

Operating Manual

compEAct N Nitrogen analyzer



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For a proper and safe use of this product follow the instructions. Keep the operating manual for future reference.

General Information <http://www.analytik-jena.com>

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Table of contents

1	Notes on this operating manual.....	5
2	Intended use.....	6
3	Safety.....	7
3.1	Safety labeling on the device	7
3.2	Requirements for the operating personnel.....	8
3.3	Safety instructions, transport and commissioning	9
3.4	Safety instructions: during operation	9
3.4.1	General safety instructions for operation.....	9
3.4.2	Safety instructions – protection against explosion and fire.....	10
3.4.3	Safety instructions – electrical equipment	10
3.4.4	Safety instructions for the operation of compressed gas containers and compressed gas systems.....	10
3.4.5	Handling of auxiliary and operating materials and samples	10
3.4.6	Safety instructions – maintenance and repair	11
3.4.7	Safety instructions for the operation with autoinjector and autosampler	11
3.4.8	Behavior in case of overpressure faults (gas pressure fault)	12
3.4.9	Behavior during emergencies	12
4	Function and design	13
4.1	Principle of operation	13
4.2	Design of the device	14
4.3	Type plate.....	21
4.4	Sample supply	22
4.4.1	Autoinjector	22
4.4.2	Autosampler.....	22
4.4.3	Autosampler LS-T	24
5	Installation and commissioning	25
5.1	Installation conditions.....	25
5.1.1	Ambient conditions	25
5.1.2	Power supply.....	25
5.1.3	Gas supply	26
5.1.4	Spatial requirements	26
5.2	Supply and control connections	28
5.3	Installing the device with sample feeding module	30
5.3.1	Setting up and connecting the device	30
5.3.2	Connect the autoinjector	32
5.3.3	Connecting the autosampler	32
6	Operation.....	35
6.1	Switching the device on and off.....	35
6.2	Measurement with autoinjector	36
6.3	Measurement with autosampler	37
7	Maintenance and care	39
7.1	Maintenance intervals.....	39
7.2	Cleaning the device and its system components	40

7.3	Check system tightness	40
7.4	Adjusting the autoinjector	42
7.5	Adjusting the autosampler.....	43
7.6	Maintenance on the combustion furnace	44
7.6.1	Removing and cleaning the combustion tube	44
7.6.2	Replace quartz wool plug	46
7.6.3	Replacing the septum on the injection port.....	47
7.6.4	Installing the combustion tube	48
7.7	Replace the membrane dryer.....	50
7.8	Servicing the auto-protection assembly	52
7.8.1	Remove and install the auto-protection assembly	52
7.8.2	Check and replace the filter.....	54
7.8.3	Replacing the pneumatic seal	55
7.9	Open and close the side panel of the device.....	57
7.10	Replace the absorber.....	58
7.11	Replace chemical ozone decomposer and filter.....	60
7.12	Removing and installing the combustion furnace	61
7.12.1	Removing the combustion furnace.....	61
7.12.2	Installing the combustion furnace	63
7.13	Cleaning the syringes	64
8	Troubleshooting	66
8.1	Troubleshooting according to software messages	66
8.2	Equipment faults and analytical problems.....	70
8.2.1	General notes.....	70
8.2.2	Device errors	70
8.2.3	Analytic problems	72
9	Transport and storage	74
9.1	Preparing the device for transport.....	74
9.1.1	Packing the autoinjector	74
9.1.2	Packing the autosampler.....	75
9.1.3	Packing the device	75
9.2	Transporting the device	76
9.3	Moving the device in the laboratory.....	76
9.4	Storage	77
10	Disposal	78
11	Specifications.....	79
11.1	Technical data	79
11.1.1	Technical data of the device	79
11.1.2	Technical data of the autoinjector.....	79
11.1.3	Technical data of the autosampler.....	80
11.1.4	PC requirements	80
11.2	Ambient conditions	80
11.3	Standards and directives	81

1 Notes on this operating manual

Content

The operating manual describes the following device model:

- compEAct N – Nitrogen analyzer

In this manual, this model will be referred to as the **device**.

The device is intended to be operated by qualified specialist personnel under observance of the operating manual.

The operating manual provides information about the design and operation of the device and provides operating personnel with the necessary know-how for safe handling of the device and its components. Furthermore, the operating manual includes information on the maintenance and servicing of the device as well as information on potential causes of malfunctions and their correction.

Conventions

Instructions for actions occurring in chronological order are numbered and combined into action units.

Warnings are indicated by a warning triangle and a signal word. The type, source and consequences of the hazard are stated together with notes on preventing the hazard.

Elements of the control and analysis program are indicated as follows:

- Program terms are in bold (e.g., the **System** menu).
- Menu items are separated by vertical lines (e.g., **System | Device**).

Symbols and signal words used in this manual

The user manual uses the following symbols and signal words to indicate hazards or instructions. These warnings are always placed before an action.



WARNING

Indicates a potentially hazardous situation which can cause death or very serious (possibly permanent) injury.



CAUTION

Indicates a potentially hazardous situation which can cause slight or minor injuries.



NOTICE

Provides information on potential material or environmental damage.

2 Intended use

The compEAct N is an elemental analyzer for determining nitrogen contents in liquid, gaseous and LPG samples. The detection takes place through pyrolysis followed by thermal oxidation in accordance with national and international standards.

The compact, stand-alone device is equipped with an on-board computer with touchscreen and the operating and control software EAvolution, which is used to control the device and to analyze the measured data. There is the alternative option to operate the software using an external keyboard, mouse and monitor or via an external PC. The software can be accessed and used to control the device remotely via a browser. For this purpose, the device must be connected to a local network or directly to the Internet.

At least one sampler module is required to operate the device.

The device and its components may only be used for the analyses listed in the user manual. Only this specified use is regarded as the intended use, ensuring the safety of the user and the device.

The following substances must not be analyzed with the device because they pose a risk of explosion:

- substances tending to spontaneous decomposition (e.g., peroxides)
- explosives, explosive materials (e.g., trinitrotoluene solution, inorganic azide solutions)

The following substances must only be analyzed with the device when using the LS-T autosampler, because otherwise there is a risk of explosion:

- highly flammable organic compounds (e.g., isopentane)

The following substances must not be analyzed with the device because they could damage the analysis system:

- inorganic substances (e.g. nitric acid)
- substances with a high content of alkaline ions and alkaline earth ions (e.g. sodium acetate solution)
- organometallic compounds (e.g. metal-organyls)
- phosphorus and organic silicon compounds or samples with a high content of these elements (e.g. the hydraulic fluid Skydrol)
- substances or samples with a high content of fluoride ions

3 Safety

For your own safety and to ensure error-free operation of the device, please read this chapter carefully before commissioning.

Observe all safety notes listed in these operating instructions and all messages and notes displayed by the control and analysis software on the monitor.

References to potential hazards do not replace the work protection regulations which must be observed.

3.1 Safety labeling on the device

Warning and mandatory action labels have been attached to the device and must always be observed.

Damaged or missing warning and mandatory action labels can cause incorrect actions leading to personal injury or material damage. The labels must not be removed. Damaged warning and mandatory action labels must be replaced immediately!

The following warning and mandatory action labels have been attached to the device:

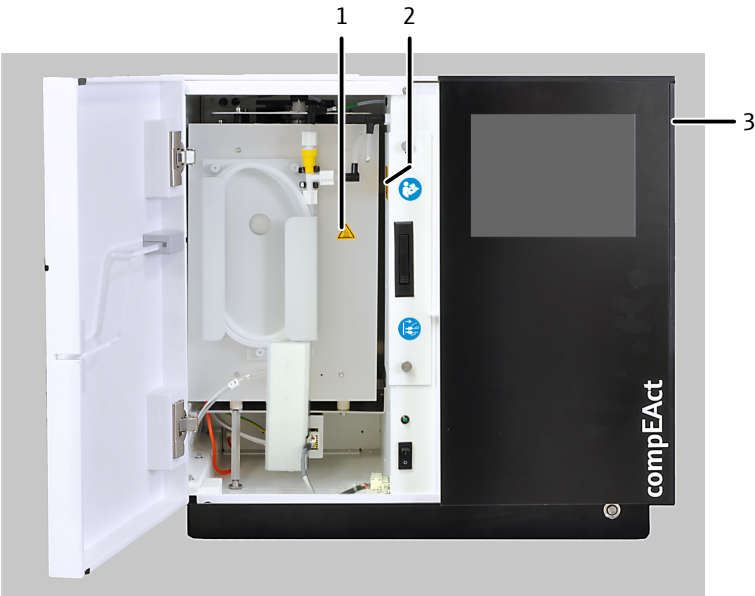






Fig. 1 Safety notices on the device

	Warning and information symbols, mandatory action signs	Position/meaning
1		On the cover plate in front of the combustion furnace + on the cover plate above the combustion furnace (not shown) Warning against burns

	Warning and information symbols, mandatory action signs	Position/meaning
		There is a risk of burns at the combustion furnace. Allow the furnace to cool down sufficiently before carrying out any maintenance on or near the furnace.
2 and 3		On the service flap inside the furnace chamber and on the removable right side of the device Warning against electric shock inside the device The voltages applied within the device can be life-threatening. Switch off the mains switch and pull the device's mains plug from the power outlet before opening the device.
Not shown		On the cover plate above the combustion furnace Warning against hazard location Do not reach into the travel path of the autosampler while it is moving.
Not shown		On the autosampler Warning of injury caused by crushing Do not reach into the travel path of the injector head while the injector head is moving.
Not shown		For China: The device contains controlled substances. Analytik Jena GmbH+Co. KG warrants that these substances will not be released from the device within the next 25 years provided the device is employed as intended.

3.2 Requirements for the operating personnel

The device must only be operated by qualified specialist personnel instructed in the use of the device. This instruction also include teaching the contents of this user manual and of the user manuals of the connected system components. We recommend training by qualified employees of Analytik Jena or its representatives.

In addition to the safety instructions in this user manual, the general applicable safety and accident prevention regulations of the respective country the device is operated in must be observed and adhered to. The operator must ensure the latest version of these regulations.

The user manual must be accessible to the operating and service personnel.

3.3 Safety instructions, transport and commissioning

Incorrect installation can create serious hazards. This may result in electric shock and explosion if the gases are not connected correctly.

- Only the Analytik Jena customer service or specialist personnel trained and authorized by them is allowed to install and commission the device and its system components.
- Unauthorized assembly and installation is not permitted.

Insufficiently secured components pose a risk of injury.

- During transport, secure the device components as specified in these operating instructions.
- Loose parts must be removed from the system components and packed separately.

To prevent health damage, the following must be observed when moving the device in the laboratory (lifting and carrying):

- For safety reasons, two persons are required to transport the device who must hold the unit by either side of the equipment.
- For transport, four hand-tight transport handles must be attached to the device. Grip the transport handles firmly and use them to lift and transport the device.

3.4 Safety instructions: during operation

3.4.1 General safety instructions for operation

The operator must make sure that the device and its safety equipment is in sound condition each time before starting up the device. This applies in particular after each modification or extension of the device or its repair.

Observe the following:

- The device may only be operated if all items of protective equipment (e.g. covers in front of electronic components) are in place, properly installed and fully operational.
- The sound condition of the protection and safety equipment must be checked regularly. Any defects must be corrected as soon as they occur.
- Protective and safety equipment must never be removed, modified or switched off during operation.
- Modifications and extensions to the device are only permitted after consultation with Analytik Jena. Unauthorized modifications may restrict operational safety and lead to limitations of warranty and liability, as well as customer service.
- Always ensure free access to the front door with the mains switch behind it, and to emergency shutdown switches and locks during operation.
- The ventilation equipment on the device must be in good working condition. Covered ventilation grilles or slots etc. may cause the device to break down or may cause damage to it.
- The furnace operates with temperatures of up to 1100 °C. The hot components must not be touched during or directly after operation of the device.
- Ensure that no liquid enters the interior of the device, for example at cable connections. There is a danger of electric shock.
- Caution when handling glass components. Risk of broken glass and therefore risk of injury!
- Keep all combustible materials away from the device.

3.4.2 Safety instructions – protection against explosion and fire

The device may not be operated in an explosive environment.

Smoking or handling open flames are prohibited in the room in which the device is operated!

3.4.3 Safety instructions – electrical equipment

Lethal voltages may occur in the device! Contact with live components may cause death, serious injury or painful electrical shock.

- The power plug must be connected to a proper power outlet to ensure that the device meets protection class I (ground connector). The device may only be connected to power sources whose nominal voltage is the same as that on the rating plate of the equipment. Do not replace the removable power cable of the device with a power cable that does not meet the specifications (with no protective ground conductor). Extensions of the supply cable are not permitted!
- The basic module and the system components may only be connected to the mains when they are switched off.
- Electrical connection cables between the basic module and the system components may only be connected or disconnected when the device is switched off.
- Before opening the device, the device must be switched off via the main switch and the power plug must be disconnected from the power outlet!
- Work on the electronics may only be carried out by the customer service of Analytik Jena and specially authorized technicians.

3.4.4 Safety instructions for the operation of compressed gas containers and compressed gas systems

- The operating gases are taken from compressed gas containers or local compressed gas systems. The operating gases must have the required purity.
- Work on compressed gas containers and systems may only be carried out by individuals with specialist knowledge and experience in compressed gas systems.
- Compressed air hoses and pressure reducers may only be used for the assigned gases.
- Pipes, hoses, screw connections and pressure reducers for oxygen must be kept free from grease.
- Check all pipes, hoses and screw connections regularly for leaks and externally visible damage. Repair leaks and damage without delay.
- Shut off the gas supply to the device prior to any maintenance and repair work on the compressed gas containers.
- After successful repair and maintenance of the components of the compressed gas containers or system, the device must be checked for proper operation prior to recommissioning.
- Unauthorized assembly and installation are not permitted!

3.4.5 Handling of auxiliary and operating materials and samples

The operator is responsible for the selection of substances used in the process as well as for their safe handling. This is particularly important for radioactive, infectious, poisonous, corrosive, combustible, explosive and otherwise dangerous substances.

When handling hazardous substances, the locally applicable safety instructions and instructions in the safety data sheets from the manufacturers of the auxiliary and operating materials must be complied with.

The combustion tube is filled with a quartz wool plug.

Observe the following instructions when working with quartz wool:

- Only store quartz wool in closed containers.
- When working with quartz wool, avoid the formation of dust! Inhaled dust may cause irritation to respiratory pathways.
- Wear personal protective equipment (laboratory coat, protective gloves, safety goggles, respiratory mask) when replacing the quartz wool and when cleaning the combustion tube.
- Collect used quartz wool in suitable, sealed containers and dispose of the material in accordance with applicable legal regulations. Contact the responsible waste disposal company to organize the disposal of the waste.

3.4.6 Safety instructions – maintenance and repair

The device is generally maintained by the customer service department of Analytik Jena or specialist personnel trained and authorized by them.

Unauthorized maintenance can damage the device. For this reason, only the activities described in the user manual in the "Maintenance and care" chapter may be performed by the operator.

- All maintenance and repair work on the device must only be carried out when the device is switched off (unless specified otherwise).
- Only clean the exterior of the device with a slightly moistened, non-dripping cloth. Use only water and, if required, customary surfactants.
- Allow the device to cool down before any maintenance work or replacement of system components.
- The gas supply must be shut off and the device vented before performing any maintenance or repair work (unless specified otherwise).
- Use only original spare parts, wear parts and consumables. They have been tested and ensure safe operation. Glass parts are wear parts and are not subject to the warranty.
- All protective equipment must be reinstalled and checked for proper function when the maintenance or repair work is complete.

3.4.7 Safety instructions for the operation with autoinjector and autosampler

Observe the following instructions when installing and operating the autoinjector and the autosampler:

- When positioning the device with an autosampler on the laboratory desk consider the movement range of the injector head during operation. Make sure that the movement range is clear.
- There is a risk of injury within the movement range of the injector head during operation. Keep a safe distance from the device.
- The autosampler and the autoinjector may only be opened by authorized Analytik Jena service personnel. Disconnect the power supply before opening the sample introduction system. Danger of electric shock!
- Only use the designated connection terminals to connect the autosampler and the autoinjector to the device. Observe the notes and illustrations in the respective installation chapter.
- The syringe bracket and the sample rack of the LS-T autosampler reach temperatures of up to 80 °C during operation. There is a risk of burns!

3.4.8 Behavior in case of overpressure faults (gas pressure fault)

Extreme caution is required during system overpressure! Incorrect operation can endanger the operating personnel and damage the analysis system. In case of an overpressure fault, the software displays a warning message and starts the routine to reduce the overpressure.

Observe the following:

- Never switch off a device subject to overpressure!
- Do not introduce any samples.
- Do not shut down the software.
- Do not cut the external gas supply.
- Wait until the overpressure in the system has dropped to normal pressure. The routine for reducing the overpressure is an automatic process.
- After the routine has ended, follow the instructions in the software.
- In case the routine does not reduce the pressure: release pressure manually. To release pressure manually, carefully open the front door of the device. Carefully switch the pneumatic seal toggle switch to the OFF position. The toggle switch is located inside the device, to the left of the mains switch.

3.4.9 Behavior during emergencies

- If there is no immediate risk of injury, switch off the device and the connected system components immediately in hazardous situations or in the event of an accident and/or disconnect the power plugs from the power outlets.
- Close the gas supply as soon as possible after switching off the devices.

4 Function and design

4.1 Principle of operation

The device is a compact elemental analyzer for determining nitrogen contents in liquid, gaseous and LPG samples.

With the optionally available gas sampling systems, the LPG module 2.0, the GSS module and the GSS/LPG combination module, it is possible to feed pressurized liquefied gas samples (LPG) or pressurized gaseous samples to the analyzer. The GSS module also makes it possible to feed gaseous samples under normal conditions.

The samples are digested at temperatures between 1000 and 1100 °C in a two-stage process consisting of a pyrolysis followed by thermal oxidation. During the first phase of the digestion the sample components are pyrolyzed in the Argon flow and the generated pyrolysis gases incinerated in the oxygen flow. Next, the remaining pyrolysis products are re-incinerated in a pure oxygen flow during the second phase.

The digestion can be summed up by the following equation:



R^* = residual hydrocarbons

NO_x = mixture of nitrogen monoxide (NO) and nitrogen dioxide (NO₂) of various compositions

The sample aliquot (liquid, gaseous, LPG) is metered directly into the combustion tube with the sample feeding module (autosampler, autoinjector, LPG module 2.0, combined GSS/LPG module) via the injection port with septum

After leaving the combustion tube the reaction gas mix is fed to the measuring gas drying process. The measuring gas is dried in a membrane dryer. The dried measuring gas is fed to the chemiluminescence detector (CLD).

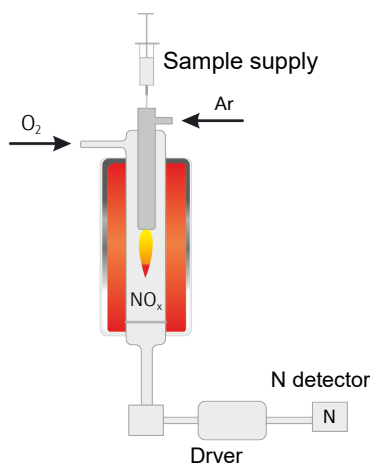
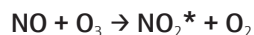


Fig. 2 Principle of operation

The detection is done using the chemiluminescence method. The reaction of nitrogen monoxide (NO) with ozone (O₃) results in the short-term production of nitrogen dioxide (NO₂^{*}) in excited state which emits electromagnetic radiation in the range of visible light when it transforms to normal state. The emitted amount of light is proportional to the NO₂ concentration. Consequently, the detected light can be used to measure the concentration. NO is the only substance involved in the reaction, which means that this method is very selective and not influenced by any other constituents of the measuring gas.



