.



</td></tr>
<tr><td>3</td><td>Click Yes if you want to continue.
The "Analysis mode" dialog is displayed:



</td></tr>
</table>

4	Select the desired analysis mode. Then click **OK**. The "Change to new mode" dialog is displayed: 
5	Click **OK** if you have refitted the instrument. The operating mode is changed.

Viewing method settings

Notes on the preset methods

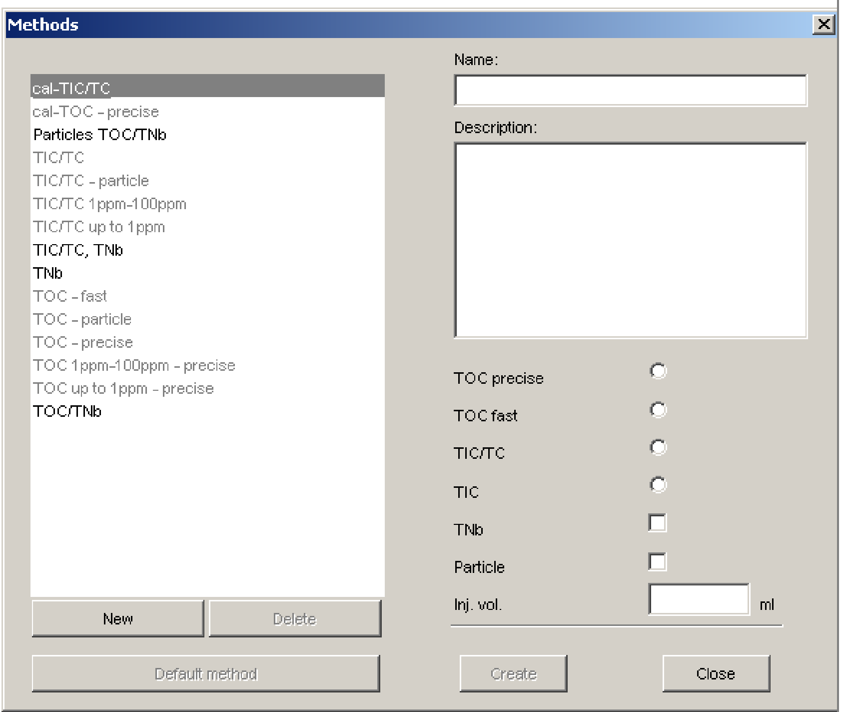
The following tables gives some notes to the preset methods:

Method	Description
TOC methods	This is a mere TC measurement (direct method). The sample will be directly injected into the furnace, i. e. the sample matrix is known or has to be pretreated accordingly.
TIC / TC methods	This is a difference measurement for the determinati-on of "TOC". First, the "TIC" is determined in the sparger. Subse-quently, the "TC" is determined by injection into the furnace.

You will receive further information by clicking the corresponding method via **Options > Settings > Methods**.

Viewing settings

Apart from the detection method of individual parameters you will find further information behind "Method". Proceed as follows to view the parameter settings for a method:

Step	Procedure
1	Open the "Edit methods" dialog in the operating software by selecting **Options > Settings > Methods**. 

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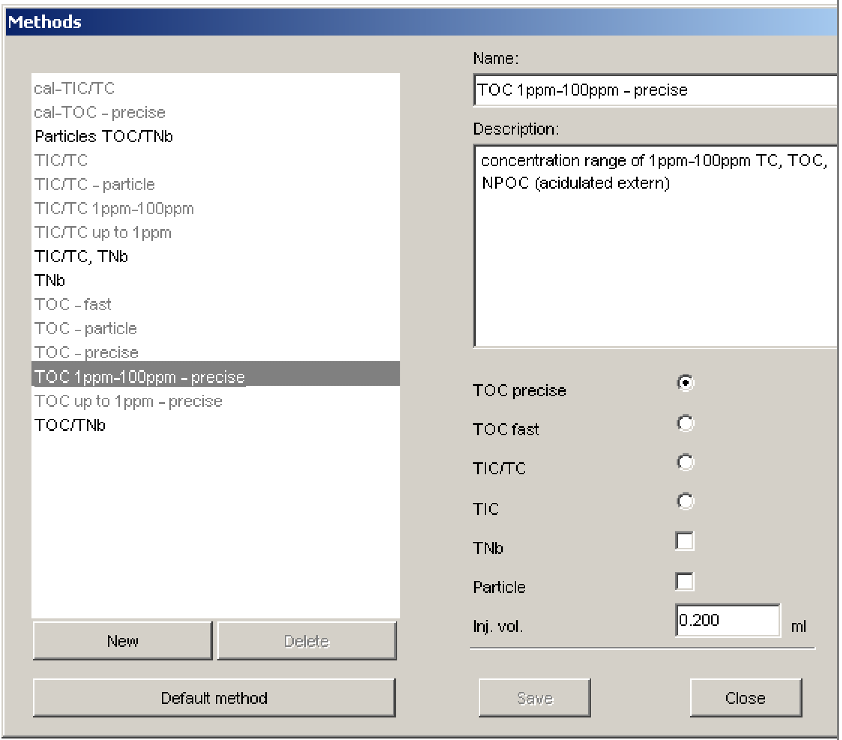
2	Select the desired method. The settings of the individual parameters are displayed in the right area of the dialog.



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Defining custom methods

Note

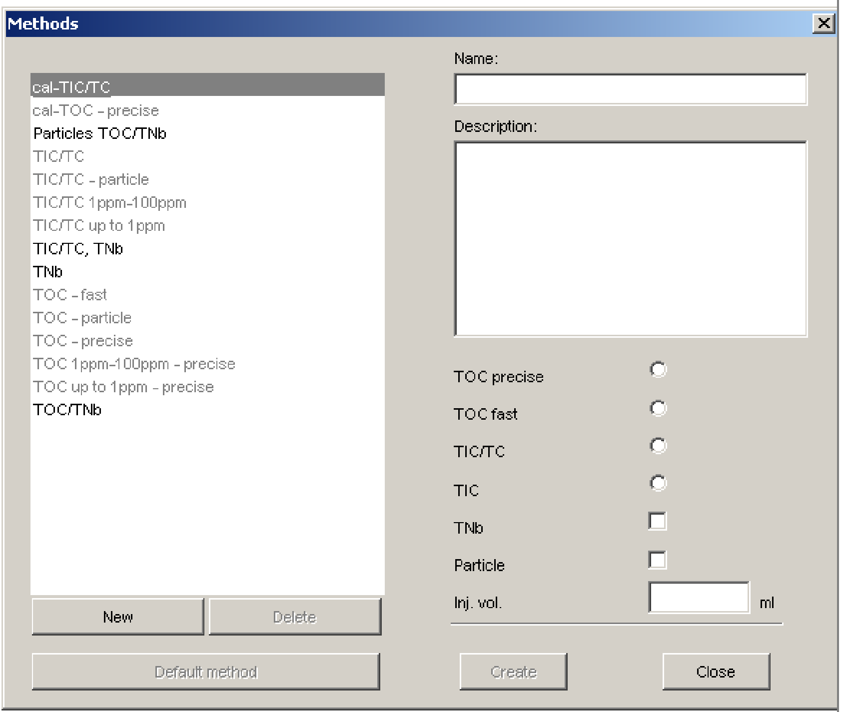
You can only define custom methods if the table of results is new, i.e.:

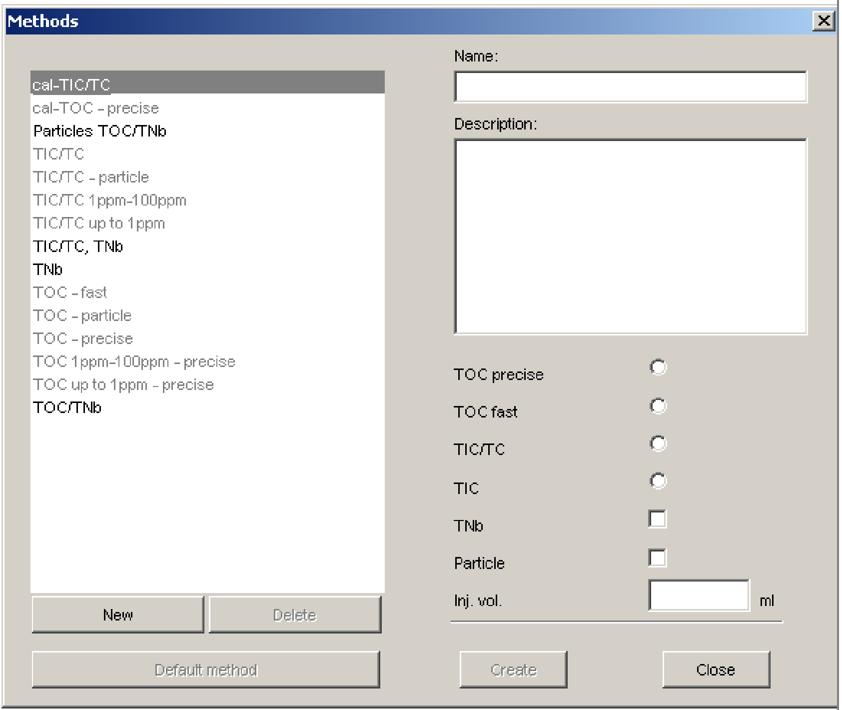
- it must not contain any entries such as name, volume, etc.
- and must not have been saved yet.

Defining custom methods

Proceed as follows to define custom methods:

Step	Procedure
1	Open the "Methods" dialog in the operating software by selecting **Options > Settings > Methods**.



<table>
<tr><td>2</td><td>Click New.
The input boxes on the right of the dialog are now empty. Here, a new method can be defined now.

</td></tr>
<tr><td>3</td><td>Enter the following:
Enter the name of your method in the "ID" field.
Enter the purpose of the method, for example, in the "Description" field.
Input the corresponding method parameters in the other boxes.</td></tr>
<tr><td>4</td><td>Click Close to close the dialog.
You have now defined the method.</td></tr>
</table>

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Settings for sample input

Facilitating input of samples

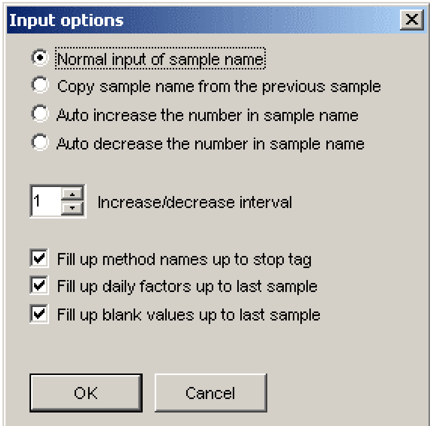
You can define settings to facilitate sample insertion in the following cases:

- An identical sample name is used several times.
- You need to increment or decrement a figure in the sample names.
- One method is used for numerous samples.
- You need to input a daily factor for numerous samples.
- You need to input a blank value for numerous samples.

Define settings

Proceed as follows to define settings for sample input:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Input options" dialog in the operating software by selecting Options > Settings > Input.



</td></tr>
<tr><td>2</td><td>Select one of the radio buttons to specify sample name input. For the bottom two radio buttons you must also specify the increment/decrement interval by using the arrows buttons.
<table>
<tr><th>Option</th><th>Meaning</th></tr>
<tr><td>Normal sample name input</td><td>The sample name is entered in the appropriate column as it is input.</td></tr>
<tr><td>Apply sample name</td><td>After entering the sample name and pressing Enter, the input name is applied to the next line as a suggestion.</td></tr>
<tr><td>autom. Auto-increment the number in the sample name</td><td>If a sample name ends with a number (e.g. "Name001"), this figure is automatically incremented by a certain amount and suggested for the next sample (e.g. "Name002").</td></tr>
<tr><td>autom. Auto-decrement the number in the sample name</td><td>Works the same way as auto-increment, only the figure in the name is decremented.</td></tr>
</table>
</td></tr>
<tr><td>3</td><td>Proceed on the basis of the following decision table:</td></tr>
</table>

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<table>
<tr><td rowspan="5"></td><td>If you have checked the following option...</td><td>...then...</td></tr>
<tr><td>Normal sample name input</td><td>go to Step 4.</td></tr>
<tr><td>Apply sample name</td><td>go to Step 4.</td></tr>
<tr><td>autom. Auto-increment the number in the sample name</td><td>set the increment interval in the text box by using the arrow buttons. Then go to Step 4.</td></tr>
<tr><td>autom. Auto-decrement the number in the sample name</td><td>set the decrement interval in the text box by using the arrow buttons. Then go to Step 4.</td></tr>
<tr><td>4</td><td colspan="2">Check the checkbox next to the appropriate options.
<table>
<tr><th>Option</th><th>Meaning</th></tr>
<tr><td>Fill method names to stop marker</td><td>The method name input for the first sample is entered for all subsequent samples up to the stop marker.</td></tr>
<tr><td>Fill blank values to last sample</td><td>The blank value input for the first sample is entered for all subsequent samples.</td></tr>
</table></td></tr>
<tr><td>5</td><td colspan="2">Click OK.
This closes the dialog and saves the settings.</td></tr>
</table>

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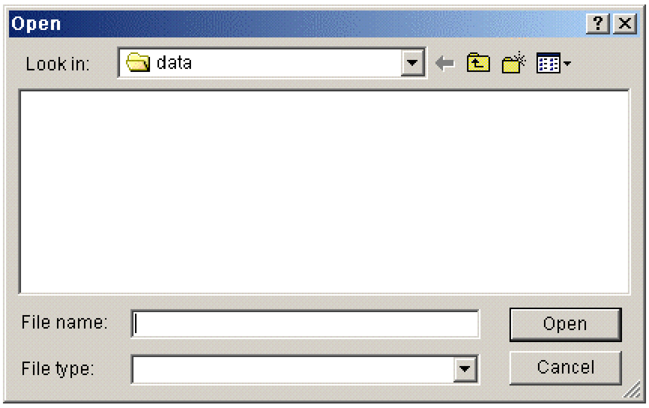
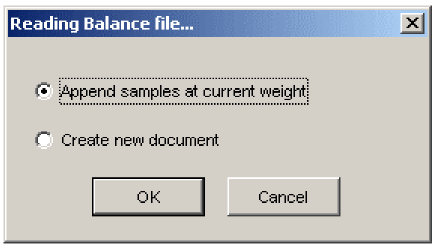
Importing weighing data

Importing weighing data

Proceed as follows to import weighing data:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Open the "Open" dialog by selecting File > Import.
</td></tr>
<tr><td>2</td><td colspan="2">Select the "Balance Files (*.dat)" file type from the "File type" drop-down listbox.</td></tr>
<tr><td>3</td><td colspan="2">From the dropdown listbox select the directory containing the weighing data file.
Select a file and click Open.</td></tr>
<tr><td rowspan="3">4</td><th>If you import into</th><th>...then...</th></tr>
<tr><td>an empty sample memory</td><td>the weighing data are saved to sample memory starting at No. 1. The import is finished.
Save the document.</td></tr>
<tr><td>a sample memory that is not empty</td><td>another dialog is displayed.
Go to Step 5.</td></tr>
<tr><td>5</td><td colspan="2">If you import into a sample memory that is not empty, the "Import Balance file" dialog is displayed.
</td></tr>
<tr><td>6</td><td colspan="2">Select the desired radiobutton in the dialog.</td></tr>
</table>

	If you select the following radio button and click OK...	...then...
	Append samples as from the current weighed sample	the weighing data are stored after the current sample weight. The import is finished. Save the document.
	"Create new document"	the weighing data are saved in a new document. The import is finished. Save the document.

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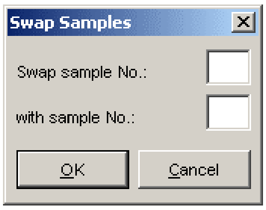
Prioritizing urgent samples

Prioritizing urgent samples

Proceed as follows to prioritize urgent samples:

Step	Procedure
1	Open the "Swap samples" dialog in the operating software by selecting **Edit > Swap**. 
2	Enter the numbers of the samples to swap in the textboxes in the dialog. Then click **OK**. This closes the dialog and the samples are swapped in the sample memory.
3	Manually swap samples in the carousel.

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5.4 Performing measurement work

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to perform all measurement work.

Overview

"Performing measurement work" is divided into the following topics:

Topic	Page
Performing a measuring series	220
Function test	224
Performing routine measuring work	227
Checklist for blank value, conditioning, daily factor and real samples measurements	229
Types of blank value determination and their settings	230
Determining blank values	231
Daily factor determination (only possible in the solids mode)	233
Description of the determination variants	237
Flushing the analyzer during an analysis run	241
Stopping continuous analysis	243

Performing a measuring series

General

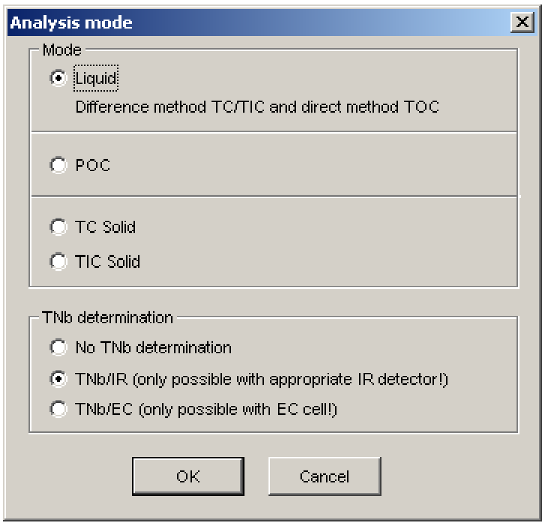
When perfoming a measuring series, it will be distinguished between:

- a general function test during intial operation and/or after the installation of a new reactor and
- the routine analysis.

Mode settings

Proceed as follows to select an analysis mode:

Step	Procedure
1	Open the dialog "Analysis mode" in the operating software by selecting **System > Mode** and choose the desired operating mode.



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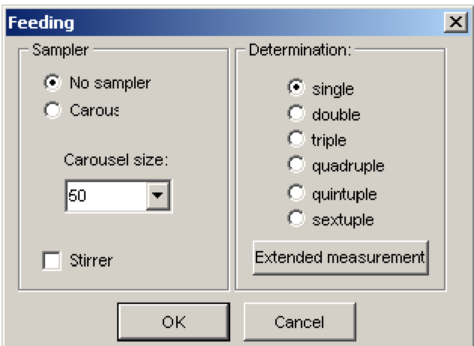
Sample feeding settings

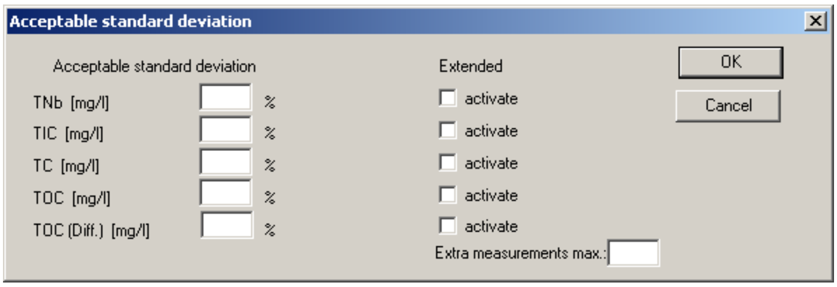
Proceed as follows, to view the setting of the sample feeding:

Step	Procedure
1	Open the "Feeding" dialog in the operating software by selecting **System > Feeding**. Here the number of determinations (e.g. triple), the function of the stirrer and the feeding unit (e.g. carousel with a 50 position magazine) can be selected.



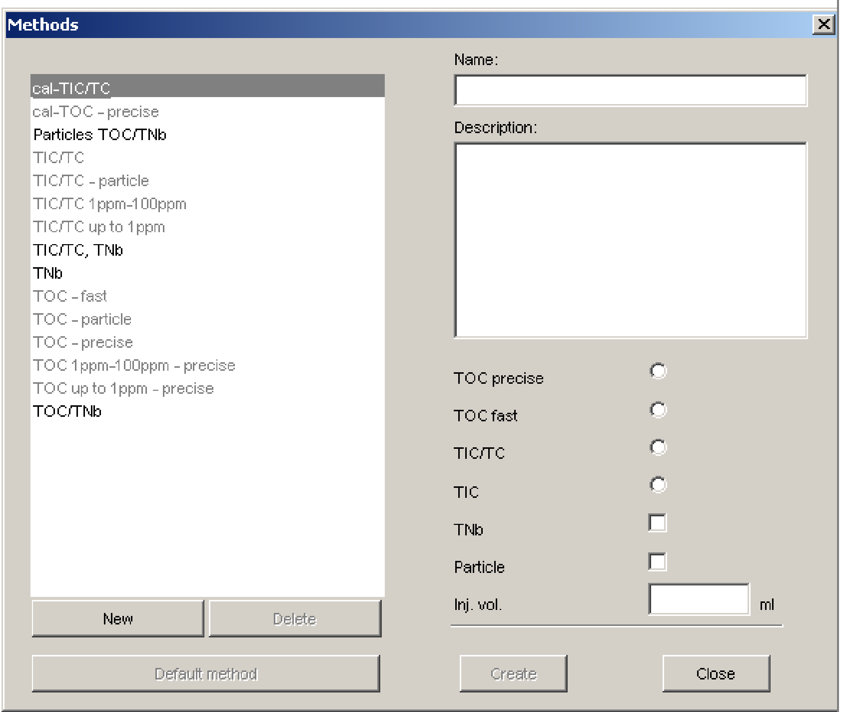
Acceptable standard deviation

Proceed as follows, to view the setting of the standard deviation:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Feeding" dialog in the operating software by selecting System > Feeding. The link "Extended measurement" allows to determine acceptable standard deviations for the correspondingen parameter.

</td></tr>
<tr><td>2</td><td>Under "Extra measurements max." the number of measurements can be defined which shall be additionally processed if the acceptable standard deviation was not observed.</td></tr>
</table>

Viewing method settings

Proceed as follows to view the parameter settings for a method:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Methods" dialog in the operating software by selecting Options > Settings > Methods.

</td></tr>
</table>

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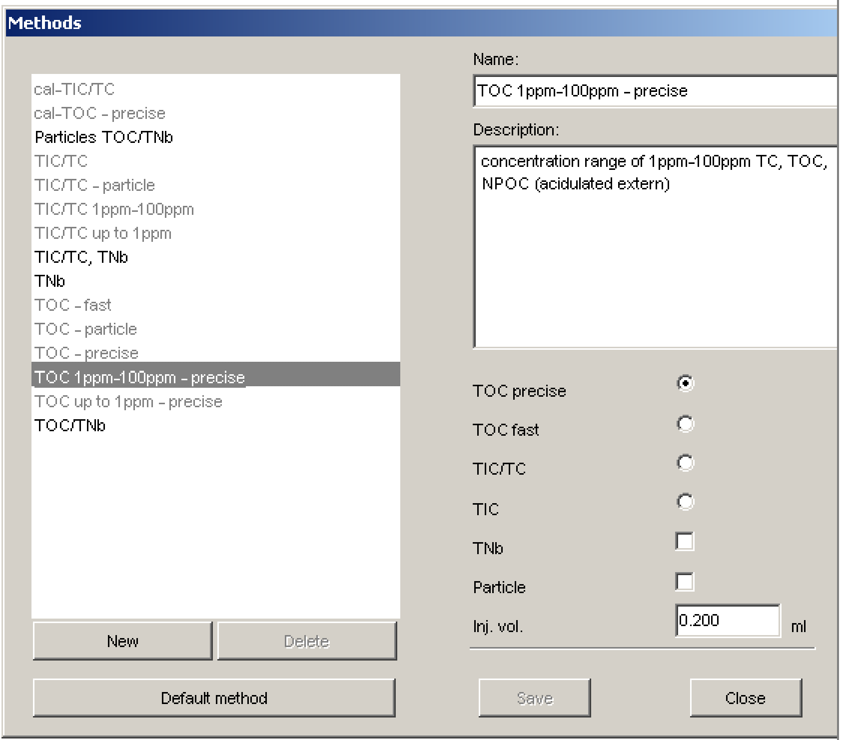
2 Select the desired method. The settings of the individual parameters are displayed in the right area of the dialog.



Settings via the method

Method settings are:

Parameter	**Meaning**
TIC / TC	TIC will be purged in the sparger and measured, subsequently TC is determined via direct injection into the furnace, the difference from TC and TIC is TOC.
TIC	TIC is purged in the sparger and measured.
TOC precise / TOC fast	The sample is injected directly into the furnace and evaluated, for TC TOC and NPOC determination; for NPOC it will be acidified externally.
TN_b determination	Simultaneous determination of the total bound nitrogen in the sample.
Particle measurements	Special measuring method for particles containing samples to avoid sedimentation as far as possible. (Can be additionally activated to the analysis mode). When measuring particles the stirrer function will be automatically recognized.
Injection volume	Specification of the injection volume (optional).

Note:

For TOC precise the first measurement runs in the backround (dummy peak) and will not be evaluated.

The advantage is that carry over effects of previous measurements in the instruments can be almost completely avoided.

Explanation TOC precise / TOC fast

	TOC precise	TOC fast
Injection	directly into the furnace	directly into the furnace
Flushing	1 to 5 times	3 to 5 times
Flush volume	free selectable (adjustable under **Settings > Parameters**)	free selectable (adjustable under **Settings > Parameters**)
Measurement	with dummy peak	without dummy peak
Measuring time (3-fold measurement)	15 min (due to dummy measurement 4 measurements)	12 min
Precision of measurements	very good	good

Note

A dummy peak measurement is an additional measurement which will not be considered in the calculation. It is relevant to avoid carry-over effects from previous measurments.

This means that 4 measurements have to be made for a 3-fold determination with the method "TOC-precise".

Explanations regarding the maximum injection volume

	vario TOC
Syringe volume (ml)	5
TIC / TC (1-fold measurement)	$\frac{5\text{ ml} - 0.6\text{ ml}^*}{3\text{ measurements}} = 1.46\text{ ml}$
TIC / TC (3-fold measurement)	$\frac{5\text{ ml} - 0.6\text{ ml}^*}{7\text{ measurements}} = 0.63\text{ ml}$
TOC precise (1-fold measurement)	$\frac{5\text{ ml}}{2\text{ measurements}} = 2.5\text{ ml}$
TOC precise (3-fold measurement)	$\frac{5\text{ ml}}{4\text{ measurements}} = 1.25\text{ ml}$
TOC fast (1-fold measurement)	max. injection volume = 2 ml
TOC fast (3-fold measurement)	$\frac{5\text{ ml}}{3\text{ measurements}} = 1.7\text{ ml}$

*0.6 ml Dummy volume sparger

Note

The calculations were done disregarding different adjustment parameters of the syringe.

The calculations are meant to understand the maximum injection volumes.

A warning notice regarding the maximum injection volume also occurs in the software.

It is not necessary to work the maximum injection volume.

Function test

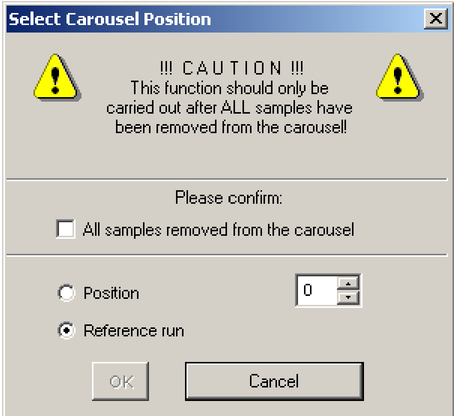
When is a function test required?

A function test is required during an initial operation and/or after installation of a new combustion tube.

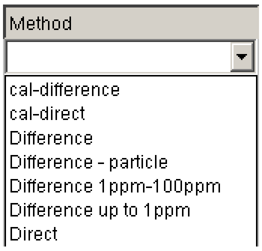
Warning	Only fill the sample vials when the carousel has been taken off! Unscrew the carousel and fill the sample vials up on a working plate.

Performing a function test

Proceed as follows to perform a function test:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Move the empty carousel to zero position.
To do so, open the "Set carousel position" dialog in the operating software by selecting System> Sample Position.


</td></tr>
<tr><td>2</td><td>Select the radio button next to "Reference run" and click OK.
The carousel moves to zero position.</td></tr>
<tr><td>3</td><td>Measure deionized water (TOC<0.5mg/l).
Proceed as follows:
▪ Fill the sample vials of the autosampler with deionized water and put them on the autosampler. If there is no autosampler available, the sample tube will be lead directly into the corresponding glass vessel.
<u>Note:</u> There are position numbers on the autosampler. These position numbers correspond to the numbers in column "hole position" (instrument software).</td></tr>
<tr><td>4</td><td>Determine the number of measurements per sample vial under System > Feeding.</td></tr>
</table>

5	Open the following input boxes in the sample view (text view): <u>Input box "Name":</u> Enter e.g. the name "Runin" for the number of the requested samples. Example: 5 sample vials 3 measurements each = 15 x <u>Input box "Method":</u> Select the appropriate method. Example: TOC precise  <u>Input box "TOC volume".</u> Enter the appropriate injection volume (if not yet determined in the method).
6	Close the input boxes and start the measuring series.
7	For continuous operation, click symbol . For a single analysis, click .
8	Now the number of preselected blank value measurements will be processed. The gained peak areas should be as small as possible and stable. If there is no stable value, the measurements have to be continued.
9	With stable measurements you can now measure test standard, e.g. 10 mg/l NPOC etc. to verify the stability of the measuring values. The procedure is as follows: ▪ fill e.g. 5 sample vials of the autosampler with test standard 10 mg/l NPOC. ▪ Enter the name for the number of the requested measurements in the input box "name", e.g. 5 sample vials 3 measurements each. ▪ Enter the adequate method in the input box "method". The method will be automatically copied for all entered sample names.
10	Enter the appropriate injection volume, e.g. 0.25 ml (if not yet determi-ned in the method).
11	Close the input boxes and start the measuring series.
12	For continuous operation, click symbol . For a single analysis, click .
13	Now the number of preselected samples will be processed. For the statistical evaluation a statistics function is available under **Math. > Statistics**.

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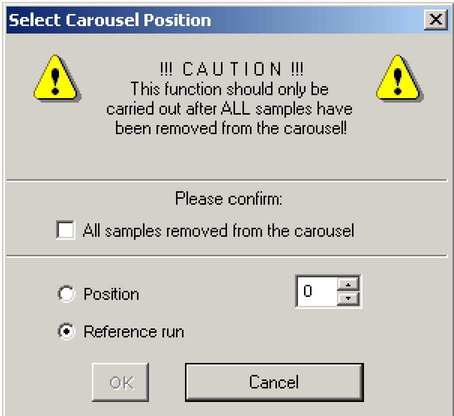
If the statistical evaluation results in a satisfying precision, the routine analysis can be started.

Measurements without previous function test and measuring routine work

Warning	Only fill the sample vials when the carousel has been taken off! Unscrew the carousel and fill the sample vials up on a working plate.

Proceed as follows to measure real samples:

Step	Procedure
1	Move the empty carousel to zero position. To do so, open the "Set carousel position" dialog in the operating software by selecting **System> Sample Position**. 
2	Select the radio button next to "Reference run" and click **OK**. The carousel moves to zero position.
3	Prepare the samples. Cf. *Sample preparation instructions* on page 199.
4	Insert the samples on the carousel. Remove the carousel.
5	Enter the sample data in sample view text view on the PC: ▪ Enter the injection volume in [ml]. ▪ Enter the name of the sample (max. 32 characters). ▪ Select a suitable method.
6	Go through the measuring start checklist. See checklist for real sample measurement
7	Start the analysis process in the operating software: ▪ Select **System> Auto** to start a multiple-sample analysis. ▪ Select **System> Single** to start a single-sample analysis.
8	Once measurement is finished, evaluate the measurement.
9	Save the data or print them out. Cf. *Data backup and printing* on page 270.

Performing routine measuring work

Overview

This section provides information about

- types of routine measuring work,
- the purpose of routine measuring work,
- and how to perform this routine measuring work depending on the mode.

Condition

The instrument is switched on, the function test was checked.

Definitions

Routine measuring work comprises the following activities:

- Determination of instrument blank values.
- Instrument conditioning with conditioning samples.
- Determination of daily factors.

Routine measuring work is performed at set intervals or on defined occasions before, during or after a series of measurements with real or standard samples.

Instrument blank values

Determination of instrument blank values is depend on your needs. The following table provides a break-down of the types and purposes of the various determinations.

Purpose	Sample	Blank value(s)	Occasion
Blank value measurement of distilled H_2O, sample additives and packing material	▪ dist. H_2O ▪ Sample additive ▪ Packing material	CO_2, NO	to consider blank values of distilled H_2O, sample additives or packing material

For details on determining blank values, cf. *Types of blank value determination and their settings* on page 230.

Conditioning samples

Conditioning samples are measured with standard substances at the start of every series of analyses. They are used to check

- the correct course of the analysis,
- the proper condition of the instrument,
- flow and pressure behavior of the gases.

Daily factor determinations

Determination of the daily factor serves

- to fine-tune instrument calibration to room conditions at the time of analysis
- to assess the condition of the instrument by observing daily factor fluctuations and drift trends.

When to perform routine measuring work

Perform routine measuring work

- perform at least once a day
- perform with large measuring series
- and perform after longer measuring breaks.

If a series of analyses exceeds a duration of 12 hours, it is advisable to determine defined standard solutions additionally in the middle and at the end of the series.

Example of a measuring routine work

Warning	Only fill the sample vials when the carousel has been taken off! Unscrew the carousel and fill the sample vials up on a working plate.

A measuring routine work could be as follows:

Step	Procedure
1	Select the method (e.g. TOC-precise).
2	Fill the sample vessel no. 1 of the autosampler with a test standard for conditioning according to the application (example: 10 ppm).
3	Fill the sample vessel no. 2-3 of the autosampler with deionized water for blank value measurement.
4	Fill the sample vessel no. 4 of the autosampler with a test standard for calibration control according to the application (example: 10 ppm).
5	Enter the following measuring series into the PC:

No.	Hole Pos.	Name	Method	TOC-Vol.[ml]	TOC Area	TNb Area	T
1	1	std-npoc 10ppm	TOC-precise	0.250	0	0	
2	1	std-npoc 10ppm	TOC-precise	0.250	0	0	
3	1	std-npoc 10ppm	TOC-precise	0.250	0	0	
4	2	Blank	TOC-precise	0.250	0	0	
5	2	Blank	TOC-precise	0.250	0	0	
6	2	Blank	TOC-precise	0.250	0	0	
7	3	Blank	TOC-precise	0.250	0	0	
8	3	Blank	TOC-precise	0.250	0	0	
9	3	Blank	TOC-precise	0.250	0	0	
10	4	std-npoc 10ppm	TOC-precise	0.250	0	0	
11	4	std-npoc 10ppm	TOC-precise	0.250	0	0	
STOP 12	4	std-npoc 10ppm	TOC-precise	0.250	0	0	

Attention should be paid to

The hole position will be automatically generated.

Step	Procedure
6	From sample vessel no. 5 on, real samples can be put into the autosampler, entering the adequate method (injection volume).

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Checklist for blank value, conditioning, daily factor and real samples measurements

Purpose of the checklist

The checklist helps you check whether the instrument is ready to measure blank value, conditioning and real samples.

Checklist

Go through the following list:

<table>
<tr><th>Item</th><th colspan="2">Checks</th></tr>
<tr><td>1</td><td colspan="2">Are the operating gases on?</td></tr>
<tr><td rowspan="4">2</td><td colspan="2">Is the furnace at setpoint temperature?</td></tr>
<tr><td>Mode</td><td>Combustion tube</td></tr>
<tr><td>Liquid</td><td>850 °C</td></tr>
<tr><td>Solid</td><td>950 °C</td></tr>
<tr><td>3</td><td colspan="2">Is pressure OK?
▪ Pressure display on the PC "Pressure": 1000 mbar</td></tr>
<tr><td>4</td><td colspan="2">Is the flow meter display OK?
▪ Measuring gas flow meter on the PC "MFC": 200 ml/min
▪ Flow sensor "Flow" 200 ml/min</td></tr>
<tr><td>5</td><td colspan="2">Do the absorption tubes still have sufficient capacity?
▪ Is at least the last quarter of magnesium perchlorate, silver wool still unused?</td></tr>
<tr><td>6</td><td colspan="2">Have tube maintenance intervals been observed? Check:
▪ the catalyst
▪ the absorption tubes
▪ the acid container
▪ Ash crucible / ash finger.</td></tr>
<tr><td>7</td><td colspan="2">Is the detector signal stable?</td></tr>
<tr><td>8</td><td colspan="2">Is the carousel loaded?</td></tr>
</table>

If you answer yes to all of the above, you can start measuring blank value, conditioning and daily factor samples.

Types of blank value determination and their settings

Background

Blank value determination can be used for various purposes and is therefore performed in different ways. The different types of blank value determination are described below with an explanation of the respective settings.

CO_2 base

For blank value determination of sample additives or packing material, the following blank samples will be measured:

- prepare blank samples:
  - without sample substance.
  - with equal amount of sample additives.
  - with the same packing material and the same packing method.
  - From distilled H_2O.
- For the blank sample, use the same method used for the real sample.
- The mean value of the blank value integrals is then entered in the software and deducted from the samples.
- Only if the blank value always remains the same by preparing the sample accordingly, it can also be "calibrated" and does not have to be deducted. However, in this case standard substances must be prepared in the same way as the samples.

Determining blank values

Condition

The name of the blank sample must be defined in **Options > Settings > Key Names**. Ex works, "Blnk" is already defined as the key word of the blank sample. If you want to change this, you must define the new name via **Options Settings > Key Names**.

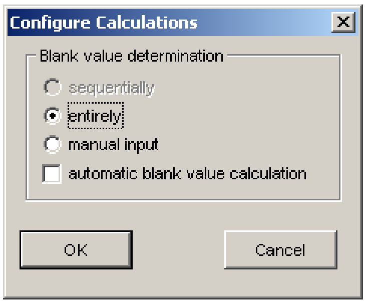
Note

The first blank values are always too high after prolonged breaks between measurements. If you want to perform an exact blank value determination, you must exclude the first blank values from the calculation. Use a different name for the first blank value sample than the key word in order to exclude the sample from the calculation.

Determining blank values

Warning	Only fill the sample vials when the carousel has been taken off! Unscrew the carousel and fill the sample vials up on a working plate.

Proceed as follows to determine blank values:

Step	Procedure
1	If you have not already done so, set the mode of blank value determination. For that purpose, open the "calculation configuration" dialog in the operating software by selecting **Options > Settings > calculations**. 
2	Define the mode of blank value determination with the aid of the table:

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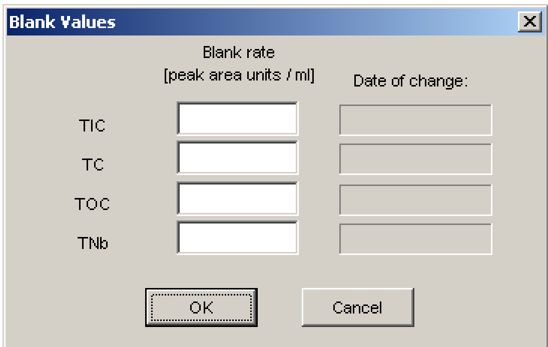
<table>
<tr><td></td><td>If you select the following in "Blank value determination"</td><td>...then...</td></tr>
<tr><td></td><td>"sequential"</td><td>a separate blank value is computed for every element for every group of blank value samples; this value is entered in the respective blank value column until the next group of blank value samples.</td></tr>
<tr><td></td><td>"total"</td><td>all blank value samples in the series are used to compute the blank value for every element. This blank value is then applied to all samples in the series for every element.</td></tr>
<tr><td></td><td colspan="2">Then click OK to save your settings.</td></tr>
<tr><td>3</td><td colspan="2">For regular cases put samples with distilled H_2O in the carousel (liquid mode).
For regular cases put the packing materials into the carousel (solids mode).</td></tr>
<tr><td>4</td><td colspan="2">Enter the following for the sample in sample view text view on the PC:
▪ Name = Blank
▪ Method (e.g. TOC-precise)
▪ e.g. injection volume, if not determined in the method</td></tr>
<tr><td>5</td><td colspan="2">Start the blank value determination via System > Continuous.</td></tr>
<tr><td>6</td><td colspan="2">Once the measurements are finished you can compute the blank value.
To do so, open the "Blank values" dialog by selecting Math > Blank Value > Compute.</td></tr>
<tr><td>7</td><td colspan="2">The computed blank rate are displayed in the "Blank values" dialog. Click OK to accept the blank values.


The blank value is now automatically used in the following measurements.</td></tr>
</table>

Daily factor determination (only possible in the solids mode)

Why is the daily factor determined?

The daily factor is determined in order to correct calibration according to atmospheric conditions (air pressure, temperature) at the time of performing the analysis. The daily factor is factored into subsequent measurements.

When must daily factor samples be measured?

Daily factor samples are measured on the following occasions:

- During routine measuring work, once a day.
- When the carousel is full and total measuring time is approx. 12 hours, daily factor samples are measured in the middle and at the end in order to check the condition of the instrument.

Ways of determining the daily factor

There are three ways to determine the daily factor:

- You can compute the daily factor manually. This makes sense if you do not want to define the substance as a factor sample.
- You can selectively trigger determination of the daily factor:
  - You can then choose the time for determining the daily factor yourself.
  - You can choose the standard samples with which the daily factor is determined yourself.
  - Condition: The daily factor samples must have a name defined in **Options > Settings > Standard Samples** and the standard substance must be enabled as a factor sample.
- Daily factor determination can be set to fully automatic.
  - If you measure substances defined as factor samples, they are recognized and the daily factor is automatically computed from them.
  - Because the daily factor is determined several times a day, it will also offset any fluctuations in the course of the day.
  - Condition: The daily factor samples must have a name defined in **Options > Settings > Standard Samples** and the standard substance must be enabled as a factor sample.

Computing the daily factor by hand

Proceed as follows to compute the daily factor by hand:

Step	Procedure
1	Measure any substance, that does not have to be defined in **Options > Settings > Standard Samples**.
2	Compute the daily factor. Daily factor = (theoretical content / actual content).
3	Allocate the daily factor to the real samples in sample view text view. Enter the daily factor in the corresponding columns for each element.

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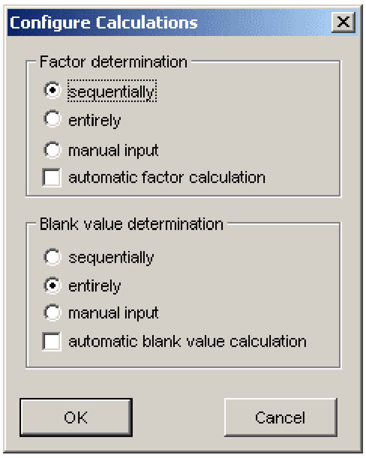
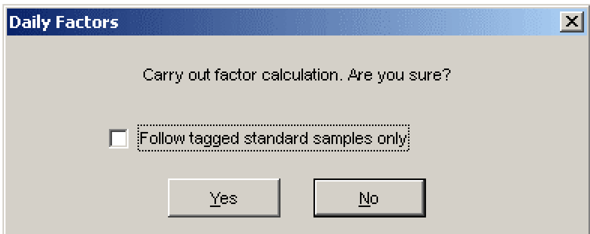
How to selectively trigger the daily factor

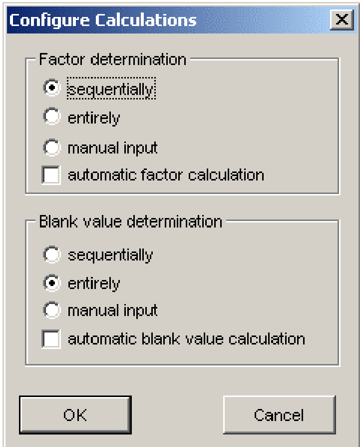
Proceed as follows to trigger daily factor determination selectively:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Define the type of factor calculation.
For that purpose, open the "calculation configuration" dialog in the operating software by selecting Options > Settings > calculations.

</td></tr>
<tr><td>2</td><td colspan="2">Define the mode of factor determination with the aid of the table:</td></tr>
<tr><td></td><td>If you select the following in "Factor determination"</td><td>...then...</td></tr>
<tr><td></td><td>"sequential"</td><td>the daily factor is computed group-by-group and changes throughout the day.</td></tr>
<tr><td></td><td>"total"</td><td>the daily factor is computed on the basis of all factor samples in the file. An average factor is computed.</td></tr>
<tr><td></td><td colspan="2">Then click OK to save your settings.</td></tr>
<tr><td>3</td><td colspan="2">Measure a standard substance, that must be defined in Options > Settings > Standard Samples, as a factor sample.</td></tr>
<tr><td>4</td><td colspan="2">If you only want to determine the daily factor from a certain number of samples, select these samples in sample view text view.</td></tr>
<tr><td>5</td><td colspan="2">Open the "Daily factors" dialog in the operating software by selecting Math > Factor.

</td></tr>
<tr><td>6</td><td colspan="2">If you selected a certain number of samples for the calculation, check "Use standard samples only".</td></tr>
</table>

7	Click **Yes** to continue. The daily factor is computed automatically and allocated to the subsequent samples.

How to set automatic daily factor determination

Proceed as follows to set fully automatic daily factor determination:

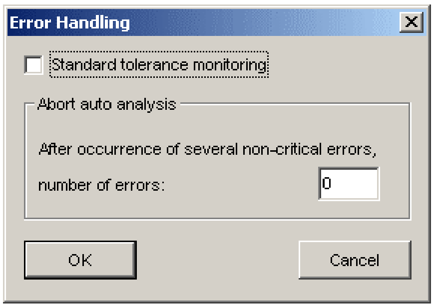
<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Define the type and degree of automation for factor calculation.
For that purpose, open the "calculation configuration" dialog in the operating software by selecting Options > Settings > calculations.
</td></tr>
<tr><td rowspan="4">2</td><td colspan="2">Define the mode of factor determination with the aid of the following table:</td></tr>
<tr><th>If you select the following in "Factor determination"</th><th>...then...</th></tr>
<tr><td>"sequential"</td><td>the daily factor is computed group-by-group and changes throughout the day.</td></tr>
<tr><td>"total"</td><td>the daily factor is computed on the basis of all factor samples in the file. An average factor is computed.</td></tr>
<tr><td>3</td><td colspan="2">Specify the degree of automation for factor determination. Check "Automatic factor determination". factor calculation.
Then click OK to save your settings.
As soon as you measure a substance defined as a factor sample, the daily factors are automatically computed afterwards.</td></tr>
</table>

Recommendation for automated daily factor determination

When automatically computing the daily factor, it is useful to enable the "Standard tolerance monitoring" function. This checks standard samples for fluctuations of results. If the tolerance define in **Options > Settings > Standard Samples** is exceeded, continuous analysis is stopped.

Enabling "Standard tolerance monitoring"

Proceed as follows to enable "Standard tolerance monitoring":

Step	Procedure
1	Open the "Error handling" dialog in the operating software by selecting **Options > Settings > Error Handling**. 
2	Check "Standard tolerance monitoring".
3	Click **OK**. "Standard tolerance monitoring" is now enabled.

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Description of the determination variants

Setting of the determination variants

The requested analysis variant can be selected under **System > Mode** and/or **System > Method** .

The actual working processes are displayed in the status view under "process", e.g. "standby" or "integration".

TC determination

The TC determination takes place in the following stages:

Step	Procedure
1	Analysis run with single or continuous measurement
2	Auto zero adjustment and baseline determination of the IR for the TC peak
3	Flushing of the sampling tubes and the syringe (sampler runs, valves switch)
4	Drawing up the sample
5	Pressure drop carrier gas, injection of the sample into the furnace
6	Pressure drop carrier gas
7	Integrator module waits for the start of the TC measuring peak
8	TC peak integration
9	Integration end
10	Water drain
11	Process end, the new start can be done.

NPOC determination

The NPOC determination takes place in the following stages:

Step	Procedure
1	Analysis run with single or continuous measurement
2	Auto zero adjustment and baseline determination of the IR for the NPOC peak
3	Flushing of the sampling tubes and the syringe (sampler runs, valves switch)
4	Drawing up the sample
5	Pressure drop carrier gas, injection of the sample into the furnace
6	Pressure drop carrier gas
7	Integrator module waits for the start of the NPOC measuring peak
8	NPOC peak integration
9	Integration end
10	Water drain
11	Process end, the new start can be done.

General Notes:

For NPOC measurement the samples have to be acidified to pH 2 with a suitable acid (e.g. HCl) prior to the measurement in due time.

Existing TIC has to be carefully purged after acidification in order to avoid a false high reading in the NPOC.

TIC / TC determination

The TIC/TC determination takes place in the following stages:

Step	Procedure
1	Analysis run with single or continuous measurement
2	Auto zero adjustment and baseline determination of the IR for the TIC peak
3	Dosing of H_3PO_4 (1%) into the sparger
4	Flushing of the sampling tubes and the syringe (sampler runs, valves switch)
5	Drawing up the sample (double amount, since TIC/TC measurement)
6	Pressure drop carrier gas, injection of the sample into the sparger
7	Pressure drop carrier gas, purging of TIC
8	Integrator module waits for the start of the TIC measuring peak
9	TIC peak integration
10	Integration end, multiway valve goes to furnace position
11	Baseline determination of the IR for the TC peak
12	Pressure drop carrier gas, injection of the sample into the furnace
13	Pressure drop carrier gas
14	Integrator module waits for the start of the TC measuring peak
15	TC peak integration
16	Integration end
17	Water drain
18	Process end, the new start can be done.

General Note:

The TOC results from the difference of TC and TIC.

For longer measuring breaks it is recommended to flush the acid tube to the sparger by **Maintenance > Flush Acid Path**.

TIC determination

The TIC determination takes place in the following stages:

Step	Procedure
1	Analysis run with single or continuous measurement
2	Auto zero adjustment and baseline determination of the IR for the TIC peak
3	Dosing of H_3PO_4 (1%) into the sparger

4	Flushing of the sampling tubes and the syringe (sampler runs, valves switch)
5	Drawing up the sample
6	Pressure drop carrier gas, injection of the sample into the sparger
7	Pressure drop carrier gas, purging of TIC
8	Integrator module waits for the start of the TIC measuring peak
9	TIC peak integration
10	Integration end
11	Water drain
12	Process end, the new start can be done.

General Note:

For longer measuring breaks it is recommended to flush the acid tube to the sparger by **Maintenance > Flush Acid Path**.

POC determination

The POC determination takes place in the following stages:

Step	Procedure
1	Analysis run with single or continuous measurement
2	Auto zero adjustment and baseline determination of the IR for the TC peak
3	Flushing of the sampling tubes and the syringe (sampler runs, valves switch)
4	Drawing up the sample
5	Pressure drop carrier gas, injection of the sample into the sparger
6	Pressure drop carrier gas, purging and oxidation of the volatile organic carbon compounds
7	Integrator module waits for the start of the POC measuring peak
8	POC peak integration
9	Integration end
10	Water drain
11	Process end, the new start can be done.

General Note:

The POC mode requires a modification to remove volatile inorganic carbon compounds.

The samples have to be alkalinized, pH = 11-12. Otherwise, there is a risk that the TIC has already been purged by acidic residues of the preceding samples

The concentration of the to be added base should be approx. 0.01 mol. For that purpose, add e.g. 0.56 g KOH to 100 ml sample, if the sample is neutral.

If the samples were acidified beforehand, the KOH amount has to be increased accordingly.

Depending on the chemical compound and polarity, the POC peak appears very sharp and fast (e.g. hologenated hydrocarbons) or broad, flat and slow (e.g. acetone, alcohols).

TN_b determination

The measurement of TN_b can be added to all analysis modes.

The processes do not change, simply a detector will be connected.

For the calibration, pay attention to the fact that the NO formation during the combustion depends on the amount of C and N in the sample. Therefore, the TN_b calibration curve may proceed non linear - unlike TOC.

Precondition is that the instrument is equipped with an adequate detector.

Option particles

The option **Particle** may be added to all analyses modes (**System > Method**).

This is a separate measuring process, in order to widely avoid sedimentation of the sample in the measuring system.

This means that for a multiple determination only one measurement will be drawn up as sample and injected in order to keep the volume in the suction syringe as low as possible.

Furthermore, the stirrer will be automatically recognized and does not have to be activated under **System > Feeding**

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Flushing the analyzer during an analysis run

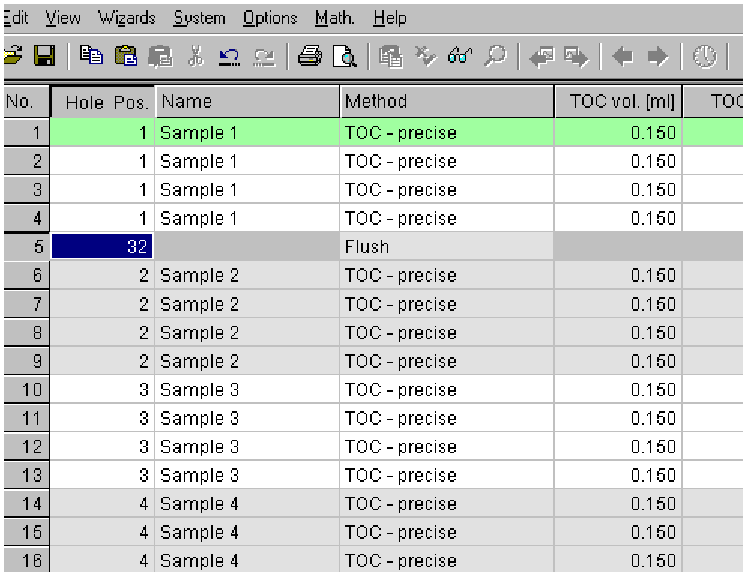
Background

If samples with high concentration differences are measured, it is required to perform flushing steps between the measurements.

Procedure

Proceed as follows to perform the flushing steps:

Step	Procedure
1	Fill in the text box where you enter sample name, injection volume and the measuring method.



No.	Hole Pos.	Name	Method	TOC vol. [ml]	TOC
1	1	Sample 1	TOC - precise	0.150	
2	1	Sample 1	TOC - precise	0.150	
3	1	Sample 1	TOC - precise	0.150	
4	1	Sample 1	TOC - precise	0.150	
5	32		Flush		
6	2	Sample 2	TOC - precise	0.150	
7	2	Sample 2	TOC - precise	0.150	
8	2	Sample 2	TOC - precise	0.150	
9	2	Sample 2	TOC - precise	0.150	
10	3	Sample 3	TOC - precise	0.150	
11	3	Sample 3	TOC - precise	0.150	
12	3	Sample 3	TOC - precise	0.150	
13	3	Sample 3	TOC - precise	0.150	
14	4	Sample 4	TOC - precise	0.150	
15	4	Sample 4	TOC - precise	0.150	
16	4	Sample 4	TOC - precise	0.150	

Step	Procedure
2	Decide in which hole position (carousel) the flushing sample shall be and put the sample into this position.

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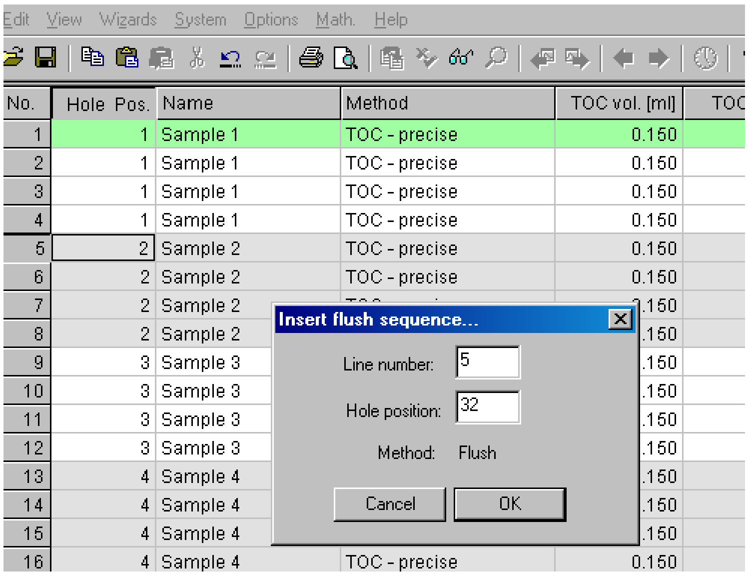
3	Open the dialog **System > Insert Flush Sequence**. The dialog opens.



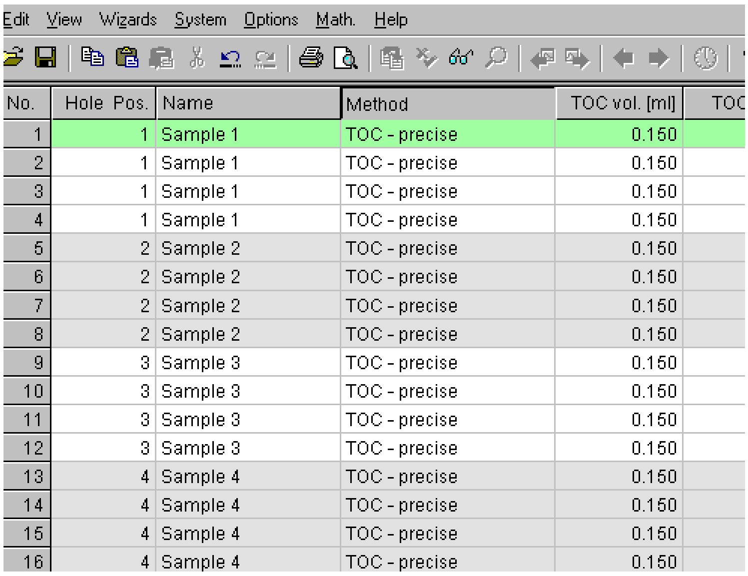
Note:

You can also open the dialog by clicking the right mouse button.

Go to the line in the text box where the flush sequence shal be inserted and select **Insert Flush Sequence**

The line number will be automatically adjusted.

4	Enter the line number where the flush step shall be inserted. Enter the hole position where the flush sample is located in the carousel.
5	After entering the required data, press **OK**. The fext box will be adjusted.



Stopping continuous analysis

When do I stop continuous analysis?

It makes sense to stop a continuous analysis in the following cases:

- If the result of the blank value suggests that the instrument is leaky.
- If the results of the conditioning sample suggest that parts of the instrument are defective or that gas pressure and flow behaviors are not OK.
- If results of the daily factor deviate substantially from the last results.

Stopping a continuous analysis spontaneously

Proceed as follows to stop a continuous analysis:

Step	Procedure
1	Execute the command **System > Single** in the operating software.
2	This stops the analysis after measuring the current sample.

Moving a stop marker

The program automatically moves the stop marker to the last sample position during sample data input. It is therefore only necessary to move the stop marker in special cases. Proceed as follows to move a stop marker:

Step	Procedure
1	Open the "Set stop marker" dialog by selecting **System > Stop Tag**. 
2	Use the arrow buttons to set the sample number at which to set a stop marker.
3	Click **OK**. This closes the dialog and moves the stop marker to the desired position.

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5.5 Preparing measuring data for evaluation

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to prepare measuring data for evaluation.

Overview

"Preparing measuring data for evaluation" is divided into the following topics:

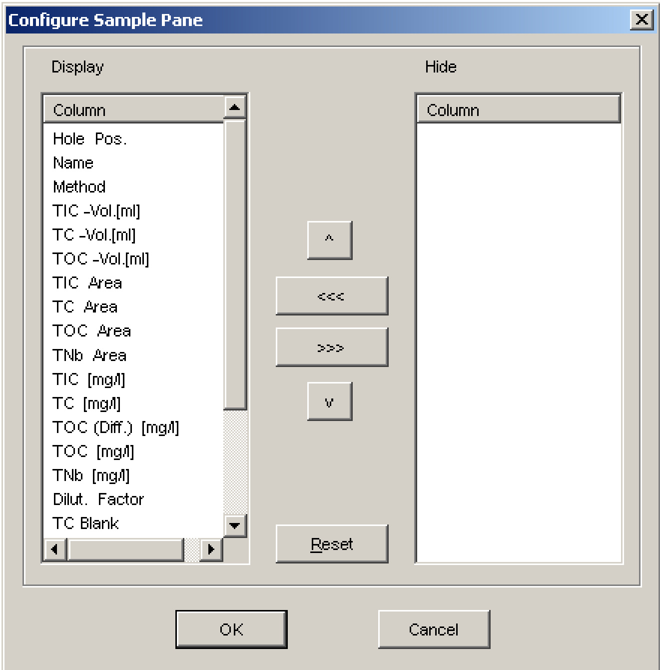
Topic	Page
Configuring the sample view	245
Determine measuring units and number of decimal places.	247
Saving the sample view	249
Loading a sample view	250
Configuring the statistics view	251
Generating statistical data	253
Formulae for generating statistical data	256
Manual peak integration	258
Configuring the graph view	264
Setting the size of the graph	266
Configure report	267
Display page view	268
Data backup and printing	270
Overview of export and import file formats	273
Exporting analysis data to Excel and viewing	274
Exporting LIMS data	276
Exporting AQA data	278

Configuring the sample view

Configuring the sample view

Proceed as follows to configure the sample view:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Select cells in the sample view.</td></tr>
<tr><td>2</td><td>Specify what you want to have displayed in the view. Open the "Configure view" dialog by selecting View > Configuration.


</td></tr>
<tr><td>3</td><td>Proceed on the basis of the following decision table:
<table>
<tr><th>If you want to...</th><th>...then...</th></tr>
<tr><td>display a value</td><td>select the entry in the "Hide" column and click <<<.
The entry is moved to the "Show" column.</td></tr>
<tr><td>hide a column.</td><td>select the entry in the "Show" column and click >>>.
The entry is moved to the "Hide" column.</td></tr>
</table></td></tr>
<tr><td>4</td><td>Change the column display order using the ^ and v buttons.</td></tr>
<tr><td>5</td><td>Click OK.
This closes the dialog and saves your settings.</td></tr>
</table>

Auto-optimizing a view

You can automatically adjust the width of individual columns to fit the whole headers and entries in the cells.

Proceed as follows to optimize sample view:

Step	Procedure
1	Select cells in the sample view.

2	Optimize sample view by selecting **View > Autofit**. This optimizes the sample view.

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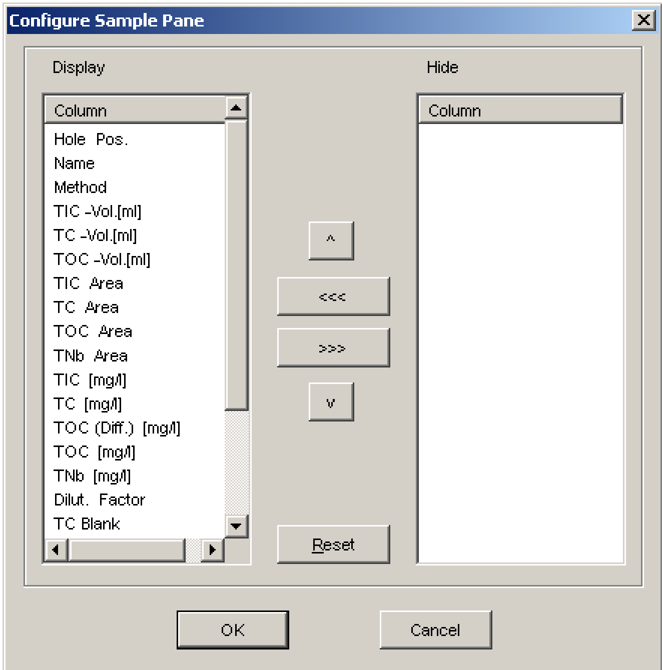
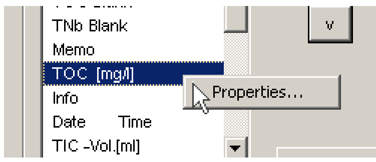
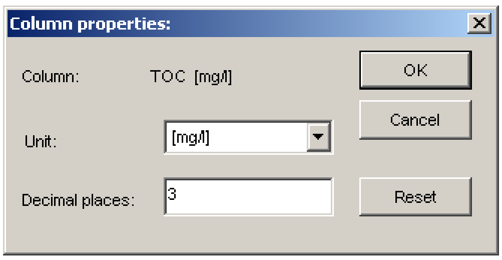
Determine measuring units and number of decimal places.

Determine measuring units and number of decimal places.

Proceed as follows to set the measuring units and number of decimal places:

Step	Procedure
1	Select cells in the sample view.
2	Open the "Configure view" dialog in the operating software by selecting **View > Configuration**. 
3	Select the column in the "Views" section whose measuring units and decimal places you want to set and click the right mouse button. 
4	Open the "Column properties" dialog by selecting the "Properties..." menu item: 
5	Enter the desired measuring unit in the "Unit" filed and the number of decimal places in the "Decimal places" field and click **OK**.
6	Click **OK** in the "Configure view" dialog. This closes the dialog and saves the settings.

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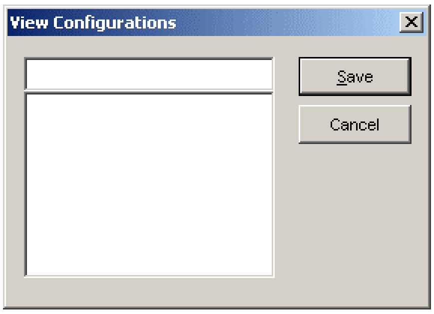
Saving the sample view

Saving the sample view

Proceed as follows to save the current sample view:

Step	Procedure
1	Open the "Views" dialog by selecting **View > Save Configuration**. 
2	Enter the name of the view in the text box at the top and click **Save**. The view is saved and can be loaded at a later point.

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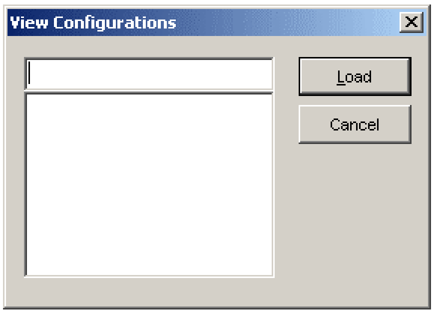
Loading a sample view

Loading a sample view

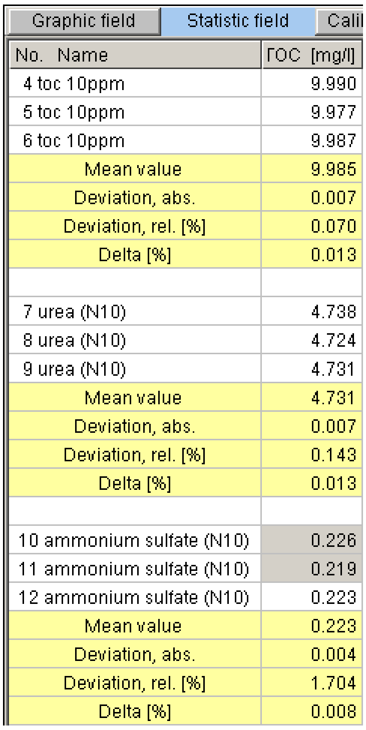
Proceed as follows to load a sample view previously saved:

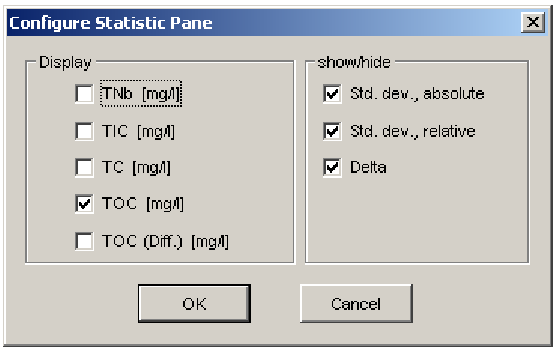
Step	Procedure
1	Open the "Views" dialog by selecting **View > Load Configuration**. 
2	Select the desired view in the listbox and click **Load**. The desired view is loaded.

Configuring the statistics view

Configuring the statistics view

Proceed as follows to configure the statistics view:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>If the statistics view of the combi view is not already being displayed, execute the command View > Change until statistics view appears or click on the name in the menu bar above the combi view. The following screenshot shows an example of a statistics view:


No. Name	TOC [mg/l]
4 toc 10ppm	9.990
5 toc 10ppm	9.977
6 toc 10ppm	9.987
Mean value	9.985
Deviation, abs.	0.007
Deviation, rel. [%]	0.070
Delta [%]	0.013
7 urea (N10)	4.738
8 urea (N10)	4.724
9 urea (N10)	4.731
Mean value	4.731
Deviation, abs.	0.007
Deviation, rel. [%]	0.143
Delta [%]	0.013
10 ammonium sulfate (N10)	0.226
11 ammonium sulfate (N10)	0.219
12 ammonium sulfate (N10)	0.223
Mean value	0.223
Deviation, abs.	0.004
Deviation, rel. [%]	1.704
Delta [%]	0.008
</td></tr>
<tr><td>2</td><td>Select the statistics view.</td></tr>
<tr><td>3</td><td>Specify what you want to have displayed in the view. Open the "Configure statistics view" dialog by selecting View > Configuration.


</td></tr>
<tr><td>4</td><td>Proceed on the basis of the following decision table:</td></tr>
</table>

	If you want to...	...then...
	display a value	check the appropriate checkbox.
	hide a column.	uncheck the appropriate checkbox.
5	Click **OK**. This closes the dialog and saves your settings.	

Generating statistical data

What are statistical data?

Statistical data are mean values and standard deviations computed from groups of measuring data. The operator compiles the groups, that may consist of analyzed samples and samples not yet measured.

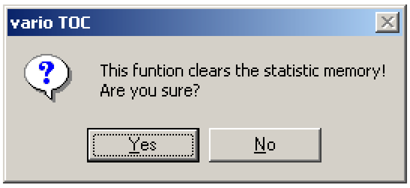
Ways of generating statistical data

There are two ways of generating statistical data:

- You can generate statistical data fully automatically. In this case, the software combines all samples of the same name into groups. The user can only exclude specific samples from the calculation. Statistical data are then automatically generated for these groups.
- You can generate statistical data manually. In this case, the user combines any samples in groups. Statistical data are then automatically generated for these groups.

Generating statistical data fully automatically

Proceed as follows to generate statistical data fully automatically:

Step	Procedure
1	Open the "vario TOC" dialog in the operating software by selecting **Math > Statistics > By Name**.  This displays sample view statistics view.
2	Proceed on the basis of the following decision table:

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	If statistics memory...	...then...
	may be deleted	go to Step 3.
	may not be deleted	Click **No** and save your data. Then open the dialof again and go to step 3.

3 Click **Yes** to continue.
Samples of the same name are combined in groups and the mean values and standard deviation are computed automatically. The following picture shows examples of statistical data:

Graphic field | Statistic field | Cali

No. Name	TOC [mg/l]
4 toc 10ppm	9.990
5 toc 10ppm	9.977
6 toc 10ppm	9.987
Mean value	9.985
Deviation, abs.	0.007
Deviation, rel. [%]	0.070
Delta [%]	0.013
7 urea (N10)	4.738
8 urea (N10)	4.724
9 urea (N10)	4.731
Mean value	4.731
Deviation, abs.	0.007
Deviation, rel. [%]	0.143
Delta [%]	0.013
10 ammonium sulfate (N10)	0.226
11 ammonium sulfate (N10)	0.219
12 ammonium sulfate (N10)	0.223
Mean value	0.223
Deviation, abs.	0.004
Deviation, rel. [%]	1.704
Delta [%]	0.008

4 If you want to exclude a sample from the calculation afterwards, select the appropriate sample line in the statistics view. Subsequently execute the command **Edit > Include/Exclude** or click the correponding button in the menu bar . The sample is discarded and the calculation updates automatically:

Graphic field | Statistic field | Cali

No. Name	TOC [mg/l]
4 toc 10ppm	9.990
~~5 toc 10ppm~~	~~9.977~~
6 toc 10ppm	9.987
Mean value	9.988
Deviation, abs.	0.002
Deviation, rel. [%]	0.024
Delta [%]	0.003

Generating statistical data manually

Proceed as follows to generate statistical data manually:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Select all samples that you want to combine in a group in sample view text view. To do so, click on the "No." column.

Graphic field | Statistic field | Cali
<table>
<tr><th>No. Name</th><th>TOC [mg/l]</th></tr>
<tr><td>4 toc 10ppm</td><td>9.990</td></tr>
<tr><td>5 toc 10ppm</td><td>9.977</td></tr>
<tr><td>6 toc 10ppm</td><td>9.987</td></tr>
<tr><td>Mean value</td><td>9.985</td></tr>
<tr><td>Deviation, abs.</td><td>0.007</td></tr>
<tr><td>Deviation, rel. [%]</td><td>0.070</td></tr>
<tr><td>Delta [%]</td><td>0.013</td></tr>
</table>

Press the Shift key to select multiple contiguous samples.
Hold down the CTRL key to select multiple non-contiguous samples.
</td></tr>
<tr><td>2</td><td>Select Math > Statistics > Group.
The selected samples are displayed as a group in statistics view. Mean values and standard deviation are computed automatically.
<table>
<tr><th>No.</th><th>Hole Pos.</th><th>Name</th><th>Method</th><th>TOC-Vol.[ml]</th><th>TOC Area</th><th>TO</th></tr>
<tr><td>79</td><td>24</td><td>std-toc/tnb 5ppm</td><td>TOC/TNb</td><td>1.000</td><td>16 488</td><td></td></tr>
<tr><td>80</td><td>24</td><td>std-toc/tnb 5ppm</td><td>TOC/TNb</td><td>1.000</td><td>16 520</td><td></td></tr>
<tr><td>81</td><td>24</td><td>std-toc/tnb 5ppm</td><td>TOC/TNb</td><td>1.000</td><td>16 511</td><td></td></tr>
<tr><td>82</td><td>25</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>29 147</td><td></td></tr>
<tr><td>83</td><td>25</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>29 183</td><td></td></tr>
<tr><td>84</td><td>25</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>29 183</td><td></td></tr>
<tr><td>85</td><td>26</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>28 687</td><td></td></tr>
<tr><td>86</td><td>26</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>28 767</td><td></td></tr>
<tr><td>87</td><td>26</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>28 740</td><td></td></tr>
<tr><td>88</td><td>27</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>30 081</td><td></td></tr>
<tr><td>89</td><td>27</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>30 138</td><td></td></tr>
<tr><td>STOP 90</td><td>27</td><td>std-toc/tnb 10ppm</td><td>TOC/TNb</td><td>1.000</td><td>30 067</td><td></td></tr>
</table></td></tr>
<tr><td>3</td><td>If you want to exclude a sample from the calculation afterwards, select the appropriate sample line in the statistics view. Then select Edit > Include/Exclude Sample. The sample is discarded and the calculation updates automatically.</td></tr>
</table>

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Formulae for generating statistical data

Statistical data

The following statistical data can be generated fron sample groups:

- Mean value of the sample group
- Absolute standard deviation of the sample group
- Relative standard deviation of the sample group
- Delta of the sample group

Mean value

The mean value of "n" element concentrations is computed with this formula:

$$\bar{c}=\frac{\sum_{i=1\ldots n} c_i}{n}$$

The formula consists of the following variables:

Variable	Meaning
$\bar{c}$	Mean value of concentrations
c_i	Individual concentrations in the group
n	Number of group members

Absolute standard deviation

Absolute standard deviation is computed according to this formula:

$$s=\sqrt{\frac{n\cdot\sum_{i=1\ldots n}(c_i^2)-\left(\sum_{i=1\ldots n} c_i\right)^2}{n\cdot(n-1)}}$$

The formula consists of the following variables:

Variable	Meaning
s	Absolute standard deviation
c_i	Individual concentrations in the group
n	Number of group members

Relative standard deviation

Relative standard deviation is computed according to this formula:

$$s_{rel}=\frac{s\cdot 100}{\bar{c}}$$

The formula consists of the following variables:

Variable	Meaning
s_{rel}	Relative standard deviation in [%]
s	Absolute standard deviation
$\bar{c}$	Mean value of concentrations

Delta

Delta is computed according to this formula:

$$\delta = c_{max} - c_{min}$$

The formula consists of the following variables:

Variable	Meaning
δ	Delta
c_{max}	Greatest element concentration in a group
c_{min}	Smallest element concentration in a group

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Manual peak integration

What is "manual peak integration"?

The vario TOC instrument software offers the possibility to manually remeasure area values peaks measured during an analysis run.

Why manual peak integration?

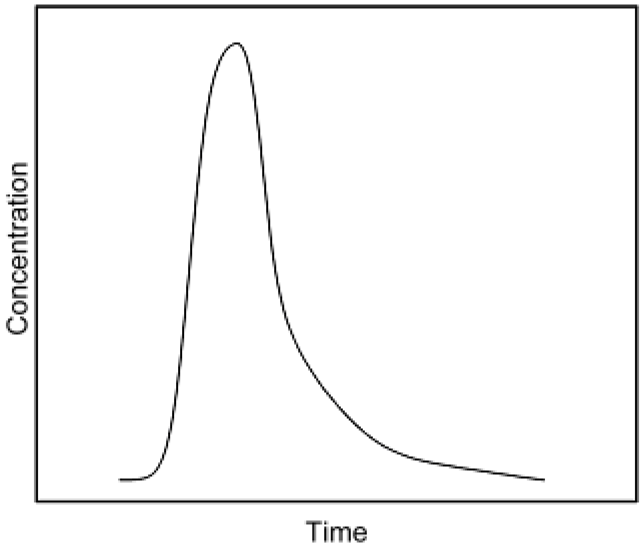
Normally the measurement of the peak areas (integration) is done automatically in the control electronic and/or the firmware of the analyzer itself. In few cases, it may be possible that the automatic integration algorithm does not give satisfactory results, in particular if two peaks are superimposed etc. In these cases the "manual reintegration" is recommended.

Peak types

In these instructions you will find different peak types. Their characteristics are listed in the follwing.

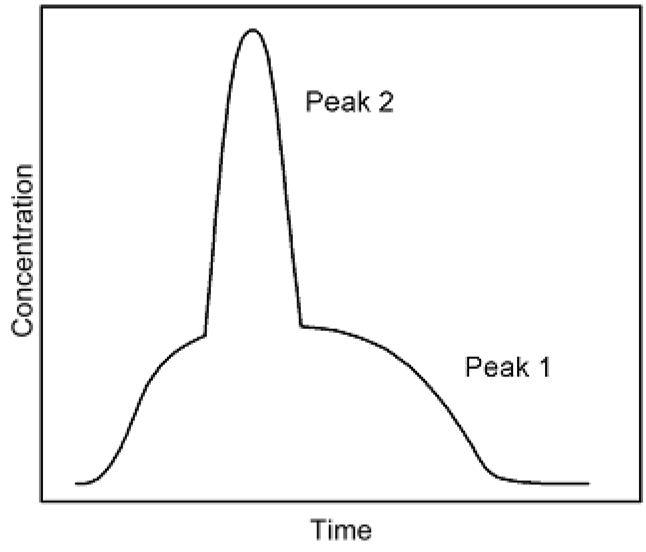
Single peaks

In general a single peak looks as follows:



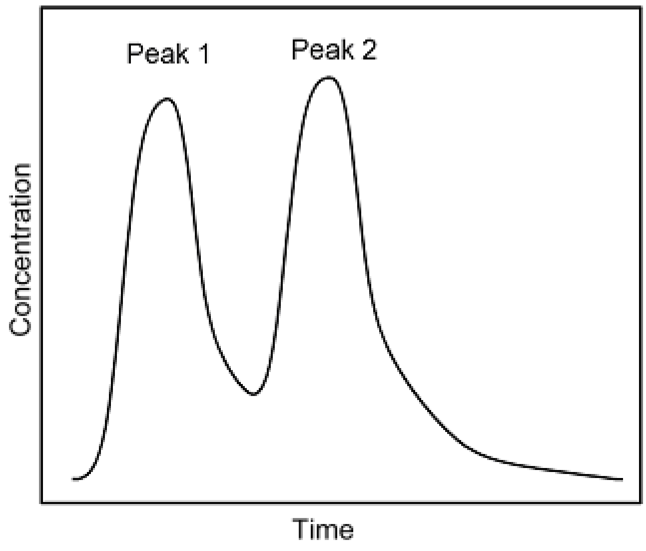
Superimposed peaks

These are two peaks where one superimposes the other. Peak 1 is designated as "socket" and peak 2 is designated as "superimposed". The following picture shows such a course.



Melted peaks

These are two consecutive peaks where the second peak already starts although the first is not yet finished. The graphic appears as follows:



Manual integratability

Regarding the integratability there are certain differences between the individual peak types:

Well integrable are:

- Sinple peaks with clear beginning and tailing. This peak type normally is integrated without any problem from the firmware implemented in the algorithm. However, a reintegration may be necessary, in particular if the peak is very small and therefore the end mark was set too early.
- Superimposed peaks where a significant difference in width between socket (large) and "superimposed" (small) noticeable.

Limited integrable are:

- Superimposed peaks, where a significant difference between socket and "superimposed" is noticeable.

Poor or not at all integrable are:

- Melted peaks, since due to the undefined peak form there are no conclusions for the actual separation points between the first and the second peak possible.

Baseline

The vario TOC instrument software allows to select a straight or bevel baseline for integration. The automatic always assumes a straight baseline. Therefore, also the manual peak integration should be done with a straight baseline. The height of the baseline will be defined during the auto zero adjust. During the manual integration the baseline can be specifically adjusted in height The option to perform the manual peak integration with a bevel baseline can be selected for special cases.

Procedure

Important note: Prior to the manual peak integration, create a copy of the actual loaded document and only perform the manual peak integration there. A copy can be created under the command **File > Save As** with subsequent input of a suitable (different) document name.

Depending from the predominant peak shape there are two different procedures:

- Integration of single peaks. Here, the requested peak beginning and end marks are set as well as the adjustment of the height of the baseline
- Integration of superimposed peaks. Here, first the peak beginnen and end marks of the socket and the height of the baseline are set, subsequently the peak beginnen and end marks of the "superimposed" peak. If requested, an intermediate point for the separation of socket and "superimposed" peak can be set. This service for a better adjustment of the socket course.

