Described product

SFU (gas sampling unit) with higher protection class

These Operating Instructions refer to the gas sampling unit of the SFU-BF NI GL in the weatherproof enclosure.

Manufacturer

SICK AG
Erwin-Sick-Str. 1
79183 Waldkirch
Germany

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Original document

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<th>35</th>
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</thead>
<tbody>
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<td>8.1</td>
<td>Compliances and Standards</td>
<td>35</td>
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<td>Dimensions</td>
<td>35</td>
</tr>
<tr>
<td>8.3</td>
<td>Operating data</td>
<td>35</td>
</tr>
</tbody>
</table>
1 About this document

1.1 Function of this document

These Operating Instructions describe:

- Device components
- Installation
- Operation
- Maintenance work required for reliable operation

1.2 Target group

This document is addressed to technicians (persons with technical understanding) installing, operating and maintaining the measuring system.

Responsibility of the operator

- Use the device only as described in these Operating Instructions. The manufacturer assumes no responsibility for any other use.
- Maintenance work should be performed as prescribed in this Manual.
- Do not remove, add or change any components in or on the device unless such changes are officially allowed and specified by the manufacturer.
  - Otherwise the manufacturer's warranty becomes void.
  - Otherwise the device can become dangerous.
- Observe special local conditions.
  - Follow all local laws, regulations, and company policies applicable at the installation location.
- Retain documents. These Operating Instructions:
  - Must be kept available for reference.
  - Must be passed on to new owners.

Requirements on the maintenance personnel

- The technician must be familiar with the exhaust gas technology of the operator's plant (overpressure, toxic and hot flue gases) and be able to avoid hazards when working on gas ducts.
- The technician must be familiar with handling compressed gas cylinders (span gases).
- The technician must be able to avoid hazards caused by noxious span gases.
- The technician must be familiar with gas lines (PTFE lines) and their screw fittings (be able to ensure gas-tight connections).
- Only electricians are permitted to work on the electrical system or electrical sub-assemblies.

1.3 Symbols and document conventions

1.3.1 Warning symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Warning" /></td>
<td>Hazard (general)</td>
</tr>
<tr>
<td><img src="image2" alt="Warning" /></td>
<td>Hazard by voltage</td>
</tr>
</tbody>
</table>

Subject to change without notice
### 1.3.2 Warning levels / signal words

**DANGER**
Risk or hazardous situation which will result in severe personal injury or death.

**WARNING**
Risk or hazardous situation which could result in severe personal injury or death.

**CAUTION**
Hazard or unsafe practice which could result in less severe or minor injuries.

**Notice**
Hazard which could result in property damage.

**Note**
Hints.

### 1.3.3 Information symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Symbol" /></td>
<td>Important technical information for this product</td>
</tr>
<tr>
<td><img src="image2" alt="Symbol" /></td>
<td>Important information on electric or electronic functions</td>
</tr>
</tbody>
</table>
2 Safety information

2.1 Basic safety information

**WARNING**
Health risk through dangerous sample gas
If dangerous sample gas is applied to the SFU:

- The operator is responsible for safe handling of sample gas.

**WARNING**
Risk of explosion in potentially explosive atmospheres

- Do not operate the SFU in potentially explosive atmospheres.

**WARNING**
Hazard through explosive or ignitable gases

- Do not use the SFU for measuring explosive or combustible gases.

2.2 Warnings on the device

![Warning signs on the device]

*Figure 1: Location of the warning signs on the device*

1. Warning sign "Caution!"
2. Warning sign "Hot surface!"

**DANGER**
Hazard by voltage

- Only authorized electricians may perform work on electrical components.
- Do not touch live components.
- Disconnect the device from the power supply before working on electrical components (e.g. by switching off the measuring system).
2.3 Intended use

The gas sampling unit is used for extracting a partial stream of a gas mixture (usually flue gas) from a line, stack or similar and for retaining particles that are contained in the gas stream.

