Multi-component FTIR emission monitoring system

ACF5000

Installation Instructions

41/23-820 EN Rev. 1

Power and productivity
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Contents

Preamble

Contents of this operator's manual

This operator's manual contains all the information you will need to safely and properly install, commission, operate and maintain the analyzer system.

This operator's manual contains information on all functional components of the analyzer system. It is possible that the analyzer system delivered differs from the version described here.

System documentation

The system documentation is supplied together with the analyzer system and includes the following documents and CD-ROMs:

- Analyzer data sheet,
- Instructions in brief for installation, commissioning and operation,
- Certificates (e.g. manufacturer's declaration),
- "Software tools and technical documentation" CD-ROM“”
- "Spare Parts Catalog for Analyzer Technology" CD-ROM,
- CD-ROM with the set of drawings prepared specifically for the analyzer system delivered and the following diagrams:
  - Component location diagram,
  - Piping diagram,
  - Interface diagram,
  - Wiring diagram,
  - Electrical plan.

Further Information

Internet

You will find information on ABB Analytical products and services on the Internet at "http://www.abb.com/analytical".

Service contact

If the information in this operator's manual does not cover a particular situation, ABB after sales service will be pleased to provide further information.

Please contact your local service representative. For emergencies, please contact

ABB Service,
Telephone: +49-(0)180-5-222 580, Fax: +49-(0)621-381 931 29031,
E-mail: automation.service@de.abb.com

Identification of safety instructions in this operator's manual

⚠DANGER	If the safety instructions identified in this way is not observed, an accident will occur. This will result in severe bodily or death.
⚠WARNING	If the safety instructions identified in this way is not observed, an accident may possibly occur. This may result in severe bodily injury or death.
⚠CAUTION	If the safety instructions identified in this way is not observed, an accident is likely to or will definitely occur. This may result in moderately severe or slight bodily injury.
WARNING!	denotes information about possible equipment damage when there is no danger to personnel.
NOTE	denotes information about particular features with regard to the handling of the analyzer system and the use of this operator's manual.

Letters and numbering used in this operator's manual

1, ***2***, ***3***, …	is the way reference numbers are used in the figures.
`Display`	is the way information is presented in the display.
`Input`	indicates an input by the user • either by pressing a soft key • or by selecting a menu item • or via the numeric keypad.

Safety instructions

Intended use

Intended use

The ACF5000 analyzer system is designed for continuous measurement of the concentration of individual components in gases or vapors.

Any other application is not compliant with the specified use.

Intended use also includes taking note of this operator's manual.

The analyzer system may not be used for the measurement of ignitable gas/air or gas/oxygen mixtures during normal service. The analyzer system may not be set up in potentially explosive atmospheres.

In normal service, the interior of the analyzer system contains no potentially explosive atmosphere. Accordingly, installation of explosion protection in the interior is not necessary for operation of the analyzer system.

Safety instructions

Requirements for safe operation

In order to operate in a safe and efficient manner, the device should be properly handled and stored, correctly installed and set up, properly operated and correctly maintained.

Qualifications of the personnel

Only persons familiar with the installation, commissioning, operation and maintenance of comparable devices and certified as being capable of such work should work on the device.

Instructions and regulations to be observed

These include

- The contents of this operator's manual,
- The safety information affixed to the device,
- The applicable safety regulations for installing and operating electrical devices as well as
- The applicable safety regulations for working with gases, acids, condensates, etc.

National regulations

The regulations and norms, standards and directives cited in this operator's manual are applicable in the Federal Republic of Germany. The applicable national regulations should be followed when the device is used in other countries.

Device safety and safe operation

The device has been designed and tested in accordance with EN 61010 Part 1, "Safety requirements for electrical equipment for measurement, control, and laboratory use" and has been shipped ready for safe operation.

In order to maintain this condition and to assure safe operation, the safety information in this operator's manual must be observed. Failure to do so can put personnel at risk and lead to equipment damage as well as damage to other systems and devices.

Protective conductor terminal

The protective conductor (grounding wire) should be attached to the protective conductor terminal before any other connection is made.

Risk when the equipment grounding conductor is interrupted

The unit can pose a danger if the protective conductor (equipment grounding conductor) is interrupted inside or outside the unit or is disconnected from the protective conductor terminal.

Risks involved when opening the covers

Current-conducting components can be exposed when the covers or parts are removed, even if this can be done without tools. Current can be present at some connection points.

Risks involved in working with open equipment

All work on equipment that is open and connected to power should be performed only by trained personnel who are familiar with the risks involved.

When safe operation can no longer be assured …

If it is apparent that safe operation is no longer possible, the device should be taken out of operation and secured against unauthorized use.

The possibility of safe operation is excluded:

- If the device is visibly damaged,
- If the device no longer operates,
- After prolonged storage under adverse conditions,
- After severe transport stresses.

Safety instructions for handling the analyzer system

⚠WARNING

The warning symbols affixed to the analyzer system must be observed“”:

Heed the operating instructions!

Hot surface! (Temperature > 60 °C)

Risk of electric shock!

The following must also be observed:

- The safety instructions for handling an analyzer system with integral VOC analyzer (see page 10)
- The safety instructions for working with poisonous gases (see page 13)
- The safety instructions for handling an FTIR spectrometer (see page 12)

⚠WARNING

The gas paths in the analyzer system and the integral analyzer must not be opened! The gas paths can become leaky as a result!

If the gas paths inside the analyzer system must nevertheless be opened, it is essential that they be subjected to a leak test after being closed again.

Safety instructions for handling an analyzer system with integral VOC analyzer

Safety precautions

If a VOC analyzer is installed in the analyzer system, the following safety precautions must be taken at the factory to ensure safe operation:

- Installation of a hydrogen flow restrictor in the cabinet wall (bulkhead fitting with an integrated flow restrictor, max. 10 L/h, for connection to the combustion gas line),
- Use of stainless steel piping, compression fittings and valves,
- Shutoff of the hydrogen supply in the event of malfunctions,
- Check of the combustion gas paths for leaks inside the analyzer cabinet,
- Installation of a sintered metal fitting in the cabinet wall to allow escape of hydrogen to the outside in the event of leaks.

⚠WARNING

The combustion gas path in the analyzer cabinet and especially in the integral VOC analyzer must not be opened! The combustion gas path can become leaky as a result!

If the combustion gas path inside the analyzer cabinet must nevertheless be opened, it is essential that it be subjected to a leak test with a hydrogen leak detector (thermal conductivity) after it is closed again!

The bulkhead fitting with integral flow restrictor for connection of the combustion gas line is a safety-relevant component. It must not be removed, modified or replaced under any circumstances!

The integrity of the combustion gas path in the analyzer system as well as the combustion gas feed line must be checked prior to commissioning as well as regularly during operation.

Combustion gas that escapes from leaks in the gas paths can cause fires and explosions, even outside the analyzer system!

"Hydrogen monitoring of the analyzer cabinet" option

Function

The "hydrogen monitoring of the analyzer cabinet" option is an additional safety measure. If a leak occurs in the hydrogen path inside the analyzer cabinet and hydrogen accumulates inside the cabinet, both the hydrogen supply and the power are shut off before the explosion limit is reached – at 40 % LEL. This prevents formation of an ignitable mixture.

Scope of delivery

Installed in the analyzer cabinet:

- In the upper area, an ATEX-certified gas sensor with connection socket,
- On the sidewall, a solenoid valve that interrupts the hydrogen supply at 40% LEL.

Also supplied:

- A gas warning center for evaluating the gas sensor signal,
- A contactor for disconnecting the power supply to the analyzer cabinet,
- A contactor for disconnecting the UPS if the system is prepared for a UPS.

Installation

The **gas warning center** must be installed outside the analyzer cabinet in a non-hazardous area in a distribution cabinet or the like. It must be electrically connected to the gas sensor (see the project-specific drawings in this regard). Operation and signal evaluation are the responsibility of the user; they are independent of the analyzer system.

The **solenoid valve** for disconnecting the hydrogen supply as well as the coils of the contactors and relays for disconnecting the power supply and UPS (if present) must be connected to a fault-signaling contact in the gas warning center. The fault-signaling contact must be set so that the voltage is shut off at 40% LEL and the contact itself latches.

The measuring signals (analog outputs and inputs), the status signals (digital outputs and inputs) as well as the bus systems of the analyzer system are so designed that after the power supply (and possibly the UPS) are disconnected no component in the analyzer cabinet (contactor, relay, motor etc.) that could generate an ignition spark can be actuated from the outside.

In the factory-supplied state, the measuring and status signals as well as the bus systems do not need to be shut off in the event of an alarm. If, however, an additional external signal is fed in, it is necessary to check whether this signal must be shut off when the gas sensor indicates a fault.

⚠WARNING

If the above-mentioned instructions are not observed or the option is installed incorrectly, a hydrogen explosion may occur in the event of a malfunction.

Safety instructions for handling an FTIR spectrometer

Electrical safety

	The FTIR spectrometer has an unprotected metal housing that is connected directly to ground potential via the power cable and is thus classified as "Safety Class 1 Equipment".
⚠WARNING	Before fuses are replaced, the unit must be disconnected from the power supply. To avoid electric shock, the unit may not be operated if there is an indication that any part of the outer surface is damaged.
⚠CAUTION	To protect against fires, only a fuse of the specified type and current rating may be used. To protect against electric shock, the protective conductor (equipment grounding conductor) of the power cable must be connected to ground potential.
WARNING!	The unit must not be exposed to any source of the excessive moisture. The unit may not be used in an explosive hazardous atmosphere.
NOTE	Approval from the responsible authorities is required for measurement of combustible gases.

Laser safety

	Under normal conditions, the FTIR spectrometer can be operated completely safely (Class 1 laser product – see name plate).
	Type of laser installed in the interferometer: Class 3B VCSEL laser to IEC 60825-1 as well as 21 CFR Chapter 1, Subchapter J Output: max. 2 mW Wavelength: 760 nm (laser beam invisible to the human eye)
⚠WARNING	The housing of the interferometer may not be opened during normal operation. It contains no user-operated parts. The housing of the interferometer may be opened only by authorized ABB service personnel. Opening the housing of the interferometer and the interferometer module in particular can result in contact with laser radiation. Radiation from Class 3B lasers poses a danger to the human eye both when viewed directly or if reflected. When working on an open interferometer, it is absolutely essential to wear safety glasses that protect against laser radiation!

Safety instructions for working with poisonous gases

⚠WARNING

Some gas components whose concentration is measured with the analyzer system are hazardous to health or poisonous.

For this reason, the sample gas must under no circumstances be allowed to escape from the sample gas path in either the measurement mode or when performing maintenance.

The analyzer system must be checked for leaks regularly.

The diluted stack gas must be discharged outside the room where the analyzer cabinet is installed.

