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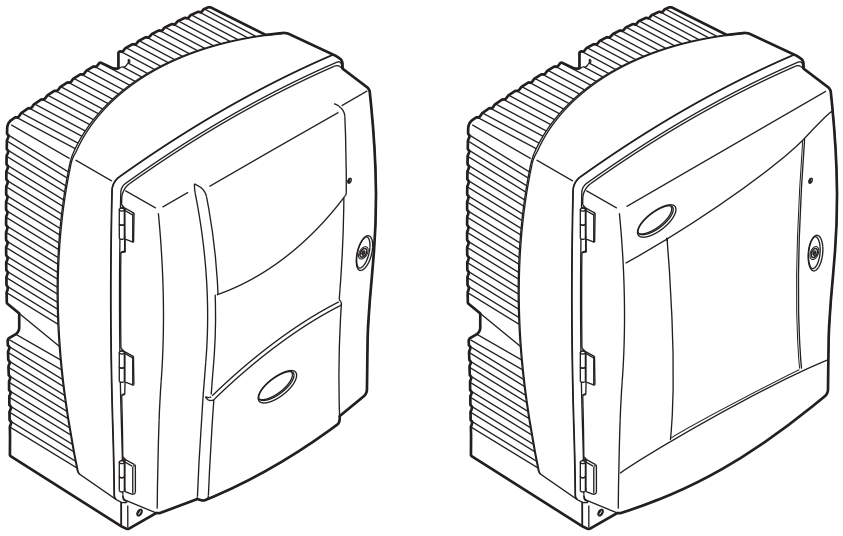
# PHOSPHAX sc, PHOSPHAX indoor sc

USER MANUAL

05/2021, Edition 7



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# Section 1 Specifications

Specifications are subject to change without notice.

| | |
|---|---|
| **Enclosure rating** | PHOSPHAX sc: IP55<br>PHOSPHAX indoor sc: IP54 |
| **Enclosure material** | ASA/PC UV-resistant |
| **Measuring method** | 2-beam photometer (yellow method) |
| **Measuring range** | 0.05 to 15 mg/L $PO_4$–P |
| | 1 to 50 mg/L $PO_4$–P |
| **Detection limit** | 0.05 mg/L, with standard solution: (0.05 to 15 mg/L $PO_4$–P Measuring Range) |
| | 1.00 mg/L, with standard solution (1 to 50 mg/L $PO_4$–P Measuring Range) |
| **Measuring accuracy (with standard solution)** | 2 % of the measured value + 0.05 mg/L (0.05 to 15 mg/L $PO_4$–P Measuring Range) |
| | 2 % of the measured value + 1.0 mg/L (1 to 50 mg/L $PO_4$–P Measuring Range) |
| **Repeatability (with standard solution)** | 2 % of the measured value + 0.05 mg/L (0.05 to 15 mg/L $PO_4$–P Measuring Range) |
| | 2 % of the measured value + 1.0 mg/L (1 to 50 mg/L $PO_4$–P Measuring Range) |
| **Response time (90 %)** | < 5 minutes |
| **Adjustable measuring interval** | 5 to 120 minutes |
| **Power supply** | Power supply with power cable, using the sc1000 controller only<br>(analyzer, Filter Probe sc, and drain tubing: 115 V versions **or** 230 V versions) |
| **Data transmission** | Data transmission with data cable on the sc1000 controller |
| **Electrical power consumption** | 500 VA |
| **Electrical fuse protection** | Via sc1000 controller<br>Maximum of 2 analysis instruments for each sc1000. |
| **Outputs** | Relay, current outputs, network interface via sc1000 controller. Refer to the sc1000 manual for detailed specifications for analog, relay, and digital outputs. |
| **Operating temperature** | PHOSPHAX sc: –20 to 45 °C (–4 to 113 °F); 95 % relative humidity, non-condensing<br>PHOSPHAX indoor sc: 5 to 40 °C (41 to 104 °F); 95 % relative humidity, non-condensing |
| **Storage temperature** | –20 to 60 °C (–4 to 140 °F); 95 % relative humidity, non-condensing |
| **Sample temperature** | +4 to +45 °C (39 to 113 °F) |
| **Sample pressure** | With continuous sample preparation –30 mbar to +50 mbar at overflow vessel |
| **Sample flow** | Range: 1.0–20.0 L/h |
| **Sample quality** | Ultra filtrated or comparable |
| **Sample level** | Level of liquid in basin with filtration probe must be below analyzer |
| **Permissible pH value of the sample** | 5 to 9 |
| **Permissible chlorid range** | ≤ 1000 mg/L $Cl^-$ |
| **Dimensions (Figure 1 on page 7, Figure 2 on page 8)** | PHOSPHAX sc: (W × H × D) 540 × 720 × 390 mm (21.25 × 28.35 × 15.35 in.)<br>PHOSPHAX indoor sc: (W × H × D) 540 × 720 × 370 mm (21,25 × 28,35 × 14.5 in.) |
| **Data and power cable lengths** | 2 m (80 in.) (from edge of enclosure) |
| **Weight** | PHOSPHAX sc: Approximately 31 kg, without Filter Probe sc and without chemicals<br>PHOSPHAX indoor sc: Approximately 29 kg, without Filter Probe sc and without chemicals |
| **Certifications** | CE conform. Listed to UL and CSA safety standards by TUV. |

## Specifications

| | |
|---|---|
| **Altitude** | 2000 m |
| **Pollution degree** | 2 |

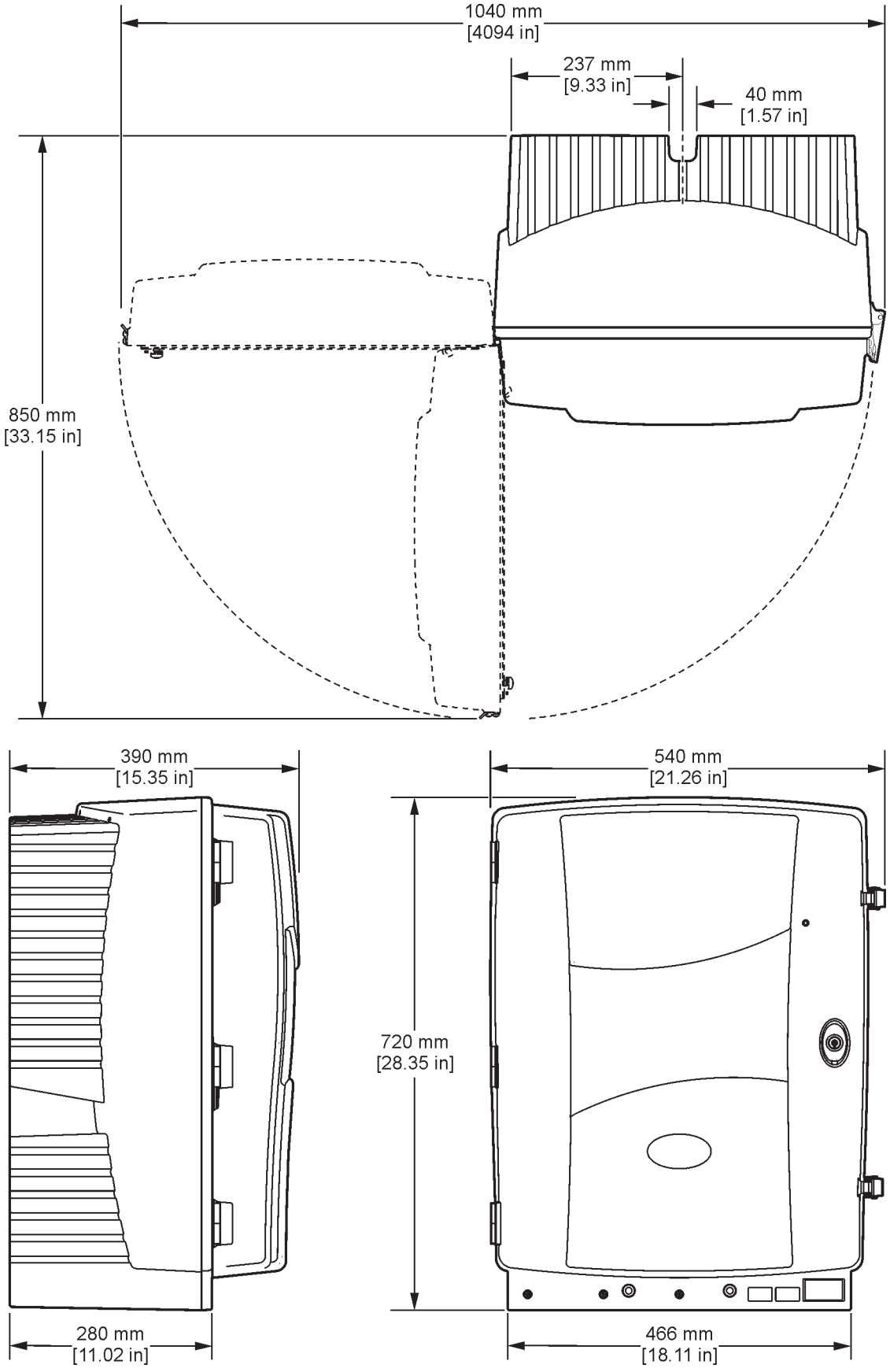



Figure 1 Instrument dimensions PHOSPHAX sc

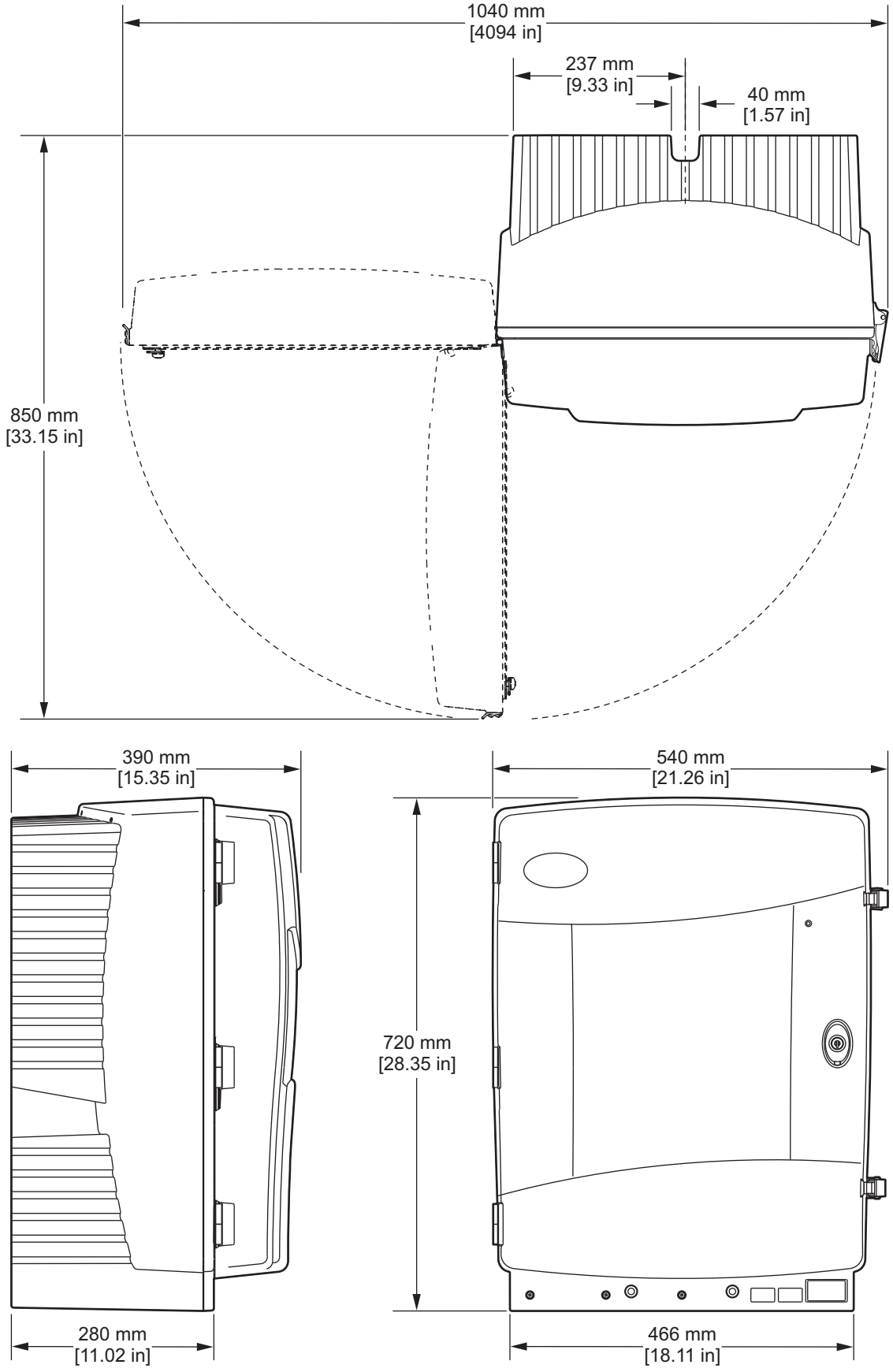



Figure 2 Instrument dimensions PHOSPHAX indoor sc

# Section 2 General Information

## 2.1 Safety information

Please read this entire manual before unpacking, setting up or operating this equipment. Pay attention to all danger and caution statements. Failure to do so could result in serious injury to the operator or damage to the equipment.

Make sure that the protection provided by this equipment is not impaired, do not use or install this equipment in any manner other than that specified in this manual.