2.4 Qualification of the operator

The SFU may only be maintained by persons properly instructed on the tasks assigned, possible risks and protective measures.
### Product description

#### 3.1 Product identification

<table>
<thead>
<tr>
<th>Product name</th>
<th>SFU-BF NI GL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>The exact type designation can be found on the type plate.</td>
</tr>
</tbody>
</table>

**Accessories:**
- 0.5 m unheated maritime gas sampling tube
- 0.8 m unheated maritime gas sampling tube
- 0.5 m heated gas sampling tube
- 0.8 m heated gas sampling tube
- 1.0 m heated gas sampling tube
- 1.5 m heated gas sampling tube
- 2.0 m heated gas sampling tube
- IP54 enclosure
  - Can already be ordered pre-assembled in combination with the maritime gas sampling unit SFU-BF NI GL

**Name of the pre-assembled set:**
**Consisting of:**
- SFU-BF NI GL in IP54 enclosure (PN 2098126)
- SFU-BF NI GL
- IP54 enclosure for SFU

**Manufacturer**
- SICK AG
  - Erwin-Sick-Str. 1 · D-79183 Waldkirch · Germany

**Type plate**
- The type plate is located on the underside of the gas sampling unit.

---

⚠️ **NOTICE**

It is possible that your SFU has a different configuration to that described in this Manual.

- Refer to the System Documentation delivered with your SFU for the individual configuration of your system.
3.2 Product description

![Image of a gas sampling unit with numbered components]

Figure 2: Example configuration of a set consisting of weatherproof enclosure and SFU

- **①** Weatherproof enclosure
- **②** Gas sampling tube
- **③** SFU filter housing
- **④** Flange
- **⑤** Silicone press ring seal (gas sampling tube seal)

The gas sampling unit consists of filter housing, gas sampling tube, weatherproof enclosure and optional pre-filter.

**Application area**

The gas sampling unit SFU is used for flue gas extraction and filtering for analysis in a measuring system.

The flue gas is taken via a gas sampling tube and fed to a measuring system after filtration.

The gas sampling tube is optionally available in various lengths.

As an option, the gas sampling tube contains a pre-filter at the probe tip.

For maritime applications, unheated gas sampling tubes without pre-filters are used.

**Measuring system**

The gas sampling unit is operated on a SICK measuring system. Thus, only this operating mode is described in this Manual.

Applications with customer-owned peripheral devices are not planned.
3.3 Design

![Gas Sampling Unit Diagram](image)

**Figure 3: SFU-BF NI GL**

1. Gas sampling tube
2. Filter housing
3. 3 pneumatic lines (backflush, activation of main valve, zero gas)
4. Output sample gas line
5. Input connection bundle (electrical and pneumatic lines)
6. Filter element with rotary handle

The gas sampling unit consists of the following subassemblies:

- Gas sampling tube:
  - Heated gas sampling tube:
  - Unheated maritime gas sampling tube
  - Optional: Pre-filter at the tip of the gas sampling tube
- SFU in IP54 enclosure:
  - Heated filter housing with filter element
  - Weatherproof enclosure

The electrically heated filter housing is made of coated aluminum. The filter housing is insulated by an aluminum housing lined with polyimide.

The weatherproof enclosure is made of glass fiber reinforced plastic (GRP).

**Thermostatic control**

The gas sampling unit is thermostatically controlled.

- Heating control with Pt100 sensor and external heating control
- Limit value monitoring in the controller of the measuring system

### 3.3.1 Gas sampling tube

The length of the gas sampling tube depends on the conditions at the sampling point. The gas sampling tube is available for maritime applications in an unheated version.

Type and length of the gas sampling tube are described in the supplied system documentation.

**NOTE**

The gas sampling tube is supplied pre-assembled.
4 Installation and start-up

4.1 Important information

**WARNING**
Risk of injury by a heavy load
The weatherproof enclosure including the sampling system with flange weighs approx. 30 kg.
- Use proper lifting techniques to lift or move the device.
- Lift the unit by the enclosure. If necessary, remove the cover in order to grip the device better and reduce the weight.
- Always work in pairs.

**WARNING**
Health risk through dangerous sample gas
If dangerous sample gas is applied to the SFU: The operator is responsible for safe handling of sample gas.
- In addition to these Operating Instructions, observe all local laws, technical rules, and company-internal instructions valid at the site where the SFU is installed.
- Operate the SFU only in rooms with adequate installation OR install suitable gas monitoring equipment.
- Channel sample gas off safely.

**WARNING**
Hazard through sample gas pressure
The stacks can have underpressure or overpressure.
- Observe information from the plant operator.