Ensure adequate ventilation of the room in which the analyzer system is installed.

Description of the ACF5000 analyzer system

Description of the analyzer system

Application

The ACF5000 analyzer system is a multi-component analyzer system for continuous measurement of the concentration of individual components in the flue gas of industrial incinerators.

The field of application of this measuring equipment basically involves tasks associated with emissions monitoring; use in process control applications, however, is also possible.

Function

The gas to be measured is drawn from the gas channel by means of a gas sampling probe and conveyed to the analyzer cabinet via a heated sample gas line. The sampling probe contains a particulate filter that removes dust particles from the gas. As a standard feature, the analyzer system controller offers the ability to connect the zero gas and test gas to the sampling probe upstream of the filter element automatically. Automatic cleaning of the sampling probe filter is available as an option.

The gas path from the sampling location to the analyzer is heated throughout (180 °C) to prevent the temperature from dropping below the dew point or condensation of flue gas. The heating is controlled and monitored by the system's electronics.

An optional heated measuring point selector can be configured for process measurements.

Conveying of the sample to the analyzer is based on the injector principle and employs an air jet injector that is integrated into the heated sample handling block (ASP block). This, in turn, is connected directly to the heated gas cell.

Test gases can be connected either automatically or manually to both the gas sampling probe and directly to the analyzer.

Measuring principle

The analyzer system operates on the principle of FTIR spectrometry. The concentrations of a variety of stack gas components that exhibit absorption bands in the mid-infrared range can be determined.

Each gas absorbs infrared radiation in a specific region of the spectrum. The radiation absorbed at a given wavelength is a function of the gas concentration. The FTIR analyzer (spectrometer) measures how much radiation was absorbed at specific wavelengths.

The information about the absorption processes is processed in the system's electronics and converted into measured values. At the same time, the spectra of all components are recorded.

A zirconium dioxide sensor for measurement of the oxygen content is an integral part of the analyzer system.

Options

Validation

A validation wheel can be installed in the beam path of the spectrometer to confirm the validity of the spectrometer adjustment.

Total carbon measurement

A flame ionization detector (FID) for measurement of the total carbon content (VOC) can be incorporated into the analyzer system.

Display and signal processing

The current concentration of the individual measured components and the status signals are shown on the system display.

The system controller has been designed for the requirements of emissions and process measurement. It offers a system-internal CAN bus and field bus systems such as Modbus and PROFIBUS as interfaces. An Ethernet interface for remote monitoring of the entire analyzer system and transmitting data via internal or external TCP/IP networks is included. Remote control of the analyzer system is possible via a UMTS router. Analog outputs for the measured components and relay contacts for fault/status messages are standard.

Components of the analyzer system

The analyzer system delivered can deviate from the version described in this section.

Gas sampling

- Stainless steel probe tube, unheated (Type 40) or heated (Type 42)
- Filter unit, heated (Type PFE2), with check valve, with back-purging (option)
- Sample gas line, heated (Type TBL01)
- Heated selector valve for switching between two sampling points

Sample gas handling

- Sample gas handling block (ASP block), heated, with stainless steel microfilter and air jet injector
- ACF5000 electronics box with automatic connection of purge gas and test gas
- Flow rate, pressure and temperature sensors

Air purifier

- Zero gas for the spectrometer and the oxygen analyzer
- Purge gas for the spectrometer and the entire measuring system

Analyzers

- FTIR spectrometer with heated sample cell
- Oxygen analyzer (zirconium dioxide sensor)
- VOC analyzer (flame ionization detector, option)

Control, operation and display

- Display and control unit in the door of the analyzer cabinet
- AO2000 system controller
- ACF5000 electronics box
- Controls for the air jet injector as well as the oxygen and VOC analyzers
- Interfaces for
  - Measured values and status signals (analog and digital outputs or Modbus)
  - Remote control and diagnosis (modem and/or Ethernet)

For emission measurements in compliance with applicable European Directives, the analyzer system must be operated with certified AO2000 system software.

Preparing for installation

Selection of the sampling point, installation of the wall tube

Selection of the sampling point

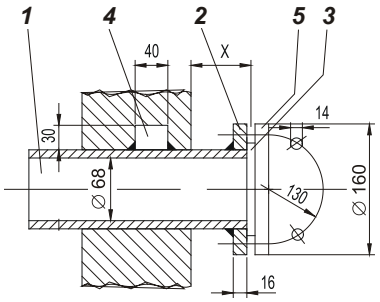
- The sampling point must be suited for extracting a representative sample stream.
- The probe tube must be readily accessible for maintenance work.
- The PFE2 filter unit must be protected from direct exposure to heat and soiling. The protective enclosure provides protection class IP54.

NOTE	In compliance with DIN EN 15259, the sampling point for emission measuring equipment is specified by the responsible entities accredited in accordance with DIN EN ISO/IEC 17025.

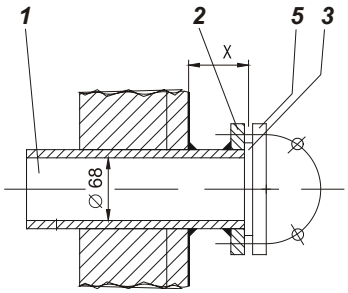
Installation of the wall tube with mounting flange

The wall tube with mounting flange (DN 65, PN 6, Form B to DIN 2573; not included with delivery) should be installed at the sampling point such that the probe tube can be inserted and withdrawn without difficulty.

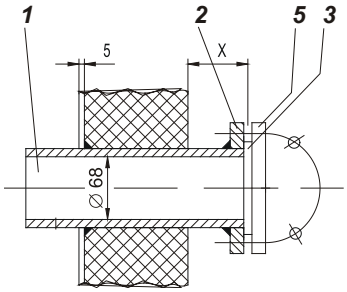
Installation of the wall tube in brickwork (dimensions in mm):



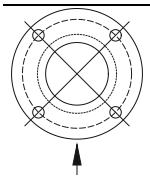
Installation of the wall tube in brickwork with metal sheeting (dimensions in mm):



Installation of the wall tube in an insulated sheet-metal channel (dimensions in mm):



1	Wall tube
2	Assembly flange DN 65, PN 6, Form B to DIN 2573
3	Gasket
4	Welded-on rectangular block
5	Sampling probe flange



The figure shows an image of the flange as viewed from the process to the filter. The arrow indicates the flow direction of the process gas.

Select the mounting position of the wall tube so that the holes are located in the position shown here.

Minimum distance x_{min} of the mounting flange on the wall tube from the wall as a function of installation angle α:

Installation angle α	10°	15°	20°	25°	30°	35°
x_{min}/mm	229	248	268	287	307	324

Requirements for the analyzer cabinet installation site

WARNING! The analyzer cabinet may not be set up in potentially explosive atmospheres!

Short gas paths

- The analyzer cabinet should be set up as close as possible to the measuring point. A short sample gas line translates into short dead times. Because of the pressure drop in the line and the required electrical protection, the length of the heated sample gas line must not exceed 60 meters when connected to 230 V AC and 40 meters when connected to 120 V AC. Depending on the altitude of the installation site, these values may be lower.
- The test gas bottles should be set up as close as possible to the analyzer cabinet.

Protection from adverse conditions

- The analyzer cabinet must be protected from
  - Jets of water,
  - Contact with chemicals,
  - Strong sunlight and heat,
  - Strong air currents,
  - Extremely dusty environments,
  - Corrosive atmospheres,
  - Vibration.

Climatic conditions

- Ambient temperature for storage and transport -25…+65 °C
- Ambient temperature during operation
  - with built-in fan (option) +5…+30 °C
  - With built-in air conditioner (option) +5…+45 °C
- Relative humidity during operation
  - Annual average max. 75 %
  - briefly max. 95 %
- seldom and slight condensation permissible if the analyzer system is switched on and the FTIR spectrometer is purged

NOTE The analyzer cabinet should be packaged during storage and transport!

Installation site

The gas analyzer is intended solely for installation indoors.

The maximum altitude of the installation site is 800 m above sea level (for 10 m longer sample gas line with probe).

Note: The minimum inlet pressure at the analyzer cabinet is 900 hPa. This yields a maximum elevation of the installation site of 800 m; however, the pressure drop across the gas sampling probe (15 hPa for a new and clean probe) and the sample gas line must be taken into account. Higher altitudes would result in insufficient gas flow through the system. The inlet pressures for the ACF5000 may not be lowered, as this directly reduces the sensitivity of the FTIR spectrometer. As a consequence, the measuring accuracy and drift in accordance with QAL1, QAL2 and QAL3 for components with a low concentration cannot be assured.

Space requirement

•	to the right	0.5 m	for the gas lines and the electrical lines as well as for air entry into the fan (option)
•	to the left	0.5 m	for air discharge from the fan (option)“”
		1 m	for the air conditioner (option)
•	at the front	1 m	for opening the door (hinged on the left)
•	above	0.5 m	with built-in air conditioner in order to prevent heat buildup

Floor

The floor at the installation site must be level and sufficiently strong to support the weight of the analyzer cabinet (approx. 300 kg).

Sample gas inlet conditions

Sample gas inlet conditions

⚠WARNING	The analyzer system may not be used for the measurement of ignitable gas/air or gas/oxygen mixtures during normal service.
WARNING!	The analyzer system may not be used for the measurement of gases containing organometallic compounds, e.g. lead-containing fuel additives or silicone oils. If the analyzer system is used to measure HF, the seals in contact with the sample gas must be made of FFKM. This applies also in the case of a gas sampling probe delivered separately.

Temperature	Controlled to 180 ± 2 °C by means of the heated sample gas line
Inlet pressure	Analyzer cabinet inlet leading to the sample gas handling block: p_{abs} = 900–1100 hPa (0.9–1.1 bar)
Flow rate	Typically approx. 200…250 L/h

Process gases and test gases

FTIR spectrometer

Zero gas:	
Quality	Clean compressed air from the air purifier
Inlet pressure	p_e = 2000 ± 100 hPa (2.0 ± 0.1 bar)
Flow rate	500 L/h
Span gas:	
Quality	Measured component in N_2, 70…80 % of the measuring range (accuracy ± 2 %)
Inlet pressure	p_e = 1500 ± 100 hPa (1.5 ± 0.1 bar)
Flow rate	500 L/h
NOTE	The test gases H_2O, HCl, HF and NH_3 are produced by a vapor generator through vaporization of distilled water, HCl, HF or NH_3 solutions with known concentrations.