The NO_x contained in the measuring gas is a mixture of NO and NO_2 . The measuring gas is passed through a converter which renders the NO_2 portion usable for the reaction and hence for detection purposes. Inside the converter the NO_2 is reduced to NO.

The ozone (O_3) required for the reaction is produced within the device using pure oxygen (O_2) that is fed into the device interior. Excess O_3 is removed in the ozone decomposer after the reaction and will not be discharged into the environment.

4.2 Design of the device

Main components

The device consists of the following main components:

- Electronics
- Internal computer with touchscreen
- Gas supply
- Combustion system
- Auto-protection assembly
- Measuring gas dryer
- Chemiluminescence detector (CLD)
- Sample introduction system

All components of the device to be operated or serviced by the user can be reached via the front door and the opening at the top of the device.



Fig. 3 Main component of the device

- | | |
|---|--|
| 1 Touchscreen | 2 ON/OFF switch |
| 3 Mains switch | 4 Auto-protection assembly behind insulating block |
| 5 Combustion furnace | 6 Membrane dryer |
| 7 Head of the combustion tube with injection port and gas terminals | |

Electrical components and gas supply

Electrical connections, gas connections and the connections for the sample feeding module are located on the rear of the device.

The two process gases argon and oxygen are controlled via the internal gas box in the device. The gas box does not require any maintenance from the user.

The device is a standalone device with integrated computer. The control and analysis software is operated via the touchscreen on the right-hand side of the device. Alternatively, control via an external PC is possible through the software.

Combustion system

A resistance-heated combustion furnace for digestion temperatures of 700 to 1100 °C is used in the device. Depending on the application, the samples are digested inside the combustion tube at temperatures between 950 °C and 1100 °C.

A combustion tube is inserted into the combustion furnace of the device, is used for all applications. The combustion tube is made of quartz glass. A quartz wool plug inserted in the inner tube ensures a slow and steady vaporization of the sample. The connection between the combustion tube and the measuring gas dryer is implemented via the auto-protection assembly.

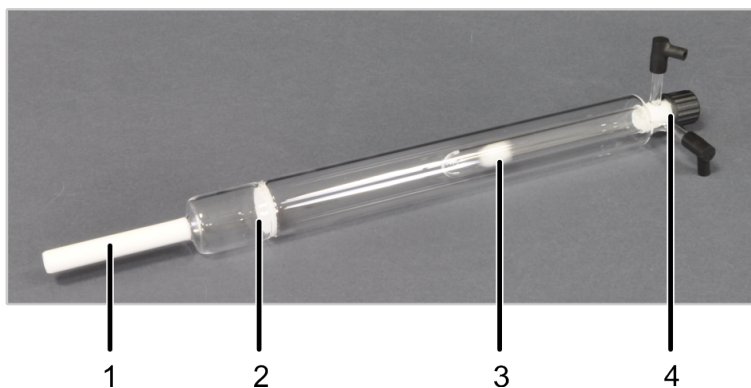


Fig. 4 Combustion tube

- | | |
|--|--|
| 1 Connection to the auto-protection assembly | 2 Glass drip |
| 3 Internal tube with quartz wool plug | 4 Head with injection port and gas terminals |

The injection port and the gas terminals are located on the head of the combustion tube.

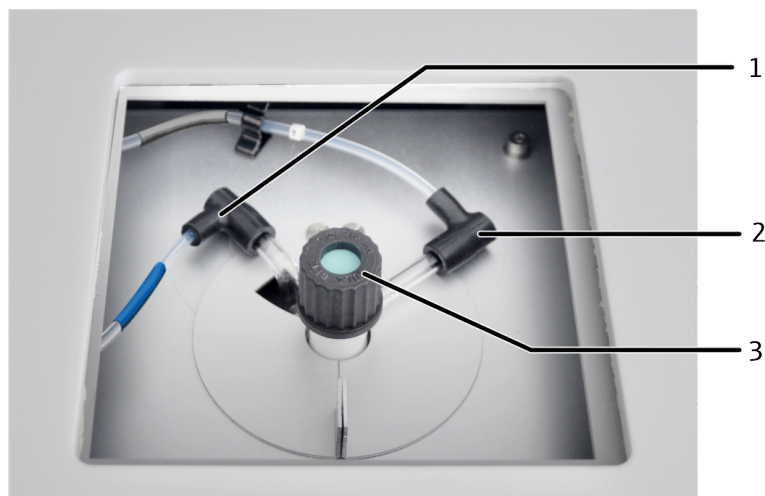


Fig. 5 Connections to the combustion tube

- | | |
|---|--|
| 1 Oxygen connection (hose no. 3, blue sheath) | 2 Argon connection (hose no. 4, gray sheath) |
| 3 Injection port | |

Auto-protection assembly

The auto-protection assembly is used to couple the combustion tube to the measuring gas dryer. The assembly has an integrated replaceable filter. The filter protects the downstream membrane dryer and the detector against soot particles and solid pyrolysis products in case of incomplete combustion. The filter also retains condensed water and other aerosols; only water vapor passes through.

The auto-protection assembly is mounted to a plug-in unit below the furnace.

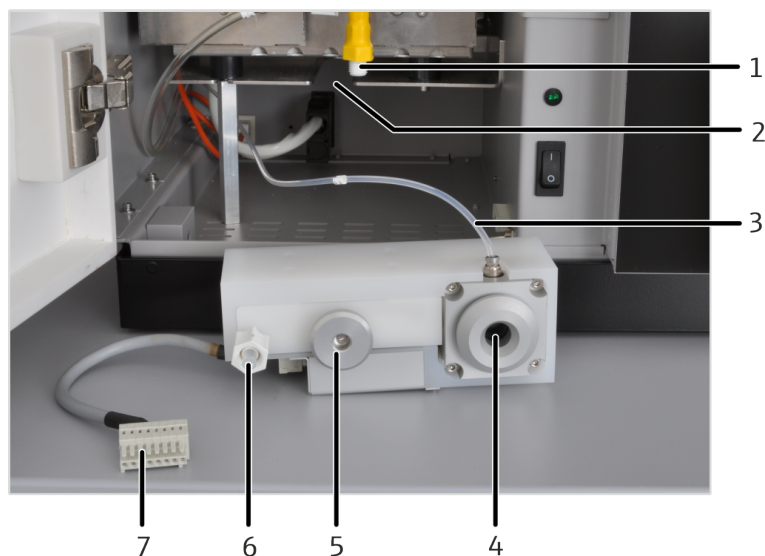


Fig. 6 Auto-protection assembly

- | | |
|---|---|
| 1 Membrane dryer | 2 Plug-in unit for the auto-protection assembly |
| 3 Gas connection for the pneumatic seal (argon) | 4 Pneumatic seal |
| 5 Holder | 6 Connection to the membrane dryer |
| 7 Electrical connection | |

The combustion tube is plugged into the auto-protection assembly and sealed with a pneumatic seal. The seal is operated using argon.

A toggle switch is used to open and close the seal:

- Toggle switch down: combustion tube is sealed
- Toggle switch up: combustion tube is released

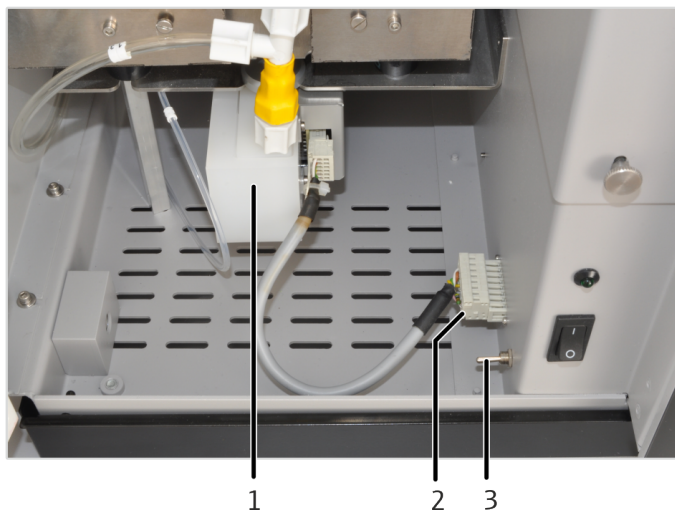


Fig. 7 Toggle switch for the pneumatic seal

- 1 Mounted auto-protection assembly
- 2 Connection of the auto-protection assembly
- 3 Toggle switch for the pneumatic seal

Measuring gas dryer

The measuring gas is dried by means of a membrane dryer which is attached to the furnace. Oxygen is used as a purge gas for the operation of the membrane dryer. To increase the drying effectiveness a pump is used to aspirate the rinse gas through the membrane dryer.

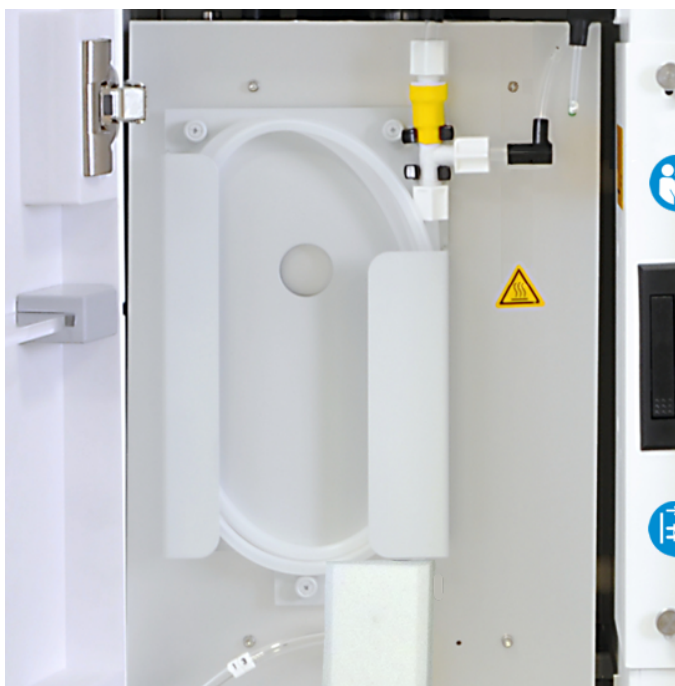


Fig. 8 **Membrane dryer**

Detector

The device uses a chemiluminescence detector. The detector measures the amount of emitted light which is released when nitrogen dioxide is produced in the chemical reaction of nitrogen monoxide and ozone. The initial substances for the reaction are produced by the reactor itself. Excess ozone is decomposed.

The chemiluminescence detector consists of the following components:

Component	Function
Micro-plasma chamber	Preparation of ozone (O ₃) from oxygen
Converter	Transformation of nitrogen dioxide (NO ₂) into nitrogen monoxide (NO)
Reactor with sensor	Reaction of nitrogen monoxide (NO) with ozone (O ₃) to produce nitrogen dioxide (NO ₂ *) Detection of the amount of emitted light
Thermal and chemical ozone decomposer	Decomposition of excess ozone (O ₃)
Diaphragm pump	Conveyance of the measuring gas through the detector
Differential pressure sensor	Regulation of the pressure compensation between the variable measuring gas flow (300 to 500 ml/min) and the constant aspiration flow generated by the diaphragm pump (approx. 600 ml/min at 500 mbar)
Absorber	Cleaning of the aspirated air before entering the diaphragm pump

Gas flow diagrams

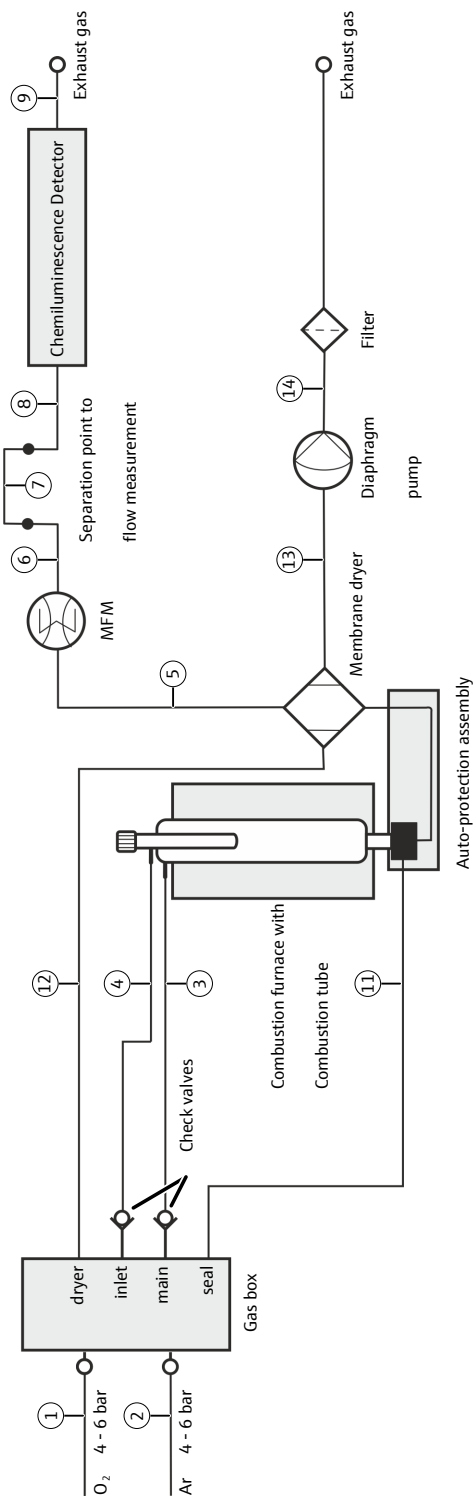


Fig. 9 Gas flow diagram for the device; the numbering corresponds to the numbering of the hose connections on the device

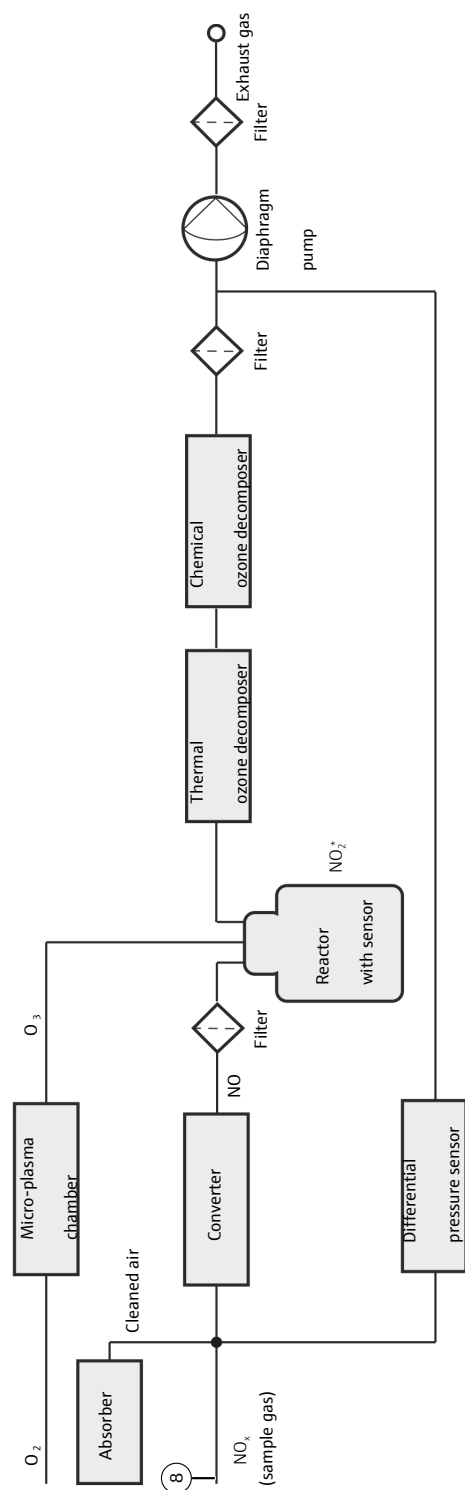


Fig. 10 Gas flow diagram of the chemiluminescence detector

4.3 Type plate

The rating plate is located on the rear of the device next to the mains connection.

The type plate contains the following information:

- manufacturer address, trademark
- Designation of the device, serial number
- Electrical connection data
- Conformity markings
- WEEE marking

4.4 Sample supply

4.4.1 Autoinjector

The autoinjector is used for the injection of individual samples up to a volume of 1 to 100 μl . For this purpose, the samples are injected directly into the combustion tube. The interface on the rear panel of the device is used to control the autoinjector and to supply it with electrical current. The autoinjector is controlled by the device's software and powered by the device.

Design

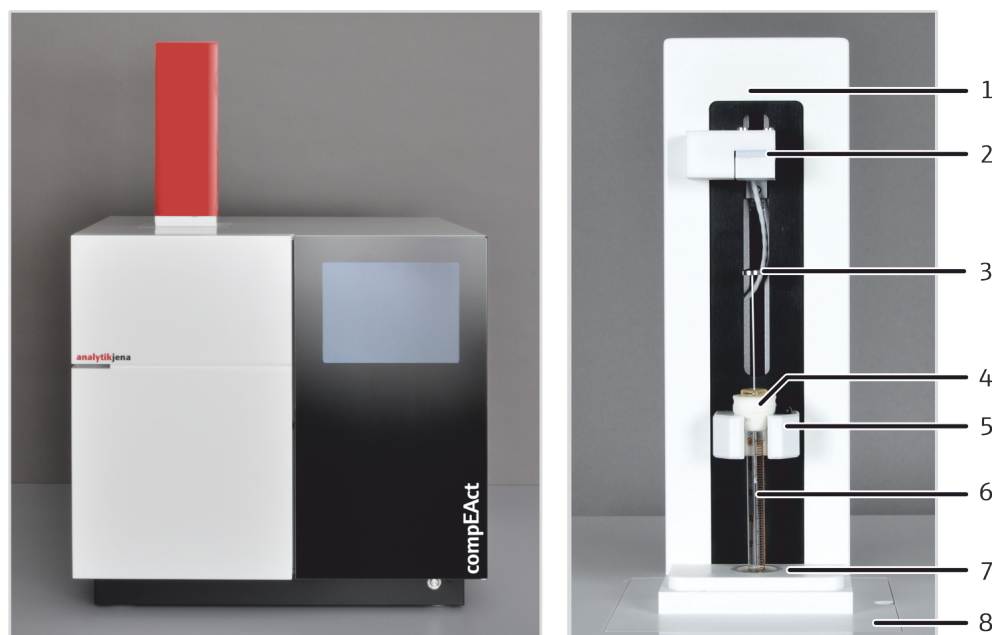


Fig. 11 Autoinjector setup

- | | |
|---|--|
| 1 Base element with mechanics and control electronics | 2 Guiding device to push down the syringe plunger in a controlled manner |
| 3 Syringe plunger | 4 Conical guide at the syringe |
| 5 Syringe bracket | 6 Syringe cylinder |
| 7 Guide on the injection port | 8 Base plate |

4.4.2 Autosampler

The autosampler is an automatic sampler for liquid samples. It is available in 2 versions. The LS 1 is intended for small series with up to 18 samples. The samples are arranged in a linear sequence on the fixed sample rack. The injector head for taking up the samples and injecting them into the combustion tube moves on the rack along the guide arm from left to right towards the injector port.

