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</tr>
<tr>
<td></td>
<td>Packing</td>
<td>30</td>
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</tbody>
</table>
A few initial remarks

Supplementary Documentation

Supplementary to this Operator’s Manual the following specification sheet is available for the sample gas extraction system:

Specification Sheet "System Components for Sample Gas Sampling"
Publication No. 10/23-5.10 EN

This publication can be ordered from your ABB marketing representative or from ABB Automation Products GmbH, Analytical, Marketing Communication, Fax: +49-69-79 30-45 66, E-Mail: analytical-mkt.deapr@de.abb.com

Additional Information on the Internet

Additional information on ABB Analytical products and services is available on the Internet at http://www.abb.com/analytical.

Symbols and Fonts Used in the Manual

⚠️ Identifies safety information to be heeded during Modular Sample Gas Extraction System operation in order to avoid risks to the user.

ℹ️ Identifies specific information on operation of the Modular Sample Gas Extraction System as well as on the use of this manual.

1, 2, 3, ... Identifies reference numbers in figures.
Safety instructions

**Preconditions for safe operation**
For perfect and safe operation of the modular sample gas extraction system it is essential that the system is appropriately transported and stored, professionally installed and put into service, used according to the instructions and carefully maintained.

**Qualification of personnel**
Only persons familiar with the installation, putting into service, operation and maintenance of comparable systems and who are appropriately qualified to perform such work are permitted to work on the modular sample gas extraction system.

**Instructions and specifications to be observed**
The following must be observed:
- the contents of this Operator's Manual,
- the safety instructions attached to the modules of the system,
- the relevant safety regulations for setting up and operating electrical plants and
- the relevant safety regulations for handling gases, acids, condensate, compressed air, etc.

**National regulations**
The regulations, standards and guidelines quoted in this Operator's Manual are valid in the Federal Republic of Germany. When using the modular sample gas extraction system in other countries the relevant national regulations must be observed.

**Safety of the modular sample gas extraction system and safe operation**
The modular sample gas extraction system was constructed and tested according to EN 61010 Part 1 "Safety regulations for electrical process, measuring, control and laboratory equipment" and left the factory in perfect condition as regards technical safety.

In order to maintain this state and ensure safe operation the safety instructions marked with the symbol \(\triangle\) in this Operator's Manual must be observed. Otherwise personal injury may occur and the system itself or other systems and equipment may become damaged.

**Further information**
If the information in this Operator's Manual does not cover a particular situation, ABB Service is prepared to supply additional information as needed.

Contact your local ABB service representative or

ABB Service, Telephone: +49-180-5-12 35 80, Fax: +49-6 21-3 81-51 35, E-mail: callcenter.automation@de.abb.com
Chapter 1  
Overview

Specified use

Probe tubes and filter units are the modules of the sample gas extraction system. The purpose of this system is to continually extract gases during processes. Operation is permissible also under extremely difficult extraction conditions such as high temperatures, high levels of gas humidity, high dust content, high flow velocities, condensable and aggressive components. The precondition for this is the combination of the appropriate modules made by ABB Analytical on the basis of the operating data provided by the customer.

Any other application is not compliant with the specified use.

Observation of this Operator's Manual is also part of the specified use.

Mode of operation

Through an opening (in the wall) prepared by the customer the process gas is extracted with the probe tube and channeled to the filter unit in order to eliminate any interfering particles. The cleaned gas flows from the filter unit to the analysis system via sample gas pipes which can be heated.

Modular design

<table>
<thead>
<tr>
<th>Combination possibilities</th>
<th>Probe tube type</th>
<th>Filter unit type</th>
<th>Type of assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40</td>
<td>FE2, PFE2, PFE3</td>
<td>screwed</td>
</tr>
<tr>
<td></td>
<td>42</td>
<td>FE2, PFE2, PFE3</td>
<td>flanged</td>
</tr>
</tbody>
</table>
**Chapter 2 Preparing for installation**