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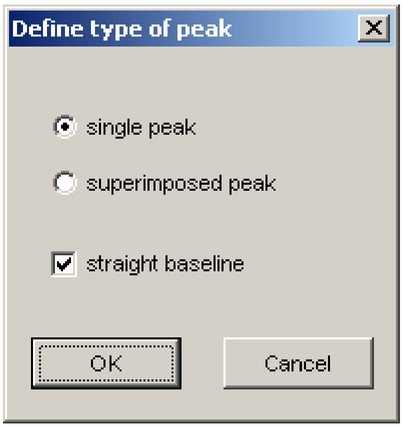
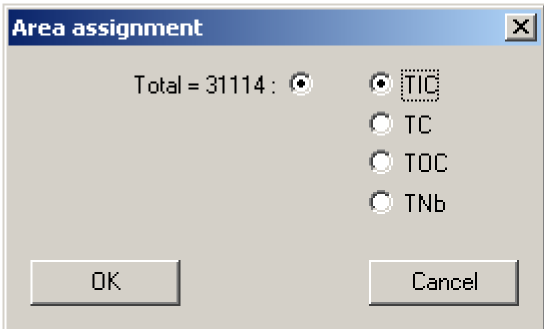
Integration of single peaks

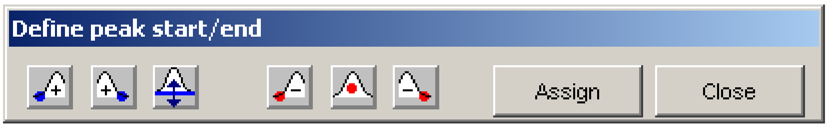
Proceed as follows to manual integrate single peaks:

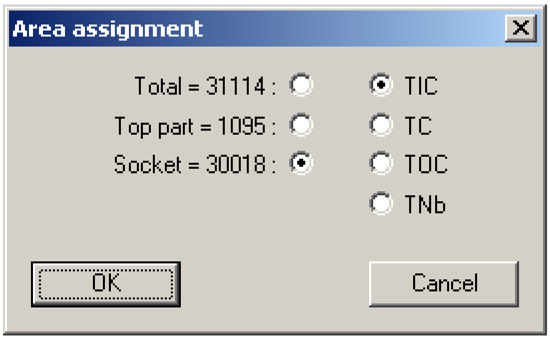
Step	Procedure
1	Open the instrument software via the dialog "Define Peak Type" via the menu command **Math. > Manuel Peak Integration > Type**.  **Note:** The menu command is only accessible, if the grafic view is activated.
2	Activate "single peak" and "straight baseline" and subsequently click **OK**, to leave the dialog.
3	Select the requested sample so its peak course is displayed in the graphic view.

4	Open the instrument software via the dialog "Define peak start/end" via the menu command **Math. > Manuel Peak Integration > Integrate**.  **Note:** The menu command is only accessible if the graphic view is activated and configurated that only the single corresponding peak course is displayed. If necessary, deactivate other graphics (e.g. pressure, temperature, etc.).
5	Click and mark the peak start as follows: position the mouse pointer to the position where the peak begins and click the left mouse key.. The peak start tag is displayed as a vertical blue line.
6	Click and mark the peak end in the same way as described under point 5 for the peak start. As soon as peak start and end are marked, a baseline is drawn automatically and the integration result is displayed below the peak graphic. Furthermore, the area content appears in light blue.
7	Click to adjust the height of the baseline. To find out the original height which was determined during the automatic integration, first place the peak start and end tags directly over the tags generated from the automatic (magenta crosses). Then move the baseline as long as the manual integration result matches the automatic one. Subsequent-ly, you can move the peak start and end tag to the requested position, if necessary (see point 5 and 6).
8	Click **Assign**, if the integration result meets your requirements. The dialog "Area assignment" opens.  Select the element which shall be assigned to the manually integrated peak area. Leave the dialog by clicking **OK**.
9	The peak area was entered in the corresponding cell in the sample view and the new concentration value was calculated. Furthermore, the date for the corresponding sample was deleted and the text "Ma-nInt" was entered in the info column. Now the manual single peak integration is completed.

Integration of superimposed peaks

Proceed as follows to manually integrate superimposed peaks:

Step	Procedure
1	Open the dialog "Define peak type" via the instrument software as described under point 1 of the procedure for single peaks.
2	Activate "superimposed peak" and "straight baseline" and subsequently click **OK**, to leave the dialog.
3	Select the requested sample so its peak course is displayed in the graphic view.
4	Open the instrument software via the dialog "Define peak start/end" via the menu command **Math. > Manuel Peak Integration > Integrate**.  **Note:** The menu command is only accessible if the graphic view is activated and configurated that only the single corresponding peak course is displayed. If necessary, deactivate other graphics (e.g. pressure, temperature, etc.).
5	Click and/or to tag the peak start and and of the socket as described under step 5 and 6 for the procedure of single peaks.
6	Click to adjust the height of the baseline, as described under step 7 of the procedure for single peaks.
7	Click and mark the peak start of the "superimposed" peak as follows: position the mouse pointer to the position where the superimposed peak begins and click the left mouse key. The peak start tag is displayed as a vertical red line.
8	Click and mark the peak end of the superimposed peak in the same way as described under step 7 for the peak start. As soon as peak start and end are tagged, a red baseline is drawn automatically and the integration result is displayed below the peak graphic. Furthermore, the peak area of the superimposed peak is displayed in light red.
9	Click , to set an intermediate point. By doing so, you may reach a better adjustment of the socket course.

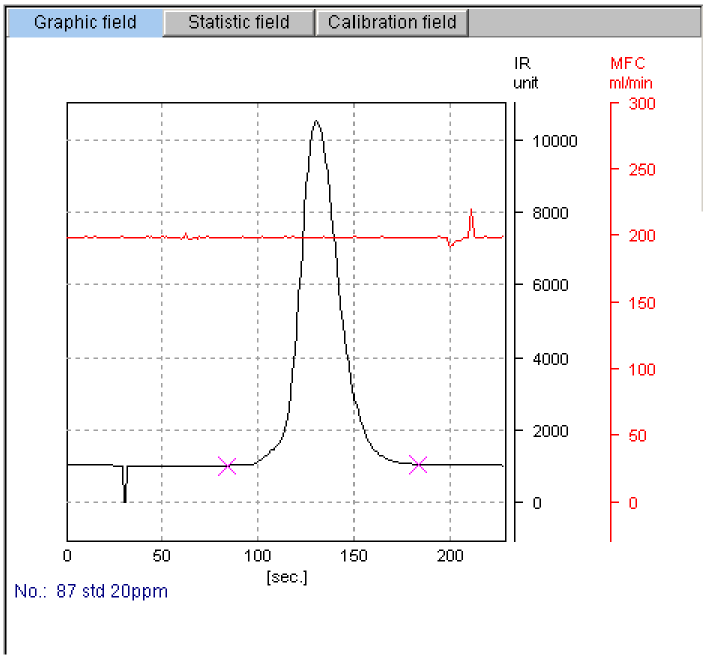
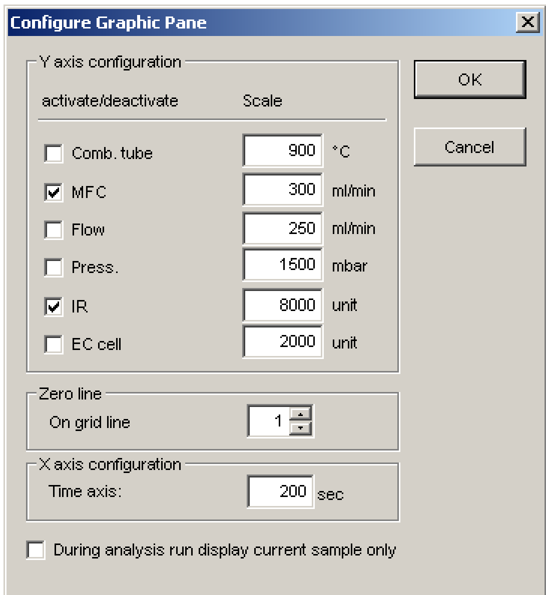
<table>
<tr><td>10</td><td>Click Assign, if the integration result meets your requirements. The dialog "Area assignment" opens.


Select the manually integrated peak area and the element which shall be assigned. Leave the dialog by clicking OK.</td></tr>
<tr><td>11</td><td>The peak area was entered in the corresponding cell in the sample view and the new concentration value was calculated. Furthermore, the date for the corresponding sample was deleted and the text "ManInt" was entered in the info column. Now the process of the manual integration of superimposed peak is completed.</td></tr>
</table>

Configuring the graph view

Configuring the graph view

Proceed as follows to configure the graph:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>If the graphic view of the combi view is not already being displayed, execute the command View > Change until graphic view appears or click on the name in the menu bar above the combi view. The following screenshot shows an example of a graph view:

</td></tr>
<tr><td>2</td><td>Specify what you want to have displayed in the view. Open the "Configure graph view" dialog by selecting View > Configuration.

</td></tr>
<tr><td>3</td><td>Use the following decision table for the "Y-axis configuration" section:</td></tr>
</table>

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<table>
<tr><td></td><td>
<table>
<tr><th>If you want to...</th><th>...then...</th></tr>
<tr><td>display a value</td><td>check the appropriate checkbox.
Enter the graph scale range in the textbox next to it.

You can have a max. of 4 checks, for the sake of clarity.</td></tr>
<tr><td>hide a column.</td><td>uncheck the appropriate checkbox.</td></tr>
</table>
</td></tr>
<tr><td>4</td><td>In the "Zero line" section, specify which of the horizontal grid lines to take as the zero line for the graph view. A value of 0 means that the zero line is at the bottom edge of the graph view. Use the arrows to set the desired value.</td></tr>
<tr><td>5</td><td>Specify the division of the time axis (X axis) in the "X-axis configuration" section. Enter the desired value in the textbox.</td></tr>
<tr><td>6</td><td>Specify what graph to display during analysis. Proceed on the basis of the following decision table:
<table>
<tr><th>During an analysis, you want</th><th>...then...</th></tr>
<tr><td>to view the graph of the current sample only</td><td>check the checkbox next to "Do not hide current sample graph".</td></tr>
<tr><td>to maybe view the graph of a previously analyzed sample, too.</td><td>uncheck the appropriate checkbox next to "Do not hide current sample graph".</td></tr>
</table>
</td></tr>
<tr><td>7</td><td>Click OK.
This closes the dialog and saves your settings.</td></tr>
</table>

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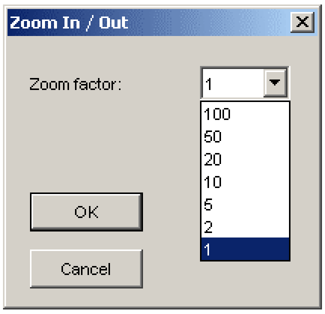
Auto-optimizing a view

By selecting **View > Auto Align** you can auto-scale the graph to fit it completely in the window.

Setting the size of the graph

Setting the size of the graph in the dialog

Proceed as follows to set the size of the graph in the dialog:

Step	Procedure
1	Open the "Zoom in/out graph" dialog in the operating software by selecting **View Zoom in/out**. 
2	Use the arrow buttons to Increase or decrease the graph zoom factor.
3	Click **OK**. This closes the dialog and displays the graph according to your settings.

Setting the size of the graph with the mouse

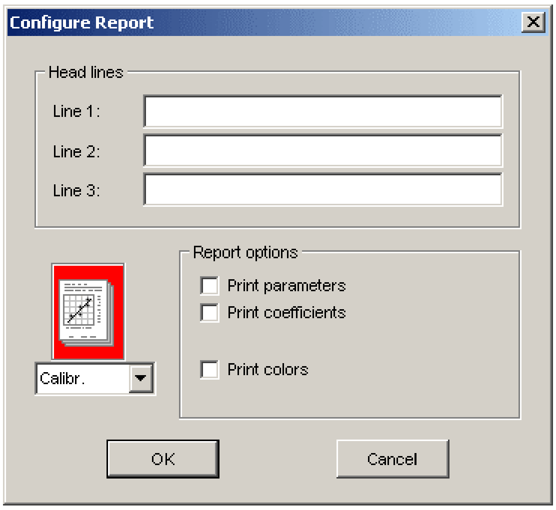
Proceed as follows to set the size of the graph with the mouse:

Step	Procedure
1	Drag a rectangle in graph view using the mouse. The selected area is displayed larger.

Configure report

Configure report

Proceed as follows to configure the report:

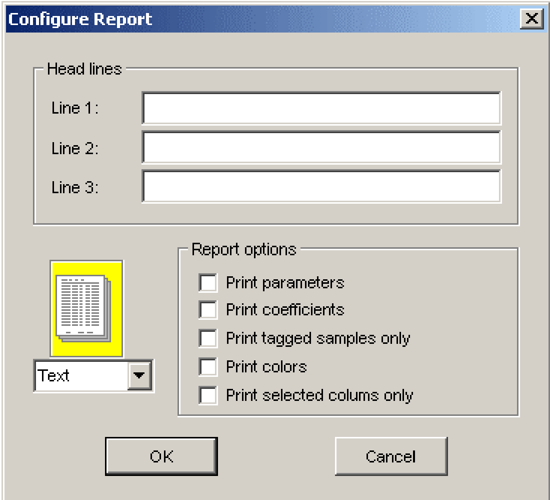
Step	Procedure
1	Open the "Configure report" dialog by selecting **File > Report Configuration**. 
2	Define the print settings as required: ▪ Enter up to three headers in the "Title" section. ▪ Check the appropriate options in the "Report options" section.
3	Click **OK**. This closes the dialog and saves the settings.

Display page view

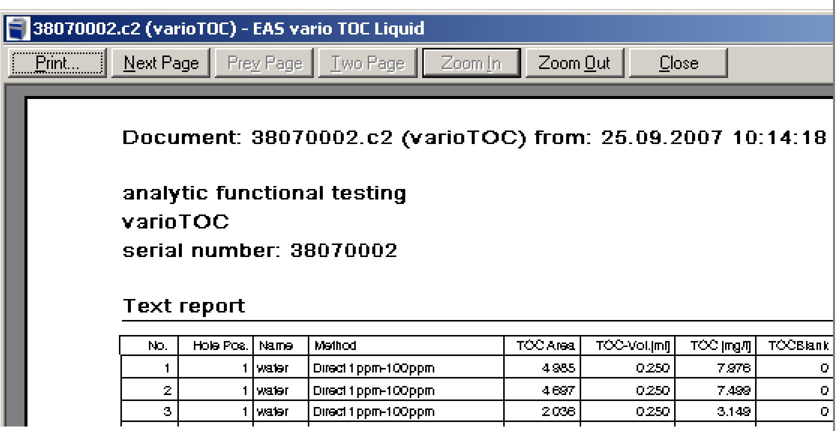
Display page view

Proceed as follows to display page view:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Configure report" dialog in the operating software by selecting File > Page View.



</td></tr>
<tr><td>2</td><td>Define your report settings. Cf. Configuring a report "Configure report" on page 267. You can also change the report type in this dialog below the icon. Then click OK.
Page view is displayed:



</td></tr>
<tr><td>3</td><td>Assess the page view:

The Next and Previous buttons allow you to browse multiple documents.
The Two Pages and One Page buttons (hidden in the screenshot) allow you to view two pages next to each other or a single page.
The Zoom in and Zoom out buttons allow you to zoom the document in/out in order to see it better.
</td></tr>
<tr><td>4</td><td>Proceed on the basis of the following decision table:</td></tr>
</table>

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	If the page view	...then...
	is OK and you want to print out the document	click **Print**. The "Configure report" dialog is displayed again, click **OK**. The "Print" dialog is displayed.
	is not OK and you want to change it	click **Close**. Open the "Configure report" dialog by selecting **File > Report Configuration**. Cf. *Configuring a report* "Configure report" on page 267.

Data backup and printing

Why backup and print data?

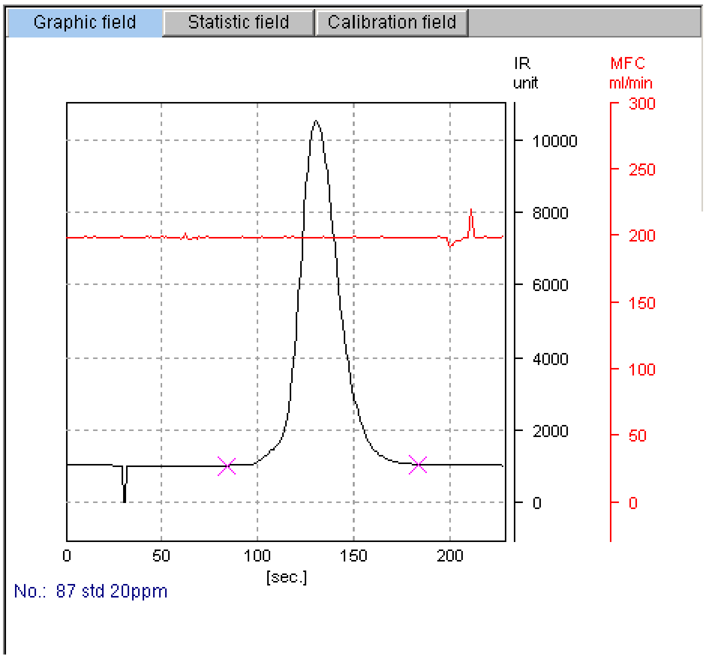
The measuring data of a sample are displayed on screen and saved to a temporary file after every analysis. In order to save the data permanently, it is necessary to save them separately or print them out.

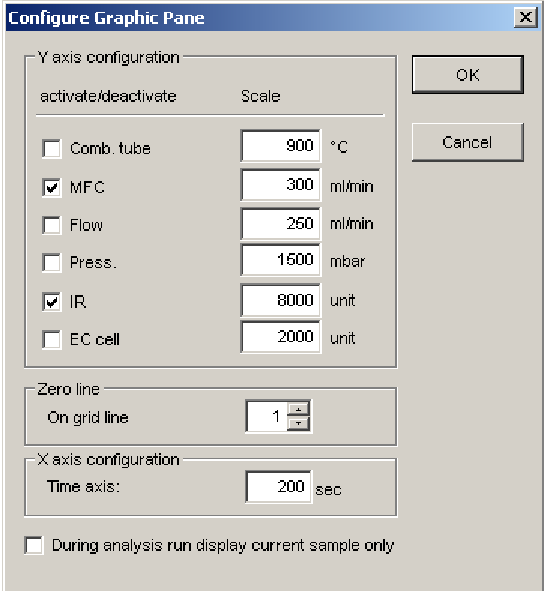
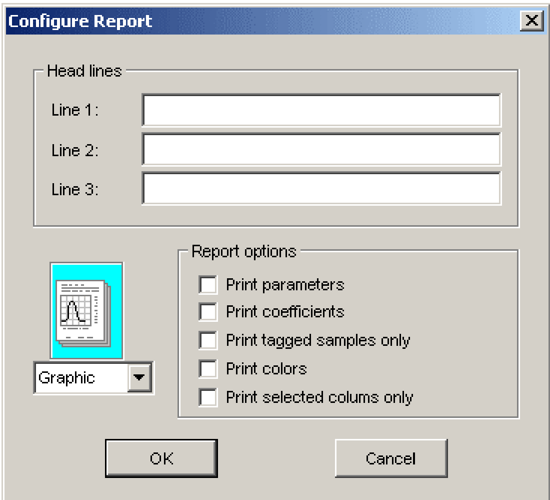
Graph view

All graphical information (pressure, peaks, etc.) of a sample are saved. This allows you to view and print various measuring variables in a graph. If any error messages or fluctuating measuring values occur, it is useful to consult the graph.

Viewing and printing the graph

Proceed as follows to view and print the graph:

Step	Procedure
1	In sample view text view, select the sample line whose graph you wish to display.
2	If sample view graph view is not already being displayed, execute the command **View > Change** until graph view appears. The following screenshot shows an example of a graph view: 

<table>
<tr><td>3</td><td>Specify what measuring variables you want to display in the graph.
Open the "Configure graph view" dialog by selecting View > Configu-ration.

</td></tr>
<tr><td>4</td><td>Define your settings:
Check the measuring variables to display. You can select up to 4 measuring variables.
In the "Zero line" section you can move the zero line up.
In the "X-axis configuration" section you can influence the graph display area.</td></tr>
<tr><td>5</td><td>Click OK.
The graph is displayed with your settings.</td></tr>
<tr><td>6</td><td>Click on the print icon to print the graph.
The "Configure report" dialog is displayed.

</td></tr>
<tr><td>7</td><td>Define the print settings as required:
Enter a title in the "Title" section.
Check the appropriate options in the "Report options" section.</td></tr>
</table>

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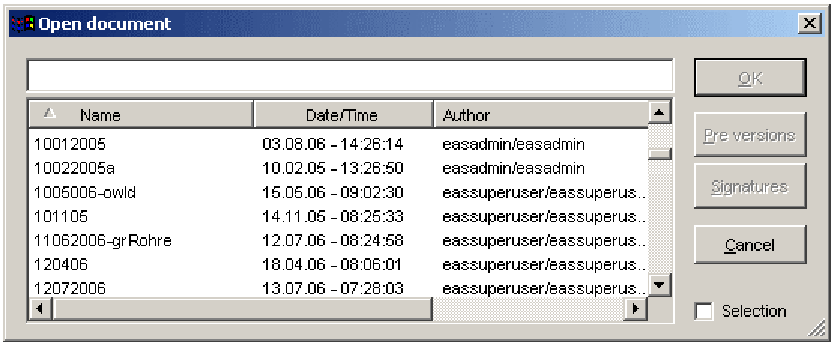
8	Click **OK**. The "Print" dialog is displayed in which you can start printing.

Permanently backing up measuring data and graphical information

Proceed as follows to permanently backup measuring data and graphical information:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td rowspan="4">1</td><td colspan="2">Execute the following command: File > Save.</td></tr>
<tr><td>If the document</td><td>...then...</td></tr>
<tr><td>already has a name</td><td>the document is automatically updated.</td></tr>
<tr><td>does not have a name yet</td><td>the "Select document name" dialog is displayed. Go to Step 2.</td></tr>
<tr><td>2</td><td colspan="2">

Enter a document name in the header.</td></tr>
<tr><td>3</td><td colspan="2">Click OK.
The measuring data are saved.</td></tr>
</table>

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Overview of export and import file formats

Export and import

The analysis data are managed in a database, so it is not possible to load and save them as files in the usual way. By selecting **File > Export** and **File > Import** you can "export" database documents from the database and "import" external documents into the database.

Export and import file formats

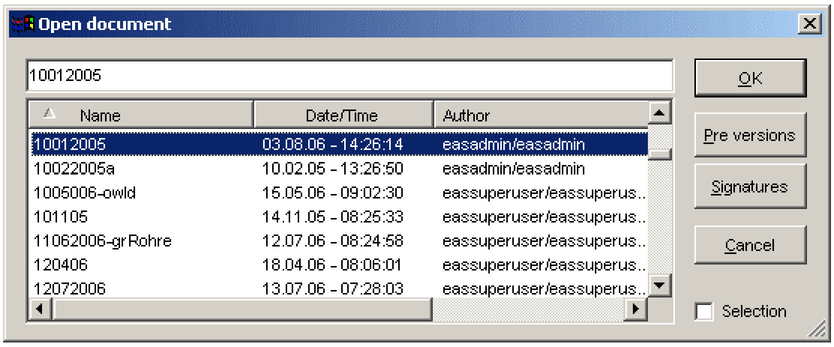
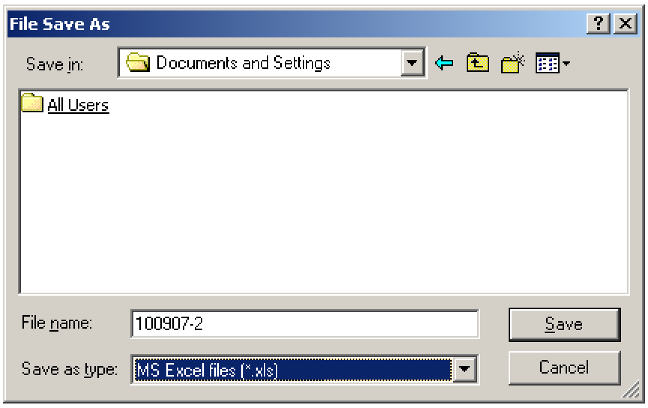
The following tables lists the file formats and their uses:

File type	Import	Export	Description
mdb	yes	yes	▪ MS Access database file. ▪ Requires more memory than the other file types. ▪ Includes graphical informations in the export. ▪ Suitable for transferring files to be evaluated by someone else, e.g. by Support.
xls	yes	yes	▪ MS Excel file. ▪ Does not include graphical informations in the export. ▪ Suitable for further numerical processing in MS Excel. ▪ It is possible, but not advisable, to import these files because graphical information is deleted if a file of the same name exists.
dat	yes	no	▪ Balance file ▪ Files with weighing data generated by the "Balance" program (product from Elementar Analysensysteme GmbH) can be impor-ted. It is not, however, possible to import other files with the .dat extension.

Exporting analysis data to Excel and viewing

Exporting analysis data to Excel

Proceed as follows to export analysis data to Excel:

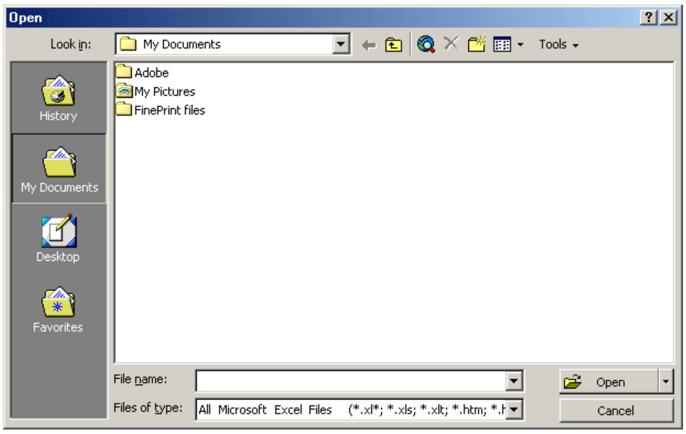
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Select document name" dialog in the operating software by selecting File > Export.</td></tr>
<tr><td>2</td><td>Select the desired file and click OK.

</td></tr>
<tr><td>3</td><td>This displays the "Save file as" dialog:
▪ Select the directory to save to in the "Save" field.
▪ Then select "MS Excel Files" in the "File type" field and click Save.

</td></tr>
<tr><td>4</td><td>This displays the "vario TOC" dialog. Click Yes to begin exporting.


The export process is performed.</td></tr>
</table>

Viewing analysis data in Excel

Proceed as follows to view analysis data in Excel:

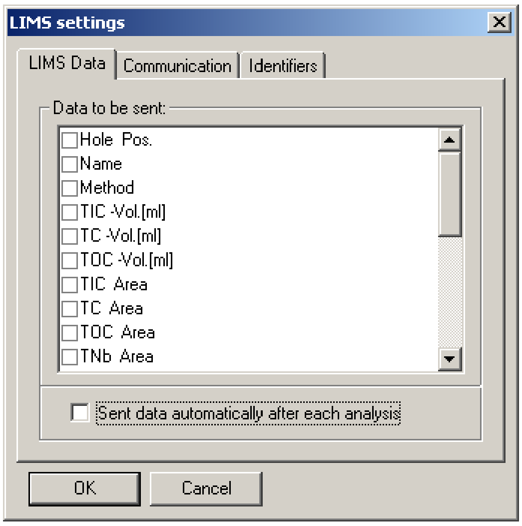
Step	Procedure
1	Launch MS Excel.

<table>
<tr><td>2</td><td>Open the "Open" dialog by selecting File > Open.

</td></tr>
<tr><td>3</td><td>Select "All Microsoft Excel Files" as the file type to open in the "File type" field.
Select the directory containing the desired analysis file in the "Search in" field.
Then select the desired analysis file in the list below and click Open.</td></tr>
<tr><td>4</td><td>The data are displayed on different tabs in Excel.
Edit the imported data as required and save them when you are finis-hed.</td></tr>
</table>

Exporting LIMS data

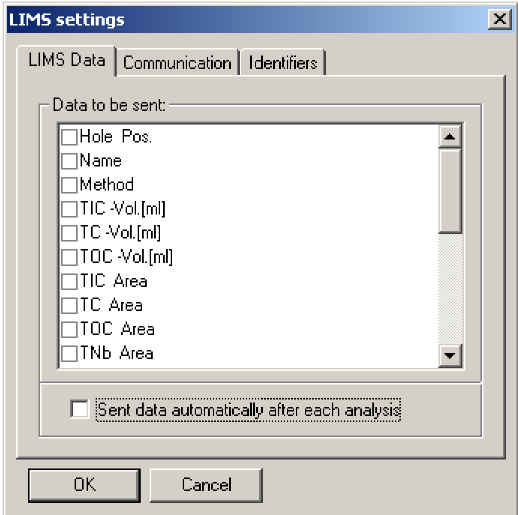
Selecting data to send

Proceed as follows to select data to send:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Open the "LIMS settings" dialog by selecting Options> Settings> LIMS.

</td></tr>
<tr><td>2</td><td colspan="2">Open the "LIMS data" tab.</td></tr>
<tr><td rowspan="4">3</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><th>To do the follo-wing...</th><th>...then...</th></tr>
<tr><td>send data</td><td>check the appropriate checkbox in the "Data to send" section.</td></tr>
<tr><td>not send data</td><td>uncheck the appropriate checkbox in the "Data to send" section.</td></tr>
<tr><td>4</td><td colspan="2">Click OK in the "LIMS settings" dialog.
Your settings are saved and the dialog is closed.</td></tr>
</table>

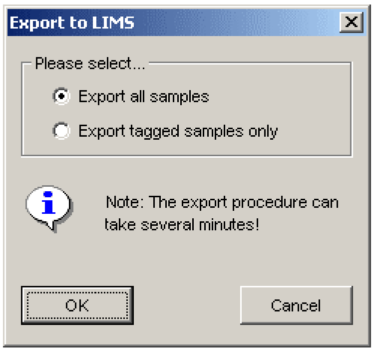
Auto-exporting LIMS data

Proceed as follows to auto-export LIMS data after every analysis:

Step	Procedure
1	Open the "LIMS settings" dialog by selecting **Options> Settings> LIMS**. 
2	Open the "LIMS data" tab.
3	Check the "Auto-export data after every analysis" checkbox.
4	Click **OK** in the "LIMS settings" dialog. Your settings are saved and the dialog is closed. The software now sends analysis data to LIMS after every analysis.

Exporting LIMS data manually

Proceed as follows to export LIMS data manually:

Step	Procedure
1	Open the "Export to LIMS" dialog by selecting **File> Export to LIMS**. 
2	Select the radio button next to the desired setting.
3	Click **OK** in the "Export to LIMS" dialog. The export process is performed.

Exporting AQA data

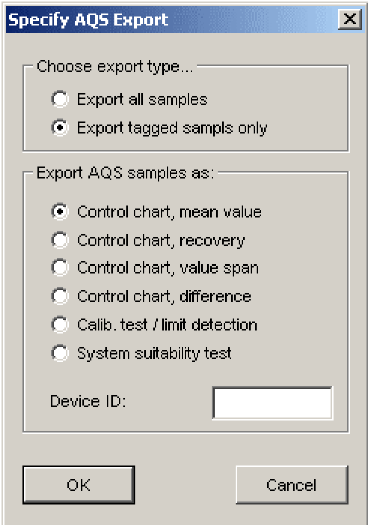
Note

The AQA software must be started before you can export data otherwise the system displays a message.

Exporting AQA data

Proceed as follows to export AQA data:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Select the sample data to export in the sample view.
Refer to Copying documents via the clipboard on page 292 for details on how to select cells in the sample view.</td></tr>
<tr><td>2</td><td>Open the "Define AQA export" dialog by selecting File> Export to AQA.



</td></tr>
<tr><td>3</td><td>Select the radio button next to the desired setting in the "Please specify export type" section.</td></tr>
<tr><td>4</td><td>Select the radio button next to the desired setting in the "Export AQA samples as" section so that the software knows how to process the data.</td></tr>
<tr><td>5</td><td>If multiple analyzers send data to AQA, enter the ID of the current instrument in the "Instrument ID" text box.</td></tr>
<tr><td>6</td><td>Click OK in the "Define AQA export" dialog.
The export process is performed.</td></tr>
</table>

5.6 Shutting down the instrument temporarily

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to shut down the instrument temporarily according to instructions.

Overview

"Shutting down the instrument temporarily" is divided into the following topics:

Topic	Page
Shutting the instrument down for short measuring breaks (standby)	280
Shutting the instrument down for long measuring breaks (switching off)	282
Optimizing sleep and wake-up behavior	283

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Shutting the instrument down for short measuring breaks (standby)

What are short measu-ring breaks?

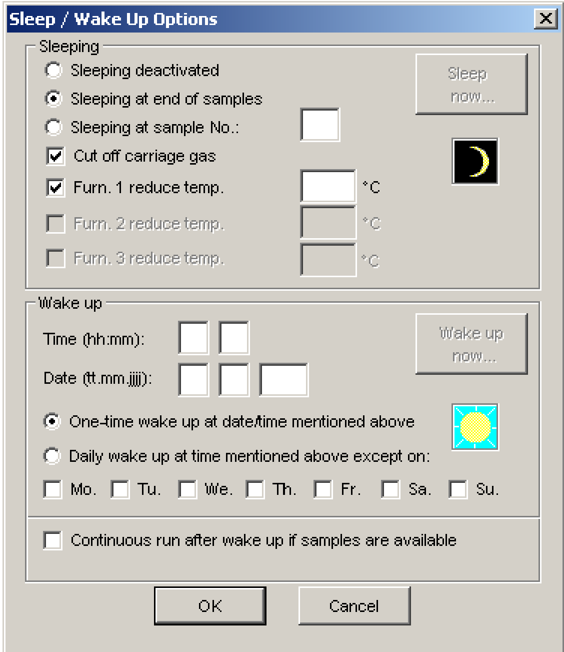
Short measuring breaks are breaks that last overnight or for 2-5 days.

Procedure

The analyzer and the PC stay online during short measuring breaks. Only the sleep function is activated for the instrument.

Setting the analyzer sleep function.

Proceed as follows to set the analyzer sleep function:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Sleep/wake-up functions" dialog in the operating software by selecting Options > Settings > Sleep/Wake-up.

</td></tr>
<tr><td>2</td><td>Define when to enable the sleep function. Select one of the following options:
<table>
<tr><th>Option</th><th>Meaning</th></tr>
<tr><td>"Sleep now..."

</td><td>The instrument is shut down immediately.</td></tr>
<tr><td>"Sleep after end of sample"</td><td>The instrument is shut down after finishing the last weighed sample.</td></tr>
<tr><td>"Sleep at sample No.:"</td><td>The instrument is shut down prior to the appropriate sample.</td></tr>
</table></td></tr>
<tr><td>3</td><td>Check "Shut off carrier gas".</td></tr>
<tr><td>4</td><td>Check "Reduce furnace 1 temp".</td></tr>
<tr><td>5</td><td>Enter 100 °C in the box next to "Reduce furnace 1 temp".</td></tr>
</table>

6	Specify when to "wake up" the instrument again. The working temperatures are increased again and the instrument is flushed with gas. Choose one of the following options: ▪ Enter the "Date" and "Time" at which to "wake up" the instrument and select the box next to "One-time wake-up at above time/date". ▪ Enter a "Time", select the box next to "Daily wake-up at above time, except:" and select the weekdays on which you do not want to wake up the instrument.
7	If you shut down the instrument in the middle of a series, you can continue this series after "wake-up". To do so, check "Continue after wake-up if there are samples".
8	Click **OK** to close the window and save your settings. The instrument is shut down and woken up again according to your settings.

Shutting the instrument down for long measuring breaks (switching off)

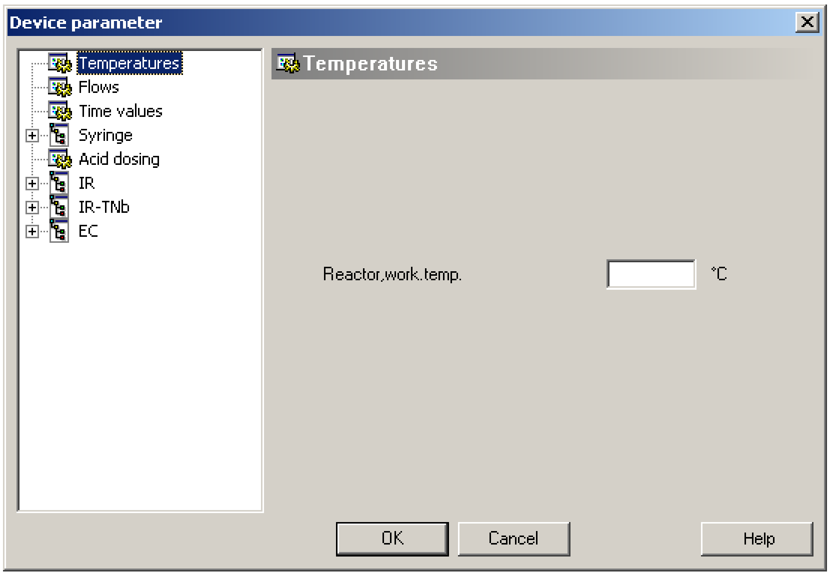
What are long measuring breaks?

Long measuring breaks are breaks that last longer than 5 days.

Preparing the instrument for long measuring breaks.

Caution	Lack of ventilation of the analyzer A lack of ventilation leads to overheating of the analyzer. Before switching off the instrument: ▪ Set furnace setpoint temperature to 0 °C. ▪ Allow the furnace to cool down until the temperature displayed is 100 °C.

Proceed as follows to prepare the instrument for long measuring breaks:

Step	Procedure
1	Shut off the gas supply.
2	Set the setpoint temperature of the furnace to 0 °C in the operating software. Open the "Instrument parameters" dialog by selecting **Options > Settings > Parameters**. 
3	Wait 2–3 hours until the instrument has cooled down to at least 100 °C.
4	Quit the operating software. Execute the following command: **File > Exit**.
5	Switch the analyzer and its peripherals off.
6	Disconnect the analyzer from the mains. Disconnect the power supply plug. The instrument is ready for long measuring breaks.

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Optimizing sleep and wake-up behavior

What can you optimize?

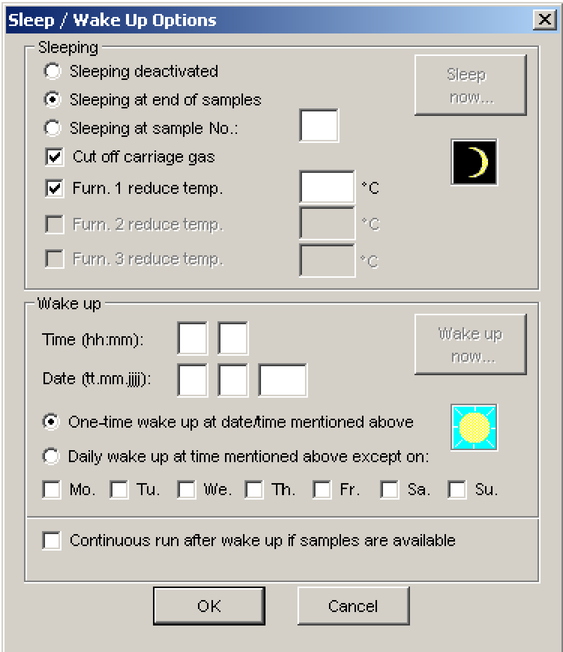
You can set sleep/wake-up behavior so that conditioning samples in a series are measured before the first user starts work on the instrument in the morning.

Note

Remember to prepare the appropriate conditioning samples and to sort them into the carousel after the samples of the last measurement of the day.

Optimizing sleep and wake-up behavior

Proceed as follows to optimize sleep/wake-up behavior:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Sleep/wake-up functions" dialog in the operating software by selecting Options > Settings > Sleep/Wake-up.


</td></tr>
<tr><td>2</td><td>The last measurement of the day must be stopped before the appended conditioning samples. To do so, select the radio button next to "Sleep at sample No." in the "Sleep" section. In the box next to it, enter the sample number at which you want the instrument to sleep; it corresponds to the first conditioning sample.</td></tr>
<tr><td>3</td><td>In the "Wake-up" section, enter the time and days on which the wake up the instrument.</td></tr>
<tr><td>4</td><td>To do so, check the checkbox next to "Continue after wake-up if there are samples".</td></tr>
<tr><td>5</td><td>Click OK.
This closes the dialog and saves the settings. The conditioning samples will be processed the next time the instrument wakes up.</td></tr>
</table>

5.7 Working with documents

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to work with database documents.

Overview

"Working with documents" is divided into the following topics:

Topic	Page
Creating new documents	285
Editing documents	286
Deleting documents	288
Finding documents	289
Copying documents via the clipboard	292
Importing documents	293
Signing documents	294
Checking documents for authenticity	296

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Creating new documents

Usual procedure

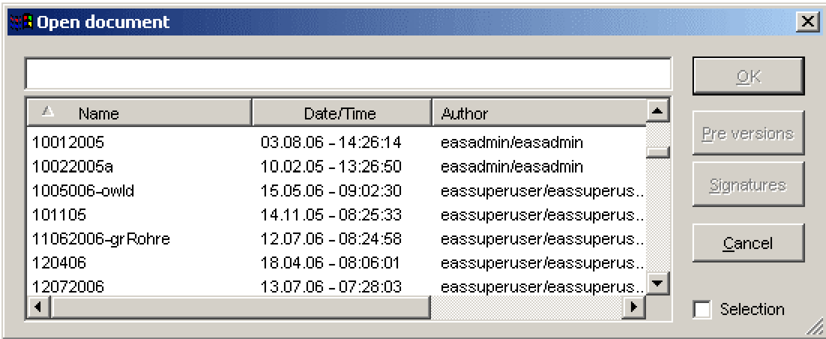
Usually, one document is created per day. The data are separated and evaluated by customer at the end of the day.

Document capacity

Up to max. 599 measuring data can be saved in one document.

Creating new documents

Proceed as follows to create new documents:

Step	Procedure
1	Select **File > New** to create a new document.
2	Save the new document by selecting **File > Save**. The "Select document name" dialog is displayed: 
3	Enter the desired document name in the text box at the top and click **OK**. This closes the dialog and saves the document.

Editing documents

Note

Cell contents and lines can only be deleted or inserted until the samples have been completely processed.

Deleting cell contents

Proceed as follows to delete cell contents:

Step	Procedure
1	Select the cell whose contents you want to delete.
2	Delete the contents by selecting **Edit > Cut**. The cell now contains its default contents, for example 0.0000. The deleted contents are in the clipboard.

Deleting lines

Proceed as follows to delete lines:

Step	Procedure
1	Select the line by clicking the number next to the line.
2	Delete the line by selecting **Edit > Delete Line**. This deletes the line and the other samples move up.

Inserting cell contents

Proceed as follows to insert cell contents:

Step	Procedure
1	Copy the desired contents to the clipboard.
2	Select the cell in which to insert the contents.
3	Insert the contents in the cell by selecting **Edit > Paste**.

Inserting lines

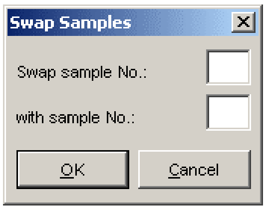
Proceed as follows to insert empty lines:

Step	Procedure
1	Select the line above which to insert the empty line by clicking the number next to the line.
2	Insert the line by selecting **Edit > Insert Line**. This inserts the line and all of the following samples move down one line.

Swap samples

Proceed as follows to swap samples:

Step	Procedure
1	Go to **Edit > Swap** in the software.

<table>
<tr><td>2</td><td>The dialog Swap Samples opens.


</td></tr>
<tr><td>3</td><td>Enter the sample numbers to be swapped and confirm with OK.</td></tr>
</table>

Editing finished samples

Finished samples are only edited in special cases. See *Editing analysis data* on page 136.

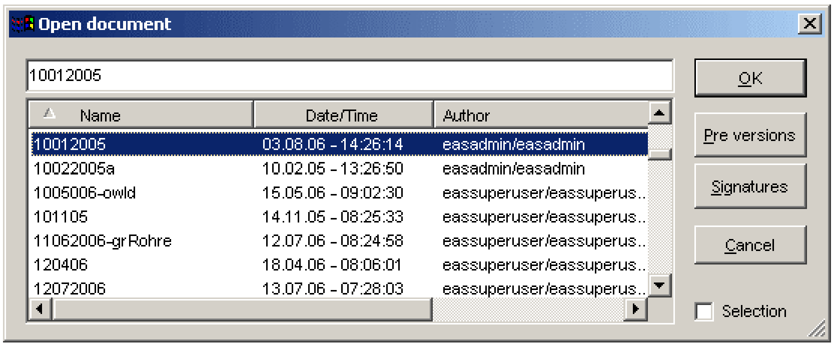
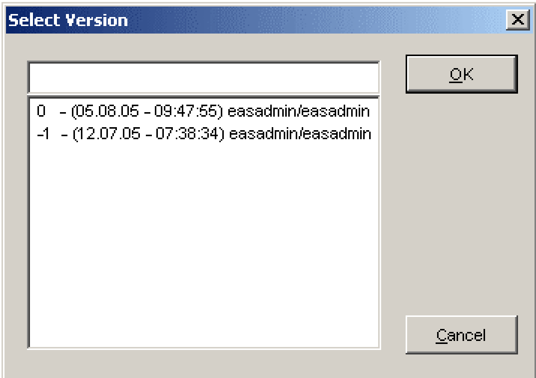
Deleting documents

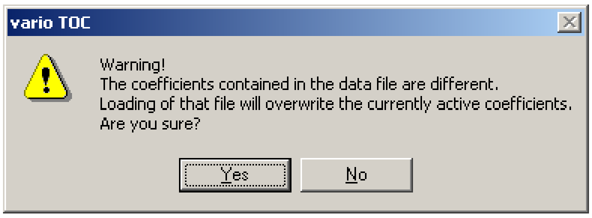
Who is allowed to delete?	Deleting documents is reserved for the Administrator level.
What is deleted?	The documeht itself is deleted along with all previous versions of the document.
Consequences	If 21 CFR Part 11 functionality is enabled, the user is prompted to input a comment after deleting the document.

Finding documents

Finding previous versions

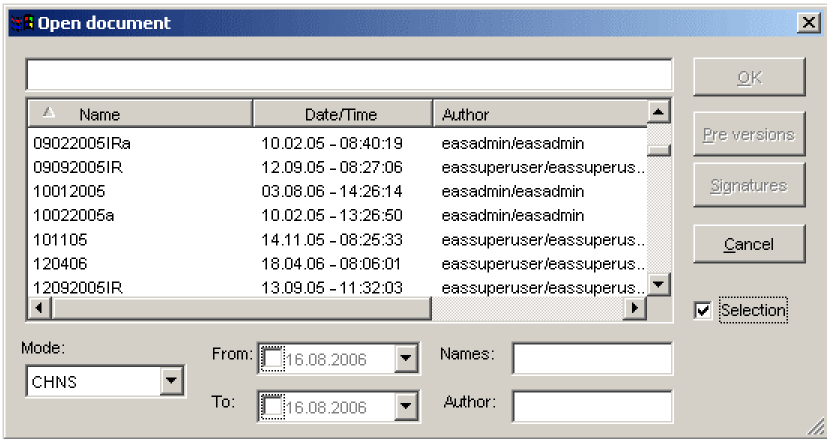
Proceed as follows to find previous versions of a document:

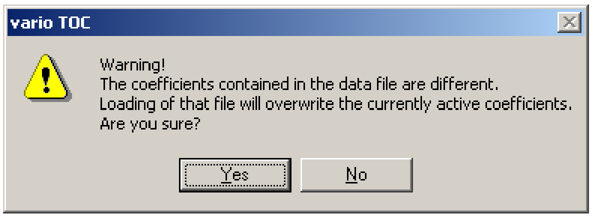
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Select document name" dialog in the operating software by selecting File > Open.

</td></tr>
<tr><td>2</td><td>In the listbox select the document whose previous versions you want to view. Then click Previous versions.
The "Select version" dialog is displayed:

</td></tr>
<tr><td>3</td><td>Select the desired version in the listbox and click OK. The current version is indicated by number 0, previous versions are indicated by a minus sign.</td></tr>
<tr><td>4</td><td>Proceed on the basis of the following decision table:</td></tr>
</table>

	If the coefficients of the selected previous version...	**...then...**
	match the current coefficients	the previous version is displayed immediately.
	do not match the current coefficients	a message is displayed. Go to Step 5.
5	The following message is displayed:  Click **Yes** to continue. The previous version is displayed.	

Searching with filter criteria

Proceed as follows to search using filter criteria:

Step	Procedure
1	Open the "Select document name" dialog in the operating software by selecting **File > Open**. Activate **Selection** to show the document search filter criteria. 
2	Proceed on the basis of the following decision table:

<table>
<tr><td></td><td>If you are looking for documents...</td><td>...then...</td></tr>
<tr><td></td><td>as of a certain date</td><td>enter a date in the "from" text box and check the checkbox next to it.</td></tr>
<tr><td></td><td>up to a certain date</td><td>enter a date in the "to" text box and check the checkbox next to it.</td></tr>
<tr><td></td><td>in a certain period of time</td><td>enter a date in the "from" and "to" text boxes and check the checkboxes next to them.</td></tr>
<tr><td></td><td>with a certain name</td><td>enter the document name you are looking for in the "Name" textbox. Wildcards such as ? and * are also allowed.</td></tr>
<tr><td></td><td>of a certain author</td><td>enter the name of the author in the "Author" textbox.</td></tr>
<tr><td>3</td><td colspan="2">The software now only displays documents matching your filter criteria. Select the desired document in the listbox and click OK.</td></tr>
<tr><td>4</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><td></td><td>If the coefficients of the selected documents...</td><td>...then...</td></tr>
<tr><td></td><td>match the current coefficients</td><td>the document is displayed immediately.</td></tr>
<tr><td></td><td>do not match the current coefficients</td><td>a message is displayed. Go to Step 5.</td></tr>
<tr><td>5</td><td colspan="2">The following message is displayed:


Click Yes to continue.
The document is displayed.</td></tr>
</table>

Copying documents via the clipboard

What can you copy?

You can only copy the contents of the sample view to the clipboard via **Edit > Copy**; you cannot copy graphics. You must select the cells to copy in the sample view. The next paragraph explains how to select cells.

Selecting cells

You can select cells in the sample view in the following ways:

- Select the whole sample view by left-clicking on the "No." field.
- Select a whole line by left-clicking on the number next to the line.
- Select a whole column by left-clicking on the title of the column.
- You can select multiple successive lines by clicking and holding the Shift key.
- You can select multiple non-contiguous cells, lines or columns by clicking and holding the CTRL key.
- Left-click to select a single cell.

Inserting data

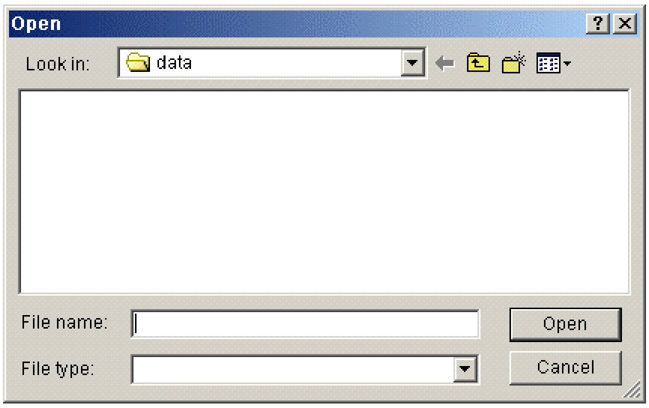
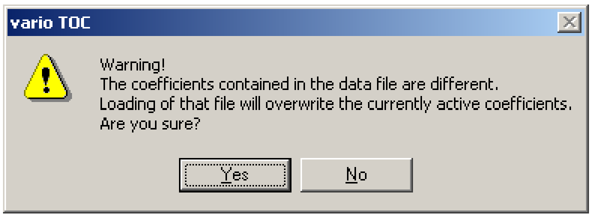
You can insert data from the clipboard by selecting **Edit > Paste**:

- to insert them into a new document in the database or
- into an Excel document.

Importing documents

Importing documents

Proceed as follows to import documents:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Open the "Open" dialog by selecting File > Import.

</td></tr>
<tr><td>2</td><td colspan="2">From the dropdown listbox select the directory containing the document. Select the document file and click Open.</td></tr>
<tr><td rowspan="4">3</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><td>If the coefficients of the selected documents...</td><td>...then...</td></tr>
<tr><td>match the current coefficients</td><td>the document is imported immediately.</td></tr>
<tr><td>do not match the current coefficients</td><td>a message is displayed. Go to Step 4.</td></tr>
<tr><td>4</td><td colspan="2">The following message is displayed:


Click Yes to continue.
The document is imported.</td></tr>
</table>

Signing documents

What signature is allocated?

The signature that is enabled in the document and whose radio button is chekked is allocated; in the screenshot below, for example, the "created" signature is allocated. The following rules apply:

- The "created" signature is assigned to a document first.
- The "checked" signature is assigned to a document if it already has a "created" signature.
- The "released" signature is only assigned to a document if it already has a "created" and a "checked" signature.

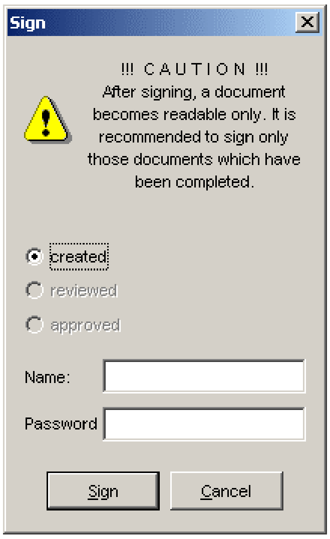
Note

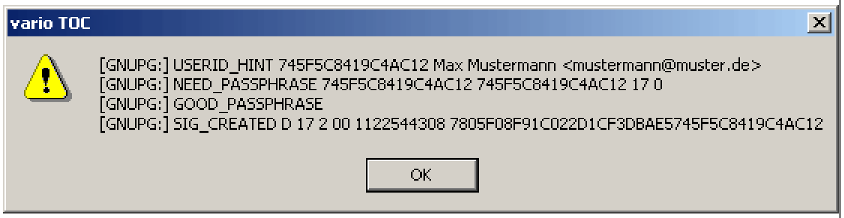
Note the following:

- The signature program must be installed.
- Documents can only be signed if 21 CFR Part 11 functionality is enabled.
- Only sign finished documents. After signing, the document is read-only.

Signing documents

Proceed as follows to sign documents:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Sign" dialog in the operating software by selecting File > Sign.

</td></tr>
<tr><td>2</td><td>Enter your name set up in the signature program in the "Name" field.</td></tr>
<tr><td>3</td><td>Enter your password set up in the signature program in the "Password" field.</td></tr>
</table>

4	Click **Sign**. The program checks whether you are authorized to sign the docu-ment. The result is displayed in another dialog:  "GOOD_PASSPHRASE" indicates that you are authorized to create the signature. The signature has been created.

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Checking documents for authenticity

What signature is checked?

Only those signatures can be checked that are enabled in the dialog and if their radiobutton is checked; for example the "created" signature in the screenshot below. If the document already has multiple signatures, the user must select one to check.

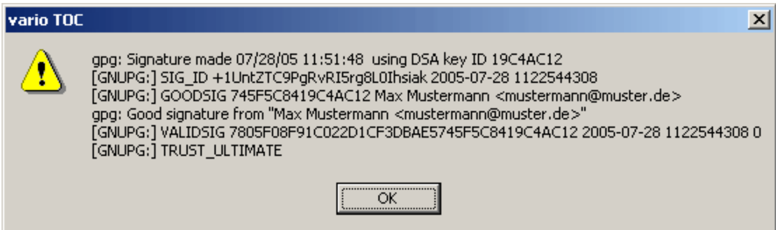
Note

Note the following:

- The signature program must be installed.
- Signatures can only be checked or created if 21 CFR Part 11 functionality is enabled.

Checking a signature

Proceed as follows to check signatures:

Step	Procedure
1	Open the document to check.
2	Open the "Verify digital signature" dialog in the operating software by selecting **File > Verify**. 
3	Check the radiobutton next to the signature you want to check.
4	Click **Verify**. The programs begins to check. The result is displayed in a new dialog and indicates whether the signature is authentic or not.  "Good signature from" indicates that the signature is authentic.

Maintaining the instrument

6

Target group The target group of this section is personnel authorized by Elementar Analysen-systeme GmbH.

Purpose This section is designed to maintain proper working order of the instrument.

Overview "Maintaining the instrument" is divided into the following sections:

Section	Page
Important information about maintenance	298
Performing the calibration	310
Calibration tables	325
Removing, cleaning and installing the carousel	328
Replacing the ash crucible/finger	335
Replacing sealing elements	355
Maintain multiway valve and injection plug	358
Maintaining the ball valve (solids mode)	370
Removing, cleaning and installing the condenser	381
Maintain syringe	388
Emptying and filling standard reaction tubes	393
Removing/installing and conditioning the reaction tubes	400
Filling, removing and installing drying, absorption and filter tubes	408
Filling the acid container	418
Flushing the combustion tube and the sparger.	420

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6.1 Important information about maintenance

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section provides important information about maintenance.

Overview

"Important information about maintenance" is divided into the following topics:

Topic	Page
Maintenance work to be performed by the customer	299
Viewing the status of maintenance intervals	301
Defining maintenance intervals in the software	302
Installing used tubes	304
Preparing and following up maintenance work	305
Conditioning newly installed tubes	307

Maintenance work to be performed by the customer

Note

Observe that the maintenance or replacement times indicated here are greatly dependent on the respective sample matrix. All intervals and figures indicated are only examples and by no means guarantee service life of consumables or wear and tear parts.

Maintenance work to be performed by the customer

The following table lists the maintenance work that you can perform yourself as customer and the intervals for these tasks.

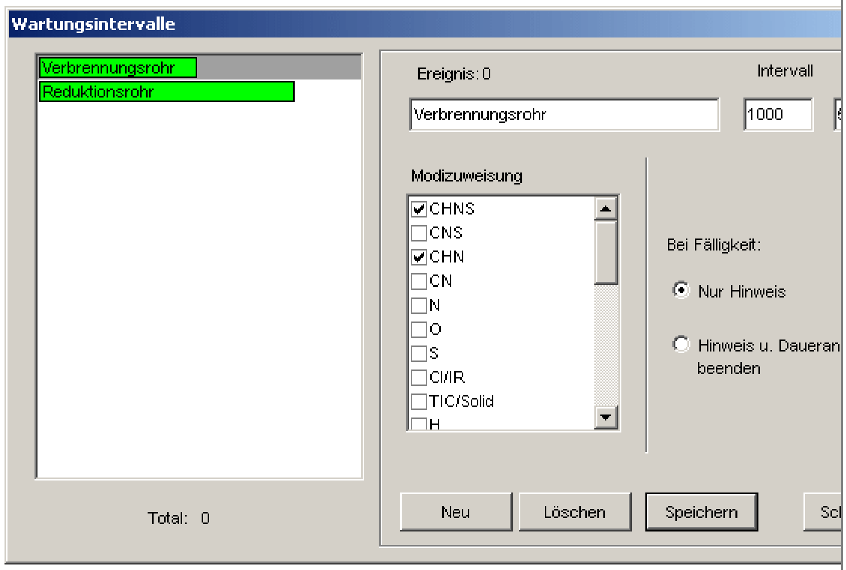
Maintenance work	Interval	Cf. ...
Check absorption tubes / Change filling Magnesium perchlorate / silver wool	Daily visual inspection	*Filling, removing and installing drying, absorption and filter tubes* on page 408
Replacing the ash crucible/finger	Depending on the sample matrix.	*Replacing the ash crucible/finger* on page 336
Instrument and supply lines leak test	Daily visual inspection of the flow display.	*Performing a leak test* on page 528
Checking hard disk capacity and reloacting data to disk if necessary.	Backup every week, relocate data to disk as required.	*Starting the database backup* on page 149
Calibration	For deviations of the standard solutions for measuring routine work. 3-point calibration is recommended, when a measuring series will be started. When the daily factor is not between 0.0-1.1 anymore.	*Performing calibration* "Performing the calibration" on page 317
Clean multiway valve, possibly replacing seals.	Depending on the sample matrix.	*Clean, assemble and install the multiway valve and the injection plug.* on page 364
Replace sealing elements (o-rings, quad rings, half shells)	As required.	*When to replace sealing elements* on page 356 *Removing sealing elements from grooves* on page 357
Cleaning the carousel	As required.	*Removing, cleaning and installing the carousel* on page 328
Clean syringe	After particles containing samples and demanding samples.	*Maintain syringe* on page 389
Replace comubstion tube, replace fillings, check plugs and o-rings at the same time	Replacement intervals, cf. **Options > Maintenance > Intervals** in the operating software.	*Removing the reaction tube from the furnace* "Removing the standard reaction tubes from the furnace" on page 401
Fill acid container	Daily visual inspection	*Filling the acid container* on page 419
Check supply gases for correct intake pressure and sufficient volume	Before every series of analyses.	*Gases and chemicals to be provided* on page 171

Recommendation	Taking out a service contract for full annual maintenance saves time and money. Contact your service office for details.

Viewing the status of maintenance intervals

Viewing maintenance intervals

Proceed as follows to view maintenance intervals:

Step	Procedure
1	Open the "Maintenance intervals" dialog in the operating software by selecting **Options > Maintenance > Intervals**. 
2	In the overview field on the left all maintenance events are displayed, i.e. the corresponding assignment as well as the percentaged count as a highlighted bar.
3	Click the respective event in the overview field. On the tab, the "Status" field displays the number of individual sample measurements performed since the last maintenance. The "Interval" field indicates how many measurements until maintenance is due.

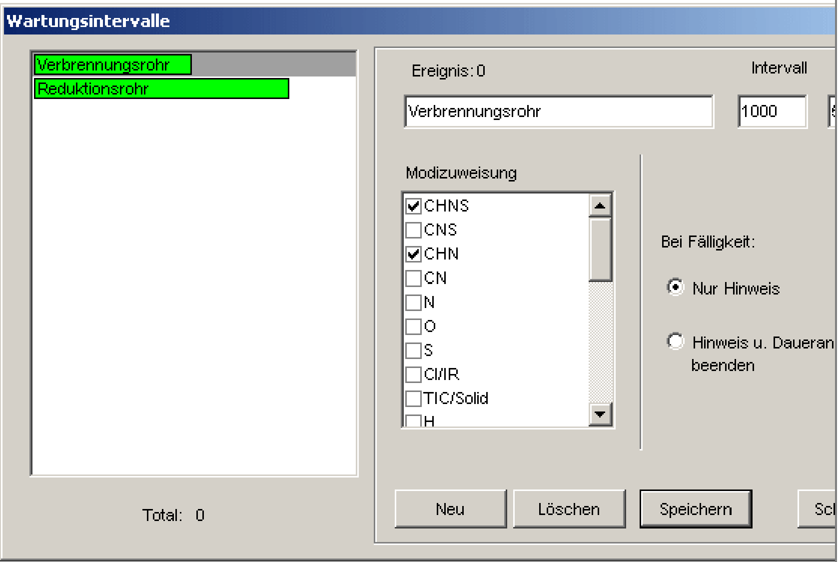
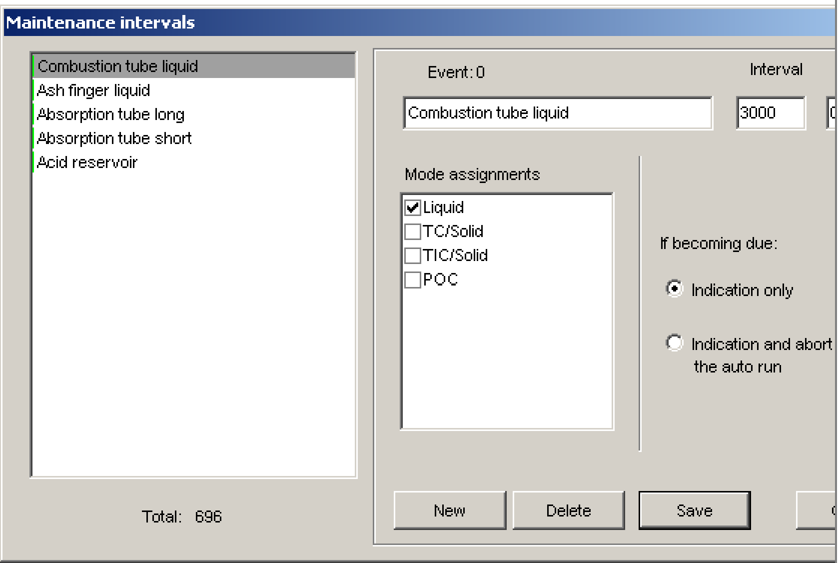
Defining maintenance intervals in the software.

Background

In order to make it easier to observe replacement and maintenance intervals, you can define "maintenance events" with set intervals in the operating software. Several maintenance events are already defined by default and need to be adjusted according to the customer's long-term experience.

Defining maintenance intervals

Proceed as follows to define maintenance intervals:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Maintenance intervals" dialog in the operating software by selecting Options > Maintenance > Intervals.

</td></tr>
<tr><td>2</td><td>Click on a tab labeled "Event" that is not yet in use.

</td></tr>
<tr><td>3</td><td>Enter the following:

In the "Event" field enter the maintenance event, e.g. ball valve.
In the "Interval" field specify the number of measurements of individual samples after which the ball valve has to be serviced.
</td></tr>
</table>

4	Define your settings:
	▪ In the "Mode allocation" section check the modes for which the maintenance event applies.
	▪ Select the following in the "When due" section:
	    ▪ Either "Message only" if you just want to have a message displayed on screen when the maintenance is due.
	    ▪ Or "Message and stop continuous analysis" if you want to have message displayed on screen and contonuous analysis to be stopped when maintenance is due.

5	Click **OK** to save your settings. The maintenance event is now defined.

Notes regarding further operation

Observe the notes regarding further operation:

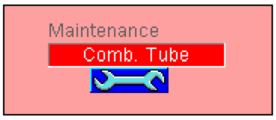
- The "Overview" tab displays the number of measurements since the last maintenance in percent for all maintenance intervals.
- On the tabs labeled "Event" the "Status" field displays the number of individual sample measurements performed since the last maintenance.
- If the maximum number of measurements is reached, a message is displayed in the status view in the "Maintenance" field reminding the user of the maintenance. See Fig. "Status view message".

Status view message

If the maximum number of measurements is reached for a maintenance event:

- the due maintenance event is displayed in the status view in the "Maintenance" field
- the background of the "Maintenance" field turns red
- a wrench flashes.

The following screenshot shows the status view message:



To be observed after maintenance

If you have performed the due maintenance you must manually reset the "Status" field to zero on the respective "Event" tab.

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Installing used tubes

Installing used tubes

When you install a used tube, and if a maintenance event has been defined for this maintenance work, you must increment the interval counter in the "Maintenance intervals" dialog accordingly. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.

Preparing and following up maintenance work

Why prepare and follow up maintenance work?

In order to perform maintenance work it is necessary to make certain preparations so as to avoid risks for the user. This also prevents the instrument from sending an error message and shutting down automatically. It is also necessary to perform follow-up work after maintenance in order to get the instrument ready to measure again.

Decision table

The following table helps you with further procedure:

If you are going to perform the following maintenance work...	...then...
▪ Removing or installing the absorption tube ▪ Replacing the ash crucible/finger ▪ Replace sealing element ▪ Removing the reaction tubes from the furnace ▪ Installing reaction tubes in the furnace ▪ Removing and installing the drying tube ▪ Removing the combustion tube connection ▪ Fill acid container	▪ requires special preparation/follow-up work. This is explained in the specific instructions.
▪ Ball valve maintenance	▪ requires special preparation/follow-up work. This is explained in the specific instructions.
▪ Maintain multiway valve	▪ requires special preparation/follow-up work. This is explained in the specific instructions.
▪ Maintain syringe	▪ requires special preparation/follow-up work. This is explained in the specific instructions.

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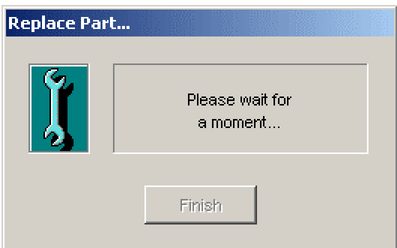
Preparing the instrument: Gas pressure

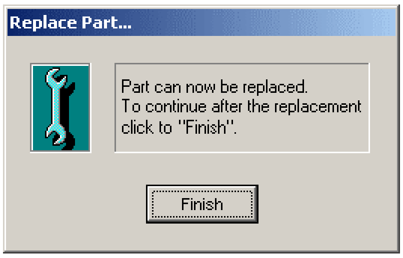
Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Before replacing tubes or the ash crucible/finger, shut off the gas supply to the instrument. To do so, execute the **Options Maintenance > Replace Part** command.

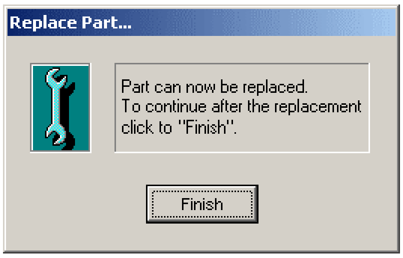
Proceed as follows to prepare the instrument:

Step	Procedure
1	Shut off gas supply. Open the "Replace part" dialog in the operating software by selecting **Options > Maintenance > Replace Part**. 

2	Wait for pressure drop without pressing any buttons until the following dialog is displayed: 
3	Pressure has been reduced when the following displays show 0 on screen: ▪ "MFC" ▪ "Flow" ▪ "Pressure". The instrument is now ready for replacement of the part.

Follow-up instrument preparation: Gas pressure / gas-tightness

Proceed as follows to perform follow-up preparation:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Close the "Replace part" dialog in the operating software.
To do so, click Finish in the "Replace part" dialog.


By doing so, the gas will be automatically turned on.</td></tr>
<tr><td rowspan="4">2</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><td>If the operating software status view displays...</td><td>...then...</td></tr>
<tr><td>approximately the same flow and pressure values as prior to maintenance work</td><td>the instrument is then ready to measure again.</td></tr>
<tr><td>distinctly different flow and pressure values to those displayed prior to maintenance work</td><td>perform a leak test. Cf. Performing leak test "Performing a leak test" on page 528.
The instrument is only ready to measure when the leak test is successful.</td></tr>
</table>

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Conditioning newly installed tubes

Purpose of conditioning

Newly installed tubes must be conditioned:

- to remove moisture from the tube fillings.
- to remove contaminations.

Without conditioning, analysis results would be distorted.

Types of conditioning

There are two types of conditioning new tubes:

- Flushing the tubes with distilled H_2O (alternatively with 0,8 % HCl or 0,8 % H_3PO_4) and high injection volume.
- Baking out tubes to remove moisture and contaminations from the tube fillings.

Flushing tubes

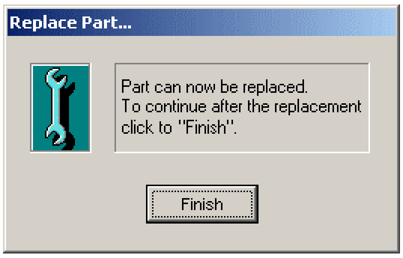
Requirements:

- A new tube has been installed.
- The analyzer is in "Replace part" status.

Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Before replacing tubes or the ash finger/ash crucible, shut off the gas supply to the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

- The tube ends are closed.

Proceed as follows to flush tubes:

Step	Procedure
1	Close the "Replace part" dialog in the operating software. To do so, click **Finish** in the "Replace part" dialog.  By doing so, the gas will be automatically turned on.
2	Proceed on the basis of the following decision table:

	If the operating software status view displays...	...then...
	approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
	distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528. Only move on to Step 3 once the leak test is successful.
3	Perform a function test or a blank value determination for instance. Utilize a high injection volume for flushing. Cf. *Determining blank values* on page 231.	
4	Only complete the function test or the blank value determination when the measuring values are stable and small. The instrument is then ready to measure again.	

Conditioning of the combustion tube

The following tables explains conditioning rules for the various modes:

Mode	Conditioning rule
Liquid/Solids	Bake out at working temperature for 30 minutes. Flush, if necessary, in the liquid mode with high injection volumes (e.g. over night).

Heat out the combustion tube

Requirements:

- A new combustion tube has been installed.
- The analyzer is in "Replace part" status.

Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Before replacing tubes or the ash finger/ash crucible, shut off the gas supply to the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Warning Hot instrument parts in the cooled-down and shut-down instrument.

When working inside the instrument there is a risk of burning as some components may still be hot (e.g. tubing).

When working inside the instrument always wear protective glasses and the enclosed protectice leather gloves.

Warning

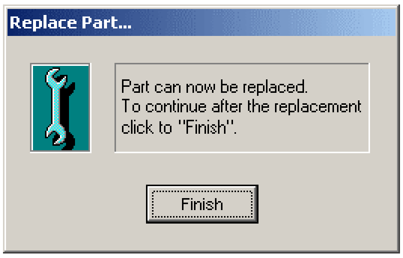
Hot instrument parts and hot ash particles

Risk of burning due to hot instrument parts.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

Proceed as follows to bake out the reaction tubes:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">Close the "Replace part" dialog in the operating software.
To do so, click Finish in the "Replace part" dialog.


By doing so, the gas will be automatically turned on.</td></tr>
<tr><td>2</td><td colspan="2">Wait the required conditioning time.
Refer to the above table "Conditioning rules for combustion tube".</td></tr>
<tr><td>3</td><td colspan="2">Make sure that:
the "Pressure" display shows 1000 mbar on screen
the measuring gas flow meter "MFC" displays 200 ml/min on screen
the flow meter "Flow" displays approx. 200 ml/ min on screen</td></tr>
<tr><td rowspan="4">4</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><td>If the operating software status view displays...</td><td>...then...</td></tr>
<tr><td>approximately the same flow and pressure values as prior to maintenance work</td><td>the instrument is then ready to measure again.</td></tr>
<tr><td>distinctly different flow and pressure values to those displayed prior to maintenance work</td><td>perform a leak test. Cf. Performing leak test "Performing a leak test" on page 528.
The instrument is only ready to measure when the leak test is successful.</td></tr>
</table>

6.2 Performing the calibration

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section provides facts about calibration and also enables you to perform calibration.

Overview

"Performing calibration" is divided into the following topics:

Topic	Page
Viewing list of defined factor, monitor and standard samples	311
Defining standard substances as calibration samples	312
Viewing calibration coefficients	315
Optimizing instrument condition for calibration	316
Performing the calibration	317
Assessing the calibration curves	323

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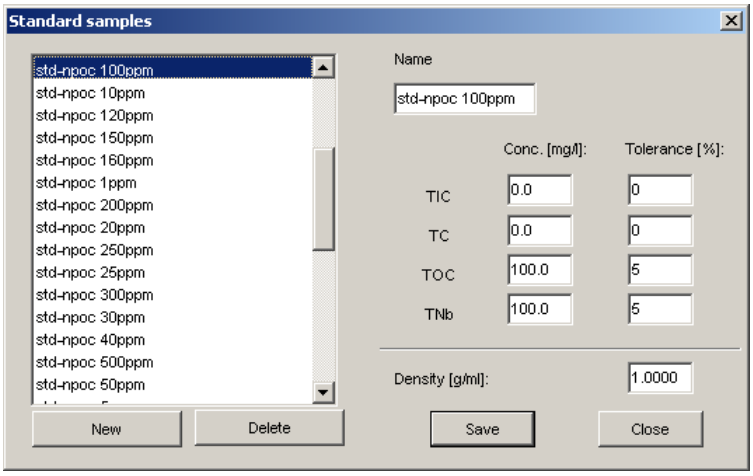
Viewing list of defined factor, monitor and standard samples

Viewing the list

Proceed as follows to view the list:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Standard samples" dialog in the operating software by selecting Options > Settings > Standard Samples.



The list box displays all currently defined standards. By checking the requested standard sample the setting in the right area of the dialog are displayed.</td></tr>
</table>

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Defining standard substances as calibration samples

Background

These operating instructions contain specific rules in the respective operating mode, cf. Calibration tables. If you want to use these rules, you must define the standard substances used there as calibration samples. Of course, you can also use different substances but then you must develop the calibration rule yourself.

Defined calibration samples are displayed along with their theoretical contents in the sample view.

Required substances

If you want to perform calibration on the basis of the calibration tables, you must define certain standard substances depending on the operating mode for which you want to perform calibration.

The following table lists the standard substances required for calibration in the respective operating mode:

Calibration for operating mode	Potassium hydrogen phthalate	Sodium carbonate	Sodium nitrate	Ammonium chloride
TOC	X			
TC	X	X		
TIC		X		
NPOC	X			
TNb			X	X
POC	X)*			

)* Coefficients are transferred (from TOC to POC).

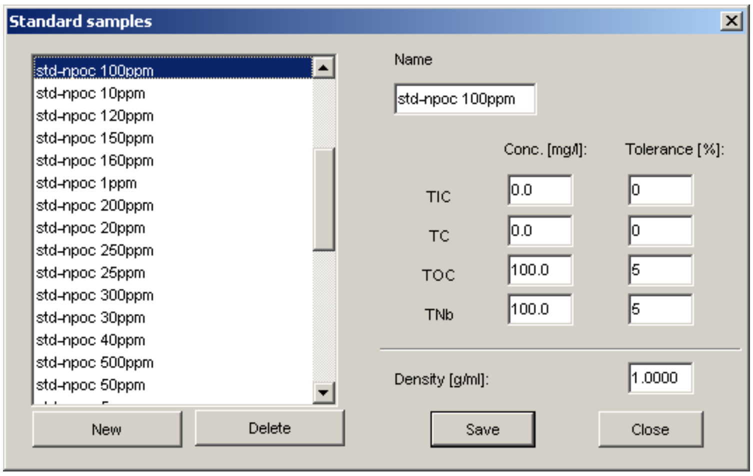
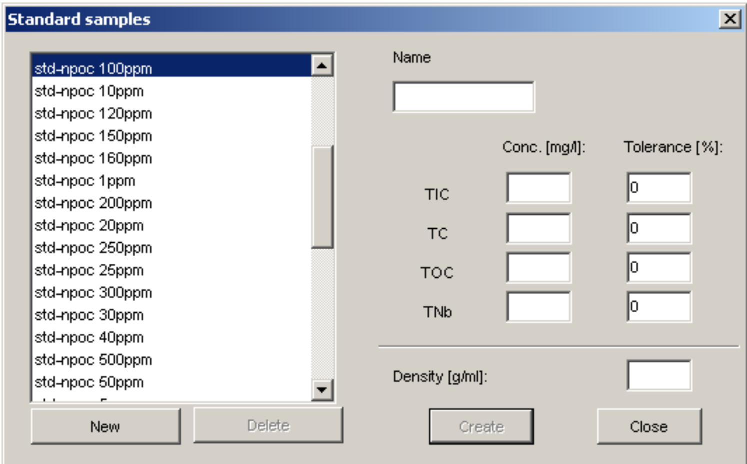
Theoretical element contents of standard substances

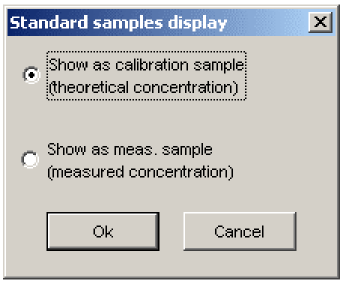
The following tables lists the theoretical element contents of the standard substances used in the calibration tables:

Standard substances	$C_{theor.}$ [%]	$N_{theor.}$ [%]
Potassium hydrogen phthalate	47,1	
Sodium carbonate	11,33	
Sodium nitrate		16,47
Ammoniun chloride		26,17

Defining calibration samples

Proceed as follows to define calibration samples:

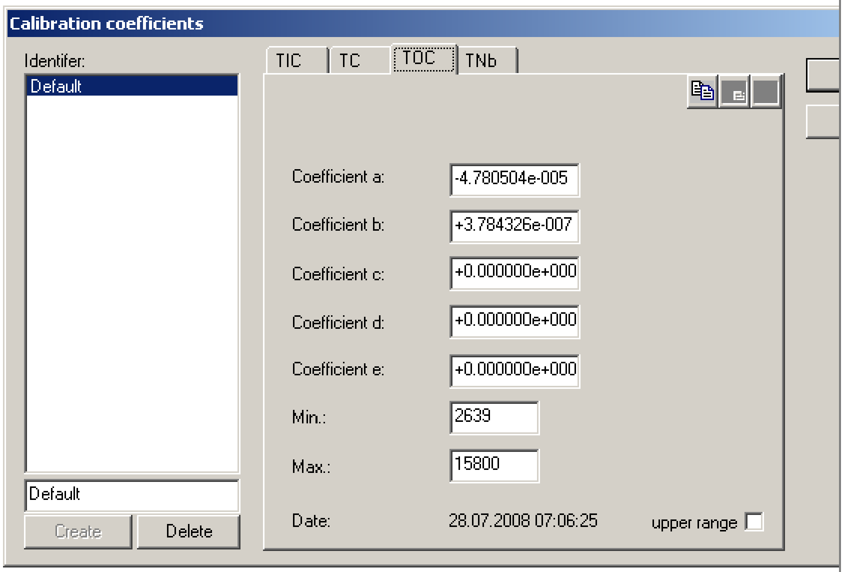
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Edit standard methods" dialog in the operating software by selecting Options > Settings > Standard Samples.

</td></tr>
<tr><td>2</td><td>Click New.
The input boxes on the right of the dialog are empty and ready for the input of a new standard.