The LS 2 is designed for up to 120 samples. The samples are arranged in 8 rows on the rack. The rack moves back and forth.

The injection port allots the samples that were taken up by the autosampler directly into the combustion tube. The autosampler is controlled by the software of the device. The sample volume that can be metered is 1 to 100 μl .



Fig. 12 LS Autosampler

- | | |
|--------------------------------|------------------------------------|
| 1 Guide arm | 2 Sample rack |
| 3 Solvent and waste containers | 4 Injector head with syringe drive |

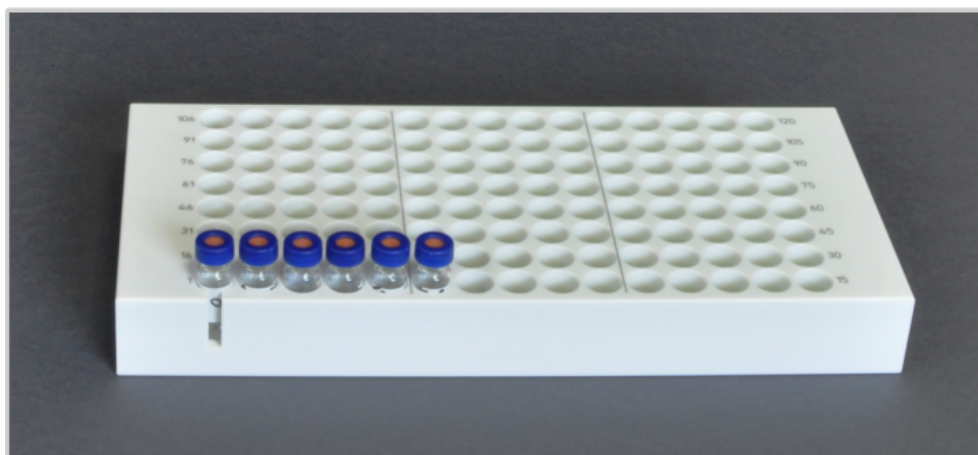


Fig. 13 Sample rack of the LS 2

The solvent and waste containers can be removed to fill or clean the autosampler. The solvent container has a removable lid to facilitate its cleaning. A waste hose is attached to the waste container. This hose must be introduced to an appropriate external waste container. To avoid contamination, the solvents are absorbed and released via ports with integrated septum.

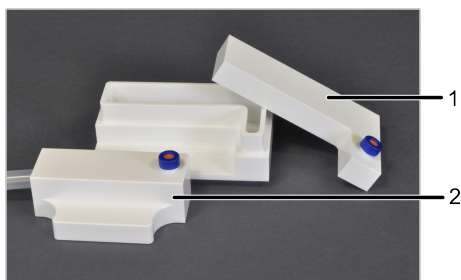


Fig. 14 Solvent and waste containers of the autosampler

- | | |
|---------------------|-------------------|
| 1 Solvent container | 2 Waste container |
|---------------------|-------------------|

The electrical connections and interfaces of the autosampler are located on the rear panel. The connections for the serial interface and power supply are effected via terminals on the rear panel of the device.

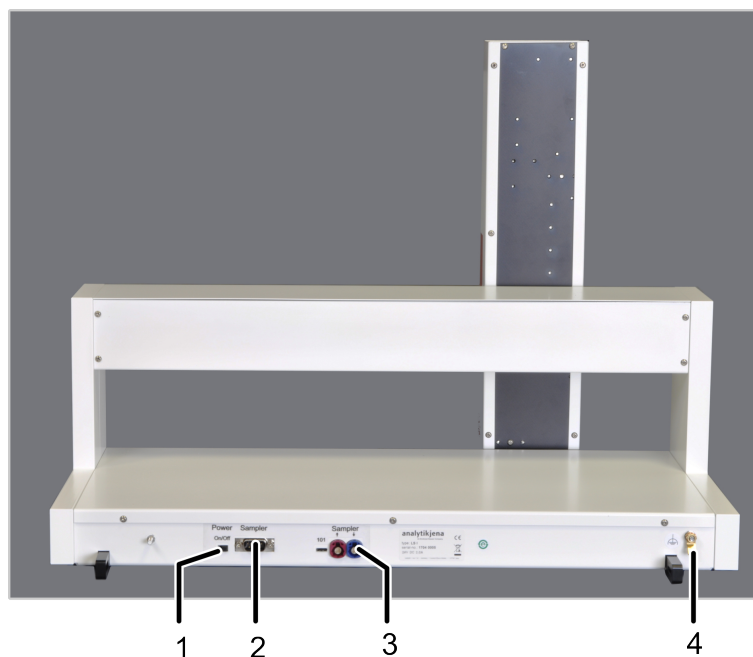


Fig. 15 Autosampler electrical connections

- | | |
|---------------------------|------------------------|
| 1 ON/OFF switch | 2 Power connection |
| 3 Interface to the device | 4 Functional grounding |

4.4.3 Autosampler LS-T

The autosampler LS-T is intended to be used with temperature-controlled syringe and a temperature-controlled sample tray. The temperature control function makes it possible to dose of a wide variety of liquid samples:

- The cooling function enables safe and quantitative injection of highly volatile liquids.
- The heating function allows fast processing of highly viscous liquids.

The autosampler LS-T is intended for up to 112 samples.

The installation and adjustment of the autosampler LS-T is described in the separate operating manual for this accessory.

The thermostat required for operation of the autosampler LS-T is not included in the scope of delivery of the autosampler LS-T.

5 Installation and commissioning

5.1 Installation conditions

5.1.1 Ambient conditions

Climatic conditions

The climate conditions for the installation location are listed in the technical specifications. If required, make sure that the room is temperature-controlled.

Installation location requirements

The installation location of the device should have the characteristics of a chemical laboratory. The installation location must meet the following requirements:

- This laboratory device is designed for indoor use.
- Do not use the device in wet and damp environments. Keep the device surface clean and dry.
- Avoid direct sunlight and radiation from heaters onto the device. If necessary, provide air conditioning.
- Place the device on a heat-resistant and acid-resistant surface.
- Do not locate the device near sources of electromagnetic interference.
- Avoid mechanical shocks and vibrations.
- Do not use the device in explosion-hazard environments.
- Avoid large temperature fluctuations.
- Keep the front door and the ventilation slits free and do not obstruct them with other devices.
- The installation site must be free of drafts, dust and caustic fumes.
- The laboratory atmosphere must be free from sulfur compounds, nitrogen compounds and halogenated compounds as well as corrosive gases and hydrocarbons

See also

📄 Ambient conditions [► 80]

5.1.2 Power supply



WARNING

Danger due to electrical voltage

- Only connect the device to a properly grounded socket which complies with the voltage indicated on the device's rating plate.
- Do not use an adapter in the feeder.

The device operates on single-phase alternating current.

The installation of the electrical equipment in the laboratory must comply with the DIN VDE 0100 standard. At the connection point, an electrical current in accordance with the standard IEC 60038 must be available.

Only the appropriate country kit (mains cable with protective earth and country-specific plug type) can be used to connect the device to the mains. The country kit can be obtained from Analytik Jena. The protective effect must not be invalidated by the use of an extension line which does not have a protective conductor.

5.1.3 Gas supply

Oxygen and argon are required to operate the device. Refer to the technical data for information on the required gas quality and gas consumption.

The operator is responsible for the gas supply and the corresponding connections and pressure reducers.

The connection hoses with outer diameter 6 mm and inner diameter 4 mm are provided with the device. Their lengths are 2 m. If other lengths are preferred, please contact Analytik Jena customer service.

See also

 Technical data of the device [► 79]

5.1.4 Spatial requirements

Dimensions of the device and its components:

Device	Dimensions (width x height x depth)
Device	54 x 51 x 53 cm
Autoinjector	9 x 27 x 11 cm
Autosampler LS 1 / LS 2	54 x 41 x 34 cm
LS-T autosampler	51 x 50 x 41 cm
Thermostat (not included)	approx. 25 x 65 x 40 cm (dependent on model)

The device has a required floor space of 65 x 60 cm (including clearance on the sides). The ventilation slits at the bottom and rear side of the device must not be obstructed by any objects.

i NOTICE! Keep a safety distance of at least 10 cm from the rear of the device to other equipment or walls

The autoinjector or the autosampler are mounted to the top of the device. Therefore, the required height is the sum of the height of the device and the height of the sample feeding module that is connected. There must be a clearance of at least 10 cm between the device system and any shelf or cabinet above the system.

When using the temperature-controlled autosampler LS-T, additional space is required for the installation of a thermostat next to the device.

If you need external control in addition to the integrated tablet, space is required next to the device for the PC, monitor and keyboard, and the printer. The PC and its components can also be placed on a separate table.

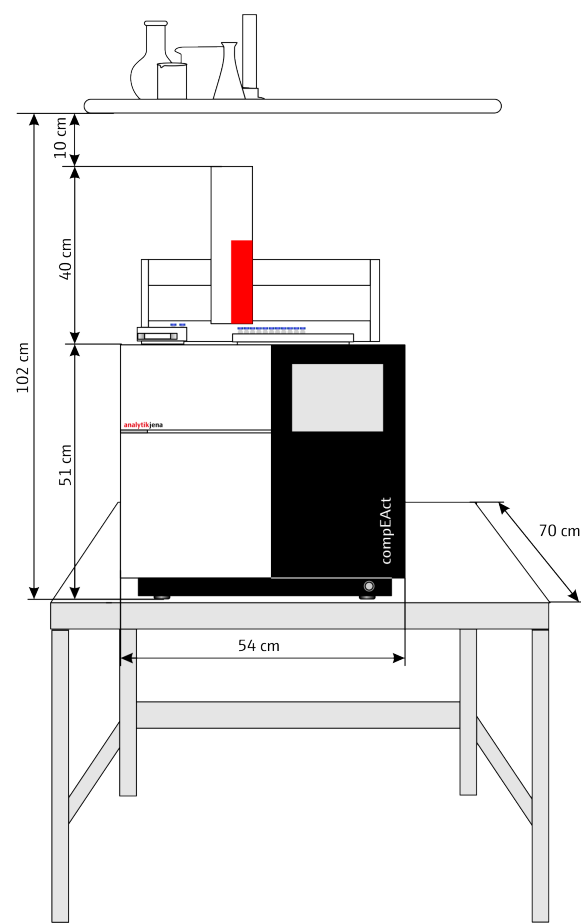


Fig. 16 Installation diagram for the device with autosampler

5.2 Supply and control connections

The electrical connections and connections for the gas supply are located on the rear panel of the device.

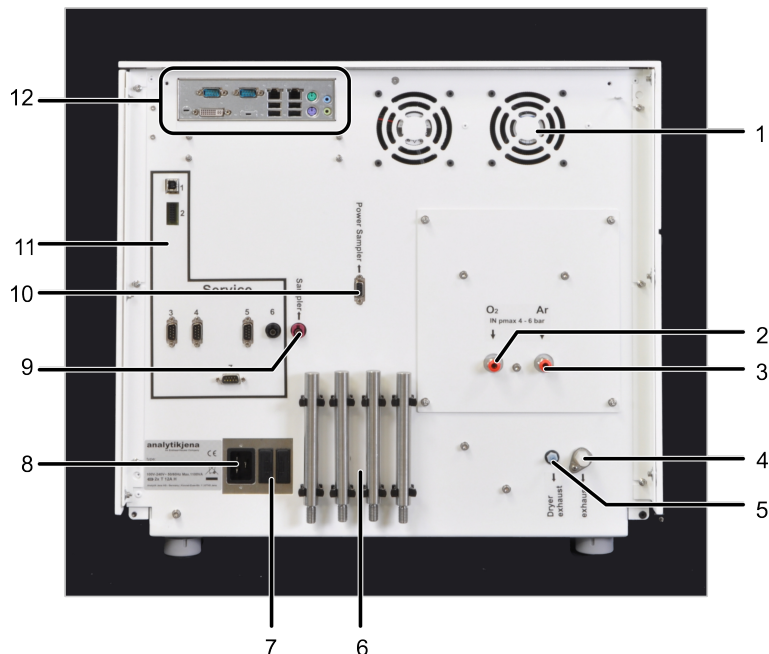


Fig. 17 Connections on the rear of the device

- | | |
|--|--|
| 1 Fan for furnace chamber and electronics | 2 Connection for oxygen (O ₂) |
| 3 Connection for argon (Ar) | 4 Exhaust gas detector (exhaust) |
| 5 Exhaust gas membrane dryer (dryer exhaust) | 6 Handles |
| 7 Device fuses | 8 Power connection |
| 9 Communication interface for autoinjector and autosampler | 10 Power connection for autoinjector and autosampler |
| 11 Service connections | 12 Connections for internal computer |

The device is equipped with a hose bridge in the interior on its right-hand side for connecting an external flow meter (MFM) for servicing purposes. Two USB ports are also located in this region, directly above the hose bridge. They are provided for software updates or for backing up the database on a flash drive.



Fig. 18 USB ports and hose bridge in the gas path behind the front door

- | | |
|-------------|-----------------------|
| 1 USB ports | 2 Hose bridge (green) |
|-------------|-----------------------|

The mains switch is located inside the device, directly behind the door. The ON/OFF switch for the device is located on the front baseboard on the right.

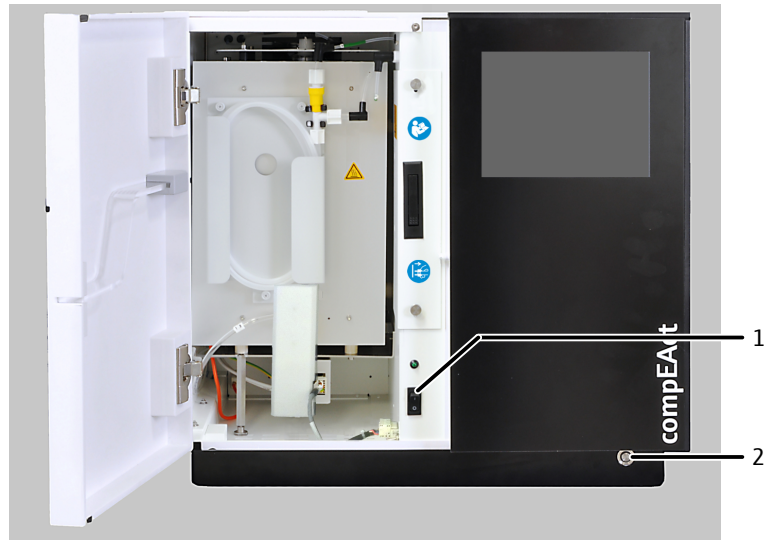


Fig. 19 Switches on the device

- | | |
|---|-----------------|
| 1 Mains switch for emergencies or servicing | 2 ON/OFF switch |
|---|-----------------|

Switch function

The mains switch is used to disconnect or to connect the device from the electric mains. In normal operation the mains switch remains switched on. It only needs to be switched off for maintenance works or in case of emergencies.

The ON/OFF switch is used to switch the device on and off. The following device functions are activated when the device is switched on:

- The software starts.
- The detector is switched on and the detector starts warming up.
- The method that was activated before switching the device off is loaded.
- The gas flows are regulated when the gas supply to the device is established.
- The combustion furnace is heated to the temperature that is specified in the method.

When the device is switched off using the ON/OFF switch or the respective command in the user interface of the software the system is shut down:

- The combustion furnace heating is switched off.
- The detector is switched off.
- The software is shut down.

5.3 Installing the device with sample feeding module

5.3.1 Setting up and connecting the device



WARNING

Danger due to incorrect installation

Incorrect installation can create serious hazards. This may result in electric shock and explosion if the gases are not connected correctly.

- Only the Analytik Jena customer service or specialist personnel trained and authorized by them is allowed to install and commission the device and its system components.
- Unauthorized assembly and installation is not permitted.



NOTICE

Keep the original packaging

Transport damage can only be avoided if the device is transported in its original packaging.

- Keep the original packaging for transport, e.g., in case the device must be returned to the manufacturer for repair.
-
- ▶ Carefully remove the device and its components from the transport packaging. Do not damage the transport packaging!
 - ▶ Use the provided packing list to verify that the delivery is complete.
 - ▶ Place the device at its intended location.
 - ▶ Unscrew and detach the carrying handles. Store the carrying handles by clamping them in the bracket on the rear panel of the device.
 - ▶ Attach the black skirting:
Push the skirting on the device from the front side. The guide pins on the skirting must protrude into the openings on the front and the back of the device.
 - ▶ Attach the gas supply hoses to the connections on the rear panel of the device.
 - ▶ Install the combustion furnace, auto-protection assembly, membrane dryer and combustion tube one after the other. For installation, follow the instructions in the respective maintenance chapters.
 - ▶ Connect the autosampler or autoinjector. For connection, follow the instructions in the respective installation chapter and the instructions for the corresponding accessories.
 - ▶ Plug in the mains plug to the connection at the rear of the device.
 - ▶ Plug in the mains cable to the mains power outlet.

The installation of the LPG module 2.0, GSS module and the combined GSS/LPG module is described in the respective user manuals of these accessories.

These accessories can be connected in series with an autoinjector or autosampler (LS 1, LS 2 or LS-T). For the installation of several modules in series, refer to the user manual of the respective accessory.

Control via the PC: Setting up remote access on the analyzer

To control the device via an external PC, remote access must be activated in the software during installation via the menu item **Remote control**.

Control is possible via a direct LAN connection between the device and the PC, as well as via the connection of both devices to a network.

- ▶ Switch on the mains switch behind the front door.
- ▶ Push the ON/OFF switch on the skirting after 30 seconds.
 - ✓ The device system starts up and the software starts on the integrated tablet.
- ▶ Select menu item **System / Settings / Remote control**.

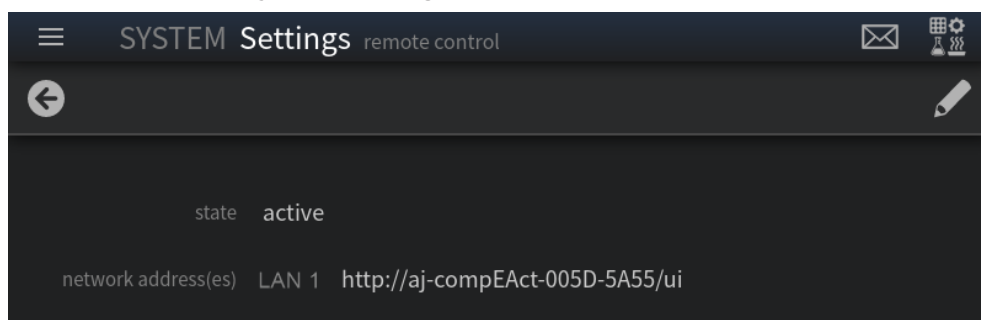



Fig. 20 Remote access page with status setting and network address of the device

- ▶ Tap  and set the parameter **Remote control** to **active** status.
- ▶ Use an Ethernet cable to connect the external PC to one of the two LAN ports on the rear panel of the device.
Alternatively, use an Ethernet cable to connect the device to the network. Verify that the PC is also connected to the network.
- ▶ Start the external PC.
- ▶ Open the browser on the PC and enter the network address shown in the **Remote control** window on device's integrated tablet computer.
The device has 2 LAN ports on its rear panel. If both LAN ports are connected to a network, 2 network addresses will be displayed; one for each port.
 - ✓ The browser displays the software user interface. You can now use the PC to control the device.