VOC analyzer

Combustion gas:	
Quality	H_2, Quality 5.0
Inlet pressure	p_e = 1200 ± 100 hPa (1.2 ± 0.1 bar)
Flow rate	approx. 4 L/h
NOTE	Provide two 40-L bottles and a selector station. A flow restrictor that limits the combustion gas flow rate to 10 L/h is installed in the bulkhead fitting for connection of the combustion gas line.
Zero gas:	
Quality	N_2, Quality 5.0
Inlet pressure	p_e = 1000 ± 100 hPa (1.0 ± 0.1 bar)
Flow rate	300 L/h
Span gas:	
Quality	n-propane C_3H_8 in N_2, 70…80 % of the measuring range (accuracy ± 2 %)
Inlet pressure	p_e = 1000 ± 100 hPa (1.0 ± 0.1 bar)
Flow rate	300 L/h
NOTE	Since the VOC analyzer measures only the number of C atoms, the concentration of the zero gas must be converted from ppm or mg/m^3 C_nH_m into ppm or mg/m^3 C.

O_2 analyzer

Zero gas:

Quality	3 vol.-% O_2 in N_2 (accuracy ± 2 %)
Inlet pressure	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)
Flow rate	500 L/h

Span gas:

Quality	Clean compressed air (20.96 vol.-% O_2) from the air purifier
Inlet pressure	p_e = 1100 ± 100 hPa (1.1 ± 0.1 bar)
Flow rate	500 L/h

Instrument air

Quality	Following ISO 8573-1 Class 2 (particle size max. 1 µm, particle density max. 1 mg/m^3, oil content max. 0.1 mg/m^3, pressure dew point max. – 20 °C)
Inlet pressure	p_e = 5500…7000 hPa (5.5…7.0 bar)
Flow rate	approx. 1800 L/h

NOTE	Provide pressure regulator and shut-off valve in the supply line to the analyzer cabinet; as close as possible to the installation site of the analyzer cabinet.

Compressed air for back-purging

Quality	Clean compressed air, dry (dew point < 3 °C), oil- and dust-free
Inlet pressure	max. 6 bar for back-purging, approx. 4 bar as control air (needed for 2-stage back-purging with Type PFE2 filter unit and VOC analyzer)
Flow rate	approx. 100 m^3/h

NOTE	Compressed air is needed to clean the sampling filter and the probe tube as well as for controlling the control valves.

Definition

$p_e = p_{abs} – p_{amb}$ with p_e = gauge pressure, p_{abs} = absolute pressure, p_{amb} = atmospheric pressure

Power supply

Power supply

Voltage	230/400 V AC, 3 phases [1] or 120/208 V AC, 3 phases [1] or 100/200 V AC, 3 phases (via transformer), ± 10 %, 48…62 Hz	
Fuse (external)	3 x 20 A or 3 x 25 A	
Power consumption	approx. 2200 VA, approx. 1500 VA	during power-up, during operation
	+ approx. 800 VA	for heated probe tube
	+ approx. 250 VA	for heated filter unit
	+ approx. 90 VA/m	for heated sample gas line
	+ approx. 1000 VA	for air conditioner
	+ approx. 350 VA	for heated selector valve with "2nd measuring point" option

1) L1, L2, L3, N, PE, current-carrying neutral is not allowed.

Uninterruptible power supply (UPS)

The option "prepared for UPS" is not possible in the case of a 100 V AC power supply.

Voltage	230 V AC, 1 phase [1] or 120 V AC, 1 phase [1], 48…62 Hz
Fuse (external)	20 A
Power consumption	approx. 500 VA (incorporated into above values)

1) L, N, PE, current-carrying neutral is not allowed.

Service socket

230 V AC or 120 V AC, 48…62 Hz, max. 5 A.

The service socket is located in the cabinet light fixture.

Fuses

	Function	Rated value
–F80	Supply ground-fault circuit interrupter	30 A/30 mA
–F81	Fan or air conditioner (option)	6 A or 16 A
–F82	Lighting, service socket	6 A
–F83	Type 42 probe tube heater, PFE2 filter unit heater, back-purging valves	6 A (only PFE2) or 10 A (PFE2 + tube 42, 230V) or 16 A (PFE2 + tube 42, 120V)
–F84	Heated sample gas line	16 A
–F85	ACF5000 electronics box, ASP block heater, gas cell heater	6 A
–F86	Air purifier, FTIR spectrometer, flow monitor, system controller, power supply unit 24 V/5 A	6 A
–F87	Option "2nd measuring point": Type 42 probe tube heater, PFE2 filter unit heater, back-purging valves	6 A (only PFE2) or 10 A (PFE2 + tube 42, 230V) or 16 A (PFE2 + tube 42, 120V)
–F88	Option "2nd measuring point": heated sample gas line	16 A
–F89	Option "2nd measuring point": heated selector valve and heated sample gas line to analyzer cabinet	6 A
–F90	UPS supply ground-fault circuit interrupter	25 A/30 mA
–F91 … –F99	Relay coils, contactor coils, solid-state relays, selector solenoid valve (ceramic fuses)	T 2 A

⚠CAUTION High leakage current: 9 mA!

Dimensions, weights and noise level

Dimensions

see "Location diagram" in the system documentation

Weights

Analyzer cabinet		approx. 300 kg
Type 40 probe tube (unheated) depends on length	500 mm	1 kg
	1000 mm	2 kg
	1500 mm	3 kg
	2000 mm	4 kg
	2500 mm	5 kg
Type 42 probe tube (heated) depends on length	1000 mm	8 kg
	1500 mm	10 kg
	2000 mm	12 kg
Type PFE2 filter unit, heated, with protective enclosure		20 kg
Type TBL01 sample gas line, heated		1 kg/m
System transformer from 100 V to 230 V		42 kg
Electrical distribution cabinet for "2nd measuring point" option		60 kg
Heated selector valve for "2nd measuring point" option		8 kg

Noise level

Fan	50 Hz	59 dB(A)
	60 Hz	61 dB(A)
Air conditioner		70 dB(A)

Scope of delivery

Standard Scope of Supply and Delivery

Qty.	Description
1	Analyzer cabinet (all components installed)
1 set	system documentation

Included with delivery if ordered

Qty.	Description
1	Type 40 (unheated) or Type 42 (heated) gas sampling probe
1	Type PFE2 filter unit, heated
1	Type TBL01 sample gas line, heated
1	System transformer, 100 V to 230 V (option)

2nd measuring point option

Qty.	Description
1	Type 40 (unheated) or Type 42 (heated) gas sampling probe
1	Type PFE2 filter unit, heated
1	Type TBL01 sample gas line, heated
1	Heated selector valve
1	Heated sample gas line to analyzer cabinet
1	Electrical distribution cabinet for 2nd measuring point

Material required for installation (not supplied)

Gas sampling

	Wall tube with mounting flange (DN 65, PN 6, Type B to DIN 2573)

Gas lines

Instrument air	1 tube or compressed-air hose, O.D. 6 mm or 1/4 in. (with pressure regulator and shut-off valve)
Combustion gas for the VOC analyzer	1 extremely clean (hydrocarbon-free) stainless steel tube (SS316), O.D. 6 mm or 1/4 in. 1 two-stage cylinder pressure reducer (designed for high-purity gases) with flow restriction
Test gas for FTIR	1 PTFE tube 4/6x1 mm or 1/6 in./1/4 in.
Test gas O_2 measurement	1 PTFE tube 4/6x1 mm or 1/6 in./1/4 in.
Test gases for VOC measurement	2 PTFE tubes 4/6x1 mm or 1/6 in./1/4 in.
Test gases for drift check	3 PTFE tubes 4/6x1 mm or 1/6 in./1/4 in.
Purge gas for sampling	1 PTFE tube 4/6x1 mm or 1/6 in./1/4 in., length about the same as the sample gas line
Stack gas	1 hose, O.D. 12 mm or 1/2 in.
	Pressure reducer for high-purity gases

Power supply lines

Power supply	5 x 6 mm^2 in compliance with DIN EN 61010-1 or 5 x AWG8
UPS (option)	3 x 2.5 mm^2 or 3 x AWG14
Connecting cables	for the connections from the analyzer cabinet to the heated gas sampling probe, filter unit and sample gas line (possibly high- temperature design; take the power consumption of these components into account)
Grounding cable	$\geq$ 10 mm^2 or AWG6
	When selecting the cable material, observe the applicable national safety requirements for installing and operating electrical equipment.

Signal lines

- Shielded cables for the analog outputs (current outputs)
- Shielded cables for the analog inputs (current inputs with the option "external analog inputs")
- Cables for the digital outputs
- Cables for the digital inputs (with the option "external digital inputs")
- Cables for the data lines (Modbus, PROFIBUS, Ethernet), possibly fiber-optic cables for longer transmission distances
- Cables for the Pt 100 resistance thermometers in the heated components

When selecting the cable material, observe the applicable national safety requirements for installing and operating electrical equipment.

Assembly

Bolts and nuts for fastening the analyzer cabinet to the floor (see "Location diagram" in the system documentation)

Installation

General information

- It is recommended that the analyzer system be installed by ABB.
- In addition to the present operator's manual, refer to the order-specific set of drawings as well as the operating instructions, technical information and data sheets for the individual devices and components when installing the analyzer system.
- If there is shipping damage which indicates improper handling, file a damage claim with the shipper (rail, mail or freight carrier) within seven days.
- Ensure that the enclosed accessories are not lost (see "Scope of delivery" (see page 46)).
- Retain the packaging material for possible future transport.

Setting up the analyzer cabinet

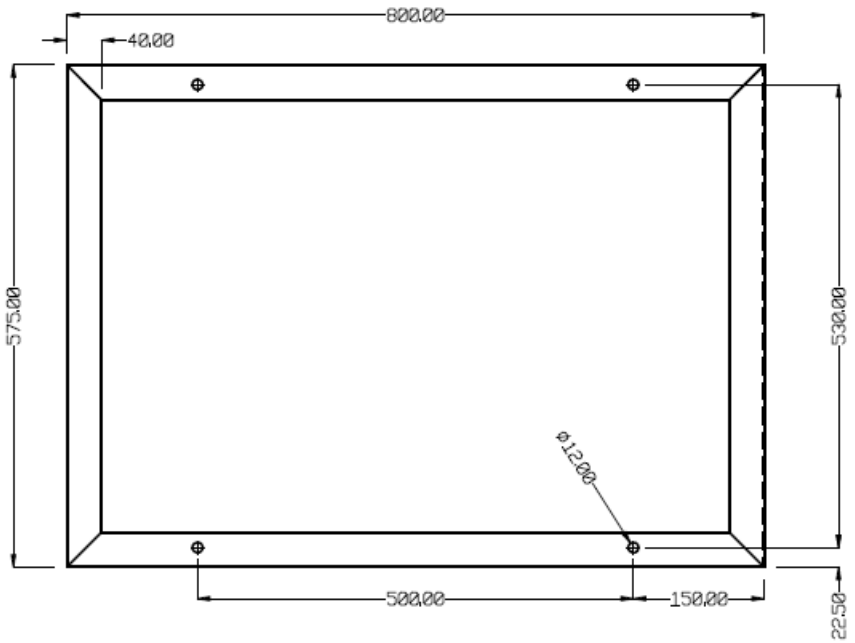
NOTE

It is strongly recommended to have the analyzer cabinet

- transported by a qualified company
- while the cabinet is lying on its back as long as possible and
- to stand it up only immediately prior to installation!