</td></tr>
<tr><td>3</td><td>For the substance, enter:
the name of the substance in the "name" field.
the theoretical element content in the "Conc. [mg/l]" fields. If you enter the theoretical element content of a substance element as 0, the element is ignored in the calculation.
the permissible tolerance for each element, usually 5%, in the "Tolerance [%]" fields.</td></tr>
<tr><td>4</td><td>Click Close.
This closes the dialog and saves the settings.</td></tr>
</table>

5	Open the "Standard samples display" dialog in the operating software by selecting **View > Standard samples**.  Select the option "Show as calibration sample".
6	Click **OK**. This closes the dialog and saves the settings.

Viewing calibration coefficients

Viewing calibration coefficients

Proceed as follows to view calibration coefficients:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Calibration coefficients" dialog in the operating software by selecting Math > Coefficients.


The calibration coefficients and the limits within the calibration is valid are displayed.</td></tr>
</table>

Optimizing instrument condition for calibration

Note

Note that calibration only makes sense if you have previously checked and optimized the condition of the instrument.

Why does the condition of the instrument need to be checked and optimized?

The condition of the instrument needs to be checked and optimized in order to avoid:

- leaks of the instrument.
- old tube fillings from distorting results.
- Residues in the instrument

Checking and optimi-zing the condition of the instrument

Proceed as follows to check and optimize the condition of the instrument:

Step	Procedure
1	Check all parameter settings of the individual operating modes via **Options > Settings > Parameters**. Correct them if necessary. Setting mode-dependent instrument parameters
2	Replace all tube fillings. Cf: ▪ *Filling the combustion tube, liquid mode* "Fill standard reaction tube, liquid mode" on page 395 ▪ *Filling the combustion tube, solid mode* "Fill standard combustion tube, solids mode" on page 398 ▪ *Filling, removing and installing drying, absorption and filter tubes* on page 408
3	Check the complete injection unit (multiway valve, injection cannula and syringe). Cf: ▪ *Clean, assemble and install the multiway valve and the injection plug.* on page 364 ▪ *Maintain syringe* on page 389
4	Replace the ash finger/ash crucible. Cf. *Replacing the ash crucible/finger* on page 336.
5	Perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528.
6	Determine the blank value as a measure of gas-tightness. Perform blank value determination during calibration measurement. Cf. *Types of blank value determination and their settings* on page 230.
7	Perform test measurments so that the instrument is stable when you subsequently perform the calibration measurement. Measure 5 triple determinations 10 ppm each according to the stan-dard solution.

Performing the calibration

Target group

The target group is personnel authorized by the customer. Successful calibration is only possible if the user is familiar with the operating instructions and the analyzer.

Note

Perform calibration carefully as perfect calibration is a condition for correct measuring results. Calibration must be performed for each operating mode and must comprise the complete range for every element.

Procedure

"Performing calibration" is divided into the following steps:

Step	Description
1	Prepare samples and perform measurement
2	Optimizing calibration curves and apply calibration

Requirements:

Before starting work, the following requirements must be met:

- Read *Background knowledge required for calibration* on page 73 and *Assessing the calibration curves* on page 323.
- If you have not already done so, define the following by selecting **Options > Settings > Standard Samples:**
  - the required calibration substances. Cf. *Defining standard substances as calibration samples* on page 191.
  - the required substances for daily factor determination. Cf. *Defining standard substances as factor and monitor samples* "Defining standard substances as calibration samples" on page 191.
- Check and optimize the condition of the instrument. Otherwise it makes no sense to calibrate. Optimizing instrument condition for calibration

Step 1: Prepare samples and perform measurement

Warning	Only fill the sample vials when the carousel has been taken off! Unscrew the carousel and fill the sample vials up on a working plate.

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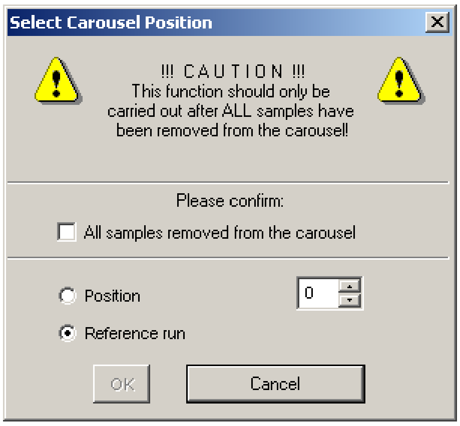
Proceed as follows to prepare the samples and perform the measurement:

Step	Procedure
1	Move the empty carousel to zero position. To do so, open the "Set carousel position" dialog in the operating software by selecting **System> Sample Position**. 
2	Select the radio button next to "Reference run" and click **OK**. The carousel moves to zero position.
3	Prepare the samples. Only fill the sample vials when the carousel has been taken off.
4	Prepare conditioning samples and calibration samples. Refer to *Calibration tables* on page 325, "Kalibration table difference method (TIC/TC)" on page 327, "Calibration table direct method (TC, TOC, NPOC)" on page 326 for the recommended settings for each mode.
5	Insert the filled sample vials on the carousel.
6	Put the carousel with the samples onto the instrument.

7	Enter the following sample data in sample view text view on the PC:
	▪ the name of the sample (max. 32 characters)
	    ▪ "Blnk" for blank samples
	    ▪ Daily factor or calibration samples must have the name defined in **Options> Settings > Standard Samples**.
	▪ the adequate method,
	▪ the injection volumen in [ml] if it has not been transmitted by the method,

8	Start the analysis process by selecting **System > Auto**.
9	Watch the measuring results whether they are stable. If not, stop the continuous analysis by selecting **System > Single**.
10	Save the original values. Cf. *Data backup and printing* on page 270.

Note:
Point 7 "Input in the text field" can also be processed via the calibration wizard. See *Calibration wizard* on page 82.

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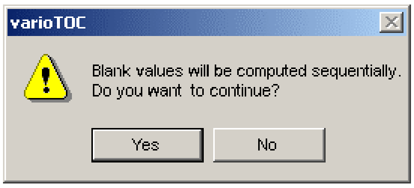
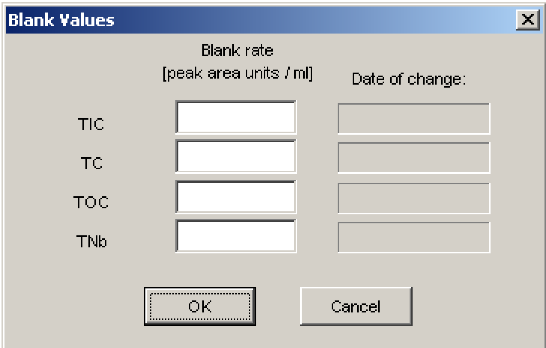
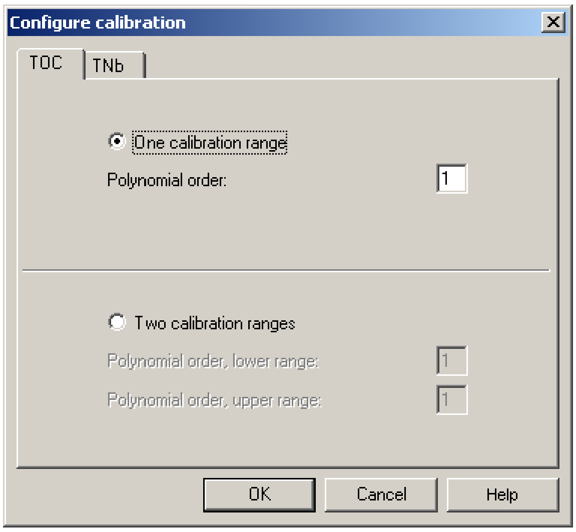
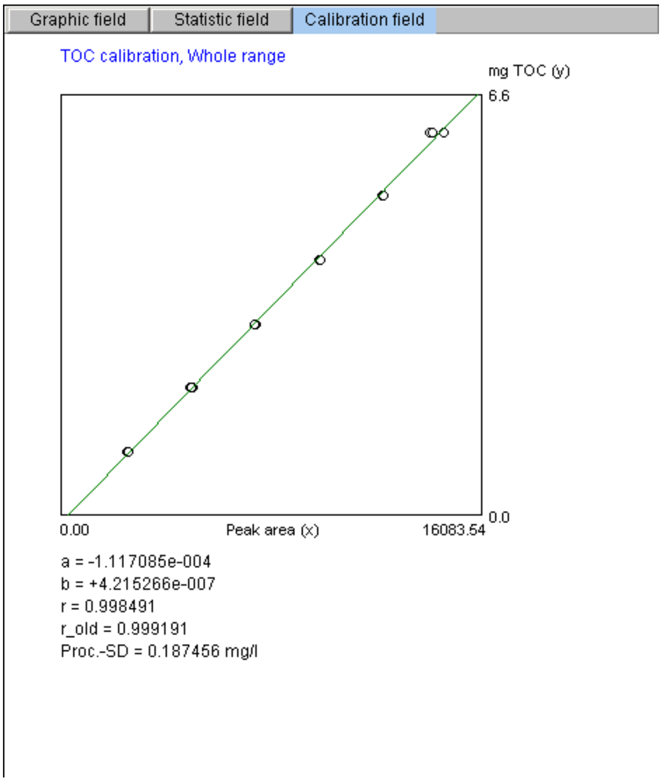
Phase 2: Perform calculation

Proceed as follows to ascertain the appropriate calculation method for each element:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Execute the following command: Math > Calibration.
The following dialog is displayed.
</td></tr>
<tr><td>2</td><td>Click Yes to continue.
The calibration field will be activated. Press the button "next" in the menu field as long as the calibration to be evaluated appears.
The following dialog is displayed:
</td></tr>
<tr><td>3</td><td>A dialog appears where the polynominal degree and the calibration range can be selected for the corresponding parameter.

Note:
It is recommended:
▪ TOC, TIC, TC: Polynominal degree 1
▪ TNb: Polynomial degree 1 or polynomial degree 2
The use of two calibration ranges is required in exceptional cases.</td></tr>
</table>

3	A dialog is displayed with a graph generated from the element quantities of the samples and their peak areas in a linear calculation. The graphic shows the calibration for TOC: 

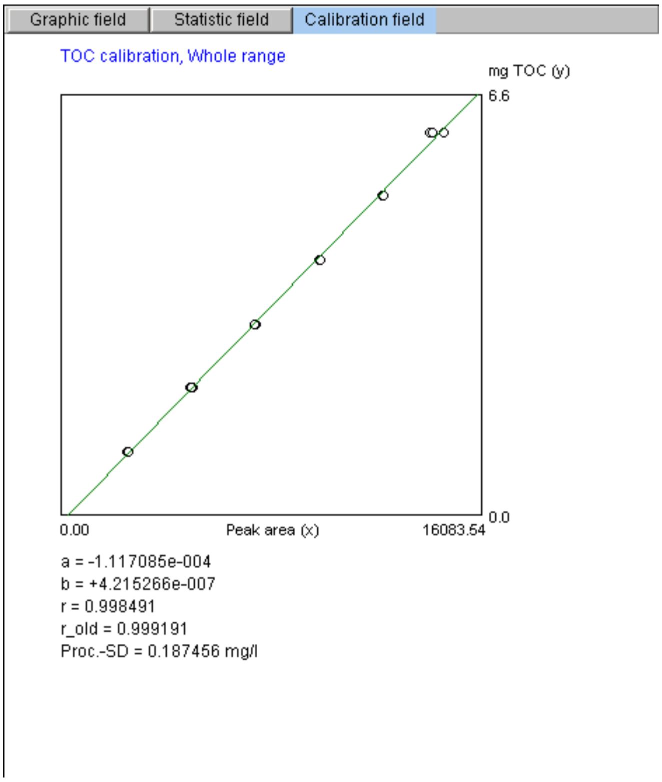
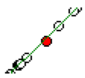
Step 3: Optimizing calibration curves and apply calibration

Background information can be found in *Assessing calibration curves* "Assessing the calibration curves" on page 323.

In order to optimize the calibration curve you must exclude samples that deviate significantly from the curve.

Proceed as follows to optimize calibration curves and apply the calibration:

Step	Procedure
1	Zoom in/out the graph by selecting **View > Zoom in/out** so that you can check the overall curve.

<table>
<tr><td>2</td><td>Click the button to move from sample to sample of the calibration curve and check the deviation "Diff.". Samples that display excessive deviation must be deleted.

</td></tr>
<tr><td>3</td><td>Select a sample to delete.
Then click the "Include/Exclude" button" .
The deleted sample is highlighted red.
</td></tr>
<tr><td>4</td><td>Compare "r" (new value) and "r_old" (old value) of the calibration curve and check whether deleting has had the desired effect.
Cf. Assessing calibration curves "Assessing the calibration curves" on page 323.</td></tr>
<tr><td>5</td><td>If deleting has not had the desired effect, you can undo it.
To do so, select the deleted sample and click the "Include/Exclude" button again. The sample is now included again.</td></tr>
<tr><td>6</td><td>Once you have exclude all samples with significant deviations from the calibration curve, click the "Next" button.
The calibration curve of the next measuring method is displayed in the calibration view.</td></tr>
</table>

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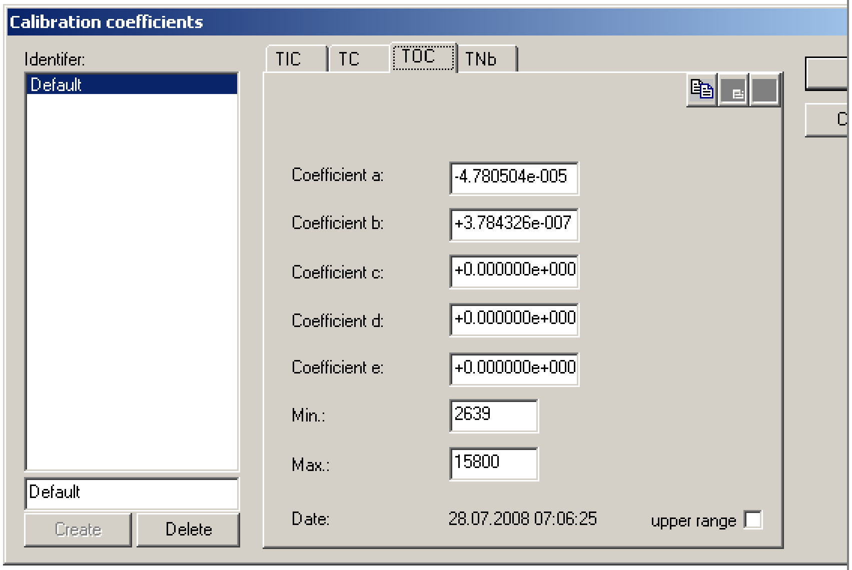
7	Once you have optimized the last calibration curve and clicked the "Next" button, the "Calibration coefficients" dialog is displayed.



8 Check the calibration coefficients for each parameter:

- the calibration coefficients
  Note:
  For the lower calibration range it is important that the coefficient a is as small as possible. Coefficient a corresponds to a calibrated blank value and should be as small as possible.
- as well as the possible working range defined in "Min." and "Max.".

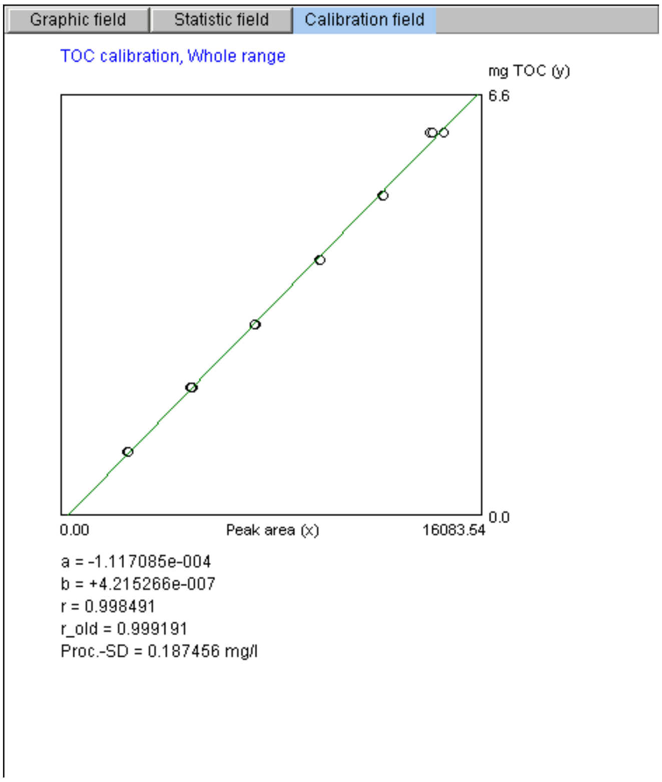
If...	...then...
you want to apply the calibration coefficients	click **OK**. The calibration coefficients are applied.
you do not want to apply the calibration coefficients	click **Cancel**. Calibration is aborted.

Assessing the calibration curves

Calibration curve display in the calibration view

After the calibration curves have been computed, the calibration points and the calibration curve for the respective element are displayed in the calibration view. The individual calibration points are displayed as circles.

The following picture shows an example of a calibration curve for TOC:



Displayed characteristics

The following table explains the characteristics relating to the calibration curve, as displayed in the above picture:

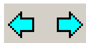
Parameters connected with the curve	Description
Zoom	Shows the current graph zoom factor.
a, b, c, d, e	Coefficients of the current polynomial.
r	Quality factor for the degree of fit of the current curve calculation. ▪ For a polynomial calculation of the first degree, "r" is the correlation coefficient.
r_old	Quality factor for the degree of fit of the last curve calculation. It is used for comparison with "r". This allows you, for example, to check whether it makes sense to delete certain samples.
Proc-SD	Process standard deviation: a measure of the degree of distribution of sample values around the calibration curve.

The following table explains the characteristics relating to the sample, as displayed in the above picture:

Parameters connected with the sample	Description
Sample No.	Shows the analysis number of the sample selected at the cursor.
Area	Integral of the selected sample.
slope	slope of the curve at the calibration point of the selected sample [1/µg].
$TOC_{setpoint}$	Theoretical absolute content of the selected sample [µg]
$TOC_{setpoint}$	Absolute content of the selected sample, computed with the current curve [µg]
Diff.	Difference between "$TOC_{setpoint}$" and "TOC_{actual}" in µg
Diff.	Difference between "$TOC_{setpoint}$" and "TOC_{actual}" in %

Aids for assessing the calibration curve

The following aids are available for assessing the calibration curve:

- Via **View > Zoom in / Zoom out** you can display the graph so that you can visually check the curve.
- You can click on the circle to select any sample. This displays the characteristics of the sample.
- You can also select a sample using the buttons . This displays the characteristics of the sample.

Assessing the calibration curve

The following are used to assess the calibration curve:

- Process standard deviation "Proc-SD"
- Quality factor "r"
- Coefficient "a", that corresponds to a calibrated blank value.

6.3 Calibration tables

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section contains specific rules for calibration in the respective operating mode. If you want to use these rules, you must define the standard substances used there as calibration samples. Of course, you can also use different substances but then you must develop the calibration rule yourself.

Overview

"Calibration tables" is divided into the following topics:

Topic	Page
Calibration table direct method (TC, TOC, NPOC)	326
Kalibration table difference method (TIC/TC)	327

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Calibration table direct method (TC, TOC, NPOC)

Calibration table direct method

The following presents a suggestion for TOC calibration with a 10 ppm standard. The user can customize settings to the specific analytical task.

Groups	Sample type	Injection volume [ml]	Absolute content	Name	Method
3	Conditioning	10 ppm NPOC Standard 0.2 ml	–	Run-in	TOC precise
5	blank value samples	distilled H_2O in ml: 0,6	–	Blank	TOC precise
6	Calibration samples	10 ppm NPOC-Standard in ml: 0,1 - 0,6	10 ppm NPOC Standard corresponds to: 0.1 ml -> 1 µg 0.2 ml -> 2 µg 0.3 ml -> 3 µg 0.4 ml -> 4 µg 0.5 ml -> 5 µg 0.6 ml -> 6 µg	std-npoc 10ppm	TOC precise

Kalibration table difference method (TIC/TC)

Calibration table difference method

The following presents a suggestion for TIC/TC calibration with a 2-fold standard 10 ppm TOC, 10 ppm TIC. The user can customize settings to the specific analytical task.

Groups	Sample type	Injection volume [ml]	Absolute content			Name	Method
3	Conditioning	TIC/TC-Standard 0.2 ml	–			Run-in	TIC / TC
5	blank value samples	distilled H_2O in ml: 0,6	–			Blank	TIC / TC
6	Calibration samples	TIC/TC-Standard in ml: 0,1 - 0,6	10 ppm TIC/TC corresponds to:			std-tic/tc 10ppm	TIC / TC
			Iinjection volume	TIC	TC		
			0.1 ml	1 µg	2 µg		
			0.2 ml	2 µg	4 µg		
			0.3 ml	3 µg	6 µg		
			0.4 ml	4 µg	8 µg		
			0.5 ml	5 µg	10 µg		
			0.6 ml	6 µg	12 µg		

6.4 Removing, cleaning and installing the carousel

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to remove, clean and install the carousel.

Overview

"Removing, cleaning and installing the carousel" is divided into the following topics:

Topic	Page
Removing, cleaning and installing the carousel (liquid mode)	329
Removing, cleaning and installing the carousel (solids mode)	331

Removing, cleaning and installing the carousel (liquid mode)

Purpose of cleaning

Dust accumulations or damaged sample packings may soil the carousel in the course of time. Cleaning the carousel prevents these foreign substances from entering the apparatus when you introduce the sample and cause errors.

Requirements:

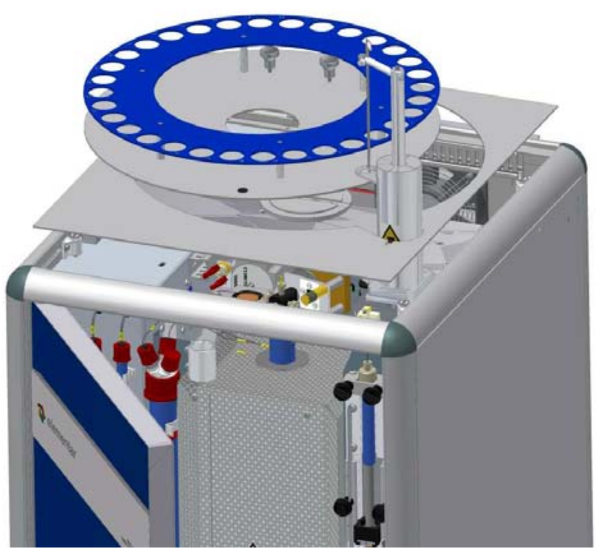
Keep the following ready:

- a soft cloth
- some water with a mild laboratory cleaner.

Cleaning the carousel

Caution	Damaged base panel Damage to the base panel will impair proper functioning of the carousel. When dismantling and cleaning the carousel: ▪ Never use pointed objects to dismantle the carousel. ▪ Never use sharp or aggressive cleaners. ▪ Before starting maintenance work, always remove all samples from the carousel.

Proceed as follows to clean the carousel:

Step	Procedure
1	Perform a reference run in order to move the carousel to the correct position **System > Sample position**. If necessary, move the sample arm up **System > Arm up**.
2	Loosen both screws and lift the carousel toward the top. Also remove the cover plate. 
3	Clean the plastic top section and ring with a soft cloth and some water with a mild laboratory cleaner.

4	Allow the carousel to dry. If necessary, remove the last traces of moisture with warm air.
5	Put the cover plate back onto the instrument: Put the carousel back into the recess and tighten both screws. The analyzer performs the automatic carousel recognition. Wait until it is completely processed.

Removing, cleaning and installing the carousel (solids mode)

Purpose of cleaning

Dust accumulations or damaged sample packings may soil the carousel in the course of time. Cleaning the carousel prevents these foreign substances from entering the apparatus when you introduce the sample and cause errors.

Requirements:

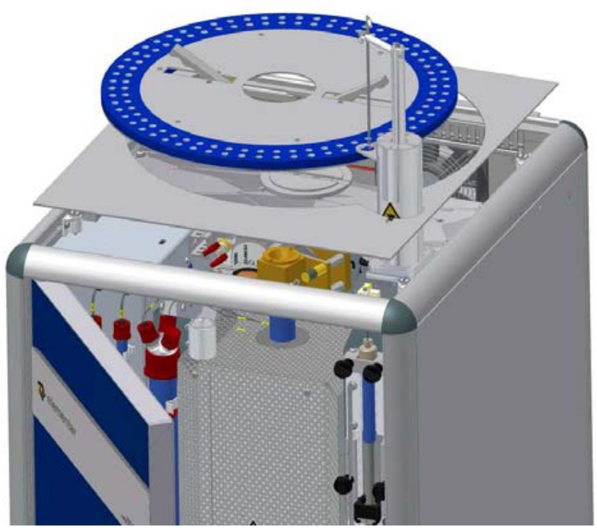
Keep the following ready:

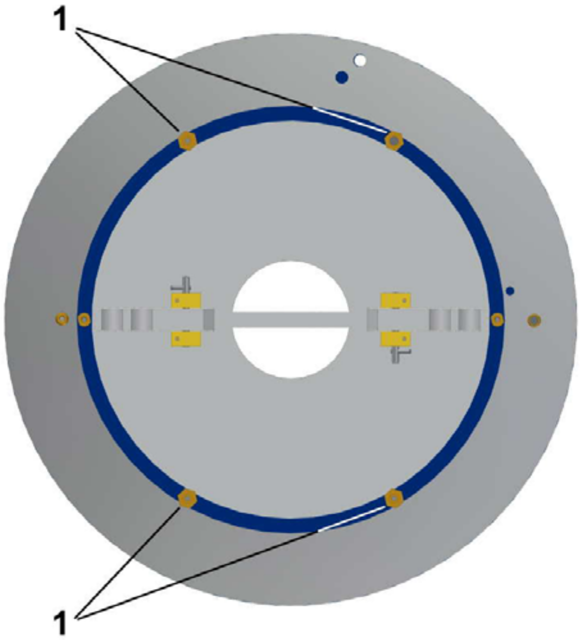
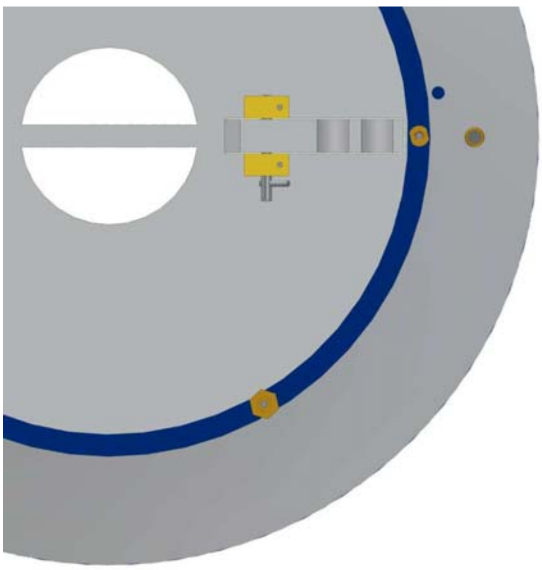
- a soft cloth or bottle brush
- some water with a mild laboratory cleaner.

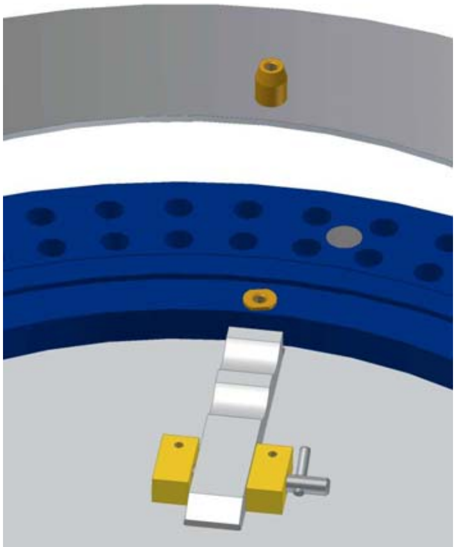
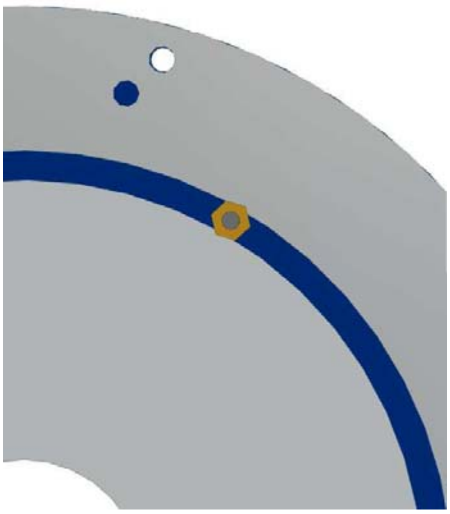
Cleaning the carousel

Caution	Damaged base panel Damage to the base panel will impair proper functioning of the carousel. When dismantling and cleaning the carousel: ▪ Never use pointed objects to dismantle the carousel. ▪ Never use sharp or aggressive cleaners. ▪ Before starting maintenance work, always remove all samples from the carousel.

Proceed as follows to clean the carousel:

Step	Procedure
1	Ensure that all samples have been removed from the carousel.
2	Perform a reference run in order to move the carousel to the correct position.
3	Press both handles down and lift the carousel with the protruding handles toward the top. Also remove the cover plate when working with the combustion tube. 

4	Dismantle the carousel into its two component parts: ▪ the metal ring and ▪ the plastic top section with the ring holder magnets. Remove the 4 hexagon head screws with a wrench. 
	

	Lift off the ring at the pilots. 
5	Clean the plastic top section and ring with ▪ a soft cloth or bottle brush and ▪ some water with a mild laboratory cleaner.
6	Allow the carousel to dry. If necessary, remove the last traces of moi-sture with warm air.
7	Replace the ring on the plastic top section and use a wrench to turn the hexagon head screws so that the tips of the screws prevent you from lifting off the ring (tighten the screws only slightly). The metal ring will be held with the plastic top section by means of a magnet.
8	Move the plastic section until the reference hole (bore in the plastic section without number indicated by a white ring) matches the bore in the metal ring. 

9	Insert the carousel into the holder and observe ▪ that the ejector openings of the ring must be above the ball valve.

Subsequently, perform a reference run.

6.5 Replacing the ash crucible/finger

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to replace the ash crucible and/or the ash finger.

Overview

"Replacing the ash crucible/finger" is divided into the following topics:

Topic	Page
Replacing the ash crucible/finger	336
Removing the ash crucible (liquid mode)	337
Installing the ash crucible (lliquid mode)	341
Remove the ash finger (solids mode)	346
Installing the ash finger (solids mode)	351

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Replacing the ash crucible/finger

Distinction between ash crucible and ash finger

If...	...then
the system is operated with standard reaction tubes in the liquid mode	use ash crucibles and proceed with *Removing the ash crucible* and/or *Installing the ash crucible.* Installing the ash crucible
the system is operated with special reaction tubes in the solids mode	use ash crucibles and proceed with *Removing the ash crucible* and/or *Installing the ash crucible.* Installing the ash finger

Why replace the ash crucible/finger?

This is necessary because combustion residue in the ash crucible can distort readings.

Types of ash crucibles

The following table lists the various types of ash crucibles and their usage:

Type of ash crucible	Usage
Ash crucible with bottom	▪ Ash crucible for liquid samples ▪ Protection of the catalyst
Protection tube slotted on the side	▪ Protection of the combustion tube

Types of ash finger

The following table lists the various types of ash fingers and their usage:

Type of ash finger	Usage
Ash crucible, open at bottom and top and slotted on the side	▪ Usually employed ash finger for solid samples. ▪ Protection of the catalyst

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Removing the ash crucible (liquid mode)

Note

The following section describes the first part of replacing the ash crucible. The topic is continued in "Installing the ash crucible".

Procedure

"Installing the ash crucible" is divided into the following steps:

Step	Description
1	Preparing the instrument: Gas pressure
2	Filling a new ash crucible
3	Removing the ash crucible

Safety instructions

Observe the following safety instructions during all steps:

Warning Hot instrument parts and hot ash particles

When replacing the ash crucible there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing the ash crucible:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot ash crucible in a tube rack on a level, non-combustible surface.
- Protect the hot ash crucible from unauthorized access.
- Never leave the instrument unattended when the furnace has been pulled out.

Requirements:

Before starting work, the following requirements must be met:

- Keep a tube rack ready to hold hot components.
- Keep the catcher, the plug tool and a screwdriver ready.

Step 1: Preparing the instrument: Gas pressure

Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Before replacing tubes or the ash crucible/finger, shut off the gas supply to the instrument. To do so, execute the **Options Maintenance > Replace Part** command.

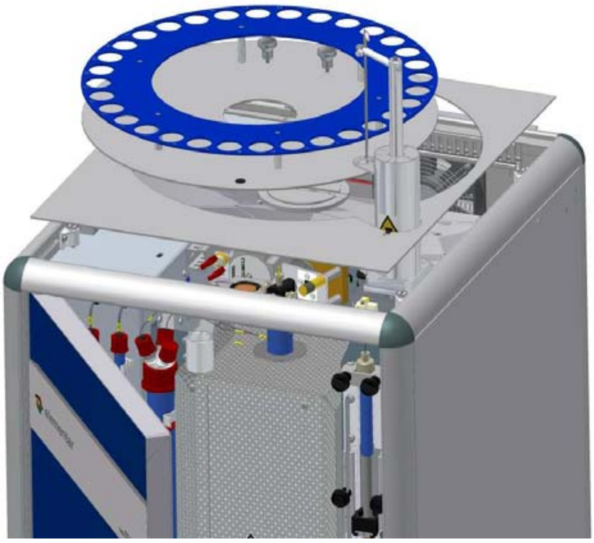
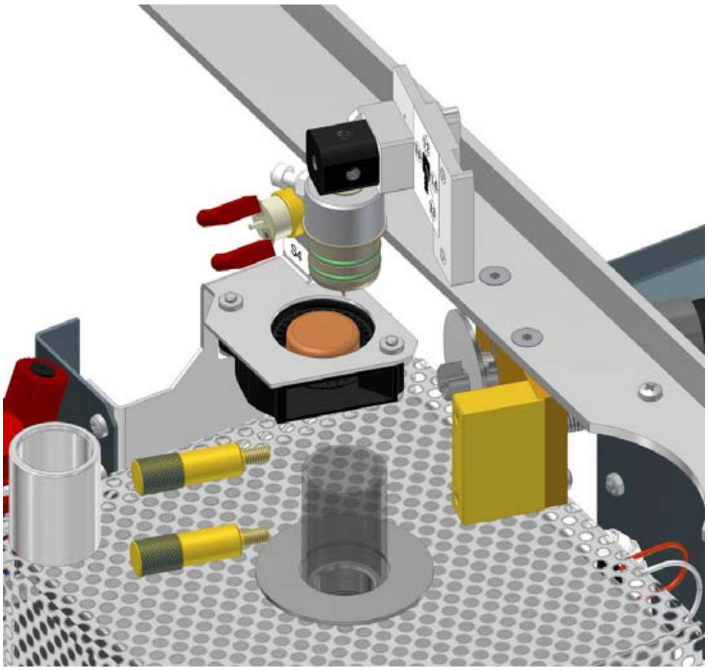
Step 2: Filling the new ash crucible

Proceed as follows to fill the ash crucible:

Step	Procedure
1	Place the ash crucible on a level surface.
2	Compress quartz wool with the plug tool to a 10 mm strong bottom in the ash crucible.

Step 3: Removing the ash crucible

Proceed as follows to remove the ash crucible:

Step	Procedure
1	Move the sample arm up via **System > Arm up**. Also remove the cover plate. Remove the carousel and open the front door. 
2	Loosen the locking screw from the multiway valve as well as the gas supply to the combustion tube. Loosen the plug with multiway valve out of the combustion tube with careful jiggling motions. Pull the injection unit out from the tube. Put the plug and the multiway valve into the provided park position. Cf. *Furnace section* on page 26. 

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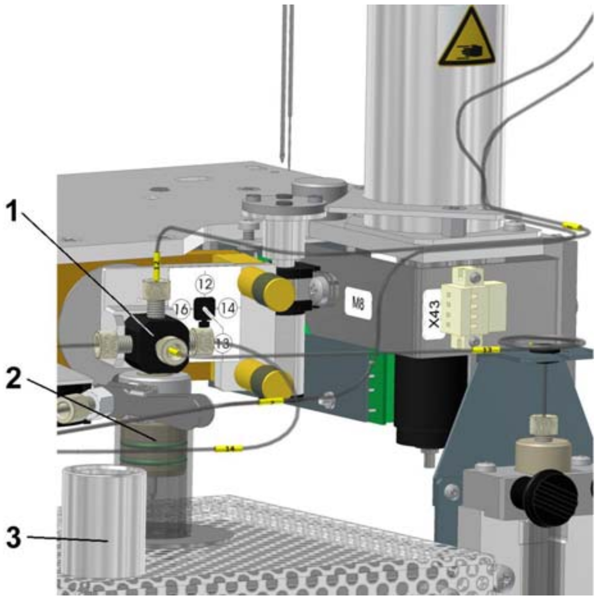
3	Proceed with replacing the ash crucible. Caution: Temperature of ash crucible and sheath tube is approx. 1000 °C! Use heat proof gloves for protection. Insert the tongs from the top into the combustion tube and pull out the sheath tube. Place the sheath tube on a non-combustible surface. 
4	After clamping the tongs in the ash crucible, pull the ash crucible slowly upwards. If the ash crucible has been almost completely removed from the combustion tube, grip it by pliers or strong tweezers. Place the ash crucible in the tube rack into the vent (preferable) or else on a heat-resistant surface until it has completely cooled down.
5	If there are any quartz chips on the bottom of the ash crucible, top up some quartz chips in the combustion tube.

Furnace area in detail

The following picture shows the furnace area in detail:



The following list designates the parts illustrated in the picture:

1 multiway valve

2 Combustion tube

3 Park position multiway valve

Installing the ash crucible (lliquid mode)

Procedure

"Installing the ash crucible" is divided into the following steps:

Step	Description
1	Installing a new ash crucible
2	Instrument must be ready to measure

Requirements:

Before starting work, the following requirements must be met:

Keep the following ready:

- Plug tool
- Catcher
- Screwdriver

Warning

Hot instrument parts and hot ash particles

Risk of burning due to hot instrument parts.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

Warning

Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Before the replacing tube or the ash finger/ash crucible, shut off the gas supply to the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Step 1:
Installing a new ash crucible

Proceed as follows to install the new ash crucible:

Step	Procedure
1	Grasp the new ash crucible with the catcher und insert it carefully and slowly into the combustion tube. If the ash crucible has a plugged bottom it must not be pushed to the top. 
2	Check whether the ash crucible is placed in the combustion tube at the proper position. If necessary, top up with quartz chips.
3	Grip the protection tube with the tongs and place it carefully on the ash crucible in the combustion tube.
4	Now check the plug and the multiway valve for cleanliness and clean the injection unit if necessary. See *Clean, assemble and install the multiway valve and the injection plug* "Clean, assemble and install the multiway valve and the injection plug." on page 364.

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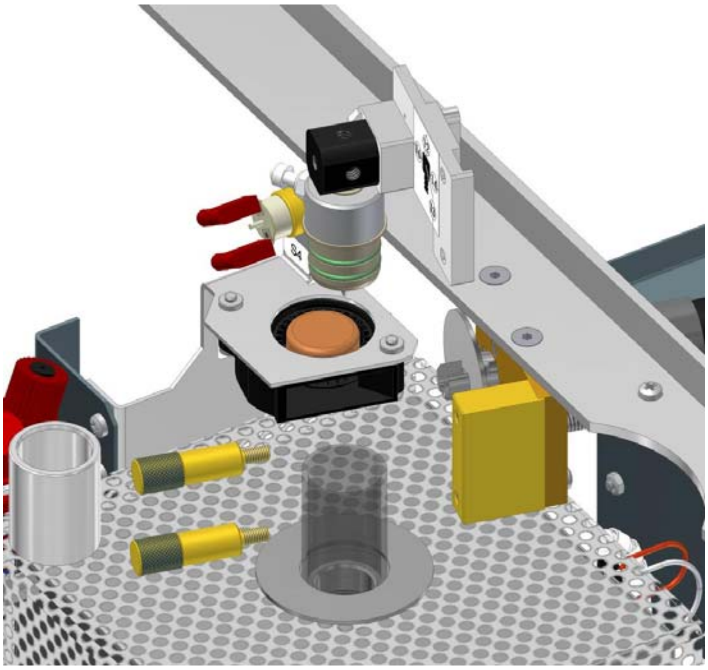
5	Proceed with installing the ash crucible. Put the plug with the multiway valve into the combustion tube, where there is a guiding provided for the multiway valve which has to snap into the tappet of the motor. 

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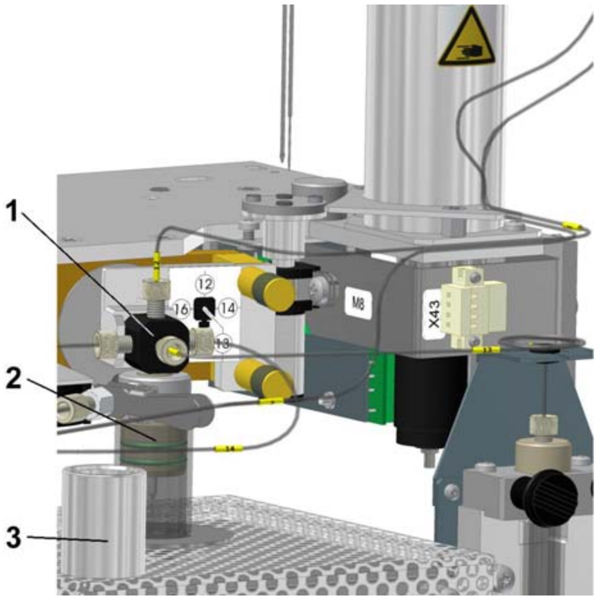
Furnace area in detail

The following picture shows the furnace area in detail:



The following list designates the parts illustrated in the picture:

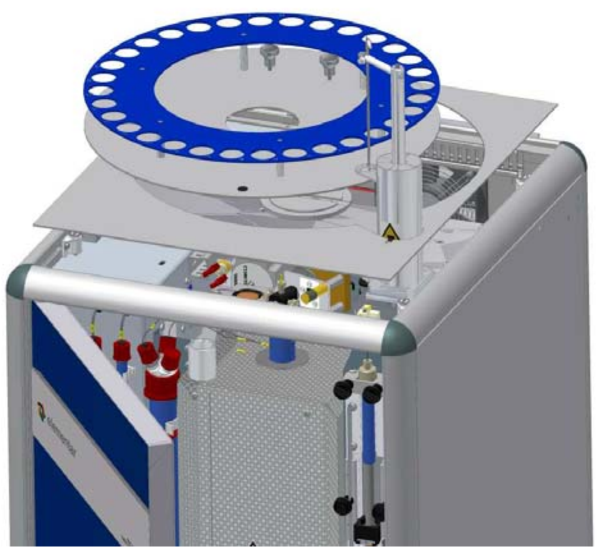
1 multiway valve

2 Combustion tube

3 Park position multiway valve

Step 1: Installing a new ash crucible, continued

Step 1 continued:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>6</td><td colspan="2">Check the correct position of the plug in the multiway valve.</td></tr>
<tr><td>7</td><td colspan="2">Tighten the multiway valve with both lock screws.</td></tr>
<tr><td>8</td><td colspan="2">Connect the gas supply to the combustion tube.</td></tr>
<tr><td>9</td><td colspan="2">Put the cover plate back onto the instrument:
Put the carousel on the instrument and tighten it.
The analyzer performs the automatic carousel recognition. Wait until it is completely processed.
</td></tr>
<tr><td>10</td><td colspan="2">Close the front door.</td></tr>
<tr><td rowspan="4">11</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><td>If the operating software status view displays...</td><td>...then...</td></tr>
<tr><td>approximately the same flow and pressure values as prior to maintenance work</td><td>the instrument is then ready to measure again.</td></tr>
<tr><td>distinctly different flow and pressure values to those displayed prior to maintenance work</td><td>perform a leak test.
The instrument is only ready to measure when the leak test is successful.</td></tr>
</table>

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Step 2: Instrument must be ready to measure

After completing all maintenance work, put the instrument back into a state ready for measurement.

Leave the dialog "**Replace parts**" by clicking "**Finish**".

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "**Status**" field to zero on the respective "**Event**" tab.

Step 3: Empty the old ash crucible

If the ash crucible is not damaged it may be cleaned and used again.

Proceed as follows to empty the ash crucible with bottom:

Step	Procedure
1	Empty the cooled down ash crucible or scratch it out by means of a screwdriver.
2	Dispose of the chemicals according to the relevant disposal categories.

Remove the ash finger (solids mode)

Note

The following section describes the first part of replacing the ash finger. The topic is continued in "Installing the ash finger".

Please observe that this ash finger is only used for instruments equipped with reaction tubes in the solids mode.

Procedure

"Removing the ash finger" is divided into the following steps:

Step	Description
1	Preparing the instrument: Gas pressure
2	Filling a new ash finger
3	Removing the ash finger

Safety instructions

Observe the following safety instructions during all steps:

Warning

Hot instrument parts and hot ash particles

When replacing the ash finger there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing the ash finger:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot ash finger in a tube rack on a level, non-combustible surface.
- Protect the hot ash finger from unauthorized access.
- Never leave the instrument unattended when the furnace has been pulled out.

Requirements

Before starting work, the following requirements must be met:

- Remove all samples from the carousel.
- Keep a tube rack ready to hold hot components.
- Keep a catcher ready.

**Step 1:
Preparing the instrument: Gas pressure**

Warning

Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Before replacing tubes or the ash crucible/finger, shut off the gas supply to the instrument. To do so, execute the **Options Maintenance > Replace Part** command.

To prepare the instrument for maintenance work follow the instructions in "Preparing the instrument: Gas pressure in *Preparing and following up maintenance work* on page 305.

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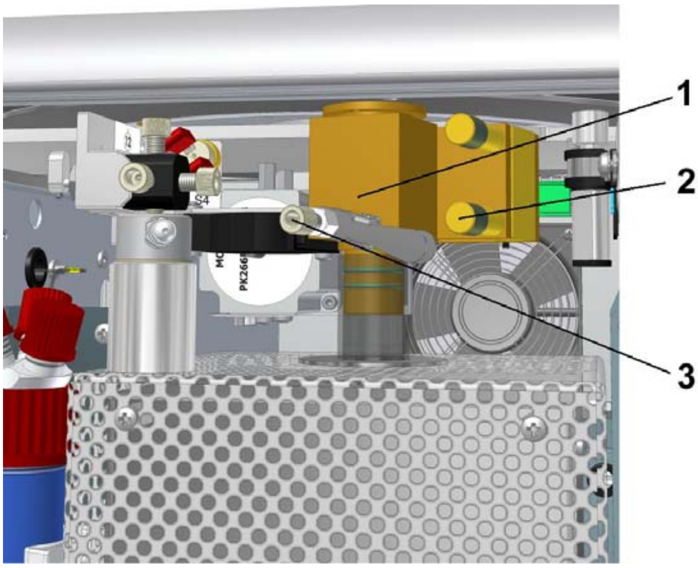
Furnace area

The following picture shows the furnace area of the analyzer.



The following list describes the relevant components in this section:

1 Ball valve

2 Locking screws

3 Carrier gas supply

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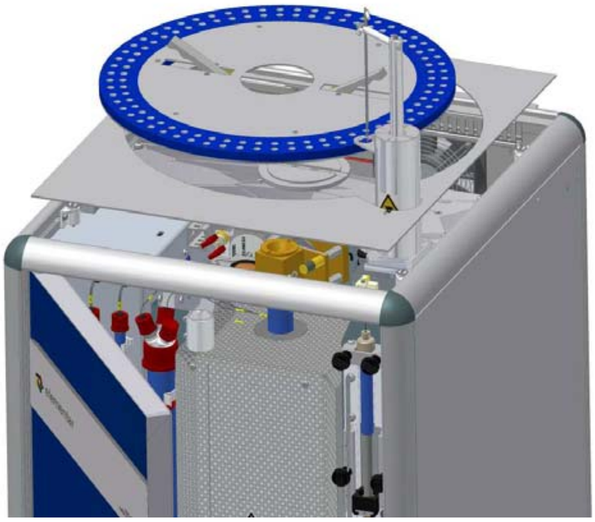
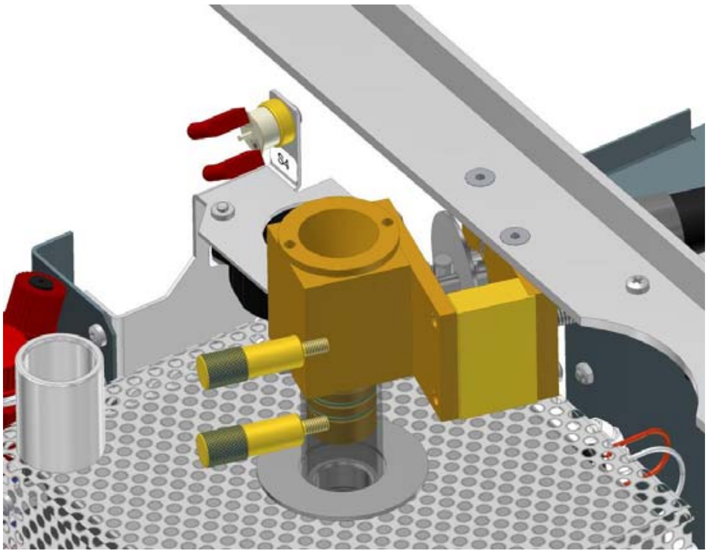
Step 2:
Filling a new ash finger

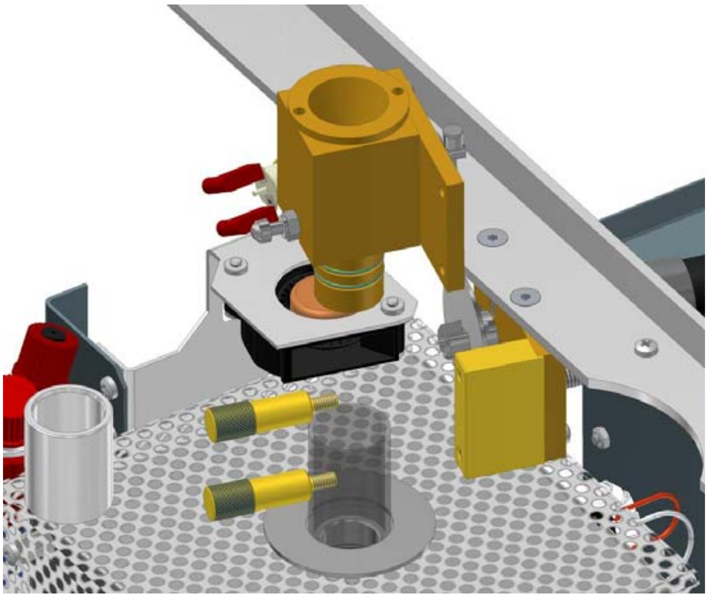
Proceed as follows to fill the ash finger:

Step	Procedure
1	Place the ash finger in the tube rack.
2	In the ash finger produce a 10 mm thick bottom by densifying Al_2O_3 wool using the plug tool.
3	If your ash finger is virgin, once more plug the bottom extra solid. The Al_2O_3 wool adheres poorly on the polished quartz wall of a new ash finger.

Step 3:
Removing the ash finger

Proceed as follows to remove the ash finger:

Step	Procedure
1	Also remove the cover plate. Remove the carousel and open the front door. 
2	Loosen the locking screw from the ball valve as well as the gas supply to the combustion tube. 

3	Pull the ball valve out of the combustion tube with careful jiggling motions.  Pull it out from the tube.

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**Step 2:
Removing the ash finger, continued**

Step 2 continued:

Step	Procedure
4	Place the ball valve on the tube rack.
5	Insert the tongs into the combustion tube. After clamping the crucible tongs in the protection tube, pull it out. Then, in the same manner, pull out the ash finger from the combustion tube.

6	Place both the ash finger and the protection tube in the tube rack into the vent (preferable) or else on a heat-resistant surface until they have completely cooled down. Protect the hot parts from unauthorized access.
7	If there are any quartz chips on the bottom of the ash finger, top up some quartz chips in the combustion tube.

Installing the ash finger (solids mode)

Note

The following section is a continuation of "Removing the ash finger". All steps described in "Removing the ash finger" must already have been performed.

Procedure

"Installing the ash finger" is divided into the following steps:

Step	Description
1	Installing the ash finger
2	Follow-up instrument preparation: Gas pressure / gas-tightness

Safety instructions

Observe the following safety instructions during all steps:

Requirements

Before starting work, the following requirements must be met:

- Remove all samples from the carousel.
- The instrument must be in "Replace part" status. Cf. instructions at "Preparing the instrument: Gas pressure" in *Preparing and following up maintenance work* on page 305.

> **Warning**
>
> Gas pressure and caustic substances in the instrument
>
> Consumables may escape under pressure and cause chemical burns.
>
> Before replacing tubes or the ash finger/ash crucible, shut off the gas supply to the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

- Keep a catcher ready.
- Keep a filled ash finger ready.

Step 1:
Installing the ash finger

Proceed as follows to install the new ash crucible:

Step	Procedure
1	Clean the new ash finger of fingerprints before installing. Use acetone, for example, for cleaning.

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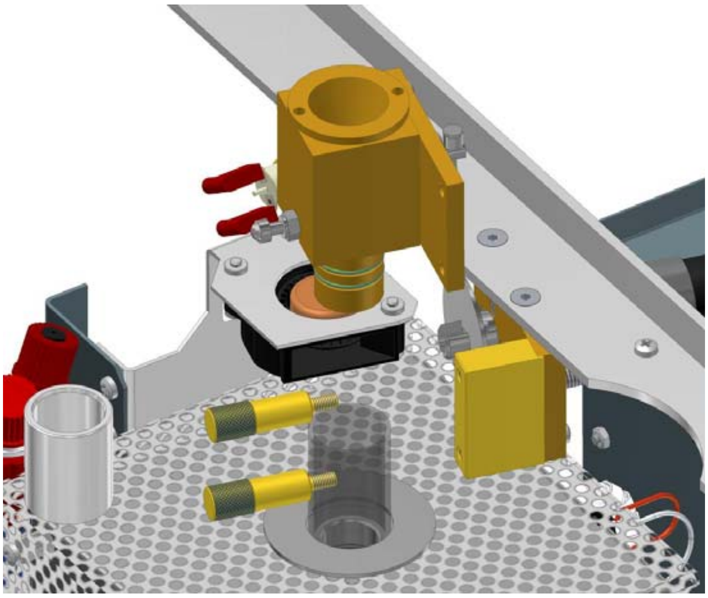
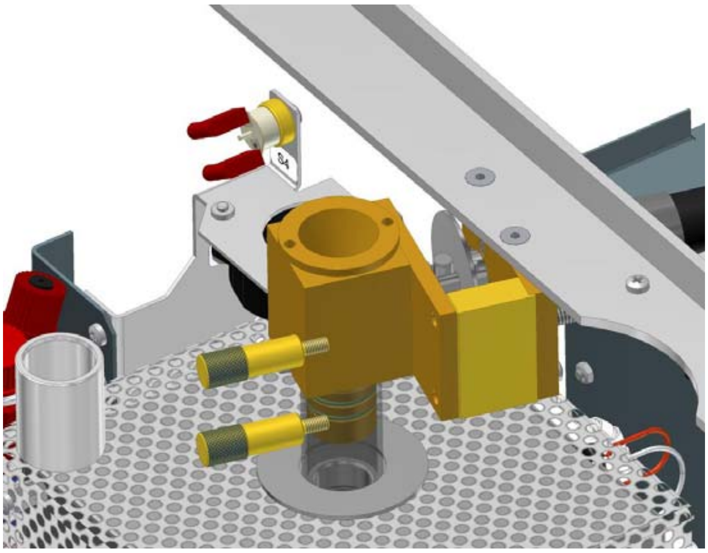
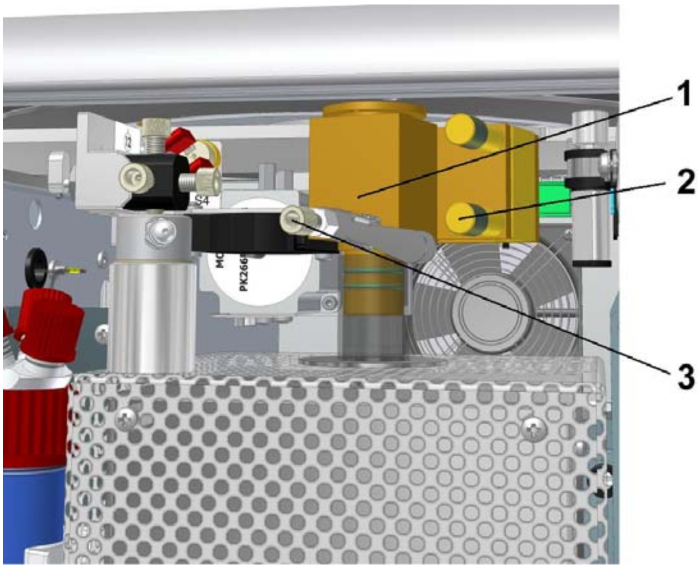
2	Insert the new ash finger with the crucible tongs into the combustion tube. 
3	Subsequently, put the protection tube with the crucible tongs on the ash finger in the combustion tube.
4	Put the ball valve onto the combustion tube.  Ensure that the tappet of the ball valve engages to the tappet of the motor.

5	Tighten the ball valve with the locking screws and fasten the carrier gas supply lines at the ball valve by means of the ground-in clamp. 

Furnace area in detail

The following picture shows the furnace area in detail:



The following list designates the parts illustrated in the picture:

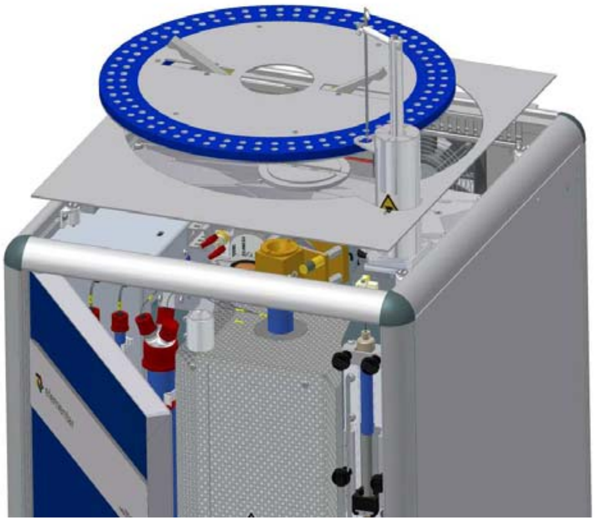
1 Ball valve

2 Locking screws

3 Carrier gas supply

Step 1: Installing the ash finger, continued

Step 1 continued:

Step	Procedure
6	Put the cover plate back onto the instrument: Observe the throw-in hole position of the carousel.  Put the carousel onto the instrument. Observe the throw-in hole position of the carousel.
7	Close the front door.
8	Proceed on the basis of the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. The instrument is only ready to measure when the leak test is successful.

Phase 2: Follow-up work: gas pressure/ tightness

After completing all maintenance work, put the instrument back into a state ready for measurement.

Leave the dialog "**Replace parts**" by clicking "**Finish**".

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab.

6.6 Replacing sealing elements

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

Replacing sealing elements prevents leaks. As a result of chemical corrosion, mechanical and thermal stress, sealing elements in various components of the instrument can become leaky over time.

Overview

"Replacing sealing elements" is divided into the following topics:

Topic	Page
When to replace sealing elements	356
Removing sealing elements from grooves	357

When to replace sealing elements

What sealing elements are used?

The following sealing elements are used:

- Half shells
- O-rings
- Quad rings
- Ferrules

When to replace sealing elements

The following table gives an overview of what instrument components contain which sealing elements and when to replace these sealing elements:

Instrument component	What to replace	To be replaced when...
Ball valve / multiway valve	Half shells	the ball valve/the multiway valve is serviced and the half shells exhibit grooves.
	O-rings	▪ the ball valve/multiway valve is serviced and ▪ the o-rings exhibit cracks or other damage or ▪ the o-rings no longer protrude round out of the grooves.
Condenser	O-rings	you cannot feel any elastic resistance when you press in the o-rings when installing the quartz glass bridge.
Injection cannula / plug	Ferrules	ferrules exhibit cracks or other damage.
Carrier gas supply Combustion tube	O-rings	▪ the ball valve/multiway valve is serviced and ▪ the o-rings exhibit cracks or other damage or ▪ the o-rings no longer protrude round out of the grooves.

Visual o-ring/quad ring check

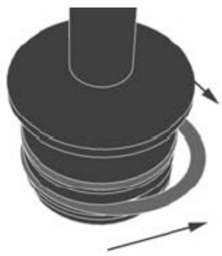
You can tell when o-rings or quad rings need to be replaced if they no longer protrude round out of the grooves of the respective component.

Removing sealing elements from grooves

Removing sealing elements from grooves

Caution	Cutting sealing elements apart/out (o-rings, quad rings, half shells, ferrules) When cutting sealing elements apart/out with a knife you may damage sealing surfaces. Never remove sealing elements with a knife but rather with tweezers.

Proceed as follows to remove sealing elements from grooves:

Step	Procedure
1	Grasp the sealing element (o-ring, quad ring, half shell, ferrule) between your thumb and forefinger.
2	Push the sealing element out to the side so that it forms a loop. You can find sealing elements with grooves at the injection plug of the multiway valve. 
3	Grasp the loop with a pair of tweezers and pull the sealing element off.

6.7 Maintain multiway valve and injection plug

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to maintain the multiway valve and the injection plug.

Overview

"Maintain multiway valve and injection plug" is divided into the following topics:

Topic	Page
Remove and dismantle the multiway valve and the injection plug	359
Clean, assemble and install the multiway valve and the injection plug	364

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Remove and dismantle the multiway valve and the injection plug

Note

The following section describes the first part of "Maintain multiway valve and injection plug".

Purpose of maintenance

The maintenance of the manifild valve and the injection plug is meant to avoid leaks. Foreign particles have to be removed. If necessary, half shells and o-rings must also be replaced.

Procedure

"Removing and dismantling the multiway valve and the injection plug" is divided into the following steps:

Step	Description
1	Preparing the instrument: Gas pressure
2	Remove multiway valve and injection plug
3	Dismantle multiway valve and injection plug

Requirements:

Before starting work, the following requirements must be met:

- Keep the following tools ready:
  - pliers
  - Syringe
- Keep acetone ready to clean components.

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Step 1: Allow instrument to cool down and disconnect from the mains

Warning Hot instrument parts and hot ash particles

Risk of burning due to hot instrument parts.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

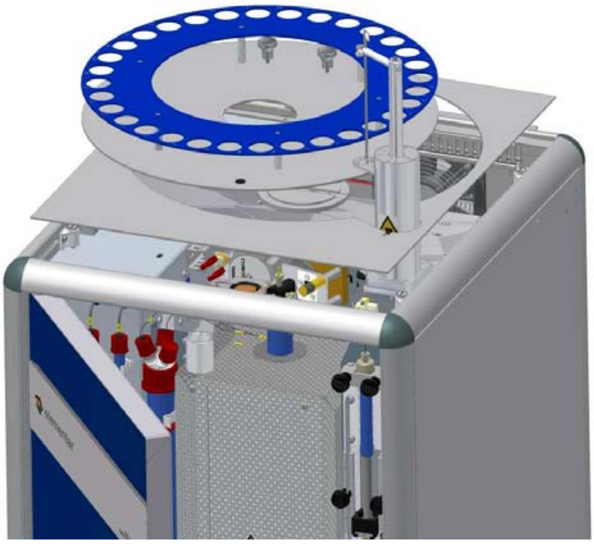
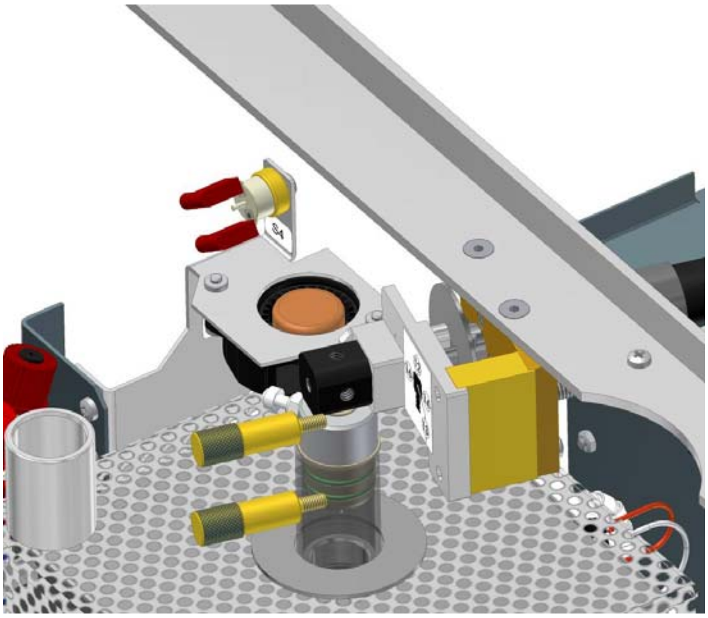
Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Prior to maintaining the injection unit, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Step 2:
Remove multiway valve and injection plug

Proceed as follows to remove the multiway valve and the injection plug:

Step	Procedure
1	Remove the carousel.  Open the front door and remove the cover plate from the instrument.
2	Loosen the locking screws at the multiway valve and the ground-in clamps of the carrier gas line to the combustion tube. 

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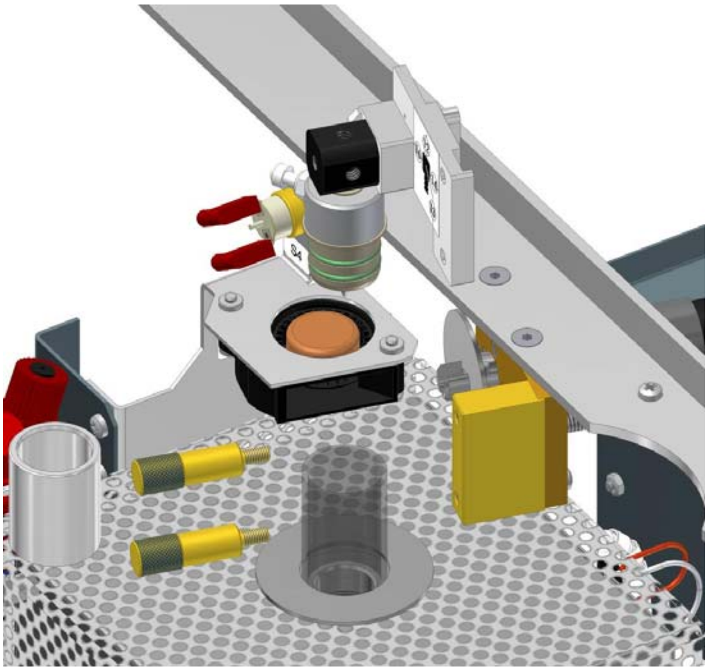
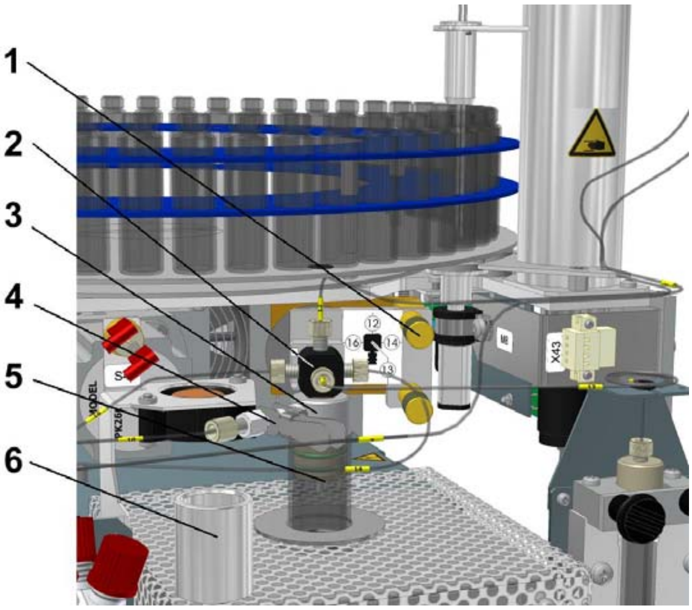
3	Pull the injection unit out of the combustion tube with careful jiggeling motions.  Hold the combustion tube with one hand and pull slowly at the plasic plug.
4	Loosen the hose pipes at the multiway valve after you have pulled the injection unit out from the furnace.

Furnace area

The following picture shows the furnace area of the analyzer.



The following list describes the relevant components in this section:

1 Locking screws
2 multiway valve
3 Injection plug

4 Ground-in clamp/carrier gas supply

5 Combustion tube

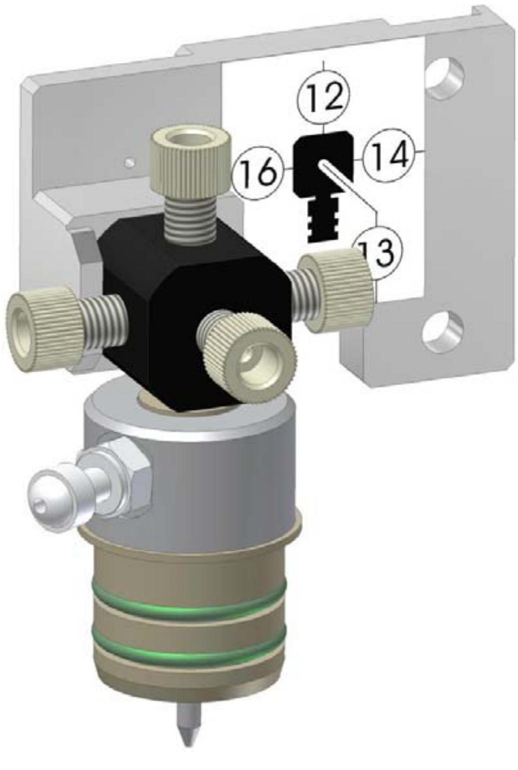
6 Park position multiway valve

Step 3: Dismantling the injection plug valve

Caution	Cutting sealing elements apart/out (o-rings, quad rings, half shells, ferrules) When cutting sealing elements apart/out with a knife you may damage sealing surfaces. Never remove sealing elements with a knife but rather with tweezers.

Caution	Dismantling the multiway valve may lead to irreparable damages !!!

Proceed as follows to dismantle the injection plug:

Step	Procedure
1	Loosen the injection plug from the multiway valve by a counter clock-wise rotation. 

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2	Carefully pull the injection cannula out of the injection plug toward the top and loosen the sealing.  **Caution** During loosening of the sealing the injection cannula may break! Turn out the sealing with a slight pull!
3	Now the injection unit can be maintained.

Clean, assemble and install the multiway valve and the injection plug.

Note

The following section is a continuation of "Removing and dismantling the multiway valve and the injection plug".

Procedure

"Cleaning, assembling and installing the manifild valve and the injection plug" is divided into the following steps:

Step	Description
1	Cleaning the injection plug and the injection cannula
2	Cleaning the multiway valve
3	Assembling the multiway valve and the injection plug
4	Installing multiway valve and injection plug
5	Instrument must be ready to measure

Requirements

Before starting work, the following requirements must be met:

- Keep the following tools ready:
  - Syringe
- Keep acetone ready to clean components.
- The multiway valve and the injection plug had to be removed.

To prepare the instrument for maintenance work follow the instructions in "Preparing the instrument: Gas pressure" in *Preparing and following up maintenance work*.

Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Prior to maintaining the syringe, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Safety instructions

Observe the following safety instructions during all steps:

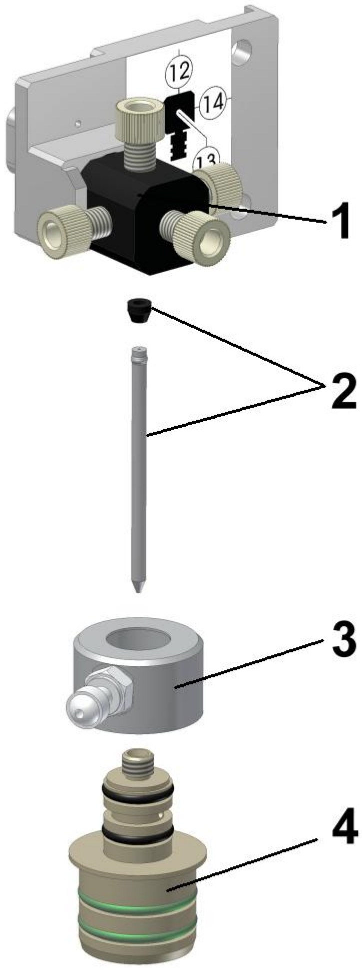
Warning Hot instrument parts and hot ash particles

When replacing hot instrument parts there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

Disassamble multiway valve with holder



The following list describes the relevant components in this section:

1 multiway valve

2 Injection cannula with sealing

3 Plastic ring

4 Injection plug

Step 1:Cleaning the injection plug and the injection cannula

Proceed as follows to clean the injection plug and the injection cannula:

Step	Procedure
1	Remove the sealing elements from injection cannula and injection plug.
2	Clean both plugs and the injection cannula with acetone.

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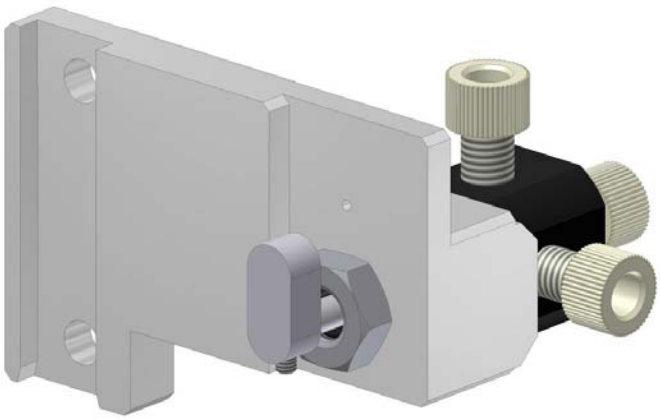
Step 2: Cleaning the multiway valve

Proceed as follows to clean the multiway valve:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Take the provided syringe (filled with water) and fasten it in position 13 of the multiway valve.

</td></tr>
<tr><td>2</td><td>Turn tappet at the back side of the multiway valve by a quarter rotati-on. Thoroghly flush this position with distilled water.
Perfom this for each possible position of the multiway valve.
</td></tr>
</table>

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Step 3: Assemble multiway valve and injection plug

Proceed as follows to assemble the multiway valve and the injection plug:

Step	Procedure
1	Check all the sealings and o-rings for their capability.

2	Put the sealilng onto the injection cannula. Put the plastic ring onto the injection plug. Insert the injection cannula into the injection plug.  **Caution** During assembly the injection cannula may break!
3	Screw the plug with injection cannula onto the multiway valve. The carrier gas line connection shall be directed towards the front.
4	Connect the tube connections. The preset position is marked on the mounting plate. It is adjustable by turning the plastic ring.

Step 4: Install multiway valve and injection plug

Caution: Improper installation may break the injection cannula.

Proceed as follows to install the multiway valve and the injection plug:

Step	Procedure
1	Insert the manifold valve and the injection unit into the combustion tube.

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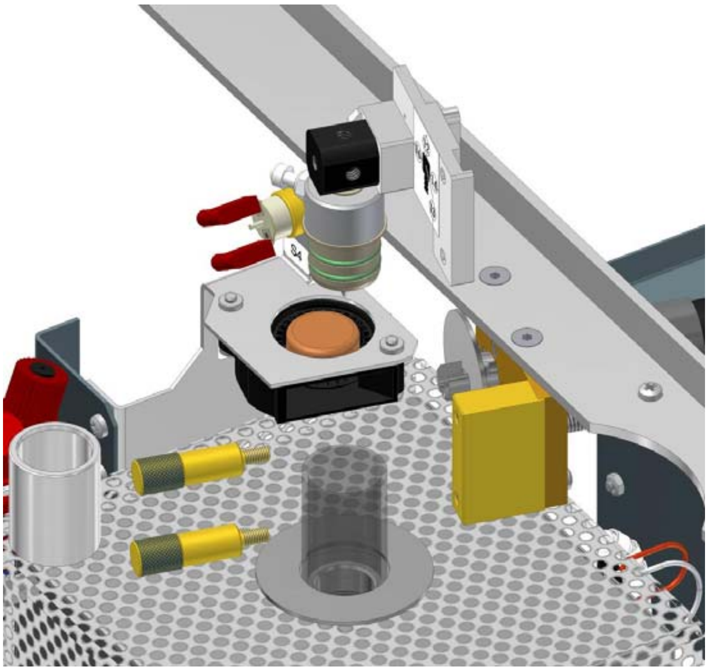
2	Put the the multiway valve and the injection plug into the combustion tube, where there is a guiding provided for the multiway valve which has to snap into the tappet of the motor. 
3	Tighten the injection unit with the locking screws.
4	Connect the ground-in ball-and-socket joints that lead to the injection unit (carrier gas supply).
5	Proceed on the basis of the following decision table:

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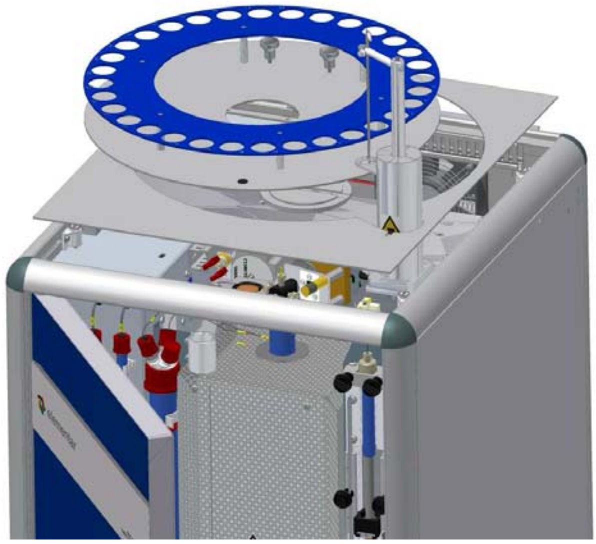
	If the operating software status view displays...	...then...
	approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
	distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528. The instrument is only ready to measure when the leak test is successful.
6	Mount the carousel and the cover plate again. The analyzer performs the automatic carousel recognition. Wait until it is completely processed. 	
7	Close the front door.	

Step 5: Instrument must be ready to measure

After completing all maintenance work, put the instrument back into a state ready for measurement.

Leave the dialog "**Replace parts**" by clicking "**Finish**".

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.

6.8 Maintaining the ball valve (solids mode)

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to maintain the ball valve.

Overview

"Ball valve maintenance" is divided into the following topics:

Topic **Page**
Removing and dismantling the ball valve..371
Cleaning, assembling and installing the ball valve...376

Removing and dismantling the ball valve

Note

The following section describes the first part of "Ball valve maintenance". The topic is continued in "Cleaning, assembling and installing the ball valve". Cf. *Cleaning, assembling and installing the ball valve* "Cleaning, assembling and installing the ball valve." on page 376.

Purpose of maintenance

Maintenance of the ball valve serves to avoid ball valve leaks. For this purpose, it is necessary to remove particles such as dust or sample abrasion that gets between the ball and the Teflon half shells. If necessary, half shells and o-rings must also be replaced.

Procedure

"Removing and dismantling the ball valve" is divided into the following steps:

Step	Description
1	Preparing the instrument: Gas pressure
2	Removing the ball valve
3	Dismantling the ball valve

Requirements:

Before starting work, the following requirements must be met:

- Remove all samples from the carousel.
- Keep the following tools ready:
  - Knock-out
  - Hook wrench
  - Phillips screwdriver
  - 8 mm open jaw wrench
- Keep acetone ready to clean components.

Step 1: Allow instrument to cool down and disconnect from the mains

Warning Hot instrument parts and hot ash particles

When replacing hot instrument parts there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Prior to maintaining the injection unit, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

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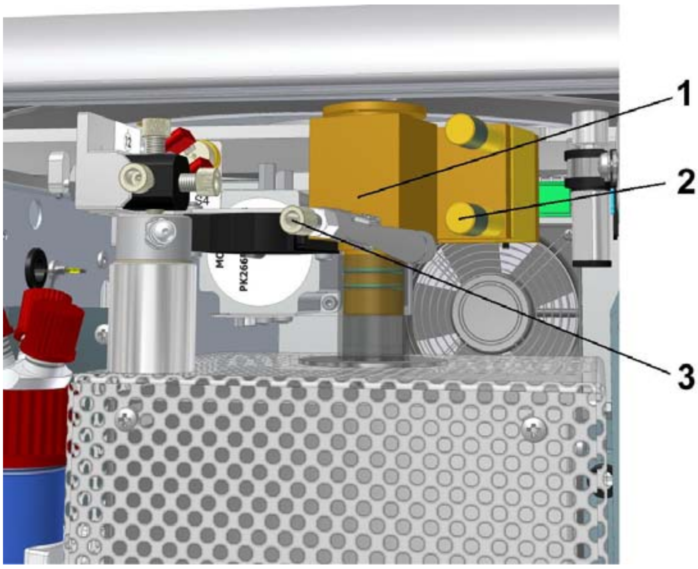
To prepare the instrument for maintenance work follow the instructions in "Preparing the instrument: Gas pressure" in *Preparing and following up maintenance work*.

Furnace area

The following picture shows the furnace area of the analyzer.