See also

- 📖 Replace the membrane dryer [▶ 50]
- 📖 Removing and installing the combustion furnace [▶ 61]
- 📖 Remove and install the auto-protection assembly [▶ 52]
- 📖 Installing the combustion tube [▶ 48]
- 📖 Connect the autoinjector [▶ 32]
- 📖 Connecting the autosampler [▶ 32]

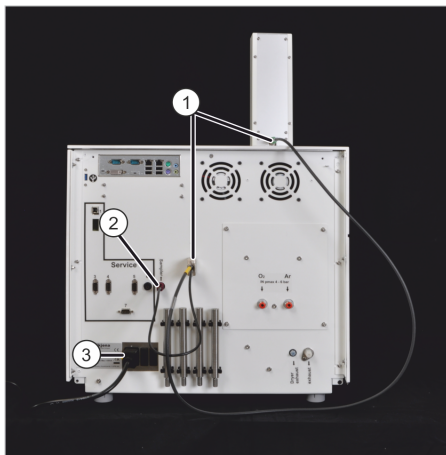
5.3.2 Connect the autoinjector



NOTICE

Short circuits during connection can damage the autoinjector. Only connect the autoinjector when the device is switched off at the mains switch and the mains plug is not connected to the device.

Do not hold the autoinjector by the red front panel when attaching it or removing it.



- ▶ Remove the cover above the combustion tube of the device.
- ▶ Place the autoinjector onto the opening at the top of the device. When doing so, move the base plate of the autoinjector until the ring-shaped seating fits onto the injection port of the combustion tube. The autoinjector is correctly inserted when the base plate completely sits in the opening and is flush fitting with the surface of the device.
- ▶ Establish the electrical connections between the autoinjector and the device:
 - Power supply (1)
 - Communication interface (2)
- ▶ Plug in the mains cable to the device (3).
 - ✓ The device and the autoinjector are installed.

The stepper motor of the autoinjector must be calibrated before initial commissioning. Refer to the instructions in the corresponding maintenance chapter.

See also

📖 Adjusting the autoinjector [► 42]

5.3.3 Connecting the autosampler



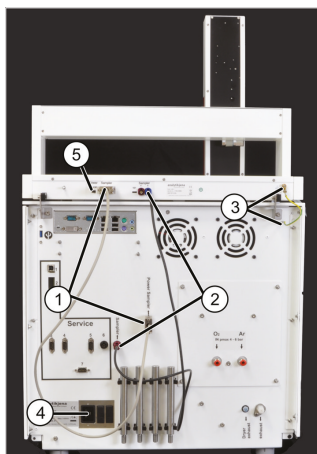
NOTICE

Short circuits during connection can damage the autosampler. Only connect the autosampler when the device is switched off at the mains switch and the mains plug is not connected to the device.

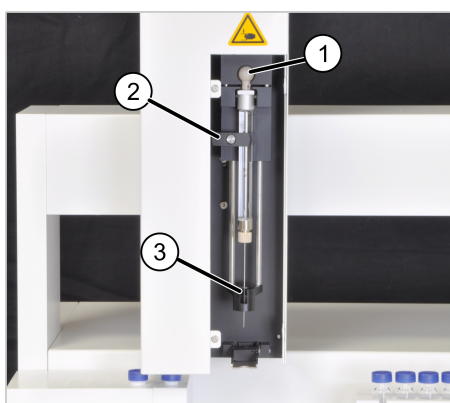
- ▶ Put the cover onto the opening above the combustion tube of the device.
- ▶ Screw on the mounting brackets provided with the autosampler to the device.
- ▶ Place the autosampler onto the device. Ensure that the rear and the left edge of the autosampler are flush fitting with the edges of the device.



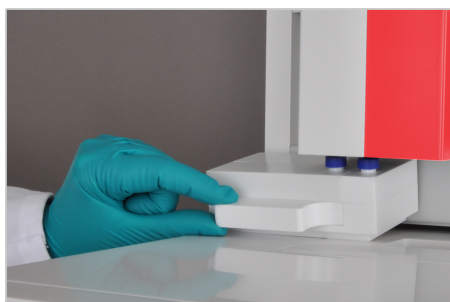
- ▶ Attach the autosampler to the mounting brackets using the plastic brackets. To do this, insert the nuts to the groove of the plastic bracket. Do not yet tighten the connection. It must still be possible to slightly move the autosampler back and forth within the groove.



- ▶ Establish the electrical connections between the autosampler and the device:
 - Power supply (1)
 - Communication interface (2)
 - Functional grounding (3)
- ▶ Connect the mains cable to the device (4).
- ▶ Switch on the ON/OFF switch of the LS (5).



- ▶ Insert the syringe to the injector head:
 - Push the cannula through the cannula guide (3)
 - Insert the ball knob of the piston into the bracket (1)
 - Slightly pull out the hinge on the housing and attach the syringe (2). The spring on the hinge pushes the syringe into the bracket.



- ▶ Fill the solvent container with approx. 30 ml of solvent and place it on the bracket of the autosampler together with the waste container.

i NOTICE! Proceed with care when inserting the filled solvent container and do not tilt the container too far to avoid spilling the solvent.

- ▶ Introduce the waste hose to an appropriate waste container. Route the hose in a constant downward slope.
- ▶ Insert the sample rack.
- ▶ Switch on the device and adjust the autosampler using the software. For adjustment, refer to the instructions in the corresponding maintenance chapter.



- ▶ Use the two screw connections to fix the autosampler in the adjusted position.
- ✓ The device and the autosampler are installed.

See also

- 📖 Adjusting the autosampler [▶ 43]

6 Operation

6.1 Switching the device on and off

Switching the device on using the mains switch

i NOTICE! In normal operation the mains switch remains switched on. The device must only be disconnected from the mains by actuating the mains switch in case of an emergency, for transport or during maintenance and servicing.

- ▶ Open the external gas supply.
- ▶ Switch on the mains switch behind the front door.
- ▶ Push the ON/OFF switch on the skirting after 30 seconds.
 - ✓ The device system starts up and the software is started. The method that was activated before switching the device off is loaded.

Switching on using the ON/OFF switch

- ⇒ The mains switch is already switched on.
- ▶ Open the external gas supply.
- ▶ Switch on the device via the ON/OFF switch.
 - ✓ The device system starts up and the software is started. The method that was activated before switching the device off is loaded.

Switching off using the ON/OFF switch

- ▶ Switch off the device via the ON/OFF switch. Alternatively, select the menu item **System / Power Down** in the software.
 - ✓ The combustion furnace heating is switched off. After 2 minutes, the gas flows within the device are shut off and the detector is switched off.
- ▶ Wait for 2 minutes, then cut the external gas supply.
 - ✓ The fans will continue to run for 30 minutes to ensure that the device is properly cooled down. During this time, the LED in the front door flashes. After that, the LED is turned off and the device system is shut down.

Switching off the device using the mains switch



NOTICE

Switching off the device via the mains switch too early may damage the device!

Switching off the device using the mains switch before shutting down with the ON/OFF switch and before the LED in the front door has permanently stopped flashing can cause permanent damage to the device due to overheating. Furthermore, this may cause malfunctioning of the installed software.

Only switch the device off prematurely at the mains switch in an emergency!

Carry out the following steps before all maintenance and service work:

- ▶ Switch off the device using the ON/OFF switch (see section "Switching off using the ON/OFF switch").
- ▶ Wait until the LED in the front door stops flashing (approx. 30 minutes).
- ▶ Switch off the mains switch behind the front door.
 - ✓ The device is now completely switched off.

Controlling the device via an external PC



CAUTION

Risk of injury from moving parts on the device and its components.

Movements of the autosampler arm and the autoinjector can cause injuries such as bruises or puncture wounds to the hands. Make sure that no other user is present at the device and its components before controlling the device via the external PC.

- ▶ On the screen of the integrated tablet, select the menu item **System / Settings / Remote control**.
- ▶ Open the browser on the PC and enter the network address shown in the **Remote control** window on device's integrated tablet computer.
The device has 2 LAN ports on its rear panel. If both LAN ports are connected to a network, 2 network addresses will be displayed; one for each port.
 - ✓ The browser displays the software user interface. You can now use the PC to control the device.

6.2 Measurement with autoinjector



CAUTION

Risk of injury when handling the cannula

The cannula of the syringe has a sharp tip. Do not touch the syringe by the cannula. There is a risk of injury and contamination of the cannula.



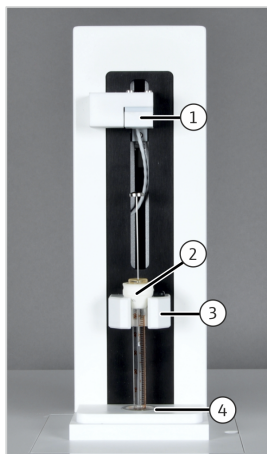
NOTICE

The autoinjector must only be loaded with syringes specifically available for this type of autoinjector. The volume of the syringe must be defined in the software. Please observe the information provided in the software's operating instructions.

Ensure that dosing does not start prematurely when inserting the syringe into the autoinjector.

- ▶ Draw the sample into the autoinjector syringe up to the required volume marking.
 - Immerse the cannula in the sample solution. To flush, draw up and expel sample solution several times to remove small bubbles.
 - Slowly draw up the desired volume to avoid any more bubbles forming.
 - Carefully wipe the outside of the cannula with soft cellulose. Otherwise, sample residues could contaminate the septum.
- ▶ Remove the cover from the autoinjector.
- ▶ Start the measurement in the software, Wait until prompted by the software before installing the syringe into the autoinjector.

i NOTICE! When inserting the syringe into the autoinjector, do not touch the plunger and do not press it down!



- ▶ Hold the syringe by the white plastic cone (2) and pierce the cannula through the cannula guidance (4) of the autoinjector and through the septum of the combustion tube.
- ▶ Insert the cannula into the combustion tube until the cone of the syringe fully rests on the holder of the autoinjector (3). The positioning pin must sit in the cavity if the syringe is in the right position.
- ▶ Confirm the installation of the syringe in the software with **OK**.
 - ✓ The software controls the injection of the sample into the combustion tube while the plunger moves downward (1). Analysis is carried out.

As soon as the injection is finished, the software prompts you to remove the syringe from the autoinjector immediately.

- ▶ Remove the syringe from the autoinjector and confirm the withdrawal in the software with **OK**.

i NOTICE! Removing too late or large fluctuations in the collection time significantly affect the analysis time, the useful life of the septum and the quality of the analysis results.

6.3 Measurement with autosampler



CAUTION

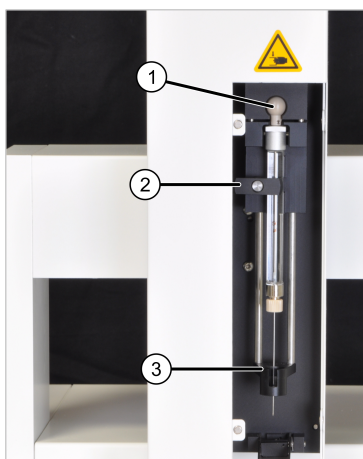
Risk of injury when handling the cannula

The cannula of the syringe has a sharp tip. Do not touch the syringe by the cannula. There is a risk of injury and contamination of the cannula.

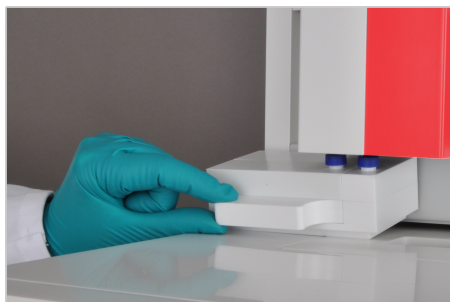


NOTICE

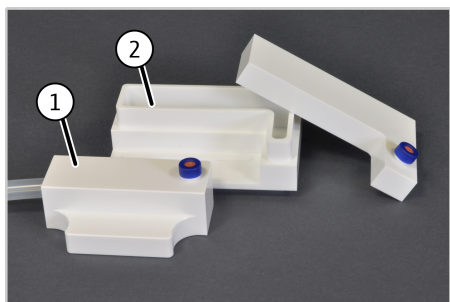
Ensure that the autosampler is calibrated and the correct syringe volume is set in the software before starting the measurement. Please observe the information provided in the corresponding maintenance chapter and in the software's operating instructions.



- ▶ Remove the injector head of the autosampler from the magnetic attachment.
- ▶ Insert the syringe to the injector head:
- ▶ Push the cannula through the cannula guide (3)
- ▶ Insert the ball knob of the piston into the bracket (1)
- ▶ Slightly pull out the hinge and rotate into horizontal position (2). The spring on the hinge pushes the syringe into the bracket and retains it in this position.



- ▶ Remove the solvent and waste containers from the autosampler.



- ▶ Fill the solvent container (2) with approx. 30 ml of solvent.
- ▶ Empty and clean the waste container (1).
- ▶ Assemble the containers and attach them to the bracket of the autosampler.

i NOTICE! Proceed with care when inserting the filled solvent container and do not tilt the container too far to avoid spilling the solvent.

- ▶ Route the hose from the waste container in a constant downward slope to an appropriate receptacle.



- ▶ Insert the sample containers into the rack.
- ▶ Start the measurement in the software,

See also

- 📖 Adjusting the autosampler [▶ 43]

7 Maintenance and care

7.1 Maintenance intervals

Analyzer

Maintenance task	Maintenance interval
Check system tightness	If the software reports any leaks
Cleaning and servicing the device	Weekly
Check hose connections for tight fit	Weekly
Replace membrane dryer	In case of soiling or damage
By customer service: Replace the backup battery on the control computer (HMI board)	Every 3 years
Replace absorber	Annually
Replace chemical ozone decomposer and solids filter	Annually or as soon as the smell of ozone is perceptible at the gas outlet ("Exhaust").

Combustion tube

Maintenance task	Maintenance interval
Check injection port with septum for damage and soiling	Daily and in case of abnormal measurement results (wide scattering, carry-over, excessively high or low measured values)
Quartz wool plug: check correct position	After maintenance work on the injection port
Replace quartz wool plug	<ul style="list-style-type: none"> ■ If the plug is damaged or soiled ■ In case of abnormal measured values (wide scattering, carry-over, elevated blank values) or strange peak shapes
Check the combustion tube for cracks and damages	Monthly and each time it is cleaned
Replace combustion tube	In case of devitrification, cracks or other damages and soiling that cannot be removed
Check the FAST connectors on the inlet of the combustion tube for tight fit, cracks or other damages	Monthly and in case of gas leaks
Replace septum	If leaking, damaged or contaminated

Auto-protection assembly

Maintenance task	Maintenance interval
Check filters	<ul style="list-style-type: none"> ■ Monthly ■ In case of abnormal measurement results ■ In case of incomplete combustion of the sample
Replace filter	In case of soiling and in case of abnormal measurement results
Replacing the pneumatic seal	If leaking or damaged

Autoinjector

Maintenance task	Maintenance interval
Calibrate autoinjector (stepper motor)	<ul style="list-style-type: none"> ■ On initial commissioning of the device
Clean and care of the autoinjector	Weekly

Maintenance task	Maintenance interval
Clean or replace syringe	As required
Clean or replace the cannula	If clogged or damaged

Autosampler

Maintenance task	Maintenance interval
Adjusting the autosampler	<ul style="list-style-type: none"> ■ On initial commissioning of the device ■ After the autosampler has been removed from the device ■ After servicing the autosampler and replacing the syringe or sample tray ■ After replacing the combustion tube
Clean and care of the autosampler	Weekly
Clean or replace syringe	As required
Clean or replace the cannula	If clogged or damaged

The maintenance of the LPG module 2.0, GSS module and the combined GSS/LPG module is described in the respective user manuals of these accessories.

7.2 Cleaning the device and its system components



WARNING

Risk of short circuit!

Switch the device off with the mains switch before cleaning.

Do not use any dripping wet cloths for cleaning. Make sure that no liquid enters the interior of the devices.

- Avoid contamination by handling sample substances carefully.
- Immediately wipe up spilled sample or reagents with blotting paper.
- Use a soft, clean cloth to wipe away any contamination from the device. A commercially available neutral cleaning agent (dishwashing liquid) can be used for maintaining the casing.

7.3 Check system tightness

The system's tightness is monitored automatically. If the system is leaking, the message **device leaky** appears in the **Device Status** window. Starting a measurement is not possible in this case.

Smaller leaks can be detected if the control flow in the system drops when applying additional counter pressure. The flow monitoring set which is provided with the device can be helpful for finding leaks. The set is assembled as follows:

- ▶ Plug the Luer adapter (d) onto the filter (c).
- ▶ Connect the two short pieces of hose (b, e) to the Luer adapter and the filter outlet.
- ▶ Push the long thin hose (a) into the short hose (b).

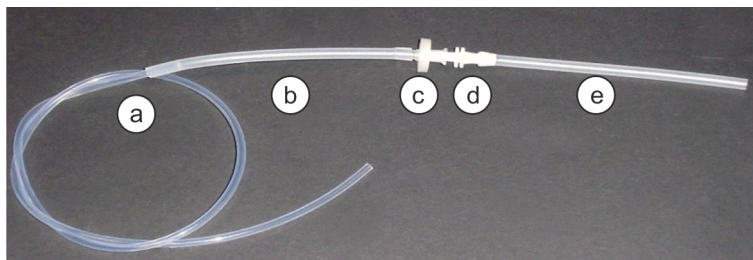


Fig. 21 Hose set for flow check

Proceed as follows to start the device and the gas supply:

- ▶ Open the gas supply to the device.
- ▶ Switch on the device. To switch on, refer to the instructions in the corresponding operating chapter.
- ▶ Make sure that the pneumatic seal on the auto-protection assembly is closed. Flip the toggle switch for the closed state downward.
 - ✓ After starting up the system, the status window of the software displays the specified gas flows in the active method.

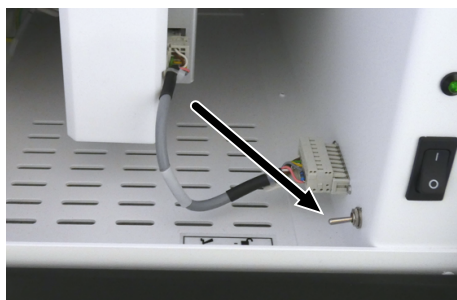


Fig. 22 Close the toggle switch for sealing on the auto-protection assembly

Proceed as follows to check for leaks before the detector:

- ▶ Go to **system | device | maintenance | Control Flow** to read the control flow.
- ▶ Detach the hose bridge (hose no. 7) from one of the two FAST connectors.
- ▶ Attach the loose end of hose a to the FAST connector.
- ▶ Plug the other end of the flow monitoring set into the loose end of hose no. 7 using the hose e.
- ▶ Re-read the control flow.



