

## Operating instructions

### GSS module



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# 1 Basic information

## 1.1 User manual notes

The GSS gas sampling system is a systems module for the multi EA 5100, multi EA 5000 and compEAct elemental analyzers. This user manual therefore only applies in conjunction with the following documents:

- The user manual of the analyzer (multi EA 5100, multi EA 5000 or compEAct)
- The software manual of the control and analysis software (multiWin or EAvolution)

This user manual describes the design and function of the GSS module and introduces the GSS adapter box as an optional accessory. It provides operating personnel familiar with analysis with the necessary knowledge for the safe operation of the devices and their components. The user manual also provides information on maintenance and service, as well as on possible causes and remedies in the event of an error.

User manual conventions

**Instructions** in chronological sequence are numbered, grouped into blocks of instructions and the expected result is indicated.

**Safety instructions** are indicated by pictographs and signal words. The type and source of the danger are stated together with notes on preventing the danger.

Symbols and signal words

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



### WARNING

Indicates a potentially hazardous situation which might cause death or very serious injuries (deformities).



### CAUTION

Indicates a potentially hazardous situation which might cause light or minor injuries.



### ATTENTION

Provides information on potential material or environmental damage.

## 1.2 Intended use

Addition of the GSS module to the multi EA 5100, multi EA 5000 and/or compEAct allows for the dosing of expanded gases in both elemental analyzers. If the optional GSS adapter box is used, pressurized gases ( $p_{\max} = 200 \text{ bar}$ ) can also be supplied to the analyzers.

Use of the GSS gas sampling system and the GSS adapter box is only possible in connection with the multi EA 5100, multi EA 5000 and compEAct elemental analyzers. The modules are controlled via the multiWin or EAvolution software.

The gas sampling system and the adapter box may only be used for the procedure for determining the sulfur, nitrogen, chlorine and carbon levels of gases described in this user manual and in the user manuals of the analyzers. Any other use is not as intended!

## 1.3 Warranty and liability

The warranty duration and liability comply with the legal requirements and the provisions in the general terms and conditions of Analytik Jena.

Deviations from the intended use described in this user manual result in limitations of warranty and liability in the event of a damage. Damage to wearing parts is not included in the warranty.

Warranty and liability claims are excluded for personal injury and property damage due to one or several of the following causes:

- improper use of the gas sampling system
- improper commissioning, operation and maintenance of the gas sampling system
- modifications to the gas sampling system without prior consultation with Analytik Jena
- unauthorized manipulation of the gas sampling system
- operation of the gas sampling system with defective safety equipment or incorrectly applied safety and protection equipment.
- inadequate monitoring of the device components subject to wear
- use of other than original spare parts, wearing parts or consumables
- improper repairs
- faults due to the non-observance of this user manual

## 2 Safety instructions

### 2.1 General notes

For your own safety and to ensure error-free, safe operation of the GSS module and the GSS adapter box, please read this chapter carefully before commissioning. Please also observe the safety notes in the operating instructions of the multi EA 5100, multi EA 5000 or the compEAct.





Follow all safety instructions in this user manual, as well as all messages and notifications output by the control and evaluation software.


### 2.2 Safety markings and indication labels on the gas sampling system

Safety markings have been applied to the gas sampling system. These must be strictly observed.

Damaged or missing safety symbols can cause incorrect actions leading to personal injury or material damage! The safety symbols must not be removed! Damaged safety symbols must be replaced without delay!

The following warning signs and indication labels have been applied to the gas sampling system:

Warning / indication label	Meaning
	Warning! Risk of dangerously high electrical voltage! Do not open the device housing without authorization. Maintenance work on the device may only be performed by authorized Analytik Jena service personnel.
	Observe the operating manual Before working on the device, inform yourself on the necessary safety precautions and work steps in the operating instructions.
	Before opening the device always disconnect the power plug Always disconnect the device from the power supply before performing maintenance.
	The device contains controlled substances (in accordance with the guideline "Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products"). Analytik Jena guarantees that these substances will not escape from the device in the next 25 years and will not pose a threat to the environment or health within this time period.

The GSS adapter box is marked with the  symbol.

## 2.3 Summary of safety instructions

### Observe the following notes:

- Only use the GSS module and the GSS adapter box as intended and do not endanger yourself and others. Only operate these module under supervision!
- Only gas sample bags filled with gas may be connected to the GSS module. Only uncompressed gases may be dosed. The dosing of liquids or the connection of pressurized gas containers is strictly prohibited for safety reasons. There is a risk of explosion!
- When combined with the GSS adapter box, the application range of the GSS module is extended to compressed gases with pressures of up to 200 bar. Samples in compressed gas cylinders can be dosed with the aid of this additional module.
- The investigation of hazardous substances is the exclusive responsibility of the operator. Always wear suitable protective equipment (respiratory protection, goggles and protective gloves)!
- Observe in particular the statutory and local regulations for the storage and handling of radioactive, flammable, explosive, biological or other hazardous substances.
- Never dose gas samples containing particles. Minute particles cause wear and hence damage to the dosing units and may lead to leaks.

## 2.4 Safety instructions for positioning and connection

### Observe the following notes:

- If the device is defective or improperly operated, there is a risk of dangerous or health-hazardous gases escaping! Use gas monitoring equipment when examining hazardous substances. Such equipment warns the personnel if gas escapes.
- Only connect the gas sampling system to a properly earthed socket which complies with the voltage indicated on the device's type plate.
- Only connect argon to the device as carrier gas. Connecting an incorrect gas may be a fire hazard and cause severe damage to the device.
- Check before commissioning that all hose connections are present and tight and that the "waste" connection is connected to an explosion-proof exhaust vent.

For examining compressed gases in connection with the GSS adapter box, the following applies:

- The sample cylinder is connected via a Swagelok quick coupler. A Swagelok adapter (6 mm) must be screwed on to the sample cylinder. Do not use other connectors or brands!
- Risk of injury and measuring errors from a leaking system! The stand serves only to hold the cylinder in place. No forces must be applied through the mount onto the sample cylinder connection, otherwise the system might start leaking!
- The user is responsible for the safety and conformity of both the sample cylinder and the mount. A stand with a sample cylinder mount is supplied with the GSS adapter box by Analytik Jena. If this stand does not fit, the customer must ensure proper mounting.



- The substances may not escape unchecked from the sample cylinders. Only open the sample cylinder's valve when the sample cylinder has been properly connected to the GSS adapter box.

## 2.5 Safety instructions for operation

- Only operate the gas sampling system and its accessories under supervision!
- Danger from hazardous or toxic gases escaping! Use suitable gas monitoring equipment devices when analyzing dangerous substances. Such equipment warns the personnel if gas escapes.
- Check the device regularly for gas leaks during operation, in particular at the connections of the sample cylinder.
- Ensure adequate room ventilation (e.g. using an explosion-proof extraction device)!
- Close the sample bag or cylinder immediately if leaks or dangers are detected.
- If you detect escaping gas, remove the cause of the leak immediately or call Service, if applicable!

For examining compressed gases in connection with the GSS adapter box, the following applies:

- Relieve the pressure from the GSS adapter box before performing any maintenance work or changing the sample cylinder. To do so, carefully open the "flow analyt" needle valve for setting sample flow until the pressure gauge has gone down to zero. Only shut down the GSS module when the system has been depressurized.

## 2.6 Behavior during emergencies

In emergencies, the following regulations apply:

- Close the gas sample bag/cylinder immediately.
- Ensure adequate ventilation. Take additional measures appropriate for the escaped substance in accordance with the emergency plan of the operator.
- If there is no immediate risk of injury, switch off the device at once via the power switch on the rear. Disconnect the device's plug from the power socket.
- If possible, shut off the gas supply.