### 2.1.1 Use of hazard information

***DANGER***
***Indicates a potentially or imminently hazardous situation which, if not avoided, will result in death or serious injury.***

***WARNING***
***Indicates a potentially or imminently hazardous situation which, if not avoided, could result in death or serious injury.***

***CAUTION***
***Indicates a potentially hazardous situation that may result in minor or moderate injury.***

***Important Note:*** *Indicates a situation which, if not avoided, may cause damage to the instrument. Information that requires special emphasis.*

***Note:*** *Information that supplements points in the main text.*

## 2.1.2 Precautionary labels

Read all labels and tags attached to the instrument. Personal injury or damage to the instrument could occur if not observed. A symbol, if noted on the instrument, will be included with a danger or caution statement in the manual.

| | |
|---|---|
|  | This symbol, if noted on the instrument, references the instruction manual for operation and/or safety information. |
|  | Electrical equipment marked with this symbol may not be disposed of in European public disposal systems after 12 August of 2005. In conformity with European local and national regulations (EU Directive 2002/96/EC), European electrical equipment users must now return old or end-of life equipment to the Producer for disposal at no charge to the user.<br>***Note:*** *For return for recycling, please contact the equipment producer or supplier for instructions on how to return end-of-life equipment, producer-supplied electrical accessories, and all auxiliary items for proper disposal.* |
|  | This symbol, when noted on a product enclosure or barrier, indicates that a risk of electrical shock and/or electrocution exists. |
|  | This symbol, if noted on the product, indicates the need for protective eye wear. |
|  | This symbol, when noted on the product, identifies the location of the connection for Protective Earth (ground). |
|  | This symbol, when noted on the product, identifies the location of a fuse or current limiting device. |
|  | This symbol, when noted on the product, identifies a risk of chemical harm and indicates that only individuals qualified and trained to work with chemicals should handle chemicals or perform maintenance on chemical delivery systems associated with the equipment. |
|  | This symbol, when noted on the product, indicated that the marked item can be hot and should not be touched without care. |
|  | This symbol, when noted on the product, indicated the presence of devices sensitive to Electro-static Discharge (ESD) and indicated that care must be taken to prevent damage with the equipment. |
|  | When carrying or transporting the instrument/instrument components and if the total weight is more than 18 kg, make sure that suitable lifting equipment is used and/or that the instrument/instrument components are carried by 2 people. |
|  | Danger! Do not reach into the device! |

### 2.1.3 Change instrument labels

Several safety labels (3 in the analytical section) are applied to the instrument. If necessary, apply the correct language label over the existing safety labels.

## 2.2 Product overview

The PHOSPHAX sc (Figure 3, Figure 4) measures ortho-phosphate ions ($PO_4^{3-}$) in waste water and surface water. Diphosphates and polyphosphates are not measured. The PHOSPHAX sc must be used in combination with the sc1000 controller. The sc1000 controller is used to configure, power, and output the measured values. The measured value is displayed in unit of mg/L $PO_4$–P on the controller.

To convert the measured value of $PO_4$–P to $PO_4^{3-}$, use the following conversion formula: $PO_4$–P x 3.07 = $PO_4^{3-}$

The PHOSPHAX sc can operate using single or dual channel modes. Operation with the Filter Probe sc uses single channel only The sc analyzer can be converted from a single channel operation to dual channel operation. Contact the manufacturer for more information.

Dual-channel operation is only possible with continuous sample preparation, e. g. FILTRAX or Ultrafiltration. Sample preparation and filtration must be provided before installing the instrument.

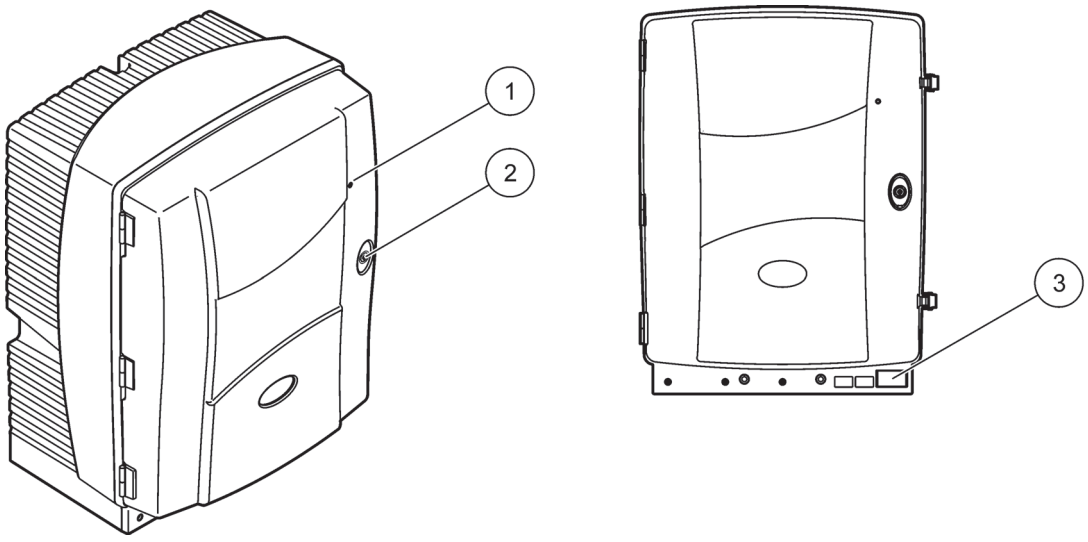



Figure 3 PHOSPHAX sc enclosure

| | | | | | |
|---|---|---|---|---|---|
| **1** | LED for operating state. Refer to Table 7 on page 49 for more information. | **2** | Door lock | **3** | Rating plate with model number, serial number, voltage and frequency information, and power consumption information |

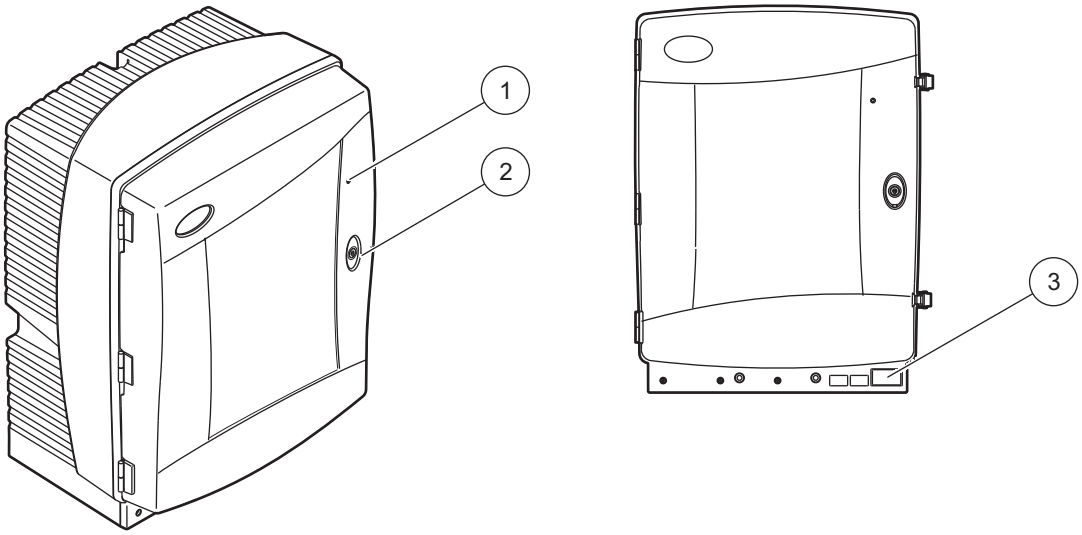



Figure 4 PHOSPHAX indoor sc enclosure

| | | | | | |
|---|---|---|---|---|---|
| **1** | LED for operating state. Refer to Table 7 on page 49 for more information. | **2** | Door lock | **3** | Rating plate with model number, serial number, voltage and frequency information, and power consumption information |

# Section 3 Installation

***DANGER***
***Only qualified personnel should conduct the tasks described in this section of the manual.***

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

***DANGER***
***Potential danger in the event of contact with chemical/biological materials. Handling chemical samples, standards and reagents can be dangerous. Familiarize yourself with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.***

***Normal operation of this instrument may involve the use of hazardous chemicals or biologically harmful samples.***

- ***Observe all cautionary information printed on the original solution containers and safety data sheet prior to their use.***
- ***Dispose of all consumed solutions in accordance with national regulations and laws.***
- ***Select the type of protective equipment suitable to the concentration and quantity of the dangerous material at the respective work place.***

## 3.1 Basic installation overview

1. Unpack the instrument (section 3.2).
2. Mount the instrument (section 3.3 on page 16).
3. Remove any transport locks (section 3.4.2 on page 21).
4. Install the collecting tray and the humidity sensor (section 3.4.3 on page 22 and section 3.4.4 on page 24).
5. Determine the appropriate installation option (section 3.4.5 on page 25).
6. Mount the Filter Probe sc or Filtrax, if necessary. Refer to the appropriate manual for more information.
7. Connect the Filter Probe sc or Filtrax to the PHOSPHAX sc, if necessary. Refer to section 3.5.4 on page 28 for the Filter Probe sc. Refer to the Filtrax manual for more information.
8. Connect the Drain Heating Connection, if necessary (section 3.5.5 on page 29).
9. Make all plumbing connections (Appendix A Plumbing and connection options on page 63).
10. Install the reagents (section 3.6 on page 31).
11. Connect the PHOSPHAX sc to the sc1000 controller to supply power to the system (section 3.7 on page 33).
12. Connect the data network (section 3.8 on page 34).

## 3.2 Unpack the instrument

***CAUTION***
***Pay attention to the weight (approximately 31 kg) of the instrument. Do not try to carry the instrument without assistance. Use only suitable lifting tackle for transport.***

Open the shipping container while it is on its end and then slide the analyzer out of the cardboard.

The items supplied will vary depending on the order.
Standard items supplied for a minimal configuration:

- PHOSPHAX sc and User Manual
- Collecting tray
- Initial set of reagent and cleaning solution
- Fastening bracket and angle bracket
- Accessories for tubing and flow-through variant
- Plug set

## 3.3 Mechanical installation

Select a suitable place to install the instrument. Plan the mechanical installation before positioning posts or drilling holes. Refer to Figure 1 for instrument dimensions.

Make sure that the fastening has sufficient load bearing capacity (approximately 160 kg). The wall plugs must be selected and approved to suit the properties of the wall.

Plan cable and tubing routes to avoid sharp bends and tripping hazards.

When connecting two analyzers (e. g. for measuring two parameters with a FILTRAX or Ultrafiltration), plan where the instruments are to be installed and consider the length of the heated drain tubing (2 m).

### 3.3.1 Mount the instrument

The PHOSPHAX sc can be mounted in three different ways:

- Wall Mount (section 3.3.1.1),
- Rail Mount; refer to the instruction sheet supplied with the Rail Mounting Hardware.
- Stand Mount; refer to the instruction sheet supplied with the Stand Mounting Hardware.

#### 3.3.1.1 Wall mount

Refer to Figure 5, Figure 6, and following instructions to mount the analyzer to a wall.

1. Align and install the fastening bracket to the wall.
2. Attach the angle bracket to the instrument using the supplied screws.
3. Slide the bottom of the enclosure onto the fastening bracket.