Fig. 23 Hose bridge (hose 7)

If the impact of the filter causes the control flow to reduce by more than 5 ml/min there is a leak before the detector. Determine and correct possible causes. Contact the customer service department at Analytik Jena if this is not successful.

The control flow may deviate from the indicated gas inflow (sum of Main O₂ and Inlet Argon) because the principle used may cause the control flow sensor to respond differently to the different gases.

See also

📖 Switching the device on and off [► 35]

7.4 Adjusting the autoinjector




CAUTION

Risk of injury from moving parts on the device and its components

Movements of the autosampler arm and the autoinjector can cause injuries such as bruises or puncture wounds to the hands. Carry out all software-controlled maintenance and adjustment work only by means of the integrated touch screen or an external PC set up in the immediate vicinity.

During the software-supported adjustment of the autoinjector, the system checks the geometry of the syringe that is used. If required the number of steps that the stepper motor pushes down the syringe piston is adjusted to the geometry of the syringe that is used.

⇒ The autoinjector is mounted onto the device and connected. For installation of the autoinjector, refer to the instructions in the corresponding chapter

- ▶ Select the command **system | device | maintenance | syringe adjust**.
- ▶ Start the adjustment with .
- ▶ When prompted, pull out the syringe plunger up to the maximum volume (50 or 100 µl) and confirm with **OK**.
 - ✓ The autoinjector presses the syringe down to half the volume (25 or 50 µl).
- ▶ Read the actual value on the syringe plunger and enter the value in the input field. Confirm with **OK**.
 - ✓ The autoinjector has been adjusted.

See also

📖 Connect the autoinjector [► 32]

7.5 Adjusting the autosampler






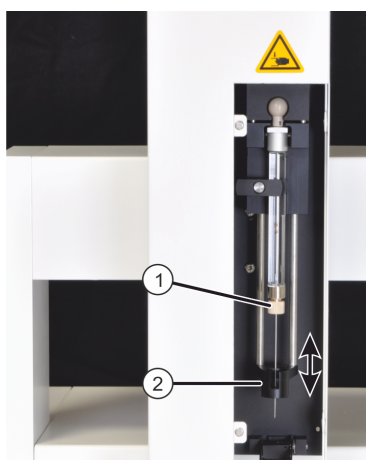
CAUTION

Risk of injury from moving parts on the device and its components

Movements of the autosampler arm and the autoinjector can cause injuries such as bruises or puncture wounds to the hands. Carry out all software-controlled maintenance and adjustment work only by means of the integrated touch screen or an external PC set up in the immediate vicinity.

The following instruction describes how to adjust the autosamplers LS 1 and LS 2. The adjustment of the autosampler LS-T is described in the separate manual for this accessory.

- ⇒ The autosampler is mounted onto the device and connected. For installation, observe the instructions in the corresponding chapter.
- ▶ Switch on the device and autosampler using the ON/OFF switch on the rear panel of the autosampler.
- ▶ Remove the cover of the injector head of the autosampler from the magnetic attachment to facilitate the view on the syringe.
- ▶ Put a closed sample container to position 1 of the sample tray.
- ▶ In the software, select the following commands one after the other: **system** | **device** | **maintenance** | **Sampler** | **Sampler Adjust**.
- ▶ From the list **Reference Positions** select **1st Rack Position** and tap on the adjustment symbol .
- ▶ Use **left-right** to align the cannula at the center of the septum in the sample cover. Use **up-down** to lower the cannula to between 1 and 2 mm above the bottom of the container.
Only for LS 2: Use **backward-forward** to align the depth of the sample tray position.
- ▶ Select sample position **Furnace** and tap on the adjustment icon .
- ▶ Use **left-right** and **up-down** to position the cannula just above the injection port of the combustion tube.
If the depth position of the needle is not yet centered in the combustion tube loosen the autosampler attachment at the rear of the device and move the autosampler to the required depth position. Then re-tighten the screw connections.
- ▶ Use **up-down** to lower the injector head until the cannula screw connection of the metering syringe (1) is located in the cannula guidance (2). During this adjustment, only lower the injector head up to a level that allows moving the cannula guidance up and down by hand by approximately 1 or 2 mm.
- ▶ Once adjustment has been completed, move to the adjustment positions **1st Rack Position** and **Furnace** with the  symbol and check them.



See also

 Connecting the autosampler [► 32]

7.6 Maintenance on the combustion furnace



NOTICE

Alkali and alkaline earth salts from hand perspiration cause devitrification in the quartz glass when it is heated by the combustion furnace after installation. Devitrification reduces the service life of the combustion tube.

Do not touch the combustion tube with your hands when installing. Wear suitable protective gloves. Wipe the outside of the combustion tube off with ethanol and a paper towel before insertion.

7.6.1 Removing and cleaning the combustion tube



CAUTION

Risk of burns on the combustion tube

Only perform maintenance work when cold. Allow the device to cool sufficiently.



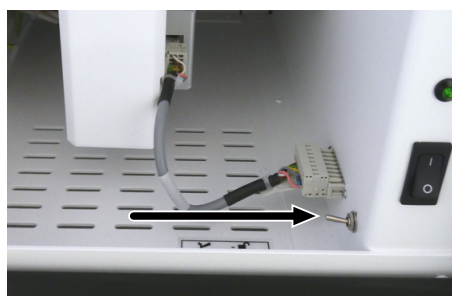
CAUTION

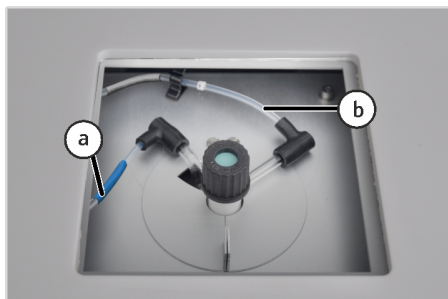
Danger of skin irritation and respiratory irritation

Quartz wool can cause skin irritation. Wear suitable protective equipment (laboratory coat, protective gloves, safety goggles) when handling the combustion tube and quartz wool.

Quartz wool can irritate the respiratory tract. Wear a respiratory mask or work under an exhaust vent.

- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.
- ▶ Clear the opening at the top of the device:
 - Autoinjector: Remove the autoinjector from the device and put it aside. Do not tear off the connecting pipes!
 - Autosampler: Slide the injector head over the rack. The injector head must only be moved very slowly by hand when the device is switched off at the mains switch. Remove the cover from the opening.
- ▶ Open the pneumatic seal on the auto-protection assembly. Flip the toggle switch up.
 - ✓ This releases the combustion tube and it can now be pulled out of the auto-protection assembly.





- ▶ Pull hose 3 (a, blue sheath), and hose 4 (b, gray sheath) out of the FAST connectors.



- ▶ Open the two-part heat guard above the opening of the combustion furnace.
- ▶ Carefully pull the combustion tube out of the furnace.



- ▶ Check the combustion tube for devitrification, cracks and blown out spots.

i NOTICE! Only reuse intact combustion tubes.

- ▶ If used or damaged: Replace the used or damaged combustion tube with an intact combustion tube.

- ▶ If contaminated:
 - Remove the screw cap with septum and the 2 angled FAST connectors.
 - Remove the quartz wool plug from the combustion tube using the hook provided.
 - Clean the inside of the combustion tube with a suitable solvent and a cotton bud or a bottle brush. Clean the side arms with pipe cleaners. Rinse with distilled water if the solvent mixes with water. Otherwise, rinse with ethanol.
 - Dry the combustion tube (e.g., by blowing it through with an inert gas).
 - Push new quartz wool loosely up to the positioning mandrel in the inner tube using the glass rod provided. For replacing the quartz wool, observe the instructions in the corresponding chapter.

✓ The combustion furnace is cleaned.

i NOTICE! Product of incomplete combustion, such as soot, or solid pyrolysis residue can deposit in the combustion tube. These deposits can also be removed by burning off in the muffle furnace at 750 – 900 °C or with a suitable burner flame, e.g., propane gas burner.

See also

📖 Switching the device on and off [▶ 35]

7.6.2 Replace quartz wool plug



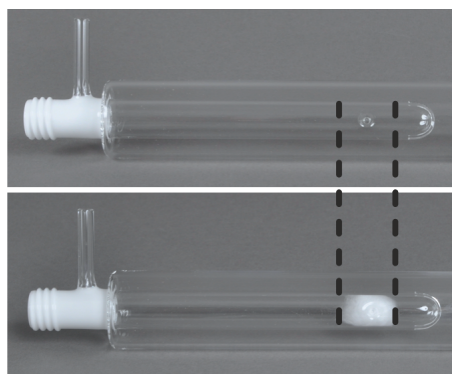
NOTICE

Only use the pure quartz wool supplied by Analytik Jena. Contaminated quartz wool may damage the combustion tube and clog the filter.

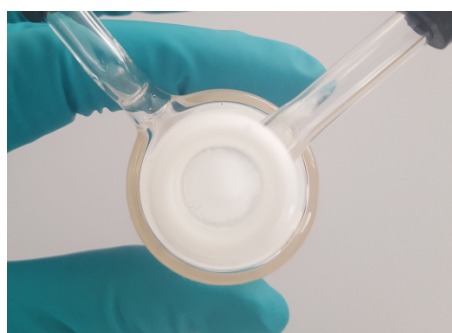
Make sure that the quartz wool plug is correctly positioned. When the plug is not in correct position the sample does not vaporize evenly. The glass rod provided has a mark for the correct position depth.



- ▶ Remove the combustion tube; observe the instructions in the corresponding chapter.
- ▶ Roll a small amount of quartz wool into a loose plug approx. 2 cm long.
- ▶ Remove the old quartz wool plug from the combustion tube using the hook provided.



- ▶ Insert the new quartz wool plug into the inner tube of the combustion tube using the glass rod provided.
- i** NOTICE! Clean all tools prior to use.
- ▶ Push the quartz wool plug into the tube until the mark on the glass rod is at the same height as the inlet to the combustion tube. The quartz wool plug is then at the correct depth.



- i** NOTICE! The plug must not seal the bottom slot in the inner tube. The plug should cover the entire cross section of the inner tube. When viewed from above the slot must no longer be visible in the tube.

After replacing the quartz wool the analysis system must be cleaned through a minimum of 3 measurements with pure solvent (e.g. isooctane, toluene, xylene). Repeat the blind measurements until the nitrogen blind value is below 20 AU/ μ l solvent (AU/ μ l: area unit per microliter of solvent). The blank value may vary dependent on the solvent that is used.

See also

- 📖 Removing and cleaning the combustion tube [▶ 44]

7.6.3 Replacing the septum on the injection port



CAUTION

Risk of burns on the combustion tube

Only perform maintenance work when cold. Allow the device to cool sufficiently.



CAUTION

Danger of skin irritation and respiratory irritation

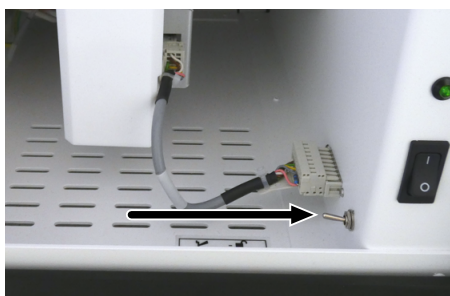
Quartz wool can cause skin irritation. Wear suitable protective equipment (laboratory coat, protective gloves, safety goggles) when handling the combustion tube and quartz wool.

Quartz wool can irritate the respiratory tract. Wear a respiratory mask or work under an exhaust vent.

The septum on the injection port of the combustion tube must be replaced if it is worn, as this will cause leaks in the system.

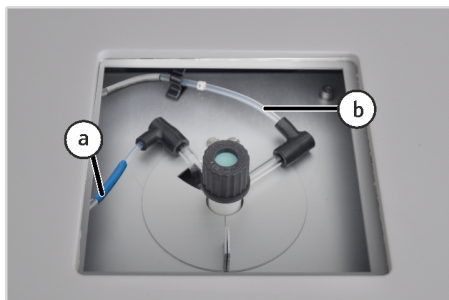
Releasing the combustion tube Follow the steps below to change the septum:

- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.
- ▶ Clear the opening at the top of the device:
 - Autoinjector: Remove the autoinjector from the device and put it aside. Do not tear off the connecting pipes!
 - Autosampler: Slide the injector head over the rack. The injector head must only be moved very slowly by hand when the device is switched off at the mains switch. Remove the cover from the opening.
- ▶ Open the pneumatic seal on the auto-protection assembly. To do this, flip the toggle switch up.
 - ✓ This releases the combustion tube.
 - ✓ The septum can be replaced. Optionally, the combustion tube can be removed for replacement.



Optionally: Removing the combustion tube

If the combustion tube needs to be removed to replace the septum, follow the steps below:



- ▶ Pull hose 3 (a, blue sheath), and hose 4 (b, gray sheath) out of the FAST connectors.



- ▶ Open the two-part heat guard above the opening of the combustion furnace.
- ▶ Carefully pull the combustion tube out of the furnace.
 - ✓ The combustion furnace is removed. The septum can be replaced.

Replace septum

- ▶ Unscrew the screw cap of the combustion tube.
- ▶ Remove the old septum from the screw cap.
- ▶ Insert the new septum
- ▶ Check the glass wool plug in the combustion tube is properly seated. Then screw the screw cap back onto the combustion tube.
 - ✓ Replacing the septum on the combustion tube is now complete.
 - ✓ If the combustion tube was removed for replacement, it can now be reinstalled. Refer to the instructions in the corresponding chapter.

See also

- 📖 Switching the device on and off [▶ 35]

7.6.4 Installing the combustion tube



WARNING

Risk of explosion or carbonization!

Make sure that the gas hoses are installed at the correct opening on the combustion tube. Mixing up the connections can result in explosions or soot formation.



CAUTION

Risk of burns and possible damage to the auto-protection assembly!

Only install the combustion tube in the cold state! Allow the device to cool sufficiently.

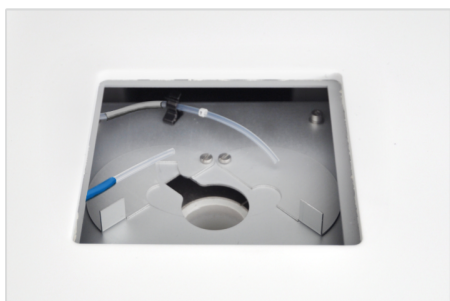


NOTICE

Alkali and alkaline earth salts from hand perspiration cause devitrification in the quartz glass when it is heated by the combustion furnace after installation. Devitrification reduces the service life of the combustion tube.

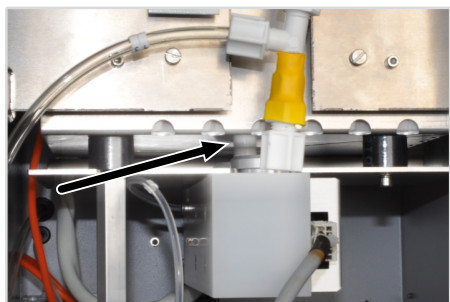
Do not touch the combustion tube with your hands when installing. Wear suitable protective gloves. Wipe the outside of the combustion tube off with ethanol and a paper towel before insertion.

- ▶ If the FAST connectors have been removed: Slide the angled FAST connectors onto the gas connections of the combustion tube.
- ▶ Close the injection port of the combustion tube with septum and screw cap.
- ▶ Wipe the combustion tube on the outside with a cellulose wetted with ethanol.
- ▶ Open the two-part heat guard at top of the combustion furnace.
- ▶ Slide the auto-protection assembly into the mount below the furnace.

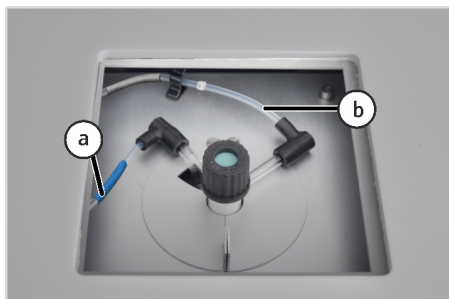


- ▶ Check that the glass wool plug is properly seated.
- ▶ Insert the combustion tube into the combustion furnace. The bent gas connection for hose 3 (with blue casing) must be fitted into the recess on the furnace.
- ▶ When inserting the tube, change the position of the auto-protection assembly until the combustion tube slides easily into the opening of the assembly.


i NOTICE! The combustion tube is fragile. If pressure is applied to the tube it might break.

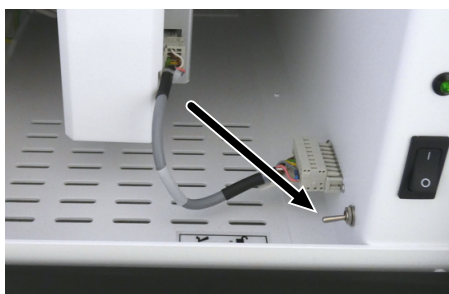


- ▶ If the insulating block in front of the auto-protection assembly has not yet been removed: remove the insulating block.
- ▶ In the gap between the combustion furnace and the auto-protection assembly check that the combustion tube sits correctly in the assembly.
- ▶ Fit the insulating block in front of the auto-protection assembly.



- ▶ Slide hose 3 (a, blue sheath) and hose 4 (b, gray sheath) into the FAST connectors at the combustion tube.

 **WARNING!** Risk of explosion or carbonization! The hoses at the combustion tube must not be mixed up!



- ▶ Open the gas supply at the pressure reducer.
- ▶ Close the pneumatic seal on the auto-protection assembly. Move the toggle switch down.

- ▶ Assemble the sampler module:
 - Autoinjector: Place the autoinjector onto the combustion tube.
 - Autosampler: Place the cover over the opening to the combustion tube.
- ✓ The device is ready for operation and can be switched on at the mains switch.



NOTICE

When using the autosampler: After servicing the combustion tube, check the adjustment of the injector head to the sample position **Furnace**. For adjustment of the autosampler, refer to the instructions in the corresponding chapter

See also

 Adjusting the autosampler [▶ 43]

7.7 Replace the membrane dryer



CAUTION

Risk of burns on the combustion tube

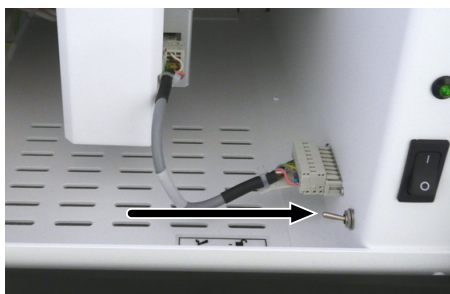
Only perform maintenance work when cold. Allow the device to cool sufficiently.



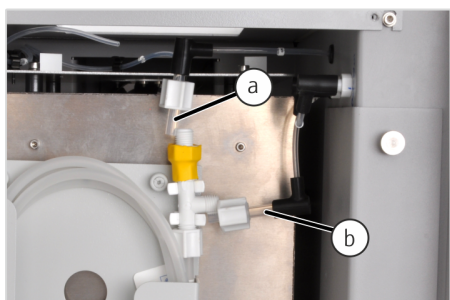
NOTICE

The membrane dryer is equipped with a sensitive membrane for exchanging water vapor. Squeezing or twisting the hose of the membrane dryer will damage the membrane. The connectors are particularly sensitive. Make sure that the connectors are not twisted during installation.