Providing the foundation

- Refer to the "Requirements for the installation site" (see page 17).
- Refer to the "Location diagram" in the system documentation.
- Provide concrete base with cast-in stud bolts (M10) or iron base frame with holes or grate (dimensions in mm, see following image).



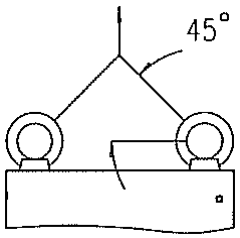
Unpacking the analysis cabinet

⚠CAUTION

The analysis cabinet weighs approx. 300 kg! A crane with suitable transport gear is required for unpacking and transporting!

Use the transport lugs provided to sling the pull ropes on the analysis cabinet.

The pull ropes must be long enough to ensure a minimum angle of 45° when under tension (see figure below)! If this is not the case, the analysis cabinet can warp!



1 Open the transport case and take out the analysis cabinet.

2 Do not remove the plastic film in which the analysis cabinet is wrapped for the time being! Unpacking the analysis cabinet when cold can cause condensation.

3 Remove the plastic film only when the analysis cabinet has reached room temperature. This takes at least 24 hours.

Installing the analysis cabinet

- Observe the "Requirements for the installation location" (see page 33).
- Provision the "Requisite material" (see page 48).
- Observe the "Arrangement diagram" in the system documentation.
- Earthing via central earthing screw, route earthing cable (≥ 10 mm^2, AWG6 with "CSA version") option through the M16 cable gland provided in the right-hand cabinet wall for this purpose.

Removing transport securing devices in the analyzer unit

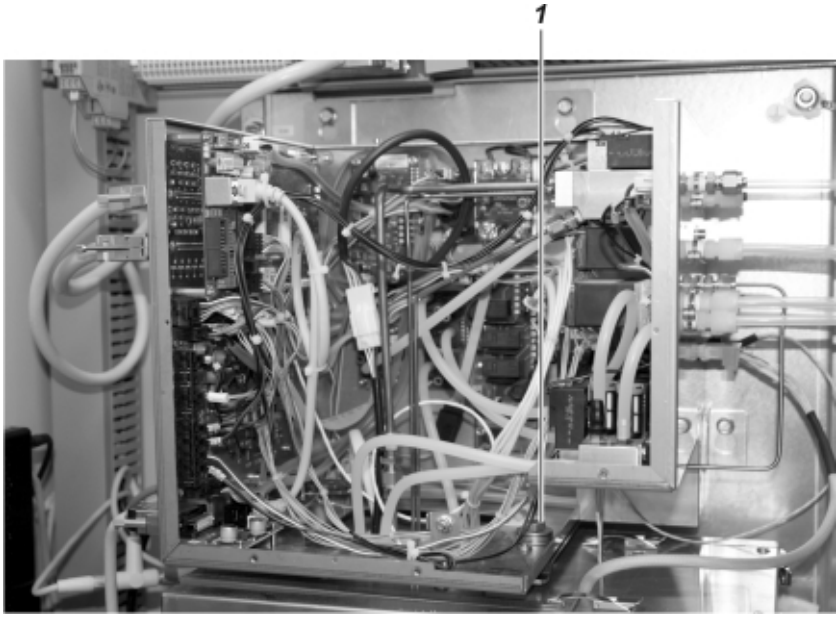
NOTE Removing the transport securing devices immediately before commissioning the analyzer system is highly recommended.

Removing the transport securing device in the ASP block

The ASP block is fastened by means of a M8x80 transport securing device. This is routed from above through a hole in the housing of the ACF5000 electronic box and screwed into the ASP block.

1 Open the cover of the ACF5000 electronic box and take it out.

2 Using a 13 mm spanner, undo the transport securing ***1*** and remove it together with the washer.



3 Remount the cover of the ACF5000 electronic box and close.

4 Keep the securing screw together with the washer for transporting at a later time.

"2nd measuring point" option

Installing the electrical distributor cabinet

The electrical distributor cabinet for connecting the 2nd measuring point must be installed as close to the analysis cabinet as possible.

Cables of approx. 5 m in length are slung at the analysis cabinet for connecting to the electrical distributor cabinet.

Installing the heated switchover valve

The heated 3/2-way solenoid valve for switching between the two measuring points must be assembled as close to the analysis cabinet as possible.

The sample gas lines from the two sampling points and the 1.5 m sample gas line to the analysis cabinet must be connected to the switchover valve. During installation of the sample gas lines, the information in Section "Installing sample gas line" (see page 62) must be observed.

Installing the gas sampling probe and filter unit

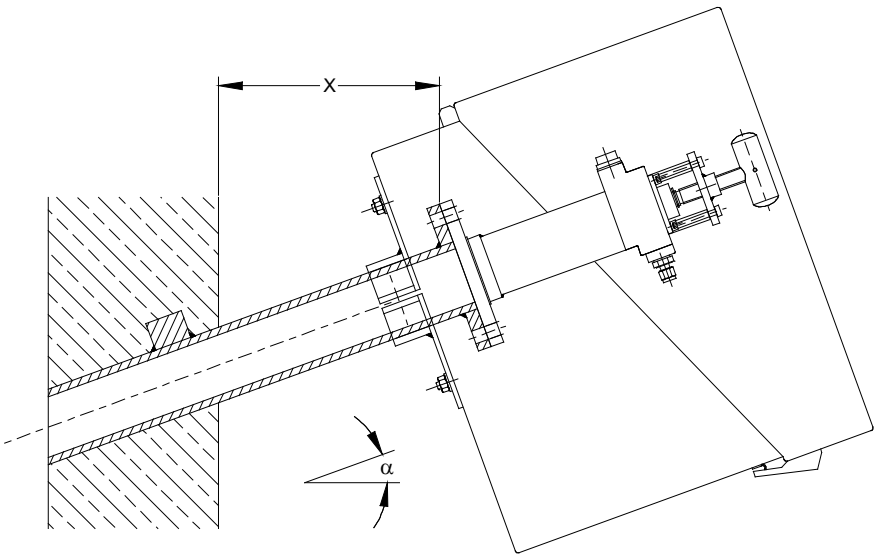
Installing the gas sampling probe and filter unit

- Observe the "Piping diagram" in the system documentation.
- Install the gas sampling probe and filter unit:

⚠CAUTION The pre-assembled probe tube with filter unit weights approx. 17–32 kg, depending on the version! Two persons are required for the transporting and assembly operations!

  - Probe tube 40: Insert pre-assembled probe tube with filter unit into the wall tube and screw the assembly flange to the filter device flange.
  - Heated probe tube type 42: Insert probe tube into the wall tube and screw up to the assembly flange. Screw filter unit up to the flange.
- Connect the electrical leads on the gas sampling probe and filter unit as per the "Wiring diagram" and "Terminal diagram" in the system documentation.

Assembling the probe's protective case with the filter unit PFE2



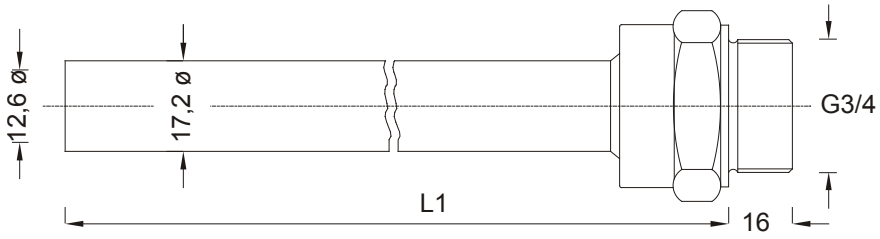
Mounting angle α	10°	15°	20°	25°	30°	35°
x_{min}/mm	229	248	268	287	307	324

Probe tube type 40

L1 = length of the probe tube (dimensions in mm)

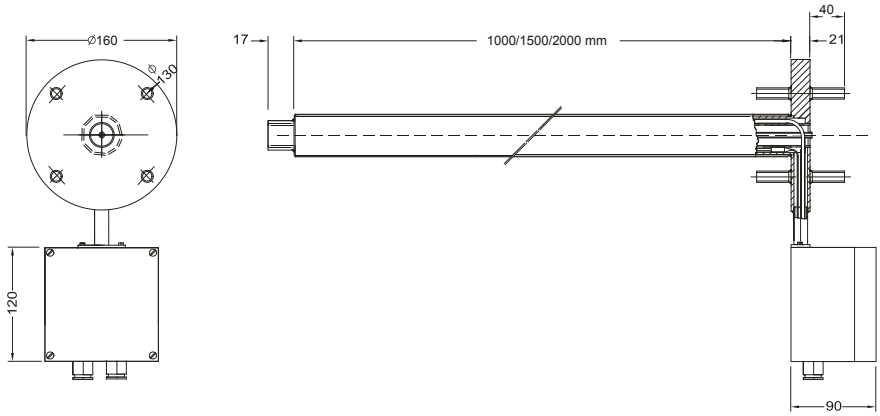
L1 = 500/1000/1500/2000/2500 mm

Edelstahl W-Nr. 1.4571 (max. 500 °C)



Probe tube type 42

(dimensions in mm)



- If the PFE2 filter unit with standard protective box (450x450x400mm) is mounted to the heated, type 42 probe tube, the electrical connections on the probe tube must be connected to the connected to the terminal box of the filter unit; in this case, the small terminal box, which is part of the heated probe tube, is not required.
- It must be ensured that the sample gas in the gland base, which is installed between the type 42 heated probe tube and the PFE2 filter unit, does not fall below operating temperature. The same applies for the wall tube with assembly flange. Insulation and where necessary an auxiliary heater is required for this purpose.

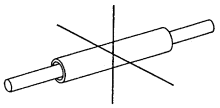
Installing the sample gas line

Installing the sample gas line

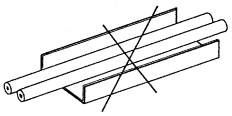
- Observe the "Piping diagram" in the system documentation.
- Connect the sample gas line to the gas sampling probe.

NOTE Neither grease or lubricant may be used during installation of the gas sample line. This can falsify the measured values.