**Unpacking**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unpack the probe tube and the filter unit.</td>
</tr>
<tr>
<td>2</td>
<td>If damage has occurred during transit due to improper handling, please submit a damage report to the transport institution (railway company, post office, forwarding agency) within seven days.</td>
</tr>
<tr>
<td>3</td>
<td>Check the contents of the delivery to see if it is complete by comparing the actual goods with the relevant dispatch note. Make sure that any accompanying accessories do not get lost.</td>
</tr>
<tr>
<td>4</td>
<td>Keep the packing material for possible future transport.</td>
</tr>
</tbody>
</table>

**Choosing the extraction point**

- The extraction point must be suitable for extracting a representative specimen flow.
- Install the wall tube with assembly flange (DN 65, PN 6, type B according to DIN 2573) at the extraction point in such a way that the probe tube can be easily installed and removed (see page 7).
- The probe tube must be easily accessible to allow maintenance work to be performed.
- Protect the filter unit FE2 against direct heat radiation, rain, draught and extreme contamination. If necessary, protect the filter unit with a protective box.

In the case of emission measuring devices the responsible technical inspection association specifies the extraction point.
Notes for wall tube installation

Figure 1
Wall tube installation
(dimensions in mm)

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Wall tube</td>
</tr>
<tr>
<td>2</td>
<td>Assembly flange DN 65, PN 6, Form B to DIN 2573</td>
</tr>
<tr>
<td>3</td>
<td>Gasket</td>
</tr>
<tr>
<td>4</td>
<td>Welded-on rectangular block</td>
</tr>
<tr>
<td>5</td>
<td>Sampling probe flange</td>
</tr>
</tbody>
</table>

Minimum distance $x_{min}$ of the assembly flange from the wall depending on mounting angle $\alpha$:

<table>
<thead>
<tr>
<th>$\alpha$</th>
<th>0°</th>
<th>10°</th>
<th>15°</th>
<th>20°</th>
<th>25°</th>
<th>30°</th>
<th>35°</th>
</tr>
</thead>
<tbody>
<tr>
<td>$x_{min}$/mm</td>
<td>100</td>
<td>133</td>
<td>138</td>
<td>143</td>
<td>147</td>
<td>151</td>
<td>153</td>
</tr>
</tbody>
</table>
## Installing probe tube type 40

**CAUTION!**
The probe tube type 40 in the silicon-carbide version must be installed in vertical orientation.

### Installing probe tube type 40

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Install the customer-supplied wall tube with assembly flange into the wall of the flue gas duct or chimney (see page 7) and seal it off against the wall using the green seal from the accessories supplied.</td>
</tr>
<tr>
<td>2</td>
<td>Insert the pre-assembled sample gas extraction system into the wall tube.</td>
</tr>
<tr>
<td>3</td>
<td>Screw the assembly flange to the flange of the filter unit.</td>
</tr>
</tbody>
</table>

### Figure 2

**Probe tube type 40**

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

- **Special Steel Material No. 1.4571 (max. 450 °C)**
  - L1 = Length of the probe tube
  - G3/4
  - Ø16
  - Ø21,4

- **Special Steel Material No. 1.4893 (max. 900 °C)**
  - L1 = Length of the probe tube
  - G3/4
  - Ø16
  - Ø21,4

- **Silicon-Carbide (max. 1300 °C)**
  - L1 = Length of the probe tube
  - G3/4
  - Ø16
  - Ø15

*Continued on next page*
If the system is supplied without backflushing or with a non-return valve for Advance Cemas-FTIR, the connecting pipe between the protective box and flanged pipe is not part of the scope of supply.
Installing probe tube type 42

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Install the customer-supplied wall tube with assembly flange into the wall of the flue gas duct or chimney (see page 7) and seal it off against the wall using the green seal from the accessories supplied.</td>
</tr>
<tr>
<td>2</td>
<td>Insert the pre-assembled sample gas extraction system into the wall tube. Position the terminal box so that it faces downwards.</td>
</tr>
<tr>
<td>3</td>
<td>Screw the assembly flange to the flange of the probe tube heating.</td>
</tr>
</tbody>
</table>

Figure 4

Probe tube type 42
L1 = Length of the probe tube (dimensions in mm)
Connecting the sample gas and compressed-air pipes

Figure 5
Position of the connections

![Diagram of connections]

- **A**: Bulkhead stuffing box (for 4…6 bar compressed air) G 1/2
- **B**: Bulkhead stuffing box (for 4…6 bar compressed air) G 1/2
- **C**: Sample gas connection hose connector/threaded pipe joint 6 x 4 x 1 mm
- **E**: Plug, tracer gas connection G 1/4

Connecting the sample gas pipe

Connect the sample gas pipe at the test outlet of the filter unit to the connection nozzle **C** with the clamping ring threaded joint.