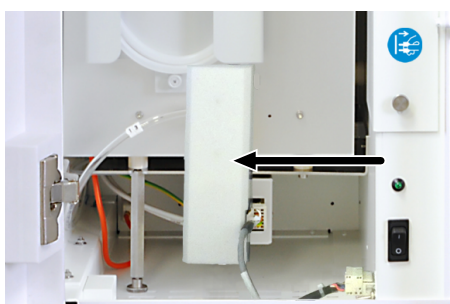
- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.



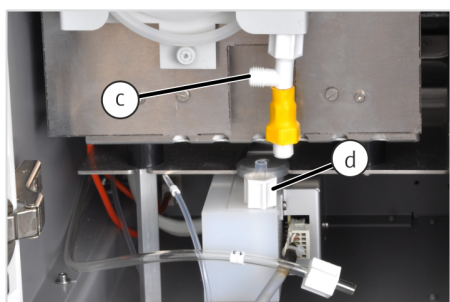
- ▶ Open the pneumatic seal on the auto-protection assembly. To open, flip the toggle switch upward.
- ▶ Allow the device to cool down sufficiently.



- ▶ At the top of the membrane dryer unscrew the hose olives at the top and side connection and pull the hose adapter for the hoses 5 (a) and 12 (b) out of the connectors.



- ▶ Remove the insulating block in front of the auto-protection assembly.



- ▶ At the bottom of the membrane dryer unscrew the hose olives at hose 13 (c) and at the connection of the auto-protection assembly.



- ▶ Remove the old membrane heater from the mount.
- ▶ Carefully insert and clamp the new membrane dryer in the mount. The gas connection at the top end must point to the right and the gas connection at the bottom end to the left.

i NOTICE! Never twist the connections on the membrane dryer! The sensitive internal membrane could be damaged and the membrane dryer rendered useless.

- ▶ Screw the gas connections back onto the correct connections in reverse order. Whilst doing so, hold the connections at the membrane dryer from the yellow shrink tubes to prevent them from twisting.
 - ✓ The membrane dryer is installed and ready for operation. The insulating block can be reinstalled and the pneumatic seal switched on again. The device can then be put back into operation.

See also

- 📖 Switching the device on and off [▶ 35]

7.8 Servicing the auto-protection assembly

The following maintenance tasks must be performed at the auto-protection assembly:

- Check the filter for contamination: during maintenance of the combustion tube, after incomplete combustion or carbonization of the system, in case of overpressure faults and analytical problems.
- Replace the filter.
- Replace the pneumatic seal: If the seal no longer seals.

7.8.1 Remove and install the auto-protection assembly

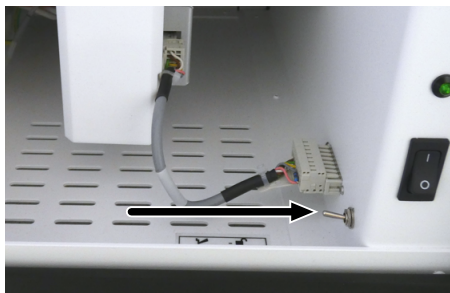


CAUTION

Risk of burns on the combustion tube

Only perform maintenance work when cold. Allow the device to cool sufficiently.

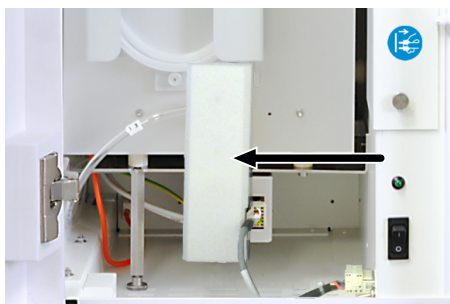
- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.



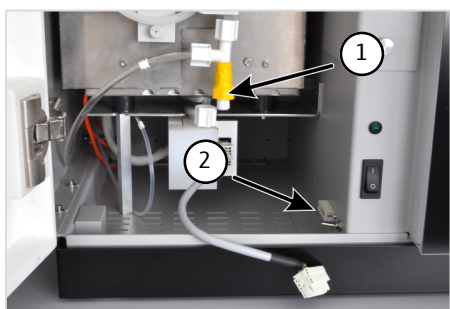
- ▶ Open the pneumatic seal on the auto-protection assembly. Flip the toggle switch up.

- ▶ Remove the combustion tube from the combustion furnace.

i NOTICE! For removal of the combustion tube, refer to the instructions in the corresponding chapter.



- ▶ Remove the insulating block in front of the auto-protection assembly.



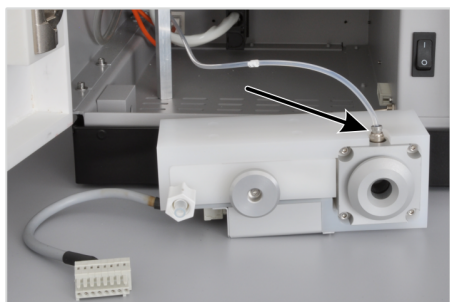
- ▶ Unscrew the union nut from the gas connection between the membrane dryer and the auto-protection assembly (1). Whilst doing so, hold the connections at the membrane dryer from the yellow shrink tubes to prevent it from twisting.

⚠ CAUTION! The connections at the membrane dryer must never be twisted. The sensitive internal membrane could be damaged and the membrane dryer rendered useless.

- ▶ Unplug the connector of the auto-protection assembly from the electrical connection in the right side panel (2).



- ▶ Pull the auto-protection assembly out of the mount under the combustion furnace.



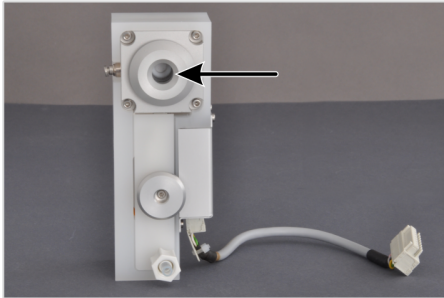
- ▶ Press the ring of the connector of hose no. 11 down and pull the hose out of the connection.

✓ The auto-protection assembly has been removed.

The installation of the auto-protection assembly is in reverse order.

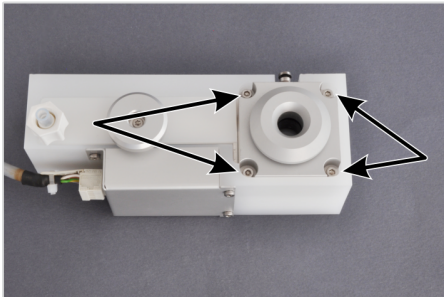
See also

- 📄 Removing and cleaning the combustion tube [► 44]
- 📄 Switching the device on and off [► 35]

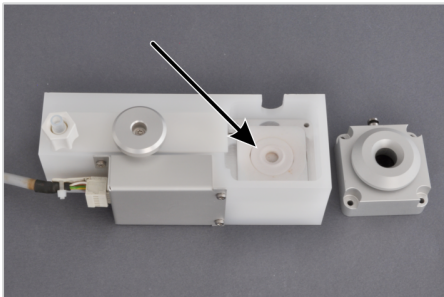
7.8.2 Check and replace the filter

⇒ Combustion tube and auto-protection assembly have been removed. For removal, follow the instructions in the respective chapters.

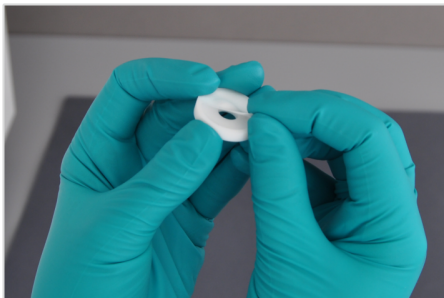
- ▶ Check the filter of the auto-protection assembly through the opening of the seal for carbonization, other contamination or cracks.
 - If the filter is OK, re-install the auto-protection assembly.
 - If the filter needs replacing, follow the remaining instructions.



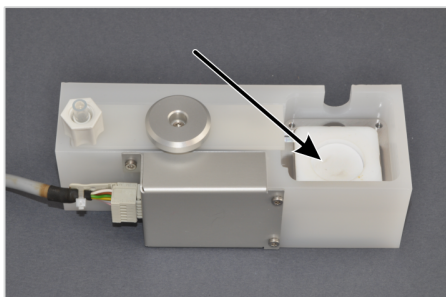
- ▶ Unscrew the 4 screws attaching the pneumatic seal to the auto-protection assembly.
- ▶ Remove the seal from the assembly.



- ▶ Remove the intermediate ring.



- ▶ Remove the filter from the intermediate ring. If required, carefully wipe the intermediate ring or the Teflon base element of the auto-protection assembly to clean it.

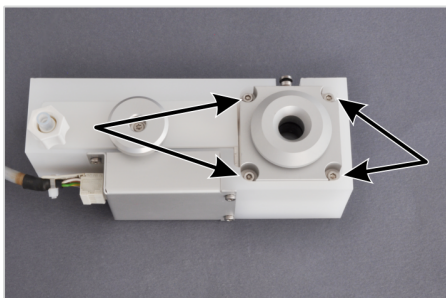


- ▶ The filter consists of a PTFE filter and a carrier fabric which are pressed against one another. Insert the new filter to the assembly with the carrier fabric facing downwards.
- ▶ Insert the intermediate ring.
- ▶ Re-insert the pneumatic seal. Make sure that the intermediate PTFE film is properly seated. Fasten the pneumatic seal with the 4 screws.
- ✓ The filter has been replaced. The auto-protection assembly can now be reinstalled underneath the furnace. For installation of the auto-protection assembly, refer to the instructions in the corresponding chapter.

See also

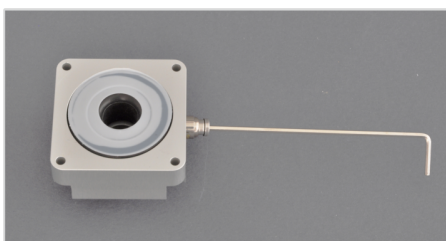
- 📖 Removing and cleaning the combustion tube [▶ 44]
- 📖 Remove and install the auto-protection assembly [▶ 52]

7.8.3 Replacing the pneumatic seal

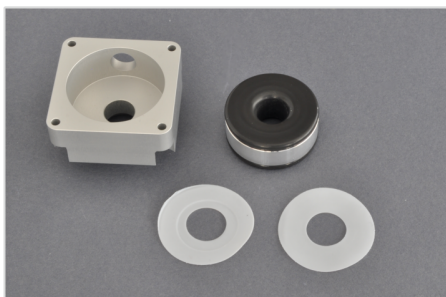


⇒ Combustion tube and auto-protection assembly have been removed. For removal, follow the instructions in the respective chapters.

- ▶ Unscrew the 4 screws attaching the pneumatic seal to the auto-protection valve assembly.
- ▶ Remove the housing of the pneumatic seal from the auto-protection assembly.



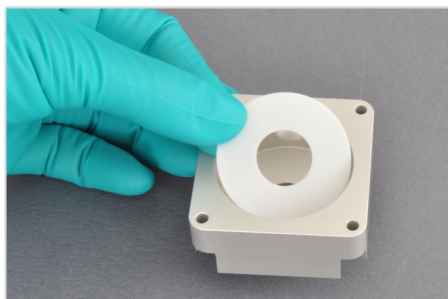
- ▶ Remove the gas connection. Insert a hexagon socket wrench (2 mm, not included) into the connection and unscrew the connection.



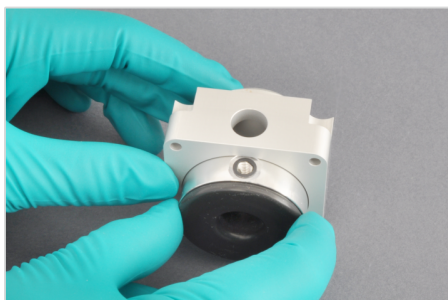
- ▶ Remove the seal from the housing.
- ▶ Pull the PTFE intermediate films from the seal.



- ▶ Separate the seal from the ring.
- ▶ Insert a new seal into the ring.



- ▶ Insert the PTFE intermediate film into the housing.



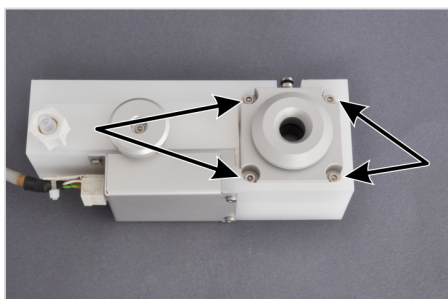
- ▶ Insert the seal into the housing. The openings for the gas connection in the sealing ring and housing must be above each other.



- ▶ Screw in the gas connection. Tighten with the hexagon socket wrench.



- ▶ Place the PTFE intermediate film onto the intermediate ring in the auto-protection assembly.



- ▶ Insert the pneumatic seal into the auto-protection assembly and attach it with 4 screws.
 - ✓ The pneumatic seal has been replaced. The auto-protection assembly can now be reinstalled underneath the furnace. For installation of the auto-protection assembly, refer to the instructions in the corresponding chapter.

See also

- ▢ Removing and cleaning the combustion tube [▶ 44]
- ▢ Remove and install the auto-protection assembly [▶ 52]

7.9 Open and close the side panel of the device



WARNING

Danger of electric shock!

Before carrying out any maintenance work inside the device, first switch the device off at the ON/OFF switch and, after the system has completely shut down, switch it off at the mains switch behind the front door. Unplug the mains plug from the socket on the back of the device.

The side panel must be opened for some maintenance tasks on the device.

Opening the side panel

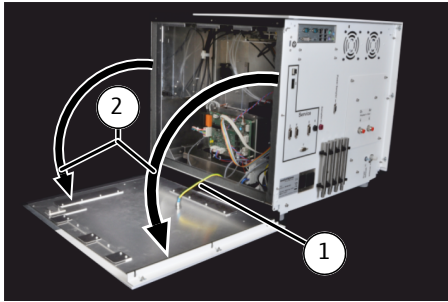
- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.
- ▶ Unscrew the 3 hexagon nuts securing the side panel to the rear panel of the device and remove the washers.



- ▶ The side panel is held in position with clamping plates in addition to the screw connection on the inside. First push the side panel sideways toward the back panel.

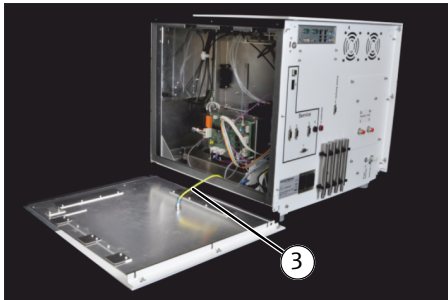


- ▶ Then lift the side panel away from the device to open it.



- ▶ Pull the functional grounding (1) off the side panel. Place the side panel aside (2).
- ✓ The device is opened.

Closing the side panel



- ▶ To close the side panel first plug the functional grounding into the housing and side panel (3).



- ▶ First place the side panel against the housing in a way that the clamping plate at the bottom of the panel sits behind the housing frame and the top clamping plates offset with the top attachments of the housing. The panel then sits flat against the housing.
- ▶ Slide the wall sideways toward the front of the device. The front clamping plate of the panel then moves behind the housing frame. The screw pins on the rear of the device protrude into the corresponding slots in the panel rail.
- ▶ Push the washers onto the screw pin and re-attach the panel with 3 hexagon nuts (see above).
- ✓ The device is closed.

See also

📖 Switching the device on and off [▶ 35]

7.10 Replace the absorber

**WARNING****Danger of electric shock!**

Before carrying out any maintenance work inside the device, first switch the device off at the ON/OFF switch and, after the system has completely shut down, switch it off at the mains switch behind the front door. Unplug the mains plug from the socket on the back of the device.



CAUTION

Risk of burns on components in the device interior

Only perform maintenance work when cold. Allow the device to cool sufficiently.

In the device the diaphragm pump aspirates the measuring gas with a constant aspiration flow through the CLD detector. In order to equalize pressure differences caused by differing gas flows, it is possible to use an absorber to allow air to enter the device. The absorber filters constituents from the air which may distort the analysis.

The absorber must be replaced once a year. The absorber is located inside the device directly in front of the chemical ozone decomposer.

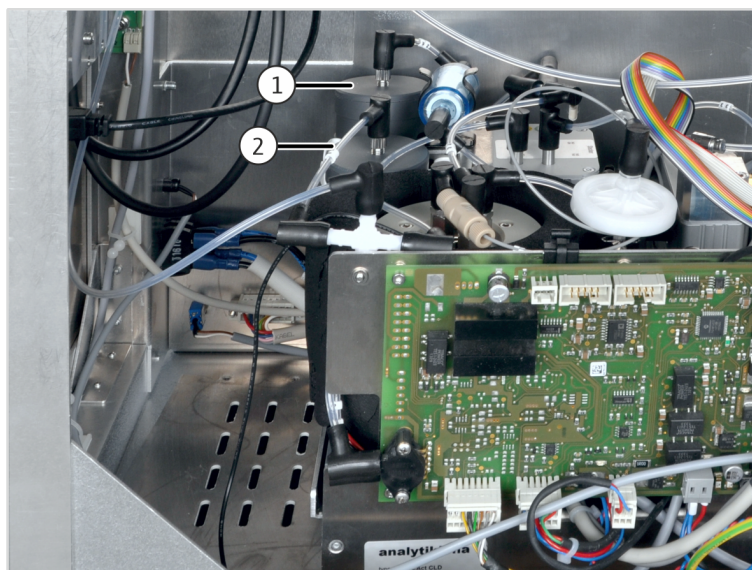


Fig. 24 Components in the device interior

1 Chemical ozone decomposer

2 Absorber

- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.
- ▶ Open the side panel, pull the functional grounding off the side panel and safely put the side panel aside.
- ▶ Pull the absorber out of the mount in the device interior.
- ▶ Pull hose no. 32 with FAST connector off the top of the absorber. (Ambient air enters the absorber via the underside. There is no hose connection here.)
- ▶ Connect the new absorber with the FAST connector to hose no. 32.
- ▶ Clamp the absorber into the bracket.
- ▶ Close the side wall.
- ✓ The absorber has been replaced. The device is ready to use again.

See also

- 📖 Open and close the side panel of the device [▶ 57]
- 📖 Switching the device on and off [▶ 35]

7.11 Replace chemical ozone decomposer and filter



WARNING

Danger of electric shock!

Before carrying out any maintenance work inside the device, first switch the device off at the ON/OFF switch and, after the system has completely shut down, switch it off at the mains switch behind the front door. Unplug the mains plug from the socket on the back of the device.



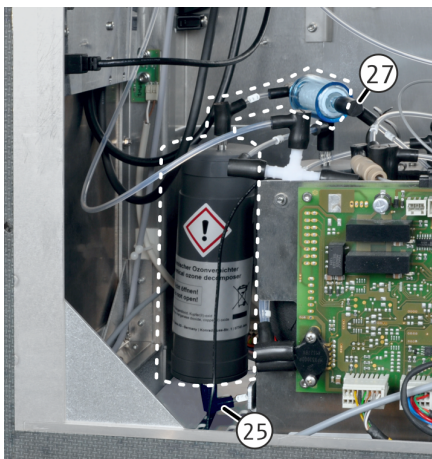
CAUTION

Risk of burns on the ozone decomposer

Only perform maintenance work when cold. Allow the device to cool sufficiently.