4. Attach the enclosure to the fastening bracket.
5. Attach the angle bracket on the enclosure to the wall.

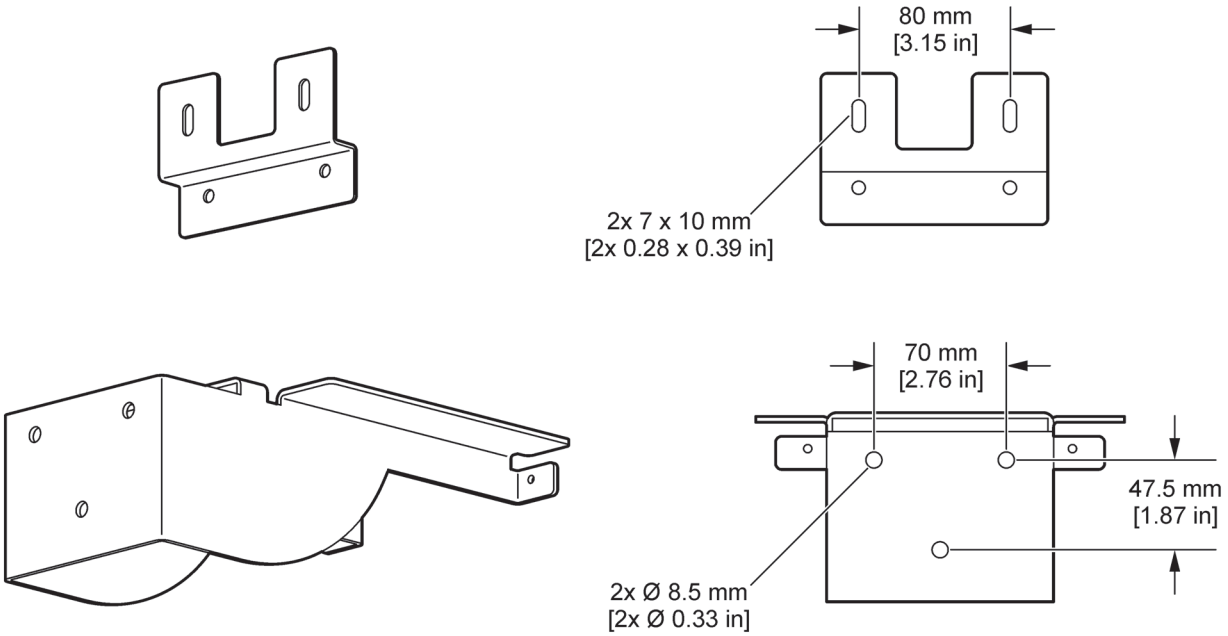



Figure 5 Bracket dimensions for wall mounting

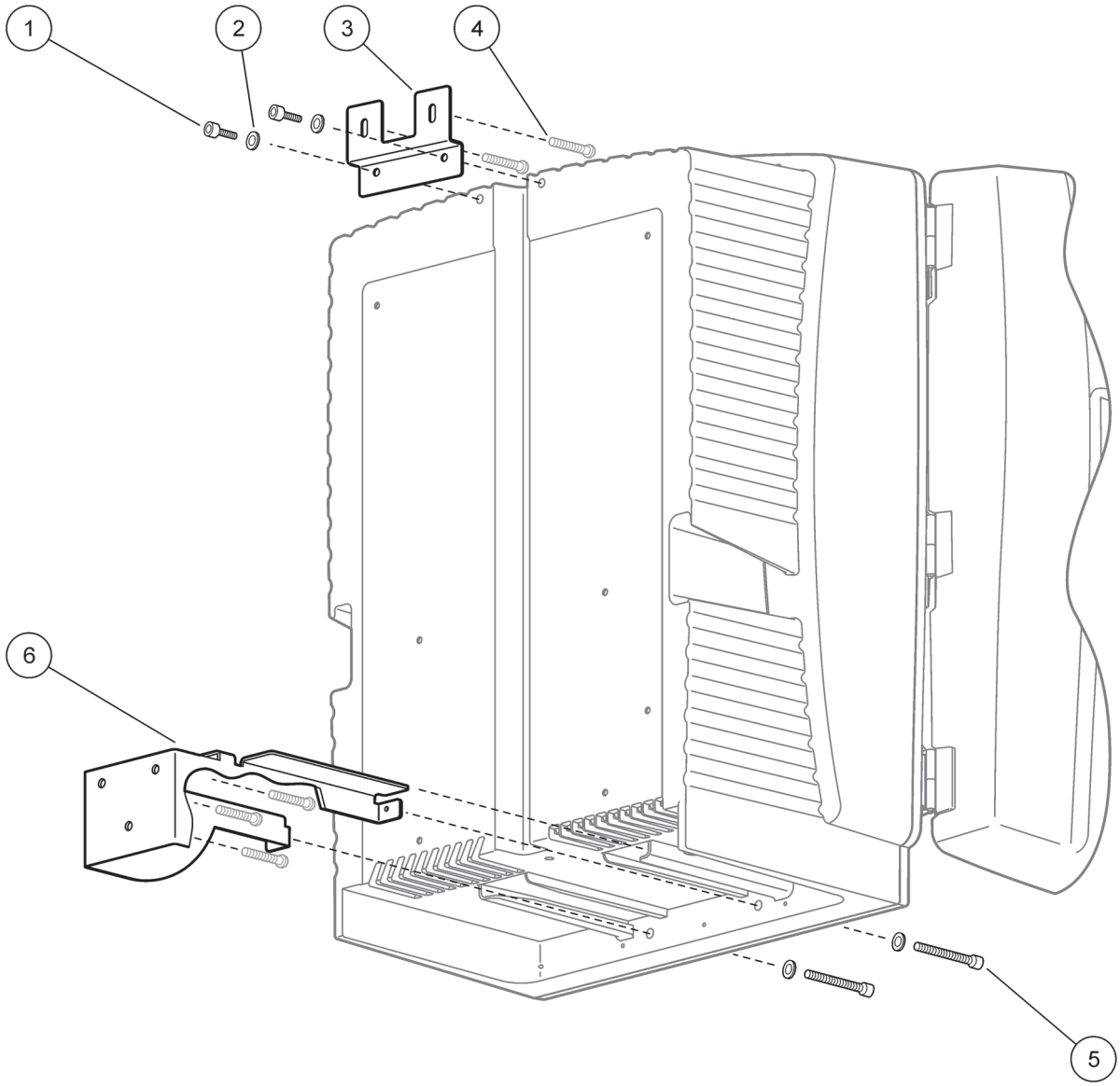



Figure 6 Wall mounting the analyzer

| | | | |
|---|---|---|---|
| **1** | Washer, M5 (4X) | **4** | Screw, customer supplied |
| **2** | Socket head cap screw, M5 X 8 (2X) | **5** | Socket head cap screw, M5 X 40 (2X) |
| **3** | Angle bracket | **6** | Fastening bracket |

## 3.4 Initial instrument setup

### 3.4.1 Open the enclosure

***DANGER***
***To reduce the risk of electrical shock, make sure that no water can enter the enclosure or come into contact with circuit boards.***

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

1. Unlock the instrument (item 4, Figure 7, item 3, Figure 8).
2. Open the side latches and release the door catch.
3. Open the door and secure the door using the hook or completely remove the door.

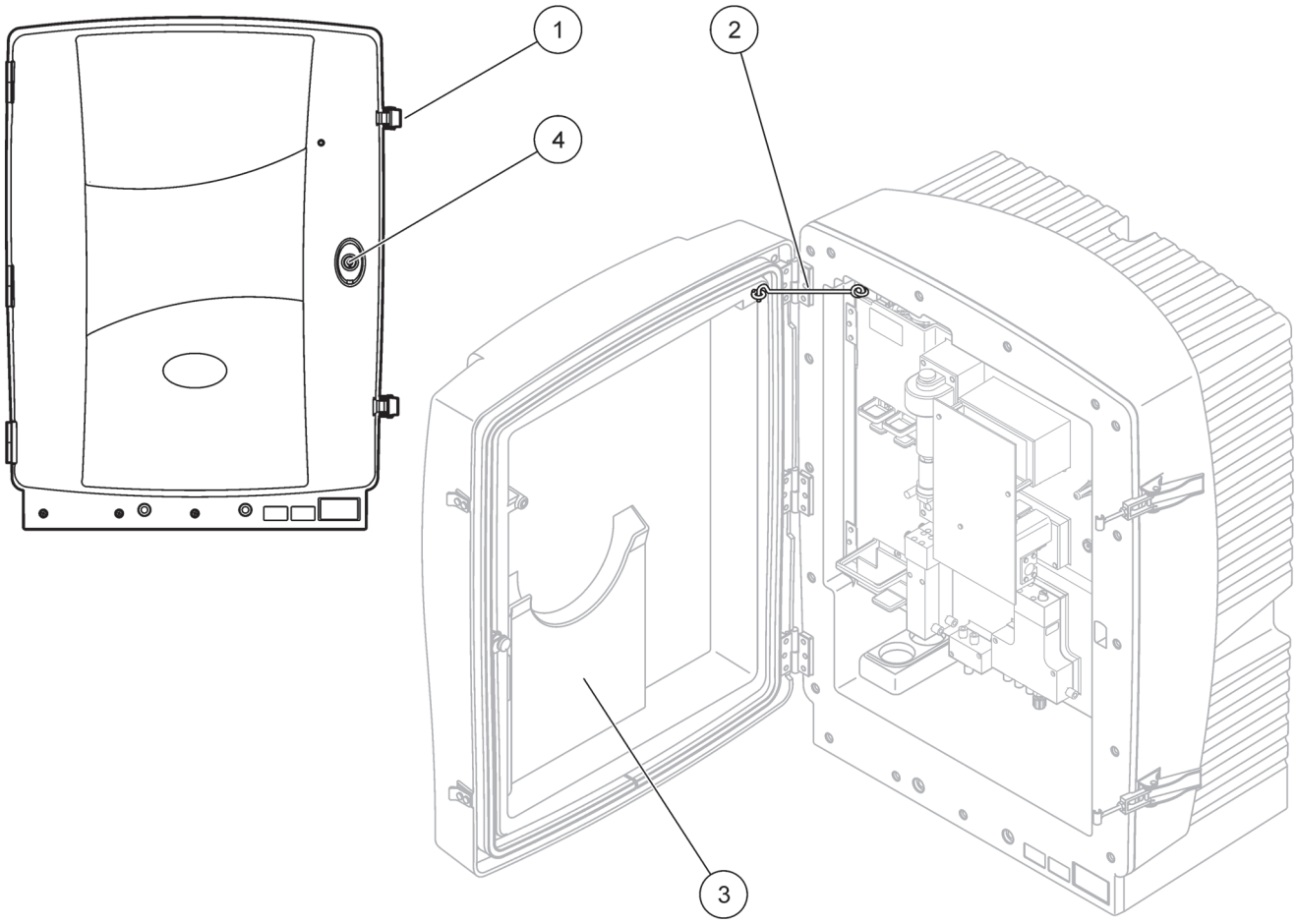



Figure 7 Open the PHOSPHAX sc enclosure

| | | | |
|---|---|---|---|
| **1** | Latches | **3** | Pocket for manual |
| **2** | Door hook | **4** | Lock with key |

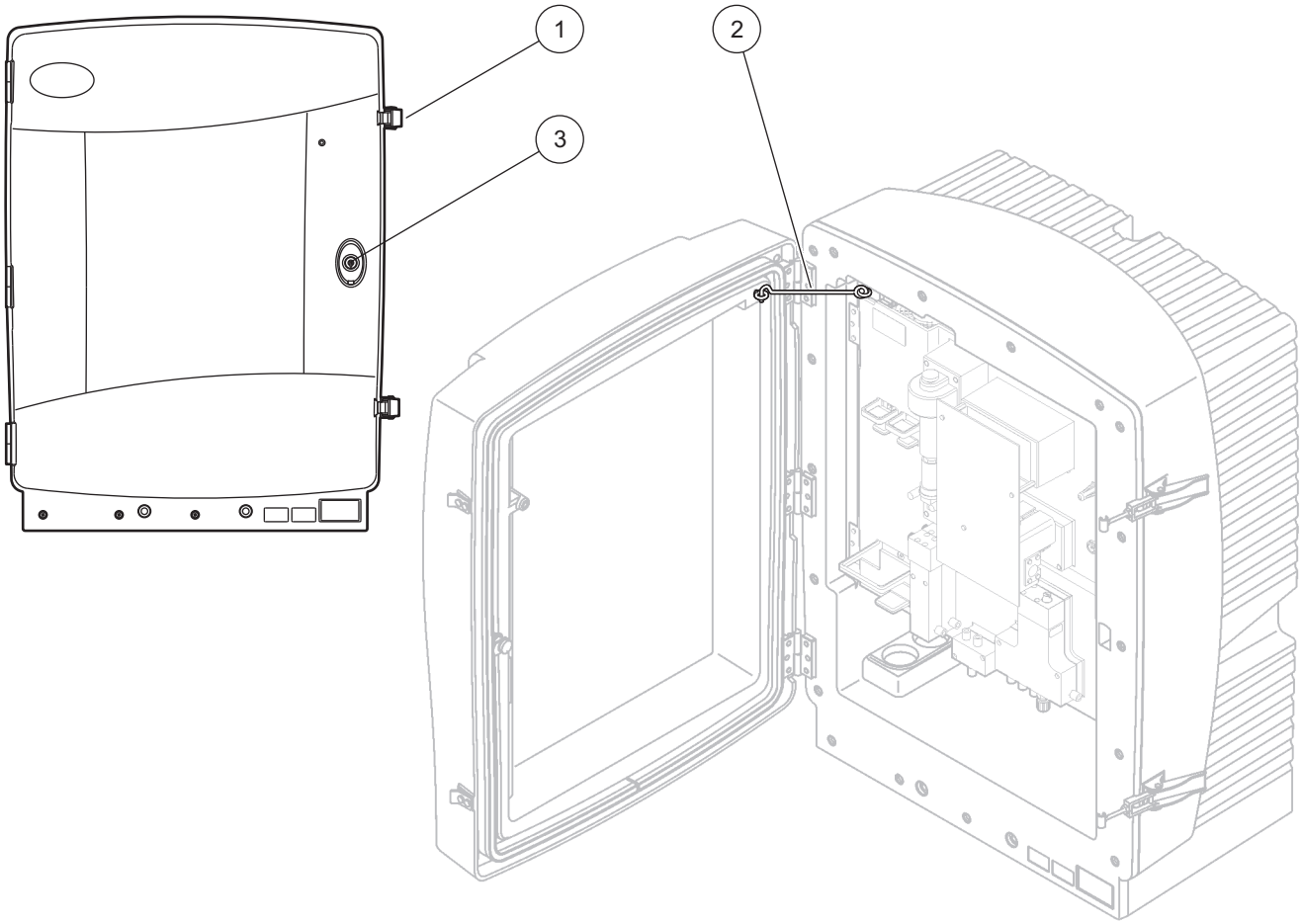



Figure 8 Open the PHOSPHAX indoor sc enclosure

| | | | |
|---|---|---|---|
| **1** | Latches | **3** | Lock with key |
| **2** | Door hook | | |

### 3.4.2 Remove the shipping transport locks

Prior to system start-up, the shipping transport locks must be removed from the sc analyzer.

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

***Important note:*** *The cuvette insulation for the measuring unit is NOT a transport lock. Do NOT remove the cover on the measuring unit.*

1. Open the enclosure door and secure with the door hook.
2. Remove the transport lock on the analyzer panel (Figure 9).

   ***Note:*** *If the instrument is operated with a Filter Probe sc, it is equipped with an internal compressor.*
3. Remove the cable tie and pull out the compressor transport lock to the left (Figure 10).