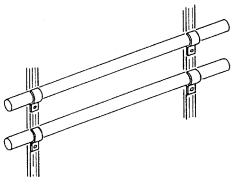
- The sample gas line from the gas sampling probe to the analysis cabinet must be inclined and run as close as possible in a separate channel. Water pockets must not be allowed to form, especially at the sampling point.
- The sample gas line must be laid so as to avoid sharp bends, kinks and the crossing of other lines. The minimum bending radius is 200 mm.
- The heated sample gas line
  - must never be laid through walls if there is a possibility of subsequent sealing by means of sealing compounds. The sample gas line can become damaged as a result;
  - must not be laid in a cable channel;



  - must not be laid near other gas or power lines in a cable grid. This applies in particular for closed cable grids.



- Assemble the heated sample gas lines on freely-laid C-profiles using a counterpart. Do not over-tighten.



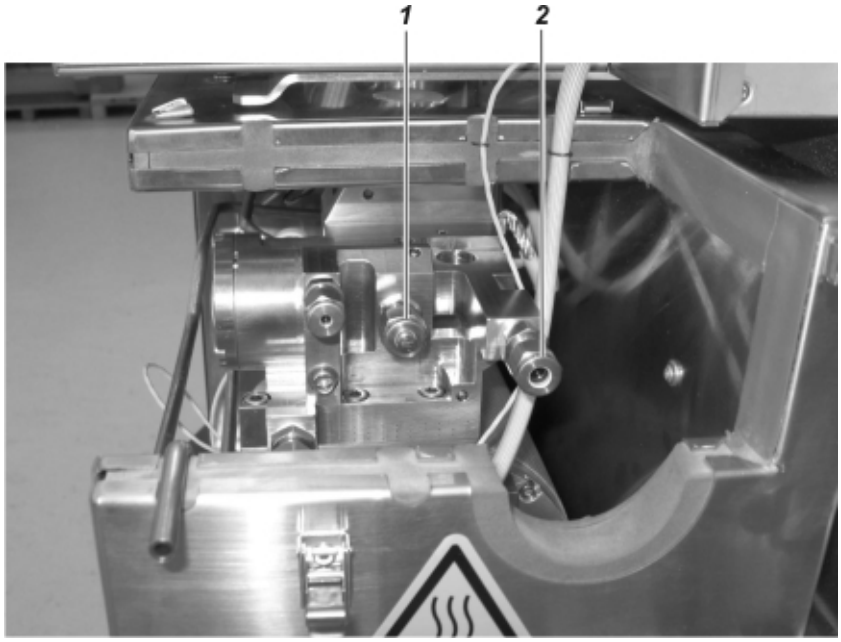
- Insert the sample gas line through the opening in the right-hand cabinet wall.

WARNING!

Do not connect the sample gas line to the sample gas inlet on the ASP block yet! This connection is made by ABB personnel during the commissioning procedure.

First connect a PTFE tube of approx. 0.5 m in length to the sample gas inlet ***2*** on the ASP block. Ambient air will then be sucked into the analysis cabinet from outside once the FTIR spectrometer is powered-up.

The inlet for the water steam generator ***1*** on the ASP block must be closed by means of a blanking plug.



1 Inlet for the water vapor generator

2 Sample gas inlet

- Connect the electrical leads on the gas sampling line as per the "Wiring diagram" and "Terminal diagram" in the system documentation.

Installing the operating gases

Installing the instrument air supply

- Observe the "Requirements for the instrument air supply" (see page 38).
- Provide the material required for the installation (see page 48).
- Observe the "Piping diagram" in the system documentation.
- Connect the instrument air connection lead to the bulkhead fitting in the right-hand cabinet wall.
- Install a shut-off device with pressure gage p_e = 5.5…7 bar in the instrument air connection lead.

Installing the test gas cylinders

- Observe the "Piping diagram" in the system documentation.
- Fit the test gas cylinders with pressure reducers and install in the proximity of the analysis cabinet. Short test gas lines mean short dead times.
- Observe the national regulations for operating pressure vessels, as well as the permissible ambient temperature and the markings on the pressure reducers.

Connecting the Gas Lines

- Provide the material required for the installation (see page 48).
- Observe the "Piping diagram" in the system documentation.
- Ensure the utmost cleanliness when connecting the gas lines! Gas inlets, outlets, fittings, hoses and pipes must be free of dust and grease.
- If there is a risk of frost, heat the gas lines.
- The gas connections (bulkhead fittings) are located in the right-hand cabinet wall. Hold back the bulkhead fittings when connecting the gas lines!

Combustion gas for the VOC analyzer

- Connect the combustion gas line: Connect two-stage cylinder pressure reducer (version for high purity gases) to the combustion gas cylinder. Connect combustion gas line to the bulkhead fitting provided.
  For safety reasons (see page 14) a flow limiter, which limits the combustion gas flow to 10 l/h, is integrated into this bulkhead fitting.

⚠WARNING	This bulkhead fitting is a safety-relevant component. It must not be removed, modified or replaced under any circumstances!

- Check the seal integrity of the combustion gas line: Set the high-pressure stage of the pressure reducer of the combustion gas cylinder to p_e = 1200 ± 100 hPa (1.2 ± 0.1 bar) and purge the combustion gas line. Using a hydrogen leak detector (measuring principle: thermal conductivity) to check the seal integrity of the combustion gas line. Close the combustion gas cylinder.

Waste gas

- Connect the gas discharge line (shortest possible line with inside diameter ≥ 8 mm). Allow waste gas to discharge freely; do not install restrictions or shut-off valves. The inside diameter of the gas discharge line must be expanded as close behind the analysis cabinet as possible, in order to prevent dynamic air pressure on account of excessive line length.
- Ensure air and condensate are separated after discharge. According to the gas transport principle, the sample gas is dissolved in a ratio of approx. 1:5 after being measured in the instrument air. Nonetheless, condensation can occur when the dew point of the water in the mixture has reached ambient temperature.

Purge gas to the probe

- Connect the purge gas line to the gas sampling probe (for emergency purging and feeding test gas to the probe). The purge gas line can be laid on the same tray as the sample gas line.

Compressed air supply for back-purging the probe (option)

- Connect compressed air for cleaning the sampling filter and the probe tube (back-purging option) to the corresponding connections on the probe's protective box.

Connecting the electrical leads

Connecting the electrical leads

- Provide the material required for the installation (see page 48).
- Observe "Arrangement diagram", "Wiring diagram" and "Terminal diagram" in the system documentation.
- The cable glands for the electrical leads are located in the right-hand cabinet wall.
- When laying the electrical leads, observe the relevant national safety regulations for installing and operating electrical systems.

Connect the signal lines

- Lay the signal lines separately from the power supply lines.
- Lay analog and digital signal lines separately from each other.
- Carefully plan the combination of signal lines in cables, including for the purpose of feeding through the cable glands.
- Connect signal lines to the terminal blocks on the I/O modules at the rear wall.
- Lay the screen of the screened cable in accordance with the local regulations. In doing so, consider the potential differences and inter-spersion of interference signals.

Connecting the power supply lines

⚠CAUTION	High leakage current: 9 mA!

- Observe the "Requirements for the power supply" (see page 41).
- Before connecting the power supply, make sure that the operating voltage set on the analyzer system matches the mains voltage.
- The protective earth connection must be attached to a protective earth before any other connections are made. The analyzer system is potentially hazardous if the protective earth is interrupted inside or outside the analyzer system or the protective earth connection is un-made.
- The power supply connection leads and the power supply lines for the heated sampling assemblies (temperature-proof version where applicable) to the corresponding terminal blocks or circuit breakers.
- Attach the connection leads to the Pt100 resistance thermometers of the external, heated sampling assembles to the interface module – X82 on the right-hand side of the wall.

Commissioning

Restart

Commissioning

The analyzer system is essentially commissioned by the authorized personnel of the manufacturer or of the supplier.

Restart

To restart the analyzer system from cold, after a prolonged shutdown for example, proceed as follows.

Procedure

1 Power Supply Activation

  1 Make sure that all circuit breakers are deactivated.

  2 Turn on the main switch.

  3 Activate the circuit breaker in the FTIR spectrometer.

2 Feed-in the instrument air

  1 Check pilot pressure and if necessary set to p_e = 5.5…7 bar.

  2 Check pressures and flows on the pneumatic plate on the right-hand cabinet internal wall against the values in section "Operating gases and test gases" (see page 38).

  WARNING! The hydrogen supply must remain switched off!
  NOTE: The purge line between analyzer system and gas sampling probe must be laid.

3 Activate all other circuit breakers.

4 The analyzer system starts to heat up automatically.

- The assemblies in the analysis cabinet reach their target temperatures after approx. 2 hours. The gas sampling probe reaches its target temperature after 3-4 hours.
- The gas extraction begins as soon as the temperatures of the FTIR cell and ASP block reach 150 °C.
- The sample gas inlet and outlet pressures should adjust automatically to SGI = 850 hPa and SGO = 750h Pa.
  Failure to reach these pressure values indicates a leak in the analyzer system.

5 Connect the sample gas line to the gas sampling probe.

6 Have a complete seal integrity test carried out by certified and authorized personnel.

7 Turn on the hydrogen supply and restart the FID.

Start of the measurement

On a restart, the analyzers start to measure automatically:

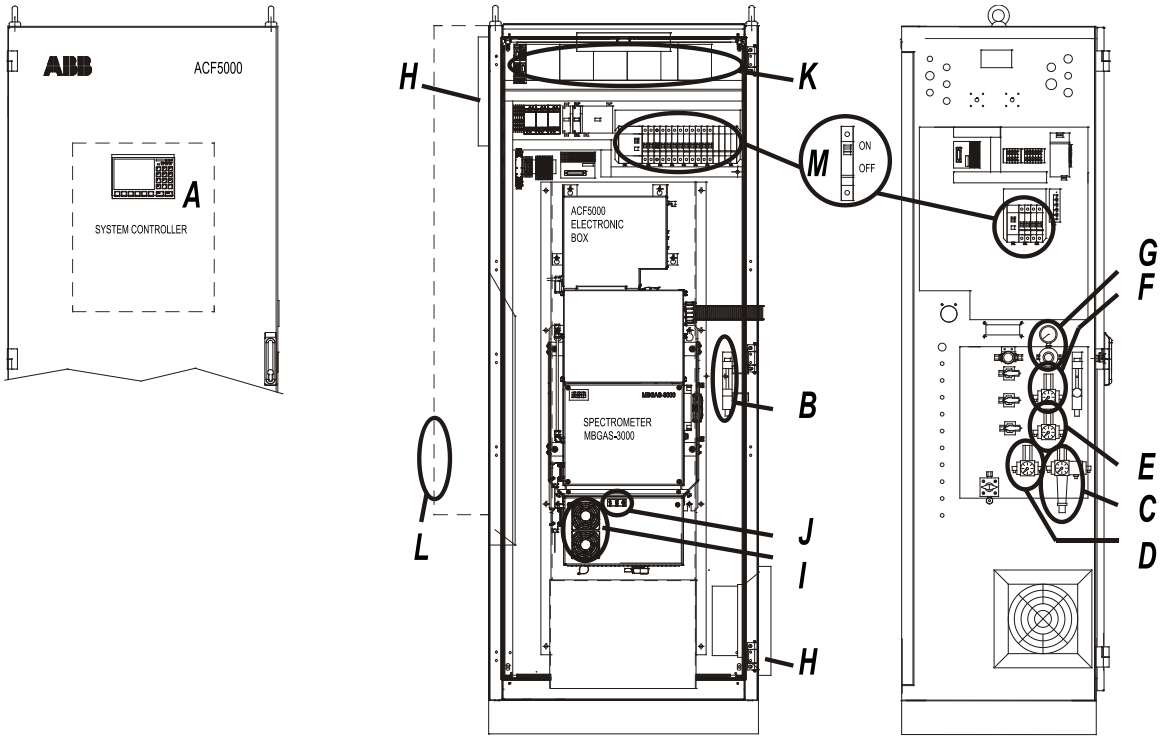
- the oxygen sensor within a few minutes of the circuit breakers being activated;
- the FTIR spectrometer within 5-10 minutes of the circuit breakers being activated (the three LEDs - Power, Status and Network - illuminate green);
- the FID on successful completion of the start sequence.