The chemical ozone decomposer must be replaced once a year but no later than when an ozone odor is noticeable at the "exhaust" gas outlet. Otherwise the intake pump of the CLD detector could be damaged. The ozone decomposer is replaced together with the filter as a unit. The ozone decomposer is located directly behind the absorber. (See illustration in chapter "Replacing the absorber").

- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.
- ▶ Open the side panel, pull the functional grounding off the side panel and safely put the side panel aside.
- ▶ Pull the chemical ozone decomposer and the solids filter out of their mounts in the device interior.
- ▶ Pull hose no. 27 with FAST connector off the solids filter (27).
- ▶ Pull hose no. 25 with FAST connector off the bottom of the ozone decomposer (25).
- ▶ Connect the new set of ozone decomposer and filter via the FAST connectors to the following hoses:
 - ▶ Filter – hose no. 27, bottom ozone decomposer – hose no. 25
 - ▶ Clamp the ozone decomposer and the filter into the mounts.
 - ▶ Close the side wall.
- ✓ The chemical ozone decomposer and the filter have been replaced. The device is ready to use again.



See also

- 📖 Open and close the side panel of the device [▶ 57]
- 📖 Switching the device on and off [▶ 35]

7.12 Removing and installing the combustion furnace



WARNING

Danger of electric shock!

Before carrying out any maintenance work inside the device, first switch the device off at the ON/OFF switch and, after the system has completely shut down, switch it off at the mains switch behind the front door. Unplug the mains plug from the socket on the back of the device.



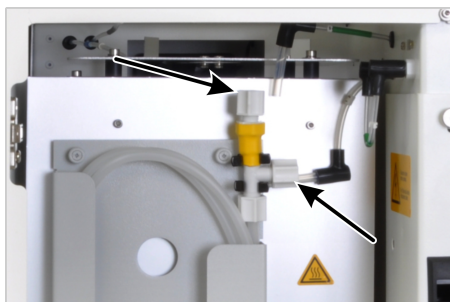
CAUTION

Risk of burns on the combustion furnace

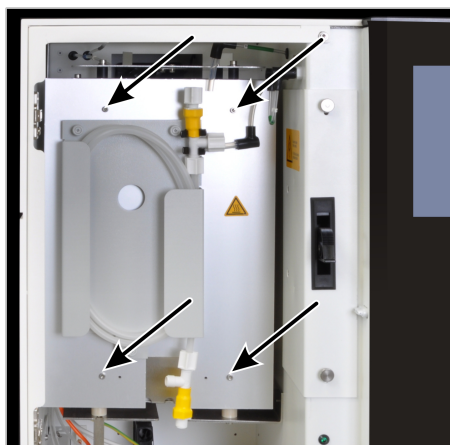
Only perform maintenance work when cold. Allow the device to cool sufficiently.

7.12.1 Removing the combustion furnace

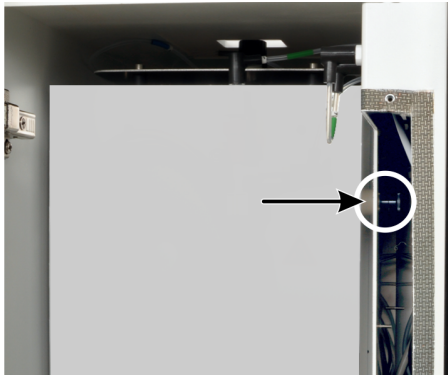
- ▶ First switch off the device from the ON/OFF switch and then, after the system has been shut down completely, from the mains switch.
- ▶ Switch off the gas supply.
- ▶ Allow the device to cool down sufficiently.
- ▶ Open and unhook the front door.
- ▶ Remove the combustion tube and the auto-protection assembly, following the instructions in the corresponding chapters.



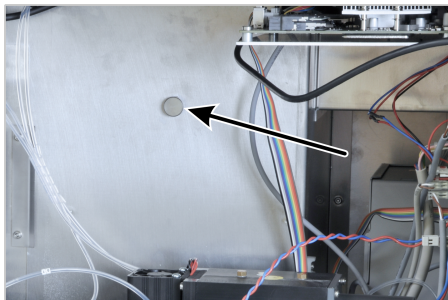
- ▶ Release the top screw connections of the top connections at the membrane dryer and pull out the gas hoses.
- ▶ Unscrew the bottom screw connection for the rinse flow of the membrane dryer.



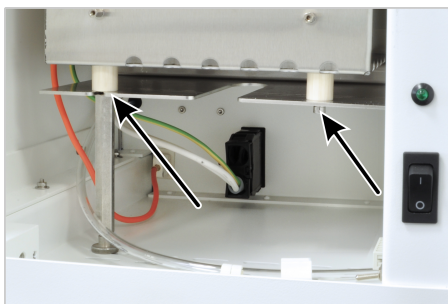
- ▶ Unscrew the 4 screws for holding the heat guard in front of the furnace and remove the heat guard together with the membrane dryer.



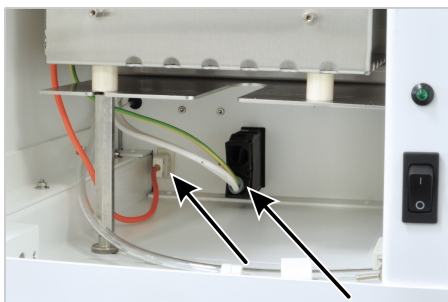
- ▶ Open the inspection flap.
- ▶ Unscrew the knurled head screw for furnace attachment to the inside wall of the electronics chamber.



- ▶ If the knurled head screw is difficult to reach through the inspection flap:
 - Open the side panel, pull the functional grounding off the side panel and safely put the side panel aside. For opening the side panel, observe the instructions in the corresponding chapter.
 - Unscrew the knurled head screw.



- ▶ Unscrew furnace from the mount in the furnace space (2 screws).



- ▶ Pull the connectors for the furnace heating and thermocoupler (orange cable) from the connections under the furnace at the rear of the furnace space.
- ▶ Lift the furnace out of the furnace space and package it.
- ▶ Close the inspection flap or plug the functional grounding into the side panel and close the side panel. Hook the front door back in and close it.
- ✓ The furnace is completely removed.

See also

- 📖 Removing and cleaning the combustion tube [▶ 44]
- 📖 Remove and install the auto-protection assembly [▶ 52]
- 📖 Open and close the side panel of the device [▶ 57]
- 📖 Switching the device on and off [▶ 35]

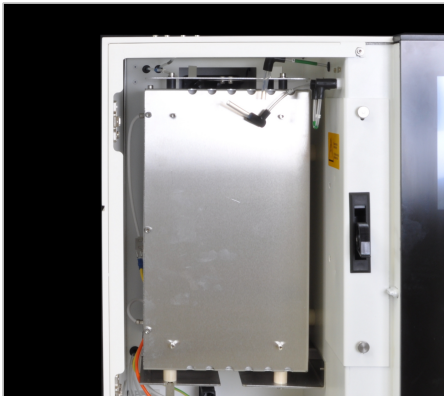
7.12.2 Installing the combustion furnace



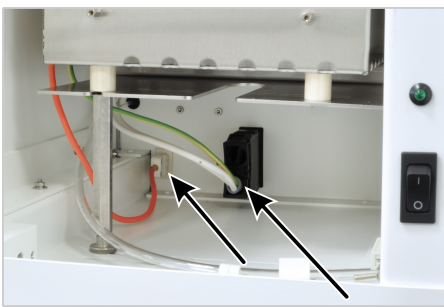
WARNING

Danger of electric shock!

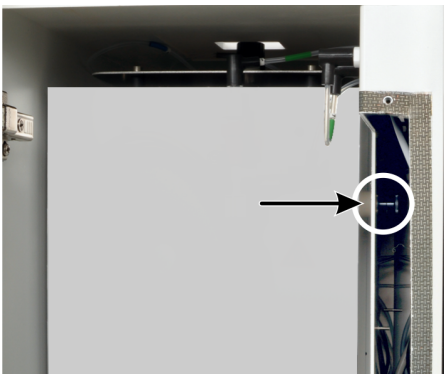
Make sure that the mains plug is unplugged from the socket on the rear of the device and that the device is therefore disconnected from the mains.



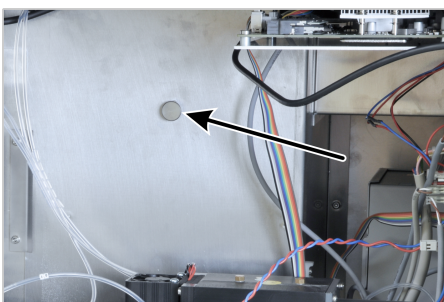
- ▶ Open and unhook the front door.
- ▶ Insert the furnace into the furnace space.



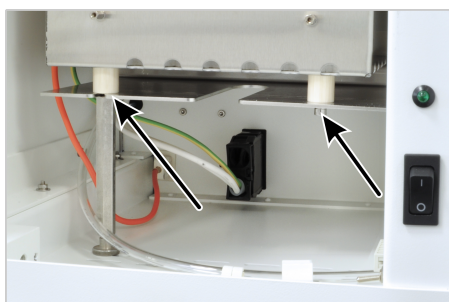
- ▶ Plug the connectors for the furnace heating and thermocoupler (orange cable) into the connections under the furnace at the rear of the furnace space.



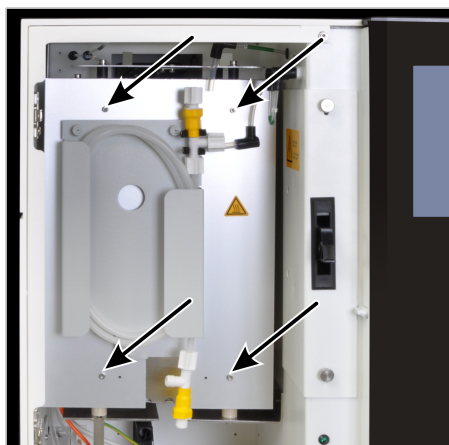
- ▶ Open the inspection flap.
- ▶ At the inside wall of the electronics chamber attach the furnace with the knurled head screw. **Do not tighten the screw yet.**



- ▶ If the screw connection is difficult to reach through the inspection flap:
 - Open the side panel, pull the functional grounding off the side panel and safely put the side panel aside. For opening the side panel, observe the instructions in the corresponding chapter.
 - At the inside wall of the electronics chamber attach the furnace with the knurled head screw. **Do not tighten the screw yet.**



- ▶ Screw the furnace with 2 Allen screws to the mount in the furnace space.
- ▶ Evenly tighten all 3 fastening screws (knurled head screw and Allen screws).



- ▶ Attach the heat guard with membrane dryer to the front of the furnace with 4 Allen screws.
- ✓ The combustion furnace is fully installed. The membrane dryer, auto-protection assembly and combustion tube can be reinstalled and the front door re-installed.

See also

- 📖 Open and close the side panel of the device [▶ 57]

7.13 Cleaning the syringes

The injection syringe in the autosampler and autoinjector must be cleaned at regular intervals.

Rinsing intervals

- The syringe must be rinsed after the end of a sequence and at a minimum must be rinsed daily after the end of work.
- When analyzing samples with a complex matrix, e.g. particle-containing and inhomogeneous solutions or highly viscous liquids, rinsing after each sample is recommended in order to avoid cross contamination.

Recommended rinsing solutions

The rinsing solution should have a similar polarity to the sample and dissolve any precipitates.

Examples of samples/rinsing solutions

Sample	Rinsing solution
Petrochemicals, oils, fuels	Isooctane, toluene, xylene
Unknown samples	Absolute ethanol
General cleaning	Absolute ethanol

Autosampler

Sample	Minimum number of rinse cycles
Normal sample	3
Samples with a complex matrix	5

- ▶ Set rinsing as an action in the sequence in the EAvolution software.

Autoinjector

Sample	Minimum number of rinse cycles
Normal sample	5
Samples with a complex matrix	10

- ▶ Remove the syringe from the autoinjector.
- ▶ Draw rinsing solution up into the syringe by hand and dispense it slowly. Repeat the process until all visible soiling has been removed.
- ▶ Insert the syringe back into the autoinjector.

Intensive cleaning

Intensive cleaning of the syringe can help with stubborn, visible soiling that cannot be removed using the above method.

- ▶ Carefully pull the plunger out of the syringe.
- ▶ Rinse the glass body and plunger with a suitable solvent or ultrapure water.
- ▶ Carefully dry the glass body and plunger. Finally, rinse both with a volatile solvent or blow out with inert gas (argon).
- ▶ When both components are clean, dry and free of particles, replace the plunger.

i NOTICE! Contamination, particles and moisture can damage the Teflon seal of the plunger during assembly. This causes the syringe to leak.

Needle blocked

- ▶ Use the cleaning wire supplied with the syringe to push out the blockage.
- ▶ Then carry out intensive cleaning.


Instructions for maintaining the function of the syringe

Observe the following instructions to maintain the functionality of the syringe. Failure to do so may damage the syringe and cause it to leak.

- Do not use the syringe without liquid unnecessarily (only for aligning the autosampler or adjusting the autoinjector). Dry movement of the plunger can damage the seal.
- Do not immerse the syringe in solvents or acidic or basic aqueous solutions.
- Do not clean the syringe in an ultrasonic bath.

8 Troubleshooting

8.1 Troubleshooting according to software messages

Error code	Error message (cause)	Remedy
100002	Communication with companion chip is disturbed	Inform the customer service department.
101001	Flow meter is defective	
	<ul style="list-style-type: none"> ■ Cause 1: The flow meter is defective. ■ Cause 2: The membrane dryer is defective. 	Inform the customer service department. Replace the membrane dryer.
101200	Control flow is too high	Inform the customer service department.
101201	Device leaking	<ul style="list-style-type: none"> ■ Check that the pneumatic seal on the auto-protection assembly is closed. ■ Check for leaks in the system using the flow check kit; refer to the instructions in the corresponding chapter. Fix any leaks. ■ Inform the customer service department.
101501	Communication with the gas box is disturbed	Inform the customer service department.
101703	Hardware error in furnace temperature (A hardware error has occurred in the "Furnace temperature" controller).	Inform the customer service department.
101723	Hardware error in furnace temperature (The measured temperature of the "Furnace temperature" controller is outside the range specified for the sensor).	Inform the customer service department.
101743	Furnace temperature not reached (The required temperature could not be reached with the "Furnace temperature" controller).	Inform the customer service department.
101760	Gas flow Main-O ₂ not sufficient (The required gas flow could not be achieved with the Main-O ₂ flow controller).	<ul style="list-style-type: none"> ■ Check gas supply and connections. ■ Inform the customer service department.
101764	Hardware error Main-O ₂ flow sensor	Inform the customer service department.
101768	Hardware error Main-O ₂ flow valve	Inform the customer service department.
10176C	Gas pressure error (Overpressure was detected in the gas path).	 CAUTION! Do not switch the device off. Do not feed any samples. Do not shut down the software. Do not close the external gas supply.

Error code	Error message (cause)	Remedy
		<ul style="list-style-type: none"> Wait until the routine for reducing the overpressure is completed. Follow the instructions of the software. In case the routine does not reduce the pressure: release pressure manually. To release the pressure manually, carefully open the front door of the device and carefully switch the toggle switch of the pneumatic seal to the OFF position. Cut the gas supply. Search for cause for overpressure and correct the defect. Reopen the gas supply and restart the device.
102002	No connection to sampler LS 1 (It is not possible to establish a connection to the autosampler LS 1).	<ul style="list-style-type: none"> Check the connections. Inform the customer service department.
102003	No connection to autoinjector (It is not possible to establish a connection to the autoinjector).	<ul style="list-style-type: none"> Check the connections. Inform the customer service department.
102004	No connection to sampler LS 2 (It is not possible to establish a connection to the autosampler LS 2).	<ul style="list-style-type: none"> Check the connections. Inform the customer service department.
102100	No connection to LPG 2.0 (It is not possible to establish a connection to the sample feeding module LPG 2.0).	<ul style="list-style-type: none"> Check the connections. Inform the customer service department.
102101	No connection to GSS/LPG (It is not possible to establish a connection to the combined GSS/LPG module).	<ul style="list-style-type: none"> Check the connections. Inform the customer service department.
102102	No connection to the GSS depressurized	<ul style="list-style-type: none"> Check the connections. Inform the customer service department.
102200	Autoinjector drive faulty (The drive or the drive sensor of the autoinjector is faulty).	Inform the customer service department.
102210	Autosampler error (A general autosampler error has occurred (zero)).	Inform the customer service department.
102211	Error in autosampler X axis (The drive of the autosampler on the X axis does not move or the sensor for the zero point is faulty).	Inform the customer service department.
102214	Autosampler emergency stop (The autosampler is in emergency stop).	Contact customer service as required.
102220	LPG 2.0: No argon inlet pressure (LPG 2.0: The argon inlet pressure is insufficient to run the module).	<ul style="list-style-type: none"> Check gas supply and connections. Adjust as required.

Error code	Error message (cause)	Remedy
102221	LPG 2.0: Cooling faulty (LPG 2.0: The cooling of the dosing valve is faulty).	Inform the customer service department.
102222	LPG 2.0: Cooling temperature sensor has failed	Inform the customer service department.
102223	LPG 2.0: Heating faulty (LPG 2.0: The heating of the expansion chamber has failed).	Inform the customer service department.
102224	LPG 2.0: Heating temperature sensor has failed	Inform the customer service department.
102225	LPG 2.0: Housing fan faulty	Inform the customer service department.
102230	GSS/LPG: No argon inlet pressure (GSS/LPG: The argon inlet pressure is insufficient to run the module).	<ul style="list-style-type: none"> Check gas supply and connections. Adjust as required.
102231	GSS/LPG: Cooling faulty (GSS/LPG: The cooling of the dosing valve is faulty).	Inform the customer service department.
102232	GSS/LPG: Cooling temperature sensor has failed	Inform the customer service department.
102233	GSS/LPG: Heating faulty (GSS/LPG: The heating of the expansion chamber has failed).	Inform the customer service department.
102234	GSS/LPG: Heating temperature sensor has failed	Inform the customer service department.
102235	GSS/LPG: Housing fan faulty	Inform the customer service department.
102240	GSS: No argon inlet pressure (GSS: The argon inlet pressure is insufficient to run the module).	<ul style="list-style-type: none"> Check gas supply and connections. Adjust as required.
102241	GSS: general pump error (A general pump error has occurred).	Inform the customer service department.
102242	GSS pump: Piston sluggish (GSS: The piston of the GSS pump is sluggish).	<ul style="list-style-type: none"> Check whether gas hoses are blocked or kinked. Replace the syringe as required. Contact customer service as required.
102243	GSS pump: Valve sluggish GSS: The valve of the pump is sluggish.	Inform the customer service department.
102244	GSS: no connection to the pump (GSS: Connection to the pump could not be established).	Inform the customer service department.
105101	Communication with the N-CLD is disturbed	Inform the customer service department.
105130	N-CLD: Ozone generator error (The ozone generator is in an error state).	Inform the customer service department.
105131	N-CLD: Sensor unit has failed (The sensor unit has failed or is not connected correctly).	Inform the customer service department.
105132	N-CLD: Ozone decomposer error (The thermal ozone decomposer is in an error state).	Inform the customer service department.