**WARNING**
Risk of burns on hot surfaces
Filter housing, flanges and sample gas line can be hot.
- Allow the surface of the device parts to cool down to body temperature or wear suitable protective gloves.

**WARNING**
Danger to life by electric voltage
- Only allow an authorized electrician to work on the electric system.

The assembly of the gas sampling unit contains the following work steps:

<table>
<thead>
<tr>
<th>Step</th>
<th>Work step</th>
<th>Special features</th>
<th>Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Install the welding neck flange</td>
<td>Has to be performed by the operator beforehand</td>
<td>page 15</td>
</tr>
<tr>
<td>2</td>
<td>Connect the sample gas line</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Connect the hoses for valves</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Connect the electrical connections</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Install the gas sampling tube</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### 4.2 Weatherproof enclosure

<table>
<thead>
<tr>
<th>Step</th>
<th>Work step</th>
<th>Special features</th>
<th>Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>Attach the SFU to the welding neck flange</td>
<td>Observe preheating period</td>
<td>page 20</td>
</tr>
</tbody>
</table>

![Figure 4: SFU-BF NI GL in weatherproof enclosure (closed left and open right)]

- 1. Enclosure cover
- 2. Enclosure base
- 3. Tension locks
- 4. Filter housing
- 5. Gas sampling tube
- 6. Ventilation membrane

**DANGER**

Hazard by voltage

Live parts are accessible after the weatherproof enclosure has been opened.

- Disconnect the gas sampling unit from the power supply before opening the enclosure (for example by switching off the measuring system).

**CAUTION**

Risk of burns on hot surfaces

You can perform the work while the filter is hot.

- Wear suitable gloves.

**Removing the enclosure cover**

1. Unlock the tension locks.
2. Pull the enclosure cover away from the gas sampling tube and lift.

**Fitting the enclosure cover**

1. Fit the enclosure cover in the direction of the gas sampling tube.
2. Lock the tension locks.
4.3 Preparing the connection bundle

Figure 5: Standard connection bundle

Standard hose bundle cable (system-specific example) with:
- Power supply
- Grounding conductor yellow/green
- Signal lines
- Tube, gray: Zero gas/span gas
- Tube, black: Main valve
- Tube, blue: Backflush

Figure 6: DNV GL approved connection bundle:

- Power supply
- Grounding conductor yellow/green
- Signal lines
- Tube, gray: Zero gas/span gas
- Tube, black: Main valve
- Tube, blue: Backflush

Halogen-reduced for use on passenger ships
Additionally improved protection against fire

The connection bundle (option) connects the SFU with the measuring system.
Preparation of the connection bundle

NOTE
Leave a sufficient length for pulling the gas sampling unit out of the stack (approx. 2 m).

1 Strip the connection bundle and shorten the hoses and lines to the required length.
   Cut the hoses at right angles. Avoid damaging the lines and hose lines.
2 Cut the flexible wires to the required length. Press the crimp lead end sleeves onto the ends of the flexible wires.

4.4 Mounting

4.4.1 Installing the welding neck flange

WARNING
Risk of burns by hot flanges.
The flanges can reach high temperatures.
  ▶ Before starting any work on the flanges, allow the flanges to cool down to body temperature or wear appropriate protective gloves.

DANGER
Health risk through hot or toxic gases/dusts in the measuring duct
The measuring duct can contain hot or toxic gases or dust deposits which can escape when opening the duct-side flange. Even if the measuring duct is out of operation during the installation, escaping gases can lead to severe damage to health.
  ▶ Always put the measuring duct out of operation for the duration of the installation.
  ▶ If required, purge the measuring duct with ambient air before starting installation work.
  ▶ During installation work, always wear protective clothing which is suitable or specified by the operating company.

The operator is responsible for installing the welding neck flange.
The specifications of the flange connection are described in the System Documentation delivered.
Figure 7: Installation requirements for welding neck flange

1. Gas sampling tube
2. Stack wall
3. Welding neck flange
4. Probe filter

- Attach the flange with a tilt of approx. 10°.
- The minimum distance a behind welding neck flange must be min. the length specified in the following table in order to maintain and dismantle the gas sampling unit.