### 3 Function and setup

The expansion of the multi EA 5100, multi EA 5000 and compEAct elemental analyzers with the GSS module allows it to determine concentrations of the following elements in gases:

compEAct S/compEAct S<sup>MPO</sup>

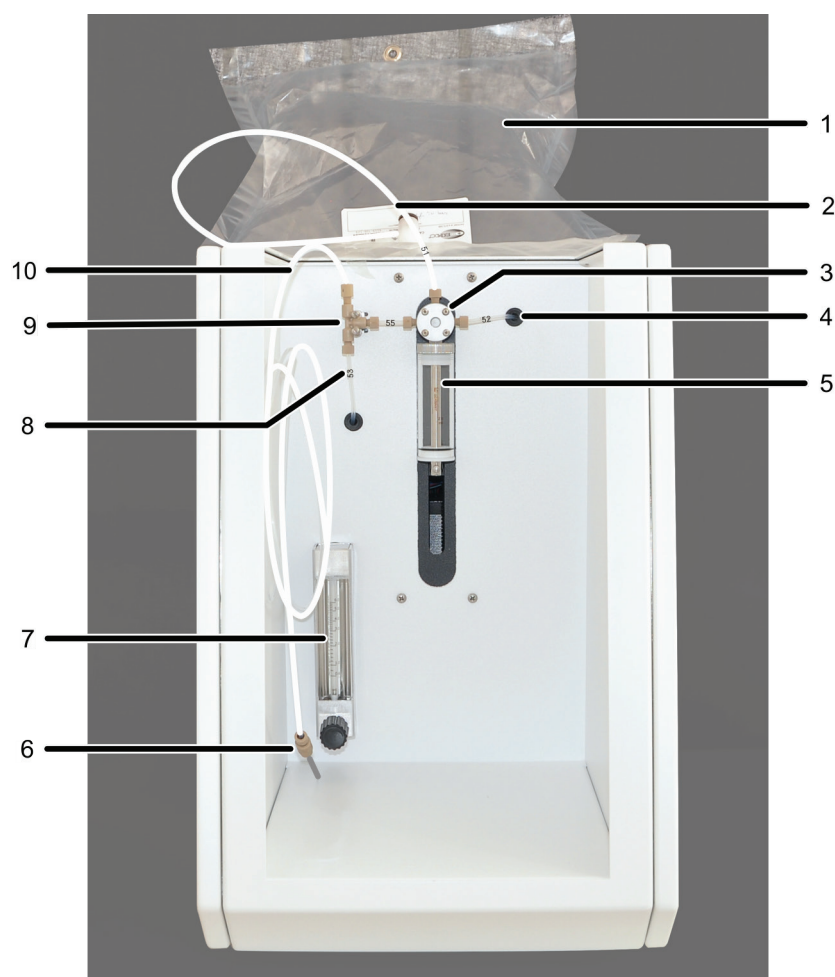
- Sulfur

compEAct N

- Nitrogen

multi EA 5100, multi EA 5000

- Sulfur
- Nitrogen
- Carbon
- Chlorine



**Figure 1** GSS module (view from front)

- |   |  |    |  |
|---|--|----|--|
| 1 | gas sample bag   | 6  | hose adapter with injection needle                     |
| 2 | hose connection no. 51<br>(distributor valve – gas sample bag) | 7  | argon flow meter                                       |
| 3 | distributor valve  | 8  | hose connection no. 53<br>(argon rotameter – T piece)  |
| 4 | hose connection no. 52<br>(distributor valve – "waste" outlet) | 9  | T piece  |
| 5 | syringe pump   | 10 | hose connection no. 50<br>(T piece – injection needle) |

The GSS module consists of the following main components:

- gas supply for the argon carrier gas flow
- flow meter for the argon supply (rotameter)
- syringe pump (25 ml)
- distributor valve
- hose connection with injection needle
- Communication interfaces to the basic modules

The GSS module extracts the gas sample from the gas sample bag with the aid of the 25 ml syringe via hose 51. For flushing, the gas sampling system feeds the extracted sample to the "waste" outlet via hose 52. For dosing, the sample is fed to the combustion tube of the basic module via hose 50 with the aid of the carrier gas.

Dosing is performed:

- via the injection needle (compEAct and multi EA 5100, multi EA 5000 in vertical operation).
- via a flexible injection needle which is led through the injection port of the ABD (multi EA 5100, multi EA 5000 in horizontal operation).

The GSS module transfers the mix of argon carrier gas and gas sample with a continuous gas flow rate of 50–60 ml/min to the elemental analyzer via hose 53. In the evaporation zone of the combustion tube a pyrolysis is first carried out in the argon flow. The pyrolysis gases are then completely oxidized and analyzed in the oxygen flow.

### 3.1 Connection of the gas sampling systems

The electrical connections and interfaces as well as the gas inlets and outlets are on the rear of the device.

The device switch for switching the module on and off is located at the top left of the rear of the device. The device fuse and power connection are located below.

The argon is supplied via the "Ar in" connection (2 in Figure 2).

The "waste" outlet (3 in Figure 2) must be connected to an explosion-proof exhaust vent. The statutory and local regulations for the proper waste disposal must always be observed.



**Figure 2 Connection and interfaces (device rear)**

- |   |   |
|---|---|
| 1 RS 232 interface for the multi EA 5100/5000                                 | 5 DIP switch for bus termination (behind cover) |
| 2 Argon connection  | 6 RS 485 interface for the compEAct             |
| 3 "Waste" gas outlet for connection to an extractor with explosion protection | 7 Power supply connection                       |
| 4 RS 485 interface for connecting further sample delivery modules             | 8 Fuse holder                                   |
|   | 9 Device switch                                 |

Communication with the multi EA 5100/multi EA 5000 is done via a connection cable for samplers (with a special RS 232 bus). The corresponding interface on the rear of the device is marked with "sampler RS 232" (1 in Figure 2). The RS 232 bus system allows for direct connection to the multi EA 5100/multi EA 5000, as well as the interposition of further sample delivery modules.

Communication with the compEAct is done via a connector cable for samplers (special RS 485 bus). The corresponding interface on the rear of the device is marked with "sampler RS 485 ←" (6 in Figure 2). The gas sampling system can be directly connected with the compEAct. In addition, other sample delivery modules can be connected in series with the gas sampling system. There is a second RS 485 interface provided on the gas sampling system (4 in Figure 2).

To connect multiple modules with the compEAct, refer to the "Connecting multiple sample delivery modules to the compEAct" Chapter, pg. 26. Setting the DIP switch for bus termination is also described there (5 in Figure 2).

### 3.2 Components for sample delivery

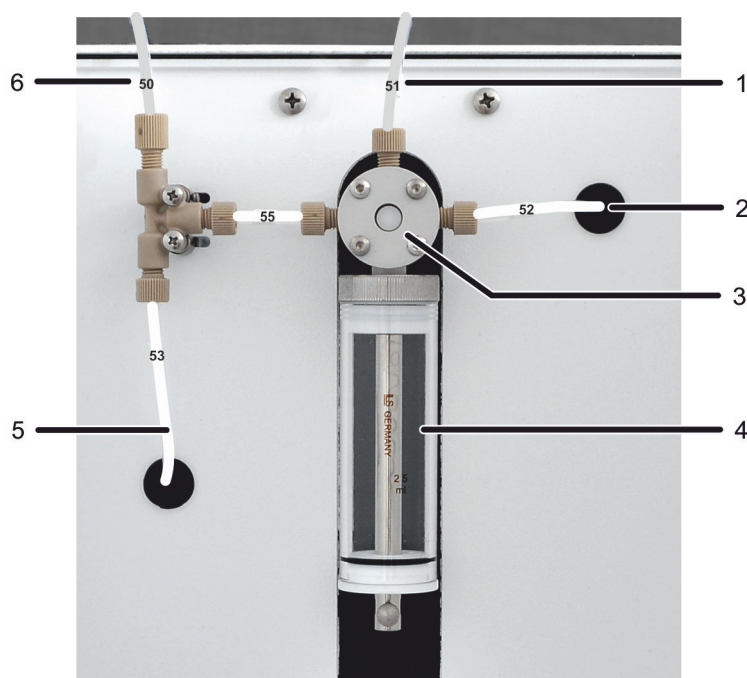
The GSS module transfers gaseous samples via a syringe pump with a 3-port valve directly into the elemental analyzer. The syringe volume is 25 ml. An injection volume of 1–100 ml can be set in the control and evaluation software. The syringe may draw gas multiple times in these cases.