The following list describes the relevant components in this section:

1 Ball valve

2 Locking screws

3 Ground-in clamp + carrier gas supply

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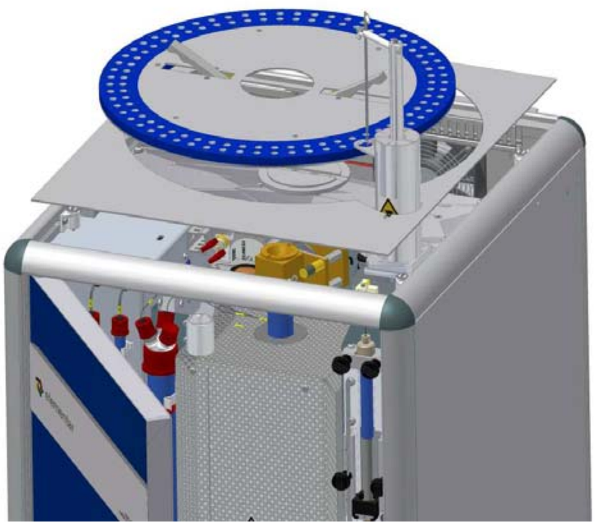
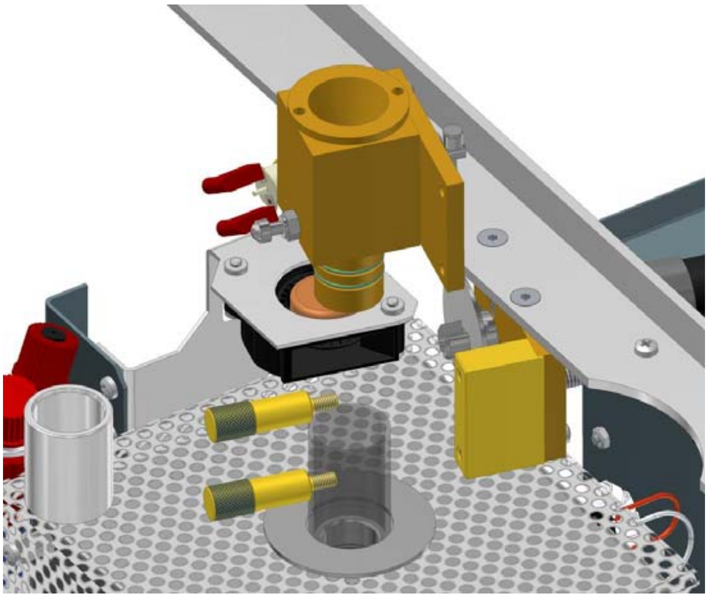
Step 2: Removing the ball valve

Proceed as follows to remove the ball valve:

Step	Procedure
1	Open the front door.
2	Remove the carousel and the cover plate. 
3	Loosen the locking screws of the ball valve.

4	Remove the ground-in clamp at the ball valve and remove the carrier gas supply.
5	Pull the ball valve out of the combustion tube with careful jiggling motions. Pull it out from the tube. 

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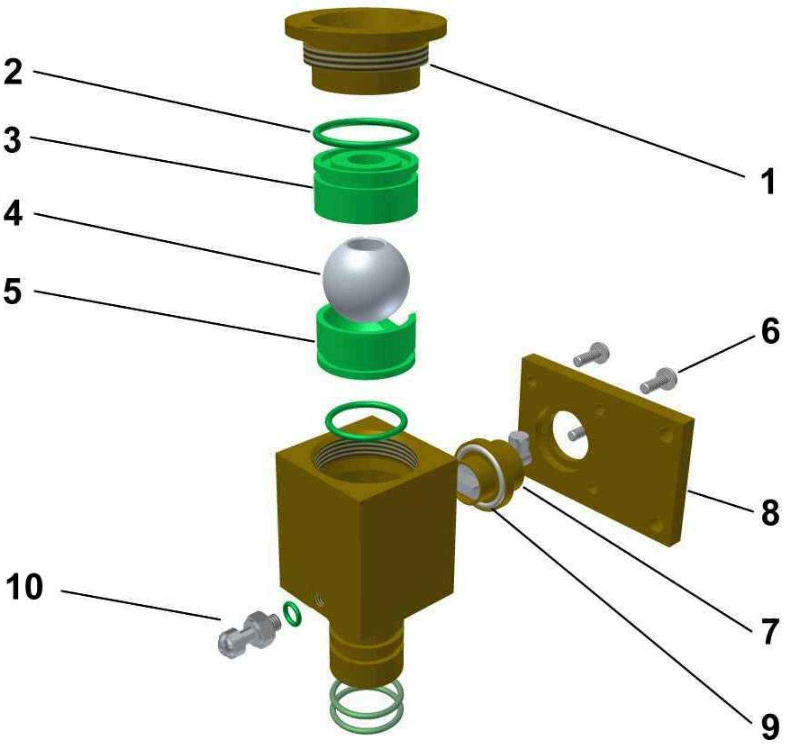
Dismantled ball valve



The following list describes the relevant components in this section:

1 Wheel flange of the half shells

2 O-ring

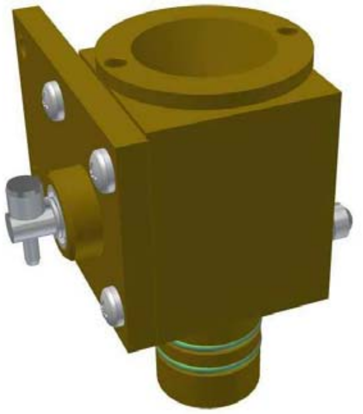
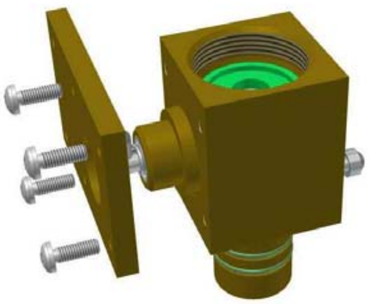
3 Top and bottom half shell

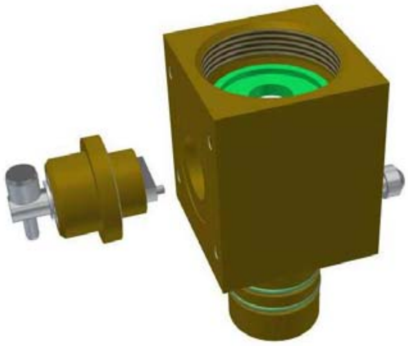
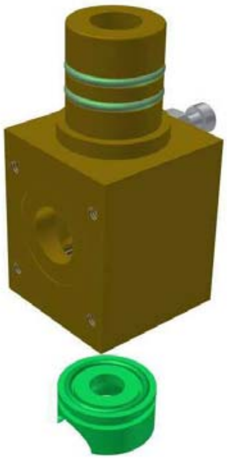
4 Ball with blind hole
5 Recess
6 Screws
7 Drive bearing
8 Holder plate
9 O-ring
10 Carrier gas supply line

Step 3: Dismantling the ball valve

Caution	Cutting sealing elements apart/out (o-rings, quad rings, half shells, ferrules) When cutting sealing elements apart/out with a knife you may damage sealing surfaces. Never remove sealing elements with a knife but rather with tweezers.

Proceed as follows to dismantle the ball valve:

Step	Procedure
1	Unscrew and remove the wheel flange of the half shells using the hook wrench. 
2	Unscrew the Phillips screws of the holder plate and remove the holder plate. 

3	Remove the drive bearing. 
4	Remove the ball and top half shell.  The ball and the top half shell slide out of the casing.
5	Remove the bottom half shell. To do so, rotate the ball valve casing and knock it on a table until the half shell drops out. 

Cleaning, assembling and installing the ball valve.

Note

The following section is a continuation of "Removing and dismantling the ball valve". All steps described in "Removing and dismantling the ball valve" must already have been performed. Cf. *Removing and dismantling the ball valve*.

Procedure

"Cleaning, assembling and installing the ball valve" is divided into the following steps:

Step	Description
1	Cleaning the half shells and ball
2	Assembling the ball valve
3	Mounting the ball balve
4	Instrument must be ready to measure

Requirements

Before starting work, the following requirements must be met:

- Keep the following tools ready:
  - Hook wrench
  - Phillips screwdriver
  - 8 mm open jaw wrench.
- Keep acetone ready to clean components.
- The ball valve must have been removed.

Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Prior to maintaining the syringe, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Safety instructions

Observe the following safety instructions during all steps:

Warning Hot instrument parts and hot ash particles

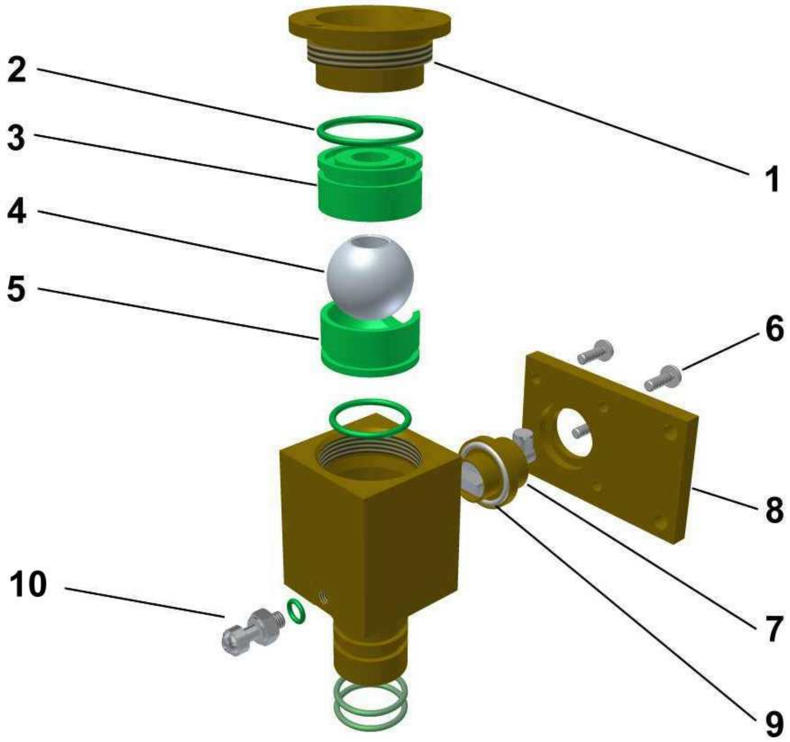
When replacing hot instrument parts there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

To prepare the instrument for maintenance work follow the instructions in "*Preparing the instrument: Gas pressure* "Preparing and following up maintenance work" on page 305 in *Preparing and following up maintenance work* on page 305.

Dismantled ball valve



The following list describes the relevant components in this section:

1 Wheel flange of the half shells
2 O-ring
3 Top and bottom half shell
4 Ball with blind hole
5 Recess
6 Screws
7 Drive bearing
8 Holder plate
9 O-ring
10 Carrier gas supply line

Step 1:Cleaning the half shells and ball

Proceed as follows to clean the half shells and ball:

Step	Procedure
1	Clean the half shells (3) and the ball (4) with acetone.
2	Check the half shells (3) for grooves. If there are any grooves, replace the half shells.
3	Check the ball (4) for grooves. If there are any grooves, replace the ball.

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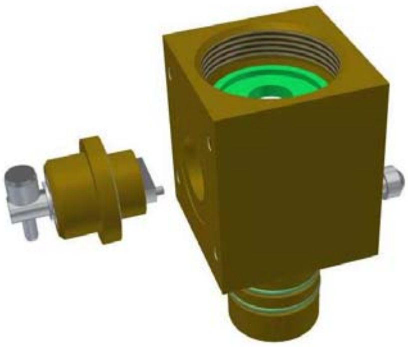
Step 2: Assembling the ball valve

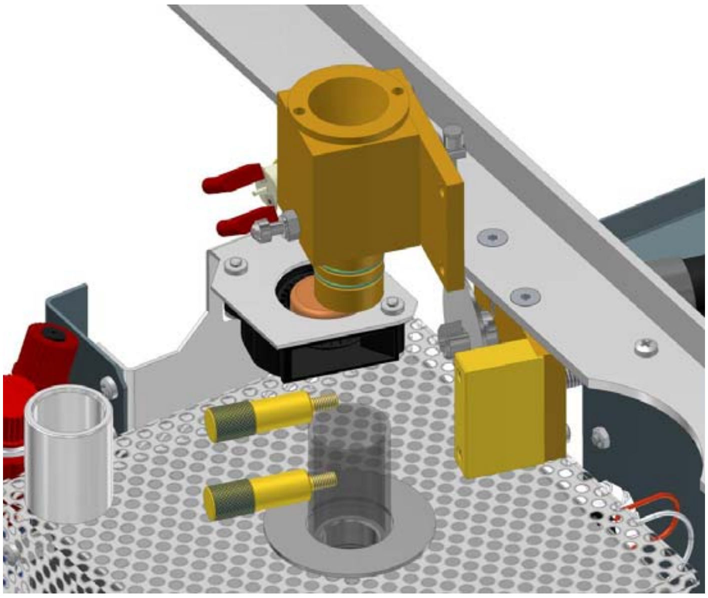
Proceed as follows to assemble the ball valve:

Step	Procedure
1	Insert the bottom half shell (3) and observe the following ▪ the fit of the o-ring (2) ▪ the recess for the drive bearing (5).
2	Insert the ball (4) with the blind hole facing down and observe the position of the recess for the drive bearing (5). 
3	Insert the drive bearing (7). Observe the following ▪ the fit of the o-ring (9) ▪ and that the cylinder pin snaps into the blind hole bore of the ball. 
4	Insert the top half shell (3) and observe the recess for the drive bea-ring (5).
5	Screw the holder plate (8) onto the ball valve.
6	Insert the wheel flange of the half shells (1) and tighten it gently by hand.
7	Move the ball valve to its basic position with the blind hole facing down.

Step 3: Installing the ball valve

Caution	Ball valve set too tight Setting the ball valve too tight damages the mechanical drive system. If the bar in the "Ball valve setting" dialog is red, loosen the wheel flange with a hook wrench until the bar turns green.

Proceed as follows to install the ball valve and adjust current drain.

Step	Procedure
1	Insert the ball valve into the combustion tube.
2	Position the ball valve in the combustion tube and ensure that the axis of the motor shaft engages in the motor tappet. 
3	Tighten the ball valve with the locking screws.
4	Close the ground-in ball-and-socket joints of the tubes leading to the ball valve.

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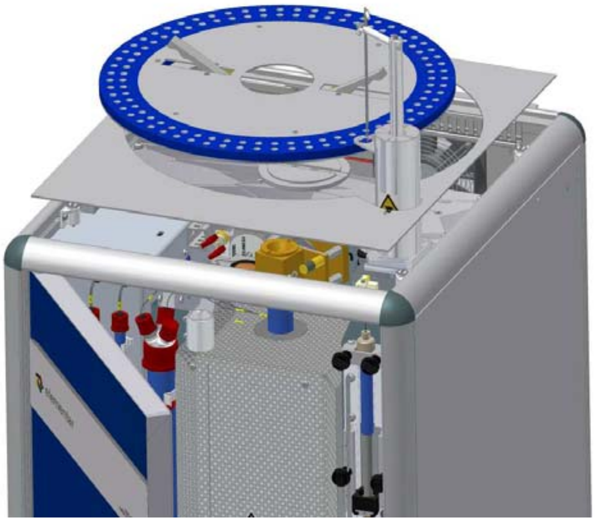
<table>
<tr><td>5</td><td>Mount the carousel and the cover plate again.
</td></tr>
<tr><td>6</td><td>Close the front door.</td></tr>
<tr><td>7</td><td>Proceed on the basis of the following decision table:
<table>
<tr><th>If the operating software status view displays...</th><th>...then...</th></tr>
<tr><td>approximately the same flow and pressure values as prior to maintenance work</td><td>the instrument is then ready to measure again.</td></tr>
<tr><td>distinctly different flow and pressure values to those displayed prior to maintenance work</td><td>perform a leak test. Cf. Performing leak test "Performing a leak test" on page 528.
The instrument is only ready to measure when the leak test is successful.</td></tr>
</table></td></tr>
</table>

Step 4: Instrument must be ready to measure

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab.

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.

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6.9 Removing, cleaning and installing the condenser

Target group The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose This section enables you to remove, clean and install the condenser.

Overview "Removing, cleaning and installing the condenser" is divided into the following topics:

Topic	Page
Removing the condenser	382
Cleaning and installing the condenser	385

Removing the condenser

Procedure

"Removing the condenser" is divided into the following steps:

Step	Description
1	Preparing the instrument: Gas pressure
2	Removing the condenser

Safety instructions

Observe the following safety instructions during all steps:

Warning	Hot components in the instrument When working inside the instrument there is a risk of burning as many parts of the instrument are hot. When working inside the instrument always wear protective glasses and the enclosed heat protection gloves.

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

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Step 1: Preparing the instrument: Gas pressure

Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Before replacing tubes or the ash crucible/finger, shut off the gas supply to the instrument. To do so, execute the **Options Maintenance > Replace Part** command.

To prepare the instrument for maintenance work follow the instructions in "Preparing the instrument: Gas pressure in *Preparing and following up maintenance work* on page 305.

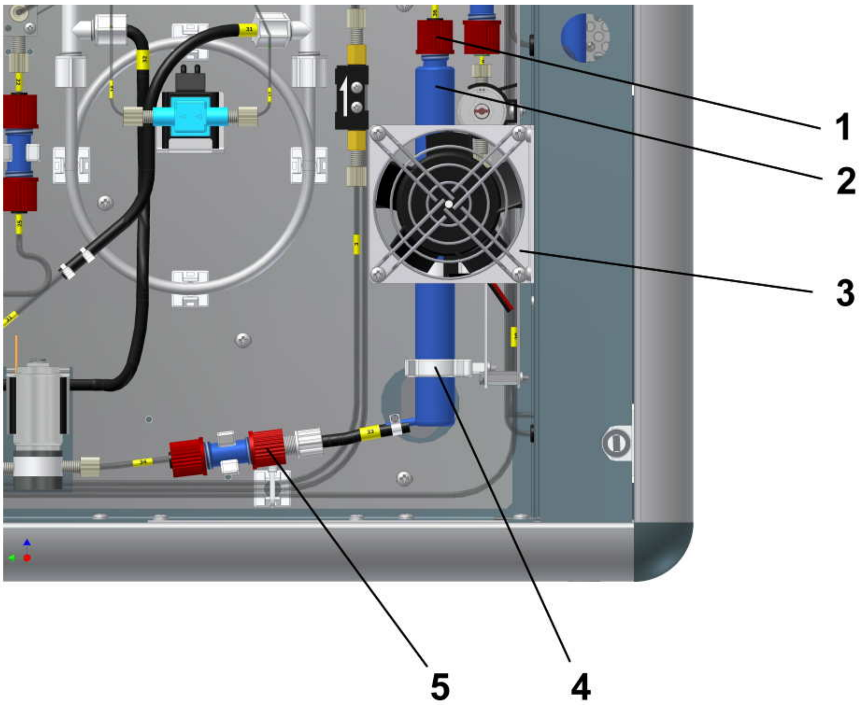
Step 2: Removing the condenser

Proceed as follows to remove the condenser:

Step	Procedure
1	Open the front door.
2	Loosen the ground-in clamp of the combustion tube connection at the lower end.
3	Open the left side wall.
4	Remove the fan.
5	Loosen the screw cap at the upper and lower end of the condenser.
6	Carefully pull the condenser out of the holding clamps.

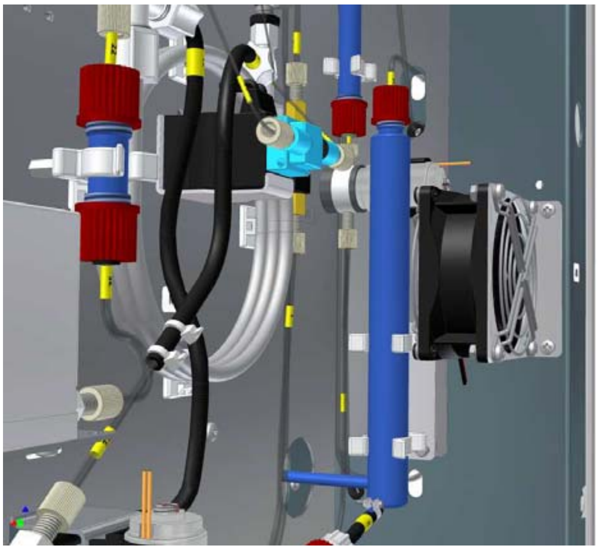
View installed condenser

The following pictures show the position of the condenser:



The following list describes the relevant components in this section:

1 Screw cap top
2 Condenser
3 Fan
4 Holding clamp
5 Screw cap bottom



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View condenser, detail

The following picture shows the condenser in detail:

Step 2:
Removing the condenser, continued

Step 2 continued:

Step	Procedure
7	Place the condenser on a non-combustible surface. Protect the hot quartz glass bridge from unauthorized access.

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Cleaning and installing the condenser

What contaminations are possible?

The following contaminations at the conser are possible:

- Salt deposits
- Sludge or particle deposits

When to clean the condenser

The condenser has to be checked for contaminations after each tube exchange and with heavily loaded samples and cleaned, if necessary.

In case of blockings, the condenser has to be cleaned

Procedure

"Cleaning and installing the condenser" is divided into the following steps:

Step	Description
1	Cleaning the condenser
2	Re-installing the condenser
3	Follow-up instrument preparation: Gas pressure / gas-tightness
4	Performing the necessary follow-up work

Requirements:

Before starting work, the following requirements must be met:

- Remove the condenser.
- Allow the condenser to cool down.
- Keep the following ready:
  - Detergent
  - Distilled water

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Step 1:
Cleaning the condenser

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Proceed as follows to clean the condenser:

Step	Procedure
1	Remove the o-rings from the ground-in connection of the quartz condenser. Check whether the o-rings need to be replaced. Cf. *When to replace sealing elements* on page 356.
2	Clean the condenser. Place it ▪ either in commercial laboratory rinsing agent in an ultrasonic bath for 20 minutes. ▪ or in a commercial laboratory rinsing agent overnight.
3	Then rinse the condenser thoroughly with distilled water.
4	Clean the condenser.

5	Insert the o-rings in the ground-in connections. Use new o-rings if necessary.

Step 2: Re-installing the condenser

Before starting work, the following requirements must be met:

- The instrument must be in "Replace part" status. Cf. instructions at "Preparing the instrument: Gas pressure" in *Preparing and following up maintenance work* on page 305.

Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Before the replacing tube or the ash finger/ash crucible, shut off the gas supply to the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.
Warning	Hot components in the instrument When working inside the instrument there is a risk of burning as many parts of the instrument are hot. When working inside the instrument always wear protective glasses and the enclosed heat protection gloves.

Proceed as follows to reinstall the condenser:

Step	Procedure
1	Carefully push the condenser through the provided opening and jam it in the holding clamps. Note: When you close the ground-in ball-and-socket joints, you must be able to feel an elastic resistance when you press the o-rings into the quartz glass bridge, otherwise you must replace the o-rings. 
2	Tighten the screw caps at the upper and lower end of condenser.
3	Fasten the fan in the provided guiding.

4	Connect the ground-in clamps to the lower end of the combustion tube. Note: When you close the ground-in ball-and-socket joints, you must be able to feel an elastic resistance when you press the o-rings into the condenser, otherwise you must replace the o-rings.
5	Close the front and the side door (left).

Step 3:
Follow-up instrument preparation: Gas pressure / gas-tightness

After completing all maintenance work, put the instrument back into a state ready for measurement. Leave the dialog "Replace parts" by clicking "Finish". Cf. "Follow-up preparation of the instrument: Gas pressure / tightness" in *Preparing and following up maintenance work* on page 305.

Step 4:
Performing the necessary follow-up work

Once you have reinstalled the condenser, you must perform the following work:

Step	Procedure
1	Perform a leak test. Only if the instrument is leak free, the measurement can be started.
1	Performing blank value determinations as a test. Cf. *Determining blank values* on page 231.
2	Only stop the measurements once you have reached normal blank values again.

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.

6.10 Maintain syringe

Target group The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose This section enables you to maintain the syringe.

Overview "Syringe maintenance" is divided into the following topics:

Topic	Page
Maintain syringe	389

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Maintain syringe

When does the syringe have to be maintained?

The syringe has to be maintained after heavily loaded samples since they are in direct contact with the syringe. Therefore, perform this maintenance work when starting the measurement slightly loaded samples after having measured heavily loaded samples

General syringe matters

The syringe serves for dosing the sample into the furnace and for flushing the measuring system.

The syringe has permanent contact with the sample and therefore needs regular maintenance.

Safety instructions

Please mind the following safety instructions for all working phases:

Caution

Danger of burns when working with hot furnaces or tubes!

Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot.

For accidents caused by violation of these instructions no liability will be assumed.

Preparing the instrument:

To prepare the instrument for maintenance work follow the instructions in "*Preparing the instrument: Gas pressure* in *Preparing and following up maintenance work* on page 305.

Warning

Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Prior to maintaining the syringe, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Procedure

"Syringe maintenance" is divided into the following topics:

Step	Description
1	Remove syringe
2	Clean syringe
3	Installing the syringe
4	Necessary follow-up work

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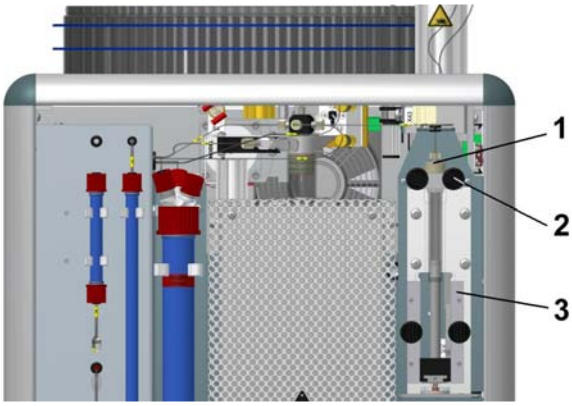
The following picture shows a top view of the furnace pulled out:



The following list describes the relevant components in this section:

1 Sampling hose

2 Fastening screw

3 Fastening rail

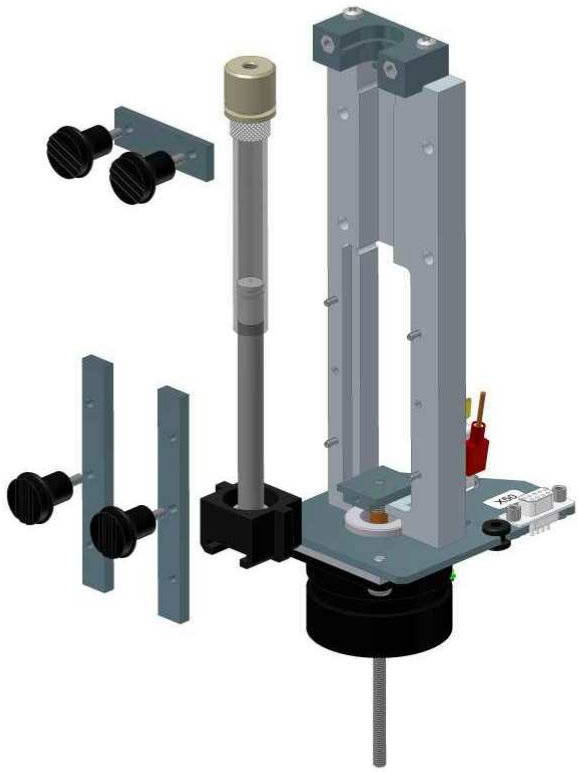
Step 1: Removing the syringe

Proceed as follows to remove the syringe:

Step	Procedure
1	Move the syringe to the original postion (top).
2	Loosen the 4 fastening screws and both fastening rails.
3	Loosen the sampling hose.
4	Carefully pull the syringe out of the syringe guiding.

Step 2: Cleaning the syringe

Proceed as follows to clean the syringe:

Step	Procedure
1	Disassemble the syringe into its components. Pull out the piston from the cylinder. 
2	Thoroughly flush the syringe parts with distilled water.
3	Dry the syringe parts.
4	Assemble the syringe.

Step 3: Installing the syringe

Proceed as follows to install the syringe:

Step	Procedure
1	Insert the syringe in the provided guidings.
2	Screw the sampling tube onto the syringe.
3	Fasten the syringe with both fastening rails and with the 4 fastening screws.
4	Leave the "Replace part" dialog. Click "Finish".
5	Proceed on the basis of the following decision table:

	If the operating software status view displays...	...then...
	approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
	distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. The instrument is only ready to measure when the leak test is successful.

Step 4:
Performing the necessary follow-up work

Once you have reinstalled the syringe, you must perform the following work:

Step	Procedure
1	Performing blank value determinations as a test. Cf. *Determining blank values* on page 231.
2	Only stop the measurements once you have reached normal blank values again.

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.

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6.11 Emptying and filling standard reaction tubes

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to empty and refill standard reaction tubes.

Overview

"Emptying and filling standard reaction tubes" is divided into the following topics:

Topic	Page
Empty standard reaction tube, liquid mode	394
Fill standard reaction tube, liquid mode	395
Empty standard reaction tubes, solid mode	397
Fill standard combustion tube, solids mode	398

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Empty standard reaction tube, liquid mode

Requirements:

Before starting work, the following requirements must be met:

- The reaction tube has been removed from the furnace.
- The reaction tube has been cooled down.
- Keep a tube rack ready.
- Keep a catcher ready.
- Keep a screwdriver ready.

Safety instructions

Please observe the following safety instruction:

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Caution	**Danger of burns when working with hot furnaces or tubes!** Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot. For accidents caused by violation of these instructions no liability will be assumed.

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Emptying the combustion tube

Proceed as follows to empty the combustion tube:

Step	Procedure
1	Remove the ash crucible and the protection tube with the tongs.
2	Empty the quartz chips above the combustion tube.
3	Empty the catalyst balls out of the combustion tube.
4	Empty the quartz chips below the combustion tube.
5	Remove the quartz wool out of the combustion tube.
6	Check whether the tube is soiled or damaged. Remove the soiling with a suitable solvent. In case of damages on its glass wall replace the combustion tube.
7	Dispose of the chemicals according to the relevant disposal categories.

Fill standard reaction tube, liquid mode

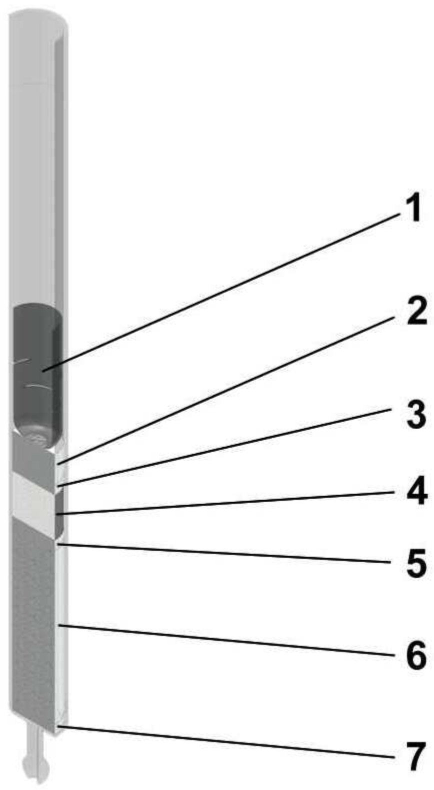
Note

Note the following rules:

- Observe the filling heights indicated as exactly as possible.
- Carbon blank values of the new catalyst may lead to a drift. It is recommen-ded to flush the catalyst with a high injection volume prio to the measure-ments (e.g. over night).

Combustion tube (Li-quid mode)

The following picture shows the fillings and filling heights of the combustion tube:



The following list indicates the fillings to use:

1 Sheath tube
2 Ash crucible
3 Quartz chips 15 mm
4 Quartz wool 5mm
5 Pt catalyst 25 mm
6 Quartz wool 5mm
7 Quartz chips 85 mm
8 Quartz wool 5mm

Filling the combustion tube

Warning 	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

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Caution	Cutting sealing elements apart/out (o-rings, quad rings, half shells, ferrules) When cutting sealing elements apart/out with a knife you may damage sealing surfaces. Never remove sealing elements with a knife but rather with tweezers.

Proceed as follows to fill the combustion tube:

Step	Procedure
1	Insert a layer of quartz wool (8).
2	Fill in the quartz splinters (7).
3	Insert a layer of quartz wool (6) and plug it in very tight.
4	Fill in Pt catalyst (5).
5	Insert a layer of quartz wool (4) and plug it in very tight.
6	Fill in the quartz chips (3).
7	Insert the ash crucible (2) and, if necessary, the protection tube (1).

Notes regarding operation:

Observe the following notes regarding further operation:

- Working temperature: 850 °C
- In liquid mode, newly filled combustion tubes have to be conditioned before you can perform measurements. Cf. *Conditioning newly installed tubes* on page 307.

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Empty standard reaction tubes, solid mode

Requirements:

Before starting work, the following requirements must be met:

- The reaction tube has been removed from the furnace.
- The reaction tube has been cooled down.
- Keep a tube rack ready.
- Keep a catcher ready.
- Keep a screwdriver ready.

Safety instructions

Please observe the following safety instruction:

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Caution	**Danger of burns when working with hot furnaces or tubes!** Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot. For accidents caused by violation of these instructions no liability will be assumed.

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Emptying the combustion tube

Proceed as follows to empty the combustion tube:

Step	Procedure
1	Remove the protection tube and the ash finger with the tongs.
2	Empty the catalyst balls out of the combustion tube.
3	Empty the quartz chips below the combustion tube.
4	Check whether crusts are visible in the tube. Remove the crust with a suitable solvent.
5	Dispose of the chemicals according to the relevant disposal categories.

Fill standard combustion tube, solids mode

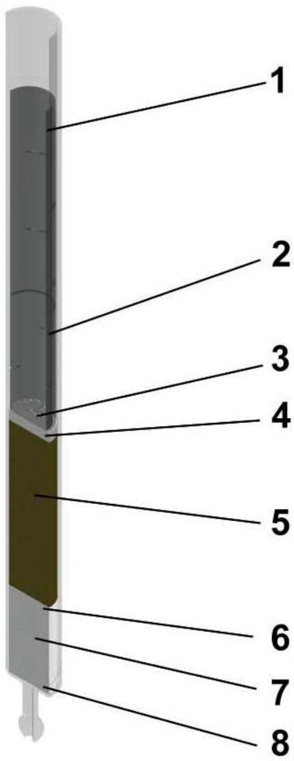
Note

Note the following rules:

- Observe the filling heights indicated as exactly as possible.

Combustion tube (Solids mode)

The following picture shows the fillings and filling heights of the combustion tube:



The following list indicates the fillings to use:

1 Sheath tube
2 Ash finger
3 Al_2O_3, stuffed, as bottom for the ash finger.
4 Corundum balls 5mm
5 Copper oxide 85 mm
6 Corundum balls 5mm
7 Quartz chips, coarse, 40 mm
8 Quartz wool 5mm

Filling the combustion tube

Warning

Sharp pieces of broken glass

When cold quartz or glass components break there is a risk of cut injuries.

Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Caution	Cutting sealing elements apart/out (o-rings, quad rings, half shells, ferrules) When cutting sealing elements apart/out with a knife you may damage sealing surfaces. Never remove sealing elements with a knife but rather with tweezers.

Proceed as follows to fill the combustion tube:

Step	Procedure
1	Insert a layer of quartz wool.
2	Fill in the quartz chips (7) and above it one layer of quartz wool (6).
3	Insert the copper oxide 5).
4	Insert a layer of quartz wool (4).
5	Insert the ash finger (2). This has to be closed at the bottom with a layer of Al_2O_3.
6	Insert the sheath tube (1).

Notes regarding operation:

Observe the following notes regarding further operation:

- Working temperature: 950 °C; max. 980 °C.

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6.12 Removing/installing and conditioning the reaction tubes

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to remove and install reaction tubes and to condition them properly.

Overview

"Removing/installing and conditioning reaction tubes" is divided into the following topics:

Topic	Page
Removing the standard reaction tubes from the furnace	401
Installing standard reaction tubes in the furnace and conditioning	404

Removing the standard reaction tubes from the furnace

Procedure

"Removing reaction tubes from the furnace" is divided into the following steps:

Step	Description
1	Preparing the instrument: Reduce gas pressure
2	Removing the reaction tube

Safety instructions

Observe the following safety instructions during all steps:

Warning Hot combustion tube

Risk of burning due to hot instrument parts.

When replacing the combustion tube:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot tube in a tube rack on a level, non-combustible surface.
- Protect the hot tube from unauthorized access.
- Never leave the instrument unattended.

Requirements

Before starting work, the following requirements must be met:

- Remove all samples from the carousel.
- Keep a tube rack ready to hold hot components.

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Step 1:
Preparing the instrument: Gas pressure

Warning Gas pressure and caustic substances in the instrument

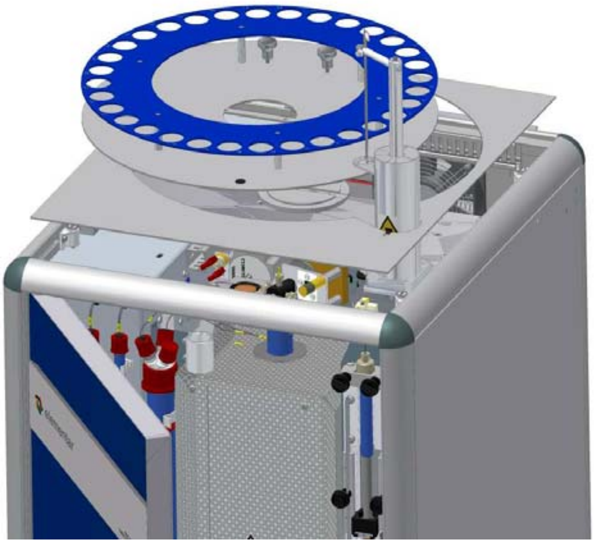
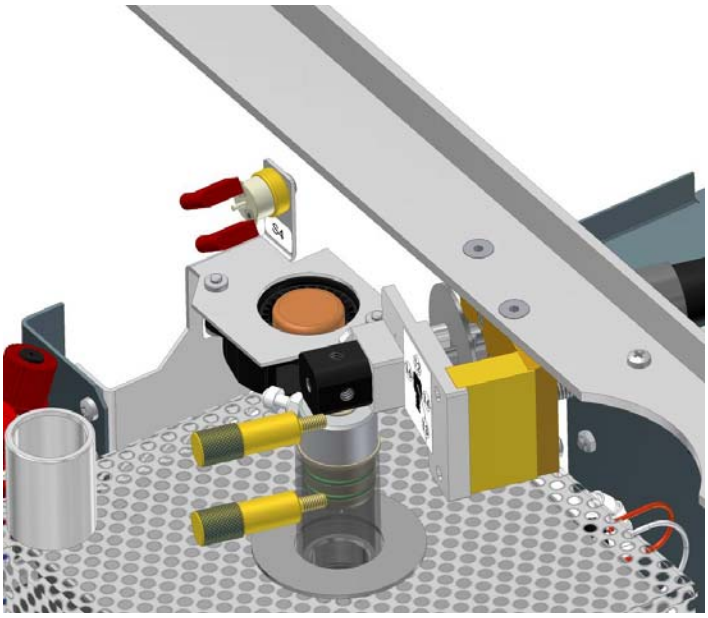
Consumables may escape under pressure and cause chemical burns.

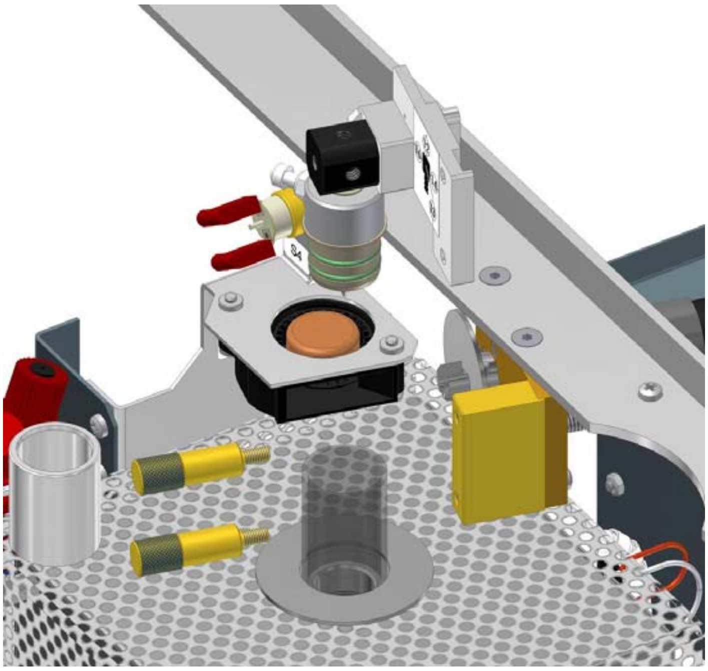
Before replacing tubes or the ash crucible/finger, shut off the gas supply to the instrument. To do so, execute the **Options Maintenance > Replace Part** command.

To prepare the instrument for maintenance work follow the instructions in "Preparing the instrument: Gas pressure in *Preparing and following up maintenance work* on page 305.

Step 2:
Removing the reaction tube

Proceed as follows to remove the reaction tubes:

Step	Procedure
1	Open the front door. Remove the carousel and the cover plate. 
2	Remove the carrier gas supply to the combustion tube connection and loosen the ground-in clamps at the lower end of the combustion tube.
3	Loosen the fastening of the multiway valve or the ball valve. Turn the fastening screws to the left. 

4	Loosen the multiway valve with injection plug / ball valve out of the combustion tube with careful jiggling motions. Pull it out of the tube toward the top and place it into the provided park position. 
5	Pull the combustion tube out of the furnace and place it into the tube retainer.

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Installing standard reaction tubes in the furnace and conditioning

Note

The following section is a continuation of "Removing reaction tube from the furnace". All steps described in "Removing reaction tube from the furnace" must already have been performed.

Procedure

"Installing reaction tube in the furnace and conditioning" is divided into the following steps:

Step	Description
1	Installing reaction tube
2	Conditioning reaction tube, getting the instrument ready to measure

Safety instructions

Observe the following safety instructions during all steps:

Warning	Hot components in the instrument When working inside the instrument there is a risk of burning as many parts of the instrument are hot. When working inside the instrument always wear protective glasses and the enclosed heat protection gloves.

Caution	Overheating if tube fillings are not appropriate for the operating mode Overheated tube fillings melt, run into the furnace area and destroy the furnace. Make sure that the tube fillings correspond to the selected operating mode.

Requirements

Fulfill the following requirements:

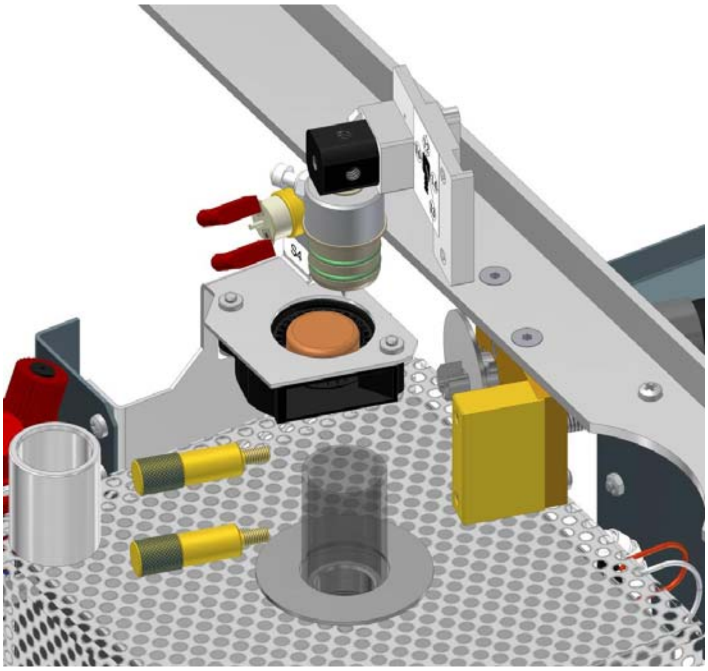
- Remove all samples from the carousel.
- The instrument must be in "Replace part" status. Cf. instructions at "Preparing the instrument: Gas pressure" in *Preparing and following up maintenance work* on page 305.

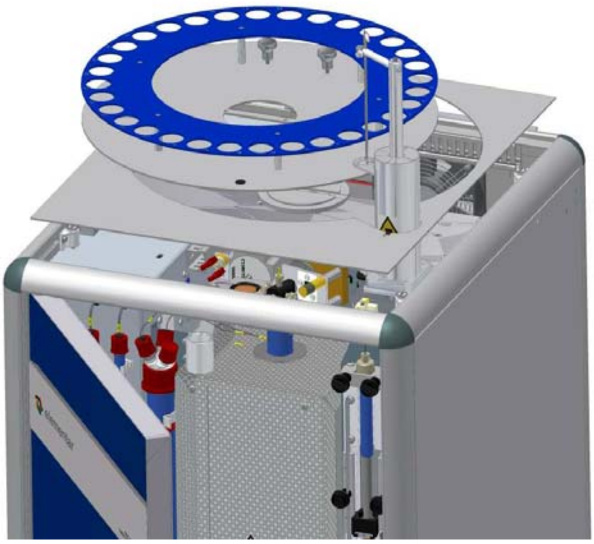
Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Before replacing tubes or the ash finger/ash crucible, shut off the gas supply to the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

- The front door has to be open and the carousel and/or the cover plate have to be removed.
- Clean off all fingerprints on quartz parts before installing them. This prevents premature ageing of quartz parts. Use acetone, for example, for cleaning.

Step 1: Installing reaction tubes

Proceed as follows to install the reaction tubes:

Step	Procedure
1	Insert the reaction tube into the furnace:
2	Connect the ground-in ball and socket joint at the lower end of the combustion tube to the condenser. Note: When you close the ground-in ball-and-socket joints, you must be able to feel an elastic resistance when you press the o-rings into the condenser, otherwise you must replace the o-rings.
3	Insert the injection plug with multiway valve / ball valve into the combustion tube.  Caution: Improper insertion of the injection unit may cause broken glass!
4	Fasten the dosing unit with both fastening screws.
5	Connect the carrier gas supply to the gas supply connection of the combustion tube by means of the ground-in clamp.

6	Close the front door and reinstall the cover plate and the carousel on the instrument. The analyzer performs an automatic carousel recognition. Wait until it is completely processed. 

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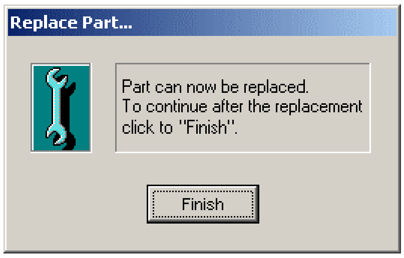
Step 2: Conditioning reaction tube, getting the instrument ready to measure

Proceed as follows to condition the reaction tube and get the instrument ready to measure again:

Step	Procedure
1	Close the "Replace part" dialog in the operating software. To do so, click **Finish** in the "Replace part" dialog.  By doing so, the gas will be automatically turned on.
2	Wait the required conditioning time. Cf. the "Conditioning rules for combustion tube" table in *Conditioning newly installed tubes* on page 307.
3	Proceed on the basis of the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528. The instrument is only ready to measure when the leak test is successful.

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.

Carbon blank values of the new catalyst may lead to a drift.

It is recommended to flush the catalyst with a high injection volume prio to the measurements (e.g. over night).

31.08.2009

6.13 Filling, removing and installing drying, absorption and filter tubes

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to fill, remove and install the drying, absorption and filter tubes.

Overview

"Filling, removing and installing the drying, absorption and filter tubes" is divided into the following topics:

Topic	Page
Filling the drying tube (magnesium perchlorate)	409
Filling the absorption tube (silver wool)	411
Filling the filter tubes	413
Removing and installing drying, absorption and filter tubes	414

Filling the drying tube (magnesium perchlorate)

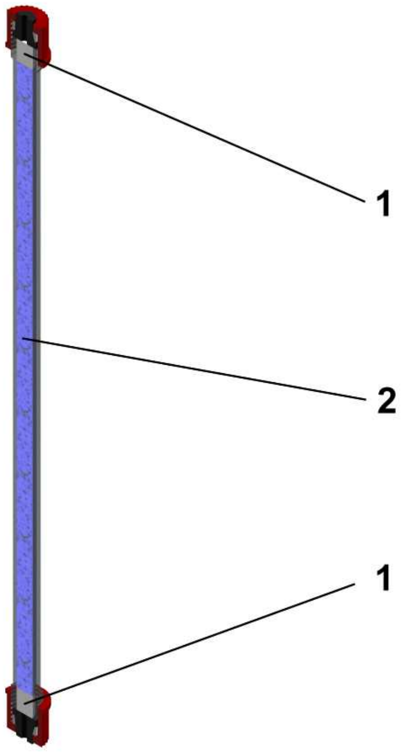
Note

Note the following rules

- Observe the filling heights indicated as exactly as possible.
- The tube filling must not have any cavities. Therefore, tap the tube wall with a piece of wood or cork when filling the tubes.

Drying tube

The following picture shows the fillings and filling heights of the drying tube:



The following list indicates the fillings to use:

1 Filter pad

2 Magnesuim perchlorate

Filling the drying tube

Warning	Sharp pieces of broken glass
	When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts. Mind the safety instruction when handling magnesium perchlorate.

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Proceed as follows to fill the drying tube:

Step	Procedure
1	At the bottom, insert a filter pad.
2	Fill in the magnesium perchlorate. To do so, tap the tube wall with a piece of wood or cork so as to prevent cavities.
3	At the top, insert a filter pad.

Notes regarding operation:

The drying tube fillings must be replaced regularly in order to ensure correct readings. Magnesium perchlorate is charged with an indicator which shows the used up zones of the tube. If ¾ of the desiccant is discolored, the filling must be replaced.

Filling the absorption tube (silver wool)

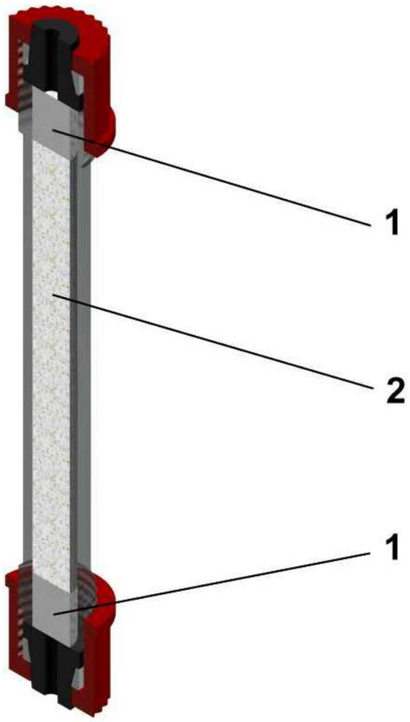
Note

Note the following rules

- Observe the filling heights indicated as exactly as possible.
- The tube filling must not have any cavities. Therefore, tap the tube wall with a piece of wood or cork when filling the tubes.

Absorption tube

The following picture shows the fillings and filling heights of the drying tube:



The following list indicates the fillings to use:

1 Filter pad

2 Silver wool

Filling the absorption tube

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Proceed as follows to fill the absorption tube:

Step	Procedure
1	At the bottom, insert a filter pad.
2	Plug the silver wool as high as there is still room left for a filter pad on the upper part of the tube.
3	At the top, insert a filter pad.

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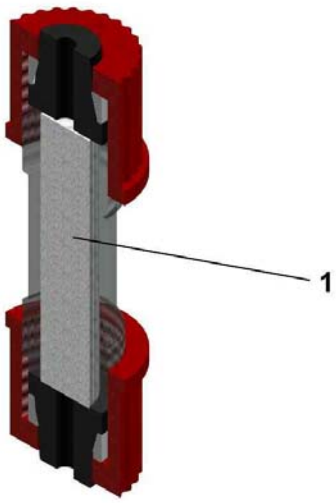
Notes regarding operation:	The absorption tube fillings must be replaced regularly in order to ensure correct readings.

Filling the filter tubes

Filter tube

The following picture shows the fillings and filling heights of the filter tube:



The following list indicates the fillings to use:

1 Filter pad

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Filling the filter tube

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Proceed as follows to fill the filter tube:

Step	Procedure
1	Insert a filter pad.

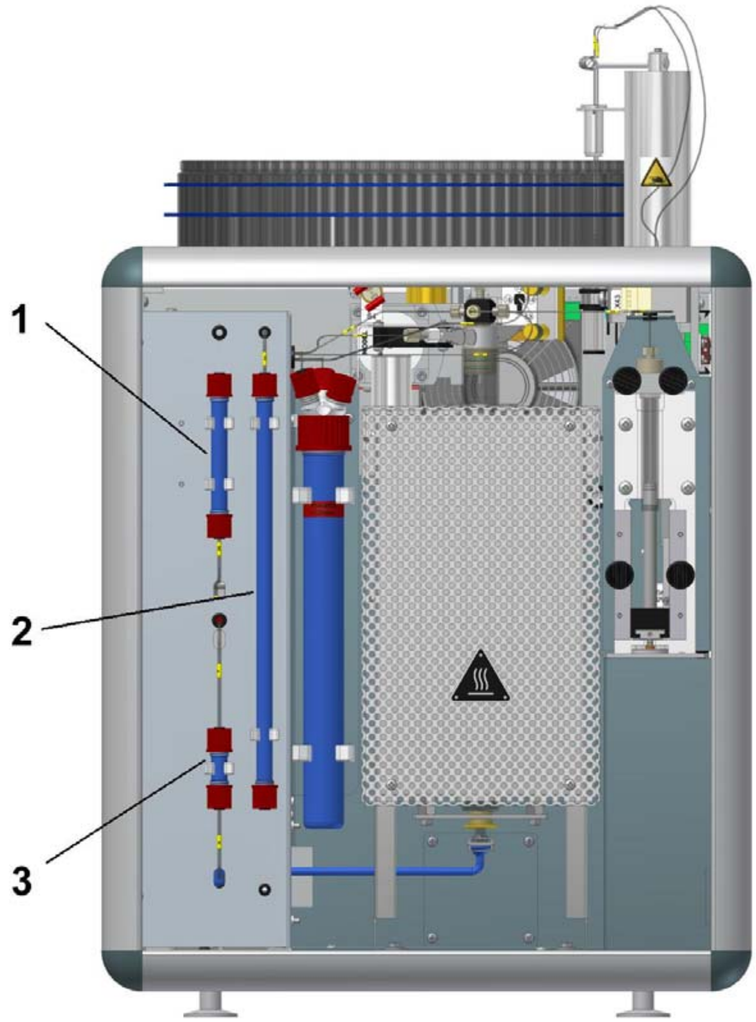
Removing and installing drying, absorption and filter tubes

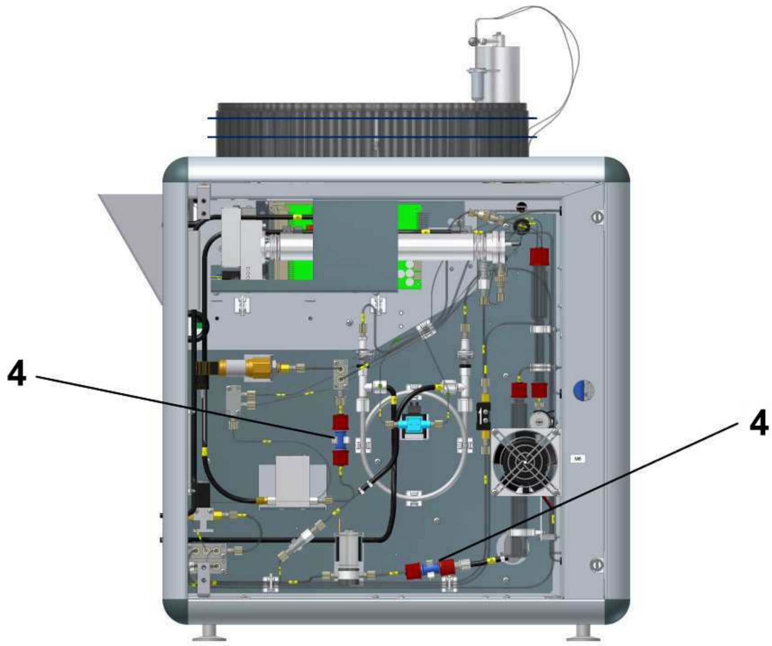
Function

The tubes serve the water absorption as well as halogen absorption and avoid dirt deposits at important construction parts.

Postion of the tubes

The following illustration shows the positions of the different tubes:





The following list describes the relevant components in this section:

1 Absorption tube silver wool

2 Drying tube magnesiumperchlorate

3 Viewing window (empty)

4 Filter tube

Procedure

"Removing and installing tubes" is divided into the following steps:

Step	Description
1	Preparing the instrument: Gas pressure
2	Removing tubes
3	Installing tubes, getting the instrument ready to measure

Safety instructions

Observe the following safety instructions during all steps:

Caution **Danger of burns when working with hot furnaces or tubes!**

Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot.

For accidents caused by violation of these instructions no liability will be assumed.

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts. Mind the safety instruction when handling magnesium perchlorate.

Step 1:
Preparing the instrument:
Gas pressure

Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Prior to exchanging parts, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

To prepare the instrument for maintenance work follow the instructions in "Preparing the instrument: Gas pressure in Preparing and following up maintenance work.

Step 2:
Removing tubes

Proceed as follows to remove the tubes:

Step	Procedure
1	Open the door (front, side door)
2	Loosen the screw caps at the inlet and outlet of the tube.
3	Remove the tubes from the holding clamps.

Step 3:
Installing tubes, getting the instrument ready to measure

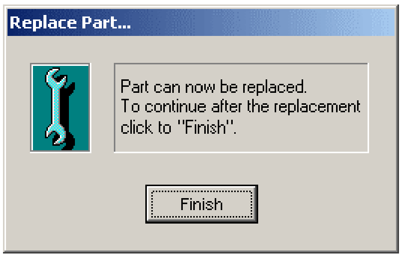
Caution	Cutting sealing elements apart/out (o-rings, quad rings, half shells, ferrules) When cutting sealing elements apart/out with a knife you may damage sealing surfaces. Never remove sealing elements with a knife but rather with tweezers.

Proceed as follows to install the tubes and get the instrument ready to measure again:

Step	Procedure
1	Screw the screw caps on the inlet and outlet.
2	Fasten the tubes from the holding clamps.
3	Close the door (front, side door)

4 Close the "Replace part" dialog in the operating software.

To do so, click Finish in the "Replace part" dialog.



5 Proceed on the basis of the following decision table:

If the operating software status view displays...	...then
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. The instrument is only ready to measure when the leak test is successful.

To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab.

6.14 Filling the acid container

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to fill the acid container.

Overview

"Filling the acid container" is divided into the following topics:

Topic **Page**
Filling the acid container..419

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Filling the acid container

Note

The acid container is located behind the front door. It contains 125 ml and has to be filled with 1% phosphoric acid (H_3PO_4)

Filling the acid container

Proceed as follows to fill the acid container:

Step	Procedure
1	Unscrew the front screw cap from the container.
2	Fill up distilled water to the filling mark 125 ml. Then fill approx. 1.5 ml 85 % acid (1% H_3PO_4) in the acid resservoir container.
3	Screw the screw caps back onto the acid container.

Safety instructions

Please mind the following safety instructions for all working phases:

Caution **Danger of burns when working with hot furnaces or tubes!**

Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot.

For accidents caused by violation of these instructions no liability will be assumed.

Warning Mind the safety instruction when handling acid ($_{H_3}PO_4$).

Wear always protective clovers and protective glasses when working.

6.15 Flushing the combustion tube and the sparger.

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to flush the reactor and the sparger.

Overview

"Flushing the reactor and the sparger" is divided in the following topics:

Topic	Page
Flushing the combustion tube with salt containing samples	421
Flushing the sparger...	422

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Flushing the combustion tube with salt containing samples

Background

If mainly salt containing samples with e.g. 35 g/l NaCl are analyzed, the capacity of the combustion tube for salt is saturated after approx. 50-100 samples.

Safety instructions

Please mind the following safety instructions for all working phases:

Caution

Danger of burns when working with hot furnaces or tubes!

Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot.

For accidents caused by violation of these instructions no liability will be assumed.

Warning

Sharp pieces of broken glass

When cold quartz or glass components break there is a risk of cut injuries.

Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Mind the safety instruction when handling magnesium perchlorate.

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Procedure

Proceed as follows to flush the combustion tube:

Step	Procedure
1	Flush the combustion tube incl. filling it with deionized water. By doing so, water sollulable salt will be dissolved and removed from the reactor.

Note

To avoid longer working breaks during the sample measurement, it is recommended to work with two combustion tubes alternately.

- one combustion tube is in the instrument
- one combustion tube is being flushed.

Flushing the sparger

Background

If mainly salt containing and particle containing samples are analyzed, the sparger has to be flushed regularly, in order to avoid blockings and inaccurate measurements (carry-over effects).

Procedure

Proceed as follows to flush the sparger:

Step	Procedure
1	Flush the acid path via dialog **Options > Maintenance > Fush Acid Path**. If there are still residues in the sparger, proceed to step 2.

Warning Sharp pieces of broken glass

When cold quartz or glass components break there is a risk of cut injuries.

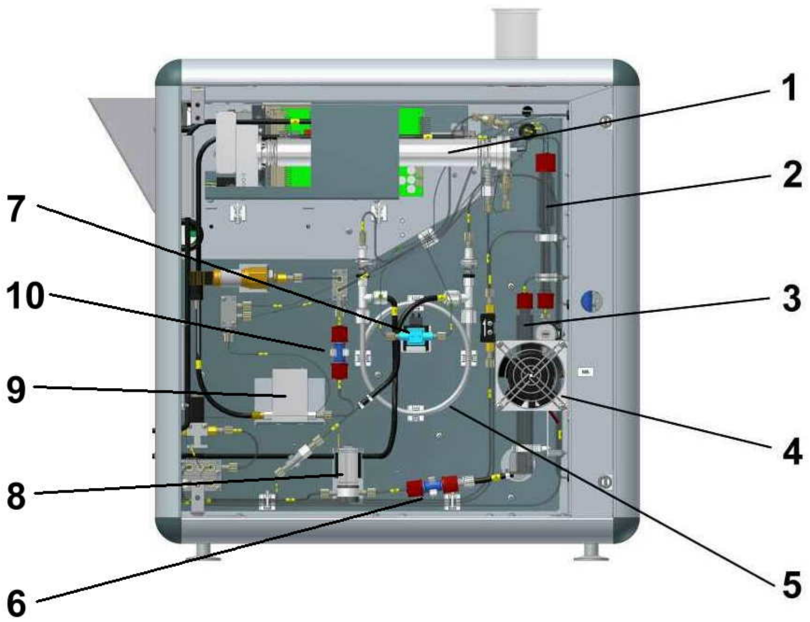
Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Mind the safety instruction when handling magnesium perchlorate.

Warning Gas pressure and caustic substances in the instrument

Consumables may escape under pressure and cause chemical burns.

Prior to exchanging parts, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.



The following list describes the relevant components in this section:

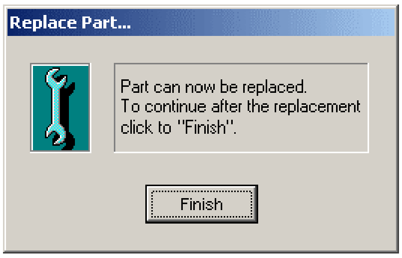
1 IR detector

2 Sparger

3 Condenser

4 Fan

5 Gas drying

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>2</td><td colspan="2">Remove the sparger.
Loosen the upper and lower screw connections.</td></tr>
<tr><td>3</td><td colspan="2">Flush the sparger with distilled water.</td></tr>
<tr><td>4</td><td colspan="2">Reinstall the sparger after cleaning.</td></tr>
<tr><td>5</td><td colspan="2">Flush the acid path via dialog Options > Maintenance > Fush Acid Path.</td></tr>
<tr><td>6</td><td colspan="2">Close the "Replace part" dialog in the operating software.
To do so, click Finish in the "Replace part" dialog.

</td></tr>
<tr><td rowspan="4">7</td><td colspan="2">Proceed on the basis of the following decision table:</td></tr>
<tr><th>If the operating software status view displays...</th><th>...then</th></tr>
<tr><td>approximately the same flow and pressure values as prior to maintenance work</td><td>the instrument is then ready to measure again.</td></tr>
<tr><td>distinctly different flow and pressure values to those displayed prior to maintenance work</td><td>perform a leak test.

The instrument is only ready to measure when the leak test is successful.</td></tr>
</table>

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Variants and modifications

7

Target group

The target group of this section is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section enables you to know the different instrument variants and to modify the instrument

Overview

"Variants and modifications" is divided into the following sections:

Section **Page**

Instrument variants....................425

Modifying the instrument....................429

System Suitability Test....................461

Modification to POC operation....................469

TIC solids module....................495

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7.1 Instrument variants

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

The section is meant to explain the instrument variants.

Overview

"Instrument variants" is divided into the following topics:

Topic	Page
The basic model	426
The model with automatic sampler in liquid mode	427
The variant with automatic sampler in solids mode	428

The basic model

Purpose

The basic model enables you to measure in liquid and solid samples in single mode.

In addition it is possible to homogenize samples in liquid mode when installing a stirring motor.

The instrument

The following picture shows the instrument:

The model with automatic sampler in liquid mode

Purpose

The model with an automatic sampler in liquid mode enables you to feed the instrument with different carousel attachments.

The carousel attachments can be provided for 32, 50 and 80 sample vials.

An integrated stirrer can homogenize the samples in the liquid mode.

The instrument

The following picture shows the instrument:

The variant with automatic sampler in solids mode

Purpose

The model with an automatic sampler in solids mode enables you to feed the instrument with different carousel attachments.

The carousel attachments can be provided for 80 and 120 sample vials.

The samples will either be measured by the folding technique packed in tin boats or by capsule technique in tin capsules.

The instrument

The following picture shows the instrument:

7.2 Modifying the instrument

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

The section is meant to explain the individual modifications.

Overview

"Modifying the instrument" is divided into the following topics:

Topic	Page
Modifying from single mode "liquid" to single mode "solids"	430
Modifying from single mode to automatic operation	436
Modifying from automatic liquid operation to automatic solids operation	450
The stirring unit	458
Adjusting the suction and purging needle	459

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Modifying from single mode "liquid" to single mode "solids"

The instrument

The following picture shows the instrument:

Note:
The modification from single mode "liquid" to single mode "solids" only requires a tube exchange and the mounting of the ball valve.

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Modification process

The modification is divided into the following steps:

Step	Description
1	Preparing the instrument:
2	Modifying the instrument
3	Getting the instrument ready to measure

Safety instructions

Observe the following safety instructions during all steps:

Caution	**Danger of burns when working with hot furnaces or tubes!** Always wear the furnished protective gloves and protective glasses since some construction parts (e.g. tubes) may still be hot. For accidents caused by violation of these instructions no liability will be assumed.

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Step 1

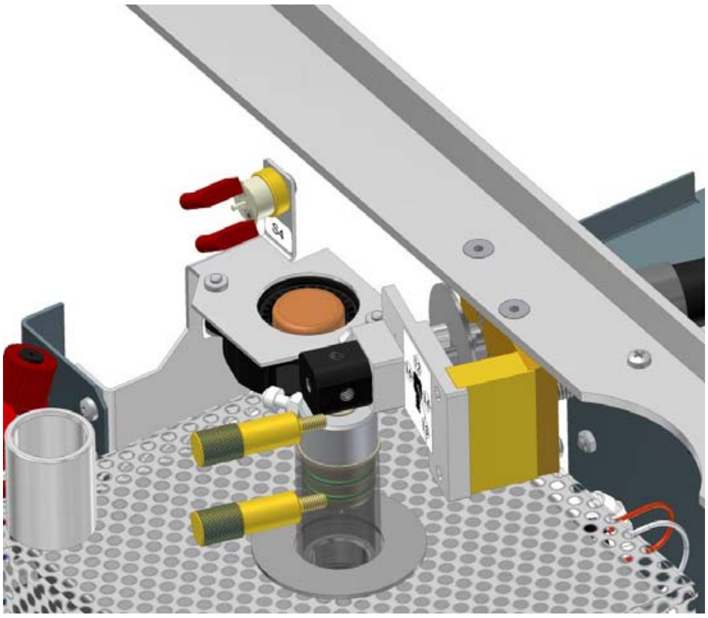
Preparing the instrument / Gas pressure

Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Prior to exchanging parts, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Step 2

Modifying the instrument

Proceed as follows to modify the instrument:

Step	Procedure
1	Remove the cover plate and open the front door.
2	Loosen the locking screws at the multiway valve and the ground-in clamps of the carrier gas line to the combustion tube. 
3	Hold the upper end of the combustion tube with one hand and move the multiway valve out of the combustion tube with careful jiggeling motions with the other. Put the multiway valve into the designated park position.

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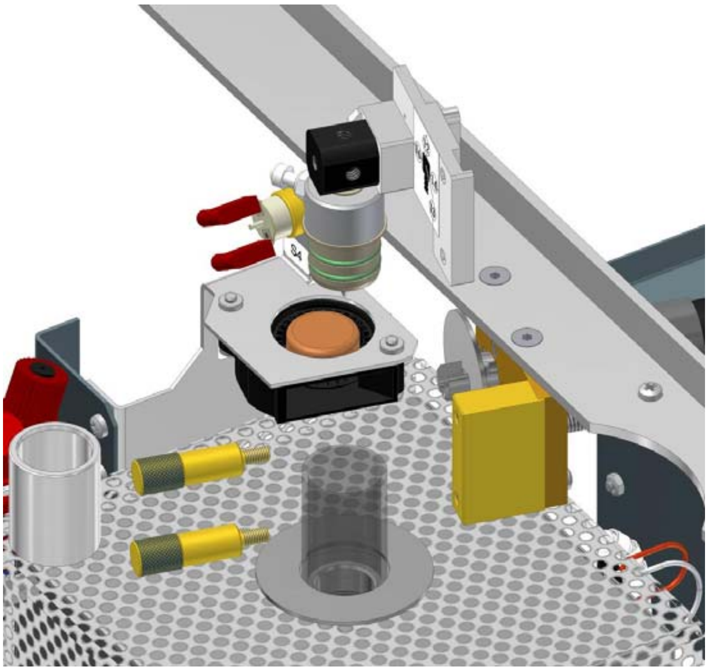
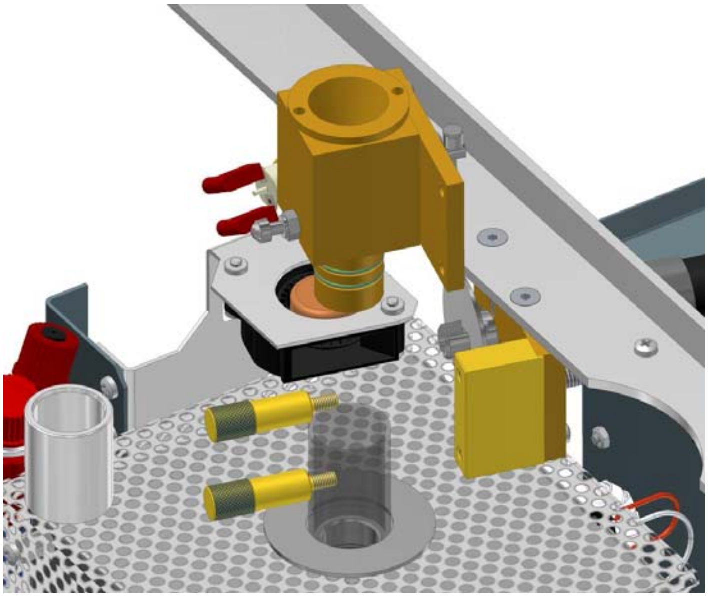
4	Remove the ground-in clamp at the lower end of the combustion tube and pull the combustion tube out of the furnace.  Place the combustion tube in the tube rack.
5	Take the combustion tube for solid samples and insert it into the furna-ce. See *Filling the combustion tube, solid mode* "Fill standard combustion tube, solids mode" on page 398.
6	Fasten the ground-in clamp at the lower end of the combustion tube and connect the condenser with the combustion tube.
7	Carefully insert the ball valve into the combustion tube so that the ball valve tappet is in the multiway valve motor. 

8	Tighten the ball valve with the locking screws.
9	Fasten the carrier gas line at the ball valve with ground-in clamp.
10	Close the front door and put the cover plate on the analyzer.
11	Remove the lid for the hole of the solid samples from the cover plate. 
12	Put the cover ring for the ball valve into the feeding hole.

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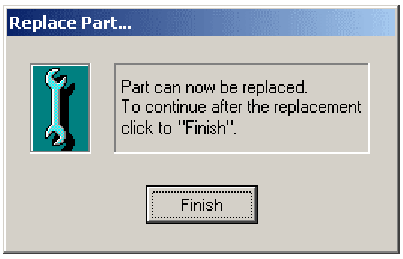
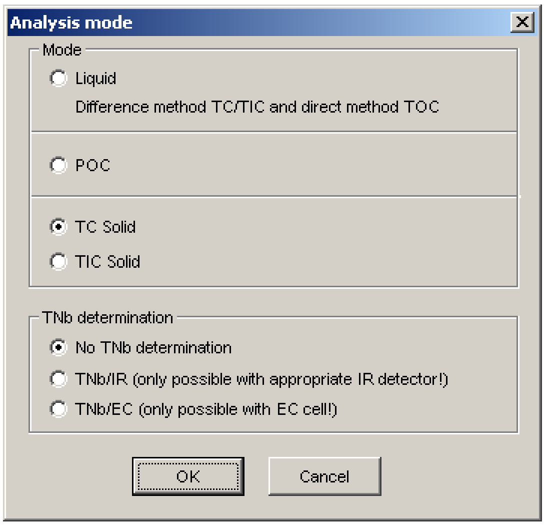
Step 3
Getting the instrument ready to measure

Proceed as follows to get the instrument ready for meaurement:

Step	Procedure
1	Close the "Replace part" dialog in the operating software. To do so, click **Finish** in the "Replace part" dialog.  By doing so, the gas will be automatically turned on.

2 Go to **System > Mode** in the operating software and enter the solids mode.

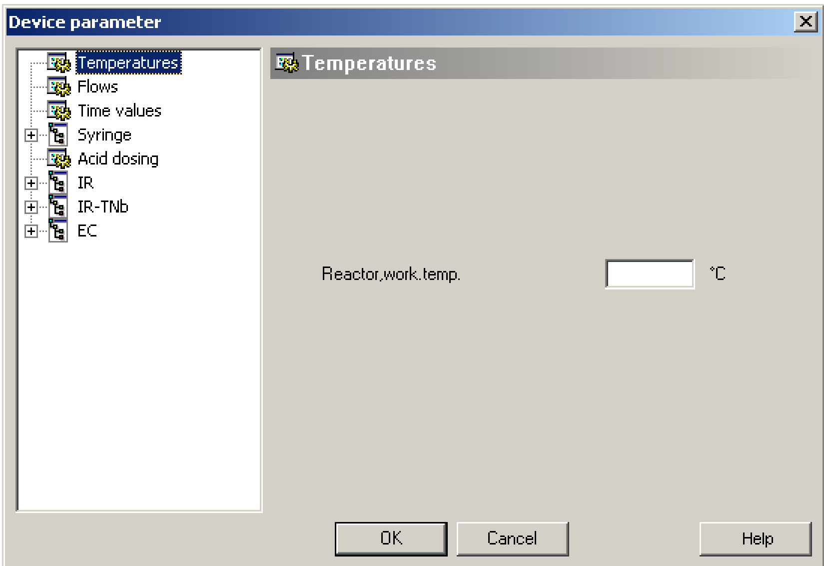


3 Proceed on the basis of the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. The instrument is only ready to measure when the leak test is successful.

4 Go to **Options > Settings > Parameter** in the operating software and enter the temperature.

The temperature in the solids mode is 950°C.



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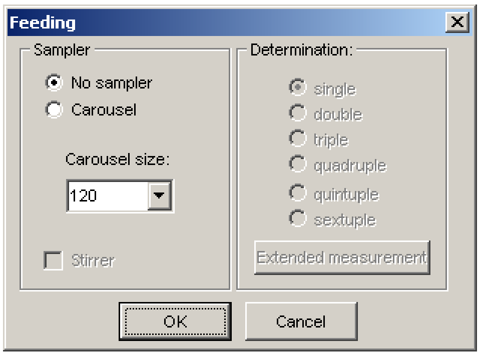
5 Go to **System > Feeding** in the operating software and enter "no sampler".



To be observed after maintenance

If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab.

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Modifying from single mode to automatic operation

The instruments

The following picture shows the instruments:

Purpose

The modification from single mode to automatic operation enables you to independently measure samples either in liquid or in solids mode.

Modification process

The modification is divided into the following steps:

Step	Description
1	Cooling down the instrument
2	Modifying the instrument
3	Deciding about the instrument variant
4	Turn on instrument

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Safety instructions

Observe the following safety instructions during all steps:

Warning

Hot instrument parts and hot ash particles

When replacing hot instrument parts there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

Caution

Lack of ventilation of the analyzer

A lack of ventilation leads to overheating of the analyzer.

Before switching off the instrument:

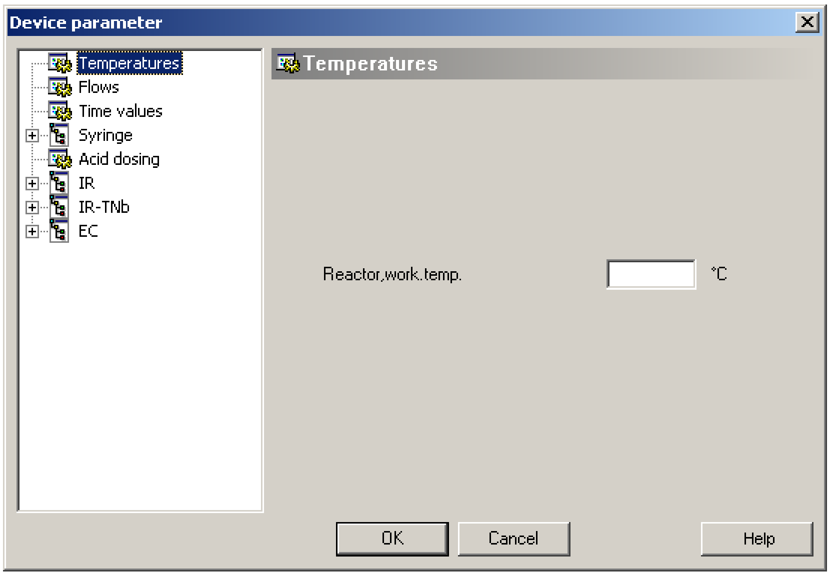
- Set furnace setpoint temperature to 0 °C.
- Allow the furnace to cool down until the temperature displayed is 100 °C.

Warning	Sharp pieces of broken glass When cold quartz or glass components break there is a risk of cut injuries. Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Warning	Sample feeding with an attached carousel is prohibited! Feed the carousel on a suitable work surface.

Risk	Live parts When replacing them there is a risk of electrocution. Before modifying the instrument: ▪ Allow the furnaces to cool down. ▪ Disconnect the power supply plug.

Proceed as follows to cool down the instrument and disconnect it from the mains:

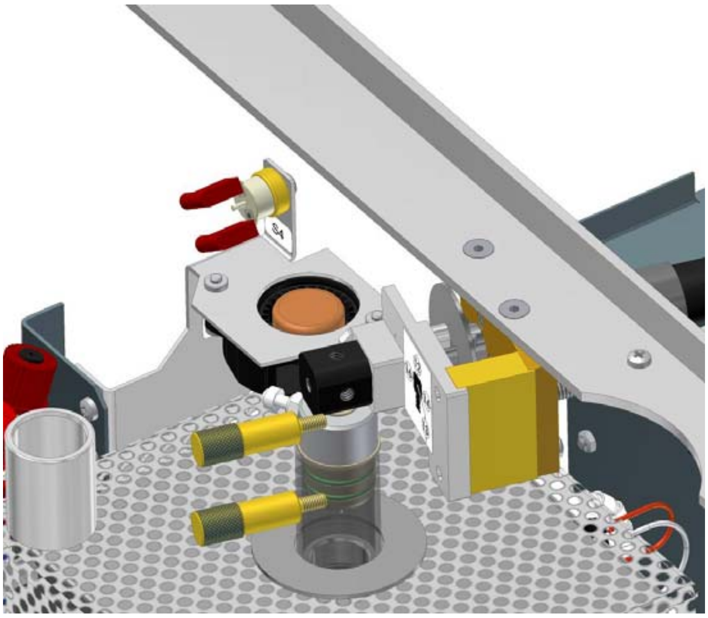
Step	Procedure
1	Set the setpoint temperature of the furnace to 0°C in the operating software. Open the "Instrument parameters" dialog by selecting **Options > Settings > Parameters**. 
2	Wait until the instrument has cooled down to at least 100°C.
3	Quit the operating software. Execute the following command: File > Exit.
4	Switch the analyzer and its peripherals off.

5	Disconnect the analyzer from the mains. Disconnect the power supply plug. The instrument is now ready for removal of the fuses.

Step 2

Modifying the instrument

Proceed as follows to modify the instrument:

Step	Procedure
1	Open the front door and remove the cover plate.
2	Loosen the locking screws at the multiway valve and the ground-in clamps of the carrier gas line to the combustion tube. 