Error code	Error message (cause)	Remedy
105133	N-CLD: Ozone decomposer error (The temperature sensor of the thermal ozone decomposer has failed).	Inform the customer service department.
105134	N-CLD: Operating voltage error (The operating voltage is outside the permitted range).	Inform the customer service department.
105135	N-CLD: Measured value exceeds measuring range (The measured value exceeds the measuring range of 30 µg/l to 10000 mg/l N).	<ul style="list-style-type: none"> ■ Dilute the sample. ■ Repeat the measurement.
105136	N-CLD: Differential pressure too low	Inform the customer service department.
105137	N-CLD: Differential pressure too high	Inform the customer service department.
201100	Last active method not available (The method that was active before switching off the device is no longer available and cannot be activated).	Create a new method.
201101	Transfer of method parameters failed (The method parameters could not be transferred to the device. The device may not be ready to carry out the measurement).	Wait until the device is ready for measurements.
201200	Service septum in 300 injections (The maintenance interval for the septum is due after 300 additional injections).	Replace the septum on the injection port in good time.
203001	Automatic backup was successful	None. The message is for informational purpose only.
203002	Automatic backup has failed (The automatic backup has failed due to a system error).	Restart the device. Repeat the backup process.
204000	Calibration point import failed (The automatic import of a measured calibration point has failed).	Repeat the procedure; if error occurs again, inform customer service.
206003	Sequence aborted with errors	Check the sequence for errors. Resume the measurement.
207001	Simulation activated (Simulation mode was activated).	None. The message is for informational purpose only.
207002	Simulation deactivated (Simulation mode was deactivated).	None. The message is for informational purpose only.

See also

- 📄 Replace the membrane dryer [► 50]
- 📄 Device errors [► 70]
- 📄 Check system tightness [► 40]

8.2 Equipment faults and analytical problems

8.2.1 General notes





Other problems that are not detected by system monitoring can also occur. Starting a measurement is possible. Such errors are usually detected on the basis of implausible measuring results (analytical problems) or are clearly visible in the equipment technology. If the suggested solutions are not successful, inform the customer service department of Analytik Jena.

8.2.2 Device errors

Error	Possible cause	Remedy
Furnace does not heat	Temperature set incorrectly in the software.	Check temperature configuration in the method.
	No method loaded.	Load a method.
	Fault in power supply.	<ul style="list-style-type: none"> ■ Switch on the device. ■ Check the internal fuse.
	Fault in the internal electronics.	Inform the service.
Furnace temperature is outside tolerance limits or target temperature is not reached	Temperature controller faulty.	Inform the service.
	Fault in the electronics.	
Process gases (inlet flow) not supplied	Gas supply not connected or not opened.	Connect or open gas supply.
	Gas inlet pressure too low.	Set the gas inlet pressure to 4 to 6 bar at the delivery point
	Gas supply leaking.	Check gas supply, adjust as necessary.
	No method loaded.	Load a method.
	Gas box faulty.	Inform the service.
Target flow at the outlet to the detector too low or message "Device leakage"	Connection between hose, FAST connector and combustion tube incorrect.	Check connection and ensure correct fit at the connection points.
	Pneumatic seal in the auto-protection assembly does not seal combustion tube.	<ul style="list-style-type: none"> ■ Check Ar supply. ■ Check that the toggle switch for the pneumatic seal is flipped down.
	Septum incorrectly positioned in the injection port or leaking.	Check position of the septum, insert new septum if leaking.
	Connection of membrane dryer or transfer line to the auto-protection assembly leaking	Check connections (do not jam thread, tighten fingertight).
Gas escaping from pneumatic seal (audible hiss)	Connector for hose 11 loose.	Press hose 11 firmly into the quick-release connector.
	Pneumatic seal faulty.	Replace pneumatic seal, refer to instructions in the corresponding chapter.

Error	Possible cause	Remedy
Auto-protection assembly does not heat up.	Connector not connected.	Connect the auto-protection assembly connector, refer to instructions regarding installation of the auto-protection assembly in the corresponding chapter.
	Heating of the auto-protection assembly faulty.	Inform the customer service department.
	Temperature controller faulty.	Inform the customer service department.
Door LED flashes, ozone generator off	Warm-up phase not yet completed.	Wait until warm-up phase is completed (approx. 30 min).
	Device in standby.	Initialize the device.
	Process gases switched off.	Switch on gases.
	No method loaded.	Load a method.
	Device status	Wait until the device is ready for measurements.
Ozone smell	Ozone decomposer not effective.	Replace ozone decomposer; refer to instructions in the corresponding chapter.
	Device leaking or faulty.	Inform the customer service department.
Pressure error	Gas outlet at the detector outlet or the membrane dryer clogged.	Check gas outlet.
	Absorber used up.	Replace absorber; refer to instructions in the corresponding chapter.
	Converter used up or worn out.	Inform the customer service department.
	Pump faulty.	Inform the customer service department.
Exhaust gas temperature outside range	Warm-up phase not yet completed.	Wait until warm-up phase is completed (approx. 30 min).
	Heating of the thermal ozone decomposer or the converter faulty.	Inform the customer service department.
	Heating temperature sensor faulty.	Inform the customer service department.
Device operation via touchscreen or PC not possible or restricted.	System crash.	Shut down system and switch off mains switch; wait for 30 s; switch on device again.

See also

-  Replacing the pneumatic seal [► 55]
-  Remove and install the auto-protection assembly [► 52]
-  Replace chemical ozone decomposer and filter [► 60]
-  Replace the absorber [► 58]

8.2.3 Analytic problems

Error	Possible cause	Remedy
Burns at the cannula	Argon and oxygen connections on the combustion tube mixed up.	Connect process gases correctly; refer to the instructions in the chapter on installation of the combustion tube.
	Damaged septum.	Replace septum in injection port.
Low results	Dosing error.	Check the metering process.
	System leaking.	Check system for leaks; refer to instructions in the corresponding chapter.
	Temperature set too low.	Check temperature configuration in the method.
	Wrong or unsuitable calibration.	Check calibration. If necessary, recalibrate or extend the calibration range.
	Sample loss due to vaporization or spillage.	Keep liquid samples sealed or use autosampler LS-T with cooling for volatile liquid samples.
	Incomplete combustion.	Clean or replace contaminated device components and eliminate causes of incomplete combustion.
Excessively high results	Incomplete combustion.	Clean or replace contaminated parts.
	Unsuitable quality of the supplied gases (argon or oxygen).	Only use gases of prescribed quality or carry out gas cleaning.
Carryover	Insufficient rinsing of the metering syringes in autoinjector or autosampler.	Rinse dosing syringes adequately prior to sampling
	Combustion tube not rinsed adequately.	Rinse combustion tube adequately with clean solvent, i.e. blank measurements until values are constant.
	The dosing is faulty.	Check the metering process.
	Contamination of injection port or combustion tube.	Wipe or replace septum. Clean combustion tube; refer to instructions in the corresponding chapter.
	Sample contains inorganic nitrogen compounds	Clean or replace contaminated parts.
	HNO ₃ / HNO ₂ condensation products in the system (combustion tube, auto-protection assembly, membrane dryer).	Clean or replace affected assemblies.
	Incomplete combustion.	Clean or replace contaminated parts.
Scattering measurements	The dosing is faulty.	Check the metering process.
	Combustion tube contaminated or severely devitrified.	Clean or replace combustion tube.

Error	Possible cause	Remedy
	Incomplete combustion	Clean or replace contaminated parts. If necessary, increase the second combustion time.
	Clogged cannula in autosampler or autoinjector.	Use the wire provided for this purpose to clean the cannula or replace it.
	Oxygen supply to micro plasma chamber interrupted.	Connect or open gas supply.
	Absorber used up.	Replace the absorber.

See also

- 📖 Installing the combustion tube [► 48]
- 📖 Removing and cleaning the combustion tube [► 44]
- 📖 Replace the absorber [► 58]

9 Transport and storage

9.1 Preparing the device for transport



WARNING

Risk of damage to health due to improper decontamination

- Decontaminate the device professionally and document the cleaning measures before returning the device to Analytik Jena.
 - The customer service department will send you the decontamination report when you register the return.
-



CAUTION

Risk of burns on combustion tube and hot furnace

Only remove the combustion tube when the device is cold. Allow the device to cool sufficiently.



CAUTION

Risk of injury

A risk of injury due to broken glass is present when handling glass parts.

- Handle glass parts with extreme caution.
-



NOTICE

Risk of device damage due to unsuitable packaging material

- Only transport the device and its components in the original packaging.
 - Empty the device completely and attach all transport locks before transporting the device.
 - Add a suitable desiccant to the packaging to prevent damage from moisture.
-

9.1.1 Packing the autoinjector



NOTICE

Only remove the device components when the device is switched off at the mains switch and the mains plug is not connected to the device.



NOTICE

Do not hold the autoinjector by the red front panel when attaching it or removing it.

- ▶ Detach the electrical connections on the rear panel of the device and the autoinjector.
- ▶ Remove the autoinjector from the device.
- ▶ Pack the metering syringe separately.
- ▶ Put the autoinjector into its original packaging.

9.1.2 Packing the autosampler




NOTICE

Only remove the device components when the device is switched off at the mains switch and the mains plug is not connected to the device.

- ▶ Remove, empty and dry the solvent and waste containers.
- ▶ Remove the sample rack and the sample containers. When using the autosampler LS-T: remove the connecting hoses to the thermostat from the sample tray, empty and dry.
- ▶ Remove the metering syringe from the injector head and pack it separately. When using the autosampler LS-T: remove the connecting hoses to the thermostat from the dosing syringe, empty and dry. Pack all components separately.
- ▶ Detach the electrical connections on the rear panel of the device and the autosampler.
- ▶ Put the autosampler into its original packaging.

9.1.3 Packing the device

- ▶ Shut down the device using the ON/OFF switch.
- ▶ Open the pneumatic seal on the auto-protection assembly. To open, flip the toggle switch upward.
- ▶ Wait 30 min. until the fans no longer rotate and the door LED goes out. Then switch off the mains switch behind the door. Allow the device to cool down.

 **CAUTION!** There is a risk of burns on the combustion tube and combustion furnace. Only carry out further preparations for transport when the device is cold. Allow the device to cool sufficiently.

- ▶ Cut the external gas supply.
- ▶ Remove autoinjector or autosampler from the device and pack them.
- ▶ Disconnect all connections on the rear of the device.
- ▶ Remove the combustion tube, the auto-protection assembly, the membrane dryer and the combustion furnace. For removal, follow the instructions in the respective chapters.
- ▶ Pack open hose ends in protective bags and attach them with adhesive tape.
- ▶ Close the door of the device.
- ▶ Pull off the black skirting towards the front of the device.

- ▶ Take the carrying handles from the bracket on the rear panel of the device and screw them hand-tight into the lateral openings at the base of the device.
- ▶ Position the top cover and secure it with adhesive tape.
- ▶ Carefully pack the combustion tube and additional accessories in their original packaging. Especially the glass components must be packed safely against breakage.

See also

- 📖 Removing and cleaning the combustion tube [▶ 44]
- 📖 Remove and install the auto-protection assembly [▶ 52]
- 📖 Replace the membrane dryer [▶ 50]
- 📖 Removing the combustion furnace [▶ 61]

9.2 Transporting the device

Refer to the instructions in the chapter "Safety instructions for transport and commissioning". Avoid the following during transport:

- Impact and vibration
Risk of damage due to shock, impact or vibration!
- Large temperature fluctuations
Risk of condensation!

See also

- 📖 Safety instructions, transport and commissioning [▶ 9]

9.3 Moving the device in the laboratory



CAUTION

Risk of injury during transport

Dropping the device poses a risk of injury and damage to the device.

- Proceed carefully when moving and transporting the device. Two persons are required to lift and carry the device.
 - The device must only be lifted by the transport handles.
-
- ▶ Shut down the device using the ON/OFF switch. Wait 30 min. until the fans no longer rotate and the door LED goes out. Then switch off the mains switch behind the door. Allow the device to cool down.
 - ▶ Close the door.
 - ▶ Switch off the gas supply.
 - ▶ Remove any loose parts:
 - Autoinjector: remove and unplug the connections on the rear panel of the device.
 - Autosampler LS-T: First remove the connecting tubes between the sample tray and the temperature-controlled syringe. Make sure that the caps are tight so that no liquid drips out. Then remove the solvent and waste containers and the sample tray.
 - Autosampler: Remove the solvent and waste containers and the sample rack.

- ▶ Disconnect all connections on the rear of the device.
- ▶ Pull off the black skirting towards the front of the device.
- ▶ Take the carrying handles from the bracket on the rear panel of the device and screw them into the lateral openings at the base of the device.
- ▶ Move the device with 2 people who must lift and hold the device by its transport handles.

The following must be observed when moving the device:

- Observe the guide values and adhere to the legally mandated limits for lifting and carrying without auxiliary means!
- For installation at the new location observe the instructions in the chapter "Installation requirements".



Fig. 25 Device with screwed-in transport handles

See also

📄 Installation conditions [▶ 25]

9.4 Storage



NOTICE

Risk of device damage due to environmental conditions

Environmental influences and condensation can destroy individual components of the device.

- Only store the device in air-conditioned rooms.
- Ensure that the atmosphere is free of dust and corrosive vapors.

If the device is not installed immediately after delivery or not required for longer periods, it should be stored in its original packaging. A suitable desiccant should be added to the equipment to prevent damage from moisture.

The requirements for the climatic conditions of the storage location can be found in the specifications.

10 Disposal

At the end of its service life, the device and its electronic components must be disposed of as electronic waste in accordance with the applicable regulations.

The chemical ozone decomposer contains metal oxides. The absorber is filled with activated carbon and soda lime. The used cartridges must be disposed of in accordance with local regulations.

11 Specifications

11.1 Technical data

11.1.1 Technical data of the device

General characteristics	Designation/type			compEAct N
	Dimensions (width x height x depth)			54 x 51 x 53 cm
	Mass			approx. 30 kg
Methods data	Digestion principle			Pyrolysis followed by thermal oxidation
	Digestion temperature			700 to 1100 °C
	Sample volume			1 to 100 µl
	Analysis parameter			Total nitrogen TN
	Detection principle			Chemiluminescence of NO
	Measurement range			N: 0.01 mg to 10000 mg/l
Gas supply	Oxygen	Quality	4.5	
		Pressure	4 to 6 bar	
		Consumption	1000 ml/min	
	Argon	Quality	4.6	
		Pressure	4 to 6 bar	
		Consumption	100 to 250 ml/min (depending on the selected method)	
Electrical variables	Connection			100 to 240 V (AC), 50/60 Hz
	Fuses			12 A T
	Power consumption			≤ 1100 VA
	Operating system of the internal computer			Linux

11.1.2 Technical data of the autoinjector

General characteristics	Designation/type			Autoinjector Typ AI-SC
	Dimensions (width x height x depth)			9 x 27 x 11 cm
	Mass			1.5 kg
	Sample volume			1 to 100 µl
Electrical variables	Connection			24 V (2.0 A)

11.1.3 Technical data of the autosampler

General characteristics

Autosampler type	LS 1	LS 2	LS-T
Dimensions (width x height x depth)	54 x 41 x 34 cm		51 x 50 x 41 cm
Mass	4.5 kg	5 kg	9.5 kg
Number of samples	18	120	112
Capacity of the sample containers	2 ml		

Electrical variables

Autosampler type	LS 1	LS 2	LS-T
Connection	24 V (2.0 A)		24 V (2.5 A)

11.1.4 PC requirements

Minimum requirements for control via an external PC	
Operating system	Operating system (Windows, MacOS, iOS, Android, Linux) supporting an up-to-date browser version
Browser	<ul style="list-style-type: none"> Chrome/Chromium, Firefox, Microsoft Edge, Safari or other Chromium-based browsers Update status 2019 or later Recommended browsers: Google Chrome, Chromium or Microsoft Edge from version 79
Graphics resolution	≥ 800 x 600 Recommended: ≥ 1024 x 768
Interface	Ethernet for direct connection (link-local network); Wi-Fi or Ethernet connection for linking the device to an existing network structure
Hardware	<ul style="list-style-type: none"> Up-to-date multicore CPU with at least 4 hardware threads RAM: ≥ 4 GB (recommended: ≥ 8 GB) Graphics card supporting 3D hardware acceleration

11.2 Ambient conditions

Ambient conditions during operation

Temperature range	21 - 35 °C
Humidity	≤ 90 % (at + 30 °C)
Air pressure	0.7 - 1.06 bar

Ambient conditions during storage

Temperature range	15 - 55 °C
Humidity	10 - 30 % (use desiccant)

11.3 Standards and directives

Protection class and protection type	The device is classified as protection class I. The casing has the protection level IP 20.
Device safety	<p>The device complies with the following safety standards</p> <ul style="list-style-type: none"> ■ EN 61010-1 ■ EN 61010-2-081 ■ EN 61010-2-010
EMC compatibility	<p>The device has been checked for transient emissions and noise immunity.</p> <p>It meets the requirements for transient emissions according to</p> <ul style="list-style-type: none"> ■ EN 61326-1 (EN 55011 group 1, class B) <p>The device meets the requirements for noise immunity according to</p> <ul style="list-style-type: none"> ■ EN 61326-1 (requirements for use in a basic environment)
Environmental and ambient influences	<p>This device has been tested in environmental simulations under operation and transport conditions and is in accordance with the requirements in:</p> <ul style="list-style-type: none"> ■ ISO 9022-2 ■ ISO 9022-3
EU directives	<p>The device meets the requirements of the directive 2011/65/EU.</p> <p>The device is designed and tested in accordance with standards meeting the requirements of EU directives 2014/35/EU and 2014/30/EU. The device leaves the factory in a sound condition with regard to technical safety. To maintain this condition and to ensure safe operation, the user must strictly observe the safety and operating instructions contained in this operating manual. For accessories delivered with the device and system components from other manufacturers, the information provided in their respective operating manuals has priority.</p>
Guidelines for China	The device contains substances subject to regulation (according to the directive GB/T 26572-2011). Analytik Jena guarantees that, if the device is used as intended, these substances will not leak within the next 25 years and therefore will not pose a threat to the environment or health within this time period.

List of figures

Fig. 1	Safety notices on the device	7
Fig. 2	Principle of operation	13
Fig. 3	Main component of the device	14
Fig. 4	Combustion tube	15
Fig. 5	Connections to the combustion tube	16
Fig. 6	Auto-protection assembly	16
Fig. 7	Toggle switch for the pneumatic seal	17
Fig. 8	Membrane dryer	17
Fig. 9	Gas flow diagram for the device; the numbering corresponds to the numbering of the hose connections on the device	19
Fig. 10	Gas flow diagram of the chemiluminescence detector	20
Fig. 11	Autoinjector setup.....	22
Fig. 12	LS Autosampler	23
Fig. 13	Sample rack of the LS 2	23
Fig. 14	Solvent and waste containers of the autosampler.....	23
Fig. 15	Autosampler electrical connections	24
Fig. 16	Installation diagram for the device with autosampler	27
Fig. 17	Connections on the rear of the device	28
Fig. 18	USB ports and hose bridge in the gas path behind the front door	28
Fig. 19	Switches on the device.....	29
Fig. 20	Remote access page with status setting and network address of the device	31
Fig. 21	Hose set for flow check.....	41
Fig. 22	Close the toggle switch for sealing on the auto-protection assembly	41
Fig. 23	Hose bridge (hose 7)	41
Fig. 24	Components in the device interior	59
Fig. 25	Device with screwed-in transport handles	77