   ***Note:*** *Keep the transport locks for transporting and storage.*

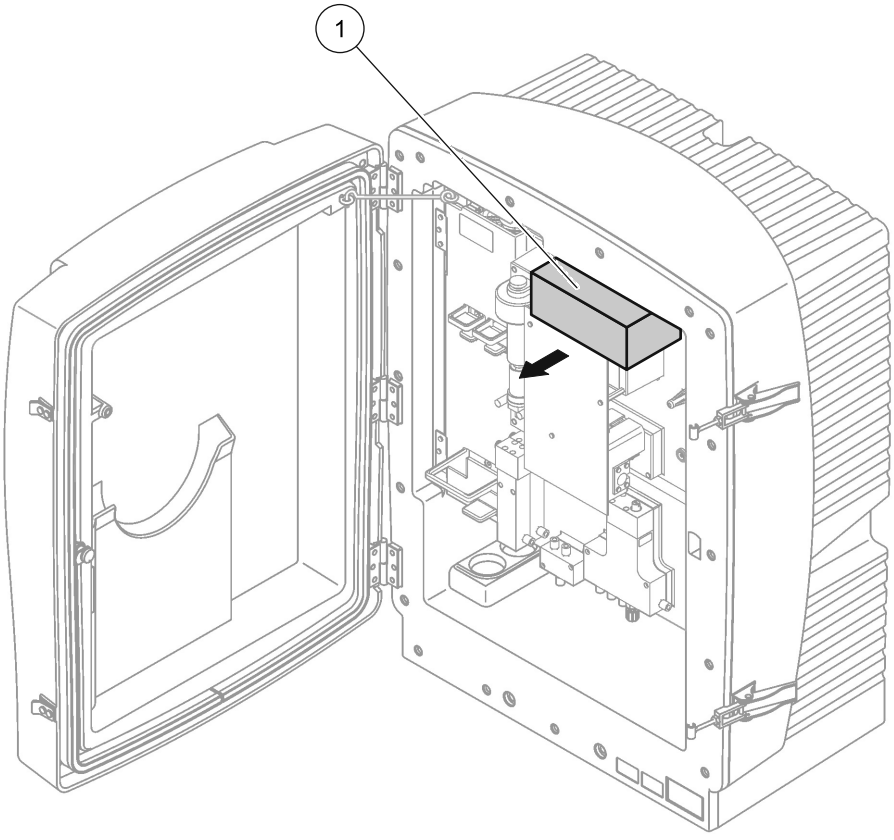



Figure 9 Remove the analyzer panel transport locks

| | |
|---|---|
| **1** | Transport lock |

### 3.4.3 Installation of the collecting tray

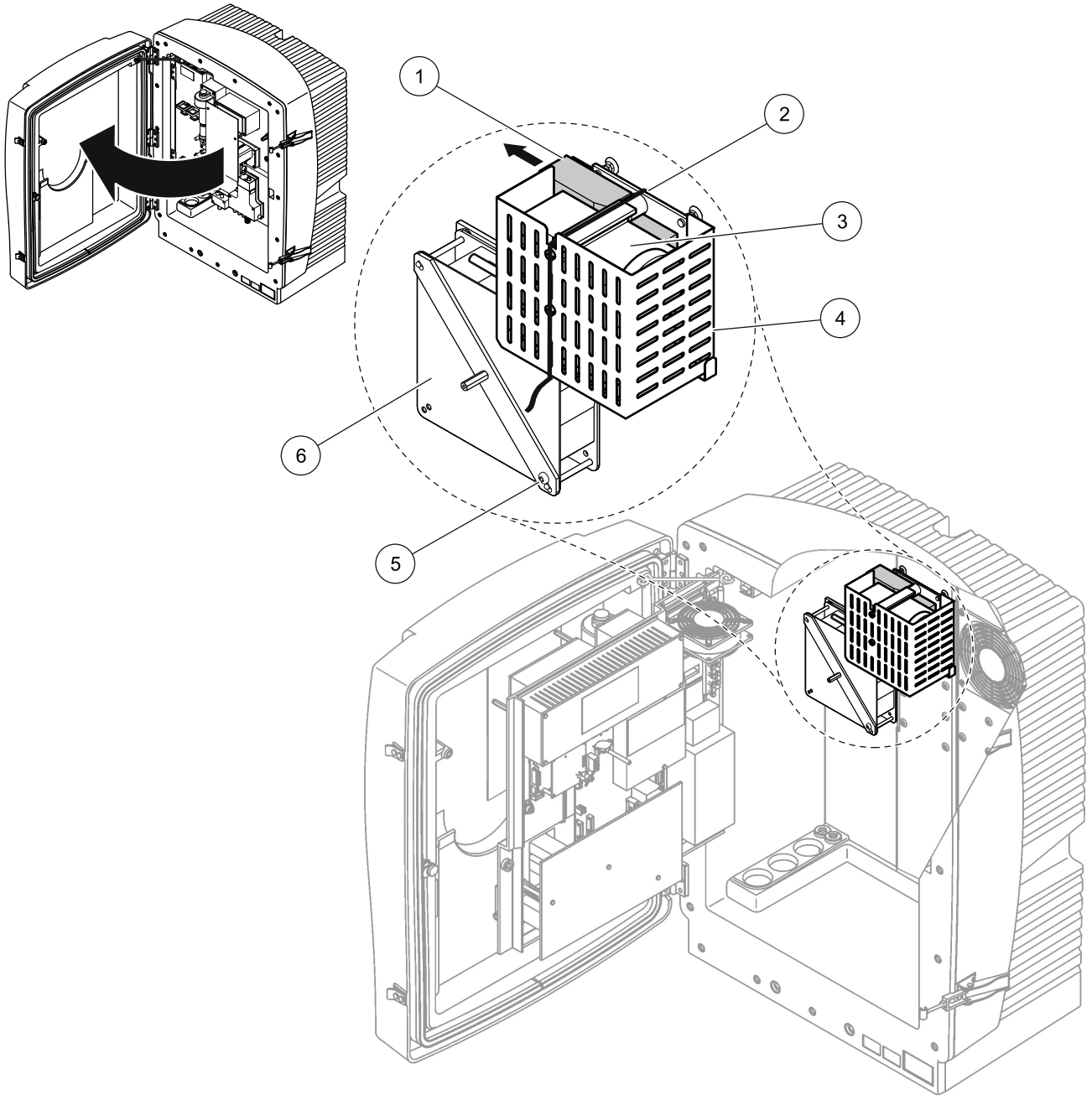



Figure 10 Remove the compressor transport lock[1]

| | | | |
|---|---|---|---|
| **1** | Compressor transport lock | **4** | Protective cover for compressor |
| **2** | Cable tie | **5** | Fan locking screw |
| **3** | Compressor | **6** | Fan |

[1] The compressor, compressor transport lock, and cable tie only apply to sc analyzers that operate using the Filter Probe sc.

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

1. Open the enclosure door and secure with the door hook.
2. Slide the collecting tray into the bottom of the enclosure (Figure 11).

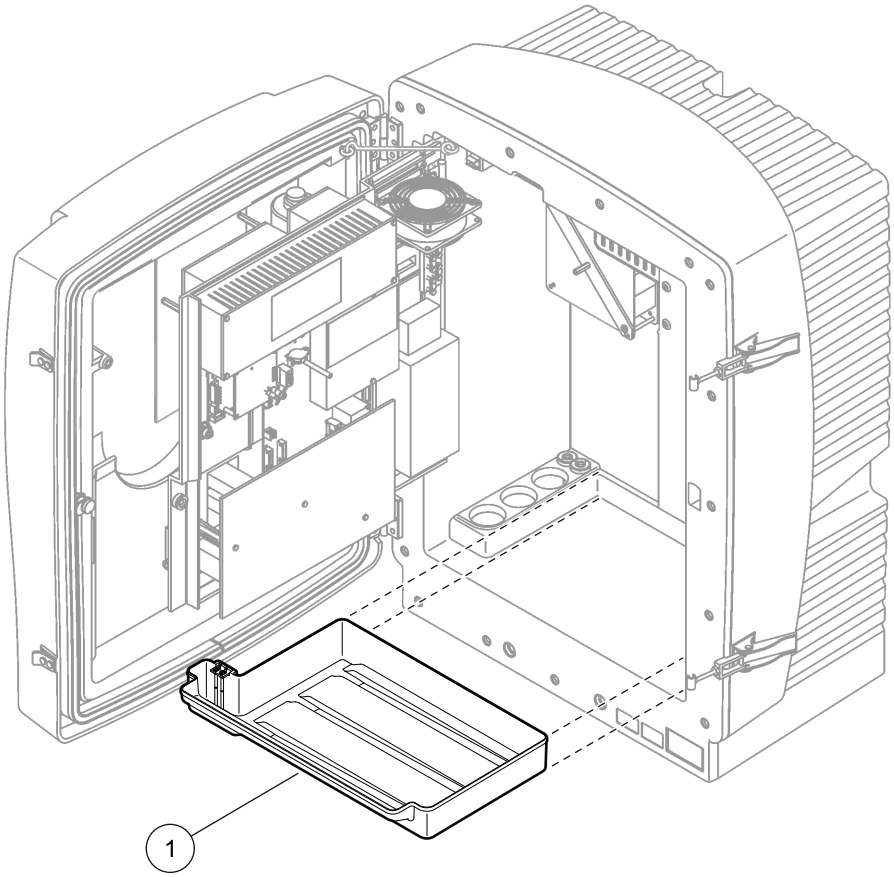



Figure 11 Installation of the collecting tray

| | |
|---|---|
| **1** | Collecting tray |

### 3.4.4 Connect the humidity sensor

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

1. Remove power from the instrument.
2. Open the enclosure door and secure with the door hook.
3. Connect the humidity sensor wires to the terminal screws on the collecting tray (Figure 12).

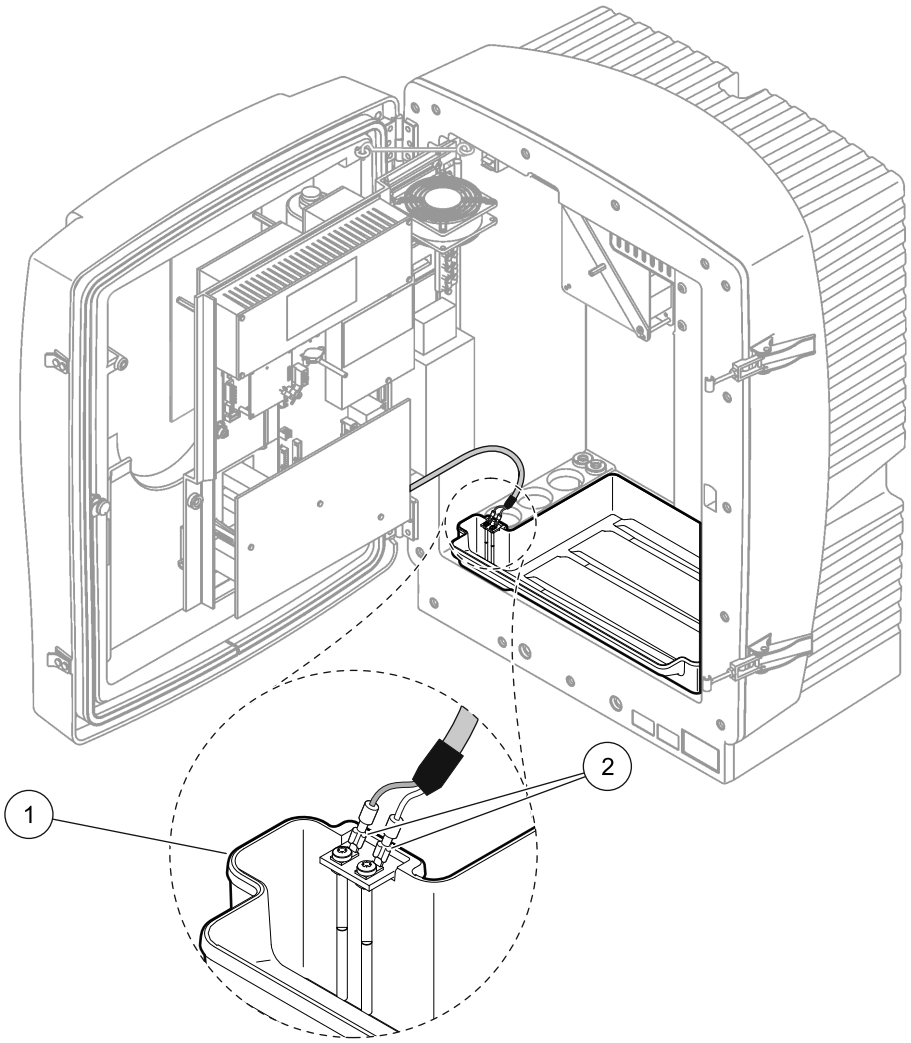



Figure 12 Connect the humidity sensor

| | | | |
|---|---|---|---|
| **1** | Collecting tray | **2** | Humidity sensor connections |

### 3.4.5 Connect the sample supplies and drain

Before connecting tubing or cables, determine the option number that corresponds the system configuration. Refer to Table 1. Based on the option number, determine the sealing plug that will be used to seal the enclosure openings, refer to Table 2.

When the option number is determined, refer to Appendix A Plumbing and connection options on page 63 for installation information.

**Table 1 System configuration options**

| Location | Filtration | Drain | Number of analyzers | Sample lines (Ch1, Ch2) | Number of parameters[1] | Option | |
|---|---|---|---|---|---|---|---|
| | | | | | | # | Refer to the following section for more information: |
| OUTDOOR | Filter Probe sc | Any | 1 | 1 | 1 | 1 | A.5 on page 66 |
| | Filter Probe sc | Heated | 1 | 1 | 1 | 2 | A.6 on page 68 |
| | FILTRAX | Heated | 1 | 1 | 1 | 3 | A.7 on page 70 |
| | FILTRAX | 2 heated | 2 | 1 | 2 | 4 | A.8 on page 72 |
| | 2 FILTRAX | Heated | 1 | 2 | 1 | 5 | A.9 on page 74 |
| | 2 FILTRAX | 2 heated | 2 | 2 | 2 | 6 | A.10 on page 76 |
| INDOOR | Filter Probe sc | Unheated | 1 | 1 | 1 | 7 | A.11 on page 78 |
| | FILTRAX | Unheated | 1 | 1 | 1 | 8 a | A.12 on page 80 |
| | | | 2 | 1 | 2 | 8 b | A.13 on page 82 |
| | 2 FILTRAX | Unheated | 1 | 2 | 1 | 9 a | A.14 on page 84 |
| | | | 2 | 2 | 2 | 9 b | A.15 on page 86 |
| | Continuous sample feed | Unheated | 1 | 1 | 1 | 10 a | A.16 on page 88 |
| | | | 2 | 2 | 2 | 10 b | A.17 on page 90 |
| | 2 continuous sample feeds | Unheated | 1 | 2 | 1 | 11 a | A.18 on page 92 |
| | | | 2 | 2 | 2 | 11 b | A.19 on page 94 |

[1] For 2-parameter options, refer to 2-parameter configuration on page 64.

**Table 2 Sealing plug types**

| Option | Analyzer 1 | | | Analyzer 2 | | |
|---|---|---|---|---|---|---|
| | Opening 1 | Opening 2 | Opening 3 | Opening 1 | Opening 2 | Opening 3 |
| **1** | Plug 2 | Plug 3 | Plug 3 | — | — | — |
| **2** | Plug 2 | Plug 1 | Plug 3 | — | — | — |
| **3** | Plug 1 | Plug 1 | Plug 3 | — | — | — |
| **4** | Plug 1 | Plug 1 | Plug 3 | Plug 1 | Plug 1 | Plug 3 |
| **5** | Plug 1 | Plug 1 | Plug 1 | — | — | — |
| **6** | Plug 1 | Plug 1 | Plug 1 | Plug 1 | Plug 1 | Plug 3 |
| **7** | Plug 2 | Plug 3 | Plug 3 | — | — | — |
| **8** | Plug 1 | Plug 3 | Plug 3 | Plug 3 | Plug 3 | Plug 3 |
| **9** | Plug 1 | Plug 1 | Plug 3 | Plug 3 | Plug 3 | Plug 3 |
| **10** | Plug 3 | Plug 3 | Plug 3 | Plug 3 | Plug 3 | Plug 3 |
| **11** | Plug 3 | Plug 3 | Plug 3 | Plug 3 | Plug 3 | Plug 3 |

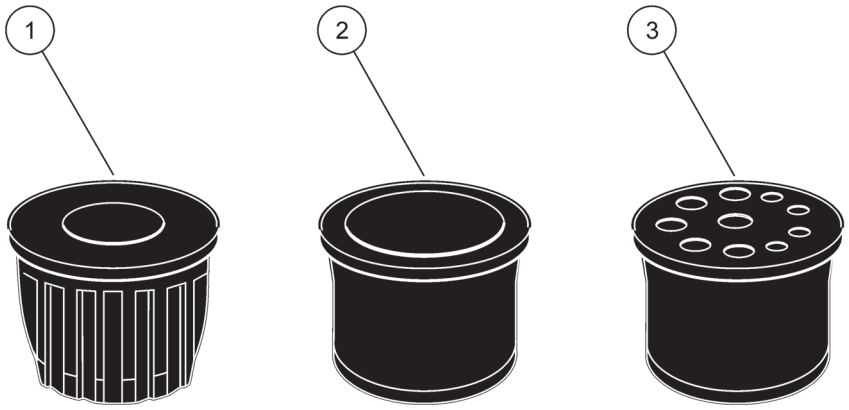



Figure 13 Sealing plug types

| | |
|---|---|
| **1** | Sealing plug type 1 |
| **2** | Sealing plug type 2 |
| **3** | Sealing plug type 3 |

## 3.5 Electrical installation

***DANGER***
***High voltage wiring connections are present under the protective cover. The protective cover must remain in place unless a qualified installation technician is installing wiring for the Filter Probe sc or the heated drain.***

See Figure 14 for protective cover removal.