The GSS module doses the gaseous samples from the gas sample bag with the aid of the argon carrier gas directly into the hot vaporization zone of the combustion tube. The dosing speed can be set to 1–40 ml/min in the software.

In the vertical operation modes of the compEAct and multi EA 5100/multi EA 5000, the measuring gas is transferred to the combustion tube via an injection needle. The injection needle is inserted through the septum on the injection port for dosing gas.

In the horizontal operation mode of the multi EA 5100/multi EA 5000, the injection tube with flexible needle is inserted through a pre-perforated septum on the injection port of the ABD.

The hose connections are attached to the 3 port valve using Fingertight connections. The body of the syringe is made of glass, and can be replaced by our customer service.



**Figure 3** Components for sample delivery

- |   |  |   |  |
|---|--|---|--|
| 1 | hose connection no. 51<br>(distributor valve – gas sample bag) | 4 | syringe pump   |
| 2 | hose connection no. 52<br>("waste" gas outlet)                 | 5 | hose connection no. 53<br>(argon rotameter – T piece)  |
| 3 | distributor valve  | 6 | hose connection no. 50<br>(T piece – injection needle) |

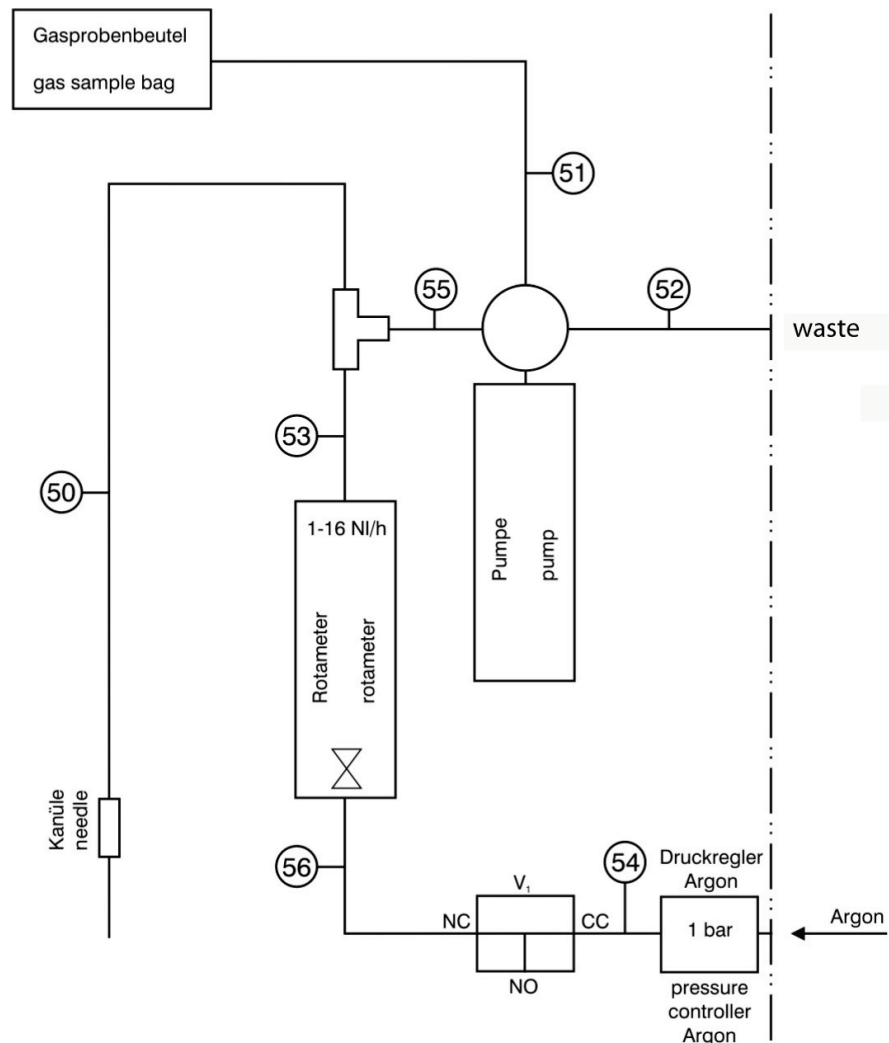


Figure 4 GSS module hose diagram

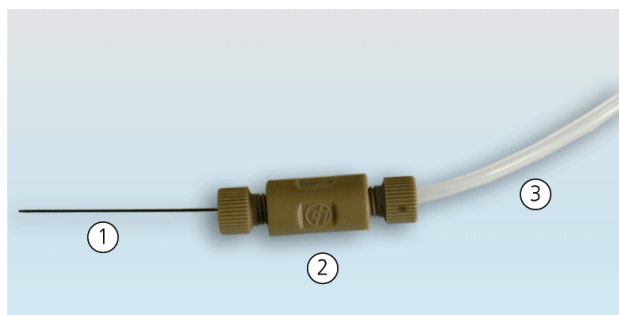
### 3.3 Measuring gas transfer

compEAct +  
multi EA 5100/5000  
(vertical operation mode)

In the vertical operation mode of the compEAct and multi EA 5100/multi EA 5000, the measuring gas is dosed directly into the combustion tube via the injection port for dosing gas (screw cap with needle guide and septum).

The transfer of measuring gas is done via hose 50, which is connected to the T piece (→ Figure 3). An injection needle (Figure 5) is on the other end of the hose, which is inserted through the needle guide and the septum. The needle is inserted into the septum as far as it will go through the Fingertight screw connection.

A Fingertight connector connects hose 50 and the injection needle. The flangeless fittings are comprised of a conical nipple and a banjo bolt, and they seal solely by fingertight tightening of the banjo bolt.



**Figure 5 Measuring gas injection needle (for vertical operation mode)**

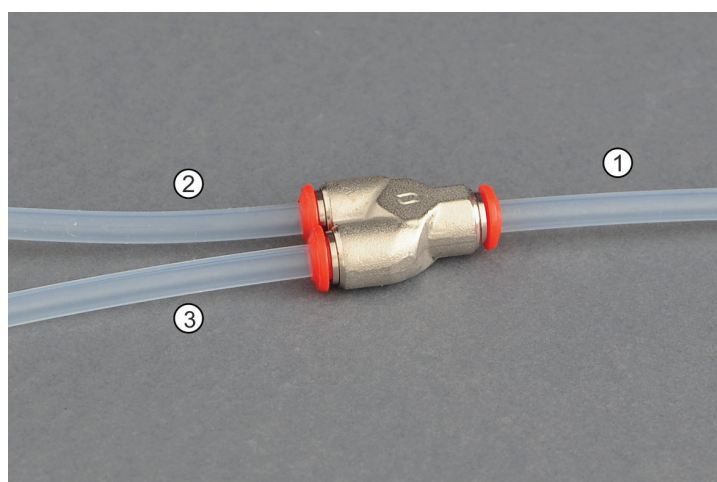
- |   |   |   |                           |
|---|---|---|---------------------------|
| 1 | injection needle                            | 3 | Hose no. 50, from T piece |
| 2 | Fingertight connector with screw connection |   |                           |

multi EA 5100/5000  
(horizontal operation  
mode)

In the horizontal operation mode of the multi EA 5100/multi EA 5000, the sample is connected to a flexible injection needle via hose no. 50 and transferred to the combustion zone over the port of the ABD (automatic boat feeder). The hose connection as well as its connection system is identical.

Argon distributor

A distributor is included in the scope of delivery for the argon carrier gas supply. The elemental analyzer and the GSS module can be supplied with argon via a delivery point with the aid of the distributor.



**Figure 6 Argon distributor**

- |   |                             |   |                   |
|---|-----------------------------|---|-------------------|
| 1 | to the argon delivery point | 3 | to the GSS module |
| 2 | to the elemental analyzer   |   |                   |

## 4 First commissioning

### 4.1 Location requirements

#### 4.1.1 Installation conditions

The location requirements correspond to those of the analyzer (→ multi EA 5100, multi EA 5000 or compEAct operating instructions).