Inspection and maintenance

NOTE	Only persons familiar with the maintenance of comparable analyzer systems and who possess the qualification required for such work are allowed to work on the analyzer system.
⚠WARNING	The following must be observed during all maintenance work: the general safety instructions (see page 7) the safety instructions for handling the analyzer system (see page 9) the safety instructions for handling the analyzer system with integrated VOC analyzer (see page 10) the safety instructions for dealing with toxic gases (see page 13) the safety instructions for handling the FTIR spectrometer (see page 12)

Visual inspection

External/internal view of the analysis cabinet



Visual inspection

	External instrument air regulator		5.5…7 bar
	External gas cylinder pressure reducer: Zero gas O_2 analyzer (3 vol. % O_2 in N_2) Combustion gas, VOC analyzer (H_2) Zero gas, VOC analyzer (N_2 or zero gas O_2 analyzer) Tail gas, VOC analyzer (propane in N_2)		 1.2 ± 0.1 bar 1.2 ± 0.1 bar 1.2 ± 0.2 bar 1.2 ± 0.2 bar
A	Display: measured values, temperatures, pressures, flows		
B	Purge gas flowmeter		> 75 l/h
C	Instrument air regulator with filter –J85		5.5 bar
D	Instrument air pressure regulator, combustion air, VOC analyzer (–J86)		1.2 ± 0.1 bar
E	Instrument air pressure regulator, injector air (–J96)		4.5 ± 0.1 bar
F	Instrument air pressure regulator, purge air, spectrometer (–J88)		1.8 ± 0.1 bar
G	Instrument air pressure regulator, zero gas (–J93)		2.0 ± 0.1 bar
H	Filter pads in cabinet fan and exit filter		White
I	Filter pads, spectrometer electronics		White
J	Status LEDs on the operator panel of the FTIR spectrometer:	"Power" "Status" "Network"	Green Green Green flashing
K	Status LEDs of the analog and digital output modules		Green
L	Cooling unit display		Actual temperature value (target: 25 °C)
M	Circuit breakers and ground fault circuit interrupters activated		ON

Cleaning instructions

Cleaning instructions

- Never use water or solvents to clean parts of the analysis cabinet interior.
- Always keep the analysis cabinet door closed during operation. Use a brush and vacuum cleaner to remove the dust that has penetrated the analysis cabinet.
- Clean the outside of the analysis cabinet with a damp cloth and mild detergent as and when required. Make sure that water droplets do not enter the analysis cabinet.

Seal integrity test

Complete seal integrity test of the analyzer system

Complete seal integrity tests of the analyzer system are reserved for certified service personnel.

These tests must be performed regularly, at least once per year.

They must be performed after gas paths within the system have been opened and following a restart from cold.

Simplified seal integrity test of the sample gas path

NOTE The simplified seal integrity test is not suitable for testing the overall analyzer system for seal integrity. Therefore, it cannot replace the regular complete seal integrity test in particular (see above).

When must the simplified seal integrity test be performed?

A simplified seal integrity test must be performed in the following cases:

- Following work on the gas sampling probe (e.g. filter replacement),
- following replacement of the sample gas line,
- following replacement of the sample gas filter in the ASP block.

The simplified seal integrity test serves to check the seal integrity of the analyzer system, from the gas sampling probe to the ASP block.

Simplified seal integrity test via oxygen measurement

This method is based on connecting oxygen and observing the oxygen measured value.

1 Feed-in nitrogen, either locally or via the gas sampling probe.

2 Observe the oxygen measured value. After a running-in time of approx. 5 minutes with local feed-in or 20 minutes with feed in via the gas sampling probe, the oxygen measured value should drop to approx. 0.08 %.

3 Failure to do so indicates a leak in the selected gas path (see the pneumatic diagram in the order-related drawings).

Simplified seal integrity test via FID

This method can be employed only if a FID is built into the analyzer system. It is based on allowing hydrocarbon to act on any leaking points in the sample gas path and observing the measured value on the FID at the same time. A commercially available felt pen is used as a punctiform "Hydrocarbon source" for this purpose.

1 Starting at the sample gas sampling probe and working towards the analysis cabinet, hold the felt pen briefly (1–2 seconds) against each fitting, connection and screw.

2 Observe the FID measured value. In the presence of a leak, the measured value rises and drops back to the normal value relatively quickly. Due to the calibration times, the measured value can rise after a delay; after each contact with the felt pen, wait at least 2 minutes for a possible reaction.

3 Open the cover of the ASP block and hold the felt pen briefly against the sample gas line connection at the ASP block.

⚠CAUTION

The ASP block is hot (approx. 180 °C)!

Wear suitable protective gloves and safety goggles!

Note: A variant of this method is using a commercially available gas lighter, which normally contains a propane-butane mixture, instead of the felt pen. Instead of holding the felt pen at the fittings etc., allow a small amount of lighter gas (no flame) to flow at the point being tested. However, this variant is significantly more non-selective for localizing a leak.

Seal integrity test of the combustion gas path in the analyzer system with VOC analyzer (FID)

The seal integrity of the combustion gas line within the analyzer system must be checked on a regular basis (at least every 6 months) using a hydrogen leak detector (leak rate < 2×10^{-4} hPa l/s). Do not use leak detector spray!

It is advisable to also check the seal integrity of the combustion gas line outside the analyzer system on a regular basis.

Other indications of leaks

The following states can indicate a leak in the analyzer system:

- The SMI and SGO pressures to be regulated by the analyzer system are no longer reached.
- The controlled variables for the SMI and SGO pressures in control mode are too great (> 90).
  The controlled variables can be found in the menu under Diagnosis/Info → Module-specific→ Regulator measured values → Fidas24.
- The measured oxygen concentration is much higher than the expected values.

This is only a possible indication of a leak. The absence of the states mentioned must not be used to conclude that the analyzer system is tight.

Replacing wearing parts

⚠CAUTION

Prior to maintenance work being performed on the analyzer system, the maintenance controller must be activated in the "Control" display in order to set the status signal "function check".

Additionally, the gas flow control in the "Control" display must be set either to "Zero gas local" (zero gas feed-in at the measuring cell itself) or "Zero gas probe" (zero gas feed-in via the probe), in order to avoid any contact with the sample gas.

On completion of the maintenance work, the maintenance control and the gas flow control must be reset again.

Replacing wearing parts

Wearing parts	Replacement cycle
Filter on the gas sampling probe	Every 3–12 months, depending on the dust content of the sample gas
Sample gas filter in the ASP block	Every 6–12 months, depending on the dust content of the sample gas
Filter in the compressed air main regulator	Every 12 months, depending on the dust content in the ambient air
Filter in the sample gas pressure controller	Every 6-12 months, depending on the dust content in the ambient air
Filter pad in the fan	Every 6-12 months, depending on the dust content in the ambient air
Battery on the system controller, Battery in the ACF5000-E-Box	Approx. every 4 years

Spare part information

Information on spare parts can be found on the Internet in "Spare Parts Information and Ordering System Parts OnLine" at http://www.abb.com/partsonline.

NOTE Only genuine ABB spare parts and consumables may be used!

Replacing filters on the gas sampling probe

Wearing parts

Wearing parts	Item no.	Replacement
Stainless steel filter	8329398	Every 3–12 months, depending on the dust content of the sample gas
Complete filter insert	8329399	

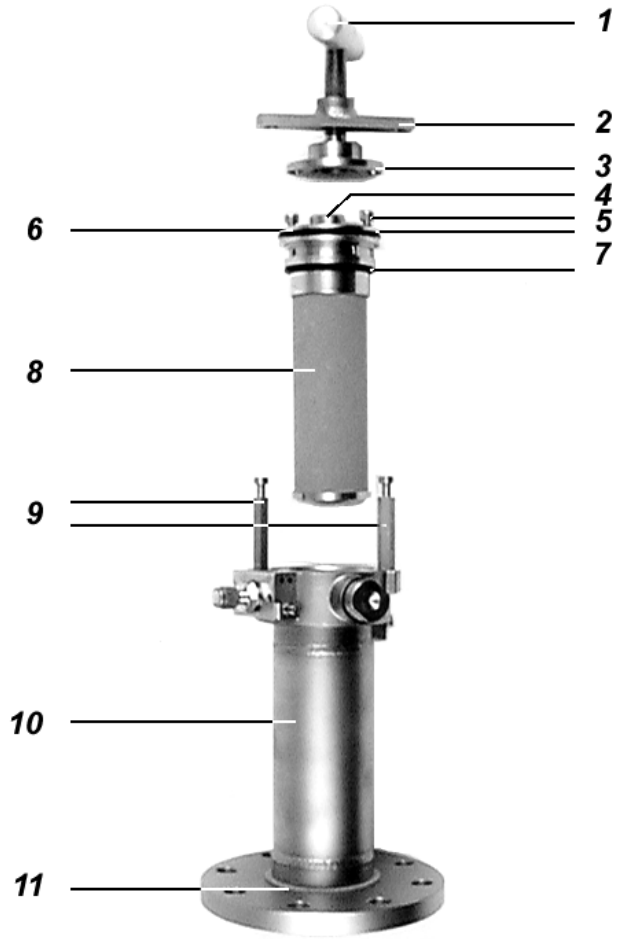
With the **System version for measuring HF**, the filter at the gas sampling probe is fitted with seals from FFKM. Seals from FFKM must also be used when replacing the filter. The following wearing parts are required:

Wearing parts	Item no.	Comments
Stainless steel filter	8329398	Always use the two FFKM O-ring seals from Item no. 801994!
FFKM seal set	801994	Two O-ring seals on the filter
FFKM seal set	730722	Filter holder with three O-ring seals

Replacing the entire filter insert

To avoid the analyzer system from being shut down for prolonged periods, the entire filter insert should be replaced. The filter can then be removed and cleaned or replaced, and the filter insert can be assembled separately.