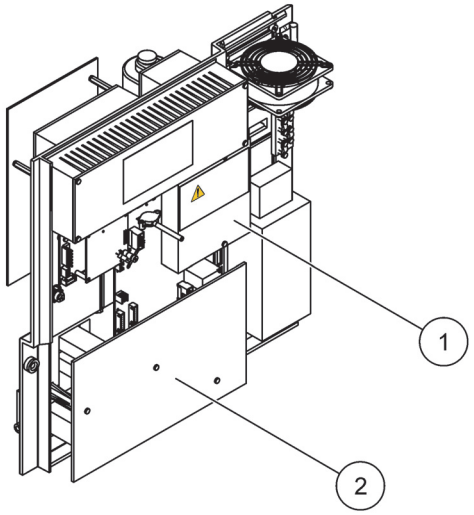



Figure 14 Remove the protective covers

| | |
|---|---|
| **1** | Protective cover for AC mains circuits (Back view) |
| **2** | Bottom protective cover for main PCB |

### 3.5.1 Electrostatic Discharge (ESD) Considerations

***Important Note:*** *To minimize hazards and ESD risks, maintenance procedures not requiring power to the analyzer should be performed with power removed.*

Delicate internal electronic components can be damaged by static electricity, resulting in degraded instrument performance or eventual failure.

The manufacturer recommends taking the following steps to prevent ESD damage to the instrument:

- Before touching any instrument electronic components (such as printed circuit cards and the components on them) discharge static electricity. This can be accomplished by touching an earth-grounded metal surface such as the chassis of an instrument or pipe or a metal conduit.
- To reduce static build-up, avoid excessive movement. Transport static-sensitive components in anti-static containers or packaging.
- To discharge static electricity and keep it discharged, wear a wrist strap connected by a wire to earth ground.
- Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and work bench pads.

### 3.5.2 Enclosure breakouts

There are four main enclosure openings to insert tubing and cables (Figure 15).

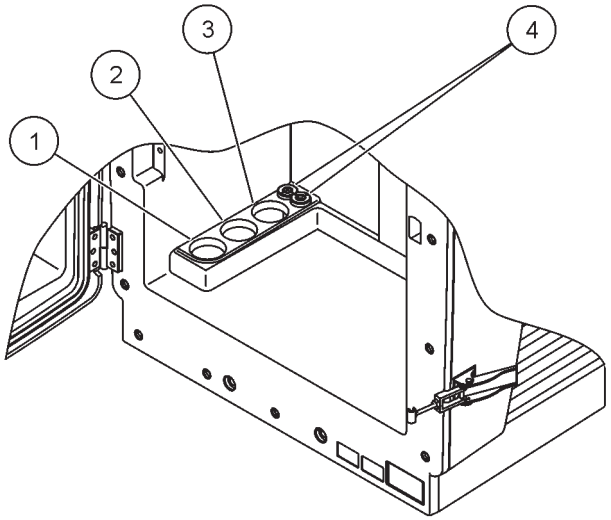
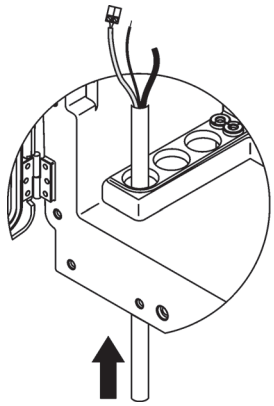


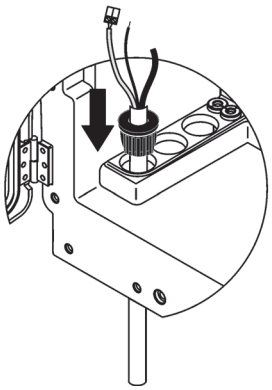

Figure 15 Enclosure breakouts

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **1** | Sample feed or refer to Table 1 on page 25 for tubing options. | **2** | Refer to Table 1 on page 25 for tubing options. | **3** | Refer to Table 1 on page 25 for tubing options. | **4** | Power and data cables |

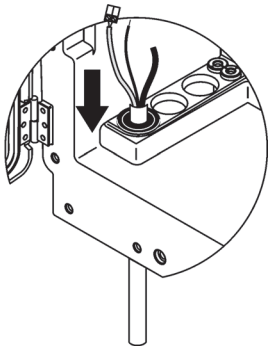
### 3.5.3 Insert tubing and/or cables



1 Guide the tubing or cables through the enclosure openings (Figure 15).



2 Push the plug from the top onto the tubing or onto the cable.



3 Pull down the plug with the tubing or the cables. Seal any unused entry with Plug #3.

### 3.5.4 Connect the Filter Probe sc to the analyzer (optional)

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

***DANGER***
***Disconnect power from the sc analyzer at the sc1000 before removing the protective covers in the analyzer.***

***Important Note:*** *Make sure that for the use of a filter probe, the level of the water in which the filtration probe is submersed, is below the level of the analyzer.*

1. Open the enclosure door and secure with the door hook.
2. Open the analyzer panel.
3. Remove the two screws from the protective cover and remove the cover (item 1, Figure 14 on page 26).
4. Connect the earth ground (green/yellow) wire (item 9, Figure 16 on page 30) from the Filter Probe sc to the ground terminal (item 5, Figure 16 on page 30).
5. Connect the power connector to the appropriate terminal connection (items 4 and 11, Figure 16 on page 30).
6. Remove the three screws securing the bottom panel cover (item 2, Figure 14 on page 26). Remove the panel.
7. Connect the data connector (item 10, Figure 16 on page 30) to the main board (item 12, Figure 16 on page 30).
8. Install all covers and panels.
9. Connect the white air tubing (item 8, Figure 16 on page 30) from the Filter Probe sc to the air tubing connection on the analyzer (Figure 16 on page 30).
10. For sample and drain line connections refer to A.5 on page 66.

### 3.5.5 Connect the optional heated drain

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

***DANGER***
***Disconnect power from the sc analyzer at the sc1000 before removing the protective covers in the analyzer.***

Refer to Figure 16 and the following procedure to connect the heated drain.

1. Open the enclosure door and secure with the door hook.
2. Open the analyzer panel.
3. Remove the protective cover (Figure 14 on page 26).
4. Connect the earth ground wire (green/yellow) to the ground wire terminal strip.
5. Connect the cables for the heated drain (item 6, Figure 16 on page 30) to the terminal block (item 3, Figure 16 on page 30).
6. Connect the drain tube as described in the appropriate Option Configuration. Refer to Plumbing and connection options on page 63 for more information.
7. Place the drain tube to the appropriate drain or basin.
8. Install all covers and panels.

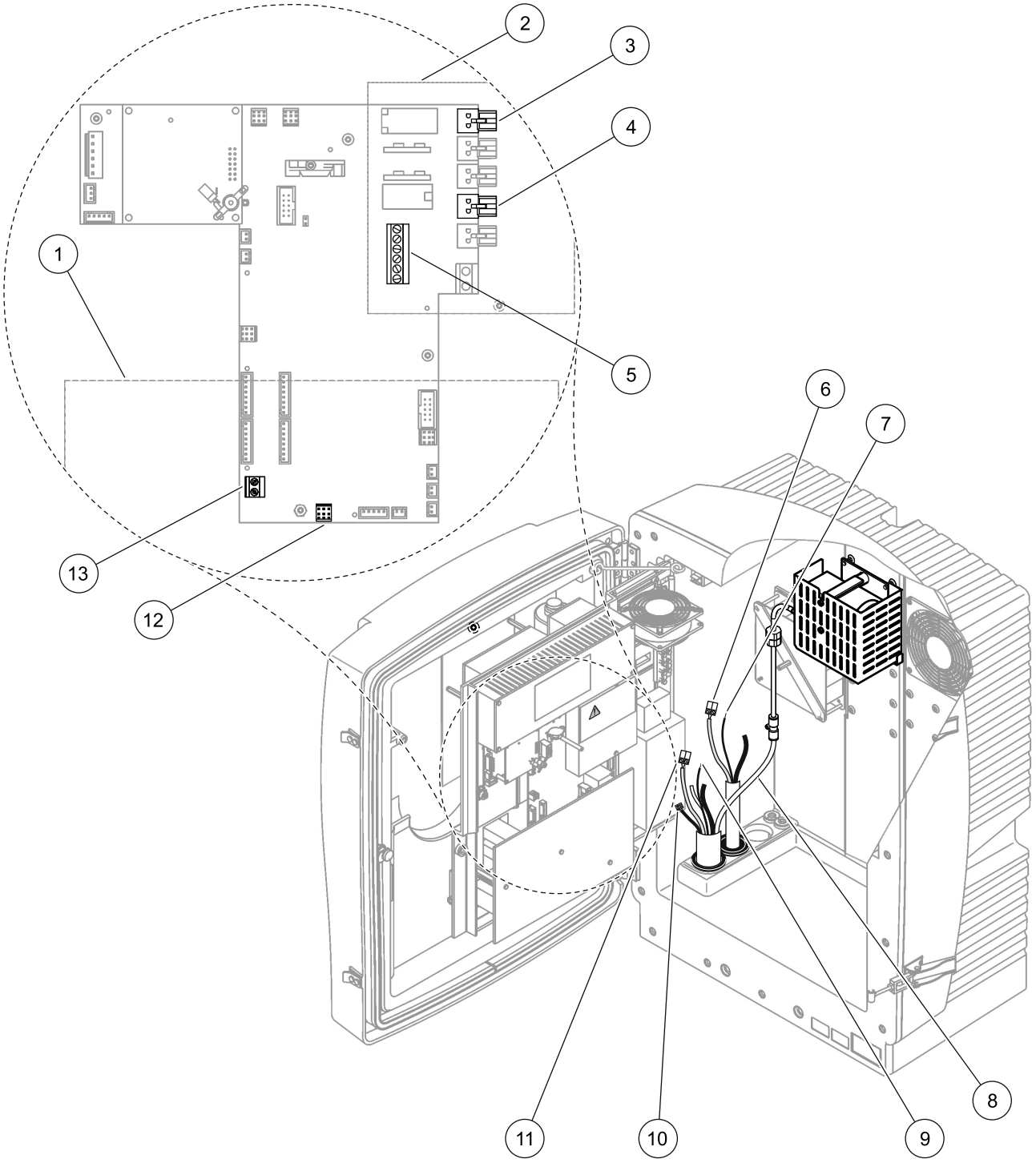



Figure 16 Connect the Filter Probe sc and optional heated drain

| | | | |
|---|---|---|---|
| **1** | Bottom panel cover | **8** | Filter Probe sc air tube (white) |
| **2** | Protective cover | **9** | Filter Probe sc ground wire |
| **3** | Heated drain (optional) power connector | **10** | Filter Probe sc data cable connector |
| **4** | Filter Probe sc power connector | **11** | Filter Probe sc power cable connector |
| **5** | Earth ground wire terminal strip | **12** | Filter Probe sc data connector |
| **6** | Heated drain power cable connector | **13** | Remote control input (15–30 V DC) (Refer to section B.3 on page 98) |
| **7** | Heated drain ground wire | | |

## 3.6 Installation of reagents

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

***DANGER***
***Potential danger in the event of contact with chemical/biological materials. Handling chemical samples, standards and reagents can be dangerous. Familiarize yourself with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.***

***Normal operation of this instrument may involve the use of hazardous chemicals or biologically harmful samples.***

- ***Observe all cautionary information printed on the original solution containers and safety data sheet prior to their use.***
- ***Dispose of all consumed solutions in accordance with national regulations and laws.***
- ***Select the type of protective equipment suitable to the concentration and quantity of the dangerous material at the respective work place.***

***CAUTION***
***Avoid unnecessary contact with sample flows of unknown concentration as they can produce hazards due to trace chemicals, radiation, or biological effects.***

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted.***

***Important Note:*** *Always lay the drain tubing so that there is a continuous fall (minimum 3°), the outlet is clear (not pressurized) and, the drain tubing is not longer than 2 meters. For more information refer to* *Appendix A on page 63**.*

***Important Note:*** *Incorrect use of the reagents can damage the instrument. Carefully read the labels on the containers to ensure there are no mistakes.*

1. Place the reagent containers in the instrument (Figure 17).
2. Insert the tubing in the reagent containers.

   ***Note:*** *If the tubing connections are twisted, no chemicals will flow through the connection and the instrument will not work correctly. Turn the bottle while holding the lid still so that the tubing connections are not twisted.*
3. Screw the reagents to the caps supplied.