#### 4.1.2 Space requirement

The gas sampling system can be set up to the right of the analyzer or the ABD. The layout depends on the use of other system components and can be adapted to the local conditions. The space requirements depend greatly on the system modules required for the measurement.

#### 4.1.3 Gas supply

The operator is responsible for the gas supply and the corresponding connections and pressure reducers. The gas pressures listed in the technical data must be complied with (→ "Specification", pg. 36).

The connection hoses with outer diameter 6 mm and inner diameter 4 mm are included with the delivery.

An argon distributor is supplied for the gas sampling system to supply the analyzer and the gas sampling system with argon via a delivery point.

#### 4.1.4 Energy supply



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#### WARNING

The gas sampling system may only be connected to a properly earthed power outlet in accordance with the voltage specifications on the type plate.

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The gas sampling system operates on single-phase alternating current.

The installation of the electrical equipment of the laboratory must comply with the standard DIN VDE 0100. After the connection point an electrical current in accordance with the standard IEC 38 must be available.



## 4.2 Unpacking and connecting the gas sampling system



### WARNING

The analyzer and the gas sampling system may only be set up, assembled and installed by Analytik Jena's customer service or by trained and authorized personnel!

Any unauthorized manipulation of the analyzer or the system components can endanger the user and the functional reliability of the device and limits or completely excludes any warranty claims.

Retain the transport packaging! Return transport for service must be in the original packaging. This alone prevents transport damage.



### WARNING

Danger of short circuit!

Always ensure that the analyzer and other system components are switched off when connecting them to a power supply.

Before connecting the power cable ensure that the power switch on the rear of the device is set to "0"!

Only use the IEC connection cable included in the scope of delivery for the connection to the power supply (VDE label, 2 m long). Extensions of the supply cable are not permitted!



### WARNING

Risk of fire and explosion from incorrect gas connection!

Only connect argon to the gas sampling systems! When connecting the wrong gas, there is a fire risk or explosive mixtures may develop. Set the preliminary pressure at the pressure reducer to 6 bar.

The operator is responsible for providing the necessary gas connection.

Assembling the components

Assemble the components of the gas sampling system as follows:

1. Carefully remove the GSS module and accessories from the transport packaging.
2. Place module at its intended location.
3. Remove any adhesive strips and protective bags.

Connecting the module

The electrical connections are located on the rear of the GSS module.



Figure 7 Rear of the GSS module with interfaces and device switches

- |   |                           |
|---|---------------------------|
| 1 RS 232 interface for the multi EA 5100/5000 | 5 Power supply connection |
| 2 Argon connection                            | 6 Fuse holder             |
| 3 "Waste" gas outlet                          | 7 Power switch            |
| 4 RS 485 interface for the compEAct           |                           |

1. Connect the power supply cable to the power connection on the rear of the device and to an earthed socket.
2. Connect the module to the analyzer with the supplied interface cable:

For the multi EA 5100,  
multi EA 5000

- "Sampler RS232" interface on the rear of the device (1 in Figure 7)
- "Sampler" interface on the rear of the multi EA 5100/multi EA 5000

**Note:**

If another system module is connected to the "Sampler" interface, the interface cables can be connected "in series" via the bus system.

For the compEAct

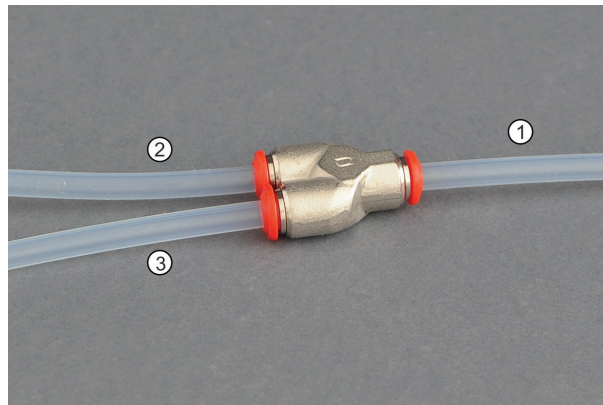
- Connect the blue interface cable connector with the "Sampler RS485 ←" interface (blue, 4 in Figure 7).
- Connect the red interface cable connector with the "Sampler" interface on the rear of the compEAct.  
The "Power sampler" interface on the rear of the compEAct is not used for the gas sampling systems.

**Note:**

Multiple sample delivery modules can be connected "in series" via the RS 485 bus system (→ "Connecting multiple sample delivery modules to the compEAct", pg. 26).

Establishing  
gas connections

1. Connect the argon carrier gas via the supplied argon distributor as follows:



## Argon distributor

- 1 Connection hose to the pressure reducer of the gas supply
- 2 to the analyzer
- 3 to the GSS module

2. Connect the "waste" outlet to an explosion-protected exhaust vent.

**Note:**

Always connect the "waste" outlet to an explosion-protected exhaust vent, even if no harmful or explosive gases are used.

3. Connect hose 50 to the T piece. Connect hose 51 to the 3-port valve. Tighten the Fingertight connections finger-tight.

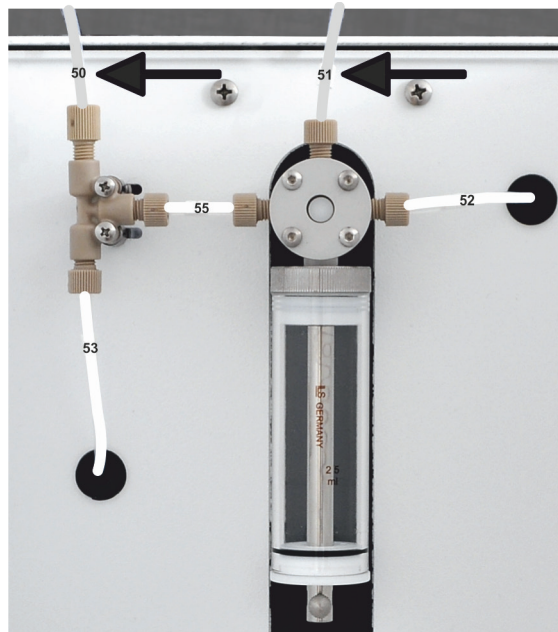


Figure 8 Connecting hoses 50 and 51

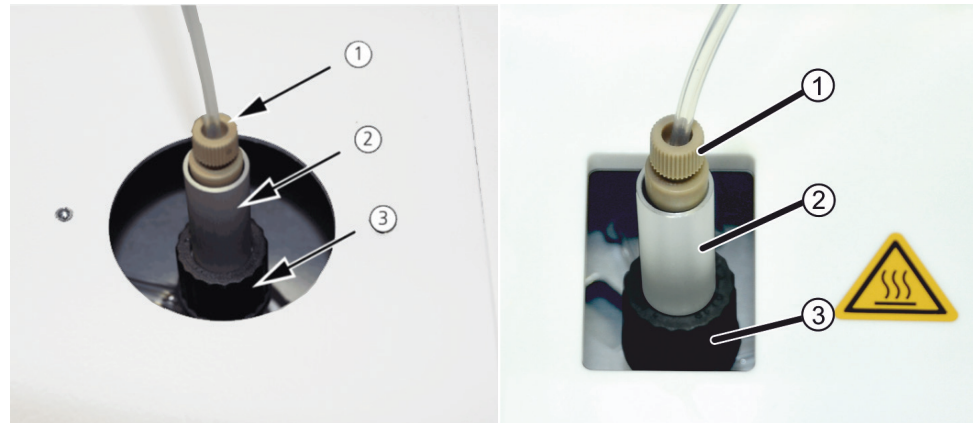
## Connecting the gas

compEAct +  
multi EA 5100/5000  
(vertical operation mode)

Connect the measuring gas to the elemental analyzer as follows:

1. Connect the injection needle to hose 50 on the front of the GSS module via a Finger-tight connector.
2. Open the front door of the analyzer and open the pneumatic seal with the toggle switch.
3. Insert the injection needle through the middle of the needle guide and the septum of the injection port for gas dosing up to its Fingertight connection.
4. Exchange the injection port on the combustion tube with the injection port for gas dosing (with preattached needle).