Filter unit



1 T-handle
2 Bridge
3 Detaching disk
4 Locking screw
5 Removal screws
6 Flange
7 O-ring seals
8 Filter
9 Bridge holding device
10 Housing
11 Housing inner seal

Cleaning or replacing filters

⚠CAUTION

Parts of the sample gas sampling unit are hot (approx. 180 °C)!
You might come into contact with the sample gas when carrying out the work described below.

Wear suitable protective gloves and safety goggles!

NOTE

Grease or other impurities on a new or cleaned filter - particularly with an analyzer system with integrated FID - can falsify the measured values.

When fitting a new or cleaned filter, wear nitrile or latex disposable gloves from in order to prevent the filter coming into contact with your skin.

Preparing to remove the filter, interrupting measuring mode

1 Set the analyzer system to "Zero gas probe".

2 Wait until all FTIR measured values have dropped to zero.

3 Disconnect the sample gas line from the gas sampling probe and seal the probe connection with a blind fitting.

4 Remove thermal insulating hood from the filter unit.

Removing the filter element

5 On the filter unit, turn the T-handle ***1*** anti-clockwise. The filter insert ***8*** is then pulled over the detaching disk ***3*** and out of the housing ***10***.

6 Rotate the bridge ***2*** until it can be pulled off the bridge holding device ***9*** through the elongated holes.

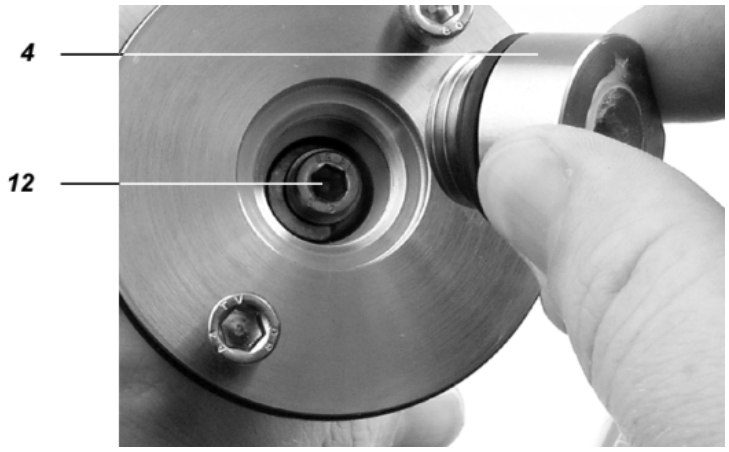
7 Pull out filter insert with bridge ***2*** and detaching disk ***3***.

8 Rotate the detaching disk ***3*** until it can be pulled off the hexagon bolts ***5*** through the elongated holes.
Never loosen or tighten the hexagon bolts ***5***. They are factory-set to enable the detaching disk ***3*** to be moved easily.

Cleaning or replacing filters

9 **Either** Clean filter ***8***: blow adherent dirt off the surface using compressed air; allow the compressed air to act diagonal to the surface.

Or Replace filter ***8***:



1 Remove screw plug ***4*** with NW 22 flat spanner.

2 Undo hexagon screw ***12*** below the screw plug ***4***.

3 Remove filter.

4 Insert new filter (Item no. 8329398, with new O-rings from the accessories).

10 Replace seals ***7*** (O-rings from the accessories).
The O-rings must not be greased; grease would falsify the measured values.
There is no need to replace the green housing seal ***11*** between flange ***6*** and housing ***10***.

Fitting the filter insert

11 Refit filter insert: Carry out steps 5 to 8 in the reverse order.

Restoring measuring mode

12 Remove blind fitting from the gas sampling probe and re-connect the sample gas line.

13 Perform seal integrity test (see page 81) on the gas sample probe, including the sample gas line connection.

14 Fasten thermal insulating hood to the filter unit.

15 Restore sample gas feed.

Replacing sample gas filter in the ASP block

Wearing parts

Wearing parts	Item no.	Replacement
Sample gas filter in the ASP block	0768914	Every 6–12 months, depending on the dust content of the sample gas

Replacing the entire sample gas filter

To avoid the analyzer system from being shut down for prolonged periods, the entire sample gas filter should be replaced. The filter can then be removed, cleaned or replaced and assembled separately.

Cleaning or replacing sample gas filters

⚠CAUTION

The ASP block is hot (approx. 180 °C)!

Wear suitable protective gloves and safety goggles!

NOTE

Hydrocarbons can - particularly on an analyzer system with integrated FID - falsify the measured values.

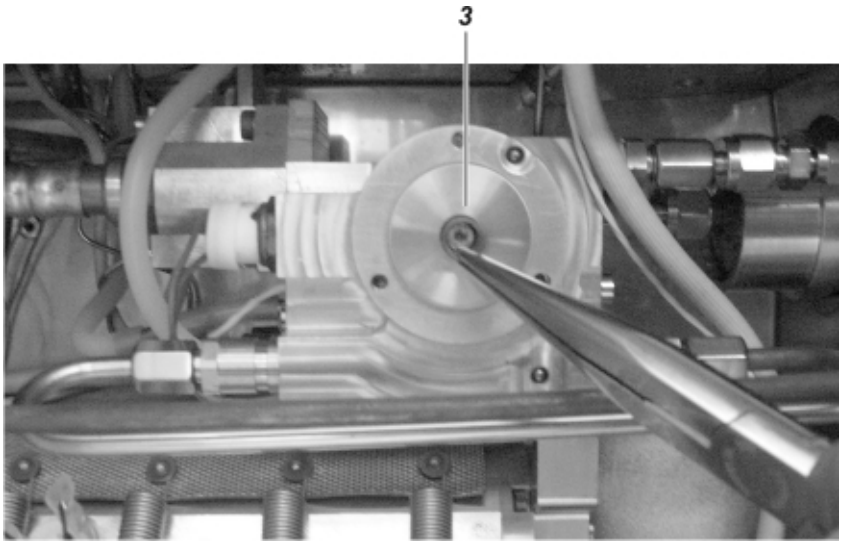
When fitting a new or cleaned filter, make sure that no hydrocarbons are introduced into the analyzer system. When handling a new or cleaned filter, wear disposable nitrile or latex gloves and use a degreased tool.

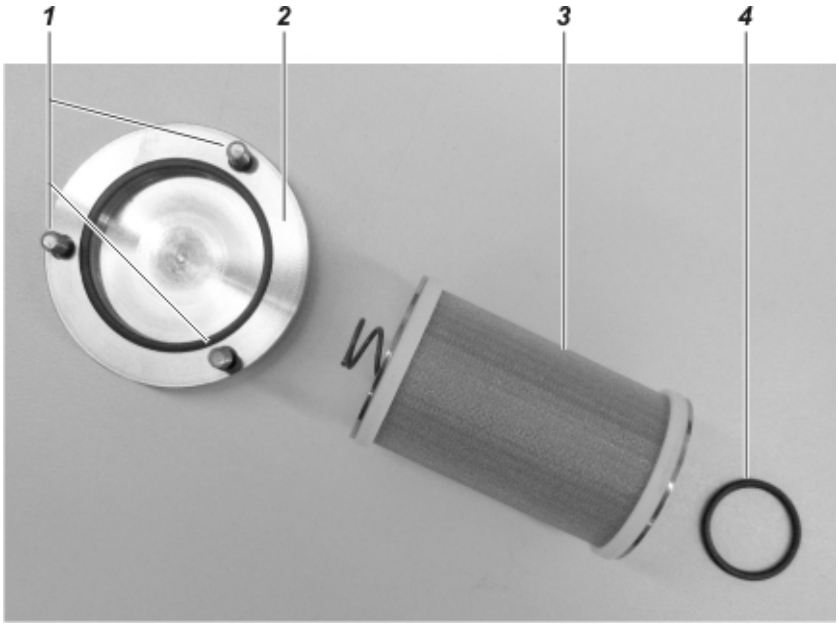
Preparing to remove the filter, interrupting measuring mode

1. Prepare a grease-free and heat-resistant working surface/shelf.
2. Lay out the degreased gripping tool (tongs, coarse tweezers or similar).
3. Lay out new filter. Make sure that the O-ring is correctly located in the groove of the filter provided for this purpose.
4. Set the analyzer system to "Zero gas probe".
5. Wait until all FTIR measured values have dropped to zero.

Removing the filter

6. Undo three fixing screws ***1*** (4 mm hexagonal spanner). Remove the cover of the sample gas filter ***2*** from the ASP block and set down on the prepared working surface.
7. Use the degreased tool to grip the sample gas filter unit ***3*** at the spring, remove from the ASP block and set down on the working surface.





Fitting the filter

8 Use the degreased tool to grip the new filter at the spring and carefully insert it into the ASP block. Make sure that the O-ring ***4*** is correctly located in the groove of the new filter provided for this purpose. Always use only new O-rings, even with a cleaned sample gas filter. Contaminated or damaged O-rings impair the seal integrity of sample gas path; this leads to erroneous measurement values.

9 Set the cover of the sample gas filter ***2*** on the ASP block and tighten with the three fixing screws ***1***. Tighten the fixing screws until there is contact with the metal of the sample gas filter holder.

Restoring measuring mode

10 Perform the seal integrity test (see page 46).

11 Restore sample gas feed.

Replacing filter in the compressed air main regulator (-J85)

Wearing parts

Wearing parts	Item no.	Replacement
Filter in the compressed air main controller	990048	Every 12 months, depending on the dust content in the ambient air

Replacing the filter element

⚠CAUTION The compressed air main regulator is pressurized (5.5…7 bar)!