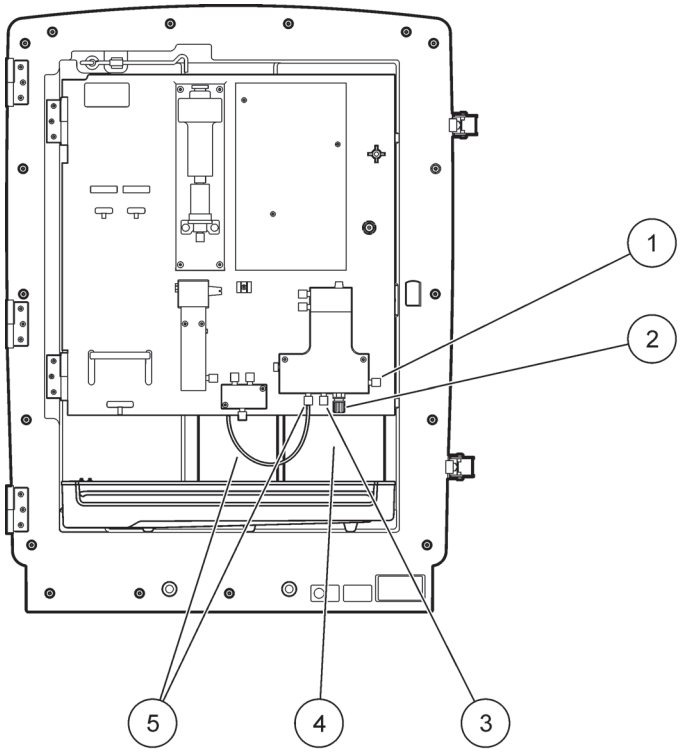



Figure 17 Chemicals and reagents in the PHOSPHAX sc (section 8.1 on page 53)

| | | | |
|---|---|---|---|
| **1** | Connection to colorimeter (detector) | **4** | Reagent |
| **2** | Drain | **5** | Cleaning solution |
| **3** | Sample line | | |

## 3.7 Supply power to the analyzer

***DANGER***
***Only connect the PHOSPHAX sc to the sc1000 power supply when the instrument is completely wired internally and it is correctly earthed.***

***DANGER***
***Always connect a ground fault interrupt circuit (GFIC) or a residual current circuit breaker (trigger current maximum at 30 mA) between the main power supply and the sc1000.***

***DANGER***
***Do not use the power sockets on controllers as general mains sockets. They are only designed to provide power for the analyzers.***

***Important Note:*** *In addition to supplying power, the power plug also serves to isolate the device quickly from the mains where necessary.*
*Therefore make sure that the sockets to which the device is connected are easy to reach by each user at all times.*

***Important Note:*** *Unless the sc1000 that connects to the PHOSPHAX sc analyzer is already fitted with ac mains overvoltage (surge) protection device, surge protection must be provided between the mains connection of the sc1000 and the PHOSPHAX sc analyzer if it is demanded by the local regulation.*

Only supply power to the instrument after all plumbing connections, reagent installations, and system start-up procedures have been completed.

sc1000 power sockets can only be connected if a wide range 115/230 V power supply is built into the sc1000 controller. This does not work with 24 V versions of the sc1000 because it does not provide the appropriate connectors for the analyzers.

Refer to the sc1000 manual for more information on connecting power.

Please note the input voltage of the device. The device is available in two non-adjustable voltage variants (115 V or 230 V).

The output voltage supplied by the controller at the outlets corresponds to the mains voltage that is customary in the country in question and to which the controller is connected.

A device designed for 115 V must not be connected to a controller with a higher mains voltage.

1. Remove the power socket from the sc controller.
2. Connect the plug from the PHOSPHAX sc to the power socket on the sc controller.

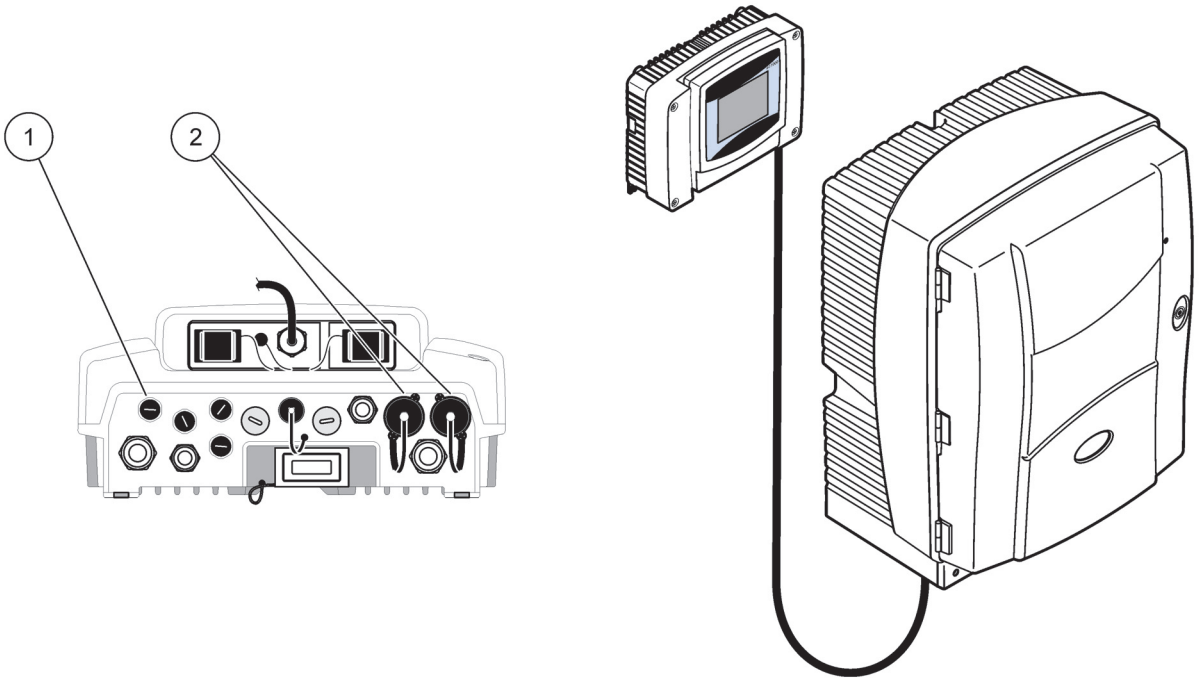



Figure 18 Connect the PHOSPHAX sc to the sc1000 power supply

| | |
|---|---|
| **1** | Data network connector |
| **2** | Power connectors |

## 3.8 Connect the data network

Refer to the sc1000 controller user manual for more information on connecting the Data Network (item 1, Figure 18).

# Section 4 System Startup

## 4.1 Initializing the instrument

***Important Note:*** *The instrument only can work correctly if it is at operating temperature. Let the instrument warm up for a minimum of an hour so the inside of the enclosure, chemicals and electrode are at operating temperature.*

1. Make sure the PHOSPHAX sc is registered in the sc1000 system. If necessary, initiate the controller to search for the analyzer. Refer to the sc1000 user manual for more information.
2. Configure the analyzer in the SENSOR SETUP menu and note the settings. Refer to section 5.2 on page 37 for more information. The factory settings (default setting) are appropriate for most typical applications.
3. From SENSOR SETUP, select PHOSPHAX sc>MAINTENANCE>TEST/MAIN.
4. Select the PREPUMP ALL function and confirm.
5. Wait until the analyzer returns to the service state (displayed in TEST/MAIN.>PROCESS) after the prepumping sequence is completed.
6. Select START from the maintenance menu.

# Section 5 Operation

The PHOSPHAX sc can only be operated with an sc1000 controller. Refer to the sc1000 user manual for more information.

An LED on the door (works with door open and closed) indicates the current operating state. Refer to the sc1000 User Manual and section 7.2.1 on page 49.

## 5.1 Sensor diagnostics menu

**SELECT PHOSPHAX sc (if more than one sensor or analyzer is attached)**

| **PHOSPHAX sc** | |
|---|---|
| ERROR LIST | Displays all errors currently present in the sensor |
| WARNING LIST | Displays all warnings currently present in the sensor |

## 5.2 Sensor setup menu

SELECT PHOSPHAX sc (if more than one sensor or analyzer is attached)

| **CALIBRATION** | |
|---|---|
| CORR. FACTOR | Displays the locations and correction factors |
| LOCATION1 | Displays location1 from CONFIGURE |
| GAIN CORR | sets correction factor for channel 1 |
| LOCATION2 | On 2-channel version |
| GAIN CORR | On 2-channel version |
| INTRINS. COLOR | Displays the zero extinction |
| EXT. FACTOR | Displays the internal device factor |
| OFFSET | can be used to slightly correct measurements which are close to Zero |
| DEFAULT SETUP | Resets the user-editable options to their factory-defaults |
| **CONFIGURE** | |
| LOCATION 1 | Settings for location 1 |
| EDIT NAME | Enter the name for the measuring location as required. |
| SET PARAMETER | Output can be set as phosphate or phosphate-phosphor. |
| SELECT UNITS | Output in mg/lL or ppm. |
| QUANTITY CH 1 | Number of measurements in succession ( = measurements on channel 1 + DISCHARGE VAL 1 channel 1). Available with the 2-channel version. |
| DISCHARGE VAL 1 | Number of discarded values after switching from channel 1 to channel 2. Available with the 2-channel version. |
| LOCATION 2 | Settings for location 2 |
| EDIT NAME | Enter the name for the measuring location as required (on 2-channel version). |
| SET PARAMETER | Output can be set as phosphate or phosphate-phosphor (on 2-channel version). |
| SELECT UNITS | Output in mg/l or ppm (on 2-channel version). |
| QUANTITY CH 2 | Number of measurements in succession ( = measurements on channel 2 + DISCHARGE VAL 2 channel 2). Available with the 2-channel version. |
| DISCHARGE VAL 2 | Number of discarded values after switching from channel 2 to channel 1. Available with the 2-channel version. |

## 5.2 Sensor setup menu (continued)

| CONFIGURE (continued) | | |
|---|---|---|
| MEASURING | | |
| | SET INTERVAL | Enter how often measurements are to be taken. ATTENTION with filtration probe and 5min operation: increased pump speed in the filtration probe, annual filtration probe maintenance is necessary instead of every 2 years. |
| | SET TO | WET/DRY, decides if the cuvette is empty (DRY) or filled (WET) between measurements at measurement intervals that are equal or greater than 10 minutes. Adapt individually for smoothest measurement values. |
| | START BY BUS: | |
| | START BY BUS: | YES/NO, decides if the instrument is measuring continuously or measurements are triggered by field-bus. The "Fieldbus" option must be activated in the TEST/MAINT menu. The instrument will switch to a 5 min interval when activated. |
| | NUMBER OF MEAS.: | Number of measurements that are taken after one activation by bus. |
| | DISCHARGE: | Number of discharged values that precedes the measurements. |
| | AVERAGE: | Number of measurements that are averaged. (effects bus triggered measurements only) |
| CLEANING | | |
| | SET INTERVAL | Number of hours between the cleanings. |
| | START | Start time for the cleaning (in case of more than one cleaning per day: start time for the first cleaning) |
| | DISCHARGE | Number of measured values that are discarded after a cleaning operation. |
| | SET OUTMODE | Value output during a cleaning operation and the following discarded values. HOLD = last measured value, SET TRANSFER = value to be entered |
| TUBE HEATING | | |
| | ON | Probe tube heating switches on at the start of the selected month. With filtration probe. |
| | OFF | Probe tube heating switches off at the end of the selected month. With filtration probe. |
| REAG. WARNING | | |
| | REAG. WARNING | ON/OFF: On determines the warning output if the reagent levels are low. |
| | WARNING | Determines the level below which the reagent must drop to trigger the warning. |
| STAT. MODUL.WAR. | | |
| | 40 %, 30 %, 15 % | Warning is released, when a filter probe is installed and the status of filtration modules falls below the defined level. |
| STATUS MODUL.ERR | | |
| | 14 %,10 %,8 %, OFF | Status of filtration modules at filter probe at which an error is generated. When switched to OFF, a deactivated sample detection will be switched to "warning". |
| SAMPLE DETECTION | | |
| | OFF/WARNING/ERROR | Determines instruments reaction when amount of available sample is to low. When instrument is in filter probe mode, deactivating the sample detection will switch a deactivated "STATUS MODUL.ERR" to 14 % |
| EXHAUST CONTROL | | |
| | ON/OFF | Determines instrument reaction when drain is blocked |
| REF | | |
| | ON/OFF | Determines if measurement reference channel is used for measurement or not. |
| BUBBLE REJECT | | |
| | ON/OFF | Use for samples that produce gas when acid is added. If active, sample is removed from cuvette after reagent has been added, then refilled again to remove bubbles. If active, the measurement interval of 5 minutes is not available. For not degassing samples the measurement values are smother with bubble rejection deactivated. |

## 5.2 Sensor setup menu (continued)

| | |
|---|---|
| **CONFIGURE (continued)** | |
| DEFAULT SETUP | Prompt as to whether the factory settings are to be re-applied. |
| LAST CHANGE | Indication of the last change to a setting on the configuration menu. |
| **MAINTENANCE** | |
| INFORMATION | |
| LOCATION 1 | Indication of measuring location 1 |
| LOCATION 2 | Indication of measuring location 2 (on two-channel version) |
| TYPE | Indication of instrument type |
| SENSOR NAME | Indication of instrument name |
| SERIAL NUMBER | Indication of serial number |
| RANGE | Indication of measuring range |
| OPTION | Indication of instrument option (filtration probe/1-channel/2-channel) |
| SOFTWARE PROBE | Filtration probe software (on filtration probe operation) |
| SOFTWARE PHOS. | Instrument software |
| LOADER | Detailed information on the software in the instrument |
| APPL | Detailed information on the software in the instrument |
| STRUCTURE | Detailed information on the software in the instrument |
| FIRMWARE | Detailed information on the software in the instrument |
| CONTENT | Detailed information on the software in the instrument |
| LANGUAGE | List of languages that are supported by the installed language package. |
| MEASURING DATA | |
| LOCATION1 | |
| GAIN CORR | Indicates the correction factor set for correcting the measured values at measuring location 1. |
| DATE | Indicates the date of the last change to the correction factor. |
| LOCATION2 | On 2-channel version |
| GAIN CORR | On 2-channel version |
| DATE | On 2-channel version |
| DEXT LAST VALUE | Indication of the delta extinction (EXT MESS-EXT REF) of the last measurement. |
| EXT MESS | Extinction during the last measurement |
| EXT REF | Extinction during the last zeroing |
| AMPLIFY MEAS. | Measuring amplifier gain factor |
| AMPLIFY REF | Reference amplifier gain factor |
| MEAS. ZERO | Measuring amplifier measured value during zeroing |
| OFFSET MEAS. | Measuring amplifier offset |
| MEAS. | Measuring amplifier measured value during measurement |
| REF ZERO | Reference amplifier measured value during zeroing |
| OFFSET REF | Reference amplifier offset |
| REF | Reference amplifier measured value during measurement |
| PROCESS | Information what instrument is currently doing (measurement, calibration etc.) |
| REMAINING TIME | Remaining time for current process, counting down to zero |
| LIST OF VALUES | List of the last 10 measured values |