- Close the pneumatic seal and the front door again.



**Figure 9** Connecting measuring gas to the multi EA 5100/5000 (left) and the compEAct (right)

- |   |                            |   |                |
|---|----------------------------|---|----------------|
| 1 | hose with injection needle | 3 | injection port |
| 2 | needle guide               |   |                |

multi EA 5100/5000  
(horizontal operation mode)

- Connect the flexible injection needle (1 in Figure 10) to hose 50 on the front side of the GSS module via a Fingertight connector.
- Unscrew the cap with septum on the injection port of the ABD (2 in Figure 10) and replace it with the pre-assembled cap with injection needle.

**⚠ CAUTION!**

For safety reasons, remove the solvent container of the MMS 5000 before opening the port. The injection needle cannot be positioned correctly otherwise.

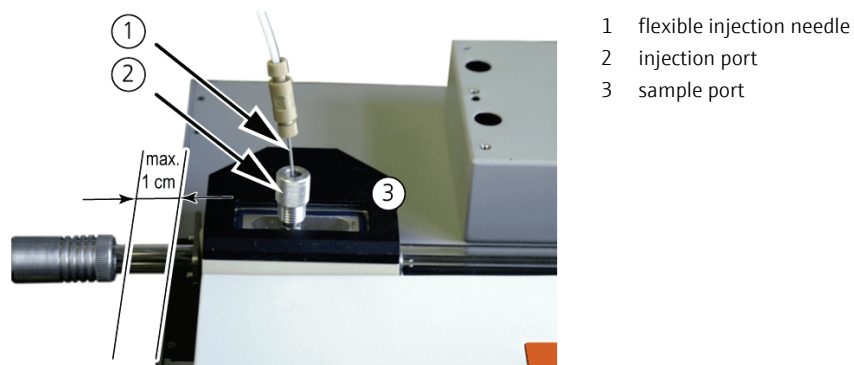
- Open the flap of the sample port of the ABD (3 in Figure 10) and thread the flexible injection needle into the hole in the injection port up to the coupling piece of the ABD.
- Close the flap of the sample port and lightly screw on the cap.

**⚠ CAUTION**

Risk of crushing Strong forces are applied when closing the sample port. Do not reach into the port while closing.

- Set the length of the flexible injection needle so that the end is located approx. 1 cm from the left side of the housing of the ABD in the coupling piece.
- Tighten the cap finger-tight.

✓ The measuring gas connection is now made.



**Figure 10** Connecting measuring gas to the multi EA 5100/multi EA 5000 in horizontal operation

## 5 Operation



---

### WARNING

Danger from flammable or harmful gases escaping!  
Risk of fire and explosion!

Only operate the gas sampling system under supervision! Use an appropriate gas detector for your samples!

Close the gas sample bag in the event of problems or leaks. Ensure adequate ventilation of the room. For further procedures, see "Behavior during emergencies", pg. 9.

Only perform analyses if the system tightness check was performed without error.

The gas samples may not escape the gas sample bags unchecked. Only open the bag when it has been properly connected to the GSS module.

Never dose gas samples containing particles. Minute particles cause wear and hence damage to the dosing units and may lead to leaks.

---

1. Check the preliminary pressure of the argon at the carrier gas pressure reducer. The preliminary pressure must be 6 bar.
2. Establish the connection between the GSS module and the combustion oven.
3. For the multi EA 500: Switch on the PC.
4. Switch on the gas sampling system.
5. Switch on the multi EA 5100, multi EA 5000 or compEAct analyzer at the power switch. Wait for initialization.
6. For the compEAct: Push the ON/OFF switch on the skirting after 30 seconds. The EAEvolution control and evaluation software will start automatically.
7. For multi EA 5100, multi EA 5000: Start the multiWin control and evaluation software on the PC.
8. Check the gas flows in the analyzer. Check the flow of argon in the gas sampling system at the rotameter: 3.0 to 3.6 L/h ( $\approx$  50 to 60 ml/min).

Note: Read off the argon flow rate at the upper edge of the float from the rotameter.

9. Connect a gas sample bag to hose 51. Open the gas sample bag at the valve or valve plug.
10. Create a new analysis method or activate an existing method  
( $\rightarrow$  multiWin or EAEvolution control and evaluation software operating instructions).

ATTENTION! Set the dosing speed in the method in a manner that prevents the combustion tube from clogging with soot. Adjust the dosing speed and sample volume to the sample matrix and adjust the element concentration. The optimal dosing speed for butane, for example, is 20 ml/min.

11. Create a sequence for the sample measurements. In multiWin, create or select a group of analyses.
12. Start the measurement via the software.
  - ✓ The analyzer begins the measurement.

## 6 Troubleshooting

### 6.1 Device errors at the gas sampling system

Error	Possible cause	Remedy
No argon flow	Module not switched on	Switch on the module at the device switch
	Argon not connected	Connect the carrier gas supply on the rear of the device
	Interface cable not connected	Connect the gas sampling system and the analyzer via the interface cable
	Housing fan faulty	Inform customer service department
Faulty dosing	System is leaking	Check the tube connection
	Pressure in the gas sample bag is too high	Only dose uncompressed gases! Allow the sample to ease to normal pressure. Fill the gas sample bag to a max. of 2/3.
	Gas sample bag is not open or not connected correctly	Open the sample bag Check the connection of the sample bag
	The gas outlet of the gas sample bag or the valve / connection port at the sample bag is clogged	Replace the sample bag ATTENTION! Gas sample containing particles can clog the gas paths of the GSS module.
	Connection between hose 50 and the injection needle is leaking	Check the hose connection and fit of the ferrules
No sample gas transfer, no measured values	Gas sample bag not connected or connected incorrectly	Connect the gas sample bag correctly. Check for leaks
	Gas sample bag not open	Open the bag

## 6.2 Analytic problems on the GSS module

Error	Possible cause	Remedy
Measured values too low or fluctuating	Gas leak in the system	First check the septum in the injection port and then check all other connections
	Faulty dosing	Check dosing
	Gas sample bag unsuitable	Use gas-tight and chemically inert sample bags of adequate size Recommendation: Tedlarbags V = 10 L Only use gas sample bags once
	Sample storage time > 24 h	Examine gas samples immediately after extraction or max. 24 h afterwards. Sample loss due to hydrolysis, adsorption, absorption, condensation or diffusion can occur rapidly
	Diffusion / hydrolysis in the tube system of the GSS module	Set a suitable number of flush steps with the sample in Analysis Method. Recommended: 3 times before the first injection and 1 time before further injections of the same sample

## 7 Maintenance

### 7.1 Maintenance intervals

Check gas flow	Daily and after maintenance or system restructure
Check the system for leaks	Daily for chlorine analysis, otherwise test is performed automatically
Check hose screw connections for tight fit	Weekly
Check injection needle	Weekly/as needed
Check the Fingertight connection on the needle	Daily
Check connections at the ABD injection port	Daily

### 7.2 Replacing the injection needle



#### WARNING

If there is a leak between the injection needle and the Fingertight screw connection, explosive or toxic gases can escape or explosive or toxic gas mixtures may develop!

Only tighten the Fingertight connection finger tight! If it is tightened too much, the ferrule may become damaged and the system may develop leaks. Do not use a tool for tightening.

Check the gas-tightness of the system after replacing the injection needle.



#### CAUTION

Risk of burns!

The injection needle is very hot after removal from the combustion tube!

Allow the injection needle to cool down to ambient temperature before replacing the needle!

The injection needle must be replaced if it is damaged. The needle may become brittle or clogged over time due to the high temperatures in the combustion tube. Fine particles can be removed with a cleaning wire.

Direct connection to the combustion tube

1. Open the front door of the analyzer and open the pneumatic seal with the toggle switch.
2. Unscrew the injection needle with the injection port from the combustion tube.
3. Allow the injection needle to cool down to ambient temperature.
4. Open the Fingertight screw connection of the injection needle.
5. Remove the damaged injection needle with the ferrule.
6. Insert the new injection needle with ferrule in the Fingertight screw connection and tighten the Fingertight screw connection finger tight.