**CAUTION!**

When tightening the threaded joint, relieve the connection nozzle e.g. by holding it in position with an appropriate spanner. Otherwise there is the risk of the connection nozzle becoming distorted and thus non-tight or it might break off.

Connecting the compressed-air pipes

Connect the compressed-air pipes to connection nozzles **A** and **B**.
PFE3 filter unit: Mounting

Figure 6
PFE3 filter unit mounting to the wall tube
(dimensions in mm)
PFE3 filter unit: Gas and electrical connections

Figure 7
Gas connections
(dimensions in mm)

![Gas connection diagram]

1. Test gas connection (optional)
   6 mm bulkhead fitting
2. Sample gas connection
   6 mm screw connection
3. Check valve (optional)

Figure 8
Electrical connections

![Electrical connection diagram]

1. Filter heater
2. Sample gas line heater
3. Pt100 (optional)
4. Pt100 sample gas line
5. Temperature monitor
Connecting the electric lines

CAUTION!
Please observe the relevant national safety regulations for the construction and operation of electric units as well as the following safety instructions.

Before connecting the unit to the power supply ensure that the operating voltage according to the rating plate is the same as the mains voltage.

The connection between the non-fused earth conductor connection and a non-fused earth conductor must be established before all other connections.

The sample gas extraction system may be dangerous if the earth conductor has been interrupted inside or outside the sample gas extraction system or if the earth conductor connection has been disconnected.

Install a 2-pin mains isolator in the power supply line since the sample gas extraction system does not have its own power switch.

Specially for probe tube type 42
The probe tube type 42 must be put into operation immediately after assembly and installation, otherwise there is the risk of corrosion and thus distorted measurements.

What type of material is required?
Choose the required line material according to
• the length of the lines and
• the anticipated current load.

Power consumption

<table>
<thead>
<tr>
<th>Length</th>
<th>1000 mm</th>
<th>1500 mm</th>
<th>2000 mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power</td>
<td>400 W</td>
<td>600 W</td>
<td>800 W</td>
</tr>
</tbody>
</table>

Conductor cross-section
The maximum conductor cross-section is 1.5 mm² according to 16 AWG.

Lay the signal lines separate from the power supply lines.
Carefully plan the collection of the signal lines in cables.

Connecting the signal lines

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Unscrew and remove the casing cover.</td>
</tr>
<tr>
<td>2</td>
<td>Push the cable through the bushings in the casing.</td>
</tr>
<tr>
<td>3</td>
<td>Connect the signal lines to the terminals according to the connecting diagrams (Figures 8 to 13).</td>
</tr>
</tbody>
</table>

Continued on next page
## Connecting the power supply

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Check to see whether the operating voltage given on the rating plate is the same as the mains voltage.</td>
</tr>
<tr>
<td>2</td>
<td>Ensure that the power supply leads are adequately fuse-protected (automatic cut-out).</td>
</tr>
<tr>
<td>3</td>
<td>Install near the sample gas extraction system either a mains isolator in the power supply leads or a switchable socket, thus making it possible to disconnect all poles of the sample gas extraction system and the switching units from the power supply if necessary.</td>
</tr>
<tr>
<td>4</td>
<td>Push the cable through the bushings in the casing.</td>
</tr>
<tr>
<td>5</td>
<td>Connect the power supply leads to the terminals according to the connecting diagrams (Figures 8 to 13).</td>
</tr>
<tr>
<td>6</td>
<td>Put on the casing cover and screw it tight.</td>
</tr>
<tr>
<td>7</td>
<td>Connect the power supply leads to the power supply.</td>
</tr>
</tbody>
</table>

The sample gas extraction system can be put into operation when it is connected to the power supply.