Preparing to replace the filter, interrupting measuring mode

1 Set the analyzer system to "Zero gas probe".

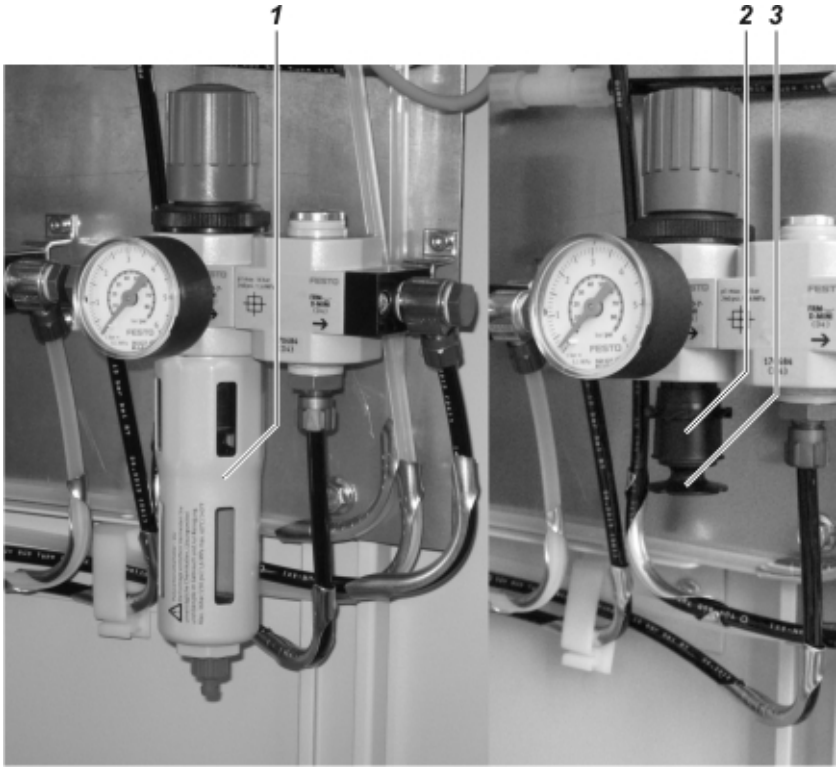
2 Wait until all FTIR measured values have dropped to zero.

3 Disconnect the sample gas line from the gas sampling probe and seal the probe connection with a blind fitting.

4 Shut off the instrument air at the connection lead (source in front of the analysis cabinet).

5 Wait until the pressure at the inlet has dropped (display on the compressed air main regulator –J85).

Replacing the filter element



6 Slowly screw on the filter housing ***1*** to relieve the residual pressure in the filter. If necessary, position a 22mm open-end wrench at the bottom end of the filter housing.

7 Unscrew filter housing and remove.

8 Undo the black closing piece ***3*** by hand; at the same time, fix the upper black cylinder ***2*** using your other hand.

9 Remove the used filter element and insert a new filter element.

10 Re-assemble the filter: carry out steps 6 to 8 in the reverse order. Screw on the filter housing only hand-tight.

Restoring measuring mode

11 Restart the instrument air supply

12 Set the analyzer system to "Zero gas probe".

13 Remove blind fitting from the gas sampling probe and re-connect the sample gas line.

14 Restore sample gas feed.

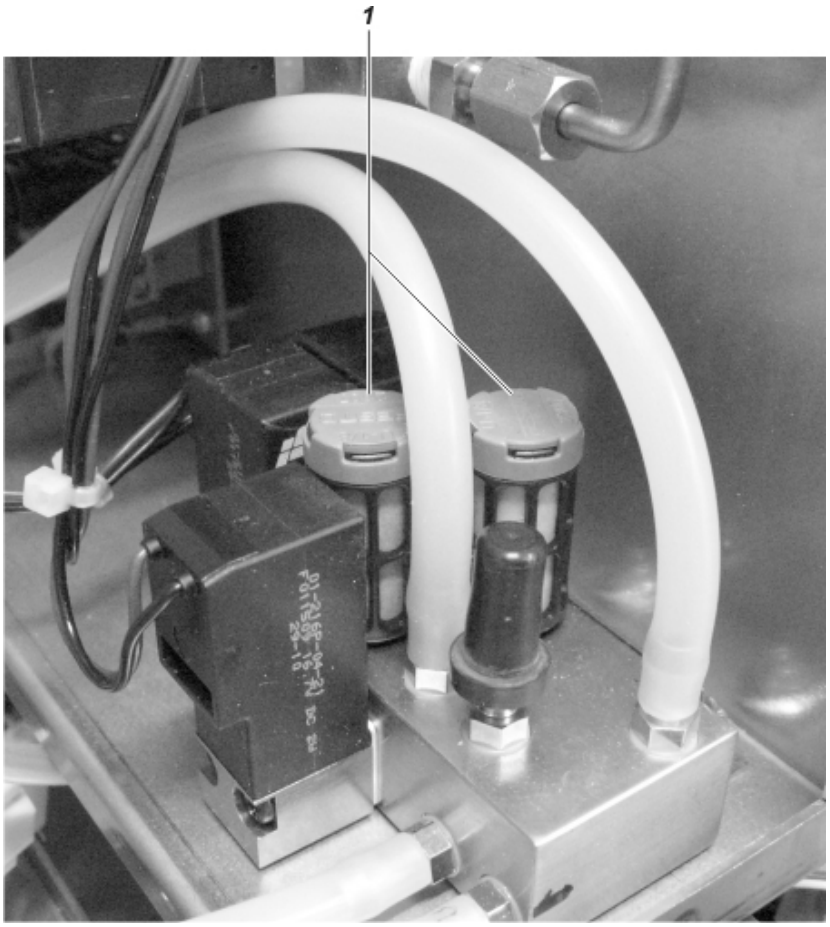
Replacing filters in the sample gas pressure regulator

Wearing parts

Wearing parts	Item no.	Replacement
Filter in the sample gas pressure controller	4805885	Every 6-12 months, depending on the dust content in the ambient air

Replacing the filter

1 Slacken 5 screws and remove the cover of the ACF5000-E-Box. The paper filters in the sample gas pressure regulator ***1*** are located on the right-hand side in the ACF5000-E-Box.



2 Undo the used paper filter by hand and insert new filter.

3 Mount cover of the ACF5000-E-Box and fasten using the screws.

Replacing filter pad in the fan

Wearing parts

Wearing parts	Item no.	Replacement
Filter pad in the inlet and outlet filter	990046	Every 6-12 months, depending on the dust content in the ambient air

Replacing the filter pad

1 Using a screwdriver, prize out fan grille of the inlet filter (at the right-hand cabinet wall, bottom) out of the frame at the two tabs.

2 Replacing filter pad in the fan grille

3 Insert fan grille into the frame and push in until it engages.

4 Repeat steps 1 to 3 at the outlet filter (at the left-hand cabinet wall, top).

Replacing back-up batteries

Wearing parts

Wearing parts	Type	Replacement
Battery on the system controller Battery in the ACF5000-E-Box	Varta CR3032 (type no. 6032) or Renata CR2032	Approx. every 4 years (as part of the maintenance work on the analyzer system)

WARNING!

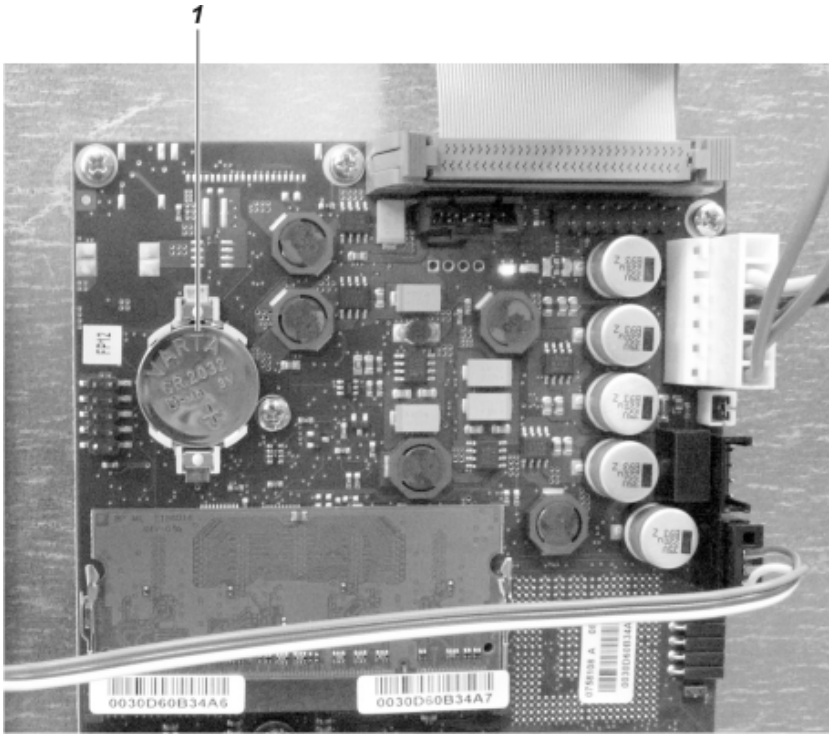
Located on the system controller and in the ACF5000-E-Box are electronic components, which are susceptible to damage by electrostatic discharges.
Measures for preventing electrostatic discharges must be taken during battery replacement.

Before the batteries are replaced, make sure that the power supply to the analyzer system is switched off.

Replacing the battery on the system controller

1 Slacken 10 screws and remove the cover of the system controller housing.

2 Remove used battery ***1*** from the holder and insert new battery into the holder.



3 Mount cover of the system controller housing and fasten using the screws.

4 Dispose of used battery in accordance with the locally applicable regulations.

Replacing battery in the ACF5000-E-Box

1. Slacken 5 screws and remove the cover of the ACF5000-E-Box.
2. Remove used battery from the holder on the electronic main board and insert new battery into the holder.
3. Mount cover of the ACF5000-E-Box and fasten using the screws.
4. Dispose of used battery in accordance with the locally applicable regulations.

Shutting down and packing the analyzer system

Shutting down the analyzer system

Shutting down the analyzer system temporarily

1. Switch the gas flow control to "Zero gas probe" (zero gas feed-in via the probe to interrupt the sample gas feed.
2. Wait until all measured values match the values of the cleaned zero air from the air treatment station.
3. Disconnect the sample gas line from the gas sampling probe and seal the probe connection with a blind fitting.
4. Switch the gas flow control to "Zero gas local" (local zero gas feed-in).
5. VOC analyzer (option): shut-off the combustion gas feed.
6. Switch off the power supply to the individual assemblies and finally the turn off the main switch on the right-hand side of the cabinet wall; with UPS, also turn off the two main switches.
7. Shut-off the instrument air supply to the analyzer system.

Packing the analysis cabinet

Packing the analysis cabinet

1 Vacuum-pack the analysis cabinet in film.

2 Lay out desiccant in the transport crate. Use an amount of desiccant that is appropriate for the packing volume and the expected transport time (min. 3 months).

3 Place the analysis cabinet into the transport crate on snubbers and chock.

4 Mark the transport crate as specified (in particular as "Fragile product").

NOTE

- Moisture that could freeze at low storage and transportation temperatures must not remain in the analyzer system.
- The analysis cabinet and/or the FTIR spectrometer must be packed at a dry and heated location, preferably at the installation location.
- Having the analysis cabinet transported by a specialist company is highly recommended. The analysis cabinet must be transported on its rear in the horizontal position.
- Ambient conditions during transport and storage:
  Temperature –25…+65 °C, humidity ≤ 75 %.

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