7. Reattach the injection needle with injection port to the combustion tube.
8. Close the pneumatic seal and the front door again.

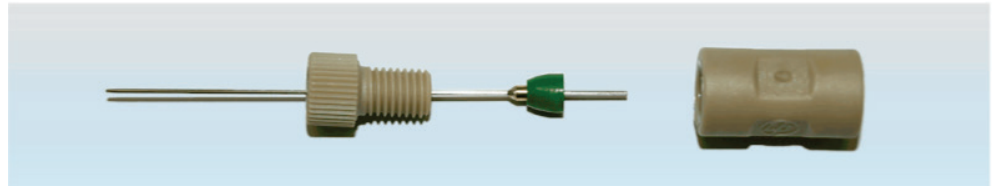


Figure 11 Replacing the injection needle

### 7.3 Replacing the hose connections

Check the hose connections for leaks and replace them with new ones if leaks or cracks are found. Remove faulty hose connections as follows:

1. Remove the faulty hose connection.
2. Replace the hose and damaged Fingertight screw connections.
3. Push the conical nipple (1 in Figure 12) of the Fingertight screw connection with the conical side facing the banjo bolt onto the hose. The conical nipple and hose end must be flush.

ATTENTION! Ensure straightly-cut, round and unknicked hoses.

4. Connect the hose connection and tighten the banjo bolt (3) finger tight.
5. Check the system for leaks.

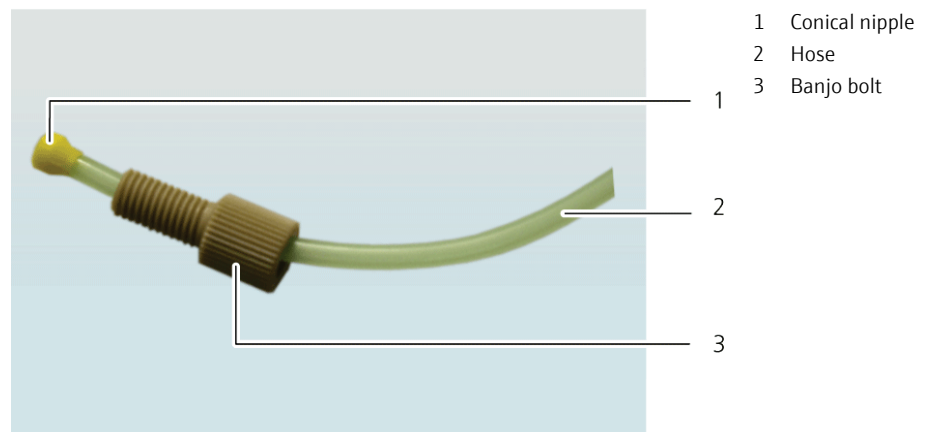


Figure 12 Replacing the hose connections

## 7.4 Check the gas sampling system for leaks



### WARNING

Danger from flammable or harmful gases escaping! Risk of fire and explosion!

Only operate the gas sampling system under supervision! Use a gas warning device!

Only perform analyses if the system tightness check was performed without error.

If a gas sample is connected to the module and the sample bag or cylinder (only when using the GSS adapter box) is open, the sample gas can help to detect leaks during a measurement.

Check the system for leaks using a gas detector suitable for your sample at the following spots:

- at the sample bag or cylinder connection
- at all joints
- in the air flow of the housing fan on the rear of the module

## 7.5 Connecting multiple sample delivery modules to the compEAct

Communication between the gas sampling system and the compEAct is done via a connection cable for sample delivery systems (RS 485, special bus). The gas sampling system can be directly connected with the compEAct. Other sample delivery modules, for example the sample delivery systems LS 1 and LS 2, can also be connected in series with the gas sampling system. Two RS 485 interfaces are located on the GSS module for this.

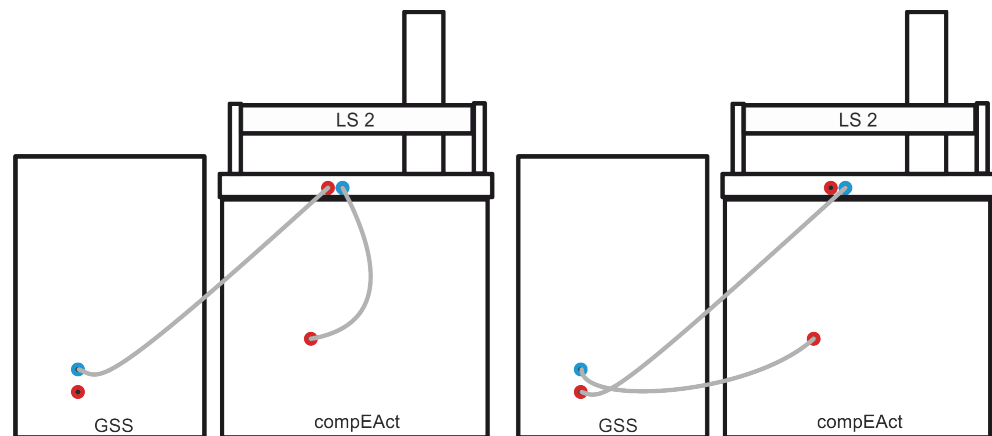
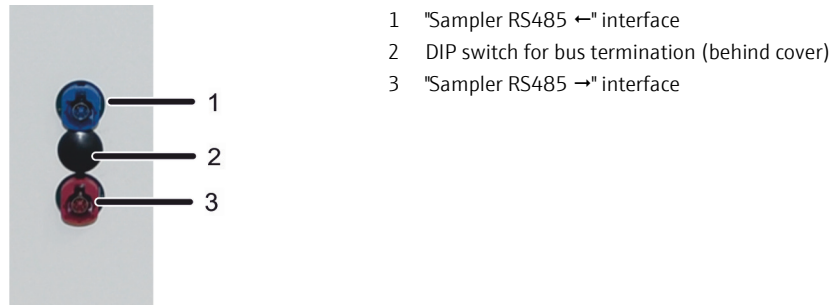


Figure 13 Connecting multiple modules to the compEAct

Left: GSS module as the last module in series

Right: Further modules after the GSS module



**Figure 14 RS 485 interfaces and bus termination switch**

Connecting the gas sampling system as the last module in series:

1. Connect the blue interface cable connector with the "Sampler RS485 ←" interface (blue, 1 in Figure 14) on the rear of the gas sampling system.
2. Connect the red interface cable connector with the red socket on the rear of the neighboring sample delivery module.
3. Remove the plastic cover over the bus termination switches with a spatula or flat head screwdriver.
4. Set both DIP switches on the circuit board to the topmost position ("ON", → Figure 15). This corresponds to the factory settings.

Other sample delivery modules follow after the gas sampling system:

1. Connect the blue interface cable connector with the "Sampler RS485 ←" interface (blue, 1 in Figure 14) on the rear of the gas sampling system. Connect the red interface cable connector with the "Sampler" interface on the rear of the compEAct.
2. Connect a second interface cable with the "sampler RS485 →" (red, 3 in Figure 14) port. Connect the blue end of this interface cable with the blue socket on the next sample delivery module.
3. Remove the plastic cover over the bus termination switches with a spatula or flat head screwdriver.
4. Set both DIP switches on the circuit board to the bottom position.



The gas sampling system is the last in series:  
 Switch 1 + 2 in topmost position  
 (factory settings)



More modules are after the gas sampling system:  
 Switch 1 + 2 in bottom position

**Figure 15 Setting the DIP switches**

## 8 GSS adapter box

The GSS adapter box is an optional accessory for the GSS module. In combination with the GSS adapter box, the gas sampling system can transfer pressurized gases into the multi EA 5100, multi EA 5000 and compEAct elemental analyzers. Sample cylinder with a pressure of up to 200 bar serve as sample containers.