---

### Figure 9

**Terminal allocation**  
**Filter unit PFE2 without protective box**

<table>
<thead>
<tr>
<th>Terminal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Heating filter</td>
</tr>
<tr>
<td>2</td>
<td>Heating sample gas pipe</td>
</tr>
<tr>
<td>3</td>
<td>1. Pt 100 filter</td>
</tr>
<tr>
<td>4</td>
<td>1. Pt 100 sample gas pipe</td>
</tr>
<tr>
<td>5</td>
<td>2. Pt 100 filter safety circuit</td>
</tr>
</tbody>
</table>

Continued on next page
Connecting the electric lines, continued

Figure 10
Probe protective box
Connecting diagram
filter unit PFE2,
terminal strip X1

1  Probe protective box
2  Terminal box, strip X1
3  1. Pt 100 filter unit FE2
4  1. Pt 100 probe tube type 42
5  2. Pt 100 filter unit FE2 (safety circuit)
6  2. Pt 100 probe tube type 42 (safety circuit)
7  Heating collar filter unit FE2 250 W or circular heating element 200 W
8  Heating probe tube type 42
9  Heating probe tube type 42
10  Pt 100 3-wire technology IEC 751 Class B
11  Pt 100 3-wire technology IEC 751 Class B
12  Pt 100 3-wire technology IEC 751 Class B
13  Pt 100 3-wire technology IEC 751 Class B
14  230 V 50…60 Hz or 115 V 50…60 Hz
15  230 V 50…60 Hz
16  115 V 50…60 Hz (parallel connection of the two heating elements)

Continued on next page
Connecting the electric lines, continued

Figure 11
Probe protective box
Connecting diagram
filter unit PFE2,
terminal strip X2

1. Pt 100 sample gas pipe
2. Pt 100 sample gas pipe (safety circuit)
3. Heating sample gas pipe; power per length max. 3,600 W
4. Frost protection heating for plant shutdown
   approx. 5 °C at ambient temperature –20 °C: 30 W
   Inside temperature approx. 100 °C; use temperature-resistant leads.
5. Pt 100 3-wire technology IEC 751 Class B
6. Pt 100 3-wire technology IEC 751 Class B
7. 230 V 50…60 Hz or 115 V 50…60 Hz
8. 230 V 50…60 Hz or 115 V 50…60 Hz
   The heating is operated without automatic control.
   Switch on externally only when the unit is at a standstill.

Continued on next page
Connecting the electric lines, continued

Figure 12
Probe protective box
Connecting diagram
filter unit PFE2,
terminal strip -X3

1 Probe protective box
2 Terminal box, strip -X3
3 Pilot valve Y2.1: Cleaning filter
4 Pilot valve Y3.1: Cleaning filter surface and pipe \(^1\)
5 Pilot valve Y1.1: Pulsed compressed air \(^1\)
6 Pilot valve Y4: Venting \(^1\)
7 Probe/flange
   Inside temperature approx. 100 °C; use temperature-resistant leads.
8 Remove for potential equalization
9 230 V 50…60 Hz or 115 V 50…60 Hz

\(^1\) only with 2-stage backflushing

Continued on next page
Connecting the electric lines, continued

Figure 13
Probe tube type 42: Probe tube heating

1 Heating
2 Temperature sensor Pt 100
3 Bridge: Mains 230 V terminals 3 + 4 (shown in the illustration)
   Mains 115 V terminals 2 + 3 / 4 + 5
4 PG 13.5 (conduit pipe thread)
5 Mains
6 Sensor
7 Connection temperature controller
Switching on the sample gas extraction system

CAUTION!
Before switching on the system, make sure that the operating voltage on the rating plate is the same as the mains voltage.

Switching on
Switch on the power supply with the external mains isolator.

CAUTION!
Warning signs in the cover and on the inside area of the protective box warn against high temperatures.