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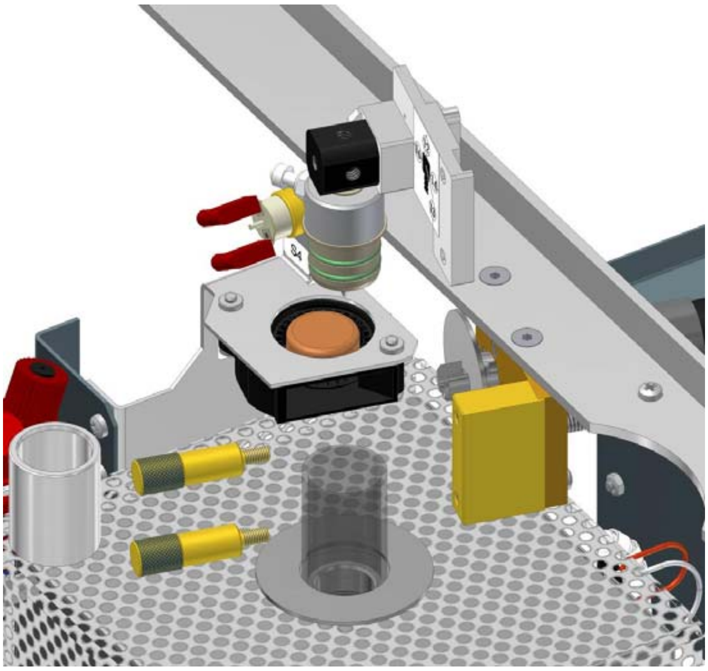
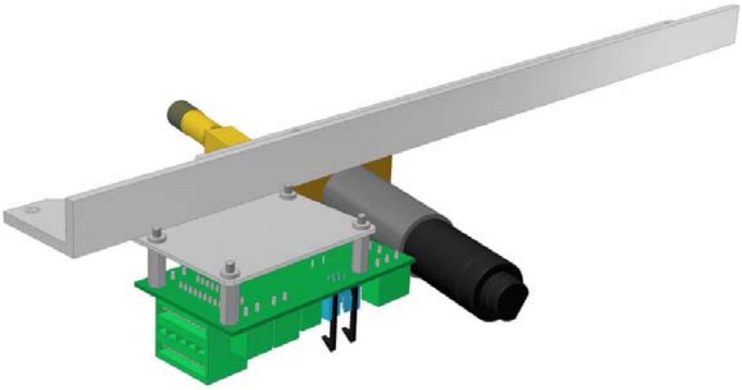
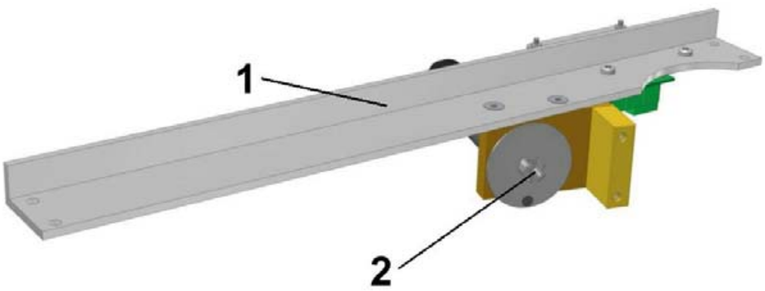
3	Loosen the injection unit from the combustion tube with careful jiggeling motions. Insert the injection unit into the parking position. 
4	Loosen ground-in clamp at the lower end of the combustion tube and pull the combustion tube out of the furnace. Place the combustion tube in the tube rack.
5	Remove the traverse from the instrument.  1 Traverse

6	Detach the electrical connections. 
7	Unscrew the multiway valve motor from the traverse.  1 Traverse 2 multiway valve motor

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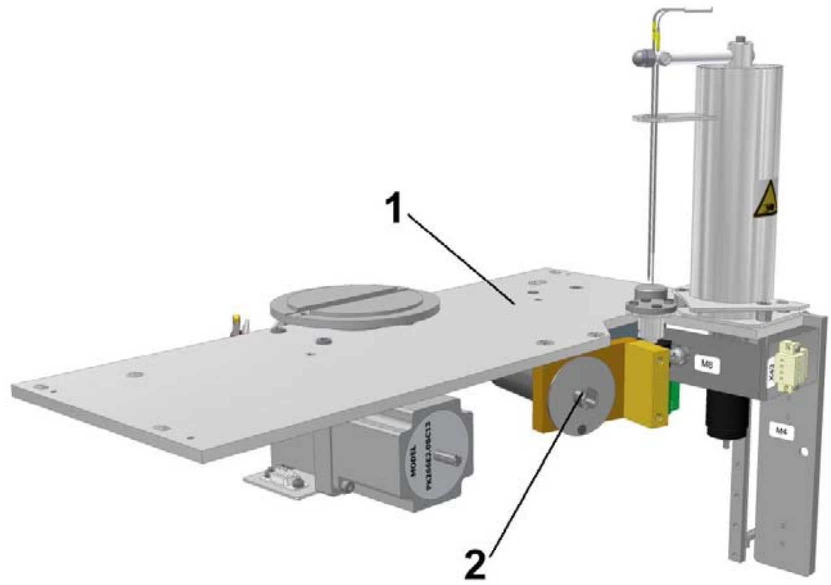
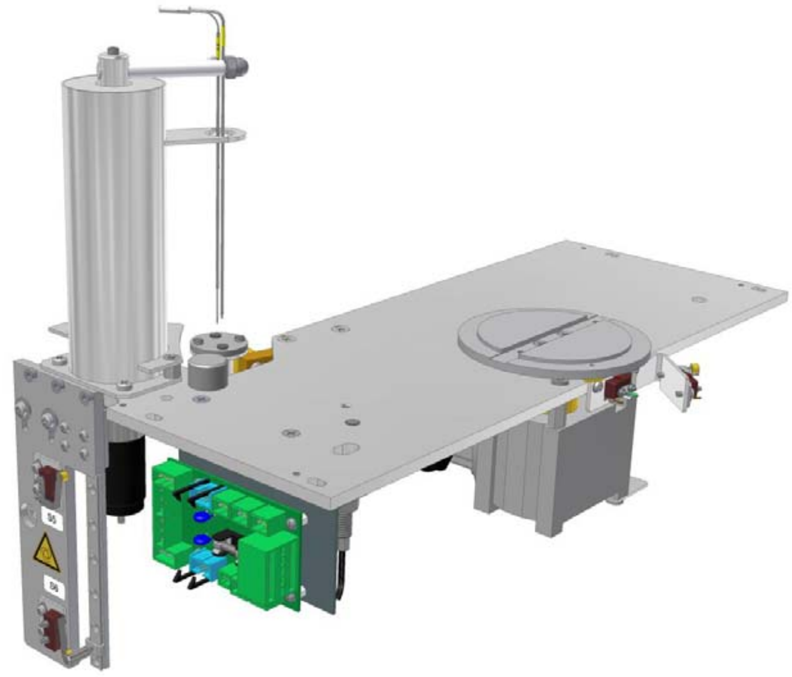
8	Take the retaining plate with ifting unit (feeding unit) and fasten the multiway valve motor.  1 Feeding unit 2 multiway valve motor

9	Put the feeding unit onto the retaining ridges.  1 Traverse with lifting unit Ensure that the injection unit is in the middle of the furnace hole. For this, you can attach the multiway valve to the motor. Now shift and align the feeding unit and tighten it with screws. Then unscrew the multiway valve again.

10	Connect the electrical connections. 

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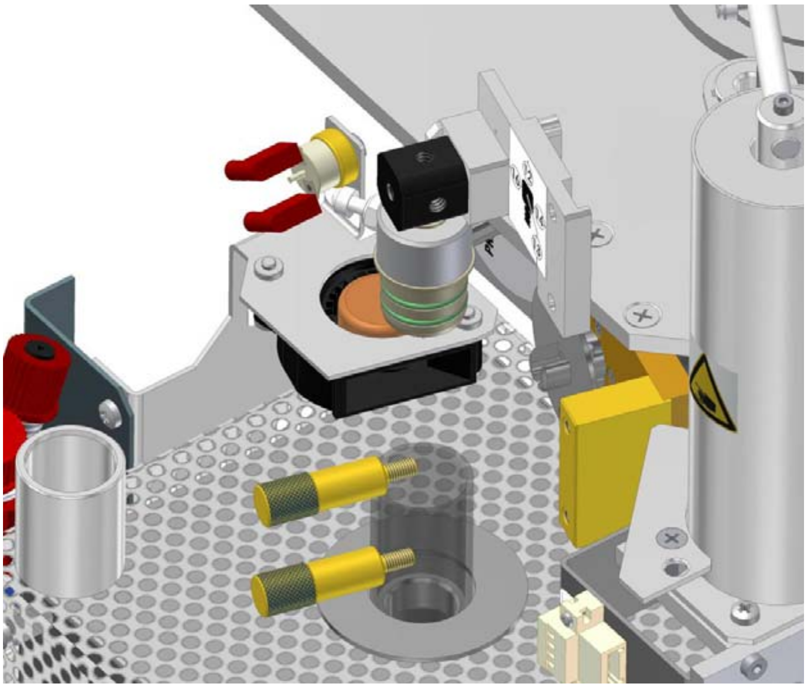
Step 3

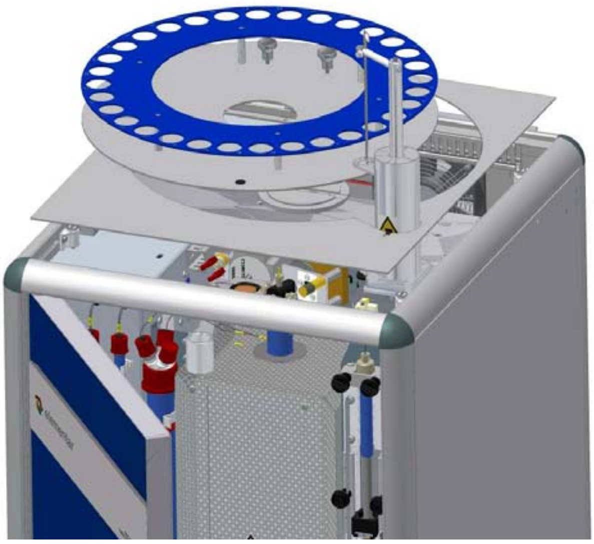
Deciding about the instrument variant

"Liquid" mode

Proceed as follows to modify the instrument to "liquid" mode:

Step	Procedure
1	Insert the combustion tube for liquid samples into the furnace. See *Filling the combustion tube, liquid mode* "Fill standard reaction tube, liquid mode" on page 395.
2	Fasten the combustion tube at the lower end with the condenser by means of a ground-in clamp.

3	Put the the multiway valve into the combustion tube, where there is a guiding provided for the multiway valve which has to snap into the tappet of the motor. 
4	Tighten the multiway valve with the locking screws and reconnect the carrier gas line with ground-in clamp.

5	Put the cover plate and the carousel back onto the instrument: The analyzer performs the automatic carousel recognition. Wait until it is completely processed. Put the suction and purging needle into the designated position. Put the stirring motor to the ideal height (see stirring device). Close the front door.  Note: Ensure that the stop pin is in hole No. 2.

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Deciding about the instrument variant

"Solids" mode

Note:

With the analyzer in automatic liquid mode it is possible to determine solid samples individually with the corresponding modification.

Modify the instrument for the solids mode.

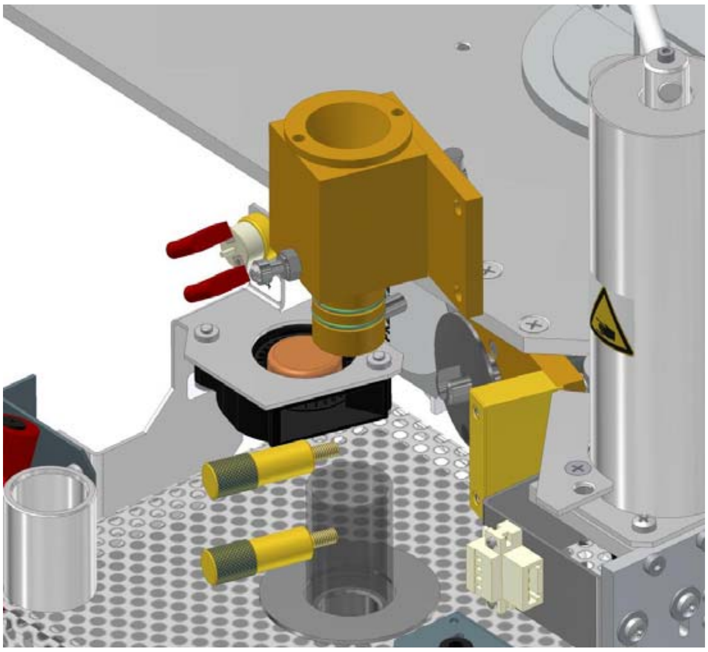
Confirm **No carousel**

The hole one the carousel serves as insertion hole.

All measurements are menu guided.

Proceed as follows to modify the instrument to "solids" mode:

Step	Procedure
1	Insert the combustion tube for solid samples into the furnace. See *Filling the combustion tube, solid mode* "Fill standard combustion tube, solids mode" on page 398.
2	Fasten the combustion tube at the lower end with the condenser by means of a ground-in clamp.

3	Insert the ball valve into the combustion tube, so that the tappet is in the multiway valve motor. 
4	Tighten the ball valve with the locking screws and reconnect the carrier gas line with ground-in clamp.
5	If the instrument has a stirring device, put them to the bottom by means of the provided locking screws. See *The stirring unit* on page 458.

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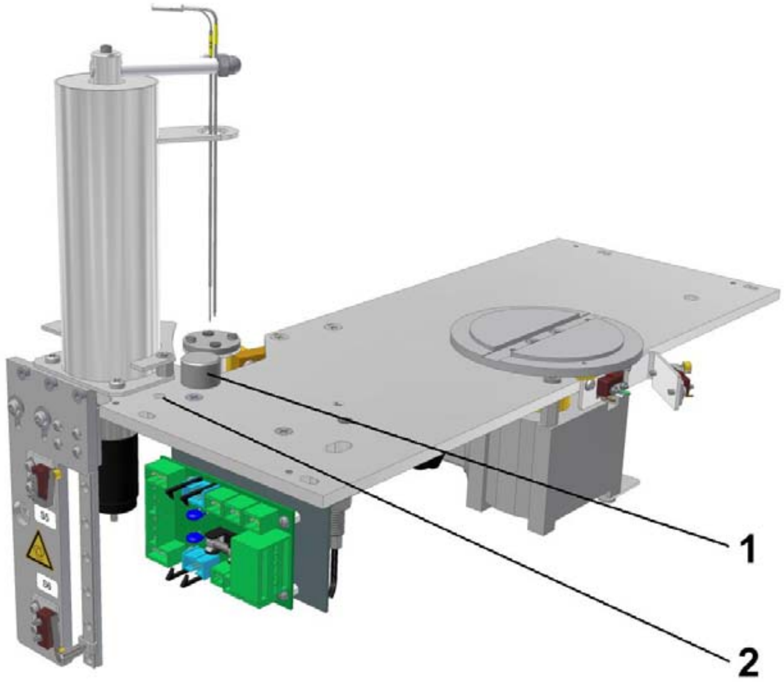
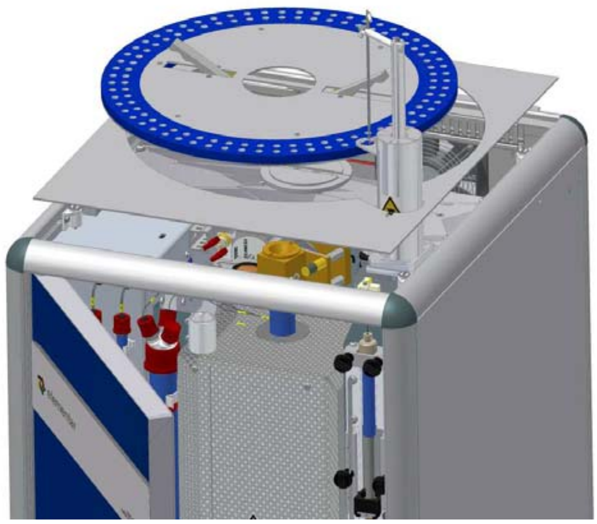
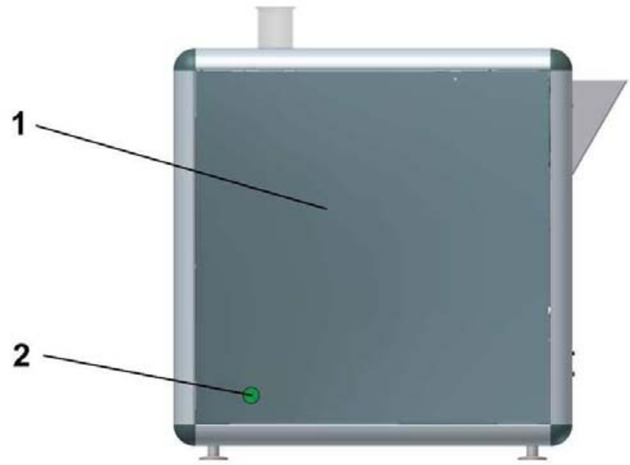
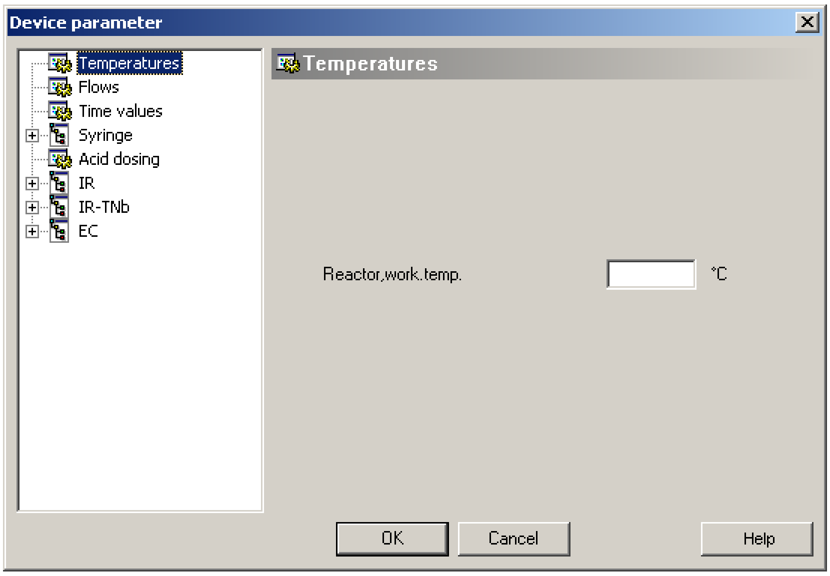
6	Place the stop pin into hole no. 2. By loosening the screws move the stirring motor toward the bottom.  1 Hole No. 2 with stop pin 2 Hole No. 1
7	Put the cover plate and the carousel back onto the instrument: Close the front door. 

Step 4
Turn on instrument

Proceed as follows to switch the instrument on again:

Step	Procedure
1	Plug the power supply plug of the analyzer into the socket.

2	Switch ▪ PC, ▪ monitor ▪ and printer on. Wait until the boot process is complete.
3	Switch the main instrument switch (2) on. Wait for completion of the reference run. 
4	Launch the operating software. Cf. *Starting the operating software* on page 205.
5	Go to **Options > Settings > Parameter** in the operating software and enter the temperature. The temperature in the liquid mode is 850°C. The temperature in the solids mode is 950°C. 

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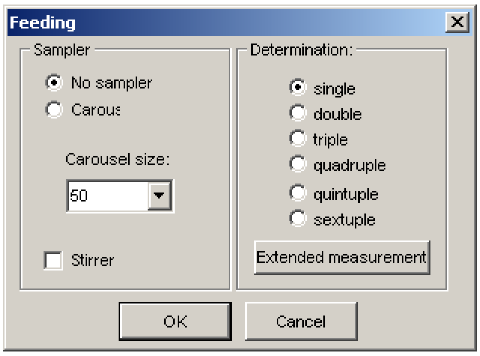
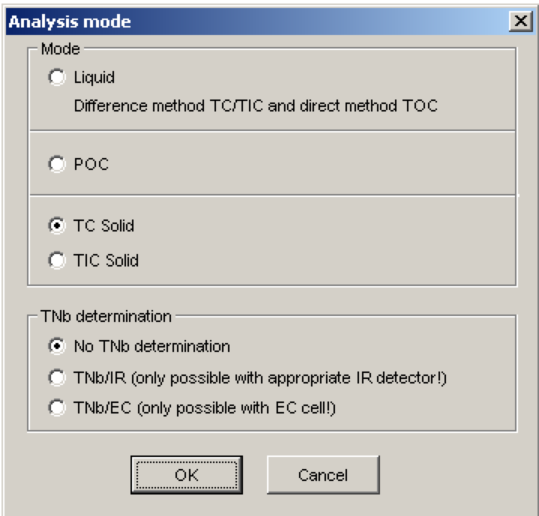
6 Go to **System > Feeding** in the operating software, enter **Carousel** and select the size of your carousel.



7 Go to **System > Mode** in the operating software and enter the solids mode or liquid mode.



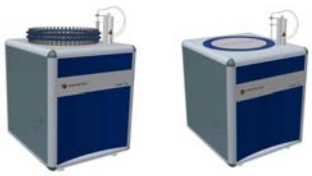
8 Proceed on the basis of the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. The instrument is only ready to measure when the leak test is successful.

Modifying from automatic liquid operation to automatic solids operation

The instrument

The following picture shows the instrument:



Note:
Modifying from one mode into the other requires tube and carousel exchange.

Modification process

The modification is divided into the following steps:

Step	Description
1	Preparing the instrument:
2	Modifying the instrument
3	Getting the instrument ready to measure

Safety instructions

Observe the following safety instructions during all steps:

Warning

Hot instrument parts and hot ash particles

When replacing hot instrument parts there is a risk of burning due to hot instrument parts and hot ash particles.

When replacing:

- Wear protective glasses.
- Wear the enclosed heat protection gloves.
- Place the hot instrument tubes in a tube rack on a level, non-combustible surface.
- Protect the hot instrument parts from unauthorized access.

Caution

Lack of ventilation of the analyzer

A lack of ventilation leads to overheating of the analyzer.

Before switching off the instrument:

- Set furnace setpoint temperature to 0 °C.
- Allow the furnace to cool down until the temperature displayed is 100 °C.

Warning

Sharp pieces of broken glass

When cold quartz or glass components break there is a risk of cut injuries.

Wear the enclosed protective leather gloves when handling cold quartz and glass parts.

Before starting maintenance work, always remove all samples from the carousel.

Step 1

Preparing the instrument:

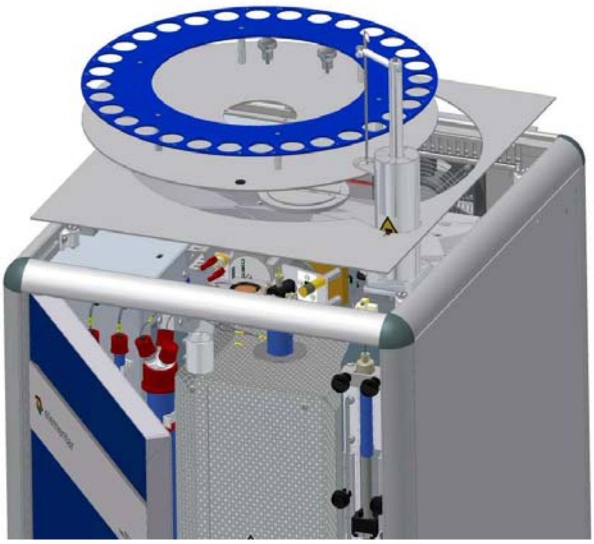
Gas pressure

Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Prior to exchanging parts, shut off the gas supply into the instrument. To do so, execute the **Options > Maintenance > Replace Part** command.

Step 2

Modifying the instrument

Proceed as follows to modify the instrument from liquid mode into solids mode:

Step	Procedure
1	Remove the carousel and the cover plate from the instrument. Pull the suction and purging needle out of the sampler arm. Open the front door. 
2	Loosen the locking screws at the multiway valve and the ground-in clamps of the carrier gas line at the multiway valve.

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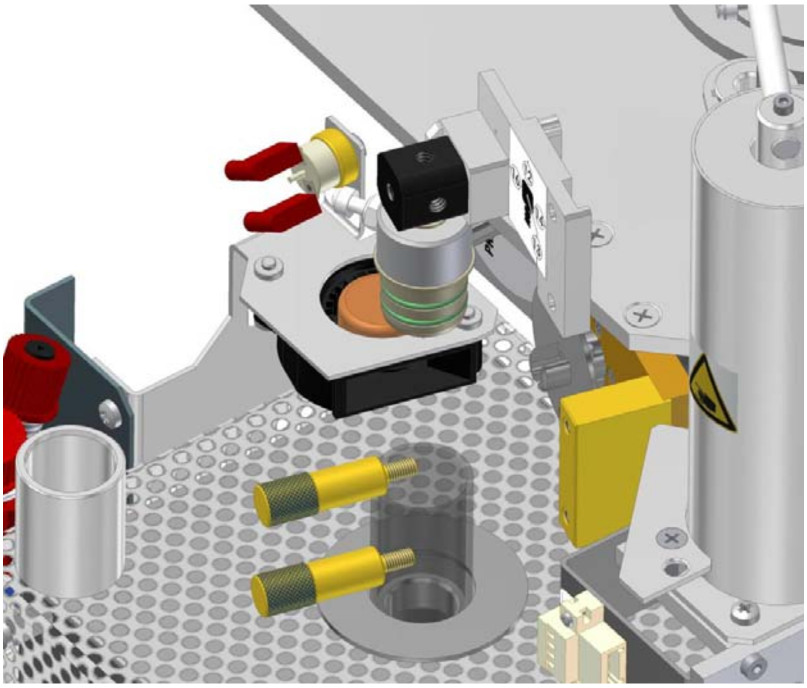
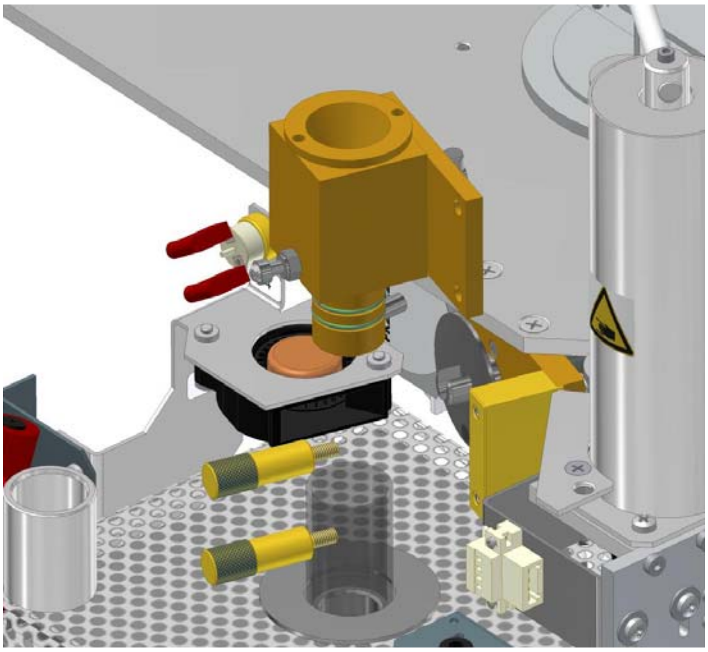
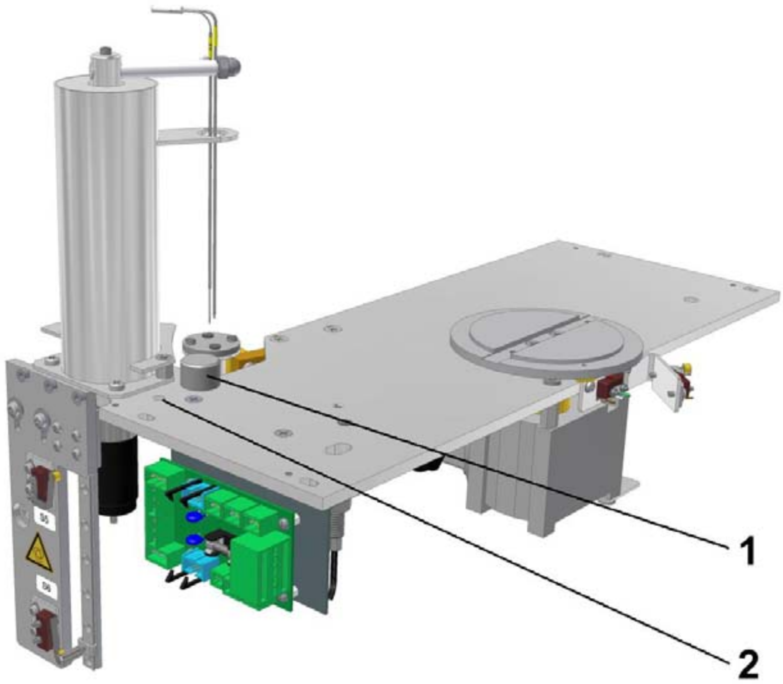
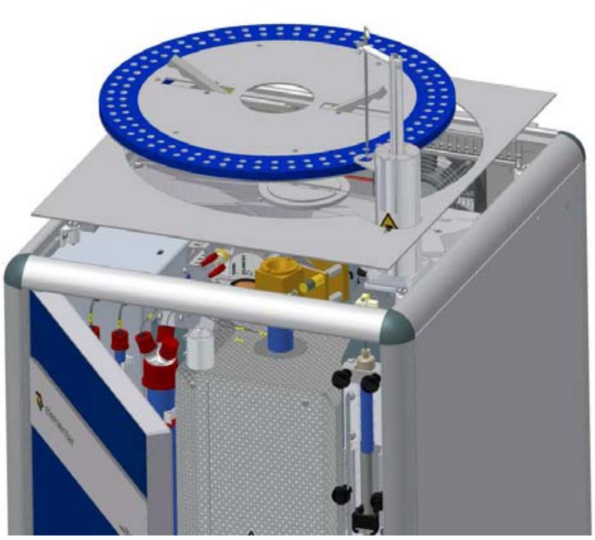
3	Pull the injection unit (multiway valve, injection plug) out of the combu-stion tube with careful jiggeling motions. Hold the combustion tube with one hand. Put the multiway valve into the designated park position. 
4	Loosen ground-in clamp at the lower end of the combustion tube and pull the combustion tube out of the furnace. Place the combustion tube in the tube rack.
5	Take the combustion tube for solid samples and insert it into the furna-ce.
6	At the lower end of the combustion tube connect the end of the con-denser with a ground-in clamp.

7	Carefully insert the ball valve into the combustion tube so that the tappet at the back of the ball valve is in the multiway valve motor. 
8	Tighten the ball valve with the locking screws and fasten the carrier gas supply lines at the ball valve by means of the ground-in clamp.
9	If the instrument has a stirring unit, move it by adjusting the screws to the bottom. The stirring unit is located behand the right side wall of the analyzer. See *The stirring unit* on page 458.

10	Place the stop pin into hole no. 1.  1 Hole No. 2 with stop pin 2 Hole No. 1

11	Put the carousel for solids onto the instrument. The feeding hole of the carousel has to be placed above the ball valve and the carousel has to snap into the holes of the rail.  Note: Suction and purging needle do not have to be installed in the solids mode. When changing from solid to liquid mode place the stop pin into hole No. 2 and align the stirring unit by moving the screws upwards.
12	Put the cover plate on the instrument and close the front door.

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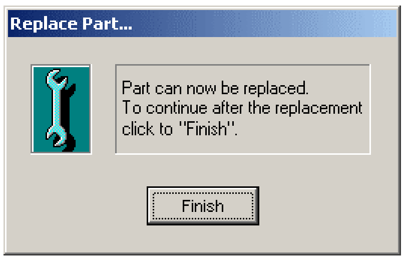
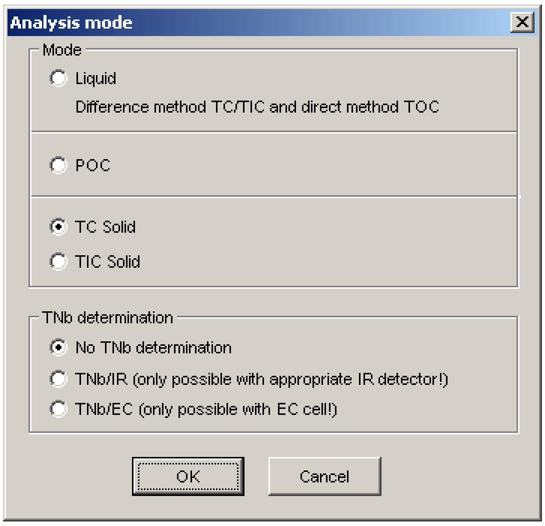
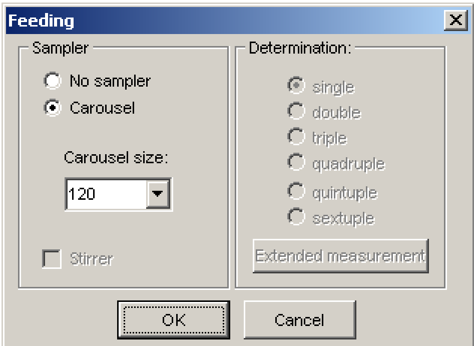
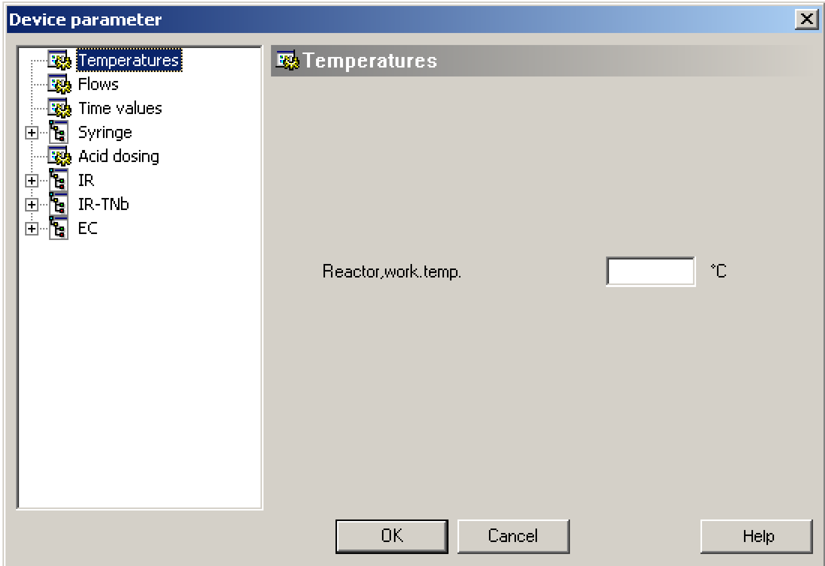
Step 3

Getting the instrument ready to measure

Proceed as follows to get the instrument ready for meaurement:

Step	Procedure
1	Close the "Replace part" dialog in the operating software. To do so, click **Finish** in the "Replace part" dialog.  By doing so, the gas will be automatically turned on.

2	Go to **System > Mode** in the operating software and enter the solids mode. 
3	Go to **System > Feeding** in the operating software and enter "carou-sel" and the size of the magazine. 

4	Go to **Options > Settings > Parameter** in the operating software and enter a temperature of 950°C.  The temperature in the liquid mode is 850°C.
5	Proceed on the basis of the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. The instrument is only ready to measure when the leak test is successful.

To be observed after maintenance

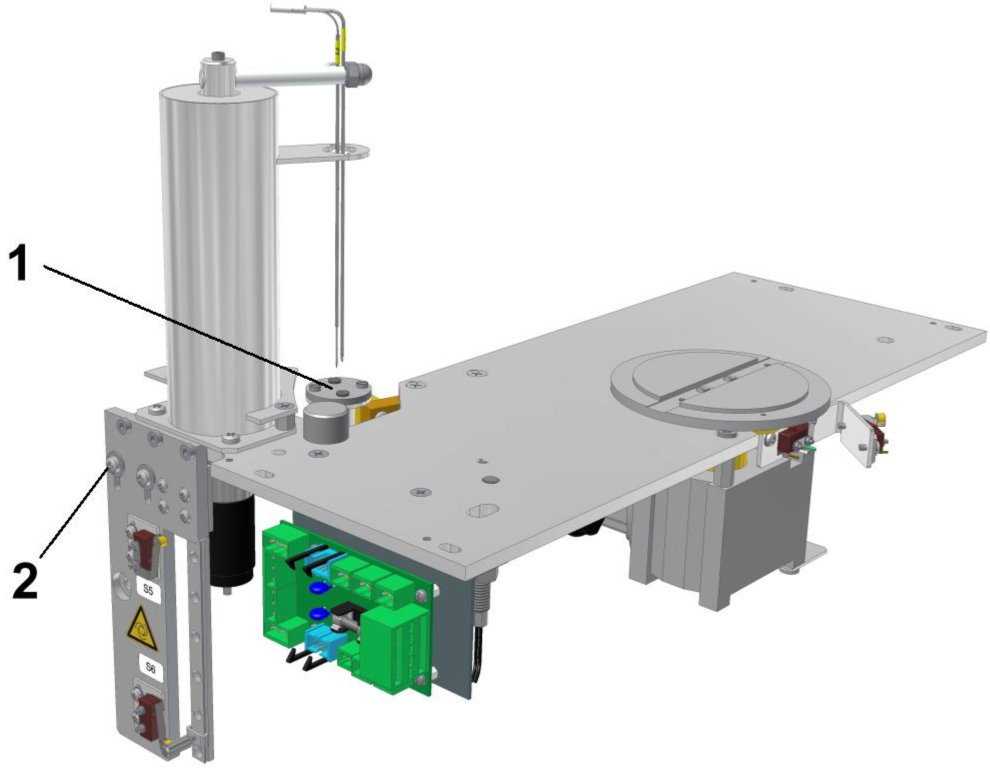
If you have performed maintenance work that has a defined maintenance interval, you must manually reset the "Status" field to zero on the respective "Event" tab.

The stirring unit

Purpose

The stirring unit serves for the homogenization of particles containing samples. These may be homogenized with either general or special methods.

The stirring unit



1 Stirring magnet

2 Setscrews for stirring unit

Note:

To adjust the stirring unit use the setcrews and define the position by moving it up and down.

Adjusting the suction and purging needle

Purpose

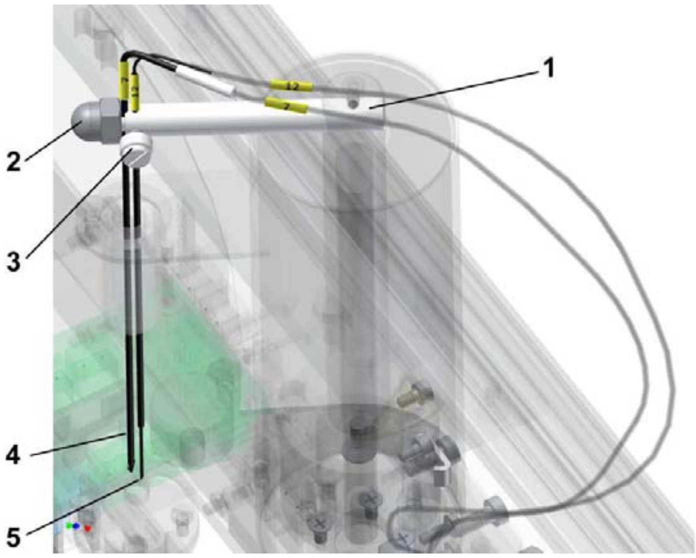
Adjusting the suction and purging needle is important for not to influence the sampling and for not to damage the instrument.

Condition

Installation of the suction and purging needle has to be carried out only if the carousel has been taken off.

Handling

The following picture shows the suction device:



1 Suction device
2 Lock screw purging needle
3 Lock screw suction needle
4 Purging needle
5 Suction needle

Proceed as follows to adjust the suction and purging needle:

Step	Procedure
1	Put the suction device (without needles) into the sample arm and fasten it with an Allen wrench.
2	Move the sample arm up via **System > Arm up**.
3	Install the purging and suction needle as in the picture shown above. Put the hose No. 12 over the suction needle. Put the hose No. 7 over the purging needle.

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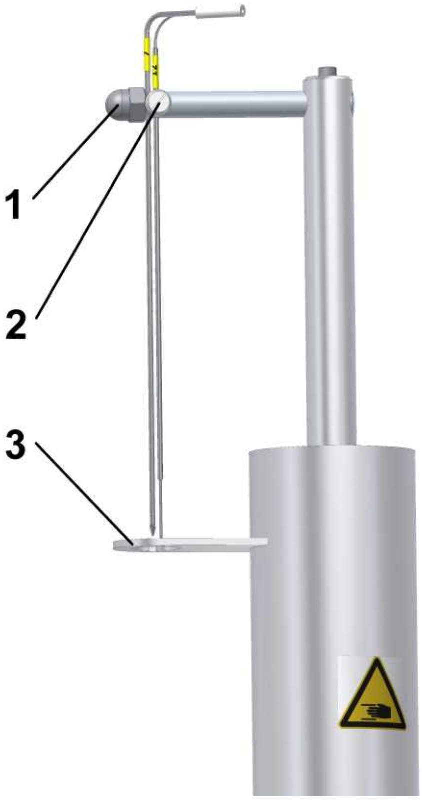
4	Proceed as follows to adjust the exact height of the needles: Pull the needles as far as they are flush with the deflector plate. Note: If septum is used, work with suction needle only! Both holes of the outer sheating of the suction needle have to be in the septum. Tighten the needles with the locking screws. See following picture:  1 Lock screw purging needle 2 Lock screw suction needle 3 Deflector plate

7.3 System Suitability Test

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

This section enables you to perform a system suitability test in order to test the quality of the instrument. The system suitability tests follows the European Pharmacopoeia 6.0, vol. 1 (20244) 2008, p.71 and the U.S. Pharmacopoeia-NF, USP 30 (643) 2007, p.257 cf.

Overview

"System Suitability Test" is divided into the following topics:

Topic	Page
System Suitability Test	462
Measurements in the trace range	466

System Suitability Test

Purpose

This system suitability test enables you to test the quality of your instrument.

Requirements

Before starting work, the following requirements must be met:

- the instrument must be switched on
- the software has to be started.
- the instrument has to be ready to measure (parameters, mode etc.)

Procedure

The system suitability test is divided into the following steps which have to be consecutively carried out.

The system suitability tests follows the European Pharmacopoeia 6.0, vol. 1 (20244) 2008, p.71 and the U.S. Pharmacopoeia-NF, USP 30 (643) 2007, p.257 cf.

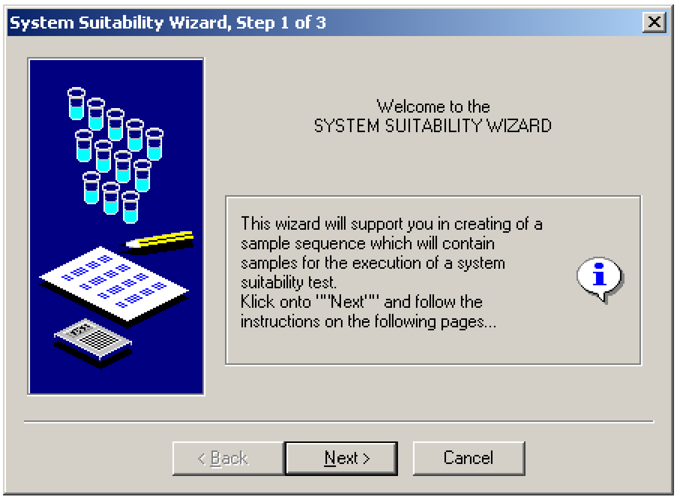
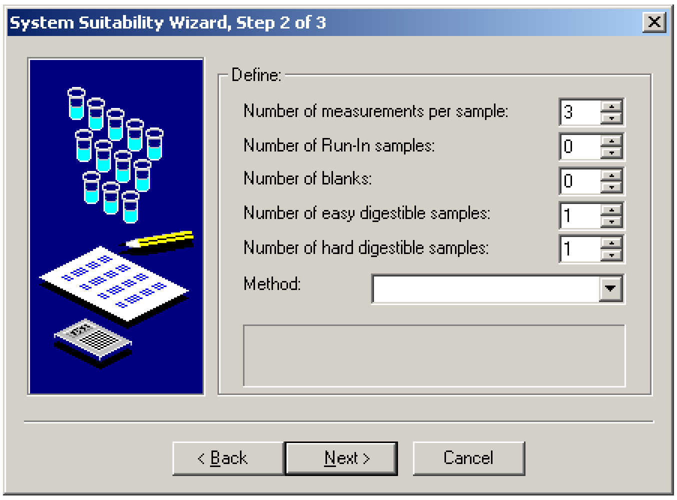
1) Preparation and measurement

2) Evaluation.

Preparation and measurement

Proceed as follows to prepare and measure:

Step	Procedure
1	Always use clean sample vials without any organic residues. Use ultra pure water (...) for rinsing the sample vials. Use ultra pur water for sample dilution as well as for blank value determination. See cleaning sample vials (refers also to "Cleaning Glass Apparatus", US Pharmacopeia-NF, USP 30 <1051> 2007, p.500).
2	Prepare a standard solution (r_s). For this, suspend sucrose in ultra pure water to a concentration of 1.2 mg/l (results in a C concentration of 0.5 mg/l). The diluted sucrose represents for the system suitability test the easily digestible substance.
3	Prepare a standard solution (r_{ss}). For this, suspend 1.4 benzoquinone in ultra pure water to a concentration of 0.75 mg/l (results in a C concentration of 0.5 mg/l as well). The diluted benzoquinone represents for the system suitability test the hardly digestible substance.

<table>
<tr><td>4</td><td>Go to Wizards > System suitability test.
The dialog "Step 1 of 3" opens.

</td></tr>
<tr><td>5</td><td>Click Next.
The dialog "Step 2 of 3" opens.


Enter the number of measurements per sample.
Enter the number of conditioning samples.
Enter the number of blan value samples.
Enter the number of easily digestible samples.
Enter the number of hardly digestible samples.
Enter the desired measure method.</td></tr>
</table>

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<table>
<tr><td>6</td><td>Click Next.
The dialog "Step 3 of 3" opens.

</td></tr>
<tr><td>7</td><td>Click "Finish".
The measuring process will be created in the text view.</td></tr>
<tr><td>8</td><td>Load the carousel with the samples according to the list in the text view.
Warning Sample feeding with an attached carousel is prohibited!
Feed the carousel on a suitable work surface.</td></tr>
<tr><td>9</td><td>Start continued alnalysis via System > Auto run.
The series of measurements will be processed.</td></tr>
</table>

Evaluation

Proceed as follows to evaluate the series of measurements:

Step	Procedure
1	Go to **Math. > System suitability test**.

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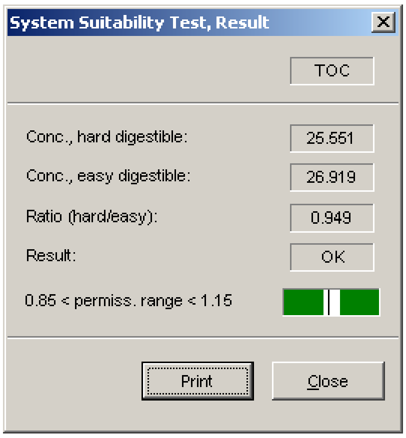
2 The following dialog is displayed:



The system suitability test is regarded as successful if a value between 0.85 and 1.15 has been computed.

The result is the ratio of the hardly to the easily digestible substance and the compensated blank value.

$$S = \frac{r_{ss} - Bw}{r_s - Bw}$$

r_{ss}	hard to digest substance
r_s	easy to digest substance
Bw	Blank value
S	System suitability

Measurements in the trace range

Target group

The target group is personnel authorized by Elementar Analysensysteme GmbH.

Purpose

Basically, analytical works have to be performed with special diligence. This applies in particular for works in the trace range, since smallest errors here can have serious influences on the result Main task is to keep the blank value of all deployed reagents and vessels as low as possible and to avoid additional contaminations.

The rule applies that the proper preparation of an anlysis already starts with the sampling. After the sampling, the appropriate transportation and stocking follows. For this we refer to the relevant technical literature for the corresponding analytical task.

It has to be observed:

Proceed as follows to prepare and measure:

Object of observation	further explanation
Solutions of low content (concentration < 5ppm) have a very short durability which is to be measured rather in hours than in days. This applies both for samples and for reference / calibration standards.	Therefore, samples with low concentration should be measured immediately after their sampling. Samples and standards with low concentrations should be prepared and/or diluted from solutions with higher concentrations immediately before they are to be analyzed.
Use solutions and standards with low concentration always freshly.	In case a short term stocking of samples and standards would become necessary, the sample can be stabilized for a short period by adding of diluted acid (e.g. approx. 10 µl 1 % HCl or 1 % H_3PO_4 for 10ml sample). After that however, measurement of TIC is no longer possible. Basically, H_2SO_4 should not be used.

Sample preparation / Cleaning the sample vials	A careful cleaning of the deployed sample vials is also part of the sample preparation. Recommendations on preparation of vessels are given in the U.S.Pharmacopoeia-NF, USP 30 □1051□ 2007, p.500. One of the methods described here is cleaning the vessels with nitric acid (HNO_3). This method has proven to be effective and quite simple in its procedure. For this, an acid bath has to be made by means of 20 % HNO_3 and the vessels have to be inserted for several hours (preferably over night). Then the vessels have to be flushed with distilled water (aprox. 10 times) and another 3 - 5 times with ultra pure water. Now the vessels have to be dryed in a clean and dedicated drying cabinet at raised temperature (Attention: Do not dry volumetric flasks at temperatures greater than 25 - 30 °C!). For further storage the vessels have to be sealed with parafilm.
All sample vials must be carefully cleaned before their usage.	It shall be considered that with TIC measurements in the lower ppm and/or ppb range the solution tends to be balanced to the carbon dioxide (CO_2) content of the air. If the samples remain on the sampler for a longer time, this may lead to a measurable accumulation of the sample with CO_2 (increase of CO_2 - concentration by and by). Therefore, the samples have to be covered. The use of aluminum foil, septum or other suitable covers are recommended. It is also recommended to measure samples with a very low TIC content immediately. The processing of few sample numbers in mulitple sequences brings more reliable results than when feeding the complete sampler at once.

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Samples with low TIC content accumulate with CO2 from the air and have to be covered and always used fresh.	Prior to the performance of an analysis run the quality of the used ultra pure water has to be checked by all means. The minimum requirements for an operational qualification (OQ) according to the requirements of the European Pharmacopoeia 01/2005:20245 is as follows: conductivity < 1.0 µS·cm-1 at 25 °C, TOC < 0.1 mg/L. However, it is recommended to use significantly lower values. As a rule, measurements in the trace range shall always be processed with fresh water and during an analysis run the same water (from the same day and from the same source) for all applications (blank determination, dilution of the samples, preparation of standards, cleaning steps) shall be used. A careful blank determination at the beginning of an analysis run is precondition for reliable measuring results.
Use fresh water for all applications during an analysis run. A careful blank determination is precondition for the accuracy of an analysis.	It may be possible that the used catalyst leads to an increased carbon blank. This can be observed especially directly after an exchange of the catalyst. In this case, the catalyst shall be conditioned first by measuring several samples which only contain diluted acid (e.g. 1 % HCl or 1 % H_3PO_4) or distilled water. For measurements in the sub-ppm range it is helpful to do without a catalyst.
A new catalyst has to be conditioned prior to usage. In the sub-ppm range the usage of a catalyst is not necessary.	

Calibration in the measuring range < 2 mg/l

Special care shall be taken for the calibration in the trace and ultra trace range.

In general, at least a 5-point calibration and at least a triple determination per calibration point shall be processed.

For calibrations in the ppb range it is recommended to work with a dilution series with fixed volumes and higher injection volumes (2 mL).

It may be helpful to force the calibration curve through the point of origin. For this purpose set the coefficient "a" = 0 manually after completion of the calibration evaluation. This shall only be applied in exceptional cases.

7.4 Modification to POC operation

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section is meant to explain the modification to POC operation.

Overview

"Modification to POC operation" is divided into the following topics:

Topic	Page
Basic security settings	470
Product description	474
The POC module	476
Function of the POC module	480
Operation of the POC module	487

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7.4.1 Basic security settings

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This section describes basic safety rules required to avoid risks for the user of the analyzer.

Overview

"Basic safety rules" is divided into the following topics:

Topic	Page
Working with the operating instructions	471
Safety instructions	472

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Working with the operating instructions

Operating the analyzer	Read the operating instructions thoroughly before performing work with the analyzer.
Storing the operating instructions	Store the operating instructions carefully and make sure the instructions are accessible for all relevant personnel.
Passing on the operating instructions	If you pass on the analyzer, always pass on the operating instructions, too.

Safety instructions

General

The POC module is an accessory to **vario TOC**.

This modification instruction only explains the operation and maintenance. The knowledge of the vario TOC operating instructions is prerequisite for a proper operation.

The POC module is exclusively suitable for the carbon analysis of liquid samples which can be decomposed under method depending combustion conditions.

The analysis of aggressive chemicals, acids, bases, solvents, explosives or materials which may form gas mixtures of potentially explosive nature is strictly prohibited. It may lead to serious damages of the instrument and injuries to the operating personnel. For the above mentioned and/or for difficult applications you may use the counseling service of our application lab in order to develop safe working instructions and to use special parameters and/or instrument options, if necessary.

Operation and maintenance may only be performed by trained personnel. In order to guarantee a trouble-free and optimum operation, it is necessary to the carefully read the supplementary operating instructions. For future questions this supplementary operating instructions shall be carefully kept. Deviations regarding illustrations and technical data in these supplementary operating instructions are subject to change due to further developments. The data mentioned in the software illustrations are only examples and may differ from the actual parameters. Please use the parameters valid for your instrument for the installation CD.

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Set up / Initial operation

The initial operation of the POC module may only be performed by personnel which was authorized by Elementar Analysensysteme GmbH.

The opening of the transport packaging may lead to loss of warranty! If visible damages of the delivered parts can be detected, please immediately inform the forwarder and the contractor.

The installation room has to be well ventilated!
The exhaust line (connection IR) has to be lead into the open and/or extractor hood since during operation toxic gases (e.g. SO2, NO, NO2, Cl2 etc.) are formed from the samples and may leave the instrument. During permanent operation the accumulation of the corresponding gases in the air may be over the admissible maximum allowance contranction.

The end of the waste gas lines must discharge into the open at a location protected from the wind as pressure fluctuations, e.g. caused by wind, cause detector instabilities.

The liquid residues of the deterimination are partly strongly acidic and must only be lead into the canalization after neutralization. If the analyzed samples contained compounds hazardeous to water, the liquid residues have to be disposed duly elsewhere.

Reagents

Observe the safety instructions of the chemical manufacturer (on the label of the bottle or in the safety data sheets) when handling chemicals.

Wear protective glasses and the protective gloves when handling acids, Sicapent® (phosphorus pentoxide) and magnesium perchlorate.
Caution: danger of chemical burns!

When handling cold quartz and glass parts use the furnished leather gloves, otherwise risk of injuries due to breakage of glass.

Maintenance / Tube exchange

The proper operation of the POC module can only be guaranteed when using original consumables and spares which can be purchased at Elementar Analysensysteme GmbH or authorized dealers. When using other consumables or chemicals of unsufficient quality injuries of the operating personnel or damages at the instrument may occur. Also the analysis results could be distorted. Unsuitable spare parts may lead to instrument damages and loss of warranty.

All maintenance intervals mentioned in this short instruction manual are significantly depending on the particular sample matrix. They are only examples and by no means guarantee service life of consumables or wear and tear parts.

The walls and doors of the instrument may only be opened by authorized personnel for the purpose of maintenance.

Prior to opening the instrument rear wall the peripheral instruments and the analyzer shall be disconnected from the mains by turning off the main switch and pulling the power supply plug.

Danger by electric shock - 110-230 Volt!

Caution: The furnaces have to be cold, otherwise overheating of some parts may occur. Prior to reinitialisation, the casing has to be reinstalled properly (mind the protective conductor).

Before and after the modification to the solids mode, remove the acid from the container and from the syringe for safety reasons.

The IR detector must not be put under pressure at any time. This may lead to damages at the components.

7.4.2 Product description

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This section provides general information about the instrument.

Overview

"Product description" is divided into the following sections:

Topic	Page
Scope of delivery	475

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Scope of delivery

Scope of delivery

POC module

Accessory to the vario TOC which allows the measurement of volatile compounds in liquids.

Prod. No. 38.00-0407

Spare parts list

Following the list of furnished spare parts:

Spare part	Article no.
CO_2 absorption tube.	38.00-0007
Hose line	38.00-0540
Ground-in clamps	05 000 287
CO_2 absorber	38.00-0408
Filter pads	03 002 399

7.4.3 The POC module

Target group

The target group is all personnel working with the instrument.

Purpose

The destion shows the construction of the POC module.

Overview

"The POC module" is divided into the following topics:

Topic	Page
Functional diagram	477
The components	478
General measuring principle	479

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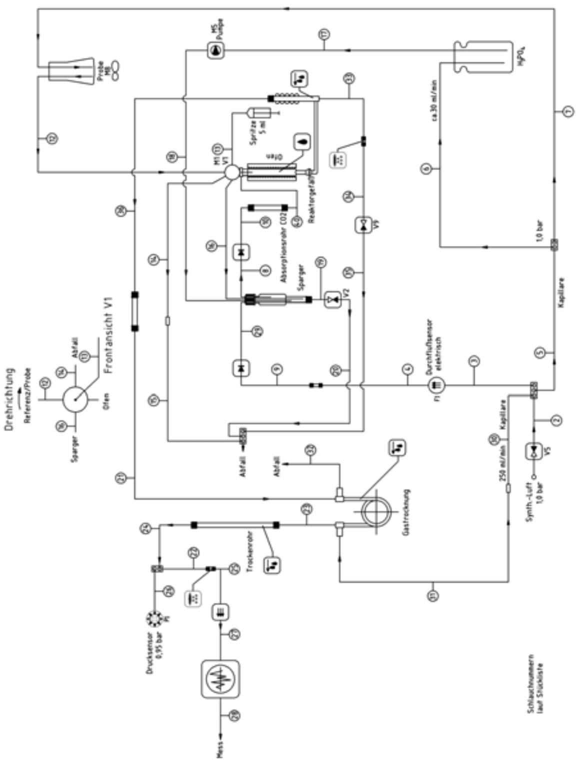
Functional diagram

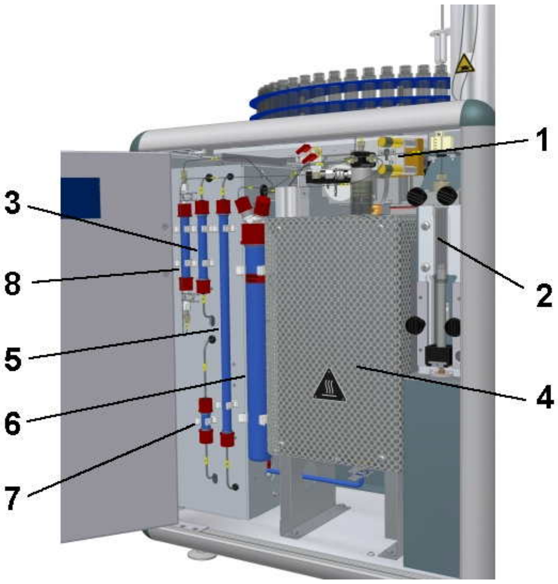
Functional diagram The following picture shows the functional diagram of the POC module:



The components

The components

The following picture shows the POC module in detail:



The following table describes the individual components of the POC module:

1 multiway valve

2 Syringe

3 Halogen absorber

4 Furnace with heat protection cover

5 Drying tube

6 Acid container

7 Control tube

8 Absorption tube

General measuring principle

General measuring principle

Sample insertion in direct procedure (POC) and initiation of measurement is divided into the following steps:

Step	Procedure
1	The IR detector performs autozero alignment of the measuring signal.
2	Meanwhile the measuring system is flushed with the corresponding sample. The multiway vale goes to two different positions a) suction of the sample b) waste
3	Subsequently, the syringe is filled the corresponding injection volume.
4	The IR detector determines the baseline.
5	The multiway valve goes to the 4th position. - Injection of the samples into the sparger
6	A pressure drop takes place and the sample is injected into the spar-ger.
7	CO_2 of inorganic origin (TIC) will be absorbed. All volatile organic compounds (POC) are purged and completey oxidized.
8	The gas flows through different absorption and drying steps and is then analyzed in the IR detector for CO_2.
9	From the integral value the POC concentration will be calculated by means of a calibration coefficient. After completion of the analysis the result can be saved.

7.4.4 Function of the POC module

Target group

The target group is all personnel working with the instrument.

Purpose

The destion shows the function of the POC module.

Overview

"Function of the POC module" is divided into the following topics:

Topic	Page
Selecting the operating mode	481
Filling the absorption tube	483
Modification to POC mode	484

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Selecting the operating mode

Essential condition

Before switching operating modes, you must have performed all refitting work required for the new operating mode.

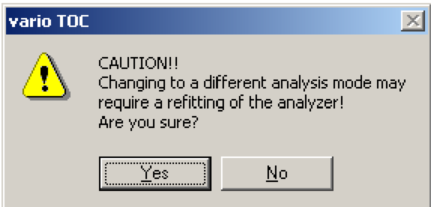
The tube fillings contain the same materials as for the TOC liquids mode.

Selecting the operating mode

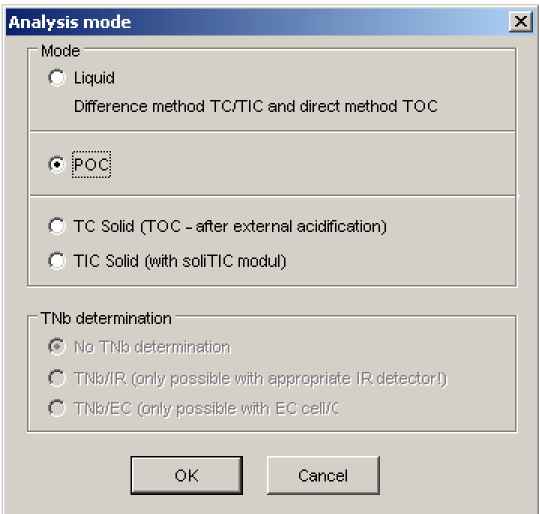
Caution	Overheating if tube fillings are not appropriate for the operating mode Overheated tube fillings melt, run into the furnace area and destroy the furnace. Make sure that the tube fillings correspond to the selected operating mode.

Proceed as follows to select the operating mode:

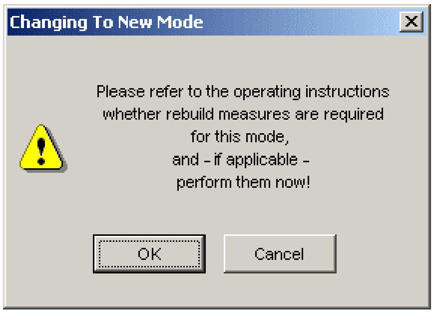
<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Perform all refitting work required for the new operating mode.</td></tr>
<tr><td>2</td><td>Open the "vario TOC" dialog in the operating software by selecting System > Mode.



</td></tr>
<tr><td>3</td><td>Click Yes if you want to continue.
The "Analysis mode" dialog is displayed:



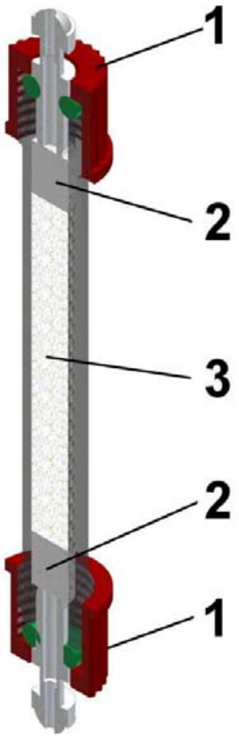
</td></tr>
</table>

4	Select the desired analysis mode. In this case "POC solids". Then click **OK**. The "Change to new mode" dialog is displayed: 
5	Click **OK** if you have refitted the instrument. The operating mode is changed.

Filling the absorption tube

Filling the absorption tube

The following picture shows the absorption tube of the POC module:



1 Screw caps
2 Filter pad
3 CO_2 absorber

To fill the absorption tube, proceed as follows:

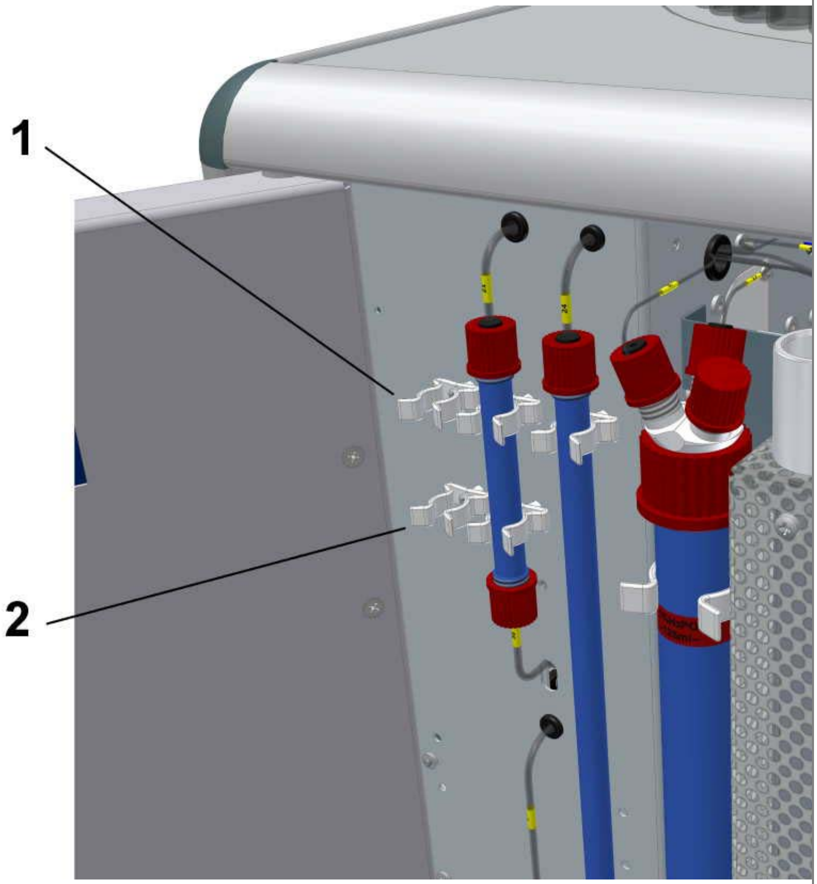
Step	Procedure
1	Put the filter pad (2) in the lower end of the absorption tube (1).
2	Screw the screw cap (1) onto the lower end of the absorption tube.
3	Fill the CO_2 absorber (3) into the absorption tube as far as a filter pad still can be put in.
4	Put the filter pad (2) in the upper end of the absorption tube.
5	Screw the screw cap (1) onto the upper end of the absorption tube.

Modification to POC mode

Modification of the basic instrument

For modifying the basic instrument the following points shall be completed one after the other.

It is necessary to turn off the vario TOC cube basic instrument.

Step	Procedure
1	Turn on the operation mode "POC" in the software under **System > Mode**.
2	Go to **System > Maintenance > Replace Parts**.
3	Take the holders and screw them into the provided bores next to the halogen absorber.  1 Holder, top 2 Holder, bottom

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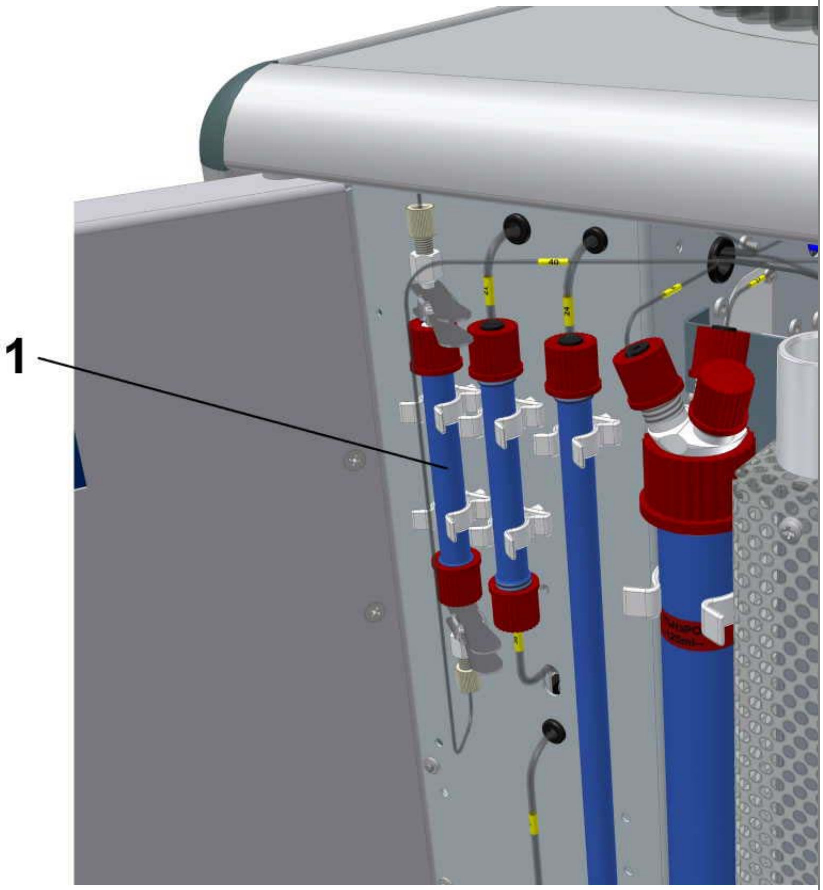
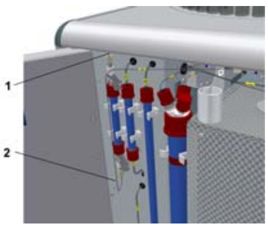
<table>
<tr><td>4</td><td>Clamp the filled absorption tube into the holders.


1 Absorption tube</td></tr>
<tr><td>5</td><td>Take the carrier gas tube no. 10 and clamp it to the upper end of the absorption tube.
Subsequently, take the tube no. 40 and clamp it to the lower end of the absorption tube.


1 Tube no. 40
2 Tube no. 10</td></tr>
<tr><td>6</td><td>Confirm the maintenance dialog with "Finish"</td></tr>
</table>

7	Check the temperature of 850°C in the software under **Options > Settings > Parameters** .

After the modification

If you have finished the modification, proceed according to the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528. The instrument is only ready to measure when the leak test is successful.

7.4.5 Operation of the POC module

Target group

The target group of this section is the personnel working with the instrument.

Purpose

This chapter enables the user to operate the POC module.

Overview

"Operation of the POC module" is divided into the following topics:

Topic	Page
Define methods	488
Define standard samples	489
Checklist	490
Calibration	491
Shut-down for measuring breaks	493
Maintenance work	494

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Define methods

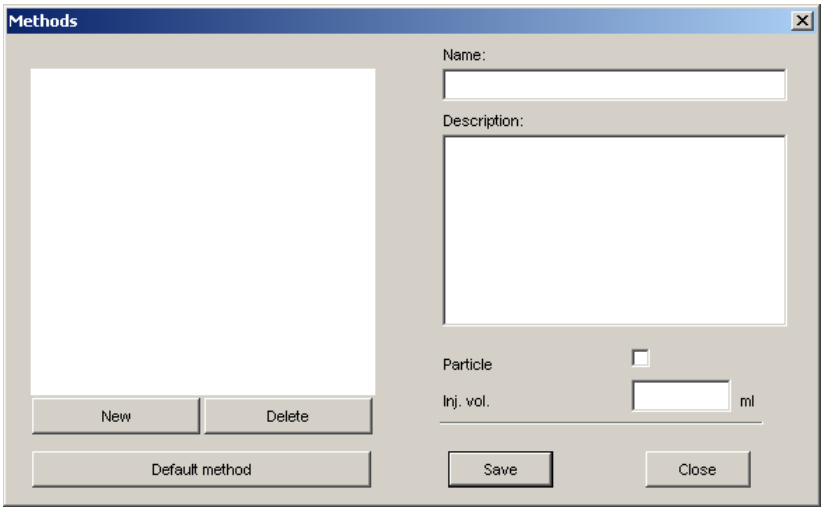
Note

You can only define custom methods if the open document is new, i.e.:

- it must not contain any entries such as name, volume, etc.
- and must not have been saved yet.

Defining custom methods

Proceed as follows to define custom methods:

Step	Procedure
1	Open the "Edit methods" dialog in the operating software by selecting **Options > Settings > Methods**. 
2	Click **New**. The "Method" dialog is displayed:
3	Enter the following: ▪ Enter the name of your method in the "ID" field. ▪ Enter the purpose of the method, for example, in the "Description" field. ▪ Input the corresponding method parameters in the other boxes.
4	Click **Save** in the "Method" dialog. This closes the dialog and your new method has been added to the list in the "Edit methods" dialog.
5	Click **Close** in the "Edit methods" dialog to close the dialog. You have now defined the method.

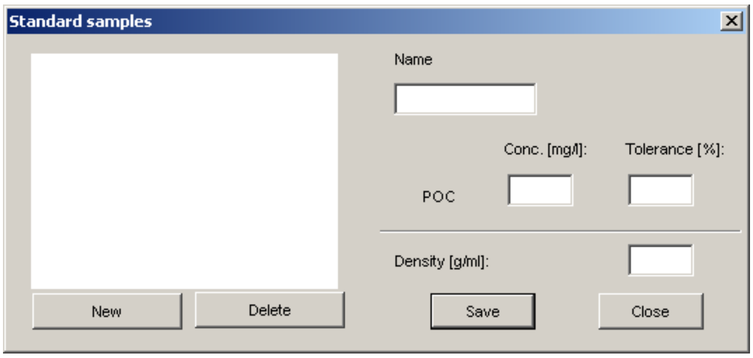
Define standard samples

Define own standard samples

Proceed as follows to define own standard samples:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Edit standard methods" dialog in the operating software by selecting Options > Settings > Standard Samples.</td></tr>
<tr><td>2</td><td>Click New.

The dialog of the standard samples is displayed:


</td></tr>
<tr><td>3</td><td>For the standard substance, enter:
the name of the substance in the "name" field.
the theoretical element content in the "Conc [%]" field; if the theoretical element content for one element of the substance is specified with 0, the element will be ignored for the calculation;
the permissible tolerance for each element, usually 5%, in the "Tolerance [%]" fields.</td></tr>
<tr><td>4</td><td>Click Save.</td></tr>
<tr><td>5</td><td>Click Close.

This closes the dialog and saves the settings.</td></tr>
</table>

Checklist

Prior to the analysis run

Prior to starting an analysis run, the following points shall be completed:

- Maintenance intervals observed?
- Operation mode "POC" set?
- Gas on?
- Pressure on?
- Lecktest passed?
- Absorption tube filled and installed?
- Detector signal stable?
- Sample name, method and standard samples edited and assigned?

Calibration

Background

These operating instructions contain specific rules for the calibration. If you want to use these rules, you must define the standard substances used there as calibration samples. Of course, you can also use different substances but then you must develop the calibration rule yourself.

Defined calibration samples are displayed along with their theoretical contents in the sample view.

Required substances

If you want to perform calibration on the basis of the calibration tables, you must define certain standard substances depending on the operating mode for which you want to perform calibration.

The following table lists the standard substances required for calibration in the respective operating mode:

Calibration for operating mode	Potassium hydrogen phthalate	Sodium carbonate	Sodium nitrate	Ammonium chloride
TOC	X			
TC	X	X		
TIC		X		
NPOC	X			
TNb			X	X
POC	X)*			

)* Coefficients are transferred (from TOC to POC).

Theoretical element contents of standard substances

The following tables lists the theoretical element contents of the standard substances used in the calibration tables:

Standard substances	$C_{theor.}$ [%]	$N_{theor.}$ [%]
Potassium hydrogen phthalate	47,1	
Sodium carbonate	11,33	
Sodium nitrate		16,47
Ammoniun chloride		26,17

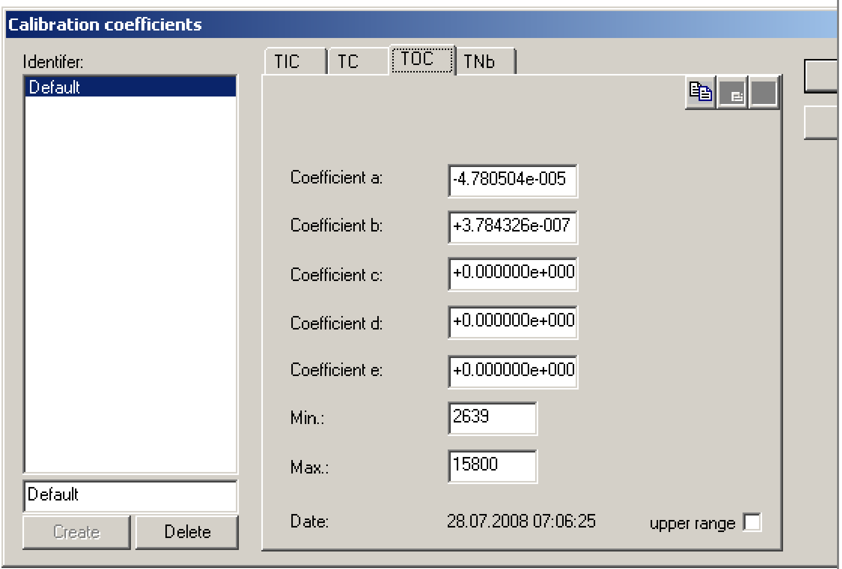
Performing calculation and optimization of calibration curves

The calculation of optimization of calibration curves will be done as in the liquid mode.

Please refer to the detailed operating instructions.

Viewing calibration coefficients

Proceed as follows to view calibration coefficients:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Open the "Calibration coefficients" dialog in the operating software by selecting Math > Coefficients.


The calibration coefficients and the limits within the calibration is valid are displayed.</td></tr>
</table>

Shut-down for measuring breaks

Short measuring breaks	For short measuring breaks, e.g. over night, it is recommended to use the sleef/wake-up function of the software. This saves the re-initialization of the system the next morning.

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Maintenance work

Maintenance work to be performed by the customer

The following maintenance work shall be performed by the user in regular intervals:

	Maintenance
1	Exchange of the CO_2 absorber and the filter pads in the absorption tube. Open the front door. Loosen the hose connections and the screw caps. Pull out the absorption tube.
2	In addition, the maintenance of the basic instrument remain. Please refer to the operating instructions of the vario TOC cube.

7.5 TIC solids module

Target group

The target group is personnel with basic knowledge of chemistry and experience with laboratory work, e.g. chemistry laboratory workers.

Purpose

This section is meant to explain working with TIC solids module soliTIC.

Overview

"TIC solids module" is divided into the following topics:

Topic	Page
Basic security settings	496
Product description	501
Function of the TIC module	517

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7.6 Basic security settings

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This section describes basic safety rules required to avoid risks for the user of the analyzer.

Overview

"Basic safety rules" is divided into the following topics:

Topic	Page
Working with the operating instructions	497
Intended use of the analyzer	498
Safety instructions	499

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Working with the operating instructions

Operating the analyzer	Read the operating instructions thoroughly before performing work with the analyzer.
Storing the operating instructions	Store the operating instructions carefully and make sure the instructions are accessible for all relevant personnel.
Passing on the operating instructions	If you pass on the analyzer, always pass on the operating instructions, too.

Intended use of the analyzer

Conventional use of the TIC solids module

This section describes what the solids module is suitable for and what substances may be analyzed with it.

Description of the instrument

The TIC solids module is an auxiliary unit to the vario TOC. The knowledge of the vario TOC operating instructions is also prerequisite for the proper operation of the TIC module.

The software will only be described in this manual as far as it concerns the functions of the TIC module.

What does the instrument do?

The TIC module is exclusively suitable for the analysis of inorganic carbon compounds (TIC) which release CO_2 by adding diluted hydrochlorid acid.

The analysis of aggressive chemicals or materials which may form gas mixtures of potentially explosive nature by adding acid is strictly prohibited.

Advice on difficult applications

You have three ways of getting advice on difficult applications:

- You will find useful tips in the "Application notes" on the www.elementar.de website.
- The application laboratory of Elementar will provide advice:

Application laboratory
Mail: application@elementar.de

- The service department will provide advice:

Service
Mail: service@elementar.de

Safety instructions

General

The TIC solids module is exclusively suitable for the carbon analysis of solid and/or pasty samples which can be decomposed under method depending combustion conditions.
The analysis of aggressive chemicals, acids, bases, solvents, explosives or materials which may form gas mixtures of potentially explosive nature is strictly prohibited. It may lead to serious damages of the instrument and injuries to the operating personnel. For the above mentioned and/or for difficult applications you may use the counseling service of our application lab in order to develop safe working instructions and to use special parameters and/or instrument options, if necessary.

Operation and maintenance may only be performed by trained personnel. In order to guarantee a trouble-free and optimum operation of the TIC solids module, it is necessary to the carefully read the supplementary operating instructions. For future questions this supplementary operating instructions shall be carefully kept. Deviations regarding illustrations and technical data in these supplementary operating instructions are subject to change due to further developments. The data mentioned in the software illustrations are only examples and may differ from the actual parameters. Please use the parameters valid for your instrument for the installation CD.

Set up / Initial operation

The initial operation of the TIC solids module may only be performed by personnel which was authorized by Elementar Analysensysteme GmbH.

The opening of the transport packaging may lead to loss of warranty! If visible damages of the delivered parts can be detected, please immediately inform the forwarder and the contractor.

The installation room has to be well ventilated!
The exhaust line (connection IR) has to be lead into the open and/or extractor hood since during operation toxic gases (e.g. SO2, NO, NO2, Cl2 etc.) are formed from the samples and may leave the instrument. During permanent operation the accumulation of the corresponding gases in the air may be over the admissible maximum allowance contranction.

The end of the waste gas lines must discharge into the open at a location protected from the wind as pressure fluctuations, e.g. caused by wind, cause detector instabilities.

The liquid residues of the TIC deterimination are partly strongly acidic and must only be lead into the canalization after neutralization. If the analyzed samples contained compounds hazardeous to water, the liquid residues have to be disposed duly elsewhere.

Reagents

Observe the safety instructions of the chemical manufacturer (on the label of the bottle or in the safety data sheets) when handling chemicals.

Wear protective glasses and the protective gloves when handling acids, Sicapent® (phosphorus pentoxide) and magnesium perchlorate.
Caution: danger of chemical burns!

When handling cold quartz and glass parts use the furnished leather gloves, otherwise risk of injuries due to breakage of glass.

Maintenance

The proper operation of the TIC solids module can only be guaranteed when using original consumables and spares which can be purchased at Elementar Analysensysteme GmbH or authorized dealers. When using other consumables or chemicals of unsufficient quality injuries of the operating personnel or damages at the instrument may occur. Also the analysis results could be distorted. Unsuitable spare parts may lead to instrument damages and loss of warranty.