### 8.1 Layout

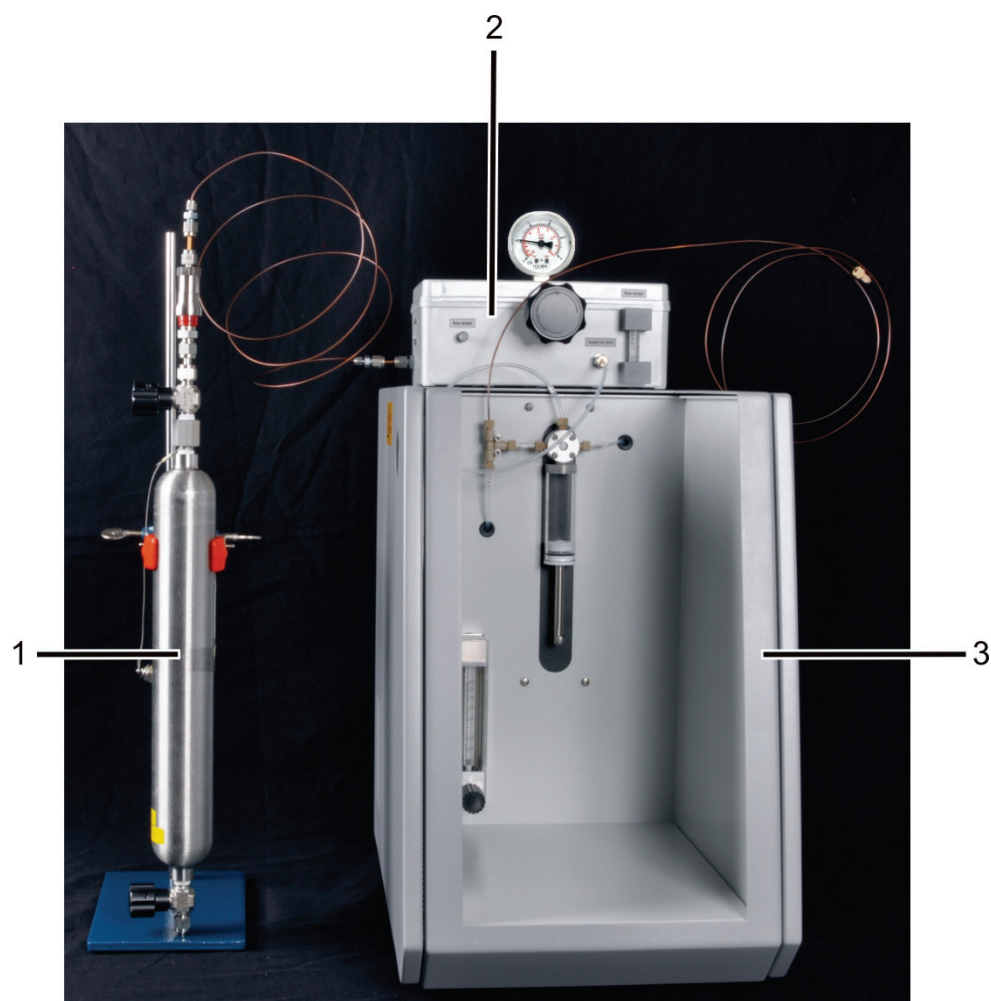


Figure 16 GSS module with GSS adapter box and sample cylinder

- 1 Sample cylinder with adapter and shut-off valve
- 2 GSS adapter box
- 3 GSS module

## 8.2 Commissioning

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### WARNING

Danger from flammable or harmful gases escaping!  
Risk of fire and explosion!

Only operate the GSS adapter box under supervision! Use an appropriate gas detector for your samples!

In case of problems or leaks close the sample cylinder valve immediately. Ensure adequate ventilation of the room. For the subsequent procedure see section "Behavior during emergencies" p. 9.

Only perform analyses if the system tightness check was performed without error.

---



### CAUTION

Risk of injury or measuring errors from a leaking system!

The stand serves only to hold the cylinder in place. No forces must be applied through the mount onto the sample cylinder connection, otherwise the system might start leaking! Only fasten the clamp finger tight!

The gas samples may not escape the gas cylinders unchecked. Only open the sample cylinder's valve when the sample cylinder has been properly connected to the GSS adapter box.

Never dose gas samples containing particles. Minute particles cause wear and hence damage to the gas sampling systems and may lead to leaks.

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### ATTENTION

The sample cylinder is connected via a Swagelok quick coupler. A Swagelok adapter (6 mm) must be screwed on to the sample cylinder. Do not use other connectors or brands!

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Attaching the sample container



- Place the sample container in the holder (1) on the stand as shown in the illustration.
- Place the sample container with stand next to the GSS module (→ Figure 16).

Hose connections

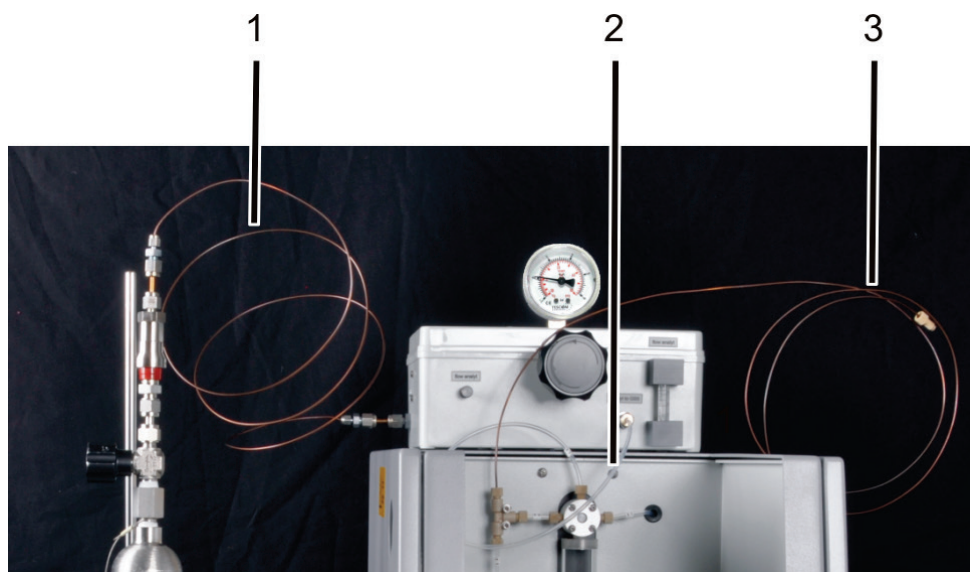
To put the GSS module with the GSS adapter box in operation, connect the following hoses on front and rear:

Hose connections at the rear



- Connect the "waste" connection of the GSS adapter box with the "waste" connection of the GSS module.  
Attach a waste hose to the vacant connector of the T piece (1). Connect the waste hose to an explosion-protected connection.

Hose connections at the front



Item	Description	Description of the connectors	
1	Tube connection	The connector side with the quick coupling is intended for the adapter on the sample container. <b>Make sure it engages securely when it is attached!</b>	Attach the other connection to the "sample in" inlet on the GSS adapter box. The input is located on the side wall.
2	Hose no. 51 A	Screw a connection into the distributor valve of the injection pump (Fingertight screw connection).	Attach the other connection side to the "Analyt to GSS" inlet on the GSS adapter box. The input is located on the front.
3	Tube connection	Attach a connector via Fingertight screw connection to the T piece.	Attach the other connection to the injection needle. Connect the injection needle to the analyzer.

The tube surface (item 1 and 3) is coated with Sulfinert/SilcoNert to prevent undesired adsorption effects and low results when sulfur trace contents are measured.