Table 1: Minimum distance behind welding neck flange

<table>
<thead>
<tr>
<th>Length of gas sampling tube</th>
<th>Minimum distance a</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 m</td>
<td>915 mm</td>
</tr>
<tr>
<td>0.8 m</td>
<td>1215 mm</td>
</tr>
<tr>
<td>1.0 m</td>
<td>1415 mm</td>
</tr>
<tr>
<td>1.5 m</td>
<td>1915 mm</td>
</tr>
<tr>
<td>2.0 m</td>
<td>2415 mm</td>
</tr>
</tbody>
</table>
4.4.2 Connection of sample gas line

![Diagram of sample gas connection SFU-BF N1 GL in weatherproof enclosure]

1. Insulating shell
2. Clamping ring screw connection
3. Sample gas line
4. Cable gland with cap nut, small
5. Cable gland with cap nut, large

**NOTE**
If you lay the heated sample gas line before installing the gas sampling unit: Observe the installation of the sample gas line:

- Start laying at the measuring system:
  - The end with electrical connection is connected to the measuring system.
  - The end without electrical connection is connected to the gas sampling unit.
    - Roll up excess length at the gas sampling unit.
    - Leave enough length for pulling out the gas sampling unit (approx. 2 m).
- Protect the line from damage (chafing through vibration, mechanical and thermal load).
- Observe a minimum bending radius of 300 mm.

1. Remove the enclosure cover (see "Weatherproof enclosure", page 13).
2. Unscrew the large cap nut and slide it onto the sample gas line.
3. Unscrew the insulation half-shell.
4. Feed the sample gas line through the large cable gland of the weatherproof enclosure and then through the installation plate and the hose clamp.
5. Screw the sample gas line tight on the clamping ring screw connection.
   - For first screwing (clamping ring still loose): 1¼ turn to "hand-tight".
   - For further screwing: (clamping ring tight) ¼ turn to "hand-tight".
6. Fasten the sample gas line using a hose clamp. The screw head can be reached via an opening in the chamfer of the installation plate.
7. Screw the insulation half-shell back on again.
8. tighten the cap nut hand-tight.
9. Check hose connections for leaks:
   - The leak tightness check is performed via the connected measuring system: See the Operating Instructions of the measuring system.
4.4.3 Connection of the pneumatic lines

**NOTICE**
Risk of damaging the measuring system.
- Ensure correct assignment of the pneumatic connections.
- Ensure leak tightness of the system.

Connection for SFU-BF NI GL

Figure 9: Connection of SFU-BF NI GL pneumatic lines

1. Push the cap nut onto the connection bundle.
2. Feed the connection bundle through the cable gland of the weatherproof enclosure and then through the installation plate.
3. Connect the 3 hoses with the 3 hose fittings on the filter housing and ensure correct layout.
4. Push the hoses flush over the hose connections of the hose fitting.
5. Hose for the zero gas: Use clamping ring screw connection with support sleeve.
6. Tighten the cap nut by hand.
7. Screw the cable gland tight.

4.4.3.1 Adapter for inch thread (option)

If you want to connect pneumatic lines with inch thread: There is an adapter set with 4 clamping ring screw fittings.

Part No. "Adapter set inch thread": 2083838
Installation

1. Wrap the thread with 2 - 2.5 layers of Teflon tape.
2. Tighten the adapter with an open-end wrench until a distinct increase in strength is felt.
   Then tighten by approx. 1/8 to 1/4 turn.

4.5 Electrical installation

**WARNING**

Danger to life by electric voltage
- Only allow an authorized electrician to work on the electric system.

**WARNING**

Risk of short-circuit due to condensate.
- Allow the electronics to acclimatize sufficiently before connecting.
Figure 11: Terminal diagram for 230 V and 115 V

The electrical connection of the gas sampling unit is made via the connection terminals on the installation plate.

Observe the terminal diagram on the SFU.

The temperature sensors and the heating cartridges are wired ex factory.

- Remove the enclosure.
- Perform electrical connections.

4.6 Installing the gas sampling tube on the gas sampling unit

Installing the gas sampling tube

The gas sampling unit with gas sampling tube is supplied pre-assembled.

Installing the pre-filter

The pre-filter can be screwed to the gas sampling tube.