All maintenance intervals mentioned in this short instruction manual are significantly depending on the particular sample matrix. They are only examples and by no means guarantee service life of consumables or wear and tear parts.

The walls and doors of the instrument may only be opened by authorized personnel for the purpose of maintenance.

Prior to opening the instrument rear wall the peripheral instruments and the analyzer shall be disconnected from the mains by turning off the main switch and pulling the power supply plug.

Danger by electric shock - 110-230 Volt!

Caution: The furnaces have to be cold, otherwise overheating of some parts may occur. Prior to reinitialisation, the casing has to be reinstalled properly (mind the protective conductor).

Before and after the modification to the solids mode, remove the hydrochloric acid from the container and from the syringe for safety reasons.

The IR detector and the TIC module must not be put under overpressure at any time. This may lead to damages at the components.

7.7 Product description

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This section provides general information about the instrument.

Overview

"Product description" is divided into the following sections:

Topic	Page
Scope of delivery	502
Analytical characteristics	503
Technical specifications	504
The components	505
Functional diagram	506
Installation and initial start up of the TIC module	509
General measuring principle	513
Selecting the operating mode	515

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Scope of delivery

Scope of delivery	**TIC module soliTIC** Additional attachment to vario TOC which allows TIC measurements in solids, suspensions or sludges. Recommended working range: max. 2 g sample weight or max. 10 mg TIC Prod. No. 36.00-0000 You will find further order information for spares or consumables in the annex and in the current consumables catalog.

Analytical characteristics

Analytical characteri-stics

The following table explains the analytical characteristics:

Analytical characteristic	Comments
Operation modes	TIC solids
Working range	1 µg - 10 mg TIC
Calibration	Linear and or polynom
Standard deviation	< 1 % rel. for 6-fold determination
Sample weight	max. 2 g, depending on sample density
Duration of analysis	minutes depending from digestion behaviour, sample weight and TIC content of the sample
Sample digestion	acit at 50°C
Data storage and data output	Storage on hard disk, floppy disk or CD. LIMS transfer possible. Data output to screen and printer.

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Technical specifications

Control and data processing

The following table contains the technical specifications of the control and data processing system:

Reference value	Technical specifications
Control and evaluation unit	PC with operating system ▪ Windows XP Professional or ▪ Windows Vista Business Printer
Software	▪ German or English ▪ menu guided ▪ Status display during analysis ▪ Real-time graphics ▪ LIMS capable ▪ GLP compliant data reduction and documentation
Interfaces	RS 232 /V24, Safety low voltage as per DIN IEC 380/VDE 0806/08.81

Dimensions and weights

The following table contains dimensions and weight of the instrument:

Reference value	Technical specifications
Dimensions	250 mm x 200 mm x 440 mm Width x Depth x Height
Weight	approx. 5 kg

Electrical and gas supply

The following table contains the technical specifications of the electrical and gas supply:

Reference value	Technical specifications
Mains voltage	100–230 Volt AC ± 10 %; 50–60 Hz
Carrier gas	, 1.2 bar consumption approx. ml/min

Ambient conditions

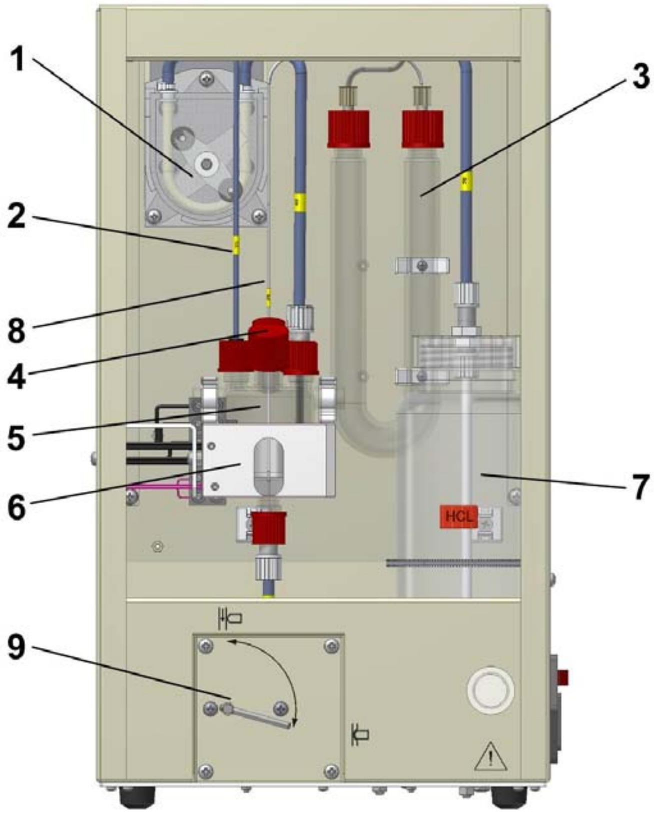
The following table contains the technical specifications of the ambient conditions:

Reference value	Technical specifications
Protection class	Protection class I, protective conductor connection
Mode of protection	IP 20, installation in dry rooms only
Permissible ambient temperature	Maximum: + 35 °C Minimum: + 15 °C

The components

Components

The following picture shows the TIC module in detail:



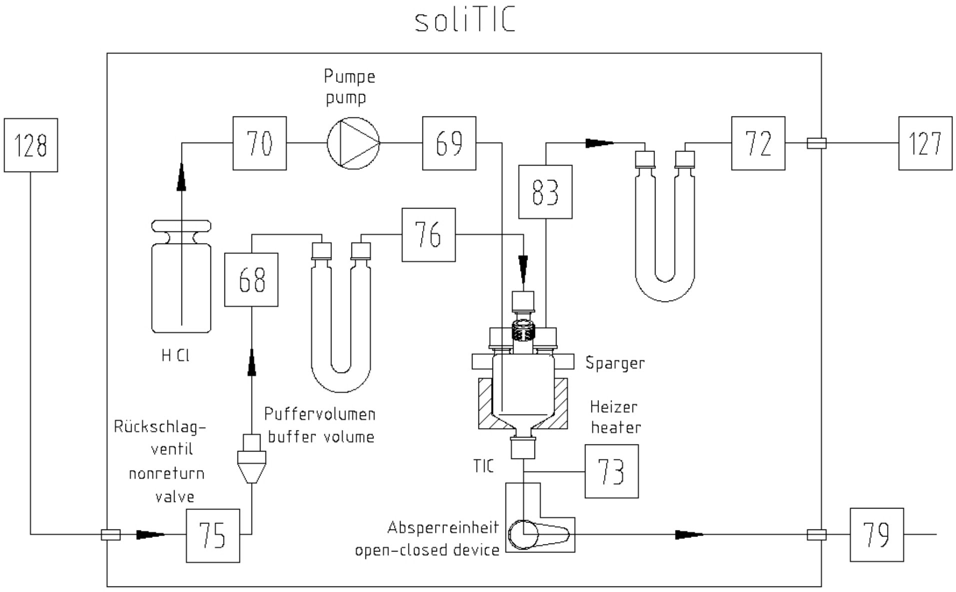
The following table describes the individual components of the TIC module:

1	Acid dosing
2	Measuring gas outlet
3	Buffer volume (U-tube)
4	Sample inlet
5	TIC reactor
6	Heater
7	Acid container
8	Gas supply
9	Changeover gas/waste

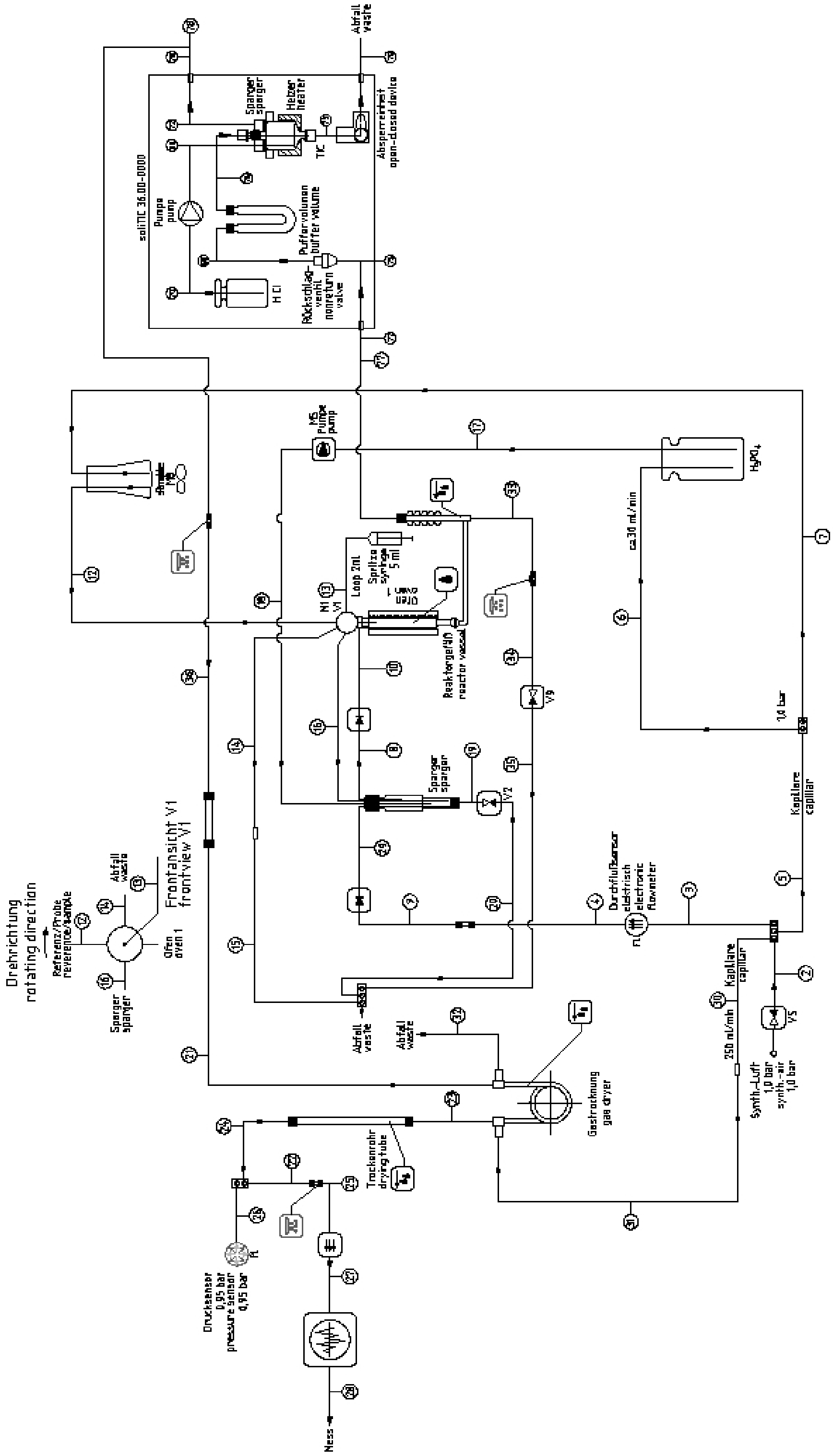
Functional diagram

Functional diagram

The following picture shows the functional diagram of the TIC module soliTIC:



The following picture shows the coupling of the TIC module (soliTIC) with the vario TOC basic instrument:



The following list names the functional and basic symbols:

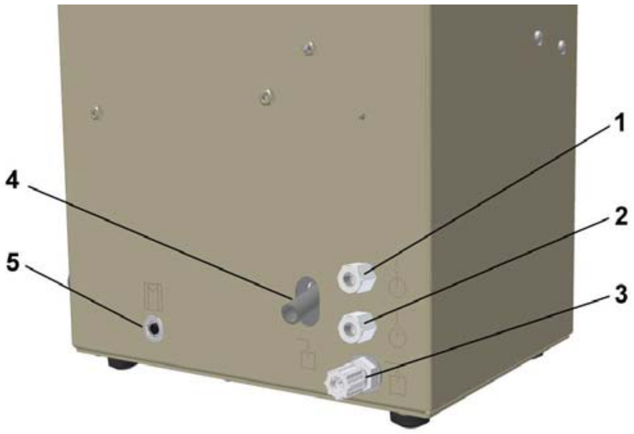
Two-way valve	Pressure sensor	Gas separation
Three-way valve	Loop	Measuring cell
Check valve	Heated tube	Sensor
Throttle	Drying	Plastic tube
Flow controller	Combustion	Copper tube
Flow sensor	Post combustion	Gas way

Installation and initial start up of the TIC module

Modification of the basic instrument

For modifying the basic instrument the following points shall be completed one after the other.

It is necessary to turn off the vario TOC cube basic instrument.

Step	Procedure
1	Turn on the operation mode "TIC solids" in the software under **System > Mode**.
2	Go to **System > Maintenance > Replace Parts**.
3	The furnace will not be used during the TIC operation. It can be set to 0°C under **Options > Settings > Parameters**.
4	The electronic communication between the vario TOC cube and the TIC module will be prepared with cable no. 5.
5	Jam the exhaust and waste water line to the remaining connections.
6	Connect all lines to the rear of the TIC module. The following picture shows the connections at the rear of the TIC module:  1 Outlet hose no. 78 2 Inlet hose no. 77 3 Gas drain 4 Water drain 5 Communication vario TOC - TIC-Module no. 5

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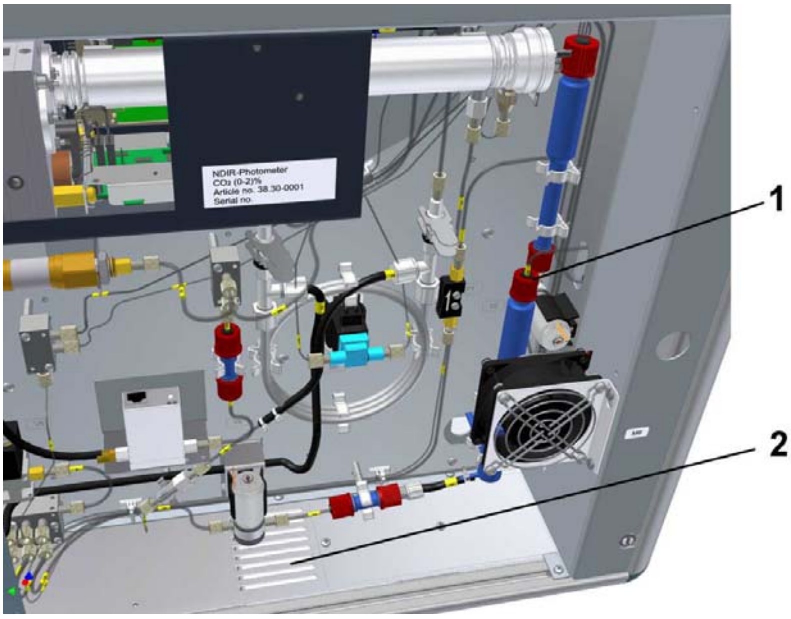
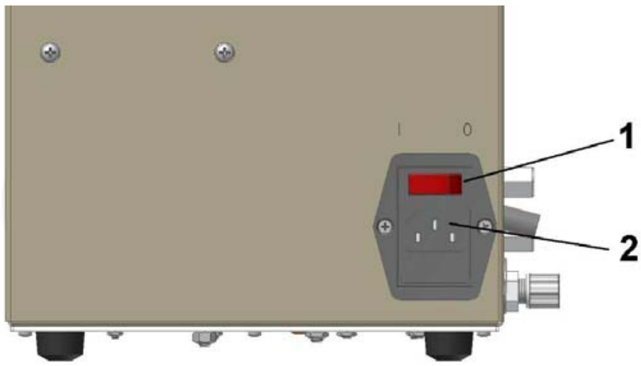
7	Connect the communication cable no. 5 to the vario TOC cube. The following picture shows the connections at the rear of the vario TOC cube:  1 TIC-Module connection
8	Unscrew the upper cap from the condenser (tube no. 36) of the basic instrument vario TOC.
9	Lead the inlet tube no. 77 and the outlet tube no. 79 through one of the louvers of the vario TOC (left sidewall, bottom).
10	Screw tube no. 77 onto the condenser.

11	Connect tube no. 78 and tube no. 36 by means of a small filter tube. The following illustration shows the left side (inside view) of the vario TOC.  1 Tube no. 36 with cap 2 Louvers
12	Fill 1.6% HCl into the acid container in the TIC module.
13	Confirm the maintenance dialog with "**Finish**"
14	The TIC module will be connected with the vario TOC basic instrument via the gas connections "Inlet" hose no. 77 and "Outlet" hose no. 78.

15	Connect the power supply cable (2). You can turn on the instrument (1). On/Off switch is located on the right side of the TIC module.  1 On/Off switch 2 Power supply connection for power supply cable

After the modification

If you have finished the modification, proceed according to the following decision table:

If the operating software status view displays...	...then...
approximately the same flow and pressure values as prior to maintenance work	the instrument is then ready to measure again.
distinctly different flow and pressure values to those displayed prior to maintenance work	perform a leak test. Cf. *Performing leak test* "Performing a leak test" on page 528. The instrument is only ready to measure when the leak test is successful.

General measuring principle

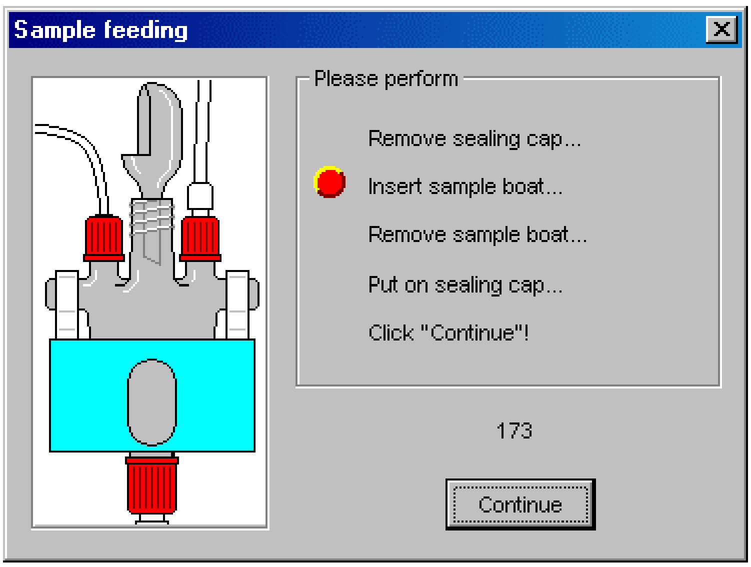
General measuring principle

The following steps show the measuring principle:

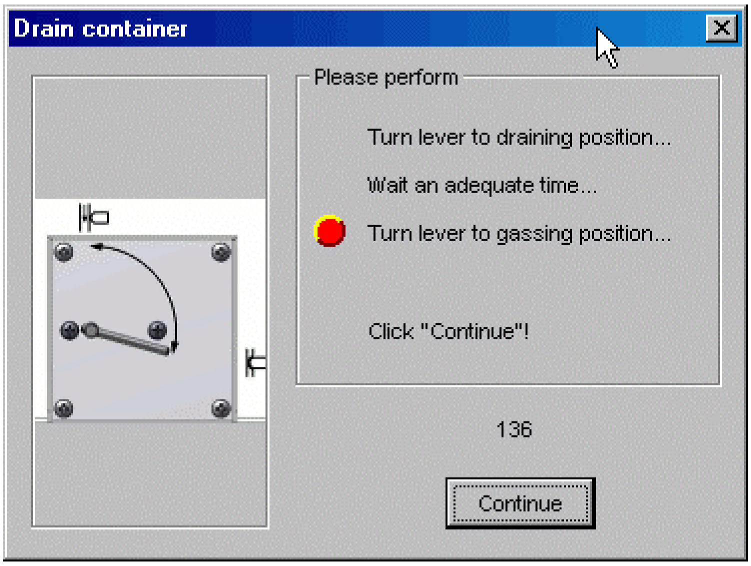
Step	Procedure
1	For the determination of the TIC, the sample to be measured has to be homogenized first and weighed-in into the furnished boat.
2	The weight will be entered in the "vario TOC" software. The analysis will be started by clicking the "Single" symbol.
3	After auto-zero of the RI detector or the TCD and after turninf off the carrier gas the boats are put on the TIC reactor and the sample is flushed into the reactor with little water.
4	After confirmation of the feeding hyrochloric acid will be automatically dosed and hte carrier gas started. The sample will be heated up to 50°C.
5	The carrier gas flows through different drying and absorption steps and will be subsequently analyzed in the IR detector or in the TCD for CO_2.
6	The TIC concentration will be calculated from the integral value of the measurement by means of the calibration coefficient.
7	After completion of the analysis the result can be saved.

All analysis steps are menu guided.

The following pictures show the analysis steps:

Step	Procedure
1	Start of the single measurement. 
2	Inserting the sample 

3	Empty container. For draining move lever upwards; for gassing move lever toward the lower right 4 o'clock position.



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Selecting the operating mode

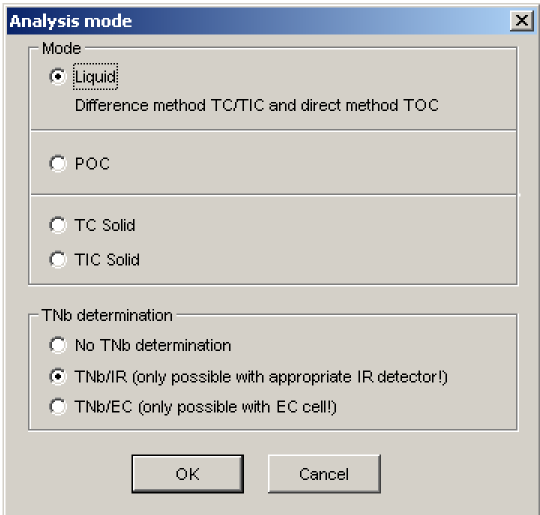
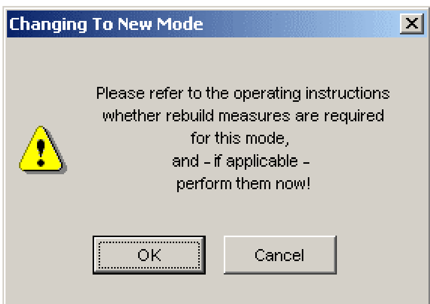
Essential condition

Before switching operating modes, you must have performed all refitting work required for the new operating mode.

Selecting the operating mode

Caution	Overheating if tube fillings are not appropriate for the operating mode Overheated tube fillings melt, run into the furnace area and destroy the furnace. Make sure that the tube fillings correspond to the selected operating mode.

Proceed as follows to select the operating mode:

Step	Procedure
1	Perform all refitting work required for the new operating mode.
2	Open the "vario TOC" dialog by selecting **System > Mode**.
3	Click **Yes** if you want to continue. The "Analysis mode" dialog is displayed: 
4	Select the desired analysis mode. In this case "TIC solids". Then click **OK**. The "Change to new mode" dialog is displayed: 

5	Click **OK** if you have refitted the instrument. The operating mode is changed.

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7.8 Function of the TIC module

Target group

The target group of this section is all personnel working with the instrument.

Purpose

This chapter enables the user to operate the TIC module.

Overview

"Operation of the TIC module" is divided into the following topics:

Topic **Page**
Analysis run.....518
Define methods.....520
Define standard samples.....521

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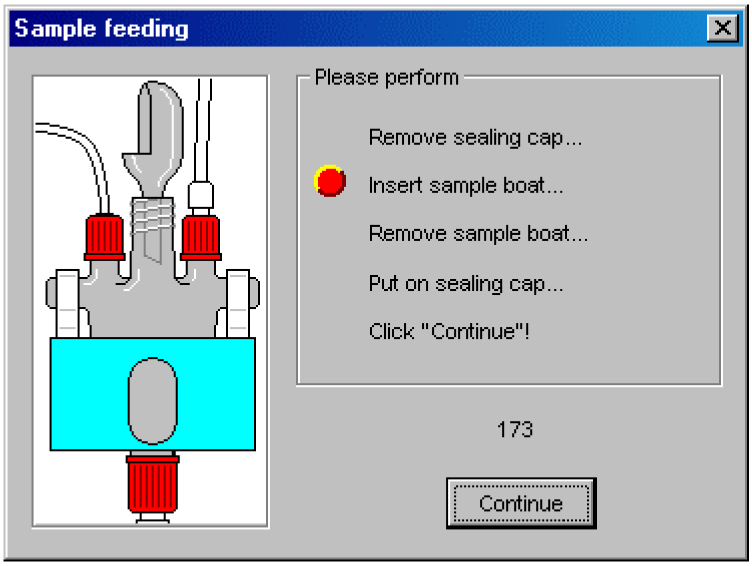
Analysis run

Note

For feeding it is recommended to weigh-in the samples into the furnished boats. It shall be taken care that the TIC reactor of the module is closed.

Performing an analysis

Proceed as follows to perforn an analysis:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Enter sample name, sample weight and measuring method into the corresponding text field of the vario TOC software.</td></tr>
<tr><td>2</td><td>Start the measuring process by clicking the "Single" start button:
</td></tr>
<tr><td>3</td><td>After the autozero and baseline recording you will be asked by a dialog to feed the TIC module.
The following picture shows the dialog:

</td></tr>
<tr><td>4</td><td>Unscrew the front screwing of the TIC reactor, put on the boat and flush the sample into the reactor with some UP water. After this the reactor has to be closed again.</td></tr>
<tr><td>5</td><td>Push the return button - now the feeding will be displayed in the software. Now the acid is automatically dosed and the carrier gas started.</td></tr>
</table>

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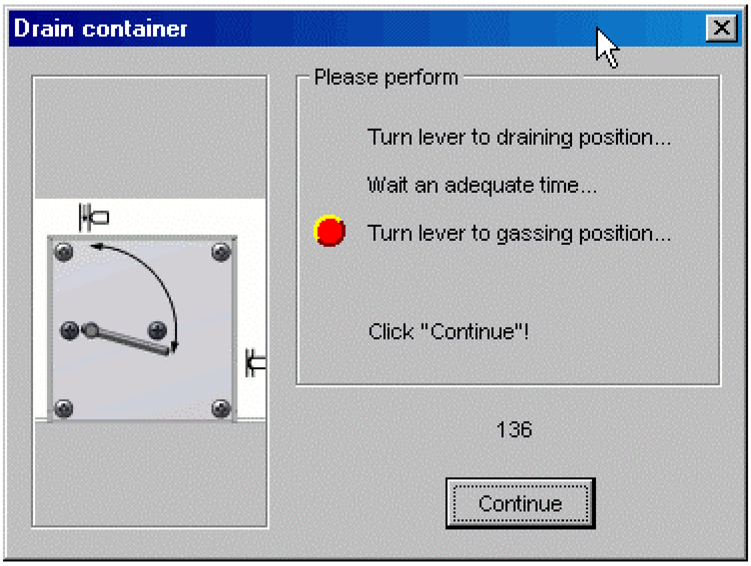
6	After completion of the peak recording the user will be requested to empty the system. For this purpose turn the lever at the casing front to the vertical position. The following picture shows the dialog: 

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Define methods

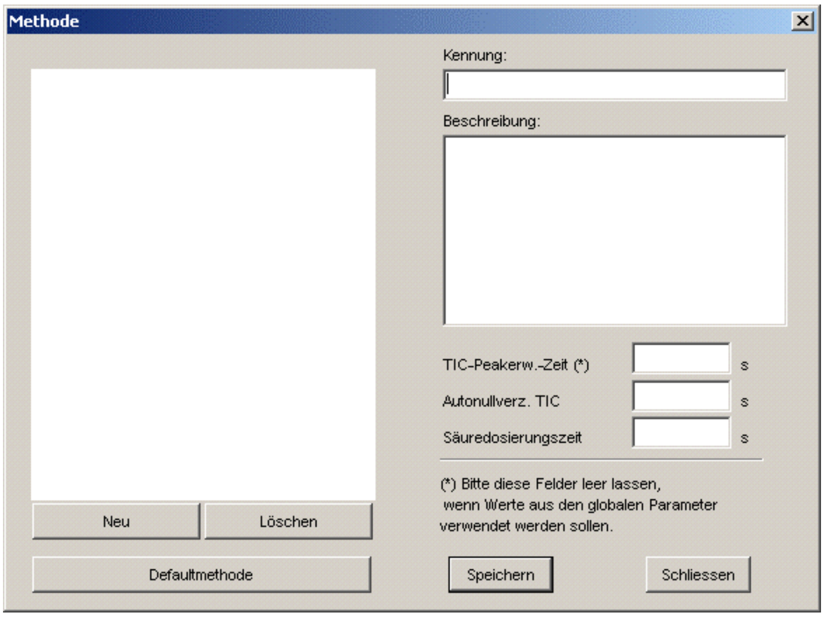
Note

You can only define custom methods if the open document is new, i.e.:

- it must not contain any entries such as name, volume, etc.
- and must not have been saved yet.

Defining custom methods

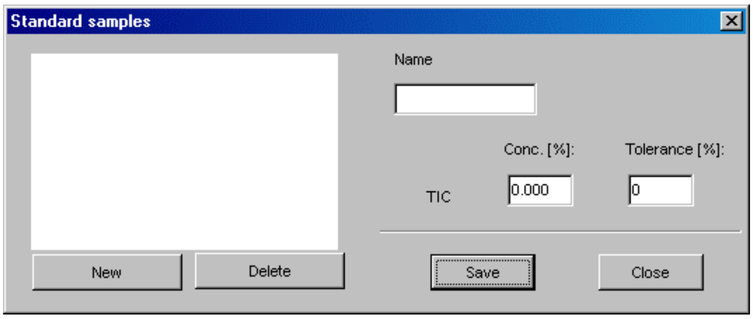
Proceed as follows to define custom methods:

Step	Procedure
1	Open the "Edit methods" dialog in the operating software by selecting **Options > Settings > Methods**. 
2	Click **New**. The "Method" dialog is displayed:
3	Enter the following: ▪ Enter the name of your method in the "ID" field. ▪ Enter the purpose of the method, for example, in the "Description" field. ▪ Input the corresponding method parameters in the other boxes.
4	Click **Save** in the "Method" dialog. This closes the dialog and your new method has been added to the list in the "Edit methods" dialog.
5	Click **Close** in the "Edit methods" dialog to close the dialog. You have now defined the method.

Define standard samples

Define own standard samples

Proceed as follows to define own standard samples:

Step	Procedure
1	Open the "Edit standard methods" dialog in the operating software by selecting **Options > Settings > Standard Samples**.
2	Click **New**. The "Method" dialog is displayed: 
3	For the standard substance, enter: ▪ the name of the substance in the "name" field. ▪ the theoretical element content in the "Conc [%]" field; if the theoretical element content for one element of the substance is specified with 0, the element will be ignored for the calculation; ▪ the permissible tolerance for each element, usually 5%, in the "Tolerance [%]" fields.
4	Click **Save**.
5	Click **Close**. This closes the dialog and saves the settings.

Repairing the instrument

8

Target group

The target group of this section is personnel authorized by Elementar Analysensysteme GmbH and that has taken part in training.

Purpose

This section is designed to restore proper working order of the instrument.

Overview

"Repairing the instrument" is divided into the following sections:

Section	Page
Reacting to malfunctions	523

8.1 Reacting to malfunctions

Target group

The target group of this section is personnel authorized by Elementar Analysensysteme GmbH and that has taken part in training.

Purpose

This section is designed to restore proper working order of the instrument.

Overview

"Reacting to malfunctions" is divided into the following topics:

Topic	Page
Interpreting PC error messages	524
Performing a system test	527
Performing a leak test	528
Leak test procedure	530
Replacing fuses	531
What to do after a computer crash	535
Reacting to a power failure	536
Stopping continuous analysis	540
Re-weighing after sample loss	541
Changing the position of the carousel	543
Export analysis data for support	544

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Interpreting PC error messages

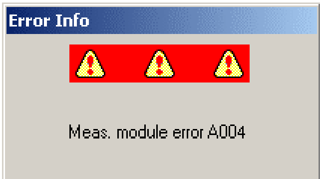
Software reaction to errors

When an error is detected, the software displays its error code on screen and saves it to the "error buffer".

- If the error is a critical error, the instrument is stopped immediately.
- If the error is a non-critical error, the instrument is only stopped:
  - if you have defined a maximum number of permissible errors in the **Options > Settings > Error Handling** menu and
  - the maximum number has been exceeded defined in the **Options > Settings > Error Handling** menu.

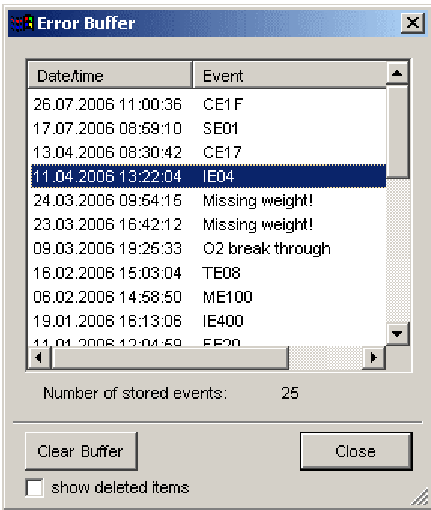
On-screen error message

The following screenshot shows a possible error message on the screen:



Interpreting error code

Proceed as follows to interpret the error code:

Step	Procedure
1	Open the "Error buffer" dialog by selecting **Options > Diagnostics > Error Buffer**. 

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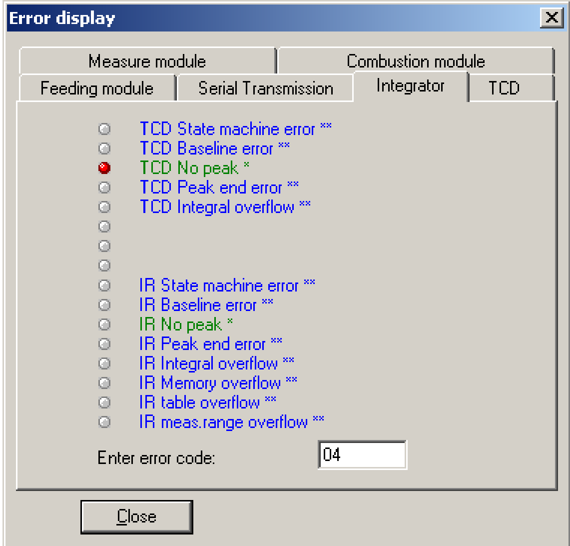
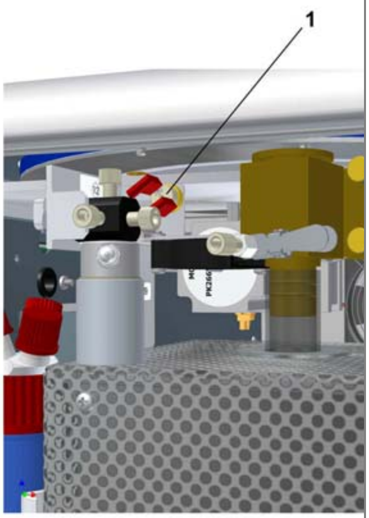
<table>
<tr>
<td>2</td>
<td>Double-click on the error code you want to interpret in the "Event" column.

This displays the "Error display" dialog that is automatically open at the appropriate tab. The causes of the error are highlighted in green.


</td>
</tr>
</table>

Interpreting combustion module error messages and troubleshooting

The following table lists combustion module error messages, explaining the causes of the errors and giving tips for troubleshooting:

Combustion module error messages	Possible causes	Corrective action
Ambient temperature too high	▪ Fan failure. ▪ Front door of the instrument was open too long.	Depress the thermoswitch above the furnace again.  1 Thermo swith Then restart the instrument and the software. Cf. last step in *Replacing fuses* on page 531. If unsuccessful, please contact the service department.

Performing a system test

What does the system test check?

The system test checks the following components of the analyzer for proper functioning:

- Sparger drain
- Acid pump
- Gas inlet
- Condenser drain
- Magnetic stirrer
- multiway valve

System test perform

Perform the system test in consultation with the service department. The service department will give you the necessary instructions to perform the system test.

You can contact Support on the following phone number:

Tel.:+49 6181 9100 - 16

Further information

Further information can be found in:

- *System test* on page 667

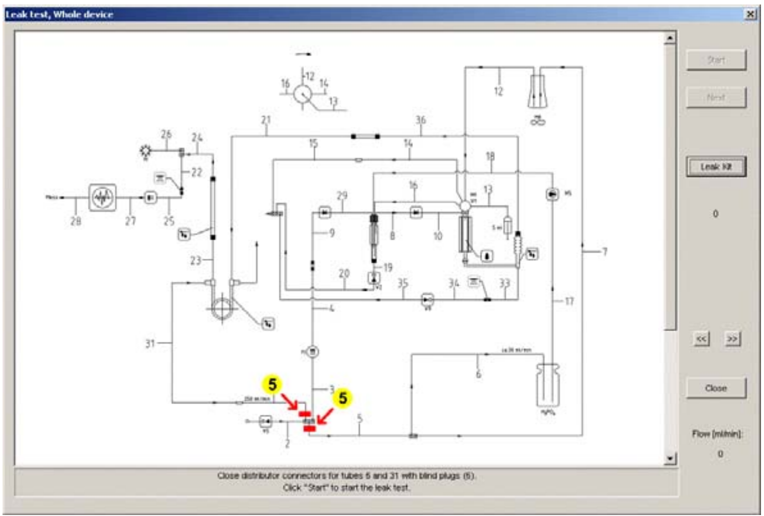
Performing a leak test

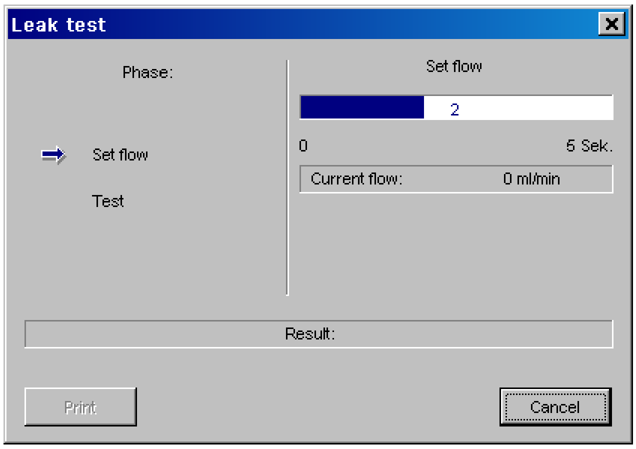
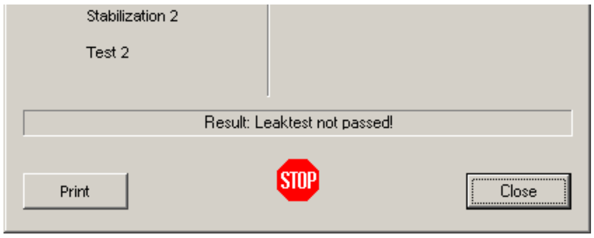
Purpose of the leak test

The leak test checks the instrument for leaks.

Performing a leak test

Proceed as follows to perform the leak test:

Step	Procedure
1	Open the "vario TOC" dialog by selecting **Options > Diagnostics > Leak Test**. 
2	Click **Yes** to start the leak test. The program opens the Leak test dialog.  The tubing diagram of the analysis system is displayed. Follow the instructions for closing the corresponding gas ways which are stated below the tubing diagram prior to starting a leak test. Then click **Start** to begin the leak test. The "Test Phases" dialog appears.

<table>
<tr><td>3</td><td>The leak test begins.

</td></tr>
<tr><td>4</td><td>The result of the leak test is displayed at the bottom. In this case, the leak test failed.

</td></tr>
<tr><td>5</td><td>Print out the result if you wish.
Click Print to do so.</td></tr>
<tr><td>6</td><td>Click Close to close the "Test Phases" dialog.</td></tr>
<tr><td>7</td><td>If the test for the whole system has not been passed, click now Next. This will activate the next test stage. Here you will be informed how to proceed. Click Start to continue with the corresponding test stage. The "Test Phases" dialog will open again showing the status of the currently running test stage.</td></tr>
<tr><td>8</td><td>Continue with the stages described under 3 to 6 until the result "Leak test not passed" is displayed. The leak is then probably located at the blue indicated gas ways.</td></tr>
</table>

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Leak test procedure

Procedure

The execution of the leak test takes place in several steps. The leak test always starts with testing of the whole system (Whole leak test). If the program detects a leak during the whole leak test, it will provide additional test stages. The purpose of these test stages is to test only a certain section of the system in sequence. As long as no leak can be detected the next section will be added to the test. However, after a leak has been detected, the location of the leak must be inside the section added last. In the "Leak test" dialog the tubing diagram of the analyzer is displayed. The gas ways are colored differently depending on the test stage carried out currently:

- No coloring: Whole leak test and/or gas ways not tested yet,
- Blue coloring: Gas way currently under test,
- Green coloring: Gas ways already tested.

By means of this coloring a detected leak can be localized easily: It must be in the blue colored section.

A test stage is started by clicking the **Start** button. The "Test Phases" dialog will open. Here, the test run can be observed.

The leak test takes place in the following stages:

Step	Description
1	Pressure build-up and stabilization
2	Test

Flow buildup and stabilization

During this stage, the valves are switched to positions allowing a gas flow build-up in a certain section of the system and its recording of the system. At the end of this stage it will be checked wether stable flow conditions prevail: if the flow did not reach a certain minimum value after this stage, the leak test has not been passed. If the minimum valve is reached, the system moves on to the next stage.

Test

The MFC flow will be set to "zero" and the valves switched in stage 1 are switched back to their initial state. By this and by corresponding measures in each test stage (closing of certain sections) it is expected that the current flow drops down if the system and/or section is tight. This process is being monitored for a fixed time and evaluated. If the flow goes below the admissible limit value after the test time (usually 5 ml/min), the leak test for the corresponding section has been passed. In this case the test can be continued with the next stage.

Replacing fuses

The fuses

The following table lists the different fuses.

Fuse holder label	Responsible for...	Fuse specifications
F1	Furnace 1	20 A
F5 + F6	Power supply	10 A
F7 + F8	Furnace transformer	15 A

Procedure

"Replacing fuses" is divided into the following steps:

Step	Description
1	Allow instrument to cool down and disconnect from the mains
2	Remove and check fuse
3	Insert fuses
4	Switch the instrument on again

Note

Please note:

- If the fuses trip, please always notify your service office as there may be serious reasons for this.
- Only use fuses matching the indicated type and the indicated voltage on the fuse holder. No fuses with a higher amperage (A) may be used.

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Step 1: Allow instrument to cool down and disconnect from the mains

Risk

Live parts

When replacing fuses there is a risk of electrocution.

Before replacing fuses:

- Allow the furnace to cool down.
- Disconnect the power supply plug.

Caution

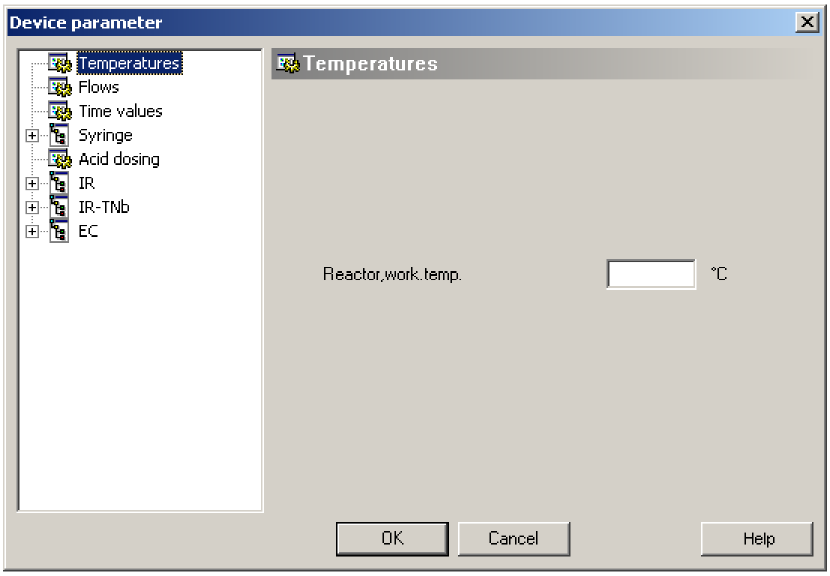
Lack of ventilation of the analyzer

A lack of ventilation leads to overheating of the analyzer.

Before switching off the instrument:

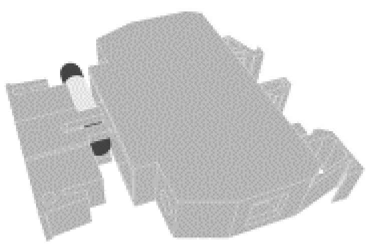
- Set furnace setpoint temperature to 0 °C.
- Allow the furnace to cool down until the temperature displayed is 100 °C.

Proceed as follows to cool down the instrument and disconnect it from the mains:

Step	Procedure
1	Set the setpoint temperature of all furnaces to 0 °C in the operating software. Open the "Instrument parameters" dialog by selecting **Options > Settings > Parameters**. 
2	Wait 2–3 hours until the instrument has cooled down to at least 100 °C.
3	Quit the operating software. Execute the following command: **File > Exit**.
4	Switch the analyzer and its peripherals off.
5	Disconnect the analyzer from the mains. Disconnect the power supply plug. The instrument is now ready for removal of the fuses.

Fuse holder

The following picture shows a fuse holder from the side:



Step 2:
Remove and check fuse

Proceed as follows to remove and check fuses:

Step	Procedure	
1	If a part of the instrument is no longer working, consult the above table to find out which fuse is resposible for the component.	
2	Unscrew the rear wall retaining screws and pull the protective earth conductor connector out of the rear wall. Then remove the rear wall.	
3	Unscrew the screws of the semiconductor relay holding plate and fold out the semiconductor relay holding plate. The electrical section is now visible.	
4	Pull out the fuse holder of the appropriate fuse.	
5	Press the fuse out.	
6	Check the fuse	
	If the fuse wire...	**...then...**
	is visible	check whether the wire is broken or not.
	is not visible	measure fuse continuity.
7	Proceed on the basis of the following decision table:	
	If...	**...then...**
	the fuse wire is broken	insert a new fuse of the same type.
	no continuity was measured on the fuse	insert a new fuse of the same type.
	the fuse wire is OK	insert the old use again.
	continuity was measured on the fuse	insert the old use again.

Step 3:
Insert fuses

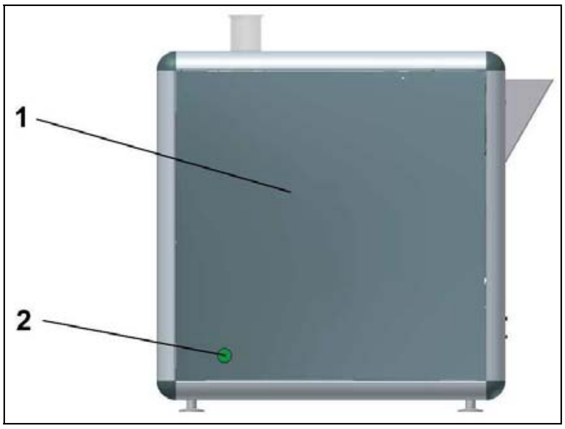
Risk	High voltage Using the wrong fuses can pose a risk of electrocution or fire. Only use fuses matching the indicated type and the indicated voltage on the fuse holder.

Proceed as follows to insert fuses:

Step	Procedure
1	Make sure that the fuse specifications match the label on the fuse holder.
2	Insert the fuse into the appropriate fuse holder.
3	Plug the protective earth conductor back into the rear wall.
4	Replace the rear wall.

Step 4:
Switch the instrument on again

Proceed as follows to switch the instrument on again:

Step	Procedure
1	Plug the power supply plug of the analyzer into the socket.
2	Switch ▪ PC, ▪ monitor ▪ and printer on. Wait until the boot process is complete.
3	Switch the main instrument switch (1) on.  1 Side door 2 Main switch The instrument performs a reference run of the multiway valve and carousel.
4	Launch the operating software. Cf. *Starting the operating software* on page 205.
5	Set the normal temperature as the setpoint temperature of the furnace. To do so, open the "Instrument parameters" dialog in the operating software by selecting **Options > Settings > Parameters**.
6	Once the setpoint temperatures have been reached the instrument is ready to measure again.

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What to do after a computer crash

After a computer crash	Because open documents are saved to a temporary file every 3 minutes, large-scale loss of data is not usual. After a computer crash, restart the operating software and the software automatically loads the most recent temporary file.

Reacting to a power failure

Open document

An open document is not lost in the event of a power failure. The temporary document file is automatically loaded when the operating software is restarted.

What to do after a power failure

Depending on when the power failure occurred, proceed as follows:

Case	Procedure
When the power failure occurred while you were performing an analysis and there was a sample in the analyzer.	Follow the instructions in "Reacting to a power failure during analysis".
Although you were performing an analysis when the power failure occurred, there was no sample in the analyzer.	Follow the instructions in "Reacting to a power failure".
The analyzer was in standby mode when the power failure occurred. The power failure lasted longer than 15 minutes.	Follow the instructions in "Checking the gas-tightness of the instrument".
The analyzer was in standby mode when the power failure occurred. The power failure lasted less than 15 minutes.	No special measures required.

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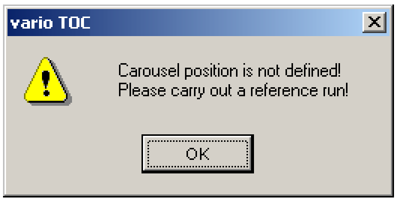
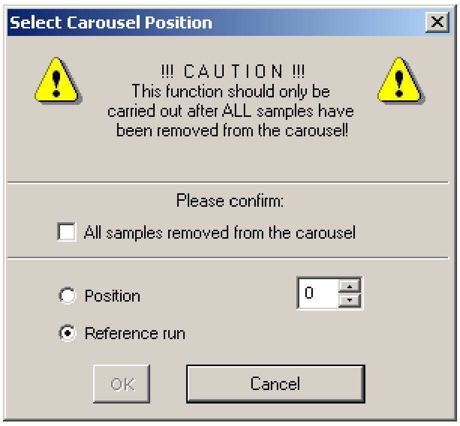
Reacting to a power failure during analysis:

Caution	Inserting multiple samples into the ball valve If there are samples in the carousel while you are changing the position of the carousel via **System > Sample Position**, multiple samples may fall into the ball valve at the same time. In this case, a service technician is required. Before changing the position of the carousel, always remove all samples from the carousel.

Proceed as follows to react to a power failure during an analysis:

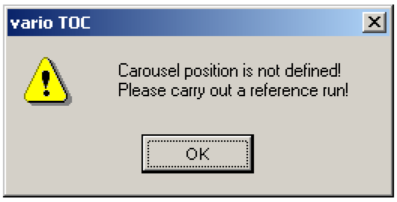
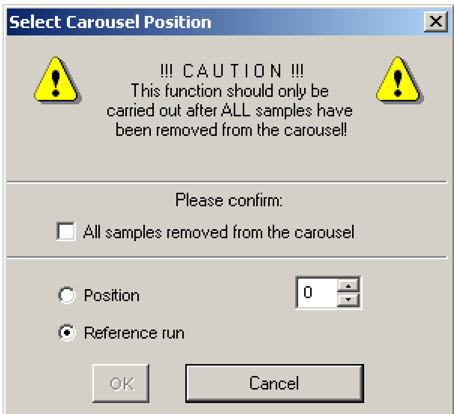
Step	Procedure
1	If the analyzer is still switched on, switch it off and wait for a moment.
2	Switch the analyzer back on.

<table>
<tr><th></th><th>If the multiway valve...</th><th>...then...</th></tr>
<tr><td></td><td>audibly performs a reference run</td><td>go to Step 3.</td></tr>
<tr><td></td><td>does not perform a reference run</td><td>disconnect the instrument from the mains, check the fuses and replace them if necessary. Cf. Replacing fuses on page 531.
Start again at step 2.</td></tr>
<tr><td>3</td><td colspan="2">Restart the operating software.
The temporary file of the most recent document is loaded. All measuring results exist except for the most recent sample. The following message is displayed:

</td></tr>
<tr><td>4</td><td colspan="2">Click OK.
This displays the "Adjusting the carousel position dialog:

</td></tr>
<tr><td>5</td><td colspan="2">Create a backup of the current document via File > Save as.</td></tr>
<tr><td>6</td><td colspan="2">Check whether the instrument is airtight.</td></tr>
<tr><td>7</td><td colspan="2">There may still be some residue of the last sample in the combustion section. Perform blank value determinations to remove the residues. Cf. Determining blank values on page 231.</td></tr>
<tr><td>8</td><td colspan="2">Correct the number of the current sample via System > Current Sample. Cf. Adjusting the current sample on page 644.</td></tr>
<tr><td>9</td><td colspan="2">Insert additional sample lines at the top of the sample view for a recovery determination standard 10 ppm via Edit > Insert Line.</td></tr>
<tr><td>10</td><td colspan="2">Prepare standard samples and place them on the carousel. Put the other samples behind this.</td></tr>
<tr><td>11</td><td colspan="2">Restart the measurement via System > Continuous.</td></tr>
</table>

Reacting to a power failure

Caution	Inserting multiple samples into the ball valve If there are samples in the carousel while you are changing the position of the carousel via **System > Sample Position**, multiple samples may fall into the ball valve at the same time. In this case, a service technician is required. Before changing the position of the carousel, always remove all samples from the carousel.

Proceed as follows to react to a power failure:

<table>
<tr><th>Step</th><th colspan="2">Procedure</th></tr>
<tr><td>1</td><td colspan="2">If the analyzer is still switched on, switch it off and wait for a moment.</td></tr>
<tr><td rowspan="4">2</td><td colspan="2">Switch the analyzer back on.</td></tr>
<tr><td>If the ball valve...</td><td>...then...</td></tr>
<tr><td>audibly performs a reference run</td><td>go to Step 3.</td></tr>
<tr><td>does not perform a reference run</td><td>disconnect the instrument from the mains, check the fuses and replace them if necessary. Cf. Replacing fuses on page 531.
Start again at step 2.</td></tr>
<tr><td>3</td><td colspan="2">Restart the operating software.
The temporary file of the most recent document is loaded. All measu-ring results exist except for the most recent sample. The following message is displayed:

</td></tr>
<tr><td>4</td><td colspan="2">Click OK.
This displays the "Adjusting the carousel position dialog:

</td></tr>
<tr><td>5</td><td colspan="2">Create a backup of the current document via File > Save as.</td></tr>
<tr><td>6</td><td colspan="2">Check whether the instrument is airtight.</td></tr>
</table>

7	Correct the number of the current sample via **System > Current Sample**. Cf. *Adjusting the current sample* on page 644.
8	Insert additional sample lines at the top of the sample view for a recovery determination standard 10 ppm via **Edit > Insert Line**.
9	Prepare standard samples and place them on the carousel. Put the other samples behind this.
10	Restart the measurement via **System > Continuous**.

Checking air-tightness of instrument

Proceed as follows to check air-tightness of the instrument:

Step	Procedure
1	Perform a leak test to check the air-tightness of the instrument. Cf. *Performing leak test* "Performing a leak test" on page 528.
2	If any leaks are detected, replace all sealing elements in the furnace area. Cf. *Replacing sealing elements* on page 355.

Stopping continuous analysis

When do I stop continuous analysis?

It makes sense to stop a continuous analysis in the following cases:

- If the result of the blank value suggests that the instrument is leaky.
- If the results of the conditioning sample suggest that parts of the instrument are defective or that gas pressure and flow behaviors are not OK.
- If results of the daily factor deviate substantially from the last results.

Stopping a continuous analysis spontaneously

Proceed as follows to stop a continuous analysis:

Step	Procedure
1	Execute the command **System > Single** in the operating software.
2	This stops the analysis after measuring the current sample.

Moving a stop marker

The program automatically moves the stop marker to the last sample position during sample data input. It is therefore only necessary to move the stop marker in special cases. Proceed as follows to move a stop marker:

Step	Procedure
1	Open the "Set stop marker" dialog by selecting **System > Stop Tag**. 
2	Use the arrow buttons to set the sample number at which to set a stop marker.
3	Click **OK**. This closes the dialog and moves the stop marker to the desired position.

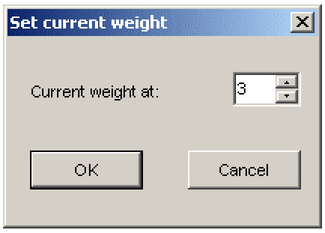
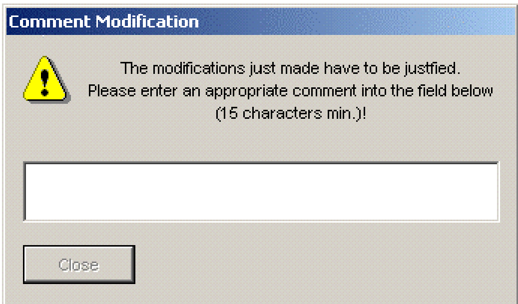
Re-weighing after sample loss

Sample loss

If you drop a sample on the floor when loading the carousel, for example, the sample is contaminated and should not be analyzed. You have to prepare, pack and weigh a new sample.

Re-weighing after sample loss

Proceed as follows to re-weigh after sample loss:

Step	Procedure
1	Prepare the sample again and pack it.
2	Open the "Set current sample weight" dialog by selecting **System > Current Sample Weight**. 
3	Use the arrows to specify the sample to re-weigh.
4	Click **OK**. This closes the dialog and the cursor moves to the "Weight" column of the selected sample number.
5	If 21 CFR Part 11 functionality is enabled, the "Comment change" dialog is displayed.  Enter a justification in the "Comment changes" dialog and click **Close**.
6	Weigh the sample If the weight is not transmitted online, enter the weight by hand in the sample view on the PC.
7	Insert the new sample on the carousel.
8	Open the "Set current weighed sample" dialog again by selecting **System > Current Weighed Sample**.
9	Use the arrows to set the number following the number of the last sample.
10	Click **OK**. This closes the dialog and the cursor moves to the "Weight" column of the selected sample number.
11	If 21 CFR Part 11 functionality is enabled, the "Comment change" dialog is displayed. Enter a justification in the "Comment changes" dialog and click **Close**.

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Changing the position of the carousel

When is this necessary?

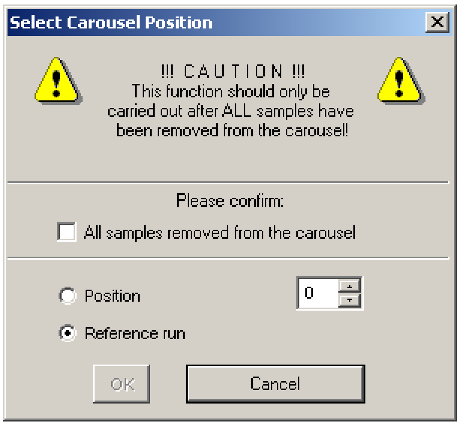
It is necessary to change the position of the carousel in the following cases:

- If the analyzer was switched off, the carousel is no longer in zero position. Before you can start an analysis, you must move the carousel back to zero position.
- If you lose samples, it may be necessary to move the carousel to a different position.

Changing the position

Caution	Inserting multiple samples into the ball valve If there are samples in the carousel while you are changing the position of the carousel via **System > Sample Position**, multiple samples may fall into the ball valve at the same time. In this case, a service technician is required. Before changing the position of the carousel, always remove all samples from the carousel.

Proceed as follows to change the position of the carousel:

<table>
<tr><th>Step</th><th>Procedure</th></tr>
<tr><td>1</td><td>Remove all samples from the carousel.</td></tr>
<tr><td>2</td><td>Open the "Set carousel position" dialog via System > Sample Position.

</td></tr>
<tr><td>3</td><td>Proceed on the basis of the following decision table:
<table>
<tr><th>If you want to</th><th>...then...</th></tr>
<tr><td>move the carousel to a position other than zero position</td><td>select the radio button next to "Position" and use the arrows to set the position in the box next to it.</td></tr>
<tr><td>move the carousel to zero position</td><td>select the radiobutton next to "Reference run".</td></tr>
</table></td></tr>
<tr><td>4</td><td>Click OK. This closes the dialog and moves the carousel to the desired position.</td></tr>
</table>

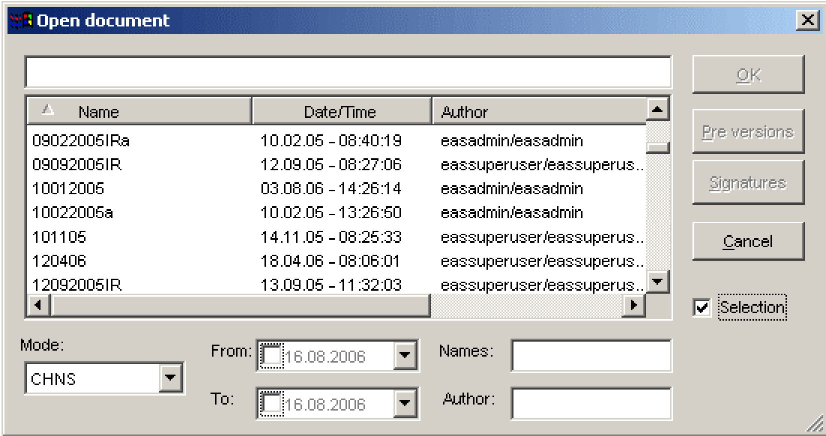
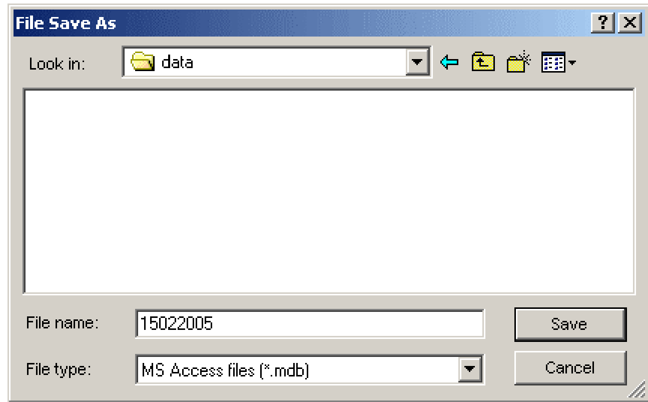
Export analysis data for support

Export for support

The support can draw conclusions about the condition of the analyzer from the analysis data, particularly the graphical information. Therefore, analysis data must be exported in mdb format for support, as this also contains graphical data.

Exporting analysis data

Proceed as follows to export analysis data:

Step	Procedure
1	Open the "Select document name" dialog in the operating software by selecting **File > Export**. 
2	Select the desired document file and click **OK**. This displays the "Save file as" dialog. 
3	Select the directory to export the document to from the "Save" drop-down listbox.
4	Select the "MS Access Files (*.mdb) file type from the "File type" dropdown listbox and click **Save**. The document is exported.

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Appendix

9

Target group

The target group of this section is all personnel working with the instrument.

Overview

"Appendix" is divided into the following sections:

Section	Page
Warranty	546
Accessories, spare parts and consumables	549
Menu and dialog descriptions	555

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9.1 Warranty

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes the warranty.

Overview

"Warranty" is divided into the following topics:

Topic	Page
Warranty of the overall instrument	547
Warranty on the furnace	548

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Warranty of the overall instrument

Warranty of the overall instrument	Please refer to your order for details on the warranty on the overall instrument.
Excluded from the warranty	Wear and tear parts and consumables are excluded from the warranty.

Warranty on the furnace

Warranty on the furnace

Elementar Analysensysteme GmbH gives a 10-year warranty on the furnace. In the event of a manufacturing or material fault, you will receive a replacement furnace free of charge during the 10 years as of the date of delivery.

What is excluded from the warranty?

Damage due to improper use is excluded from the warranty. The following instructions have been compiled for correct operation of the furnace and must be observed in order to uphold the warranty.

Instructions for operating the furnace

Observe the following instructions for using the furnace so that the warranty is upheld.

- The user must ensure that the furnace is operated according to the instructions.
- The furnace must not be heated in excess of the maximum temperature indicated in the operating instructions.
- The furnace must not be operated with a voltage higher than that indicated on the type plate.
- In the event of longer breaks lasting several days (as of 5 days) the furnace must be shut down (set temperature control to 0.00 °C).
- The furnace must be protected against penetration of liquids.
- Short-circuits in connection with the heating spirals and/or the thermocouples must be avoided.
- Inner and outer damage to the heating spirals, thermocouples and supply lines must be avoided.
- Only use original parts from Elementar for operation (e.g. combustion tubes/reduction tubes, fillings, seals, etc.).

In the event of furnace failure, the furnace must be sent into the manufacturers works at the following address for fault identification:

Elementar Analysensysteme GmbH,
Donaustraße 7,
D-63452 Hanau
Germany

If this analysis reveals that the furnace became defective due to improper use, all warranty claims shall be forfeited.

9.2 Accessories, spare parts and consumables

Target group

The target group is the personnel working with the instrument.

Purpose

This secton contains information about ordering accessories, spare parts and consumables.

Overview

"Accessories, spare parts and consumables" is divided into the following topics:

Topic	Page
Model overview	550
Required accessories	552
Optional accessories	553
Spare parts and consumables	554

Model overview

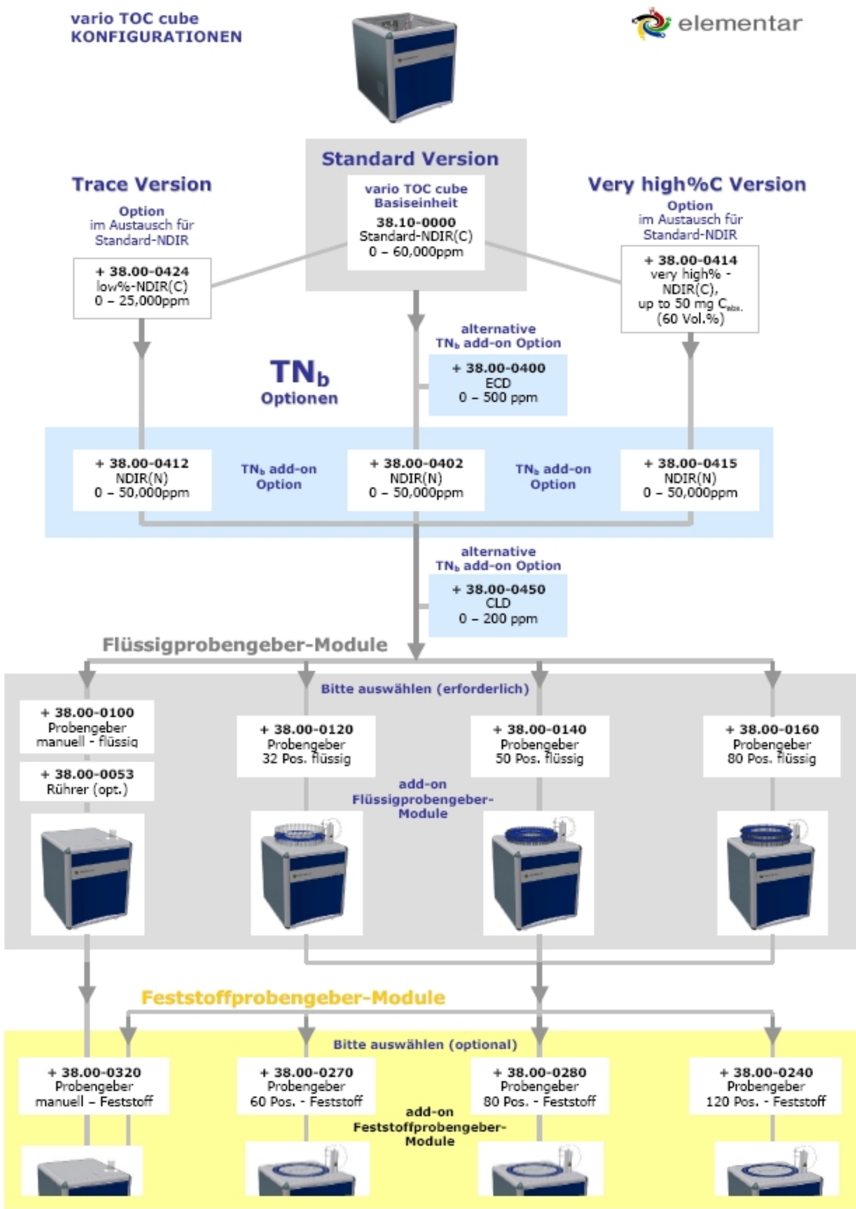
Condition

You can only order the smallest workable unit if you already have all of the necessary accessories.

Cf. *Required accessories* on page 552.

View variants

The following picture shows the variants view:



Components of the variants

- Basic instrument (single operation or automatic)
- free selectable solids or liquid operation
- NO upgrade kit for the determination of TN_b with NDIR detector, CLD or EC-cell

- Initial set solids or liquid mode
- Computer with control and application software: The computer is suited for 230 V and 50/60 Hz, other voltages on request; operating systems by Windows in German and English.

Product numbers for computer with control and application software

The product numbers for the computer with control and application software are listed below:

Product numbers for computer with control and application software	Language
50 008 369	German
50 008 368	English

Control and application software product number	Language
38.00-8000	German/English

Required accessories

Required accessories

The following section describes what accessories you need in addition to the smallest working unit and the order numbers.

Computer

A computer is essential as the control and evaluation unit. The computer can be ordered together with the software.

If you are using your own computer, please observe the following requirements:

Hardware requirements:

▪ Every PC is suitable where the following operating systems run properly:
  ▪ Windows Vista Business
  ▪ Windows XP Professional (SP1 oder neuer)
  ▪ Windows 2000 Professional (SP3 or later).
▪ Available disk space min. 2.5 GB
▪ 2 free serial RS 232 interfaces or optional:
  ▪ 1 free serial RS 232 interface
  ▪ 1 free USB interface
▪ CD-ROM or DVD-ROM drive

Printer with printer cable

Printer with printer cable:

- For 230 V, 50/60 Hz, other voltages on request
- Prod. No. 11.02 - 0043

Electronic micro balance (for solid samples)

Electronic microbalance:

- Reading precision 0.01 mg
- Weighing range up to 5.1 g
- Tare up to 5.0 g
- With V 24/ RS 232 interface
- Prod. No. 22 133 042

Pressure reducer O_2

Pressure reducer O_2:

- Two-stage, 2nd stage 0–3 bar with stop valve
- For gas quality 99.995 % or better
- Prod. No. 04 278 800
- If you want to use your own pressure reducer, it must be a two-stage precision pressure reducer of a higher quality category (Air Liquid or equivalent). Inferior reducing valves impair the results of analysis.

Optional accessories

Note	The following section lists the optional accessories. Please refer to the consumable material catalog for ordering procedure.
Consumables set for solid samples	Consumables set for solid samples: ▪ Optional ▪ Required when the material from the initial set is used up. ▪ Sufficient for approx. 2,000 analysis, art. no. 38.00-5018 ▪ Sufficient for approx. 5,000 analysis, art. no. 38.00-5049
Consumables set for liquid samples	Consumables set for liquid samples: ▪ Optional ▪ Required when the material from the initial set is used up. ▪ Sufficient for approx. 10,000 analysis, art. no. 38.00-5007 ▪ Sufficient for approx. 3,000 analysis, art. no. 38.00-5017

Spare parts and consumables

Contents

The following section describes the information available to you regarding consumables and spare parts.

Instrument CD

The CD enclosed with the instrument contains the following information:

- List of initial equipment
- Various consumable sets
- Catalog of spare parts

9.3 Menu and dialog descriptions

Target group	The target group is the personnel working with the instrument.
Purpose	This section describes the dialogs and commands in the various menus in the software.
Note	Some dialogs displayed in this section may slightly differ from those on the screen.

Overview

"Menu and dialog descriptions" is divided into the following topics:

Topic	Page
Dialog description basics	556
File menu	558
Edit menu	592
View menu	604
Menu Wizards	627
System menu	633
Options menu	652
Math menu	701
Help menu	718

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9.3.1 Dialog description basics

Target group

The target group is the personnel working with the instrument.

Purpose

This section provides basic facts about dialog descriptions.

Overview

"Basic facts about dialog descriptions" is divided into the following topics:

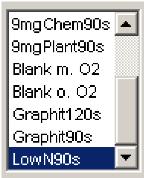
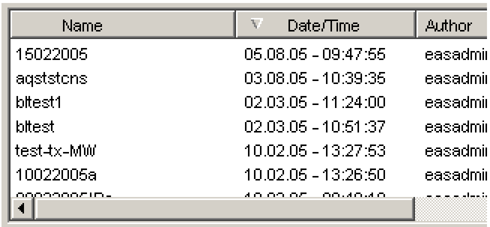
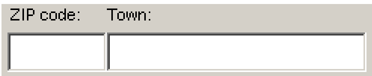
Topic **Page**

Dialog descriptions key 557

Dialog descriptions key

Element type key

The following table provides pictures of element types that feature in the dialog descriptions:

Name of element type	Example picture of element type
Label	
Dropdown listbox	
Checkbox	
Listbox	
Radiobutton	
Button	
Sliding controller	
Listbox column	
Textbox	
Textbox/label	
Textbox with checkbox	
Textbox with buttons	

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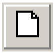
9.3.2 File menu

Target group	The target group is the personnel working with the instrument.
Purpose	This section describes dialogs and commands in the **File** menu.
Overview	"The **File** menu" is divided into the following topics:

Topic **Page**

File > New 559
Select document name 560
Select version 563
Save file as 564
File > Delete 566
Comment change 567
Signing 568
Verify digital signature 570
Export to LIMS 571
Define AQA export 572
Export peak graphic 574
Configure report 575
Print 577
Page view 579
Printer setup 580
Open 582
Configure backup 584
Reorganize database 586
Restore database 588
Log in as 589
File > Log off 590
File > Exit 591

File > New

What is the command used for?	This command creates a new document. From the toolbar: 

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Select document name

Function

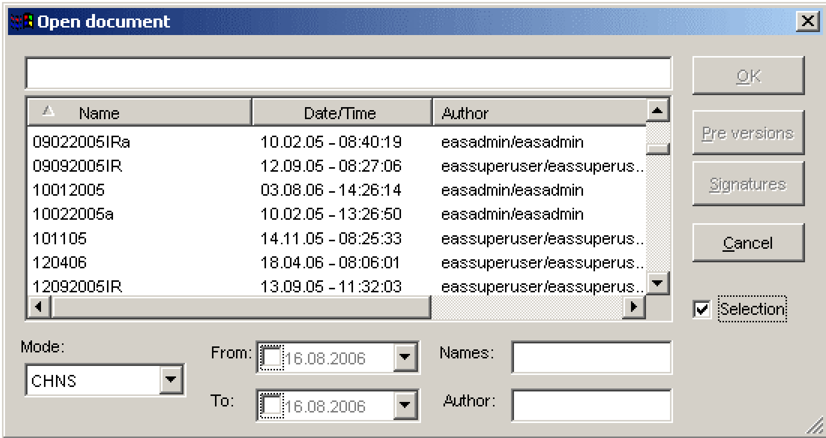
The function of this dialog differs depending on how you open it:

- If it was opened via **File > Export**, you can select a file to export.
- If it was opened via **File > Open**, you can select a document to be loaded into sample memory by the database.
- If it was opened via **File > Save** or **File > Save As**, you can select a document name under which to save the sample memory data in the database.

The dialog

Example of the dialog:

Dialog: Select document name



Open

Open the dialog via:

- **File > Export** or via
- **File > Open** (alternatively by clicking the  button) or via
- **File > Save** (alternatively by clicking the  button) or via
- **File > Saves As**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
——	Textbox/label	▪ Field to input a document name, that is automatically completed if necessary. ▪ Field displaying a document name if a document is selected in the listbox below.
Name / Date / Time / Author / Mode / Previous versions / Signatures	Listboxes	Fields listing all documents in the database if the filter function is not enabled.
Selection	Checkbox	If activated the filter elements "Mode", "From", "To", "Name" and "Author" will appear.
Mode	Dropdown listbox	Field in which you can select the operating mode as the filter criterion. Only documents in the selected operating mode are displayed.

from	Textbox with checkbox	Field in which you can select a date as the filter criterion. Only documents as from the selected date are displayed if the checkbox next to the date display is checked. In connection with the "to" textbox you can limit the display to documents in a certain period.
to	Textbox with checkbox	Field in which you can select a date as the filter criterion. Only documents up to the selected date are displayed if the checkbox next to the date display is checked. In connection with the "from" textbox you can limit the display to documents in a certain period.
Name	Textbox	Field in which you can select a document name as the filter criterion. Only documents with the selected name are displayed. Wildcards such as ? and * are also allowed.
Author	Textbox	Field in which you can select an author as the filter criterion. Only documents from the selected author are displayed. Wildcards such as ? and * are also allowed.
OK	Button	Depending on how the dialog was opened: ▪ Loads the selected document in the current version **(File > Open)** ▪ or saves data under the selected name in the database. (**File > Export**; **File > Save**; **File> Save As**)
Previous versions	Button	Opens the "Select version" dialog in which you can select a version of the document. When you select a previous version you cannot edit it but only view or print it out. Previous versions are read-only.
Signatures	Button	Opens the "Verify digital signatures" dialog in which you can verify a document's digital signatures.
Cancel	Button	Aborts the process.
Depending on how the dialog was opened, some fields and buttons may not be enabled.		

The following table describes the listbox columns:

Label	Element type	Meaning
Name	Listbox column	Document name.
Date/Time	Listbox column	Date and time when the document was last saved.
Author	Listbox column	Name of the user who was logged in at the time of last saving.
Mode	Listbox column	Analysis mode in which the document was created. The document can only be loaded in the mode in which it was created, otherwise a message is displayed.
Previous versions	Listbox column	A figure in parentheses indicates how many previous versions of the document exist.

Signatures	Listbox column	Column displaying for what purpose the document was already signed. ▪ If the document is unsigned, the column is empty. ▪ For the first signature the column displays "created". ▪ For the second signature the column displays "checked". ▪ For the third signature the column displays "released". Documents with a signature cannot be edited after loading but rather only viewed or given another signature for monitoring purposes.

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Data backup and printing* on page 270
► *Exporting analysis data to Excel and viewing* on page 274
► *Finding documents* on page 289
► *Creating new documents*
► *Exporting analysis data for support* "Export analysis data for support" on page 544

Select version

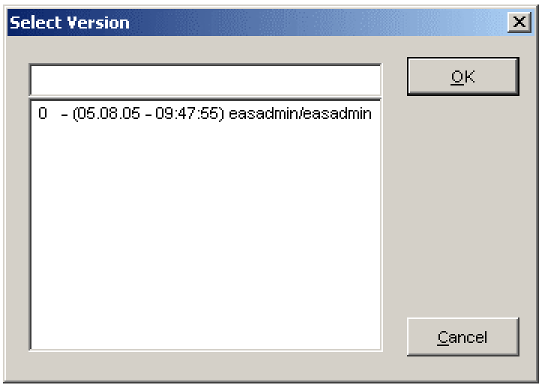
Function

In this dialog you can select a version of a document and load it from the database into sample memory. This dialog is only relevant if 21 CFR Part 11 functionality is enabled.

The dialog

Example of the dialog:

Dialog: Select version



Open

Open the dialog by clicking the **Previous versions** button in the "Select document name" dialog. Selecting the document name

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
____	Label	This field displays the document to load if you selected a document in the listbox below.
____	Listbox	This field lists all versions of document in the database along with the index number, creation date, and user name: ▪ The current version is prefixed with index number 0. ▪ Previous versions are prefixed with index numbers -1, -2, etc.
OK	Button	Loads the selected version into sample memory. If you load a previous version, you cannot edit it but only view or print it out. Previous versions are read-only.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- ► *Finding documents* on page 289
- ► *Versioning* "21 CFR Part 11 functionality" on page 110
- ► *21 CFR Part 11 functionality* on page 110
- ► *Consequences of modifying analysis data* on page 139
- ► *Select document name* on page 560

Save file as

Function

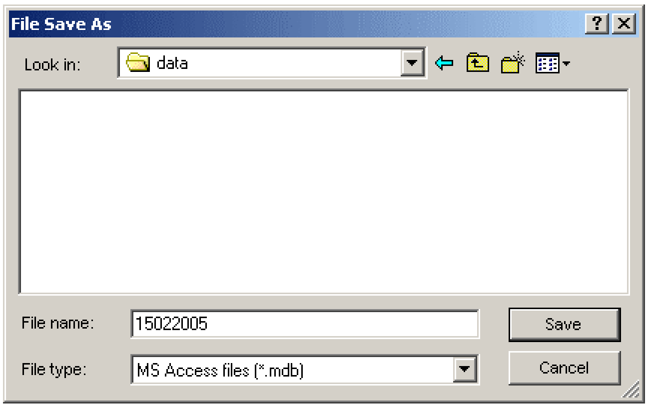
In this dialog you can specify the following for the file to export:

- Directory in which to save the export file,
- File name of the export file,
- File type of the export file.

The dialog

Example of the dialog:

Dialog: Save file as



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Open

Open the dialog by selecting **File > Export**. First the "Select document name" is displayed in which you select the export file before the "File saves as" dialog is displayed.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Save	Dropdown listbox	Field in which you select the directory to save in.
——	Listbox	Field displaying all files in the selected directory that match the file type specified below.
File name	Textbox/label	Field displaying the name of the file selected in the previous "Select file name" dialog. You can still edit this name.
File type	Dropdown listbox	Field in which you select the file type for the document export. ▪ Excel format (export without graphical information) ▪ Access database file (export with graphical information)
Save	Button	Exports the file according to the settings.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- ► *Exporting analysis data to Excel and viewing* on page 274
- ► *Exporting analysis data for support* "Export analysis data for support" on page 544
- ► *Overview of export and import file formats* on page 273

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File > Delete

What is the command used for?	This command allows you to remove the current open document from the data-base. Before deleting, the program displays a dialog in which you must confirm that you want to delete the document.
Note	If 21 CFR Part 11 functionality is enabled, the "Comment change" dialog is displayed after deleting the document from the database. The user must justify deletion of the document in this dialog.