## 5.2 Sensor setup menu (continued)

| MAINTENANCE (continued) | |
|---|---|
| MAINT. COUNTER | Counter for reagent and consumables |
| OPERATING HOURS | Displays the instrument's operating hours. |
| REAGENT | Displays the current level of the reagent. |
| CLEANING SOL. | Displays the current level of the cleaning solution. |
| AIR FILTER PADS | Days left until the next air filter change/clean. |
| PISTON PUMP | Days left until the next pump piston and cylinder replacement (PHOSPHAX piston pump) |
| REAGENT PUMP | Number of pump strokes performed by the reagent metering pump. |
| STATUS MODULES | Displays the state of the modules (on filtration probe operation). |
| CLEANING MODULES | Last filter module cleaning (on filtration probe operation). |
| NEW MODULES | Last filter module replacement (on filtration probe operation). |
| PUMP MEMBRANE | Date of the last pump membrane replacement (filtration probe sample pump) (on filtration probe operation). |
| COMPRESSOR | Days left until the replacement of the air compressor (on filtration probe operation). |
| TEST/MAINT | Maintenance processes |
| SIGNALS | |
| PROCESS | Indication of what the instrument is doing. |
| REMAINING TIME | Indication of the time left for the currently ongoing process |
| CUVETTE TEMP. | Current measuring cell temperature |
| ENCLOSURE TEMP | Current temperature in the instrument |
| COOLING | Current speed of the enclosure fan in % |
| HEATING | Current enclosure heating power |
| PRESSURE ANALY | Current pressure in the metering system of the valve block in mbar |
| HUMIDITY ANALY | Indication of whether there is liquid in the collecting tray |
| STATUS MODULES | Only if filtration probe is registered: shows status of filtration modules (0–100 %) |
| PRESSURE P. MIN | Only if filtration probe is registered :shows the averaged minimum pressure at the filter modules |
| PRESSURE PROBE | Only if filtration probe is registered: shows the actual minimum pressure at the filter modules |
| PROBE HEATING | Only if filtration probe is registered: indication of switching state of sample tubing heating |
| HUMIDITY PROBE | Only if filtration probe is registered: indication of whether there is moisture in the probe enclosure |
| DRAIN HEATING | only in 1 or 2 channel mode: shows status of drain heating |
| PROCESS | Indication of what the instrument is doing. |
| REMAINING TIME | Indication of the time left for the currently ongoing process |
| SERVICE MODE | Instrument can be set to service mode, for example for maintenance (system free of liquids, thermal management and compressor for filter probe (if installed) active) |
| SET OUTMODE | Value that is output in the service state. HOLD=last measured value, SET TRANSFER= value to be entered |
| START | Leave service mode, start measurement |
| REAGENT | Reset the maintenance counter after reagent change. |
| CLEANING SOL. | Reset the maintenance counter after changing the cleaning solution. |
| AIR FILTER PADS | Menu-based process for changing the air filter pads, resetting the maintenance counter. |
| PISTON PUMP | Days left until the next pump piston and cylinder replacement (PHOSPHAX piston pump), reset after replacement of the pump |
| REAGENT PUMP | Number of pump strokes performed by the reagent metering pump, reset after replacement of the pump. |

## 5.2 Sensor setup menu (continued)

| MAINTENANCE (continued) | | |
|---|---|---|
| PREPUMPING | | |
| | PREPUMP ALL | All liquids are pre-pumped in succession. |
| | PREPUMP REAG. | The reagent is pre-pumped. |
| | PREPUMP CLEAN. | The cleaning solution is pre-pumped. |
| | PREPUMPING PROBE | Only if filtration probe is registered: The filtration probe and modules are bled and pre-pumped. |
| | PREPUMP SAMPLE | Only if filtration probe is registered: sample is pumped from the filtration probe for 1 minute |
| MODULE CLEAN. | | Menu-based process for cleaning the filter modules, automatically resetting the maintenance counter. With filtration probe. |
| NEW MODULES | | Only if filtration probe is registered: last filter module replacement. |
| PUMP MEMBRANE | | Only if filtration probe is registered: date of the last pump membrane replacement (filtration probe sample pump). |
| COMPRESSOR | | Only if filtration probe is registered: days left until the replacement of the air compressor. |
| CLEANING | | Trigger an automatic cleaning, then start measurement |
| FLUSHING | | Pumps all liquids in succession. Put all tubings that go to reagents, standards and cleaning solutions into deionised water and start FLUSHING prior to taking instrument out of operation |
| RESET ERROR | | Reset all error messages |
| UPDATE PROBE | | Enables the filtration probe software to be updated. |
| FIELDBUS | | ENABLED/DISABLED: Enable external control of instrument by fieldbus.<br>When instrument is put into SERVICE MODE by menu, the fieldbus control is temporarily disabled. |
| OPTION | | Sets the instrument to filter-probe/ 1channel/ 2channel mode. Switching the options needs modification of hardware! |
| VALIDATION | | Menu based process to measure external samples. When "Modification required" is displayed: Disconnect sample tubing from overflow vessel, plug overflow vessel and put sample tubing into external sample. After process: Unplug overflow vessel and reconnect sample tube. |

### 5.2.1 System setup menu

For more information on System Setup (current outputs, relays, and network interfaces), refer to the sc1000 User Manual.

## 5.3 Cleaning process

***Note:*** *Make sure that the cleaning solution is available that the instrument can work properly.*

1. To configure an automatical cleaning interval select CONFIGURE>CLEANING>SET INTERVAL.

OR

1. To start a manual cleaning cycle select MAINTENANCE>CLEANING.

***Note:*** *Press START to confirm and start the cleaning process.*

A cleaning cycle may take up to 10 minutes and then the instrument returns automatically to the measuring mode.

## 5.4 Measurement process

***Note:*** *Make sure that all solutions are available to avoid incorrect measurements.*

After start up, the instrument needs to warm up to automatically initalize the measurment process. This process takes approximately 15 minutes when the instrument temperature is >15 °C (>59 °F).

***Note:*** *Lower instrument temperatures prolong the warming-up phase.*

***Note:*** *From the service mode press START to confirm the inquiry to start the measurement.*

An optimal measurement cycle may take 5 minutes.

# Section 6 Maintenance

***DANGER***
***Only qualified personnel should conduct the tasks described in this section of the manual.***

***DANGER***
***Potential danger in the event of contact with chemical/biological materials. Handling chemical samples, standards and reagents can be dangerous. Familiarize yourself with the necessary safety procedures and the correct handling of the chemicals before the work and read and follow all relevant safety data sheets.***

***Normal operation of this instrument may involve the use of hazardous chemicals or biologically harmful samples.***

- ***Observe all cautionary information printed on the original solution containers and safety data sheet prior to their use.***
- ***Dispose of all consumed solutions in accordance with national regulations and laws.***
- ***Select the type of protective equipment suitable to the concentration and quantity of the dangerous material at the respective work place.***

## 6.1 General maintenance

- Regularly check the entire system for mechanical damage.
- Regularly check all connections for leaks and corrosion.
- Regularly check all cables for mechanical damage.

### 6.1.1 Clean the analyzer

Clean the system with a soft, damp cloth. Commercially available solvents can be used for stubborn soiling.

### 6.1.2 Reagent replacement

The chemicals must be changed or renewed at regular intervals. Refer to Table 3 for information on the life of the chemicals.

**Table 3 Chemicals for the PHOSPHAX sc**

| **Chemicals (8.1 on page 53)** | **Low measuring range (LR) (0.05–15 mg/L) (Measuring interval 5 minutes)** | **High measuring range (HR) (1–50 mg/L) (Measuring interval 5 minutes)** |
|---|---|---|
| Reagent | 2000 mL for 4 months | 2000 mL for 2 months |
| Cleaning solution | 1000 mL for 1 year on daily cleaning | 1000 mL for 1 year on daily cleaning |

### 6.1.3 Replace the fan filter

The filter air pads must be cleaned or replaced regularly. Refer to section 6.2 on page 45 for more information.

The cooling fan must be stopped before completing any filter maintenance.

**To stop the cooling fan:**

1. From the MENU select SENSOR SETUP>PHOSPHAX SC and press ENTER.
2. Select MAINTENANCE>TEST/MAINT>AIR FILTER PADS and press ENTER.
3. Select START and press ENTER.

   The process is started and the cooling fan stops.

***Important Note:*** *Open the instrument door to prevent overheating.*

***CAUTION***
***Avoid injury. Keep hands clear. Although the fan is stopped, work carefully to avoid injury in case of failure.***

**To change the fan filter:**

1. Open the analyzer enclosure and the analysis panel.
2. Press ENTER.
3. The instrument counts the remaining time in seconds down to zero and goes to SERVICE STATE.
4. Change the air filter pads as described on the controller.
5. Remove the fan locking screw and slide the retaining strap to the top and remove (Figure 10 on page 22). If necessary, press the fan down to remove the retaining strap.
6. Slide the fan from the holding screws.
7. Clean the filter with soap and water and return to place.
8. Press ENTER.
9. Replace the fan. Make sure that the fan opening is positioned downward. Attach the retaining strap (hold down the fan) and install the fan locking screw.
10. Close the analyzer enclosure and the analysis panel.
11. Press ENTER.

The instrument will reset the maintenance counter and will start the analysis again.

### 6.1.4 Fuse replacement

The fuses for the power supply are found in the sc1000 controller. Refer to the sc1000 User Manual for fuse replacement information.

## 6.2 Routine maintenance schedule

The maintenance schedule is given for standard applications. Deviant applications may cause different maintenance intervals.

**Table 4 Routine maintenance schedule**

| Description | 3 months | 6 months | 12 months | 24 months |
|---|---|---|---|---|
| Check measurement chamber and history of amplification (event log). | X[1] | | | |
| Visual check analytical compartment, manual cleaning if necessary. | X[1] | X | | |
| Check filter pads, clean/ replace if necessary, particularly on fan side. | X[1] | X | | |
| Check reagents, replace if necessary. | X[1] | X | | |
| Check cleaning solution, replace if necessary. | X[1] | X | | |
| Check maintenance counters. | X[1] | X | | |
| Function check of both fans. | | X | | |
| Function check heating for analyser enclosure. | | X | | |
| General function check. | | X | | |
| Check system for air impermeability. | | X | | |
| Clean manually and adjust cleaning interval if applicable. | | X | | |
| Read out and analyse event log. Read out and check data log if necessary. | | X | | |
| Check reagent pump and replace if necessary (check every 6 months after 12 months of use). | | (X)[2] | X | |
| Replace pump head for air pump. | | | X | |

[1] Recommended, typical maintenance interval, especially for reagents. The actual reagent exchange intervals are depending on configuration.

[2] Maintenance cycles are given for standard applications. Deviant applications may cause different maintenance intervals.

## 6.3 Validation (Analytical quality assurance)

Regular validation checks of the complete instrument must be completed to make sure the analysis results are reliable.

**Required parts:**

- Blind plug LZY193 (Plugging set LZY007)
- Beaker (for example 150 mL)
- Standard solution for validation

Follow the internal menu steps for the validation.

1. From the MENU select SENSOR SETUP>PHOSPHAX SC and press ENTER.
2. Select MAINTENANCE>TEST/MAINT>VALIDATION> DISCHARGE.
3. Enter the number of measurements which should be discharged before starting the measurements of the validation. (Default value: 2; value range: 1 to 5)
4. Select NUMBER OF MEAS..

5. Enter the number of measurements which should be used for the validation measurements.
(Default value: 3; value range: 2 to 10)
6. Select START after adjusting both parameters and the analyzer is going into the service state. The remaining time is displayed in seconds.

   The OUTMODE is set to HOLD.

7. Select ENTER to modify the analyzer (Figure 19 on page 47):

   a. Unscrew the fitting (item 2) of the sample tube (item 5) which connects the overflow vessel (item 1) and the valve block (item 4) at the overflow vessel.

   b. Screw in the blind plug (item 3) in the thread of the overflow vessel (item 1) and insert the sample tube in a beaker (for example 150 mL) with standard solution for the validation.

***Note:*** *To receive stable measurement values, close the door of the analyzer.*

8. Press ENTER to start the validation.

   ***Note:*** *The remaining time is displayed in seconds:*

$$\left(\text{Discharge value} + \text{measurement value}\right) \times 5\ \text{minutes} = \frac{\text{remaining time}}{\text{sec}}$$

9. Press ENTER to escape.

   The results are displayed to note down.

- The discharge value and the Conc value are counted down to zero.
- The validation is finished when the process shows the service mode and the remaining time is 0 seconds.
- For the adjusted number of validation measurements, the values are listed and the calculated average of this value is displayed.

***Note:*** *The data log records the validation values and average value from the analyzer.*

10. Press ENTER to proceed.

    ***Note:*** *Press START to confirm the inquiry to return to the measurement process or to the service mode.*

11. Select ENTER and modify the instrument to the original analyzer configuration.
12. Start the measurement mode or hold the service mode.