1. Wrap the thread with Teflon tape.
2. Screw the pre-filter onto the tip of the gas sampling tube. Tighten by hand with a wrench.

4.7 Installing the SFU on the welding neck flange

NOTICE
Risk of contamination of the gas sampling unit

Do not install a cold gas sampling unit on the stack.

- Allow the gas sampling unit to warm up before installing it on the welding neck flange.
- Warm-up time: Approx. 1.5 h at 25 °C ambient temperature
Figure 12: Installation of gas sampling tube on welding neck flange

1. Push the seal over the gas sampling tube.
2. Push the gas sampling unit with probe tube into the welding neck flange. The hose outputs of the gas sampling unit have to point downwards.
3. Screw the filter housing flange of the gas sampling unit to the welding neck flange.
4. Fit the weatherproof enclosure: see "Weatherproof enclosure", page 13

**WARNING**

Risk of burns on hot surfaces

The gas sampling tube and the gas sampling unit become hot during operation.

- Wear suitable protective clothing, e.g. heat-resistant gloves.
5 MAINTENANCE

5 Maintenance

5.1 Important Information

WARNING
Risk of injury by a heavy load
The weatherproof enclosure including the sampling system with flange weighs approx. 30 kg.
- Use proper lifting techniques to lift or move the device.
- Lift the unit by the enclosure. If necessary, remove the cover in order to grip the device better and reduce the weight.
- Always work in pairs.

WARNING
Health risk through dangerous sample gas
If dangerous sample gas is applied to the SFU: The operator is responsible for safe handling of sample gas.
- In addition to these Operating Instructions, observe all local laws, technical rules, and company-internal instructions valid at the site where the SFU is installed.
- Operate the SFU only in rooms with adequate installation OR install suitable gas monitoring equipment.
- Channel sample gas off safely.

WARNING
Health risk through dangerous sample gas
If dangerous sample gas is applied to the SFU: The operator is responsible for safe handling of sample gas.
- In addition to these Operating Instructions, observe all local laws, technical rules, and company-internal instructions valid at the site where the SFU is installed.
- Operate the SFU only in rooms with adequate installation OR install suitable gas monitoring equipment.
- Channel sample gas off safely.

WARNING
Hazard through sample gas pressure
The stacks can have underpressure or overpressure.
- Observe information from the plant operator.

WARNING
Risk of burns on hot surfaces
Filter housing, flanges and sample gas line can be hot.
- Allow the surface of the device parts to cool down to body temperature or wear suitable protective gloves.

WARNING
Danger to life by electric voltage
- Only allow an authorized electrician to work on the electric system.

5.2 Maintenance plan

<table>
<thead>
<tr>
<th>No.</th>
<th>Maintenance work</th>
<th>Reference</th>
<th>Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>W1</td>
<td>Replace sintered metal filter element and seals</td>
<td>see <em>Replacing the sintered metal filter element</em>, page 23</td>
<td>3M¹</td>
</tr>
<tr>
<td>W2</td>
<td>Replace glass fiber filter element and seals</td>
<td>see <em>Replacing the glass fiber filter element</em>, page 26</td>
<td>3M¹</td>
</tr>
<tr>
<td>W3</td>
<td>Check gas connections</td>
<td>see <em>Checking for correct operation</em>, page 32</td>
<td>3M¹</td>
</tr>
</tbody>
</table>

¹ 3M = every 3 months
### 5.3 Spare parts

<table>
<thead>
<tr>
<th>Required spare parts for W1 and W2</th>
<th>Part number</th>
<th>Quantity required</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service kit (contains: 1<em>2 μm sintered metal filter element, 2</em>flat seals, 1*O-ring)</td>
<td>2039002</td>
<td>1</td>
<td><img src="image1.png" alt="Image" /></td>
</tr>
<tr>
<td>Service kit (contains 1<em>0.1μm glass fiber filter element, 1</em>flat seal, 1*O-ring)</td>
<td>2043616</td>
<td>1</td>
<td><img src="image2.png" alt="Image" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Required spare parts for U1</th>
<th>Part number</th>
<th>Quantity required</th>
<th>Picture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass fiber filter element with holder (contains 1<em>0.1μm glass fiber filter element, adapter, 1</em>flat seal, 1*O-ring)</td>
<td>2024972</td>
<td>1</td>
<td><img src="image3.png" alt="Image" /></td>
</tr>
</tbody>
</table>

**NOTE**
Further spare parts can be found in the individual System Description provided with the gas sampling unit.

### 5.4 Replacing the sintered metal filter element

You can perform the work while the filter element is hot.
Pay attention to the warning about hot surfaces.
The filter element may be hot inside.