Comment change

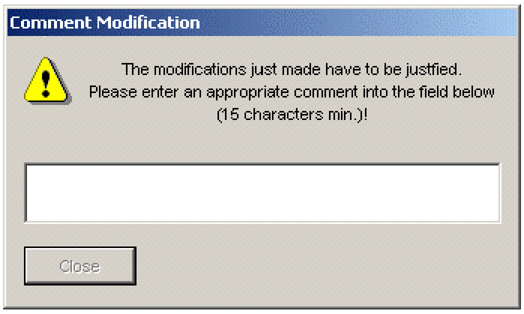
Function

In this dialog the user must justify certain actions with a comment. The comment input in this dialog is stored in the logbook together with information on the action. This allows you to track actions performed by various users.

The dialog

Example of the dialog:

Dialog: Comment change



Open

The dialog opens automatically

- if the user makes any changes that have to be commented
- and if 21CFR functionality is enabled.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
——	Textbox	Field to input a comment. The comment must be at least 10 characters long.
Close	Button	Closes the dialog. The button is only enabled if the comment contains 10 characters or more.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- ► *Reloading an old database file* "Granting authorizations" on page 128
- ► *Granting authorizations* on page 128
- ► *Reorganize database* on page 151
- ► *Defining logon timeout* on page 118
- ► *Re-weighing after sample loss* on page 541
- ► *Creating new sections* on page 120
- ► *Defining the analyzer / PC interface* on page 131
- ► *Defining the balance / PC interface* on page 134
- ► *Defining the autoexport directory* on page 147
- ► *21 CFR Part 11 functionality* on page 110

Signing

Function

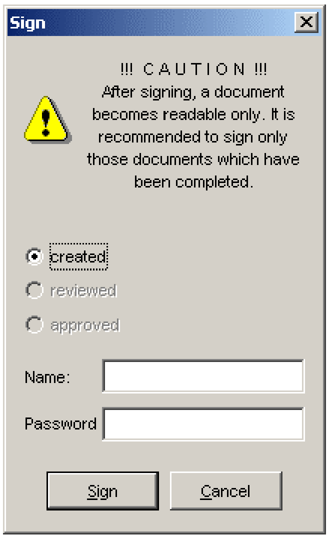
In the dialog:

- the user is warned about signing documents that may still need to be edited. After signing, the document is read-only.
- you can sign a document with an electronic signature. A document may be signed up to three times.

The dialog

Example of the dialog:

Dialog: Sign



Open

You can open this dialog, if 21CFR11 functionality is enabled, via **File > Sign**:

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
created	Radiobutton	The "created" signature is assigned to the document. This is the first signature a document may receive.
checked	Radiobutton	The "checked" signature is assigned to the document. A document may only be given the "checked" signature if it has already been given the "created" signature.
released	Radiobutton	The "released" signature is assigned to the document. A document may only be given the "released" signature if it has already been given the "created" and "checked" signatu-res.
Name	Textbox	Field to input the user's name defined in the signature program.
Password	Textbox	Field to input the password defined in the signature program.
Signing	Button	Creates the signature. The program checks whether the signature is valid on the basis of a key. The result of the signature authenticity check is displayed in another dialog.
Cancel	Button	Aborts the process.

Further information	Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog: ► *Signing documents* on page 142 ► *21 CFR Part 11 functionality* on page 110.

Verify digital signature

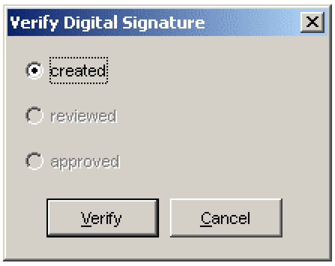
Function

In this dialog you can verify the authenticity of a document's digital signatures. This dialog is only relevant if 21 CFR Part 11 functionality is enabled.

The dialog

Example of the dialog:

Dialog: Verify digital signature



Open

You can open this dialog, if 21 CFR Part 11 functionality is enabled, via:

- **File > Verify** or via
- the **Signatures** button in the "Select document name" dialog. Cf. *Selecting the document name* "Select document name" on page 560.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
created	Radiobutton	verify "created" signature. If the radiobutton is locked, the signature does not yet exist.
checked	Radiobutton	verify "checked" signature. If the radiobutton is locked, the signature does not yet exist.
released	Radiobutton	verify "released" signature. If the radiobutton is locked, the signature does not yet exist.
Verify	Button	Starts verification of the selected signature. Opens a dialog displaying the results of verification.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- ► *Checking documents for authenticity* on page 141
- ► *21 CFR Part 11 functionality* on page 110.
- ► *Database* on page 90

Export to LIMS

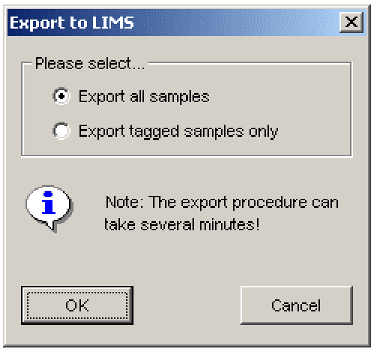
Function

In this dialog you can specify how to perform manual transfer to a higher-level LIMS system and start the transfer.

The dialog

Example of the dialog:

Dialog: Export to LIMS



Open

Open the dialog by selecting **File > Export to LIMS**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
export all samples	Radiobutton	Exports all samples in sample memory.
export only selected samples	Radiobutton	Exports selected samples in sample memory only. You can only select this radiobutton if at least one sample is selected.
OK	Button	Starts the export according to the settings.
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- *Exporting LIMS data* on page 276
- *Laboratory information and management system (LIMS)* on page 106
- *Export settings for the laboratory information and management system (LIMS)* on page 124
- *Requirements for operation of the laboratory information and management system (LIMS)* on page 107
- *LIMS settings* on page 680

Define AQA export

Function

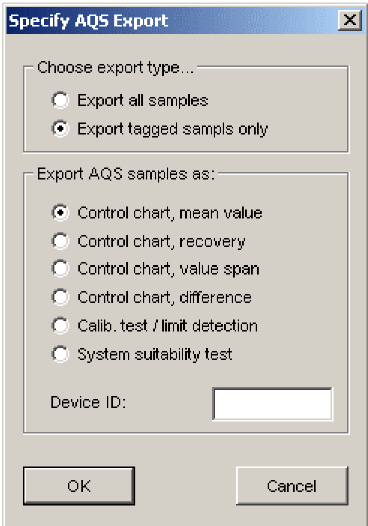
In this dialog you can define settings for exporting data to the Analytical Quality Assurance program (AQA):

- In the "Please specify export mode"section you define the samples for which to export data to the AQA.
- In the "Export AQA samples as" section you specify how you want the AQA to interpret the data it receives.

The dialog

Example of the dialog:

Dialog: Define AQA export



Open

Open the dialog by selecting **File > Export to AQS**.

Elements

The following table describes the elements of the dialog in the "Please specify export mode" section.

Label	Element type	Meaning
export all samples	Radiobutton	Exports data for all samples in a document.
export only selected samples	Radiobutton	Exports data only for the selected samples in a document.

The following table describes the elements of the dialog in the "Export AQA samples as" section:

Label	Element type	Meaning
Control card, mean value	Radiobutton	The data are sent to the control card that checks the precision of an analysis method.
Control card, recovery	Radiobutton	The data are sent to the control card that lists the recovery rate of standard substances.
Control card, span	Radiobutton	The data are sent to the control card that monitors the distribution of individual analysis results within and between the subgroups.

Control card, difference	Radiobutton	The data are sent to the control card that records the differences between duplicate samples.
Calibration test / detection limit	Radiobutton	The data are sent to the control card that lists the detection limits.
System suitability test	Radiobutton	The data are sent to the control card that checks how well suited the analysis system is for analyzing substances that are easy and difficult to decompose.
Instrument identifier	Textbox	Field to input the instrument identifier. If multiple analyzers are connected to the PC, it is necessary to enter the identifier of the appropriate analyzer so that the AQA data can be allocated to the correct analyzer.

The following table describes the dialog buttons:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Exporting AQA data* on page 278
► *User settings for analytical quality assurance (AQA)* on page 109
► *Export settings for analytical quality assurance (AQA)* on page 123
► *Analytical quality assurance (AQA)* on page 108

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Export peak graphic

Function

In this dialog you can define settings for exporting graphic data. For each sample for which a graphic shall be exported a text file will be created. The names of these files have the following format:

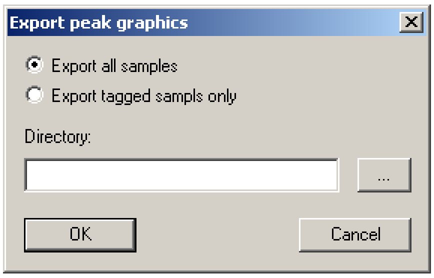
easgraph.xxx,

where xxx represents the serial number of the corresponding sample (e.g. "easgraph.001" for sample no. 1 etc.). If a file with the same name already exists, the content of this file will be overwritten with the new graphic information.

The dialog

Example of the dialog:

Dialog: Export peak graphics



Open

Open the dialog by selecting **File > Export graphics**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
export all samples	Radiobutton	The graphic data of all samples listed in the sample view will be exported. For each sample a new file will be generated.
export only selected samples	Radiobutton	The graphic data of the samples marked in the sample view will be exported. For each sample a new file will be generated.
Directory	Textbox	Defines the name of the directory where the graphic files shall be filed.
...	Button	Allows the selection of the directory via the dialog "Browse for folder".
OK	Button	Saves the settings and exports.
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► ---

Configure report

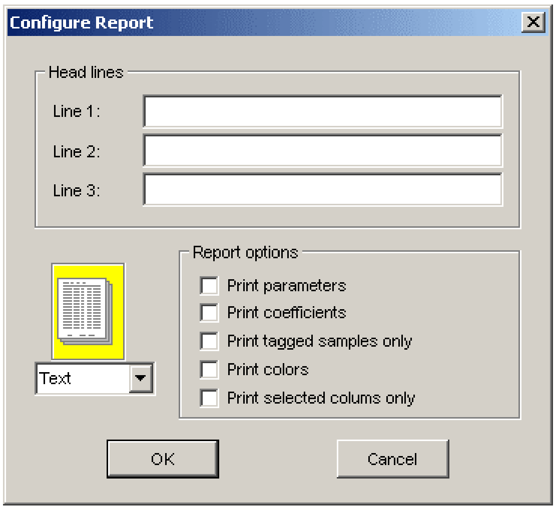
Function

In this dialog you can define up to three headers to appear on every page of the log printout and the type of printout. Report configuration applies to the current active view.

The dialog

Example of the dialog:

Dialog: Configure report



31.08.2009

Open

Open the dialog via:

- **File Print** or via
- **File > Report Configuration** or via
- **File > Page View**.

Elements

The following table describes the elements of the dialog in the "Title" section:

Label	Element type	Meaning
Line 1	Textbox	Field to input a header.
Line 2	Textbox	Field to input a header.
Line 3	Textbox	Field to input a header.

The following table describes the elements of the dialog in the "Report options" section:

Label	Element type	Meaning
Print parameters	Checkbox	The analysis log is preceded by a list of the currently valid parameters.
Print coefficients	Checkbox	The analysis log is preceded by a list of the currently valid calibration coefficients.
Color printout	Checkbox	The printout is in color. If you are using a black/white printer and the gray values corresponding to the colors are unsatisfacto-ry, do not check this box.

The following table describes the other dialog elements:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Data backup and printing* on page 270
► *Configure report* on page 267
► *Display page view* on page 268
► *Optimizing data evaluation* on page 160

Print

Function

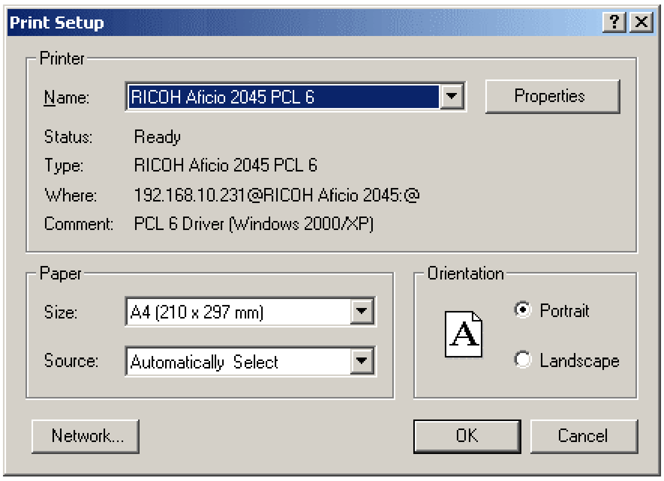
In this dialog you can define print settings. The appearance of this dialog depends on the type of printer installed / activated. It is usually used to define the following:

- the number of copies to print,
- the print format, and
- print quality.

The dialog

Example of the dialog:

Dialog: Print



Open

Open the dialog by selecting **File > Print** (alternatively via). First the "Configure report" dialog is displayed, in which you can select the headers and type of printing, before the "Print" dialog is displayed.

Elements

The following table describes the elements of the dialog in the "Printer" section:

Label	Element type	Meaning
Name	Dropdown listbox	Field displaying a list of printers connected to the computer.
Properties	Button	Opens a dialog in which you can define the properties of the printer selected on the left in the "Name" field.
Status	Label	Displays the status of the selected printer.
Type	Label	Displays the type of the selected printer.
Location	Label	Displays the location of the selected printer.
Comment	Label	Displays a comment on the printer.
Print to file	Checkbox	The print output is sent to a file instead of to a printer.
Use the Windows control panel to install printers and configure printer connections.		

The following table describes the elements of the dialog in the "Print range" section:

Label	Element type	Meaning
All	Radiobutton	Prints all pages.

Pages from ... to	Radiobutton	Prints a certain range. You can define the start and end pages in the textbox next to this button.
Selection	Radiobutton	Prints the selection only.

The following table describes the elements of the dialog in the "Copies" section.

Label	**Element type**	**Meaning**
Number of copies	Textbox with buttons	Field to input the number of copies to print.
Sort	Checkbox	Prints multiple complete copies of a document successively.

The following table describes the other dialog elements:

Label	**Element type**	**Meaning**
OK	Button	Starts the printing process according to the settings.
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- *Data backup and printing* on page 270
- *Configure report* on page 267
- *Display page view* on page 268
- *Using the help* on page 17
- *Optimizing data evaluation* on page 160

Page view

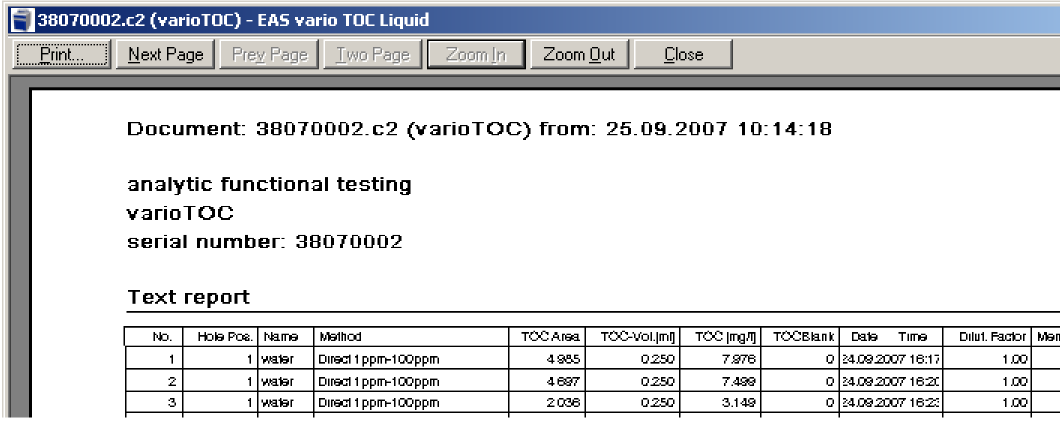
Function

This dialog displays the active document as it will print out.

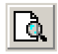
The dialog

Example of the dialog:

Dialog: Page view



Open

Open the dialog by selecting **File > Page View** (alternatively via ). First the "Configure report" dialog is displayed, in which you can define the type of print-out before the dialog is displayed.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Print	Button	Opens the "Print" dialog in which you can start a print job.
Next	Button	Displays the next page to print.
Previous	Button	Displays the previous page to print.
One Pages/Two Pages	Button	Determines whether you want one or two pages to be visible.
Zoom in	Button	Zooms in on the page.
Zoom out	Button	Zooms out of the page.
Close	Button	Closes the dialog.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Display page view* on page 268

► *Optimizing data evaluation* on page 160

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Printer setup

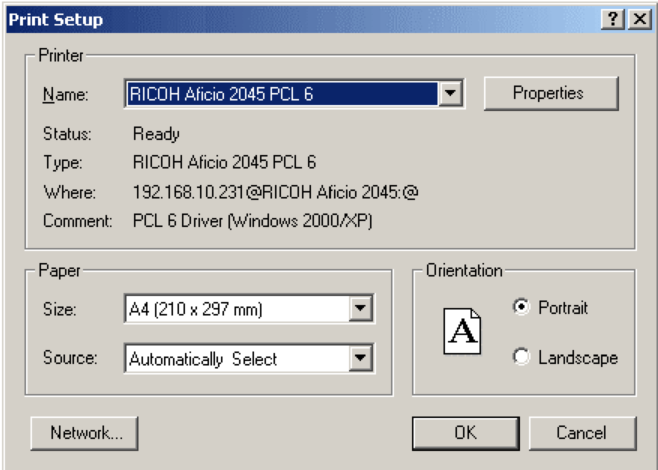
Function

In this dialog you can specify the printer and its connection.

The dialog

Example of the dialog:

Dialog: Printer setup



Open

Open the dialog by selecting **File > Printer Setup**.

Elements

The following table describes the elements of the dialog in the "Printer" section:

Label	Element type	Meaning
Name	Dropdown listbox	Field displaying a list of printers connected to the computer.
Properties	Button	Opens a dialog in which you can define the properties of the printer selected on the left in the "Name" field.
Status	Label	Field displaying the status of the selected printer.
Type	Label	Field displaying the type of the selected printer.
Location	Label	Field displaying the location of the selected printer.
Comment	Label	Field displaying a comment on the printer.
Use the Windows control panel to install printers and configure printer connections.		

The following table describes the elements of the dialog in the "Paper" section:

Label	Element type	Meaning
Size	Dropdown listbox	Field in which you can select the size of the paper to print on.
Source	Dropdown listbox	Field to select the paper tray.

The following table describes the elements of the dialog in the "Alignment" secti-on:

Label	Element type	Meaning
Portrait	Radiobutton	The page is in portrait format.

Landscape format	Radiobutton	The page is in landscape format.

The following table describes the other dialog elements:

Label	Element type	Meaning
Network...	Button	Connects to a shared network.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Printer setup* on page 164

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Open

Function

In this dialog you can specify the following for the file to import:

- Directory containing the file to import,
- File name of the import file,
- File type of the import file.

Note

You can only import files:

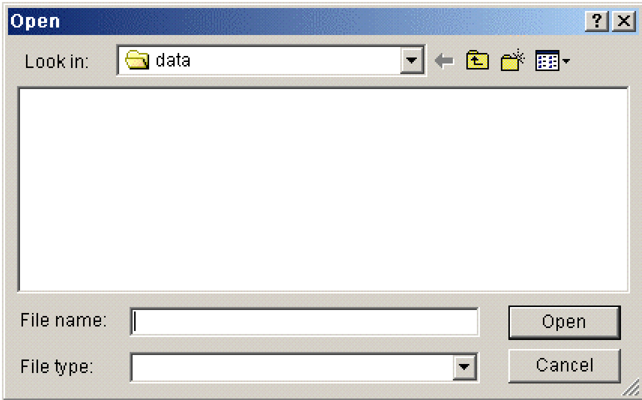
- either created with the operating software via **File > Export**
- or generated by the "Balance" weighing data capture program.

Imported data are stored in sample memory. When you import weighing data (Balance files), the data can be deposited in sample memory in different ways. Cf. *The "Balance" weighing data capture program* ""Balance" weighing data input program" on page 159.

The dialog

Example of the dialog:

Dialog: Open



Open

Open the dialog by selecting **File > Import**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Search in	Dropdown listbox	In this field you can select the directory containing the import file.
____	Listbox	This field displays files in the selected directory that match the specified file type.
File name	Textbox/label	If you have selected a file in the listbox above, the name of the selected file is displayed here. You can still edit this name.
File type	Dropdown listbox	In this field you can select the file type of the document to import. ▪ Excel format (export without graphical information) ▪ Access format (export with graphical information) ▪ Balance format (weighing data)
Open	Button	Imports the file according to the settings.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Importing documents* on page 293
► *Importing weighing data* on page 216
► *Administrative work on the database* on page 91
► *Overview of export and import file formats* on page 273
► *"Balance" weighing data input program* on page 159

Configure backup

Function

In this dialog you can define settings for creating backups of the database. Backup copies the complete existing database file to a certain directory under a different name, thereby "capturing" a certain state.

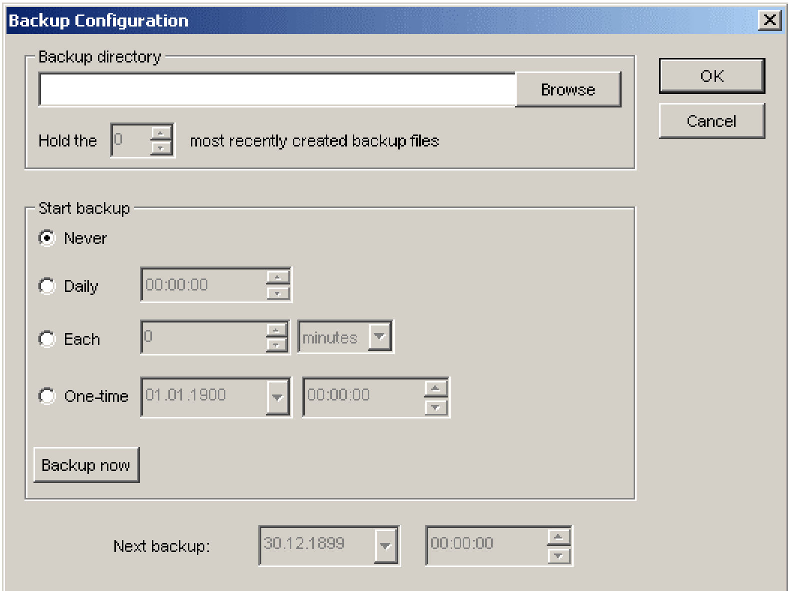
In this dialog you specify

- what directory to save the backup file to,
- how many backup files to keep at the same time,
- when the backup starts.

The dialog

Example of the dialog:

Dialog: Configure backup



Open

Open the dialog by selecting **File > Database > Backup**.

Elements

The following table describes the elements of the dialog in the "Backup directory" section.

Label	Element type	Meaning
Select	Button	Opens the "Find directory" dialog in which you can select the directory to save to. The operating software must have write access to the directory in order to be able to save the backup correctly.
____	Label	Field displaying the selected directory.
Keep max. last n backup files	Textbox with buttons	Field to input the number of backup files to keep at the same time. If you input 7, for example, and if the backup is performed once day, you can track the database file back in intervals of one day up to one week. However, avoid keeping too many backup files for reasons of memory. If the number of backup files already equals the maximum number, the oldest file is deleted when you create a new backup copy.

The following table describes the elements of the dialog in the "Start backup" section.

Label	Element type	Meaning
Never	Radiobutton	The backup is never started automatically.
Daily	Radiobutton	The backup is started automatically once a day. You can set the time in the textbox next to the button.
Every	Radiobutton	The backup is started automatically several times a day. ▪ In the textboxes next to the button you can specify the intervals in minutes, hours or days. ▪ In the following textboxes you can set the date and time as of when to start backing up several times a day. Too frequent backups can disrupt the analysis and the operating software once the database file has reached a certain size.
Once	Radiobutton	The backup is started automatically once. In the textboxes next to the button you can define the date and time to start the backup.
Backup now	Button	Manually starts the backup immediately.

The following table describes the other dialog elements:

Label	Element type	Meaning
Next backup	Label	Field displaying when the next backup will start according to the settings.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

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Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Starting the database backup* on page 149
► *Administrative work on the database* on page 91
► *Database backup* on page 92

Reorganize database

Function

In the dialog:

- the user is warned about reorganizing the database without backing up first.
- you can start a backup,
- you can start reorganizing the database.

Caution	Data loss
	Reorganizing the database irrevocably deletes all sample data and the contents of the database logbook.
	Always backup your data before reorganizing the database.

What does reorganize mean?

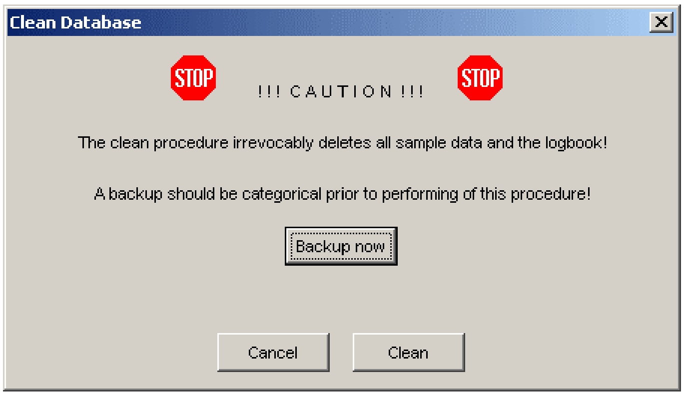
The size of the database is limited to 2 gigabytes, so it is necessary to reorganize the database from time to time. The software displays a warning if the size of the database exceeds 1 gigabyte or if available disk space is less than 1 gigabyte.

Reorganization removes all sample data and the contents of the logbook from the database file, but retains the other data such as settings, coefficients, etc.

The dialog

Example of the dialog:

Dialog: Reorganize database



Open

Open the dialog by selecting **File > Database > Clean**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Backup now	Button	Opens the "File save as" dialog in which you can save the database.
Cancel	Button	Aborts the process.
Clean	Button	Starts reorganization of the database. The button is only enabled if you have previously created a backup.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Reorganizing the database* "Reorganize database" on page 151

► *Administrative work on the database* on page 91
► *Database* on page 90

Restore database

Function

In the dialog:

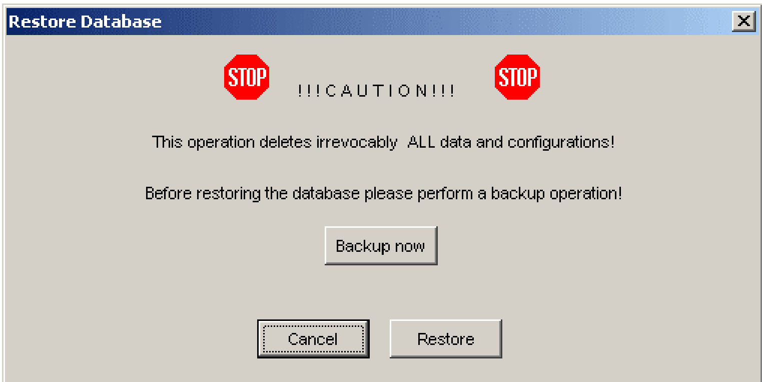
- the user is warned that importing an old database file irrevocably deletes all the current data,
- you can start a backup of the current database file before importing the old database file,
- you can reimport an old database file.

Caution	Data loss
	Restoring the database via **Restore** irrevocably overwrites all sample data, the contents of the logbook and the database configfuration parameters
	Always backup your data before restoring the database via **Restore**.

The dialog

Example of the dialog:

Dialog: Restore database



Open

Open the dialog by selecting **File > Database > Restore**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Backup now	Button	Opens the "Save file as" dialog in which you can backup the current database file under any name.
Cancel	Button	Aborts the process.
Restore	Button	Opens the "Open file" dialog in which you can select an old database file to reimport. The button is only enabled if you have previously created a backup.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Reloading an old database file* on page 153
► *Administrative work on the database* on page 91

Log in as

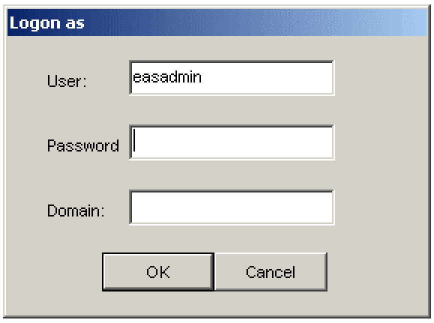
Function

This dialog is used to input user data.

The dialog

Example of the dialog

Dialog: Log in as



Open

Open the dialog

- automatically when you start the operating software or
- automaticaly if the operating software is already running and you have not input any data for a long time or
- via **File > Log in User** if the operating software is already running.

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Elements

The following table describes the dialog elements:

Label	Element type	Meaning
User	Textbox	Field to input the user name.
Password	Textbox	Field to input the password.
Domain	Textbox	Field to input the domain for company networks.
OK	Button	Launches the operating software or applies the changed user data if the operating software is already running.
Cancel	Button	Aborts the process or discards the new user data if the operating software is already running.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Starting the operating software* on page 205.
► *User administration* on page 126

File > Log off

What is the command used for?	The current user will be logged off. The program displays the log-on dialog and waits for a log-in of an authorized user. The program can only be operated after a log-on of an authorized user has been performed.

File > Exit

What is the command used for?	This command closes the operating software. If a document is open, the program prompts the user to save it.

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9.3.3 Edit menu

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **Edit** menu.

Overview

"The **Edit** menu" is divided into the following topics:

Topic **Page**

Edit > Restore....593
Edit > Undo....594
Edit > Cut....595
Edit > Copy....596
Edit > Paste....597
Edit > Insert Line....598
Edit > Delete Line....599
Swap samples....600
Edit > Include/Exclude....601
Edit > Include/Exclude value....602
Edit > Change....603

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Edit > Restore

What is the command used for?	This command restores an action that you have previously undone. From the toolbar: 
Note	You can only restore as many actions as you have previously undone - however, no more than five. The restore function only applies to actions immediately connected with editing sample data.

Edit > Undo

What is the command used for?	This command undoes a previous action. From the toolbar: 
Note	You can undo up to five previous actions. You can no longer undo an action if you have loaded a document or if the analysis system has received data during an analysis run in the meantime. The undo function only applies to actions immediately connected with editing sample data.

Edit > Cut

What is the command used for?	This command removes selected data and copies them to the clipboard. From the toolbar:
Note	You cannot execute this command if no data are selected. Cutting and copying data to the clipboard overwrites the data previously stored in the clipboard.

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Edit > Copy

What is the command used for?	This command copies selected data to the clipboard. From the toolbar:
Note	You cannot execute this command if no data are selected. Copying data to the clipboard replaces the data previously stored in the clipboard.

Edit > Paste

What is the command used for?	This command inserts a copy of the clipboard contents at the cursor position. From the toolbar:
Note	This command is not available if the clipboard is empty.

Edit > Insert Line

What is the command used for?

This command inserts a line at a certain position in sample memory.

From the toolbar: 

Note

The line at which to insert the new line must be selected. Executing this command inserts the new line at the desired position.

The inserted line is an "empty" line, i.e. every column is filled with its default value.

Edit > Delete Line

What is the command used for?	This command deletes a line at a certain position in sample memory.
Note	The line to delete must be selected. Executing this command deletes the line and all subsequent lines move up one line.

Swap samples

Function

In this dialog you can swap unprocessed samples in sample memory, e.g. if you want to prioritze urgent samples.

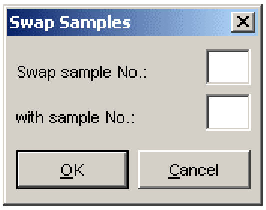
Note

The samples are only swapped in sample memory. After displaying the dialog, the user must swap the appropriate samples on the carousel by hand.

The dialog

Example of the dialog:

Dialog: Swap samples



Open

Open the dialog by selecting **Edit > Swap**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Swap sample No.	Textbox	Field to input the number of the sample to swap.
with sample No.	Textbox	Field to input the number of the sample to swap.
OK	Button	Swaps samples in sample memory. If the input is incorrect, i.e. if you specify samples that are already finished, you can quit the dialog by clicking **OK**.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Prioritizing urgent samples* on page 218
► *Optimizing sample data editing* on page 158

Edit > Include/Exclude

What is the command used for?

This command either includes a sample in the computation or excludes it.

From the toolbar:

Note

You can execute this command in the following cases:

- In the statistics view: The selected sample of a statistical group is displayed crossed-out (disabled) and the statistics computation is performed without this sample. If you execute the command again, the sample is displayed as "enabled" again and the statistical computation is performed with this sample again. If only two samples are enabled in a statistical group, you cannot disable either of these samples.
- In the calibration view: The selected sample of a calibration series is displayed as a full circle (eliminated) and is excluded from the calibration computation. Executing this command again displays the sample as "uneliminated" and includes it in the calibration computation again.

Edit > Include/Exclude value

What is the command used for?	This command either includes the value of a sample in the computation or excludes it.
Note	You can execute this command in the following cases: ▪ In the statistics view: The selected value of a sample of a statistical group is displayed crossed-out (disabled) and the statistics computation is performed without this value. If you execute the command again, the value is displayed as "enabled" again and the statistical computation is performed with this value again. If only two values are enabled in a statistical group, you cannot disable either of these values.

Edit > Change

What is the command used for?	This command allows you to edit a finished (analyzed) sample.
Note	The field you want to change must be selected. After executing this command you can edit the contents of the field. If 21 CFR Part 11 functionality is enabled, a new version of the document is created the next time it is saved.

9.3.4 View menu

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **View** menu.

Overview

"The **View** menu" is divided into the following topics:

Topic	Page
View > Toggle	605
View > Next	606
View > Previous	607
Zoom in/out graph	608
View > Next sample	609
View > Previous sample	610
View > Toolbar	611
Standard samples display	614
Configure view	615
Column properties	617
Configure graph view	619
Configure statistics view	621
Save views	623
Load views	624
Delete views	625
View > Auto align	626

View > Toggle

What is the command used for?	This command changes the field in the combi view. From the toolbar: 
Note	Execute this command several times to switch to the desired view. The sequence is: Calibration view - progression graph - statistics view - calibration view, etc. Also by clicking on the caption bar of the combi view you can change to the reqested view.

View > Next

What is the command used for?	This command displays the calibration curve of the next element type in the calibration view. From the toolbar: 

View > Previous

What is the command used for?	This command displays the calibration curve of the previous element type in the calibration view. From the toolbar:

Zoom in/out graph

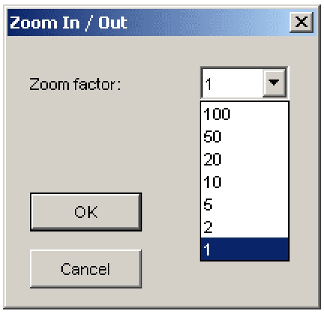
Function

In this dialog you can zoom in/out details of the graphical progression of an analysis or the calibration graph.

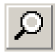
The dialog

Example of the dialog:

Dialog: Zoom in/out graph



Open

Open the dialog by selecting **File > Zoom in/out** (alternatively via ).

Elements

The following table describes the dialog elements:

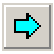
Label	Element type	Meaning
Zoom factor	Dropdown listbox	Field to select the zoom factor. You can choose between zoom factors of 1; 2, 5; 10; 20; 50 and 100. At factor > 1 the graph view is enclosed by scrollbars so that you can select a specific area.
Ok	Button	Zoom in/out of the graph.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Setting the size of the graph* on page 266

View > Next sample

What is the command used for?	This command moves the sample marker to the next sample in the calibration graph. From the toolbar: 

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View > Previous sample

What is the command used for?	This command moves the sample marker to the previous sample in the calibration graph. From the toolbar: 

View > Toolbar

What is the command used for?	This command shows or hides the toolbar. If the **toolbar** on page 612 is displayed, a check is displayed next to the menu item.

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Toolbar

The buttons on the toolbar correspond to the following commands:

Icon	Meaning
	File > New on page 559
	File > Open "Select document name" on page 560
	File > Save "Select document name" on page 560
	Edit > Cut on page 595
	Edit > Copy on page 596
	Edit > Paste on page 597
	Edit > Insert Line on page 598
	Edit > Undo on page 594
	Edit > Restore on page 593
	File > Print "Print" on page 577
	File > Page View "Page view" on page 579
	Math > Statistic > Group on page 706
	Edit > Include/Exclude on page 601
	View > Toggle on page 605
	View > Zoom in/out "Zoom in/out graph" on page 608
	View > Previous on page 607
	View > Next on page 606
	View > Previous sample on page 610
	View > Next sample on page 609
	System > Wake-up on page 646
	Help > About vario TOC on page 725
	Help > Context-sensitive help on page 721
	System > Auto on page 634
	System > Single on page 635

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Standard samples display

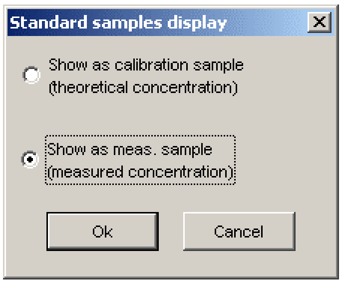
Function

In this dialog, you select how the standard samples are displayed in the sample field.

The dialog

Example of the dialog:

Dialog: Standard samples display



Open

Open the dialog via **View > Standard samples**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Show as standard sample (theoretical concentration)	Radiobutton	The sample filed displays the theoretical element concentrations of the standard samples in the corresponding columns.
Show as factor/monitor sample (measured concentration)	Radiobutton	The sample filed displays the measured (calculated) element concentrations of the standard samples in the corresponding columns.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

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Configure view

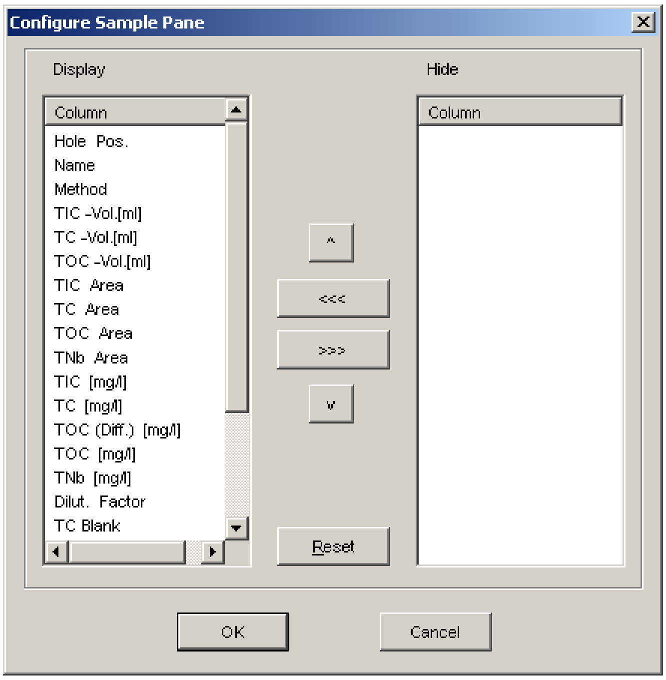
Function

This dialog is used to configure the sample view. It is possible to show/hide every column and to change the display sequence.

The dialog

Example of the dialog:

Dialog: Configure view



Open

Open the dialog by selecting **View > Configuration**. The sample view must be active in order to open the "Configure view" dialog.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Display column	Label	All sample data listed in this column are displayed.
Hide column	Label	All sample data listed in this column are not displayed.
^	Button	Changes the display sequence of the sample data. Moves selected samples one position to the left in sample view text view.
<<<	Button	Moves the sample data from the "Hide" section into the "Display" section.
>>>	Button	Moves the sample data from the "Display" section into the "Hide" section.
v	Button	Changes the display sequence of the sample data. Moves selected samples one position to the right in sample view text view.
Reset	Button	Shows all columns and resets the display sequence to the default setting.
OK	Button	Saves new settings

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Cancel	Button	Discards settings not yet saved.

Number of decimal places

You can specify the number of decimal places used in columns in the "Column properties" dialog. Open this dialog from the "Configure view" dialog with the aid of the context menu. Cf. *Column properties* on page 617.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Specifying the number of decimal places*

► *Configuring the sample view* on page 245

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Column properties

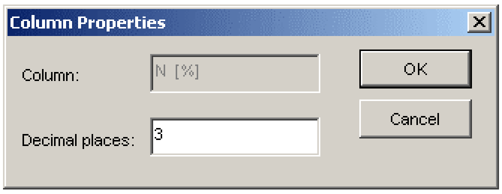
Function

In this dialog you specify the number of decimal places.

The dialog

Example of the dialog:

Dialog: Column properties

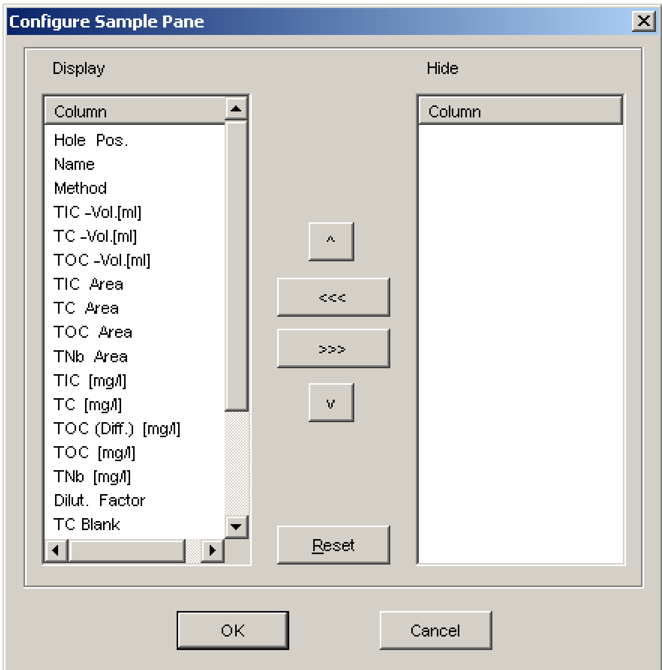


Open

The sample view must be open. Open the "Configure view" dialog by selecting **View > Configuration**. Select the appropriate column in the "Display" section and select **Properties...** from the context menu.

Opening the dialog

Proceed as follows to open the dialog:

Step	Procedure
1	Activate the sample view.
2	Open the "Configure view" dialog in the operating software by selec-ting **View > Configuration**. 

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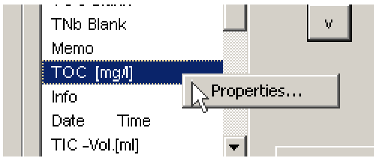
3	Select the column in the "Views" section whose decimal places you want to set and click the right mouse button. 
4	Open the "Column properties" dialog by selecting the "Properties..." menu item.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Column	Label	This field displays the column for which to set the number of decimal places.
Decimal places	Textbox	Field to input the desired number of decimal places. 0 to 7 decimal places are possible.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Specifying the number of decimal places*

► *Right mouse button function* on page 104

► *Configure view* on page 615

Configure graph view

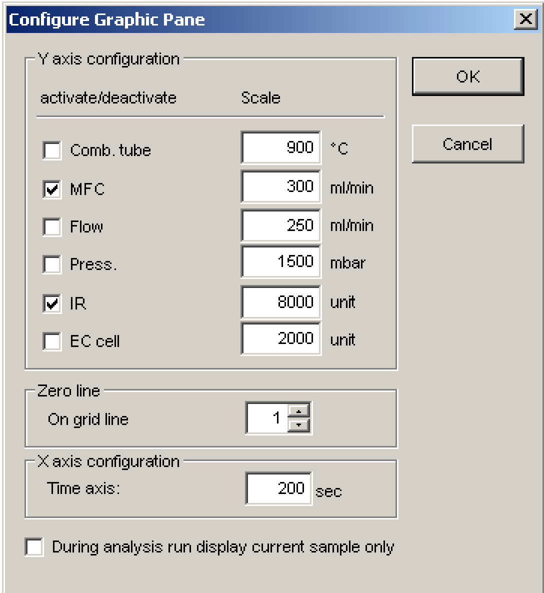
Function

In this dialog you can define the appearance of the graph view.

The dialog

Example of the dialog:

Dialog: Configure graph view



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Open

Open the dialog via **View > Configuration**. Progression view (graph view) must be enabled in order to open the "Configure graph view" dialog.

Elements

The following table describes the elements of the dialog in the "Y axis configuration" section:

Label	Element type	Meaning
Comb.tube	Checkbox	Displays the appropriate progression graph. You can set the scale range of the progression graph in the adjacent textbox.
MFC	Checkbox	See explanation of "Comb.tube".
Flow	Checkbox	See explanation of "Comb.tube".
Pressure	Checkbox	See explanation of "Comb.tube".
IR detect.	Checkbox	See explanation of "Comb.tube".
EC cell	Checkbox	See explanation of "Comb.tube".
The number of progression graphs you can display at the same time is limited to four for the sake of clarity.		

The following table describes the elements of the dialog in the "Zero line" section:

Label	Element type	Meaning
At height	Textbox with buttons	In this field you specify which of the horizontal grid lines in the graph view is assumed to be the zero line. A value of 0 means that the zero line is at the bottom edge of the graph view.

The following table describes the elements of the dialog in the "X axis configuration" section:

Label	Element type	Meaning
Time axis	Textbox	In this field you can define the division of the time axis (X axis).

The following table describes the other dialog elements:

Label	Element type	Meaning
Do not hide current sample graph	Checkbox	During an ongoing analysis you cannot view a progression graph of a previously analyzed sample.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Data backup and printing* on page 270
► *Configuring the graph view* on page 264
► *Right mouse button function* on page 104

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Configure statistics view

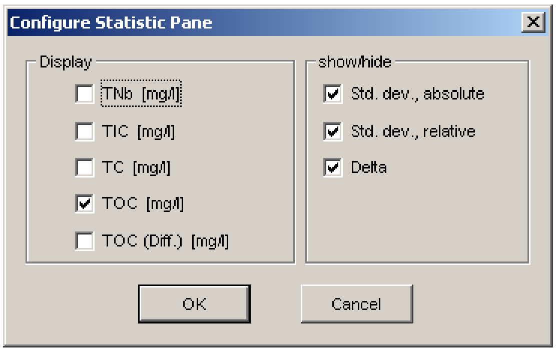
Function

In this dialog you can define the appearance of the statistics view.

The dialog

Example of the dialog:

Dialog: Configure statistics view



Open

Open the dialog via **View > Configuration**. Statistics view must be active in order to open the "Configure statistics view" dialog.

Elements

The following table describes the elements of the dialog in the "Display" section:

Label	Element type	Meaning
TNb [mg/l]	Checkbox	Only displays statistical data for the element N if this box is checked.
TIC [mg/l]	Checkbox	Only displays statistical data for the TIC components if this box is checked.
TC [mg/l]	Checkbox	Only displays statistical data for the TC components if this box is checked.
TOC [mg/l]	Checkbox	Only displays statistical data for the TOC components if this box is checked.
TOC (diff.) [mg/l]	Checkbox	Only displays statistical data for the TOC components if this box is checked.

The following table describes the elements of the dialog in the "show/hide" section:

Label	Element type	Meaning
Std. dev. absolute	Checkbox	Only displays absolute standard deviation of the individual groups if this box is checked.
Std. dev. relative	Checkbox	Only displays relative standard deviation of the indivi-dual groups if this box is checked.
Delta	Checkbox	Only displays the delta value of the individual groups if this box is checked.
The percentage contents and the computed mean value are always displayed and cannot be hidden.		

The following table describes the dialog buttons:

Label	Element type	Meaning
OK	Button	Saves new settings

Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Configuring the statistics view* on page 251
► *Right mouse button function* on page 104

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Save views

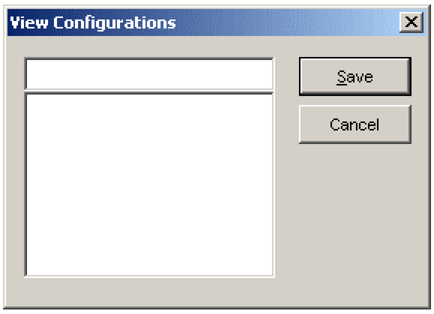
Function

In this dialog you can save the current sample view that the user has configured according to his own requirements.

The dialog

Example of the dialog:

Dialog: Save views



Open

Open the dialog by selecting **View > Save Configuration**. The sample view must be active in order to open the dialog.

Elements

The following table describes the dialog elements:

Label	**Element type**	**Meaning**
____	Textbox/label	▪ Field to input a name under which to save the view. ▪ If you have selected a file in the listbox, the name of the file is displayed here and you can overwrite the file.
____	Listbox	Field listing the saved views.
Save	Button	Saves the view under the selected name.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Saving the sample view* on page 249
► *Optimizing data evaluation* on page 160

Load views

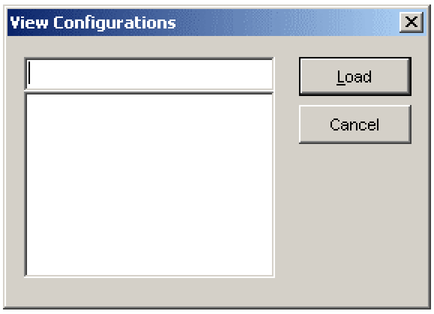
Function

In this dialog you can reload saved sample views. However, you can only load a view if the view was saved in the same operating mode as the current mode in which the analyzer is running.

The dialog

Example of the dialog:

Dialog: Load views



Open

Open the dialog by selecting **View > Load Configuration**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
____	Label	Field displaying the name of the selected view.
____	Listbox	Field listing the available views.
Load	Button	Loads the selected view.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Loading a sample view* on page 250

Delete views

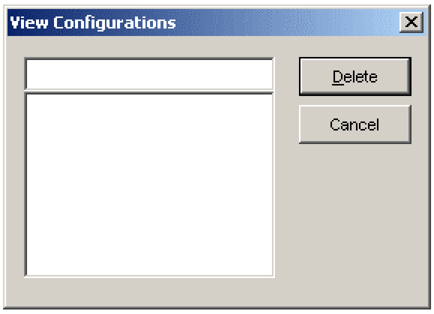
Function

In this dialog you can delete saved sample views.

The dialog

Example of the dialog:

Dialog: Delete views



Open

Open the dialog by selecting **View > Delete Configuration**. The sample view must be active in order to open the dialog.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
____	Label	Field displaying the name of the selected view.
____	Listbox	Field listing the available views.
Delete	Button	Deletes the selected view.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► -----

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View > Auto align

What is the command used for?	Depending on what is selected, this command optimizes the view of the sample view or graph view. ▪ In the sample view you can make the individual columns wider or narrower to make the headers and entries completely visible. ▪ In graph view the graph is scaled so that it is completely visible.

9.3.5 Menu Wizards

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **Wizards** menu.

Overview

"The **Wizards** menu" is divided into the following topics:

Topic **Page**

Calibration Wizard 628

System suitability wizard 631

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Calibration Wizard

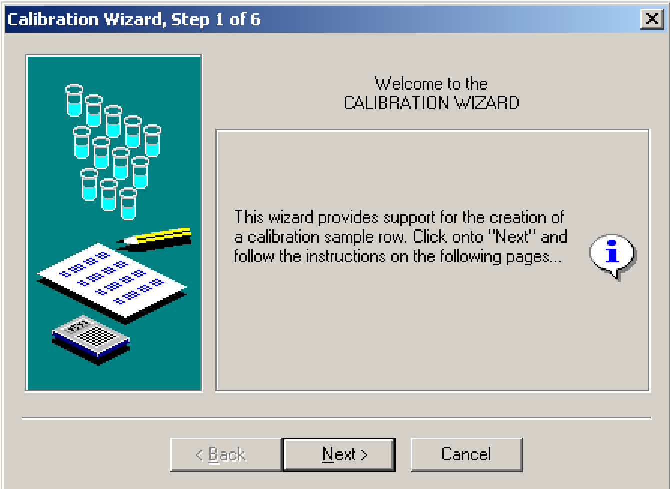
Function

The calibration wizard supports you in creating a calibration series. The data required for the creation have to be entered in several steps. After completion the program enters the corresponding sample data automatically into the sample view.

The wizard

Example of the dialog:

Wizard: Calibration



Open

Open the wizard via **Wizards > Calibration**.

Elements

Data setting will be done in several steps. Each step has its own dialog field. Below the dialog field there are general elements by means of which the individual steps of the wizard can be activated.

General elements

The following table describes the general elements of the wizard:

Label	Element type	Meaning
Back	Button	Goes back to the previous step. This element is not accessible in step 1.
Next	Button	Goes to the next step. This element is replaced by "Finish" in the last step.
Finish	Button	Closes the wizard and prepares the settings for the display in the sample view. This element is only available in the last step.
Cancel	Button	Leaves the wizard, discards the settings made so far.

Elements in step 1

A general introduction is given in this step. No settings will be made here.

Elements in step 2

The following table describes the elements of the wizard in step 2:

Label	Element type	Meaning
Number of measurements per sample	Radiobutton	Defines the number analysis which shall be taken from a sample container. **Note:** When selecting this option in connection with the injection volume make sure that the sample in the corresponding container is available in sufficient quantity!
Number of run-in samples	Textbox with buttons	Defines the number of the conditioning samples. The conditioning samples are placed in first place in the analysis series.
Number of blanks	Textbox with buttons	Defines the number of the blank value samples. The blank value samples are placed after the conditioning samples in the analysis series.
Number of calibration points	Textbox with buttons	Defines the number of the calibration points. The number of calibration samples is calculated as follows: Total number = Number of calibration points x Number of measurements per sample. The calibration samples are placed after the blank value samples in the analysis series.

Elements in step 3

The following table describes the elements of the wizard in step 3:

Label	Element type	Meaning
Method	Dropdown listbox	Defines the method with which the analysis series shall be processed. The popped-up list box displays the names of all currently available methods.
---	Label	The description of the currently selected method is displayed in this field. This facilitates the selection of the proper method.

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Elements in step 4

The following table describes the elements of the wizard in step 4:

Label	Element type	Meaning
Type of gradation	Radiobutton	Defines how the calibrations points are graduated. There are two possibilities: ▪ Different volumes. Select this option if you use one single parent solution for the calibration. The gradation of the absolute content is done via different injection volumes per calibration point. ▪ Different solutions. Select this option if you use calibration standards with different concentration for the calibration. The gradation of the absolute content is done via different concentrations with equal injection volumes.
from ...µl to ...µl	Text fields	These text fields are only accessible if the option "Different volumes" is selected. Defines the minimum and maximum injection volume. The gradation is done in equal distances, depending of the selected number of calibration points. The injection volume defined in the method will be ignored.
...µl	Textbox	These text field is only accessible if the option "Different solutions" is selected. Defines the injection volume which is valid for all calibration samples. The injection volume defined in the method will be ignored.

Elements in step 5

The following table describes the elements of the wizard in step 5:

Label	Element type	Meaning
Standard name	Dropdown listbox	Defines the standard with which the analysis series shall be processed. The popped-up list box displays the names of all currently available standards.
---	Label	The description of the currently selected standard is displayed in this field. This facilitates the selection of the proper standard.

Elements in step 6

In this last step you will find a list of notes on how to proceed after leaving the wizard. No settings will be made here.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Background knowledge required for calibration* on page 73

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System suitability wizard

Function

The system suitability test wizard offers support for the creation of a sample series for the performance of a system suitability test. The data required for the creation have to be entered in several steps. After completion the program enters the corresponding sample data automatically into the sample view.

The wizard

Example of the dialog:

Wizard: System suitability test

Open

Open the wizard via **Wizards > System suitability test**.

Elements

Data setting will be done in several steps. Each step has its own dialog field. Below the dialog field there are general elements by means of which the individual steps of the wizard can be activated.

General elements

The following table describes the general elements of the wizard:

Label	Element type	Meaning
Back	Button	Goes back to the previous step. This element is not accessible in step 1.
Next	Button	Goes to the next step. This element is replaced by "Finish" in the last step.
Finish	Button	Closes the wizard and prepares the settings for the display in the sample view. This element is only available in the last step.
Cancel	Button	Leaves the wizard, discards the settings made so far.

Elements in step 1

A general introduction is given in this step. No settings will be made here.

Elements in step 2

The following table describes the elements of the wizard in step 2:

Label	Element type	Meaning
Number of measu-rements per sample	Radiobutton	Defines the number analysis which shall be taken from a sample container. **Note:** When selecting this option in connection with the injection volume make sure that the sample in the correspon-ding container is available in sufficient quantity!
Number of run-in samples	Textbox with buttons	Defines the number of the conditioning samples. The condi-tioning samples are placed in first place in the analysis series.
Number of blanks	Textbox with buttons	Defines the number of the blank value samples. The blank value samples are placed after the conditioning samples in the analysis series.
Number of easily digestible samples	Textbox with buttons	Defines the number of samples to be measured which are considered to be easily digestible.
Number of hardly digestible samples	Textbox with buttons	Defines the number of samples to be measured which are considered to be hardly digestible.
Method	Dropdown listbox	Defines the method with which the analysis series shall be processed. The popped-up list box displays the names of all currently available methods.

Elements in step 3

In this last step you will find a list of notes on how to proceed after leaving the wizard. No settings will be made here.

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *System Suitability Test* on page 462

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9.3.6 System menu

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **System** menu.

Overview

"The **System** menu" is divided into the following topics:

Topic	Page
System > Auto	634
System > Single	635
System > Stop	636
Adjust carousel position	637
System > Arm Up	639
System > Arm Down	640
System > Hole Positions	641
System > Autozero	642
Set stop marker	643
Adjusting the current sample	644
Insert flush sequence	645
System > Wake-up	646
Sample feeding	647
Acceptable standard deviation	649
Analysis mode	650

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System > Auto

What is the command used for?

This command starts continuous analysis, i.e. the system processes all samples in sample memory up to the stop marker. Once the system reaches the stop marker, it either goes into idle mode or sleep mode, depending on settings.

From the toolbar: 

Note

You can only start the system if the following system conditions exist:

- System pressure is at least 800 mbar.
- Furnace temperatures are at least 50 °C below their setpoints.
- Working temperature of the thermal conductivity detector is at least 59 °C.
- The system has detected that the base line is stable.

If one of these conditions is not met, the system does not start and a message is displayed.

System > Single

What is the command used for?

This command starts a single analysis, i.e. the next sample in sample memory (= current sample) is processed. After processing the single sample, the system goes into idle mode again, regardless of sleep settings.

From the toolbar: 

Note

If you execute this command while continuous analysis is running, continuous analysis stops after finishing the current sample and the system goes into idle mode.

You can only start the system if the following system conditions exist:

- System pressure is at least 800 mbar.
- Furnace temperatures are at least 50 °C below their setpoints.
- Working temperature of the thermal conductivity detector is at least 59 °C.
- The system has detected that the base line is stable.

If one of these conditions is not met, the system does not start and a message is displayed.

System > Stop

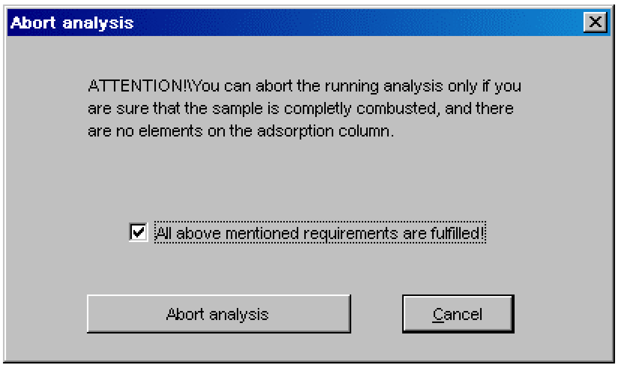
What is the command used for?

This command aborts a running analysis.

The system goes into idle mode again, regardless of sleep settings.

Note

The following dialog appears:



Observe the notes listed therein. Abort analysis only if either the sample has not been thrown in yet or has been already completely combusted. In the latter case, make sure that the column does not retain any element components, i.e. the desorption procedure has been completed. Otherwise, an abortion leads to system contaminations combined with significant damages.

To abort a running analysis, you have to confirm the note displayed in the dialog first. Only after the confirmation the **Abort analysis** button becomes accessible, thus allowing the abortion.

Adjust carousel position

Note: This function is only available in the solides modes.

Function

After a power failure or if you repeat initial startup and remove the carousel, it is necessary to readjust the position of the carousel.

In the dialog:

- you are warned about adjusting the carousel position if the carousel contains samples,
- you can move the carousel to zero position or any other position.

Caution	Inserting multiple samples into the ball valve If there are samples in the carousel while you are changing the position of the carousel via **System > Sample Position**, multiple samples may fall into the ball valve at the same time. In this case, a service technician is required. Before changing the position of the carousel, always remove all samples from the carousel.

Note

Observe the following when adjusting the position of the carousel:

The carousel is moved so that the selected position is above the insertion opening. When the next analysis starts, the carousel moves the next sample position above the insertion opening and drops the sample. Therefore, it makes sense to select the previous position when moving the carousel.

Example: You want to move the carousel so as to analyze the sample at position 26 in the next analysis. Therefore, select position 25. The carousel moves so far that position 25 is above the insertion opening. When the next analysis starts, the carousel moves one position on during the insertion process and thus drops the samples at position 26.

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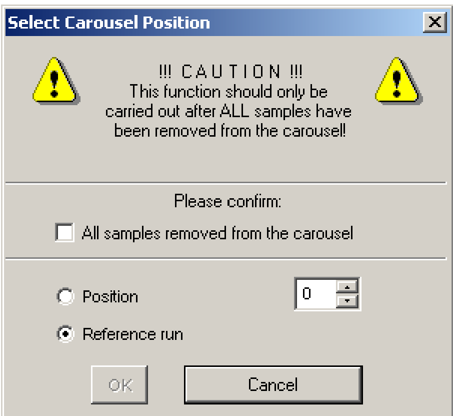
The dialog

Example of the dialog:

Dialog: Adjust carousel position



Open

Open the dialog via **System > Sample Position**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
All samples removed from the carousel	Checkbox	If you have removed all samples from the carousel, you must check this box. Otherwise the carousel will not move.
Position	Radiobutton	Moves the carousel moves to the desired position. You can set the position number in the textbox to the right. You must input the desired position number minus 1.
Reference run	Radiobutton	The carousel performs reference run, i.e. the carousel first moves to a defined reference position and then to position 0 which has almost the same location.
OK	Button	Adjusts the position of the carousel, if confirmed above that all samples have been removed from the carousel.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Reacting to a power failure* on page 536
► *Performing calibration* "Performing the calibration" on page 317
► *Changing the position of the carousel* on page 543

System > Arm Up

What is the command used for?	By this command the sample arm is moved to its upper end position.

System > Arm Down

What is the command used for?	By this command the sample arm is moved to its lower end position.
Note	If the carousel is in an undefined position this command will be ignored.

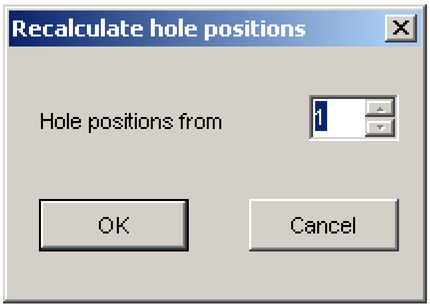
System > Hole Positions

What is the command used for?

By this command the hole positions of the individual samples will be calculated from anew. This is recommended, if e.g. one part of the analysis series shall be processed with triple determination and the other with quadruple determination.

Note

After invoking this command the dialog "Recalculate Hole Postions " opens.



Here you can define when the recalculation of the hole positions shall be started. Samples with a low number will not be influenced by the recalculation.

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System > Autozero

What is the command used for?	This command successively resets the current output values of the TCD and IR (if installed) to zero. The purpose is to reset the signals to zero if they have drifted over time.

Set stop marker

Function

In this dialog you can specify the sample at which to set the stop marker. Usually, the program automatically moves the stop marker while you input sample data. Therefore it is only necessary to move the stop marker manually in special cases.

The dialog

Example of the dialog:

Dialog: Set stop mark

Open

Open the dialog by selecting **System > Stop Tag**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Stop marker at:	Textbox with buttons	Field to input the sample number at which to set the stop marker.
OK	Button	Saves the setting.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Stopping continuous analysis* on page 540
► *Right mouse button function* on page 104

Adjusting the current sample

Function

You set the number of the current sample in the dialog. The current sample is the sample that is currently being analyzed (analysis mode) or that will be analyzed next (idle mode). It is only necessary to set the current sample after breakdowns (power failure, etc.), for example if the carousel position no longer matches the serial sample number.

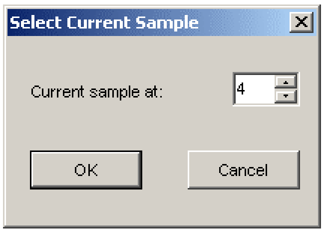
Note

The current sample is only set in sample memory. Therefore, it is necessary to check that the data of the current sample in sample memory match the data of the sample on the carousel that will actually be analyzed next. Otherwise, measurements will be incorrect.

The dialog

Example of the dialog:

Dialog: Adjusting the current sample



Open

Open the dialog by selecting **System > Current Sample**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Current sample at:	Textbox with buttons	Field to input a sample number You can also set the sample number in the textbox using the arrows.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- ► *Reacting to a power failure* on page 536
- ► *Right mouse button function* on page 104

Insert flush sequence

Function

In this dialog it will be determined at which sample a flushing sequence shall be inserted and from which container the rinsing liquid will be taken.

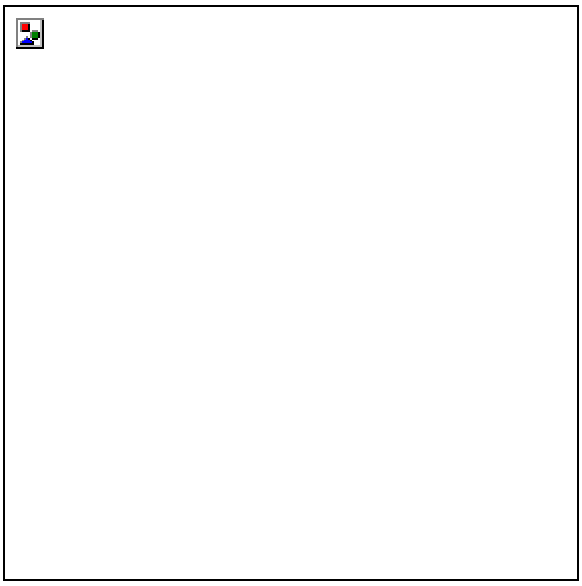
Note

If samples with high concentration differences are measured within an analysis series, it is required to perform flushing steps between the measurements.

The dialog

Example of the dialog:

Dialog: Insert Flushing Sequence



Open

Open the dialog by selecting **System > Insert Flushing Sequence**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Line Number	Textbox	Field to enter the line number where the flushing sequence shall be done.
Hole position	Textbox	Field to enter the hole position from which the rinsing liquid shall be taken.
OK	Button	Saves new settings and inserts an "empty sample" with the defined flushing methed at the corresponding place of the analysis series.
Cancel	Button	Discards settings not yet saved.

Further information

System > Wake-up

What is the command used for?	This command wakes up the "sleeping" system. The carrier gas is reactivated and the furnaces are heated back up to their working temperatures. This command is used to manually wake up the system if you need to start up the system prematurely, i.e. earlier than the chosen wake-up time. From the toolbar: 
Note	If you have defined a wake-up time that is in the past, you must wake up the sleeping system again with this command.

Sample feeding

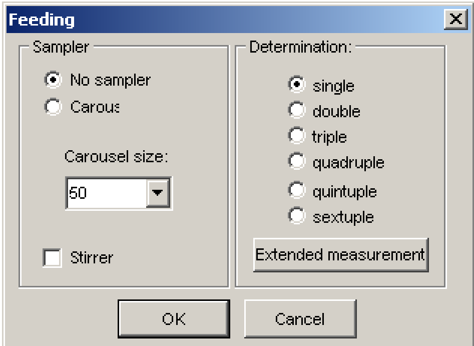
Function

In the dialog the type of feeding and the number of measurements per sample will be set. Via this dialog you will get to another dialog where additional measurements can be defined if the standard deviation exceeds a threshold for multiple determined samples.

The dialog

Example of the dialog:

Dialog: Feeding



Open

Open the dialog by selecting **System > Feeding**.

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Elements

The following table describes the dialog elements:

Label	Element type	Meaning
No autosampler	Radiobutton	Select this option, if the system shall take the sample material out of another container than from the container in the autosampler.
Carousel	Radiobutton	Select this option, if the sample material shall be taken from the containers in the autosampler.
Magazine size	Dropdown listbox	Field for the selection of the size of the carousel. If the option "carousel" has been selected, the number of the hole positions of the used carousel shall be specified.
Stirrer	Checkbox	If activated, the stirrer mounted in the instrument will be turned on.
Determination	Radiobutton	Defines the number measurements which shall be taken from a sample container of the carousel. **Note:** When selecting this option make sure that the sample in the corresponding container is available in sufficient quantity!
Extended measurement	Button	Opens the dialog "Acceptable standard deviation" where an acceptable standard deviatin for the corresponding component is defined and where the monitoring of the adherence can be activated and/or deactivated.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Performing a measuring series* on page 220

► *Acceptable standard deviation* on page 649

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Acceptable standard deviation

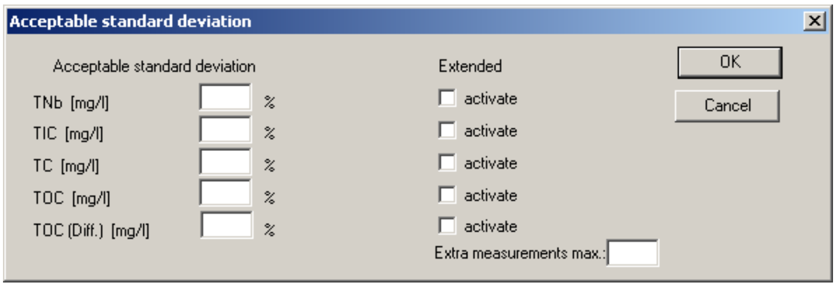
Function

In the dialog can be defined if and how many additional measurements shall be made, if the standard deviation of multiple determined samples exceeds an acceptable value.

The dialog

Example of the dialog:

Dialog: Acceptable standard deviation



Open

Open the dialog via the button **Extended measurement** in the "Feeding" dialog.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Acceptable standard deviation	Text fields	Defines the acceptable relative standard deviation for the corresponding component.
Extended measure-ment	Checkbox	Activates/deactivates the monitoring of the acceptable standard deviation for the corresponding component.
Additionam measu-rements max.	Textbox	Defines the maximal number of addtional measurements. The process is as follows: after one sample has been measured n times, the standard deviation of this group will be calculated. If the relative standard deviation is higher than the acceptable value, the additional measurements with subsequent recalculations of the standard deviations will be performed until either the result is smaller than the acceptable value or the maximum number of additonal measurements has been performed.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Performing a measuring series* on page 220
► *Sample feeding* on page 647

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Analysis mode

Function

In this dialog you can switch the operating software to a new operating mode.

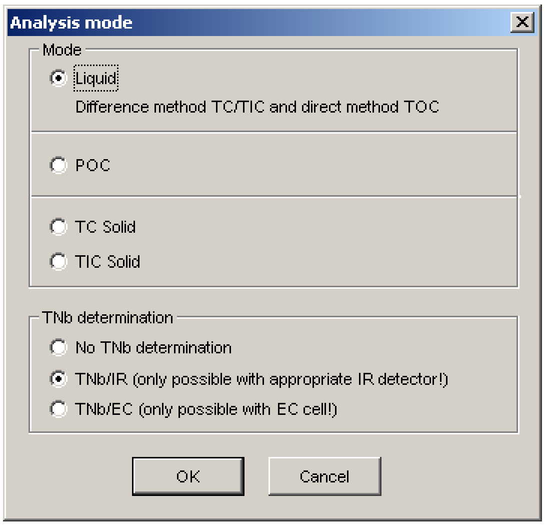
Before switching operating modes, it may be necessary to refit the analyzer. After refitting you can switch operating mode.

Caution	Overheating if tube fillings are not appropriate for the operating mode Overheated tube fillings melt, run into the furnace area and destroy the furnace. Make sure that the tube fillings correspond to the selected operating mode.

The dialog

Example of the dialog:

Dialog: Analysis mode



Open

Open the dialog via **System > Mode**. First a dialog is displayed indicating that the analyzer may need to be refitted before switching operating modes. The "Analysis mode" dialog is only displayed after you confirm this dialog.

Elements

The following table describes the dialog elements:

<table>
<tr><th>Label</th><th>Element type</th><th colspan="2">Meaning</th></tr>
<tr><td rowspan="3">Liquid</td><td rowspan="3">Radiobutton</td><td colspan="2">The instrument software is changed over to lliquid mode. The liquid mode offers two more sub modes that can be defined via the method:</td></tr>
<tr><th>difference method</th><th>direct method</th></tr>
<tr><td>determination of TC/TIC</td><td>determination of TOC</td></tr>
<tr><td>POC</td><td>Radiobutton</td><td colspan="2">The instrument software is switched to POC mode.</td></tr>
<tr><td>TC solids</td><td>Radiobutton</td><td colspan="2">The instrument software is switched to TC solids mode.</td></tr>
<tr><td>TIC solids</td><td>Radiobutton</td><td colspan="2">The instrument software is switched to TIC solids mode.</td></tr>
<tr><td>No TNb determination</td><td>Radiobutton</td><td colspan="2">The determination of TNb will be deactivated.</td></tr>
</table>

TNb/IR	Radiobutton	The determination of TNb is done by means of the IR detector.
TNb/EC	Radiobutton	The determination of TNb is done by means of the EC cell.
OK	Button	Switches the operating mode.
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Selecting the operating mode* on page 208

9.3.7 Options menu

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **Options** menu.

Overview

"The **Options** menu" is divided into the following topics:

Topic	Page
Maintenance intervals	653
Replace part	656
Adjusting the ball valve	658
Adjust carousel	659
Options > Maintenance > Flush Acid Path	661
Leak test dialog	662
System test	667
Error buffer	669
Error display	671
Options > Diagnostics > Baseline recording	672
Input options	673
Standard samples	675
Key names	677
Acoustic signals	678
calculation configuration	679
LIMS settings	680
Instrument parameters	684
Method	687
Error handling	689
Sleep / wake-up functions	690
Monthly logbook	692
Select period	694
Configure vario TOC	695
Configure key value	699

Maintenance intervals

Function

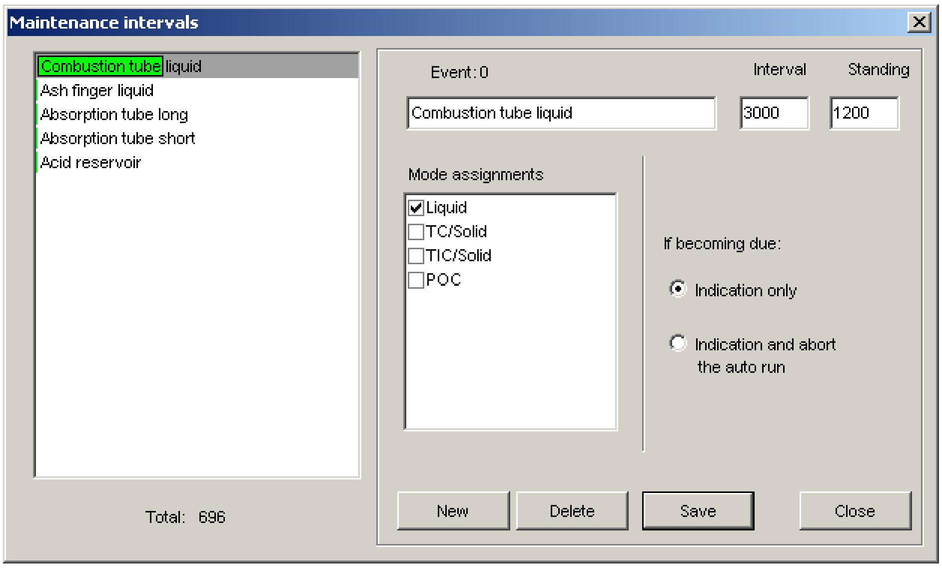
In this dialog you can view and define up to 10 maintenance events. The dialog has the following tabs:

- The "Overview" tab displays all maintenance intervals already defines and their statuses.
- The "Event" tabs are used to define the maintenance intervals.

The dialog

Example of the dialog:

Dialog: Maintenance intervals



Open

Open the dialog via **Options > Maintenance > Intervals**.

Elements of the "Overview" tab.

The following table describes the dialog elements on the "Overview" tab:

<table>
<tr><th>Label</th><th>Element type</th><th colspan="2">Meaning</th></tr>
<tr><td rowspan="5">Event 1-10</td><td rowspan="5">Label</td><td colspan="2">This field displays the name of the event and the urgency of the maintenance (bar display).</td></tr>
<tr><td>If the bar is...</td><td>...then...</td></tr>
<tr><td>green</td><td>there is still time for maintenance.</td></tr>
<tr><td>yellow</td><td>the maintenance must be performed soon.</td></tr>
<tr><td>red</td><td>the maintenance is overdue.</td></tr>
<tr><td>Total:</td><td>Label</td><td colspan="2">Displays the number of all analyses performed so far.</td></tr>
</table>

Elements of the "Event" tab:

The following table describes the elements in the top section of the "Event" tab:

Label	Element type	Meaning
Event	Textbox/label	▪ Field to input the name of a new event. ▪ The field displays the name of an event already displayed.

Interval	Textbox/label	▪ Field to input the number of analyzed samples after which the maintenance must be performed. ▪ The field displays the interval of an event already displayed.
Status	Textbox/label	▪ Field to input the number of samples already analyzed, e.g. when you install a used tube. You must enter 0 as the status after performing maintenance. ▪ This field displays the number of samples already analyzed.
___	Label	In this field the bar displays the urgency of the maintenance: **If the bar is...** → **...then...** green → there is still time for maintenance. yellow → the maintenance must be performed soon. red → the maintenance is overdue.

The following table describes the elements in the "Mode allocation" section of the "Event" tab:

Label	Element type	Meaning
Liquid	Checkbox	The event concerns the liquid mode. In this mode the "Status" field is automatically updated.
TC/Solid	Checkbox	The event concerns TC solids mode. In this mode the "Status" field is automatically updated.
TIC/Solids	Checkbox	The event concerns TIC solids mode. In this mode the "Status" field is automatically updated.
POC	Checkbox	The event concerns POC mode. In this mode the "Status" field is automatically updated.

The following table describes the elements in the "When due" section of the "Event" tab:

Label	Element type	Meaning
Information only	Radiobutton	When a maintenance event falls due, the system only displays a message in the status view. Cf. *Defining maintenance intervals in the software* "Defining maintenance intervals in the software." on page 302.
Information and stop continuous analysis	Radiobutton	When a maintenance event falls due, continuous analysis is stopped.

Dialog elements

The following table describes the buttons in the dialog that apply to all tabs:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.
Apply	Button	Button is not enabled.
Help	Button	Opens the description of the dialog in the help.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Defining maintenance intervals in the software.* on page 302
► *Viewing the status of maintenance intervals* on page 301
► *Installing used tubes* on page 304

► *Maintenance work to be performed by the customer* on page 299

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Replace part

Function

If you need to replace parts of the instrument, it is necessary to take certain precautions on the instrument beforehand. It is necessary to depressurize the analyzer.

Via the dialog:

- you can stop gas supply,
- reduce pressure,
- and the user receives further instructions.

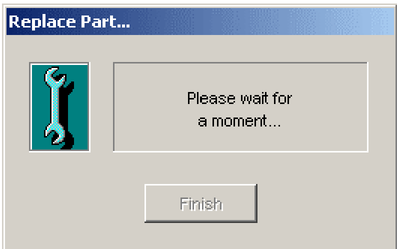
After replacing the part, you can get the instrument ready for operation again via this dialog. I.e. gas supply is reactivated and any atmospheric nitrogen is flushed out with helium.

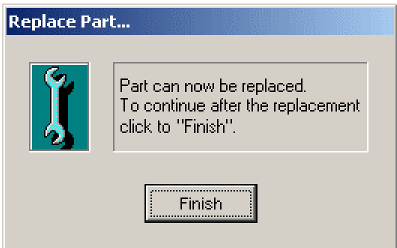
Warning	Gas pressure and caustic substances in the instrument Consumables may escape under pressure and cause chemical burns. Before replacing tubes or the ash crucible/finger, shut off the gas supply to the instrument. To do so, execute the **Opti-ons Maintenance > Replace Part** command.

The dialog

Example of the dialog:

Dialog: Replace part





Open

Open the dialog by selecting **Options > Maintenance > Replace Part**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Please wait a moment	Label	This field displays an instruction to wait for pressure drop without pressing any buttons until the next instruction is displayed.

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You can now replace the part. Click "Finish" to continue after replacing.	Label	If this instruction is displayed in the dialog and the displays "MFC-TCD", "Flow He" and "Pressure" show 0 on screen, you may replace the part.
Done	Button	Automatically switches the gas back on after replacing the part and removes any atmospheric nitrogen by flushing with helium for 5 minutes.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Conditioning newly installed tubes* on page 307
► *Preparing and following up maintenance work* on page 305

Adjusting the ball valve

Note

This function is only available in the solides modes.

Function

The ball valve is used to ensure air-free introduction of samples. The ball that receives the sample is located between two half shells that have to exert a certain contact pressure. The dialog displays whether thus contact pressure is correctly set.

Caution	Ball valve set too tight Setting the ball valve too tight damages the mechanical drive system. If the bar in the "Ball valve setting" dialog is red, loosen the wheel flange with a hook wrench until the bar turns green.

The dialog

Example of the dialog:

Dialog: Adjust ball valve

Open

Open the dialog by selecting **Options > Maintenance > Set Ball Valve**.