Temperature influences
The temperature of the inside area, the collar temperature and the outside temperature of the protective box change according to the ambient temperature (see Figure 14).

When filter unit PFE2 is operated at ambient temperatures below –20 °C, additional heating must be provided. Operation at ambient temperatures above 50 °C requires additional insulation (protection against accidental contact) and special high-temperature control valves.

Figure 14
Probe protective box Temperature diagram

1 Collar temperature
2 Set point temperature controller
3 Threaded joint of sample gas pipe
4 Pilot valve temperature
5 Outside temperature of protective box

Umgebungstemperatur = Ambient temperature
CAUTION!

The work operations described in this chapter assume specialist knowledge and under certain circumstances require work to be carried out on the open and live cooling unit! This work may therefore only be performed by specially trained personnel.

Cleaning the filter

Cleaning intervals

Choose the cleaning and maintenance intervals to suit your individual operating conditions.

Irrespective of your operational routine intervals it is necessary to clean the filter when it becomes blocked with particles of dust, dirt or corrosion. These circumstances become apparent when there is a pressure drop at the sample gas outlet.

Cleaning options

The possibilities of eliminating contamination depend on the degree of the blockage and dirt accumulation and require different cleaning procedures:

a. Backflushing the filter with compressed air: 1-stage (see Figures 15 to 17) or 2-stage (see Figures 18 to 20) if the system is designed accordingly

b. Removal and re-installation of the filter element (see pages 26 to 28): Mechanical cleaning or Replacing the filter element

Backflushing the filter element with compressed air

<table>
<thead>
<tr>
<th>Blowing free the filter element</th>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>Use clean, oil-free instrument air with a pressure level of 4 to 6 bar.</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Blow the filter element free with pulsed compressed air (Figures 15–20). This loosens any particles of dirt from the filter surface and blows them into the process area.</td>
</tr>
</tbody>
</table>
Backflushing the filter element with compressed air (1-stage)

Figure 15
Filter unit PFE2
Connections for 1-stage backflushing

1 Terminal box
2 Probe protective box
3 B Bulkhead stuffing box (for 4...6 bar compressed air)
4 E Plug, tracer gas connection
5 Pilot valve -Y3.1 cleaning filter surface and pipe
6 Diaphragm valve -Y3.2 cleaning filter surface and pipe
7 C Sample gas connection
10 Bulkhead stuffing box 6 mm, 2...6 bar control air
11 Bulkhead stuffing box 12 mm, 4...6 bar compressed air
12 Heated sample gas pipe
13 Power supply for heated pipe
14 Filter unit FE2

Continued on next page
Backflushing the filter element with compressed air (1-stage), continued

Figure 16
Piping diagram for 1-stage backflushing

- Pilot valve -Y3.1 cleaning filter surface and pipe
- Diaphragm valve -Y3.2 cleaning filter surface and pipe
- Control air 2…6 bar
- Compressed air backflushing 4…6 bar
- Sample gas pipe

Figure 17
Recommended program run for pulsed compressed air for 1-stage backflushing

- Start cleaning
- End cleaning
- Cleaning cycle
- Pilot valve/diaphragm valve -Y3.1/-Y3.2 cleaning filter surface and pipe
  - Open
  - Closed
Backflushing the filter element with compressed air (2-stage)

Figure 18
Filter unit PFE2
Connections for 2-stage backflushing

1. Terminal box
2. Probe protective box
3. B Bulkhead stuffing box (for 4…6 bar compressed air)
4. E Plug, tracer gas connection
5. Pilot valve -Y2.1 cleaning filter
6. Diaphragm valve -Y2.2 cleaning filter
7. C Sample gas connection
8. Pilot valve pulsed compressed air -Y1.1
9. Diaphragm valve pulsed compressed air -Y1.2
10. Bulkhead stuffing box 6 mm, control air 2…6 bar
11. Bulkhead stuffing box 12 mm, compressed air 4…6 bar
12. Heated sample gas pipe
13. Power supply for heated pipe
14. Filter unit FE2
15. Solenoid valve venting -Y4
16. Diaphragm valve -Y3.2 cleaning filter surface and pipe
17. Pilot valve -Y3.1 cleaning filter surface and pipe