## 8.3 Operation

Regulating the gas flow

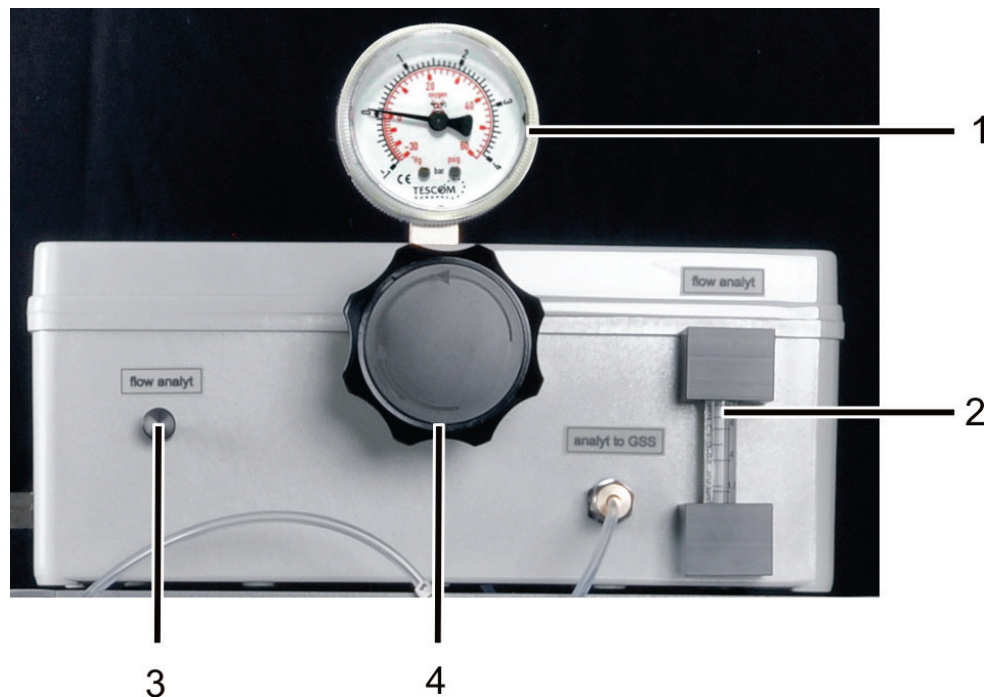


Figure 17 Setting the gas flow on the GSS adapter box

- |                 |                              |
|-----------------|------------------------------|
| 1 Pressure gage | 3 Needle valve "flow analyt" |
| 2 Rotameter     | 4 Pressure controller        |

Perform dosing with the following settings:

- Set a pressure of 0.5 – 1.5 bar with the pressure regulator (4 in Figure 17).
- Check the set pressure at the pressure gage (1).
- Set a stable flow rate via the "flow analyt" needle valve (3) – observe the position of the ball in the rotameter (2).

Attention! There must be no fast drainage! Ensure that the minimal flow rate is set – especially for sample containers and sample with a particularly low preliminary pressure (e.g. 2 bar).

## 8.4 Maintenance

Maintenance task	Interval
Clean and maintain the housing	weekly
Check all screw connections for tight fit	weekly



## 9 Transport and storage

### 9.1 Preparation of the GSS module for transport



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#### Attention

Unsuitable packaging material can cause damage to the individual components of the module!

Only transport the module in its original packaging! Ensure that the module is fully drained and all transport locks have been fitted!

The needles may bend! Only package the needles in the original packaging!

---

Prepare the module for transport as follows:

1. Close the sample bag and disconnect the hose connection to the module.
2. Disconnect the injection needle from hose 50. Package the needle in the needle packaging.
3. Shut off the gas supply.
4. Switch off the module at the device switch and disconnect the power plug from the socket.
5. Disconnect all connections on the rear of the module.
6. Package the open hose ends in protective bags and seal them, e.g. with adhesive tape.
7. Carefully package the module and accessories in their original packaging.

## 9.2 Moving the GSS module in the laboratory



### CAUTION

Risk of injury due to falling parts!

Move the module with great care! Securely hold the module with both hands from below!

When moving the module in the laboratory observe the following:

1. Close the sample bag and disconnect the hose connection to the module.
2. Disconnect the injection needle from hose 50. Package the needle.
3. Cut the gas supply.
4. Switch off the module at the device switch and disconnect the power plug from the socket.
5. Disconnect all connection on the rear of the module (interface cables, carrier gas supply, exhaust hose).
6. Grasp the module firmly with both hands on the bottom side.

For the setup at the new location observe the notes in section "Location requirements" p. 16.

## 9.3 Storing the GSS module



### Attention

Environmental influences and condensate formation can destroy individual components of the device!

The device must only be stored in air-conditioned rooms. The atmosphere must be low in dust and free from aggressive vapors.

If the device is not set up immediately after delivery or if the device is not required for a longer period of time, it must be stored in its original packaging. Include a suitable desiccant in the packaging or device to avoid damage due to moisture.

Ambient conditions

Refer to the technical data for ambient climate requirements of the device's storage location (→ "Ambient conditions for transport and storage", pg. 37).

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## 10 Disposal

The GSS module and the GSS adapter box must be flushed and cleaned before disposal.

After the service life has expired, the GSS module and GSS adapter box must be disposed of as electronics waste in accordance with the proper waste disposal regulations.

# 11 Specification

## 11.1 GSS module technical data

General characteristics	Designation / type	GSS module
	Basic device dimensions (W x H x D)	ca. 300 mm x 470 mm x 500 mm
	Mass	approx. 12 kg
Procedural data	Sample type	Gas samples from gas sample bags
	Sample condition	Pressureless gases
	Sample volume	1 to 100 ml
	Dosing rate	1 to 40 ml/min
	Syringe type	25 ml
	Transfer of measuring gas to the elemental analyzer	Via injection needle with direct connection to the combustion tube or Via flexible injection needle through the injection port of the ABD in the combustion tube
	Carrier gas	Argon
Preliminary pressure		6 bar
Consumption		Approx. 50 – 60 ml/min
Electrical variables	Power supply	110 to 240 V AC, 50/60 Hz
	Fuses	T 4.0 AH (2x) Only use original fuses from Analytik Jena
	Typical average power con- sumption	40 W
	Interfaces	to the multi EA 5100, multi EA 5000: RS 232 to the compEAct: RS 485

## 11.2 GSS adapter box technical data

Dimensions (W x H x D)	approx. 400 x 170 x 200 mm
Mass	Approx. 5 kg (w.o. containers)
Pressure range (sample)	0 to 200 bar
Pressure range (display)	0 to 4 bar

### 11.3 Ambient conditions for transport and storage

Operating conditions	Temperature range	+20 °C to +35 °C
	Max. humidity:	90% at 30 °C
	Air pressure	0.7 bar to 1.06 bar
Storage conditions	Temperature range	+15 to +55 °C
	Max. humidity:	10 to 30 % (use dessicant)
	Air pressure	0.7 to 1.06 bar

## 11.4 Standards and directives

Protection class, protection type	The gas sampling system is protection class I. The housing is protection type IP 20.
Device safety	<p>The gas sampling system complies with the following safety standards</p> <ul style="list-style-type: none"><li>▪ EN 61010-1</li><li>▪ EN 61010-2-081</li><li>▪ EN 61010-2-010</li></ul>
EMC compatibility	<p>The gas sampling system has been tested for emitted interference and interference immunity.</p> <p>It meets the requirements for emitted interference according to</p> <ul style="list-style-type: none"><li>▪ EN 61326-1 (EN 55011 group 1, class B)</li></ul> <p>It meets the requirements for interference immunity according to</p> <ul style="list-style-type: none"><li>▪ EN 61326-1 (requirements for use in a basic EMC environment)</li></ul>
Environmental compatibility	<p>The gas sampling system has been tested for environmental compatibility and meets the requirements according to</p> <ul style="list-style-type: none"><li>▪ ISO 9022-3</li><li>▪ ISO 9022-2</li></ul>
EU directives	<p>The gas sampling system is designed and tested in accordance with the requirements of EU directives 2014/35/EU (NsRL), 2014/30/EU (EMC-RL) and 2011/65/EU (RoHS). The device leaves the factory in a sound condition as far as technical safety is concerned.</p>
Guidelines for China	<p>The device contains controlled substances (in accordance with the guideline "Management Methods for the Restriction of the Use of Hazardous Substances in Electrical and Electronic Products"). Analytik Jena guarantees that the substances will not leak within the next 25 years and, therefore, will not cause any environmental danger or health risk within this period of time if the device is used as intended.</p>