Elements

The following table describes the dialog elements:

<table>
<tr><th>Label</th><th>Element type</th><th colspan="2">Meaning</th></tr>
<tr><td rowspan="6">___</td><td rowspan="6">Label</td><td colspan="2">In this field, the color of the bar indicates how the ball valve contact pressure is set.</td></tr>
<tr><td>If the bar is...</td><td>...then...</td></tr>
<tr><td>gray</td><td>contact pressure is too loose.</td></tr>
<tr><td>yellow</td><td>contact pressure is too tight. Only brief overshooting into the yellow range is permissible.</td></tr>
<tr><td>red</td><td>contact pressure is too tight and may damage the driving motor.</td></tr>
<tr><td>green and ends roughly in the middle of the selected range.</td><td>contact pressure is set correctly.</td></tr>
<tr><td>OK</td><td>Button</td><td colspan="2">Closes the dialog.</td></tr>
</table>

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Cleaning, assembling and installing the ball valve.* on page 376
► *Sample insertion and initiation of measurement* on page 54

Adjust carousel

Note

This function is only available in the liquid modes.

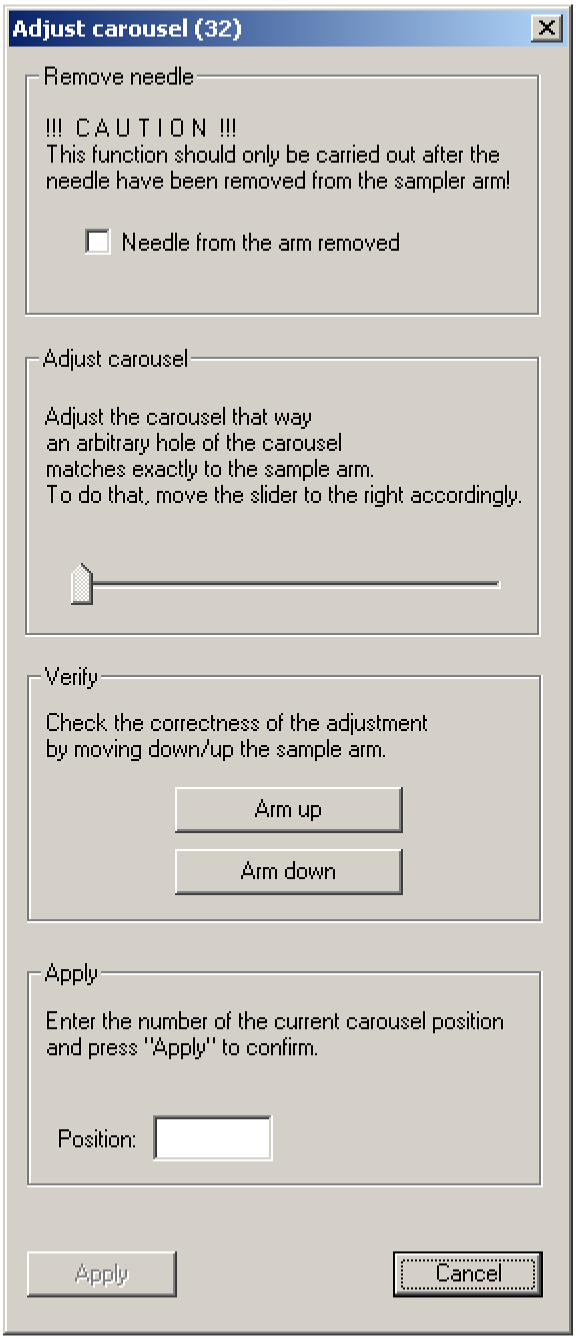
Function

In the dialog the vernier adjustment of the sample postions can be done.

The dialog

Example of the dialog:

Dialog: Adjust carousel



Open

Open the dialog via **Options > Maintenance > Carousel adjustment**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Needle removed from the arm	Checkbox	This element service for the protection of the feeding unit since an unremoved needle while turning the carousel may cause damages to the feeding unit. This element instructs you to always removed the needle first. Only if this element is activated, the elements for the adjustment are accessible.
Adjust carousel	Sliding controller	By moving the sliding controller the carousel can be positioned directly below the lifting unit of the sample arm. **Note:** The carousel is only movable in one direction. If you positioned the carousel too far, a readjustment for the next sample position has to be made.
Arm up	Button	Moves the sample arm to its upper end position. Serves for checking the adjusted carousel position.
Arm down	Button	Moves the sample arm to its lower end position. Serves for checking the adjusted carousel position.
Position	Textbox	After completion of the adjustment, enter the number of the position related to the adjustment.
Apply	Button	Saves the settings and performs a reference run of the carousel.
Cancel	Button	Closes the dialog.

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Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► ---

Options > Maintenance > Flush Acid Path

What is the command used for?	By this command the acid supply to the sparger will be flushed and ventilated. After invoking this command a window opens where the intention to flush the acid path has to be reconfirmed. After the confirmation a process starts which carries out flushing and ventilation.

Leak test dialog

Function

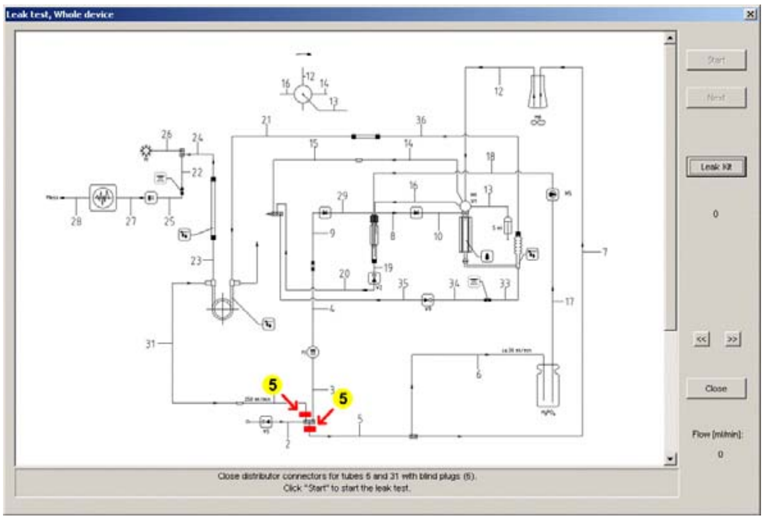
This dialog is used to perform a leak test and the leak search:

- In the display window the tubing diagram of the analysis system is shown. Depending on the currently performed leak test stage, the appearance of the tubing diagram may vary.
- Below the diagram there is a field which will show information about the actions to be performed during the certain test stages, e.g. which gas ways have to be closed etc.
- On the right margin of the dialog field there are buttons as well as the display for the current gas flow.

The dialog

Example of the dialog:

Dialog: Leak test



Open

Open the dialog via **Options > Diagnostics > Leak Test**. First a dialog is displayed in which you must confirm that you want to perform a leak test. The "Leak test: Complete instrument" dialog is displayed once you confirm.

Dialog elements

The following table describes the dialog elements:

Label	Element type	Meaning
Graphic field	Label	Shows the tubing diagram of the analysis system. Depending on the currently active test stage, some sections of the gas paths can be differently colored: No coloring: Whole leak test and/or gas ways not tested yet. Blue coloring: Gas way currently under test. Green coloring: Gas ways already tested. Prior to an execution of a test stage it may be necessary to close certain gas ways. The corresponding actions to be performed are indicated by black numbers on yellow circles. The number is the identifier of the corresponding component from the leak test kit. If the mouse pointer is moved over such a circle a window opens showing the position as well as the type of attachment of the leak test component.
Info field (below the graphic field)	Label	Gives information to the user, which actions have to be performed for the execution of a test stage (e.g. sealing of certain gas ways etc.).
Start	Button	Stars execution of the currently active leak test stage. The "Test Phases" dialog will open. Here, the test run can be observed.
Next	Button	Switches to the next test stage. The leak search strategy implemented in the program chooses automatically the proper stage to be tested next.
Leak search set	Button	Opens a dialog in which all components of the leak test kit are displayed.
<<	Button	Switch back to the next lower test stage. This function allows a manual testing of particular stages, however, the leak search strategy will be suspended by this function.
>>	Button	Switch forward to the next higher test stage. This function allows a manual testing of particular stages, however, the leak search strategy will be suspended by this function.
Close	Button	Closes the leak test dialog. The user will be requested to turn on again the oxygen supply. Afterwards, a re-initialization of the system takes place.
Flow [ml/min]	Label	Shows the current gas flow.

The titlebar of the dialog shows the denotation of the currently active test stage.

The following table describes the several test stages as well as the progress of the leak search strategy:

No.	Denotaion of the stage	Meaning
0	Complete instrument	Leak test for the whole system will be performed. Excluded are lines for gassing as well as counter current ways of the membrane gas drying. If the leak test of the whole device is successful, no further test stages are necessary (in this case, **Next** is not accessible) and the leak test dialog can be left.
1	Inlet area with sparger	The leak test for the inlet area including sparger is being performed. If a leak has been detected here, it must be located inside the blue colored range. Otherwise, clicking **Next** causes switching to stage 2.

2	Combustion tube	Leak test for the combustion tube area will be performed. If a leak has been detected here, it must be located inside the blue colored range. Otherwise, clicking **Next** causes switching to stage 3.
3	Condenser	Leak test for the condenser area will be performed. If a leak has been detected here, it must be located inside the blue colored range. Otherwise, clicking **Next** causes switching to stage 4.
4	Halogen absorber	Leak test for the halogen absorber area will be performed. If a leak has been detected here, it must be located inside the blue colored range. Otherwise, clicking **Next** causes switching to stage 5.
5	Membrane gas drying	Leak test for the membrane gas drying area will be performed. If a leak has been detected here, it must be located inside the blue colored range. Otherwise, clicking **Next** causes switching to stage 6.
6	Drying tube	Leak test for the drying tube area will be performed. If a leak has been detected here, it must be located inside the blue colored range. Otherwise, clicking **Next** causes switching to stage 7.
7	Outlet area	The leak test for the outlet are is being performed. Under normal circumstances - if the leak search strategy has routed to this stage - the leak will probably be located in this stage since this stage represents the last stage. Therefore the **Next** button is not accessible here.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- *Performing a leak test* on page 528
- *Conditioning newly installed tubes* on page 307
- *Preparing and following up maintenance work* on page 305
- *Optimizing instrument condition for calibration* on page 316
- *Start-up* on page 172
- *Maintenance work to be performed by the customer* on page 299

Leak test: Test phases

Function

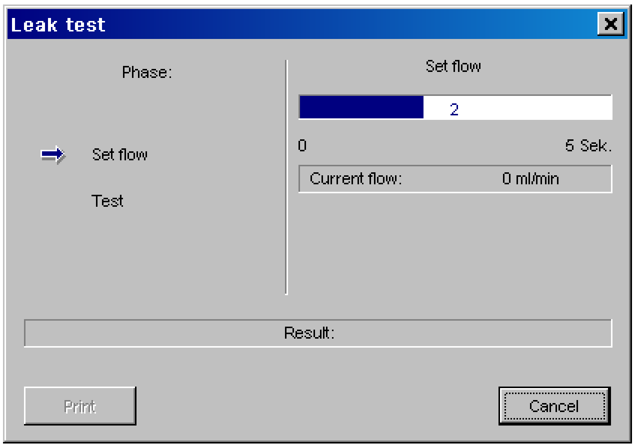
This dialog displays the current status while performing a leak test.

- The left half of the dialog displays the individual stages of the test. The current stage of the test is marked with an arrow.
- The right half of the dialog displays the remaining time of the respective stage of the test and the gas flow.
- The result is displayed at the bottom of the dialog once the test is finished.

The dialog

Example of the dialog:

Test phases dialog



Open

Open the dialog by clicking **Start** in the "Leak test" dialog.

Dialog elements

The following table describes the elements in the left section of the dialog:

Label	Element type	Meaning
Set flow	Label	The programs sends a corresponding command to the MFC which secures that a stable gas flow will be established after a certain running-in time.
Test	Label	The program sends a corresponding command to the MFC which sets the gas flow to zero, i. e. no gas flows through the MFC anymore. With a tight system the value measured by the flow sensor also has to go back to zero. If this is not the case it can be assumed that the system has a leak.

The following table describes the elements in the right section of the dialog:

Label	Element type	Meaning
0 ... 5 sec	Label	This field displays the remaining time of the respective stage of the test.
Flow, current	Label	This field displays the value of the flow sensor.

The following table describes the elements in the bottom section of the dialog:

Label	Element type	Meaning
Result	Label	This field displays whether the leak test was successful or not. The following symbols highlight the leak test result:

		Icon	Meaning
			Leak test successful.
			Leak test failed.
Print	Button	Prints the result after the leak test finishes.	
Cancel	Button	Aborts the leak test.	

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Performing a leak test* on page 528
► *Conditioning newly installed tubes* on page 307
► *Preparing and following up maintenance work* on page 305
► *Optimizing instrument condition for calibration* on page 316
► *Start-up* on page 172
► *Maintenance work to be performed by the customer* on page 299

System test

Function

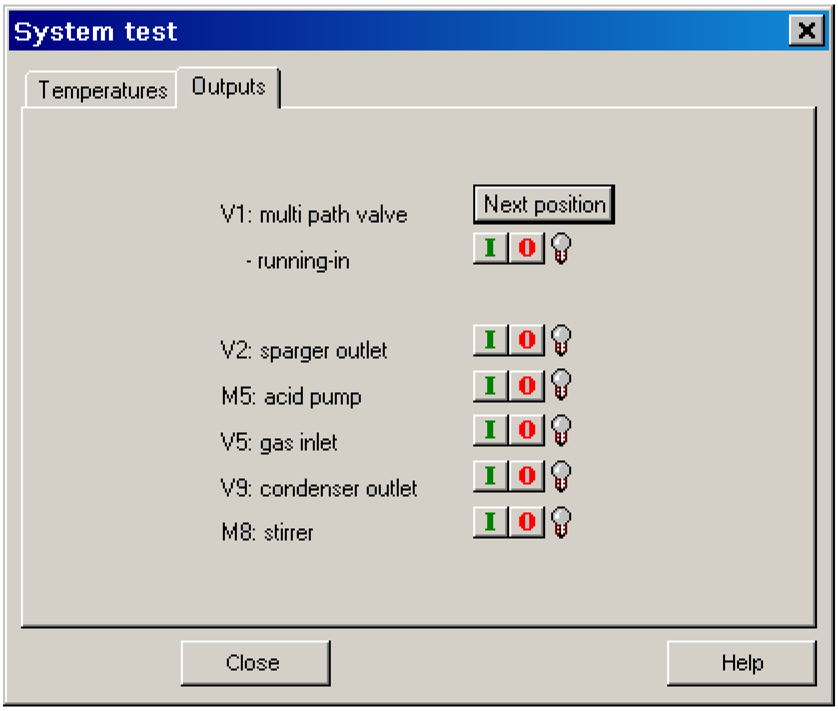
In this dialog you can test the system components of the analyzer for proper working order. The dialog contains the following two tabs:

- On the "Temperatures" tab you can test the furnaces for proper working order.
- You can test proper working order of the fans and valves on the "Outputs" tab.

The dialog

Example of the dialog:

Dialog: System test



Open

Open the dialog by selecting **Options > Diagnostics > System Test**.

Elements of the "Temperatures" tab.

The following table describes the dialog elements on the "Temperatures" tab:

Label	Element type	Meaning
furnace	Textbox/label	▪ This field displays the current temperature of the furnace. ▪ Field to input the furnace setpoint temperature. ▪ This field displays the temperature progression of the furnace towards setpoint temperature.
Apply	Button	Heats up the furnace to a previously entered temperature.
The left (grey) field shows the actual temperature. Placing the cursor in one of these fields "freezes" the temperature displayed there. You can now input a setpoint temperature om the right field. By clicking **Apply** the furnace will be controlled to the setpoint temperature. The left field now displays the current temperature again and you can observe whether and how temperature approaches the setpoint temperature.		

Elements of the "Outputs" tab

The following table describes the dialog elements on the "Outputs" tab:

Label			Element type	Meaning
V1: multiway valve, **Next pos.**			Button	moves the multiway valve to the next valve position. (only available in the liquid modes)
V1: multiway valve, Long term test	**0**	**I**	Button	▪ **0** switches the long term test off. ▪ **I** switches the long term test (continuous rotation) on. (only available in the liquid modes)
V1: Ball valve, **Next pos.**			Button	moves the ball valve to the next position. (only available in the solids modes)
V1: multiway valve, Long term test	**0**	**I**	Button	▪ **0** switches the long term test off. ▪ **I** switches the long term test (continuous rotation) on. (only available in the solids modes)
V2: Drain sparger	**0**	**I**	Button	▪ **0** removes the current from valve V2. ▪ **I** applies current to valve V2.
M5: Acid pump	**0**	**I**	Button	▪ **0** switches the pump off. ▪ **I** switches the pump on.
V5: Gas inlet	**0**	**I**	Button	▪ **0** removes the current from valve 5. ▪ **I** applies current to valve 5.
V9: Drain condenser	**0**	**I**	Button	▪ **0** removes the current from valve 9. ▪ **I** applies current to valve 9.
M8: Magnetic stirrer	**0**	**I**	Button	▪ **0** switches the magnetic stirrer off. ▪ **I** switches the magnetic stirrer on.
The light bulb behind the buttons displays the following: ▪ If the light bulb behind the button goes off, the component has been correctly switched off and current has been removed. ▪ If the light bulb behind the button lights up yellow, the component has been correctly switched on and current has been applied.				

Dialog elements

The following table describes the buttons in the dialog that apply to all tabs:

Label	Element type	Meaning
Close	Button	Closes the dialog.
Help	Button	Opens the description of the dialog in the help.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Performing a system test* on page 527

Error buffer

Function

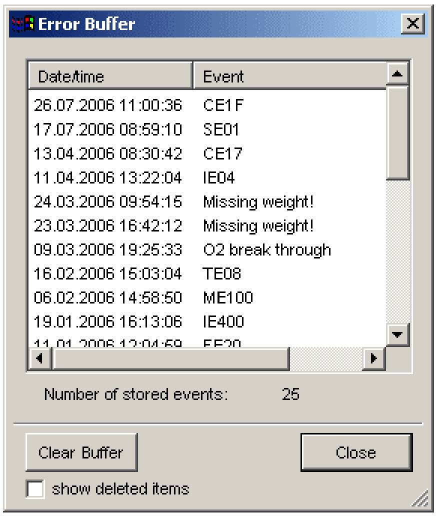
This dialog displays a chronological list of all errors and events detected by the system. Every event detected is accompanied by the following information for tracking purposes:

- Date and time in the "Date/Time" column.
- Error code in the "Event" column.

The dialog

Example of the dialog:

Dialog: Error buffer



Open

Open the dialog by selecting **Options > Diagnostics > Error buffer**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Date/time; event	Listbox	Field listing every event with the date, time and its error code.
Number of events	Label	Field displaying the total number of events currently in the error buffer.
show deleted items	Checkbox	If activated, all events which have been deleted previously will be displayed again. This element is not enabled at the lowest access level.
Delete	Button	Deletes selected events.
Close	Button	Closes the dialog.

Decoding the error code

Error codes are decoded and displayed in the "Error display" dialog. Open this dialog by double-clicking the appropriate event line. Cf. *Error display* on page 671.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Interpreting PC error messages* on page 524

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Error display

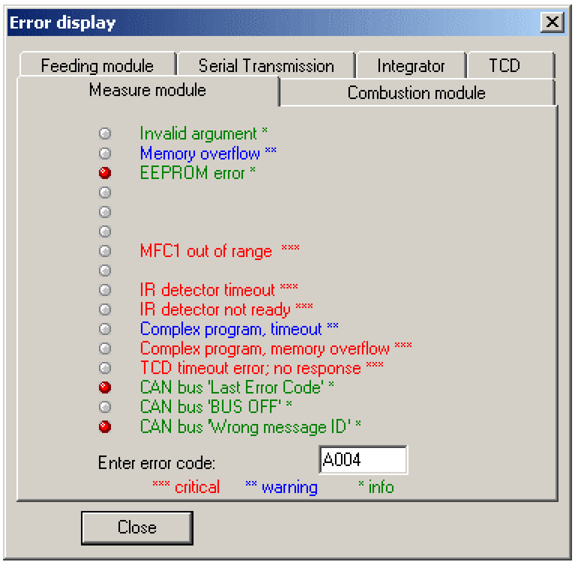
Function

This dialog decodes the various error codes and displays the results. The error types are divided into different categories and each category is allocated to a separate tab.

The dialog

Example of the dialog:

Dialog: Error display



Open

Open the dialog via:

- **Options Diagnostics > Error Display** or
- by double-clicking the appropriate event line in the "Error buffer" dialog. Cf. *Error buffer* on page 669.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Input error code	Textbox	Field to input the appropriate error code. Once the input box contains a code number, the program displays the decoded result green in the section above it.
Close	Button	Closes the dialog.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Interpreting PC error messages* on page 524

Options > Diagnostics > Baseline recording

What is the command used for?	This command displays the detector baseline in graph view. For better distinction the frame of the graphic field appears in red color. The baseline recording is used for troubleshooting, for example if a measurement deviates too strongly. Select this command again to hide the base line.

Input options

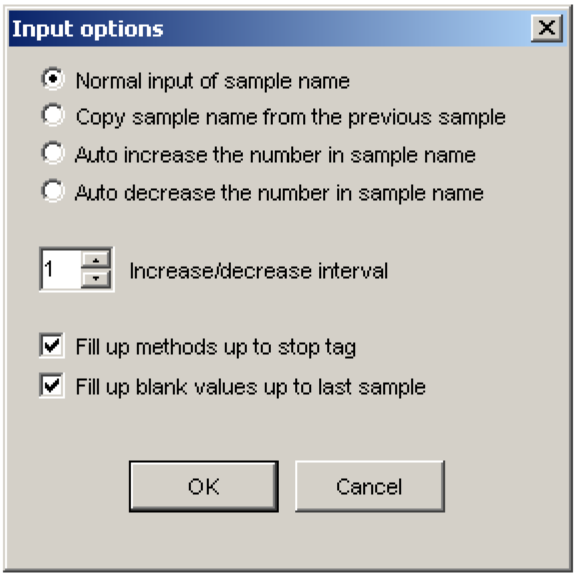
Function

In this dialog you can define what the program should do when you input the same name. This allows you to optmize sample data input and minimize keystrokes.

The dialog

Example of the dialog:

Dialog: Input options



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Open

Open the dialog via **Options > Settings > Input**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Normal sample name input	Radiobutton	The sample name is entered in the appropriate column as it is input.
Apply sample name	Radiobutton	After entering the sample name and pressing Enter, the input name is applied to the next line.
autom. Auto-increment the number in the sample name	Radiobutton	If a sample name ends with a number (e.g. "Name001"), this figure is automatically incremented by a certain amount and suggested for the next sample (e.g. "Name002"). Exceptions: ▪ If the number of characters is completely used up (e.g. "Name999"), it is not incremented and the same name is suggested for the next sample. ▪ If the figure is not at the end of the sample name (e.g. "Name001xyz"), it is not incremented.
autom. Auto-decrement the number in the sample name	Radiobutton	Works the same way as auto-increment, only the figure in the name is decremented. Exception: ▪ The figure "zero" is not decremented.

Increment/decrement interval	Textbox with buttons	In this field you can input the interval at which to increment/decrement the figure in the name. This figure can be between 1 and 99. The number must, however, fit in the displayable number of digits, otherwise the number is not changed.
Fill method names to stop marker	Checkbox	If, for example, you have input/copied 10 successive sample names with the sample memory empty, the stop marker is now at the tenth sample. If you have input a method name for the first sample, this name is entered for all ten samples.
Fill blank values to last sample	Checkbox	The blank value input for the first sample is entered for all subsequent samples.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Settings for sample input* on page 214
► *Optimizing sample data editing* on page 158

Standard samples

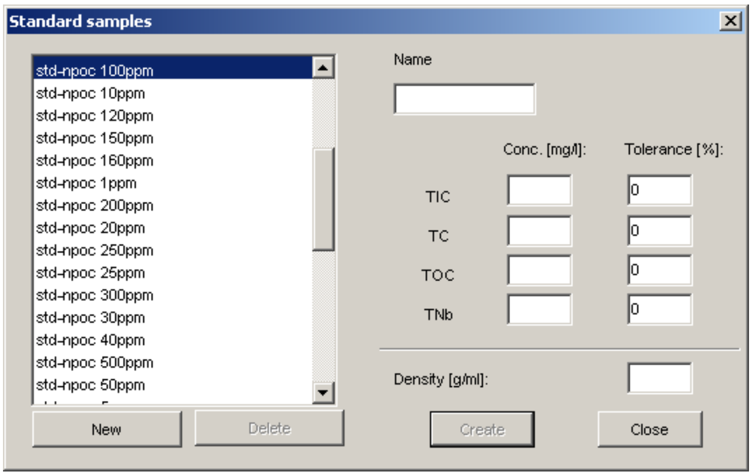
Function

In this dialog you can create, delete, view, copy and change standard samples.

The dialog

Example of the dialog:

Dialog: Standard samples



Open

Open the dialog by selecting **Options > Settings > Standards**.

Elements

The following table describes the dialog elements: Please mind that the labeling may differ in the various modes.

Label	Element type	Meaning
____	Listbox	This field lists all standard samples already defined.
Name	Textbox/label	Field to input the name of the standard sample.
TIC Conc. [mg/l]	Textbox/label	Field to input the theoretical percentage content of TIC in the respective standard sample.
TIC tolerance [%]	Textbox/label	Field to input the TIC tolerance limit. The tolerance limit is required if standard tolerance monitoring is enabled.
TC Conc. [mg/l]	Textbox/label	Field to input the theoretical percentage content of TC in the respective standard sample.
TC tolerance [%]	Textbox/label	Field to input the TC tolerance limit. The tolerance limit is required if standard tolerance monitoring is enabled.
TOC Conc. [mg/l]	Textbox/label	Field to input the theoretical percentage content of TOC in the respective standard sample.
TOC tolerance [%]	Textbox/label	Field to input the TOC tolerance limit. The tolerance limit is required if standard tolerance monitoring is enabled.
TNb Conc. [mg/l]	Textbox/label	Field to input the theoretical percentage content of TNb in the respective standard sample.

TNb tolerance [%]	Textbox/label	Field to input the TNb tolerance limit. The tolerance limit is required if standard tolerance monitoring is enabled.
New	Button	Allows the definition of a new standard sample. This function empties the input boxes, thus data for a new standard sample can be entered.
Delete	Button	Deletes a standard sample previously selected in the listbox.
Save	Button	Applies the settings after you have changed the values of a standard sample.
Create	Button	Creates a new standard sample dataset and enters the standard sample name into the listbox. This button is only available after a new standard sample has been created.
Close	Button	Closes the dialog.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Defining standard substances as calibration samples* on page 191

Key names

Function

In this dialog you specify key names for conditioning samples and blank value samples. A key name is a reserved sample name that the software recognizes and interprets in a special way.

Note

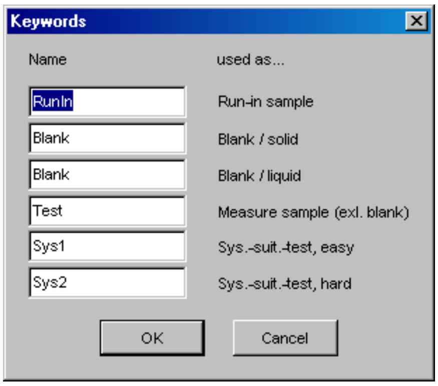
Key names are already defined for conditioning samples and blank value samples. You can change key names, but you must observe the following:

- The names must be distinguishable.
- The program does not distinguish between uppercase and lowercase, so "BLANK" has the same meaning as "blank", for example.

The dialog

Example of the dialog:

Dialog: Key names



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Open

Open the dialog via **Options > Settings > Keywords**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Conditioning sample name	Textbox	Field to input the key name for conditioning samples.
Name blank / solids	Textbox	Field to input the key name for blank value samples in the solids modes.
Name blank / liquid	Textbox	Field to input the key name for blank value samples in the liquid modes.
Name measuring sample	Textbox	Field to input the key name for measuring samples.
OK	Button	Saves the key names.
Cancel	Button	Discards key names not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Defining key names for blank and conditioning samples* on page 188

Acoustic signals

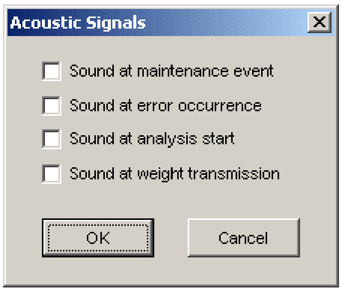
Function

In the dialog you can enable and disable acoustic signals to be output when certain events occur. The individual signals vary in pitch for easier distinction.

The dialog

Example of the dialog:

Dialog: Acoustic signals



Open

Open the dialog by selecting **Options > Settings > Acoustic Signals**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Maintenance event sound	Checkbox	If a maintenance interval is exceeded or if the interval can be expected to expire while processing a series of analyses, a warning signal is output every 2 seconds.
Error sound	Checkbox	If the analysis system reports an error, a warning sound is output every two seconds.
Analysis start sound	Checkbox	A sound is output whenever a measurement starts in continuous operation.
Weighing data transmission sound	Checkbox	A sound is output whenever a connected balance transmits a weighing value to the PC.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Enabling/disabling acoustic signals* on page 196

calculation configuration

Function

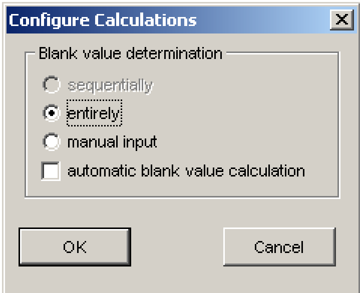
In this dialog you can set the calculation method for determining the daily factor and blank value. There are two calculation methods:

- Sequential calculation. This means that a separate factor or blank value is computed for each group of blank value samples; this is then used to correct the measuring samples until the next group of standard or blank value samples arrives. This calculation method allows you to compensate for fluctuations in measuring over a certain period.
- Total calculation method. This means that the calculation is performed for all blank value samples in a document. An average factor is computed.

The dialog

Example of the dialog:

Dialog: calculation configuration



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Open

Open the dialog via **Options > Settings > Calculation**.

Elements

The following table describes the elements of the dialog in the "Blank value determination" section.

Label	Element type	Meaning
sequential	Radiobutton	The blank value is computed sequentially. This option is only available in the solides modes.
total	Radiobutton	The blank value is computed as a total.
manual input	Radiobutton	The blank value can be entered manually, there will be no calculation of the blank value.
autom. blank value calculation	Checkbox	calculation of the blank value starts automatically after the end of every analysis.

The following table describes the other dialog elements:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Determining blank values* on page 231

LIMS settings

Function

This dialog is used to make various adjustments to a laboratory information and management system (LIMS). The dialog has three tabs.

- On the "LIMS data" tab you select which data to send to the LIMS and whether they should be sent automatically after every analysis.
- On the "Communication" tab you specify whether and how to transfer data.
- If you are using multiple analyzers with one PC, you must specify one instrument identifier on the "Identifier" tab so that the LIMS data can be allocated to the correct instrument. You can also define user names.

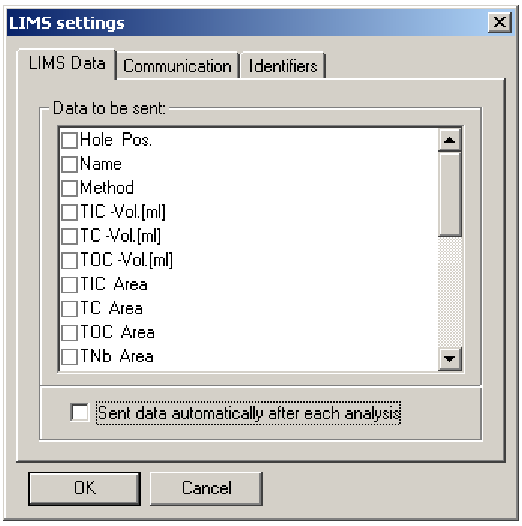
Note

Note that the LIMS port name must not be identical to the port name between the PC and the analyzer. This could lead to a system crash.

The dialog

Example of the dialog:

Dialog: LIMS settings



Open

Open the dialog via **Options > Settings > LIMS**.

Elements of the "LIMS data" tab

The following table describes the dialog elements on the "LIMS data" tab:

Label	Element type	Meaning
Weight	Checkbox	Sends the weight of the sample in the carousel. This option is only available in the solids modes.
Hole pos.	Checkbox	Sends the hole position number.
Name	Checkbox	Sends the sample name.
Method	Checkbox	Sends the method used for the sample.
TIC-Vol. [ml]	Checkbox	Sends the TIC injection volume of the sample.
TC-Vol. [ml]	Checkbox	Sends the TC injection volume of the sample.
TOC-Vol. [ml]	Checkbox	Sends the TC injection volume of the sample.
TIC area	Checkbox	Sends the detected peak TIC area of the sample.
TC area	Checkbox	Sends the detected peak TC area of the sample.

TOC area	Checkbox	Sends the detected peak TOC area of the sample.
TNb area	Checkbox	Sends the detected peak TNb area of the sample.
TIC [mg/l]	Checkbox	Sends the TIC concentration of the sample.
TC [mg/l]	Checkbox	Sends the TC concentration of the sample.
TOC (diff.) [mg/l]	Checkbox	Sends the TOC concentration value of a sample determined from a difference measurement.
TOC [mg/l]	Checkbox	Sends the TOC concentration of the sample.
TNb [mg/l]	Checkbox	Sends the TNb concentration of the sample.
Dilut. factor	Checkbox	Sends the dilution factor of the sample.
TC blank	Checkbox	Sends the TC blank value.
TIC blank	Checkbox	Sends the TIC blank value.
TOC blank	Checkbox	Sends the TOC blank value.
TNb blank	Checkbox	Sends the TNb blank value.
Memo	Checkbox	Sends notes about the samples and the analysis.
Info	Checkbox	Sends any error messages.
Date/time	Checkbox	Sends the date and time of the measurement.
Sends every element with a check mark. The order corresponds to the list from top to bottom. If you change the selection of elements to send, you must edit the LIMS software, otherwise the data may be misinterpreted.		
Send data automatically after every analysis	Checkbox	Automatically send the data to LIMS after every analysis.

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Elements of the "Communication" tab.

The following table describes the elements of the "Communication" tab in the "Data transfer" section:

Label	Element type	Meaning
none	Radiobutton	No data are sent to LIMS.
via serial port	Radiobutton	Data are transferred via the serial port.
via network	Radiobutton	The data to send to the LIMS are written to a file. The file can be accessed from the LIMS and from the vario TOC operating software.

The following table describes the elements of the "Communication" tab in the "Serial" section:

Label	Element type	Meaning
Port name	Textbox	Field to input the name of the interface. The port name must not be the same as the port for communication between the PC and analyzer. Otherwise, operation of the analysis system will be disrupted.
Baud rate	Textbox	Field to input transfer parameters.
Databits	Textbox	Field to input transfer parameters.
Stopbits	Textbox	Field to input transfer parameters.
Parity	Textbox	Field to input transfer parameters.
The textboxes in the "Serial" section only have to be filled in if you have selected the "via serial port" radio button in the "Data transfer" section. The settings here must match those of the LIMS interface.		

The following table describes the elements of the "Communication" tab in the "Network" section:

<table>
<tr><th>Label</th><th>Element type</th><th colspan="2">Meaning</th></tr>
<tr><td>Path name</td><td>Label</td><td colspan="2">This field displays the path to store the data.</td></tr>
<tr><td>Browse</td><td>Button</td><td colspan="2">Opens the "Find folder" dialog in which you can search the file structure and select a directory.

The path must already exist, it cannot be created from the vario TOC operating software.</td></tr>
<tr><td rowspan="10">File extension</td><td rowspan="10">Textbox</td><td colspan="2">Field to input the file extension. The file name is automatically generated by the program as follows: dddsssss.xxx.</td></tr>
<tr><th>File name elements</th><th>Meaning</th></tr>
<tr><td>ddd</td><td>days since January 1</td></tr>
<tr><td>sssss</td><td>seconds since midnight</td></tr>
<tr><td>xxx</td><td>defined file extension</td></tr>
<tr><td colspan="2">Thus, the file 12837894.abc was created at the following date:</td></tr>
<tr><th>File name elements</th><th>Meaning</th></tr>
<tr><td>128</td><td>File was created on the 128th day of the year, i.e. on May 9.</td></tr>
<tr><td>37894</td><td>File was created 37894 seconds after midnight, i.e. at 10:31:34.</td></tr>
<tr><td>abc</td><td>defined file extension</td></tr>
<tr><td colspan="4">You only need to edit the "Network" section if you have selected the "via network" radio button in the "Data transfer" section.</td></tr>
</table>

Elements of the "Identifier" tab

The following table describes the dialog elements on the "Identifier" tab:

Label	Element type	Meaning
Instrument identifier	Textbox	Field to input an instrument identifier. If multiple analyzers are connected to the PC, you must define an instrument identifier for each instrument so that the LIMS data are assigned to the correct instrument. The instrument identifier precedes the actual data and can be interpreted by the LIMS.
Operator name	Textbox	Field to input operator names. You can define operator names here. The name does not have to match the operator name that you logged in with. The name precedes the actual data and can be interpreted by the LIMS.

Dialog elements

The following table describes the buttons in the dialog that apply to all tabs:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Exporting LIMS data* "Defining the LIMS / PC interface" on page 133

- *Defining the LIMS / PC interface* on page 133
- *Laboratory information and management system (LIMS)* on page 106
- *Export settings for the laboratory information and management system (LIMS)* "Exporting LIMS data" on page 276

Instrument parameters

Function

This dialog serves to display and edit instrument parameters. The dialog has two options, that are accessible on the left via the navigation panel.

- In the "Temperatures" selection you can specify the setpoint temperatures.
- In the "Times" selection you can specify all times required for an ordered analysis run.

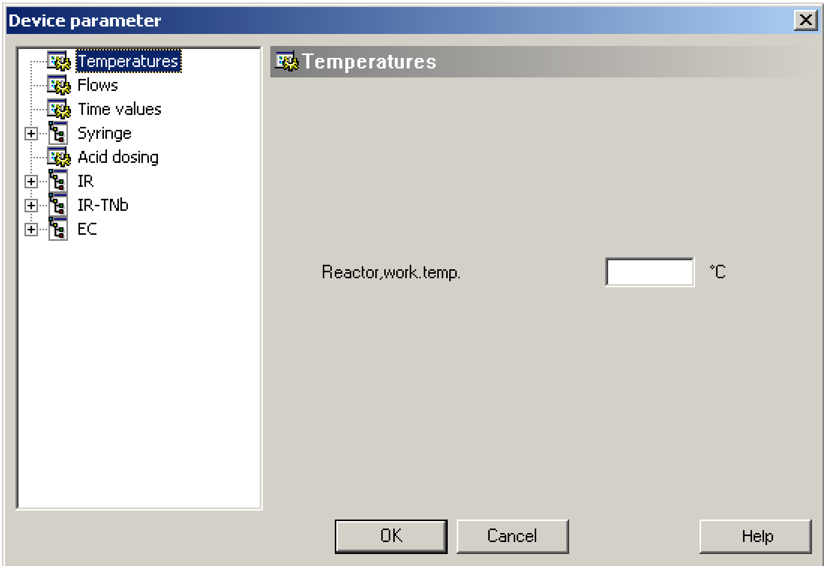
Note

Some instrument parameters, such as desorption temperatures and autozero delay and various peak expectation times, can also be defined via the method. If not otherwise defined by a method, the settings in the "Instrument parameters" dialog apply. If a parameter is defined differently in the method and in the "Instrument parameters" dialog, the method takes priority if it is used for the measurement.

The dialog

Example of the dialog:

Dialog: Instrument parameters



Open

Open the dialog via **Options > Settings > Parameters**.

Elements of the "Temperatures" tab.

The following table describes the elements of the dialog in the "Temperatures" selection:

Label	Element type	Meaning
Reactor operating temp.	Textbox	Field to input the reactor temperature.

Elements of the "Flows" tab.

The following table describes the elements of the dialog in the "Times" selection:

Label	Element type	Meaning
Carrier gas flow	Textbox	Field to input a carrier gas flow value.

Elements of the "Times" tab.

The following table describes the elements of the dialog in the "Times" selection:

Label	Element type	Meaning
Integrator reset delay, peak C	Textbox	Field to input a time. Defines the time after which the integrator is reset to zero before beginning actual integration.
Peak anticipation TIC	Textbox	Field to input a time. Defines the time the system waits for the occurrence of the appropriate peak. If the system has not detected a peak start after expiration of this peak expectation time, it assumes that the sample does not contain the respective element component.
Peak anticipation TC	Textbox	See description of peak anticipation TIC.
Peak anticipation Dummy (TIC/TC)	Textbox	See description of peak anticipation TIC.
Peak anticipation TOC	Textbox	See description of peak anticipation TIC.
Peak anticipation TNb	Textbox	See description of peak anticipation TIC.

Elements of the "Syring/Flush" tab.

The following table describes the elements of the dialog in the "Flush" selection:

Label	Element type	Meaning
Flush volume	Textbox	Field to input the required volume for a flushing procedure
Flushing procedure	Textbox	Field to input the number of flushing procedures to be performed.

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Elements of the "Syring/Speed" tab.

The following table describes the elements of the dialog in the "Speed" selection:

Label	Element type	Meaning
Filling speed	Textbox	Field to input the speed with which the syring is filled (suction).
Injection speed	Textbox	Field to input the speed with which the syringe injects (purging).

Elements of the "Acid dosing" tab.

The following table describes the elements of the dialog in the "Speed" selection:

Label	Element type	Meaning
Acid volume	Textbox	Field to input the acid volume for the acidification of a sample.

Dialog elements

The following table describes the buttons in the dialog that apply to all tabs:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.
Help	Button	Opens the description of the dialog in the help.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

- *Heating up the furnace / checking parameters* on page 180
- *Ball valve maintenance* "Maintaining the ball valve (solids mode)" on page 370
- *Replacing fuses* on page 531
- *Shutting the instrument down for long measuring breaks (switching off)* on page 185
- *Optimizing basic instrument settings* on page 157

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Method

Function

In this dialog you can view, create, copy, edit and delete methods.

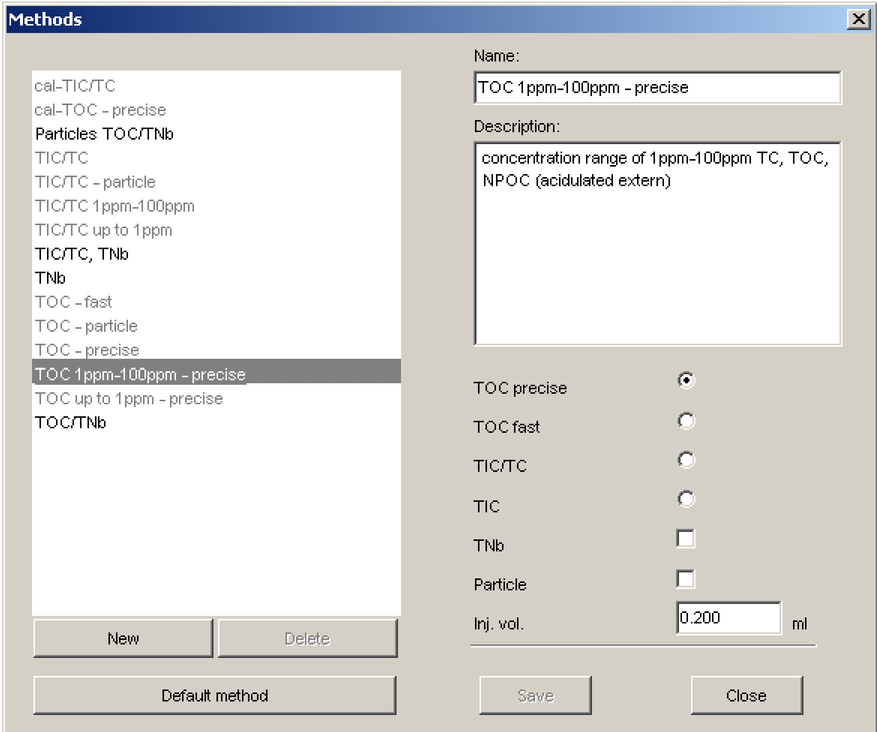
Note

Some instrument parameters, such as autozero delay and various peak anticipation times, can also be defined via the "Instrument parameters" dialog. If not otherwise defined by a method, the settings in the "Instrument parameters" dialog apply. If a parameter is defined differently in the method and in the "Instrument parameters" dialog, the method takes priority if it is used for the measurement.

The dialog

Example of the dialog:

Dialog: Method



Open

Open the dialog by selecting **Options > Settings > Methods**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
____	Listbox	This field lists all avaliable methods. Gray colored method names are factory set methods and cannot be changed. An entry displayed in bold letters represents the default method (description see below in this table).
Identifier	Textbox	Field to input the name of the method. When you enter the name in the sample view, this method is allocated to the appropriate sample.
Description	Textbox	Field to input the purpose of the method. For easier selection of a method.

TOC precise	Radiobutton	Defines that TOC with a higher precision is measured (longer analysis time).
TOC fast	Radiobutton	Defines that TOC with normal precision is measured (shorter analysis time).
TIC / TC	Radiobutton	Defines that TIC/TC is measured.
TNb	Checkbox	Defines that in addition TNb is determined.
Particles	Checkbox	Defines that particles containing samles are measured (intensified flushing cycles).
Inj.-Vol.	Textbox	Defines the injection volume.
New	Button	Allows the definition of a new method. This function empties the input boxes, thus data for a new method can be entered.
Delete	Button	Deletes a selected method. When selecting a factory set method this button is not accessible.
Default method	Button	Marks the selected sample as default method. If the analysis series contains samples for which no methods have been assigned upon the start of the analysis, the program asks whether the default method shall be used for thes samples. By clicking this button for a method already defined as default method means the cancellation as default method.
Save	Button	Applies the settings after you have changed the parame-ters of a method. When selecting a factory set method this button is not accessible.
Create	Button	Creates a new method parameter set and enters the method name into the listbox. This button is only available after a new method has been created.
Close	Button	Closes the dialog.

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Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Viewing method settings* on page 210
► *Defining custom methods* on page 212
► *Edit methods* "Method" on page 687
► *Optimizing basic instrument settings* on page 157

Error handling

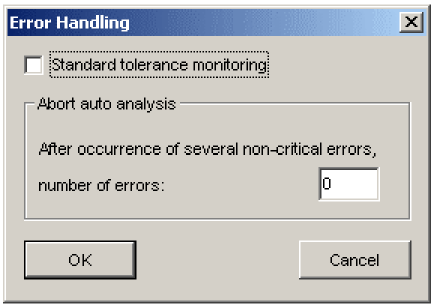
Function

In this dialog you can define how you want the operating software to react to detected errors.

The dialog

Example of the dialog:

Dialog: Error handling



Open

Open the dialog via **Options > Settings > Error handling**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Standard tolerance monitoring	Checkbox	Every finished standard sample is checked as to whether the computed percentage contents are inside the defined tolerance range for theoretical percentage contents. If the tolerance limit is exceeded, continuous analysis is aborted and "Tol" is entered in the info column of the appropriate sample. You can view the defined tolerance limits by clicking the **Details** button in the "Edit standard samples" dialog. Cf. *Edit standard samples* "Standard samples" on page 675.
Number of errors	Textbox	Field to input a number between 0 and 10. This figure defines how many successive analyzed samples may display non-critical errors before aborting continuous operation. Input 0 to disable this stop mechanism. If a critical error occurs, the analysis is immediately stopped regardles of the figure you input.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Configuring error handling* on page 197
► *Interpreting PC error messages* on page 524
► *Optimizing basic instrument settings* on page 157

Sleep / wake-up functions

Function

In this dialog you define the sleep and wake-up options for the analyzer.

Note

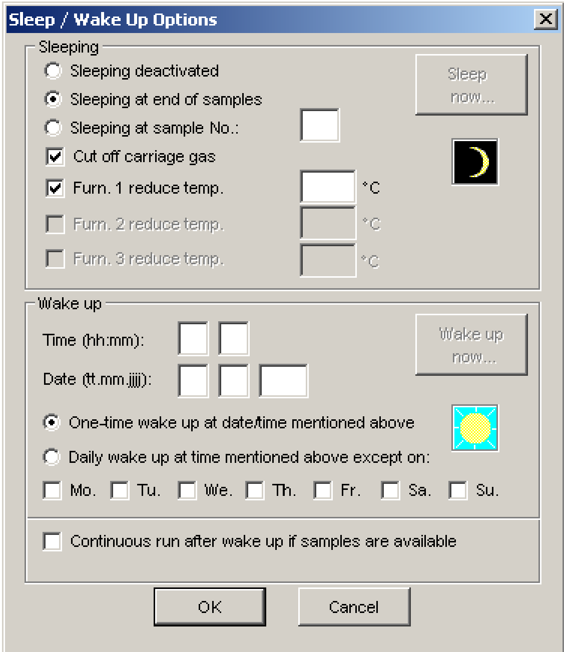
Observe the following when entering the date in the "Wake-up" section:

The program accepts numbers between 1 and 31 for day input, but it does not check whether the date is permissible (e.g. 09/31).

The dialog

Example of the dialog:

Dialog: Sleep / wake-up functions



Open

Open the dialog by selecting **Options > Settings > Sleep/Wake-up**.

Elements

The following table describes the elements of the dialog in the "Sleep" section:

Label	Element type	Meaning
Sleep disabled	Radiobutton	The sleep/wake-up function is disabled.
Sleep after end of sample	Radiobutton	The analyzer goes into sleep mode after finishing the last sample (indicated by the stop marker).
Sleep at sample No.	Radiobutton	The analyzer goes into sleep mode when it reaches the specified sample. You can enter the sample number in the adjacent textbox.
Shut off carrier gas	Checkbox	Shuts off the carrier gas when the analyzer goes into sleep mode.

Furnace 1 reduce temp.	Checkbox	Reduces the temperature of furnace 1 to the specified temperature. You can enter the temperature in the adjacent textbox.
Furnace 2 reduce temp.	Checkbox	Reduces the temperature of furnace 2 to the specified temperature. You can enter the temperature in the adjacent textbox.
Furnace 3 reduce temp.	Checkbox	Reduces the temperature of furnace 3 to the specified temperature. You can enter the temperature in the adjacent textbox.
Sleep now	Button	Causes the analyzer to go into sleep mode immediately.

The following table describes the elements of the dialog in the "Wake-up" section:

Label	Element type	Meaning
Time	Textbox	Fields to input the time in hours and minutes at which to wake up the analyzer.
Date	Textbox	Fields to input the date on which to wake up the analyzer.
One-time wake-up at above time/date	Radiobutton	Wakes up the sleeping analyzer at the date and time specified above.
Daily wake-up at above time/date, except	Radiobutton	Wakes up the analyzer every day at the time specified above.
Mon. Tues. Wed. Thurs. Fri. Sat. Sun.	Checkbox	Defines on which days not to wake up the instrument, e.g. on weekends.
Continue after wake-up if there are samples	Checkbox	If there are any unprocessed samples in sample memory, analysis is automatically resumed after "wake-up".
Wake up now	Button	Wakes up the analyzer immediately.

The following table describes the other dialog elements:

Label	Element type	Meaning
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Shutting the instrument down for short measuring breaks (standby)* on page 183
► *Optimizing sleep and wake-up behavior* on page 283
► *Optimizing basic instrument settings* on page 157

Monthly logbook

Function

This dialog contains records of the actions performed by various users in chronological order. You can search for and print out certain information via the dialog menus. The following information is stored for each action:

- Date and time of the action,
- Name of the person who performed the action,
- Type of action,
- Description of changes, e.g. of parameters,
- User's justification if the action needed to be justified.

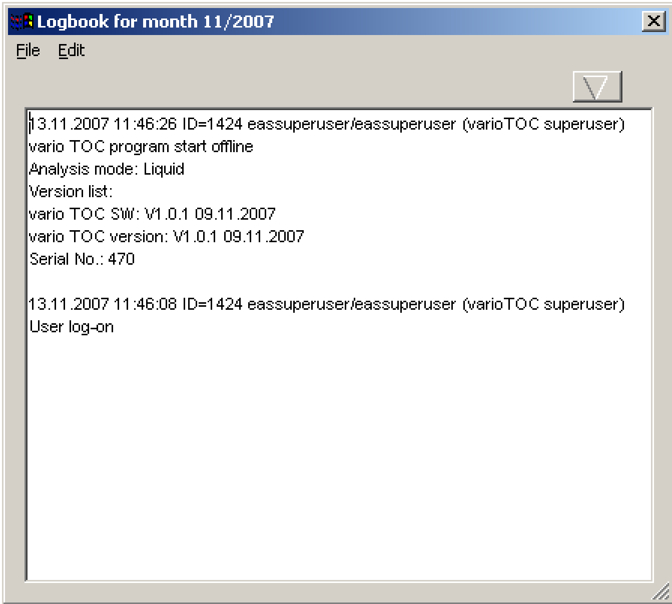
Note

The period displayed in the logbook covers a maximum of one month, usually the current month. However, it is possible to display actions preceding this period.

The dialog

Example of the dialog:

Dialog: Monthly logbook



Open

Open the dialog by selecting **Options > Logbook**. This dialog is only accessible if 21 CFR Part 11 functionality is enabled.

Dialog elements

The following table describes the elements of the dialog in the "File" section:

Label	Element type	Meaning
File > Load	Menu command	Opens the "Select period" dialog in which you select the desired period. Allows you to load actions further in the past. If no file is found for the selected period, a message is displayed.
File > Save As	Menu command	Opens the "Save logbook as" dialog in which you can save the current records to a file outside of the database.

File > Print	Menu command	Outputs the records currently being displayed to a printer.
File > Close	Menu command	Closes the dialog.

The following table describes the elements of the dialog in the "Edit" section:

Label	Element type	Meaning
Edit > Copy	Menu command	Copies the selected text to the clipboard. You can then insert this text in a text documennt, for example.
Edit > Select All	Menu command	Selects the whol text. You can then copy the selected contents via **Edit > Copy**.
Edit > Search	Menu command	Opens the "Search" dialog in which you can search for certain phrases.

The following table describes the other dialog elements:

Label	Element type	Meaning
Arrow down	Button	Reverse the chronological order; either the oldest or the most recent entry is displayed first.

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Viewing the logbook on page 144*

► *21 CFR Part 11 functionality* on page 110.

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Select period

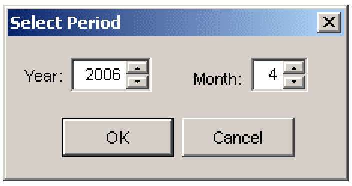
Function

In this dialog you select the period for which to display the logbook.

The dialog

Example of the dialog:

Dialog: Select period



Open

Open the "Logbook for month" dialog via **Options > Logbook**. Open the "Select period" dialog by selecting **File > Load**.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Year	Textbox with buttons	Field to input a year. You can also set the year in the textbox using the arrows.
Month	Textbox with buttons	Field to input a month. You can also set the month in the textbox using the arrows.
OK	Button	Saves new settings and opens the dialog.
Cancel	Button	Aborts the process.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Viewing the logbook* on page 144

► *21 CFR Part 11 functionality* on page 110.

Configure vario TOC

Function

In this dialog you can define initialization entries to adjust system behavior.

The individual tabs represent the respective initialization files. There are various sections in an initialization file. Each section contains entries whose values influence the behavior of the system.

During operation, the system stores certain information in the initialization files. It is usually not necessary to modify these values. The entries that may be changed are located on the following tabs:

- DEVICE.INI
- LEAKTEST.INI

Caution	Improper changes
	Improper changes impair proper operation of the system and may destroy system components.
	Only configure the instrument if you are authorized to do so and observe the operating instructions.

Note

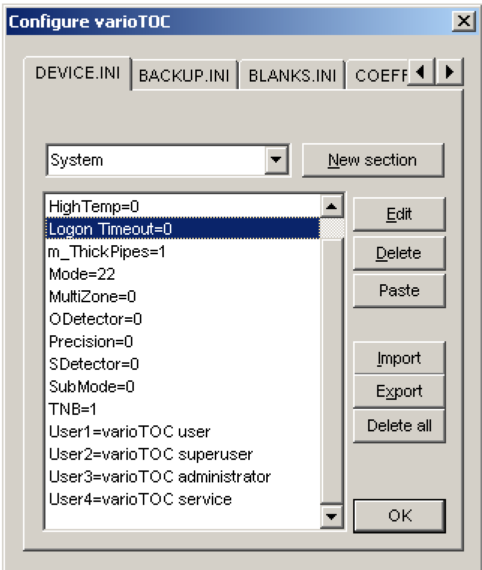
This section only describes the sections of the tabs in which you can make changes via the "Configure vario TOC" dialog only, as these sections do not have their own settings menu.

If 21 CFR Part 11 functionality is enabled, every change to the configuration must be justified in the "Comment change" dialog.

The dialog

Example of the dialog:

Dialog: Configure vario TOC



Open

Open the dialog by selecting **Options > Configuration**.

Dialog elements

The following table describes the elements in the dialog that apply to all tabs:

Label	Element type	Meaning
___	Dropdown listbox	▪ This field lists the available sections. ▪ Field to input a name for a new section.
___	Listbox	▪ This field lists the entries of a previously selected section.
New Section	Button	▪ Creates a new section under the name previously entered in the dropdown listbox.
Edit	Button	▪ Opens the "Configure key value" dialog. ▪ Allows you to edit a section entry previously selected from the list.
Delete	Button	▪ Deletes a section previously selected in the dropdown listbox. ▪ Deletes a section entry previously selected in the listbox.
Paste	Button	▪ Opens the "Configure key value" dialog. ▪ Allows you to insert new entries in a section.
Import	Button	▪ Opens the "Open" dialog. ▪ Allows you to import further sections.
Export	Button	▪ Opens the "File save as" dialog. ▪ Allows you to export sections.
Delete all	Button	▪ Deletes all entries which are included in the activated tab.
OK	Button	▪ Saves new settings

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Elements on the "DEVICE.INI" tab

The following table describes the entries under the "AnalyzerPort" section on the tab:

Entries in the "AnalyzerPort" section	Standard	Description
Name	COM1	Defines the serial interface between the PC and the analyzer.
Baud	9600	Defines the transfer rate of the serial interface between the PC and the analyzer.
Data	8	Defines the number of databits of the serial interface between the PC and the analyzer.
Stop	1	Defines the number of stopbits of the serial interface between the PC and the analyzer.
Parity	N	Defines the type of parity check of the serial interface between the PC and the analyzer. ▪ N= no parity check ▪ E= even parity check ▪ O= odd parity check.

The following table describes the entries under the "BalancePort" section on the tab:

Entries in the "BalancePort" section	Standard	Description
Name	___	Defines the serial interface between the PC and the balance.
Baud	300	Defines the transfer rate of the serial interface between the PC and the balance.
Data	7	Defines the number of databits of the serial interface between the PC and the balance.
Stop	1	Defines the number of stopbits of the serial interface between the PC and the balance.

Parity	O	Defines the type of parity check of the serial interface between the PC and the balance. ▪ N=no parity check ▪ E=even parity check ▪ O=odd parity check.

The following table describes the entries under the "Balance Init" section on the tab:

Entries in the "Balance Init" section	Standard	Description
StartString	___	Defines the character with which a weighing datum starts. This is used for correct interpretation of the characters received.
EndString	___	Defines the character with which a weighing datum ends. This is used for correct interpretation of the characters received.
WeightFactor	1	The WeightFactor allows correction of the weighing data sent by the balance. The program expects weighing data milligram format. For example, if the balance sends data in gram format, you must set WeightFactor to 1000.

The following table describes the entries under the "PGP" section on the tab:

Entries in the "PGP" section	Standard	Description
ExecutablePath	___	Defines what signature program to use for signing and verifying documents.
Sign Parameters	___	Defines what parameters must be sent to the signature program when signing.
Verify Parameters	___	Defines what parameters must be sent to the signature program when verifying.

The following table describes the entries under the "Menu" section on the tab:

Entries in the "Menu" section	Standard	Description
xxx	1,2,3	The text in this entry describes the respective menu command. The value to the right of the equals sign defines the access level with which the user may access this command. 1 means the lowest, 3 is the highest level.

The following table describes the entries under the "System" section on the tab:

Entries in the "System" section	Standard	Description
Logon Timeout	60	Defines the time that must expire before the program displays the login dialog again.
User1	___	Specifies the name of the user group that the vario TOC software regards as level 1 users.
User2	___	Specifies the name of the user group that the vario TOC software regards as level 2 users.
User3	___	Specifies the name of the user group that the vario TOC software regards as level 3 users.

Elements of the "LEAKTEST.INI" tab

The following table describes the entries under the "Leaktest" section on the tab:

Entries in the "Leak-test" section	Standard	Description
Inflate Time1	60 s	Defines the duration of pressure build-up for test stage 1 in [s].
StabilTime1	20 s	Defines the duration of the stabilization phase for test stage 1 in [s].
TestTime1	60 s	Defines the duration of the test for test stage 1 in [s].
PressDrop1	10 mbar	Defines the maximum permissible drop in pressure for test stage 1 in [mbar].
MinStabilPress1	1000 mbar	Defines the minimum pressure in [mbar] that must exist after completing the stabilization phase for test stage 1 for proper execution of the test.
ReductionTime	20 s	Defines the duration of pressure reduction between the two test stages in [s].
InflateTime2	___	Defines the duration of pressure build-up for test stage 5.08 cm [s].
StabilTime2	___	Defines the duration of the stabilization phase for test stage 5.08 cm [s].
TestTime2	___	Defines the duration of the test for test stage 5.08 cm [s].
PressDrop2	___	Defines the maximum permissible drop in pressure for test stage 5.08 cm [mbar].
MinStabilPress2	___	Defines the minimum pressure in [mbar] that must exist after completing the stabilization phase for test stage 2 for proper execution of the test.

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Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Defining the analyzer / PC interface* on page 131
► *Defining the balance / PC interface* on page 134
► *Creating new sections* on page 120
► *Granting authorizations* on page 128
► *Defining the autoexport directory* on page 147
► *Configure key value* on page 699
► *Optimizing basic instrument settings* on page 157
► *What can you modify in the configuration?* on page 117

Configure key value

Function

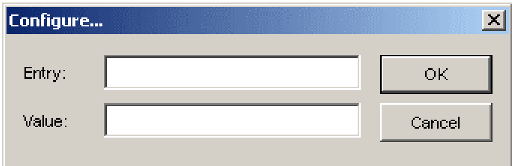
This dialog is used to configure the system. In this dialog you allocated values to the system that influence the system's behavior.

> **Caution** Improper changes
>
> Improper changes impair proper operation of the system and may destroy system components.
>
> Only configure the instrument if you are authorized to do so and observe the operating instructions.

The dialog

Example of the dialog:

Dialog: Configure key value



Open

Open the "Configure vario TOC" dialog by selecting **Options > Configuration**. Click:

- **Edit** to edit a selected entry in a section.
- **Insert** to create a new entry in a section.

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Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Key	Textbox/label	▪ Field to input the key. ▪ This field displays the key of an entry previously selected in the "Configure vario TOC" dialog and allows you to edit this key. The field is only enabled if the dialog was opened via the **Insert** button.
Value	Textbox/label	▪ Field to input the value. ▪ This field displays the key of an entry previously selected in the "Configure vario TOC" dialog and allows you to edit this key.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

▶ *Granting authorizations* on page 128
▶ *Defining logon timeout* on page 118
▶ *Creating new sections* on page 120
▶ *Defining the analyzer / PC interface* on page 131
▶ *Defining the balance / PC interface* on page 134
▶ *Defining the autoexport directory* on page 147
▶ Configure vario TOC

9.3.8 Math menu

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **Math** menu.

Overview

"The **Math** menu" is divided into the following topics:

Topic	Page
Calibration coefficients	702
Math > Statistics > Via names	704
Math > Statistics > By Multiple Determination	705
Math > Statistic > Group	706
Math > Statistic > Sort group	707
Math > Statistic > Delete group	708
Math > Statistic > Clear statistic	709
Math > Blank Value > Compute	710
Math > Factor	711
Blank values	712
Math > Recalculate	714
Acceptable standard deviation	715
Define type of peak	716
Area assignment	717

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Calibration coefficients

Function

This dialog displays the calibration coefficients of a coefficients set for each component on the appropriate tab. With suitable permission, you can also manually input the coefficients.

Note the following for manual input

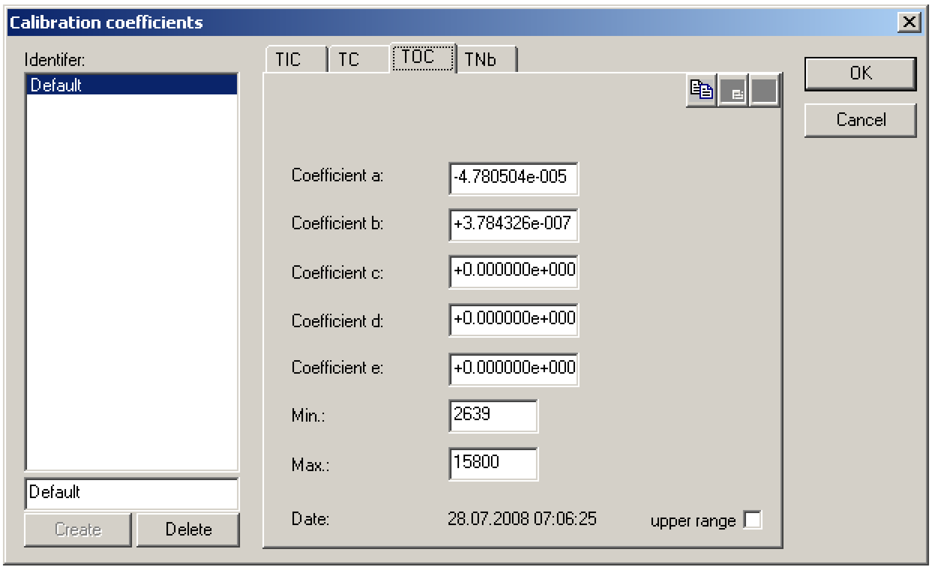
Observe the following when manually inputting calibration coefficients.

- Sample memory must be empty, otherwise manual input is not possible.
- The program interprets the comma as a decimal separator and the * sign as an exponent. If, for example, you want to input a coefficient of -2.345320e-004, input the following string of characters on the number pad. When the press the tab key, the program automatically converts the string into -2.345320e-004.

The dialog

Example of the dialog:

Dialog: Calibration coefficients



Open

Open the dialog via **Math > Calibrate**. In order to open the dialog, sample memory must contain a sufficient number of valid standard samples.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Identifier	Listbox	In this field the names of all currently available coefficients sets are displayed.
---	Label	In this field the name of the selected coefficients set is displayed. It can be modified here (changing/creation).

The following table describes the tab elements:

Label	Element type	Meaning
Coefficient a	Textbox/label	This field displays the calibration coefficient a and allows you to edit it if you have the right permission.

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Coefficient b	Textbox/label	This field displays the calibration coefficient b and allows you to edit it if you have the right permission.
Coefficient c	Textbox/label	This field displays the calibration coefficient c and allows you to edit it if you have the right permission.
Coefficient d	Textbox/label	This field displays the calibration coefficient d and allows you to edit it if you have the right permission.
Coefficient e	Textbox/label	This field displays the calibration coefficient e and allows you to edit it if you have the right permission.
Min.	Textbox/label	This field displays the lower limit of the work range and allows you to edit it if you have the right permission.
Max.	Textbox/label	This field displays the upper limit of the work range and allows you to edit it if you have the right permission.
Date	Textbox	In this field the date of creation/changing is displayed.
upper range	Checkbox	Activating this checkbox will show a second coefficients column. Thus, a two range calibration can be defined (lower and upper range).

The following table describes the dialog buttons:

Label	Element type	Meaning
OK	Button	Applies calibration coefficients that have just been computed or input.
Cancel	Button	Discards calibration coefficients that have just been computed or input.
Create	Button	This button becomes available as soon as a new name has been entered in the field above. Clicking this button will create a new coefficients set.
Delete	Button	Removes the currently selected coefficients set.

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Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Viewing calibration coefficients* on page 315
► *Defining standard substances as calibration samples* on page 191
► *Performing calibration* "Performing the calibration" on page 317
► *Background knowledge required for calibration* on page 73
► *Calibration tables* on page 325, "Kalibration table difference method (TIC/TC)" on page 327, "Calibration table direct method (TC, TOC, NPOC)" on page 326

Math > Statistics > Via names

What is the command used for?	This command combines samples of the same sample name into a statistical group. The statistical groups are then displayed in the combi view statistics view together with the appropriate results.

Math > Statistics > By Multiple Determination

What is the command used for?	This command combines samples taken from the same sample container into a statistical group. The statistical groups are then displayed in the combi view statistics view together with the appropriate results.

Math > Statistic > Group

What is the command used for?	This command combines two or more selected samples into a statistical group. From the toolbar: 
Note	This command is only available if at least two samples are selected. When you execute this command, the statitsical group and its results are displayed in the combi view statistics view.

Math > Statistic > Sort group

What is the command used for?	This command sorts statistical groups so that the groups are listed in ascending order, starting from the serial number of the first member of the group.
Note	The command is only available if the statistics view is active.

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Math > Statistic > Delete group

What is the command used for?	This command deletes a selected statistical group in the statistics view.
Note	The command is only available if the statistics view is active.

Math > Statistic > Clear statistic

What is the command used for?	This command deletes the entire statistics memory.

Math > Blank Value > Compute

What is the command used for?	This command starts a computation of blank values. The results are entered in the appropriate columns in text view.
Note	Blank value computation is only performed if sample memory contains blank samples.

Math > Factor

What is the command used for?	This command computes the daily factor of a series of analyses.

Blank values

Function

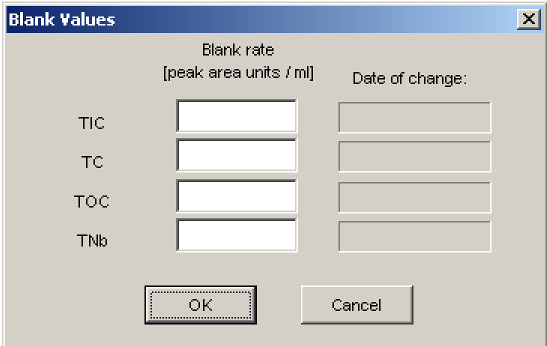
The function of this dialog differs depending on how you open it.

- If it is opened via **Math > Blank Value > Input**, the dialog displays and allows you to edit the blank values for each element. It is useful to input a blank value manually when the blank value is known. This allows you to dispense with the relatively time-consuming blank value determination.
- If it was opened via **Math > Blank Value > Compute**, the dialog displays and allows you to apply the blank values just computed.

The dialog

Example of the dialog:

Dialog: Blank values



Open

Open the dialog either

- via **Math > Blank Value > Enter**. You can only open the dialog if you have set the "total" blank value computation method. Cf. *Computation configuration* "calculation configuration" on page 679.
- or via **Math > Blank Value > Compute**. However, blank value determination is only performed if sample memory contains blank samples.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
TIC	Textbox/label	▪ Field to input the blank TIC value. (**Math > Blank Value > Input**) ▪ Field displaying the computed blank TIC value. (**Math > Blank Value > Compute**)
TC	Textbox/ Label	▪ Field to input the blank TC value. (**Math > Blank Value > Input**) ▪ Field displaying the computed blank TIC value. (**Math > Blank Value > Compute**)
TOC	Textbox/label	▪ Field to input the blank TOC value. (**Math > Blank Value > Input**) ▪ Field displaying the computed blank TOC value. (**Math > Blank Value > Compute**)
TNb	Textbox/label	▪ Field to input the blank TNb value. (**Math > Blank Value > Input**) ▪ Field displaying the computed blank TNb value. (**Math > Blank Value > Compute**)

OK	Button	▪ Saves new settings This button is only enabled if the user has the appropriate authorization and if the document is empty. (**Math > Blank Value > Input**) ▪ Applies the computed blank values. (**Math > Blank Value > Compute**)
Cancel	Button	▪ Discards settings not yet saved. (**Math > Blank Value > Input**) ▪ Discards the computed blank values. (**Math > Blank Value > Compute**)

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Determining blank values* on page 231

► *Determining the computation type for the blank value* "Specifying the computation method for blank value and daily factor" on page 194

► *Performing routine measuring work* on page 227

► *Routine measuring work* on page 85

► *Types of blank value determination and their settings* on page 230

► *Formulae for blank value determination and compensation* on page 86

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Math > Recalculate

What is the command used for?	This command recomputes the results of all samples in sample memory. This makes sense, for example, if you have analyzed a calibration series and then a measuring series immediately afterwards (e.g. overnight). If you compute the coefficients the next day, you must recompute the appended measuring samples with the newly computed coefficients.

Acceptable standard deviation

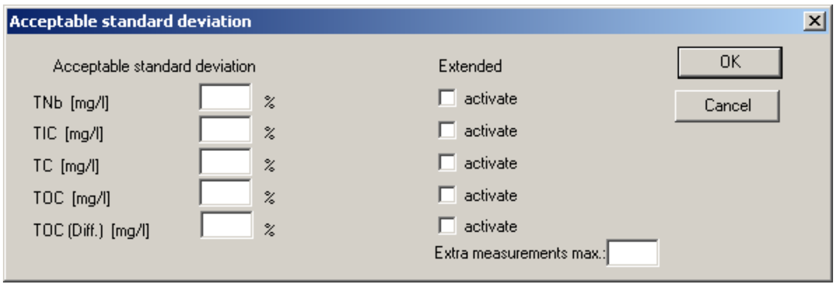
Function

In the dialog can be defined if and how many additional measurements shall be made, if the standard deviation of multiple determined samples exceeds an acceptable value.

The dialog

Example of the dialog:

Dialog: Acceptable standard deviation



Open

Open the dialog via the button **Extended measurement** in the "Feeding" dialog.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Acceptable standard deviation	Text fields	Defines the acceptable relative standard deviation for the corresponding component.
Extended measure-ment	Checkbox	Activates/deactivates the monitoring of the acceptable standard deviation for the corresponding component.
Additionam measu-rements max.	Textbox	Defines the maximal number of addtional measurements. The process is as follows: after one sample has been measured n times, the standard deviation of this group will be calculated. If the relative standard deviation is higher than the acceptable value, the additional measurements with subsequent recalculations of the standard deviations will be performed until either the result is smaller than the acceptable value or the maximum number of additonal measurements has been performed.
OK	Button	Saves new settings
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Performing a measuring series* on page 220
► *Sample feeding* on page 647

Define type of peak

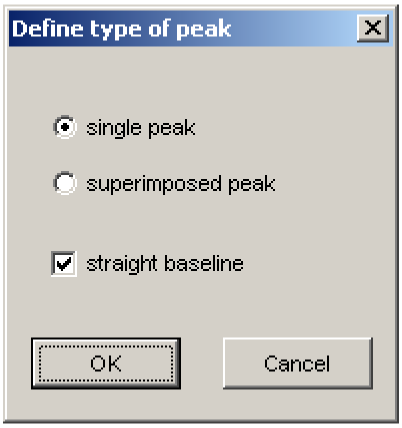
Function

In this dialog the behavior of the manual peak integration will be defined.

The dialog

Example of the dialog:

Dialog: Define type of peak



Open

Open the dialog by selecting **Math. > Manual Peak Integration > Type**. The can only be opened, if the graphic view is activated.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
single peak	Radiobutton	Sets the behavior in such a way that single peaks can be edited in the manual integration process. An integration process is executed by setting a start and end tag each.
Superimposed peak	Radiobutton	Sets the behavior in such a way that superimposed peaks can be edited in the manual integration process. An integration process is executed by setting a start and end tag each for the socket and the "superimposed" peak.
straight baseline	Checkbox	If activated, a baseline is used which runs parallel to the x-axis (time axis). If deactivated, a baseline is used which start height is at the start tag and which end height is at the end tag.
OK	Button	Saves the new settings.
Cancel	Button	Discards settings not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Manual peak integration* on page 258

Area assignment

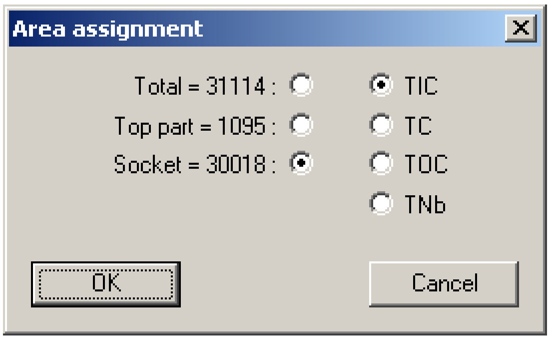
Function

In the dialog it is defined to which element the manually integrated peak area(s) shall be assigned.

The dialog

Example of the dialog:

Dialog: Area assignment



Open

Open via **Math. > Manual Peak Integration > Integrate** the dialog "Define peak start/-end" and click **Assign**, after the manual integration has been performed.

Elements

The following table describes the dialog elements:

Label	Element type	Meaning
Total	Radiobutton	Defines that the total area shall be used for the assignment.
"Superimposed" peak	Radiobutton	Defines that the area of the superimposed peak (ligh red color) shall be used for the assignment. (Not available for single peak integration)
Socket	Radiobutton	Defines that the area of the socket (light blue color) shall be used for the assignment. The area value of the socket is the difference between the total area and the area of the superimposed peak. (Not available for single peak integrati-on)
TIC, TC, TOC, TNb	Option fields	Define the element to which the selected peak area shall be assigned. The number of option fields and their labeling depend on the set analysis mode.
OK	Button	Executes the assignment and closes the dialog. After the assignment the assigned area and the resulting new element content are displayed in the sample view.
Cancel	Button	closes the dialog without assignment.

Further information

Further information includes instructions in which the dialog is used and know-ledge articles concerning the dialog:

► *Manual peak integration* on page 258

9.3.9 Help menu

Target group

The target group is the personnel working with the instrument.

Purpose

This section describes dialogs and commands in the **Help** menu.

Overview

"The **Help** menu" is divided into the following topics:

Topic	Page
Help > Contents	719
Help > Search	720
Help > Context-sensitive help	721
Elementar GmbH on the WEB	722
Product registration	723
Help > About vario TOC	725

Help > Contents

What is the command used for?	This command opens the "Contents" tab of the help window in the foreground.

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Help > Search

What is the command used for?	This command opens the "Search" tab of the help window in the foreground.

Help > Context-sensitive help

What is the command used for?

This command enables context-sensitive help. It provides information on specific topics. You can display context-sensitive topics in different ways:

- If the dialog is already open, press **F1** for a description of the dialog.
- If no dialog is open, press **Shift** and **F1** to display a description of the command. Alternatively, press the  button on the operating software toolbar for a description.

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Elementar GmbH on the WEB

What is the command used for?	This command creates an Internet link to the Elementar Analysensysteme GmbH website, on condition that the PC has an Internet connection.

Product registration

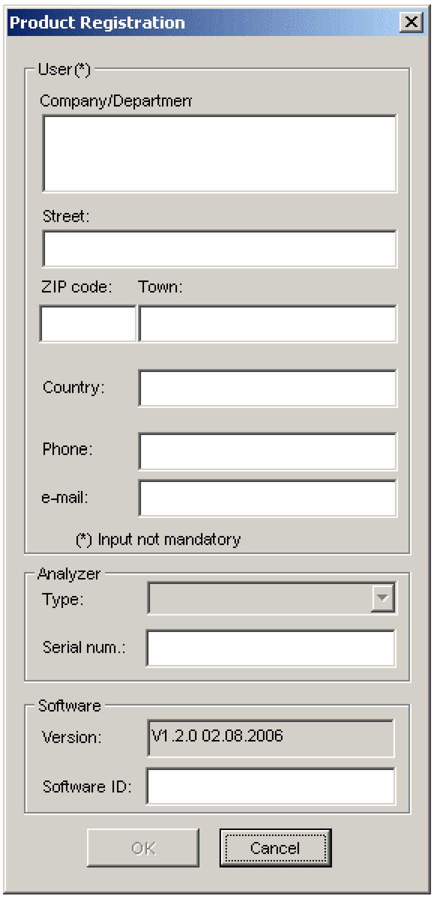
Function

In this dialog you can input your registration data to unlock the operating software.

The dialog

Example of the dialog:

Dialog: Product registration



Open

This dialog is automatically displayed when you launch the operating software for the first time, if you forgot any important details during registration. Open the dialog by selecting **Help > Registration**.

Elements

The following table describes the elements of the dialog in the "User" section:

Label	Element type	Meaning
Company/Dept.	Textbox	Field to input user data.
Street	Textbox	Field to input user data.
ZIP	Textbox	Field to input user data.
City	Textbox	Field to input user data.
Country	Textbox	Field to input user data.
Tel.	Textbox	Field to input user data.

e-mail	Textbox	Field to input user data.
These data are not mandatory. However, these data make it easier for Elementar's service department to identitfy customers if you have a problem and contact Elementar.		

The following table describes the elements of the dialog in the "Instrument" section:

Label	Element type	Meaning
Type	Dropdown listbox	Field displaying the instrument type.
Serial number	Textbox	Field to input the serial number if it was not automatically sent to the program by the analyzer. The serial number is found on the type plate on the back of the analyzer. This number should match the serial number of the installation CD cover when installing for the first time.

The following table describes the elements of the dialog in the "Software" section:

Label	Element type	Meaning
Version	Label	This field displays the software version number.
Software ID	Textbox	Field to input the identification code. If installing for the first time, this number is found on the installation CD cover. If installing and upgrading, you must send the registration details in this dialog to Elementar. You will then receive an identification code to be entered here. It is not possible to operate the system if the identification code is missing or incorrect.

The following table describes the dialog buttons:

Label	Element type	Meaning
OK	Button	Saves new registration data.
Cancel	Button	Discards registration data not yet saved.

Further information

Further information includes instructions in which the dialog is used and knowledge articles concerning the dialog:

► *Modifying the registration* on page 162

Help > About vario TOC

What is the command used for?	This command displays the following: ▪ The copyright note. ▪ The software version number. If the system is connected, the version numbers of the individual modules are also displayed. They provide valuable information about the status of the system and what to do in the event of updates. From the toolbar: 

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Index

Fehler! Keine Indexeinträge gefunden.