Continued on next page
Backflushing the filter element with compressed air (2-stage), continued

Figure 19
Piping diagram for 2-stage backflushing

![Diagram]

5 Pilot valve -Y2.1 cleaning filter
6 Diaphragm valve -Y2.2 cleaning filter
8 Pilot valve -Y1.1 pulsed compressed air
9 Diaphragm valve -Y1.2 pulsed compressed air
10 Control air 2…6 bar
11 Compressed air backflushing 4…6 bar
12 Sample gas pipe
15 Solenoid valve -Y4 venting
16 Diaphragm valve -Y3.2 cleaning filter surface and pipe
17 Pilot valve -Y3.1 cleaning filter surface and pipe

Figure 20
Recommended program run for pulsed compressed air for 2-stage backflushing

![Diagram]

1 Start cleaning o Open
2 End cleaning c Closed
3 Cleaning cycle
5 -Y1.1/-Y1.2: Pulsed compressed air
6 -Y4: Venting
7 -Y2.1/-Y2.2: Cleaning filter
8 -Y3.1/-Y3.2: Cleaning filter surface and pipe
Installing and removing the filter element

Cleaning the filter element
If the filter element is still not permeable enough after backflushing, remove it so that you can visibly eliminate the contamination mechanically.

Replacing the filter stone
If the filter stone is obviously damaged, replace it with a new one.

Figure 21
Filter unit FE2

Continued on next page
### Installing and removing the filter element, continued

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Turn the T-handle 1 of the filter removal device 1–3 in counterclockwise direction. This pulls the filter element 8 via the detaching disk 3 out of the casing 10.</td>
</tr>
<tr>
<td>2</td>
<td>Turn bridge 2 until it can be pulled off from the bridge holding device 9 through the elongated holes.</td>
</tr>
<tr>
<td>3</td>
<td>Pull out filter element 8 with bridge 2 and detaching disk 3.</td>
</tr>
<tr>
<td>4</td>
<td>Turn detaching disk 3 until it can be pulled off from the hexagon screws 5 via the elongated holes.</td>
</tr>
</tbody>
</table>

⚠️ Never loosen or tighten the hexagon screws 5. They have been adjusted at the factory so that the detaching disk 3 can be easily moved.

*Continued on next page*
### Replacing the filter element (continued)

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Clean the filter element 8.</td>
</tr>
<tr>
<td>6</td>
<td>Replace seals 7 (O-rings from the accessory set).</td>
</tr>
<tr>
<td></td>
<td>7 Re-lubrication is not necessary even after replacing O-rings 7.</td>
</tr>
<tr>
<td></td>
<td>It is not necessary to replace the green casing inner seal 11 between flange 6 and casing 10.</td>
</tr>
<tr>
<td>7</td>
<td>Re-install the filter element 8: Steps 1 to 4 in reverse order.</td>
</tr>
<tr>
<td>or</td>
<td>5 Screw off locking screw 4 with open-end spanner NW 22.</td>
</tr>
<tr>
<td>6</td>
<td>Screw out the hexagon socket screw 12 underneath locking screw 4.</td>
</tr>
<tr>
<td>7</td>
<td>Take out the filter stone.</td>
</tr>
<tr>
<td>8</td>
<td>Insert a new filter stone (Part No. 0768669; with new O-rings from the accessory set).</td>
</tr>
<tr>
<td>9</td>
<td>Replace seals 7 (O-rings from the accessory set).</td>
</tr>
<tr>
<td></td>
<td>1 Re-lubrication is not necessary even after replacing O-rings 7.</td>
</tr>
<tr>
<td></td>
<td>It is not necessary to replace the green casing inner seal 11 between flange 6 and casing 10.</td>
</tr>
<tr>
<td>10</td>
<td>Re-install the filter element 8: Steps 1 to 4 in reverse order.</td>
</tr>
</tbody>
</table>
# Chapter 5 Operating data