**WARNING**
Risk of burns on hot surfaces
The filter element can reach high temperatures in operation.
- Wear suitable gloves.
- Provide a heat-resistant support.

**WARNING**
Hazard by toxic substances
Filter elements can contain toxic substances depending on the sample gas composition.
- Observe the relevant safety regulations.
- Dispose of the filter elements in an environmentally compatible manner.
Procedure

1. Switch off the fuse of the gas sampling unit in the measuring system. The position of the fuse is described in the System Documentation enclosed with the measuring system.
2. Remove the enclosure: see "Weatherproof enclosure", page 13.
3. Check all gas connections:
   - Optical condition
   - Tight seat
   - Leak tightness:
     The leak tightness check is performed via the connected measuring system: See the Operating Instructions of the measuring system.

Changing the sintered metal filter element

1. Loosen the rotary handle counterclockwise.

   ![Image of rotary handle and mounting bracket]
   
   ① Rotary handle
   ② Mounting bracket
   ③ Pressure disk (covered)

2. Swing the mounting bracket to the right.

   **WARNING**
   Risk of burns on hot surfaces
   The inner parts of the gas sampling filter can be especially hot.
   - Wear suitable gloves.
   - Provide a heat-resistant support.

   **CAUTION**
   Risk of injury due to high weight
   - Do not drop the filter cover.

3. Pull the filter cover out using the rotary handle.
4. If the filter cover is hot: Place the filter cover on a heat-resistant mat.
5. Remove the sintered metal filter element.
6. Pull out the bottom flat seal with a hook.
7. Insert new bottom flat seal.

8. Replace O-ring and flat seal of the filter cover.

9. Insert new or cleaned filter element.
   If one side of the filter element has a groove: The groove must point in the direction of the filter cover.
10. Fit the filter cover.
11. Swing back the mounting bracket. Make sure that the pressure disk is behind the mounting bracket.

![Illustration of the filter components]

① Rotary handle  
② Pressure disk  
③ Mounting bracket

12. Tighten the rotary handle clockwise.

### 5.5 Replacing the glass fiber filter element

You can perform the work while the filter element is hot.
Pay attention to the warning about hot surfaces.
The filter can have an internal temperature of 185 °C.

---

**WARNING**

**Risk of burns on hot surfaces**
The filter element can reach high temperatures in operation.
- Wear suitable gloves.
- Provide a heat-resistant support.

---

**WARNING**

**Hazard by toxic substances**
Filter elements can contain toxic substances depending on the sample gas composition.
- Observe the relevant safety regulations.
- Dispose of the filter elements in an environmentally compatible manner.

---

**Replacing fine filter cartridge**

1. Loosen the rotary handle counterclockwise.
2. Swing the mounting bracket to the right.

**WARNING**
Risk of burns on hot surfaces
The filter element can reach high temperatures in operation.
- Wear suitable gloves.
- Provide a heat-resistant support.

**CAUTION**
Risk of injury due to high weight
- Do not drop the filter cover.

3. Pull out the filter cover with glass fiber filter element using the rotary handle.
4. If the filter cover is hot: Place the filter cover on a heat-resistant mat.
5. Pull out the bottom flat seal with a hook.
6. Loosen the glass fiber filter element from the filter handle by opening the spiral thread.

7. Insert new bottom flat seal.
8. Renew the O-ring in the filter cover.
9. Fit new or cleaned glass fiber filter element on the filter cover. Tighten the spiral thread.
   If one side of the filter element has a groove: The groove must point in the direction of the filter cover.
10. Replace the filter cover.
11. Swing back the mounting bracket. Make sure that the pressure disk is behind the mounting bracket.
12. Tighten the rotary handle clockwise.
13. Fit the housing again: see "Weatherproof enclosure", page 13.

5.6 Retrofitting the filter element

You can perform the work while the filter element is hot.
Pay attention to the warning about hot surfaces.
The filter can have an internal temperature of 185 °C.