## Probe tubes

<table>
<thead>
<tr>
<th>Extraction conditions</th>
<th>Type 40</th>
<th>Type 42 (heated)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Operating pressure</strong></td>
<td>$p_{\text{abs}} = 50...500 \text{ kPa (0.5...5.0 bar)}$</td>
<td>$p_{\text{abs}} = 200 \text{ kPa (2 bar)}$</td>
</tr>
<tr>
<td><strong>Operating temperature</strong></td>
<td>High-grade steel, material number 1.4571 max. 450 °C</td>
<td>High-grade steel, material number 1.4571 (coated) max. 180 °C</td>
</tr>
<tr>
<td></td>
<td>High-grade steel, material number 1.4571 max. 900 °C</td>
<td>Silicon carbide (max. length 1,000 mm) max. 1300 °C</td>
</tr>
<tr>
<td><strong>Heating temperature</strong></td>
<td>–</td>
<td>max. 200 °C, controlled</td>
</tr>
<tr>
<td><strong>Flow</strong></td>
<td>max. 300 l/h</td>
<td>max. 250 l/h</td>
</tr>
<tr>
<td><strong>Velocity of flow</strong></td>
<td>max. 12 m/s</td>
<td>max. 12 m/s (&gt; 1,000 mm: max. 7 m/s)</td>
</tr>
<tr>
<td><strong>Pressure drop</strong></td>
<td>approx. 10 hPa (mbar) at 30...90 l/h flow</td>
<td>approx. 10 hPa (mbar) at 30...90 l/h flow</td>
</tr>
</tbody>
</table>

## Filter units

<table>
<thead>
<tr>
<th>Process gas extraction conditions</th>
<th>Operating pressure $p_{\text{abs}}$</th>
<th>50...600 kPa (0.5...6 bar)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature</td>
<td>max. 200 °C (coated 180 °C 1)</td>
<td></td>
</tr>
<tr>
<td>Flow</td>
<td>30...500 l/h, related to 100 kPa (1 bar) and 0 °C</td>
<td></td>
</tr>
<tr>
<td>Pressure drop</td>
<td>approx. 0.6 hPa at 100 l/h</td>
<td></td>
</tr>
<tr>
<td>Dust content</td>
<td>max. 3 g/m² (application recommendation); max. 40 g/m³ with probe tube type 40 with blow-back device 1)</td>
<td></td>
</tr>
</tbody>
</table>

### Filter characteristics

- Filter fineness: 0.5 µm (optional: 0.3 µm)
- Seal-tightness: $10^{-4}$ hPa l/s

### Ambient conditions

- **Ambient temperature**
  - with auxiliary heating 1): $-20...+45$ °C
  - with auxiliary insulation 1): below $-20$ °C above $+45$ °C
- **Protection class of casing**: IP 54

1) only for FE2 and PFE2
## Putting out of service

**Putting the sample gas extraction system out of service**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Clean the filter (see Chapter 4).</td>
</tr>
<tr>
<td>2</td>
<td>Switch off the power supply of the sample gas extraction system.</td>
</tr>
<tr>
<td>3</td>
<td>Dismount the sample gas extraction system from the assembly flange of the wall tube and seal off the assembly flange with a blind flange.</td>
</tr>
<tr>
<td>4</td>
<td>Seal off the connections of the sample gas extraction system.</td>
</tr>
</tbody>
</table>

## Packing

**Packing the sample gas extraction system**

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>If the original packing material is no longer available, wrap the sample gas extraction system in bubble foil or corrugated cardboard.</td>
</tr>
</tbody>
</table>
| 2    | Pack the sample gas extraction system in an adequately large box lined with shock absorbent material (e.g. foam material).  
   | The cushioning material's thickness should be adequate for the weight of the sample gas extraction system and the mode of shipping. |
| 3    | Mark the box "Fragile! Handle with care!". |
| 4    | In addition, heat-seal the sample gas extraction system air-tight in 0.2 mm thick plastic sheeting, also including a desiccant (e.g. silica gel).  
   | The amount of desiccant used should be adequate for the package volume and the planned shipping time (at least 3 months). |
| 5    | The box should also be lined with a double layer of bitumen paper. |