**WARNING**
Risk of burns on hot surfaces
The filter element can reach high temperatures in operation.
► Wear suitable gloves.
► Provide a heat-resistant support.

**WARNING**
Hazard by toxic substances
Filter elements can contain toxic substances depending on the sample gas composition.
► Observe the relevant safety regulations.
► Dispose of the filter elements in an environmentally compatible manner.

Procedure
1. Switch off the fuse of the gas sampling unit in the measuring system.
The position of the fuse is described in the System Documentation enclosed with the measuring system.
2. Remove the enclosure: see "Weatherproof enclosure", page 13.
3. Check all gas connections:
   ○ Optical condition
   ○ Tight seat
   ○ Leak tightness:
     The leak tightness check is performed via the connected measuring system:
     See the Operating Instructions of the measuring system.

Retrofitting the sintered metal filter element to a glass fiber filter element
1. Loosen the rotary handle counterclockwise.
2. Swing the mounting bracket to the right.

**WARNING**

Risk of burns on hot surfaces
The filter element can reach high temperatures in operation.
- Wear suitable gloves.
- Provide a heat-resistant support.

**CAUTION**

Risk of injury due to high weight
- Do not drop the filter cover.

3. Pull the filter cover out using the rotary handle.
4. If the filter cover is hot: Place the filter cover on a heat-resistant mat.
5. Remove the sintered metal filter element.

6. Pull out the bottom flat seal with a hook.
7. Insert new bottom flat seal.
8. Replace O-ring and flat seal of the filter cover.

9. Fit the glass fiber filter element on the filter cover. Tighten with the spiral thread. If one side of the glass fiber filter element has a groove: The groove must point in the direction of the filter cover.

10. Replace the filter cover.

11. Swing back the mounting bracket. Make sure that the pressure disk is behind the mounting bracket.
12. Tighten the rotary handle clockwise.
13. Fit the enclosure again: see "Weatherproof enclosure", page 13

5.7 Checking for correct operation

- Check all fastening screws of the housing for tight seat.
- Check the sample gas line for damage.
- Check all hose fittings for tight seat.
- Check gas sampling unit for cleanness, dryness and freedom from corrosion.
- Check all electric connections for freedom from corrosion and tight seat.
- Check grounding conductors are free from corrosion.
- Perform a leak tightness check:
  The leak tightness check is performed via the connected measuring system: See the Operating Instructions of the measuring system.
## 6 Troubleshooting

### 6.1 Troubleshooting

<table>
<thead>
<tr>
<th>Fault</th>
<th>Possible cause</th>
<th>Correction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas throughput decreases</td>
<td>Pre-filter contaminated</td>
<td>Clean or replace</td>
</tr>
<tr>
<td></td>
<td>Filter element contaminated</td>
<td></td>
</tr>
<tr>
<td>Heating failed</td>
<td>Heating cartridge or temperature sensor defective</td>
<td>If necessary, replace seal or defective component</td>
</tr>
<tr>
<td></td>
<td>Defective seal</td>
<td>Replace seal</td>
</tr>
<tr>
<td>Contaminated or corroded gas paths</td>
<td>Defective or missing pre-filter</td>
<td>Replace</td>
</tr>
<tr>
<td>Leaky non-return valves</td>
<td>Contaminated instrument air</td>
<td>Replace</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Check the purity of the instrument air</td>
</tr>
<tr>
<td>Leaky main valve</td>
<td>Valve seating contaminated or damaged</td>
<td>Replace the valve cone</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Replace the filter housing</td>
</tr>
<tr>
<td></td>
<td>Metal bellow leaky</td>
<td>Replace the metal bellow</td>
</tr>
</tbody>
</table>
7 Disposal

The device can easily be disassembled into its components which can then be sent to the respective raw material recycling facilities.

WARNING
Filters and lines with sample gas contact can contain toxic substances. Observe the relevant safety regulations.

- Depending on their components, filters and lines with sample gas contact must be disposed of according to the legal regulations. If required, they must be treated as hazardous waste.
8 Technical data

8.1 Compliances and Standards

Compliance

The technical version of device SFU-BF NI GL complies with the following EU directives and EN standards:

- EC Directive: LVD (Low Voltage Directive)
  EN 61010-1: Safety requirements for electrical equipment for measurement, control and laboratory use

Further standards: See Declaration of Conformity provided with the device

Additional standards for SFU-BF NI GL

- MARPOL Annex VI and NTC 2008 - MEPC.177(58)
- Guidelines for exhaust gas cleaning systems - MEPC.184(59)

8.2 Dimensions

![Figure 13: SFU-BF NI GL in weatherproof enclosure](image)

8.3 Operating data

<table>
<thead>
<tr>
<th>Ambient conditions</th>
<th>SFU-BF NI GL in weatherproof enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td>-35 ... +55 °C (-31 ... +131 °F)</td>
</tr>
<tr>
<td>Storage temperature</td>
<td>-40 ... +60 °C (-40 ... 140 °F)</td>
</tr>
<tr>
<td>Relative humidity</td>
<td>Max. 95%</td>
</tr>
<tr>
<td>Degree of protection</td>
<td>IP54</td>
</tr>
</tbody>
</table>

### Installation

<table>
<thead>
<tr>
<th>SFU-BF NI GL in weatherproof enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions:</td>
</tr>
<tr>
<td>Main valve</td>
</tr>
<tr>
<td>Zero gas</td>
</tr>
<tr>
<td>Backflush</td>
</tr>
<tr>
<td>Sample gas line</td>
</tr>
<tr>
<td>Dimensions:</td>
</tr>
<tr>
<td>8 mm</td>
</tr>
<tr>
<td>6 mm</td>
</tr>
<tr>
<td>8 mm</td>
</tr>
<tr>
<td>6 mm</td>
</tr>
</tbody>
</table>
### Installation

**SFU-BF NI GL in weatherproof enclosure**

<table>
<thead>
<tr>
<th>Compressed air</th>
<th>Pressure:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Main valve</td>
<td>• 5 - 6 bar (500 - 600 kPascal)</td>
</tr>
<tr>
<td>• Zero gas</td>
<td>• 2.5 - 3 bar (250 - 300 kPascal)</td>
</tr>
<tr>
<td>• Backflush</td>
<td>• 5 - 6 bar (500 - 600 kPascal)</td>
</tr>
</tbody>
</table>

**Flange**  
NW = Rated width  
ND = Rated pressure  
NW 65 ND 6

**Fitting position**  
Horizontally with an inclination of approx. 10° (see "Installing the welding neck flange", page 15)

### Power input

**SFU-BF NI GL in weatherproof enclosure**

| probe filter | 115/230 V, 50-60 Hz, max. 450 VA |

### Device characteristics

#### Materials

- Gas sampling tube
- IP54 enclosure
- Locks
- Seals

#### Pressure

- Application-dependent; maritime unheated gas sampling tubes: 1.4547/254 SMO
- GRP enclosure (glass fiber reinforced plastic)
- Tension locks: Stainless steel
- EPDM/silicone

**Weight**  
Approx. 30 kg (SFU in IP54 enclosure with flange and gas sampling tube)

**Gas temperature in sampling system**  
Max. 250°C (482°F)

**Gas temperature in stack**  
Unheated gas sampling tube: Max. 1300°C (2400°F)  
Heated gas sampling tube: Max. 200°C (392°F)

**Heating temperature of the SFU**  
Max. 200°C (392°F)

**Temperature control**  
External, Pt100

**Limit monitoring**  
External heating controller

**Purge gas flow**  
Approx. 12 l/min

**Backpurge flow rate**  
Approx. 80 l/min

**Sample gas throughput**  
300 ... 1000 l/h

**Heating up time**  
Approx. 1.5 h (from room temperature to 200 °C)

### Standard lengths of unheated maritime gas sampling tubes [mm]; Material 1.4547/254 SMO

<table>
<thead>
<tr>
<th>Length</th>
<th>Material 1.4547/254 SMO</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td></td>
</tr>
</tbody>
</table>

### Standard lengths of heated gas sampling tubes [mm]; Material 1.4404

<table>
<thead>
<tr>
<th>Length</th>
<th>Material 1.4404</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>1500</td>
<td></td>
</tr>
<tr>
<td>2000</td>
<td></td>
</tr>
</tbody>
</table>