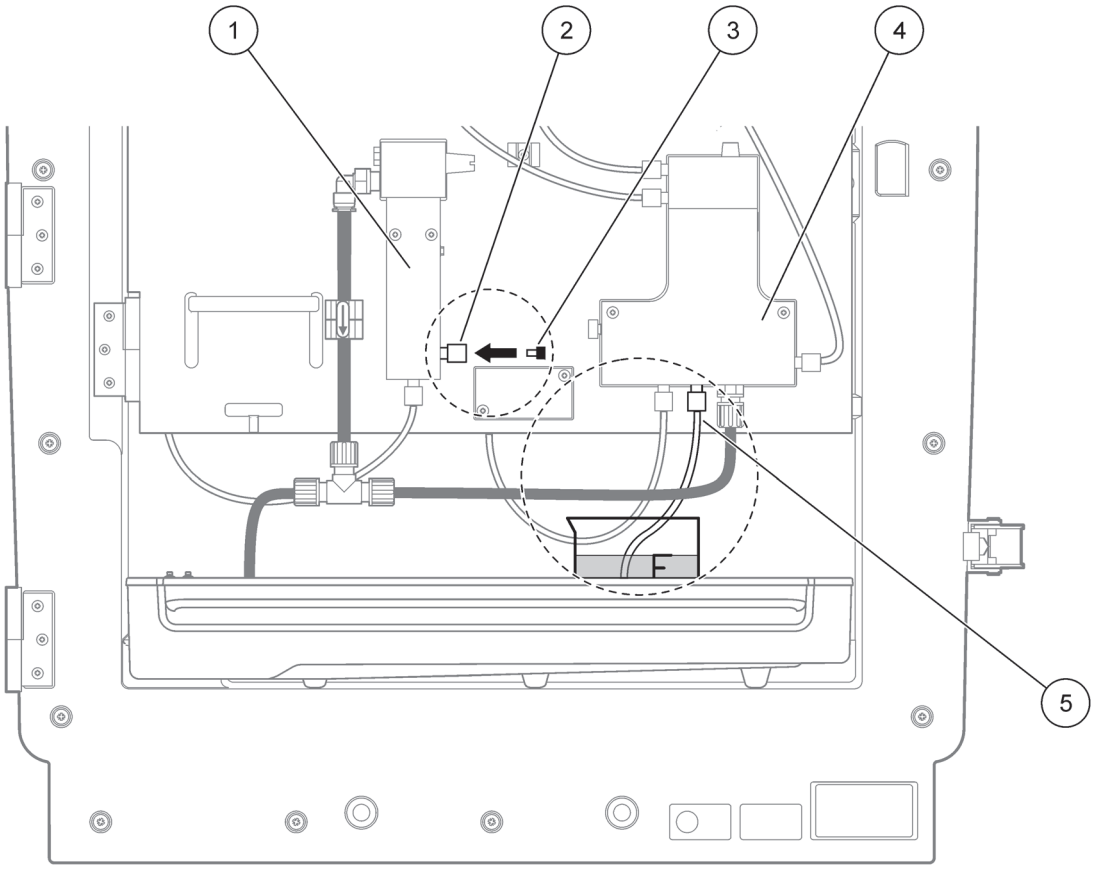



Figure 19 Modification of PHOSPHAX sc

| | | | |
|---|---|---|---|
| **1** | Overflow vessel | **4** | Valve block |
| **2** | Fitting of sample tube | **5** | Sample tube |
| **3** | Blind plug | | |

## 6.4 Shut the analyzer down

No special measures are necessary for taking out of operation for a short period (up to a few days in frost-free ambient conditions).

***Important note:*** *If the power supply to the controller is interrupted, frost damage may occur. Ensure that the instrument and tubing cannot freeze.*

1. Interrupt the measurement and switch the instrument to the service state.
2. Isolate the analysis instrument from the controller.

### 6.4.1 Shut the analyzer down for an extended period

***Important note:*** *Always wear safety equipment when handling chemicals.*

Use the following procedure if the instrument is to be taken out of operation for an extended period, or in the case of risk of frost.

1. Immerse the tubing for reagent and cleaning solutions in distilled water.
2. On the controller TEST/MAINT menu, start a cleaning cycle with distilled water using the FLUSHING.
3. Clean the canister lid with distilled water.
4. Take the tubing out of the water and start the FLUSHING function to pump the tubing and the analysis instrument empty.
5. Wipe the canister lids dry and seal the canisters with the corresponding lids.
6. Remove the canisters and store them in a frost-free place and in accordance with local regulations.
7. Isolate the system from the mains and the data network.
8. When using a Filter Probe sc, refer to the Filter Probe sc User Manual for storage information.
9. Install all transport locks.
10. Depending on the duration, remove the system from its mounting and wrap the system in a protective film or dry cloth. Store the system in a dry place.

## 6.5 Scheduled maintenance

Table 5 lists items that need to be maintained by service personnel ONLY. Contact the manufacturer for more information.

**Table 5 Repair maintenance items**

| Description | When to replace | Warranty |
|---|---|---|
| Reagent pump for sc analyzer (Valve pumps) | According to wear | 1 year |
| Pump head piston pump 10 mL (Pre-greased cylinder and piston) | 1 year | 1 year |
| Switchable Compressor 115/230V | 2 years recommended | 2 years |

## 6.6 Modify from single channel to dual channel

The sc analyzer can be converted from single channel to dual channel operation and/or continuous sampling. Contact the manufacturer for more information. Refer to Table 6 for configuration options.

**Table 6 Conversions**

| From | To | With | Conversion kit |
|---|---|---|---|
| 1-channel operation | 2-channel operation | AMTAX sc, PHOSPHAX sc | LZY170 |
| Filter Probe sc | Continuous sampling | AMTAX sc, PHOSPHAX sc | LZY241 |
| Continuous sampling | Filter Probe sc | AMTAX sc, PHOSPHAX sc | LZY242 |

# Section 7 Troubleshooting

## 7.1 Troubleshooting the controller

If entries are only implemented with a delay or are not accepted for a short time, the delay may be caused by a busy data network. Refer to the troubleshooting section in the sc1000 User Manual.

If, in normal operation, problems occur that are apparently caused by the controller, restart the system.

After a software update, a system expansion or after an interruption in the power supply, it may be necessary to set the system parameters again.

Note all the values that are changed or entered so all the necessary data can be used to configure the parameters again.

1. Save all important data.
2. Isolate the supply of power and wait for 5 seconds.
3. Reapply power to the controller.
4. Check all relevant settings.
5. If the problems still occurs, contact Technical Support.

## 7.2 Troubleshooting the analyzer

If the complete analysis instrument is not working, check whether the humidity sensor has tripped. Fix the damage, dry the humidity sensor and restart the system.

If the problems still occurs, contact Technical Support.

### 7.2.1 LED status

**Table 7 LED Status and definitions**

| LED status | Definition |
|---|---|
| green LED | No errors of warnings |
| red LED | Error |
| orange LED | Warning |
| LED flashing | No communication with controller |

### 7.2.2 Error messages

| Error displayed | Instrument reaction | Cause | Solution | Reset error |
|---|---|---|---|---|
| TEMP.<br>< 0 °C/32°F? | Warms up and goes into the service state | instrument was below 4 °C (39 °F) on power up | Check whether instrument is frozen (Cleaning solution/sample/reagent/ standards). If necessary use pre-warmed reagents. Thaw electrode, delete error. Instrument will then continue to warm up and start | Reset error manually<br>TEST/MAINT><br>RESET ERROR |
| ANALYZ. TOO COLD | Instrument goes into the service state | Instrument interior has been below 4 °C (39 °F) for more than 5 minutes | Close instrument, check heating | Reset error manually<br>TEST/MAINT><br>RESET ERROR |

## 7.2.2 Error messages (continued)

| Error displayed | Instrument reaction | Cause | Solution | Reset error |
|---|---|---|---|---|
| NO HEAT UP | Instrument goes into the service state | Instrument cannot heat interior adequately. (internal temp <20°C (68°F) for 30 min) | Close instrument, check heating | Reset error manually |
| COOLING FAILED | Service state, starts automatically after cooling down | Instrument interior is too warm (>57°C (135°F)) | Check air filter and clean/replace, check fan. | Manual reset or automatically when temperature falls 2 °C (3.6 °F) below limit |
| HUMIDITY ANALY | Service state | There is liquid in the collecting tray | Identify cause and rectify | Reset error manually |
| HUMIDITY PROBE | Service state, the filtration probe sc is isolated from the mains | There is liquid in the filtration probe enclosure | Immediately take filtration probe sc out of operation and contact service. Take the filtration probe sc out of the tank and store the filter modules so that they remain moist. (See operating instructions for the filtration probe sc). | Reset error manually |
| PROBE MISSING | Service state, the filtration probe sc is isolated from the mains | The filtration probe sc is faulty or not connected | Immediately take filtration probe sc out of operation and contact service. Take the filtration probe sc out of the tank and store the filter modules so that they remain moist. (See operating instructions for the filtration probe sc). | Reset error manually |
| TEMPSENS DEFECT | Service state, fan running, heating off | The temperature sensor for the internal instrument temperature is faulty | Immediately switch off instrument, contact service, replace main circuit board | Reset error manually |
| CUVSENSOR DEFECT | Service state, cuvette heating off | The temperature sensor for the cuvette is faulty | Contact service, replace cuvette/sensor | Reset error manually |
| CUVHEAT DEFECT | Continued measurement | The cuvette is not being heated adequately | Close instrument door, contact service, check cuvette heating, check main circuit board | Reset error manually |
| CUV TOO HOT | Service state, cuvette heating off! | The cuvette is over-heated. | Sample too hot/ heating regulation faulty, check main circuit board, contact service | Reset error manually |
| PHOTO LEVEL LOW / PHOTO LEVEL2 LOW | Continued measurement | Photometer signal too low (1channel, 2 channel operation , depending on channel that triggered the error). Not enough sample available. | Trigger cleaning (several times). Manually clean photometer. If this action solves the problem, increase automatic cleaning, otherwise contact service. Check sample delivery. | Reset error manually or automatic if level is OK again |

## 7.2.2 Error messages (continued)

| Error displayed | Instrument reaction | Cause | Solution | Reset error |
|---|---|---|---|---|
| PHOTO LEVEL HIGH / PHOTO LEVEL2 HIGH | Continued measurement | Photometer signal too high (1 channel, 2 channel operation , depending on channel that triggered the error) | Contact service | Reset error manually or automatic if level is OK again |
| MODULES CONTAM. | Continued measurement | Filter modules heavily soiled | Clean filter modules immediately | Reset error manually |
| DRAIN BLOCKED | Service state | Drain is blocked | Clean drain line | Reset error manually |
| SAMPLE1 / SAMPLE2 | Continued measurement | the amount of sample is not sufficient (channel1 / channel2) This occurs as error if SAMPLE DETECTION is set to ERROR | Check sample delivery, make sure that sample line has no negative pressure, check tightness of piston pump, check overflow and air valve | Automatic reset when enough sample is available, or manuell reset |

## 7.2.3 Warnings

| Warning displayed | Instrument reaction | Cause | Solution | Reset warning |
|---|---|---|---|---|
| WARMUP PHASE | Instrument is warming up sample tubing after start (de-frosting) | If there is a risk that the sample tubing is frozen, a warning is displayed | As far as possible, wait until end of the warm-up phase (except if certain there is no frost), to cancel please place instrument in service state and start measurement again | Automatic |
| COOLING DOWN | Fan 100 % , standstill until cool enough | Instrument is cooling down after start using ventilation, if it was heated excessively | Wait until instrument has cooled down enough | Reset, automatically as soon as cool |
| ANALYZER TO COLD | Measurement | Instrument has cooled below 15°C (59 °F) | Close instrument door, if necessary check heating | Reset, automatically as soon as warmer |
| ANALYZER TO WARM | Measurement, but no more air cleaning | At very high internal temperature, the air cleaning of the filter modules is disabled to generate less wasteheat of the internal compressor. (internal temp. = 55°C(131°F )) | Change/clean air filter, check air ducts for blockage, check enclosure fan, is ambient temperature allowed? | Reset, automatically as soon as cool |
| CUV TOO COOL | Continued measurement | The cuvette is not being heated adequately. 2 min after sample change: temp. = ((target temp. of cuvette) - 1 °C(34°F)) | Close instrument door, check/fit cuvette insulation. | Automatic |

## 7.2.3 Warnings (continued)

| Warning displayed | Instrument reaction | Cause | Solution | Reset warning |
|---|---|---|---|---|
| PHOT LEVEL LOW / PHOT LEVEL2 LOW | Continued measurement | Photometer signal low (dependent on chanel if 2 chanel mode is used) . Not enough sample. | Trigger cleaning (several times). Manually clean photometer. If this action solves the problem, increase automatic cleaning, otherwise contact service. Check sample delivery. | Automatic |
| MODULES CONTAM. | Continued measurement | Filter modules soiled | Clean filter modules soon | Automatic |
| SERVICE MODE | Service state | The instrument is in the service state or is switching to this state | – | Automatic when the service state is left |
| REAGENT LEVEL | Continued measurement | Amount of reagent has dropped below warning level set | Check reagent level and replace if necessary, then reset reagent level. The level is indicated mathematically and can only function reliably if the counter is only reset when the solution is changed | On the menu MAINTENANCE/ TEST/MAINT COUNTER/ REAGENT |
| CLEAN SOLU LEVEL | Continued measurement | Amount of cleaning solution has dropped below warning level set | Check cleaning solution level and replace if necessary, then reset cleaning solution level. The level is indicated mathematically and can only function reliably if the counter is only reset when the solution is changed | On the menu MAINTENANCE/ TEST/MAINT COUNTER/ CLEANING SOLU. |

# Section 8 Replacement Parts and Accessories

## 8.1 Standards and reagents

| Description | Cat. No. EU customer | Cat. No. US customer |
|---|---|---|
| Cleaning solution, PHOSPHAX sc (1 L) for all measurement ranges | LCW870 | 28253-52 |
| Reagent, PHOSPHAX sc (2 L) for all measurement ranges | LCW869 | 28252-54 |

## 8.2 Analyzer accessories

| Description | Cat. No. |
|---|---|
| Set of plugs , (rubber) for sc analyzer (type 1 (3), type 2 (1), type 3 (3)) | LZY007 |
| Accessories for AMTAX/PHOSPHAX sc for continuous sampling (1 or 2-channel) | LZY189 |
| Cutter for tubing | LZY201 |
| Heated drain hose, 230 V | LZY302 |
| Heated drain hose, 115 V | LZY303 |
| Set of connectors for sc analyzers | LZY190 |
| Set of screws for sc analyzer, M3x6 (4), M3x25 (2), M3x50 (2) | LZY191 |

## 8.3 Mounting hardware

| Description | Cat. No. |
|---|---|
| Wall mount kit, includes 4 screws 5*60 incl. 4 anchors | LZX355 |
| Mounting kit for sc analyzer, includes fastening, angle bracket, and screws | LZY044 |
| Set of screws for fastening and angle bracket | LZY216 |
| Set of screws for sc analyzer | LZY223 |
| Set of screws for rail mounting LZY285 and LZY316 | LZY220 |
| Rail mounting, analyzer with controller | LZY285 |
| Rail mounting, analyzer without controller | LZY316 |
| Stand mounting, sc analyzer with controller | LZY286 |
| Stand mounting, sc analyzer without controller | LZY287 |

## 8.4 Replacement parts

(Refer to Figure 20 on page 56–Figure 24 on page 60)

| Item | Description 1 | Cat. No. |
|---|---|---|
| 1 | Door for sc analyzer enclosure | LZY143 |
| 1 | Door for sc analyzer enclosure (indoor) | LZY682 |
| 1 | Instrument labels (4 pieces) | LZY144 |
| 2 | Door hook | LZY148 |
| 3 | Enclosure for sc analyzer, without door | on request |

## 8.4 Replacement parts (continued)

(Refer to Figure 20 on page 56–Figure 24 on page 60)

| Item | Description 1 | Cat. No. |
|---|---|---|
| 4 | Set of filter pads (2 pieces) | LZY154 |
| 5 | Clamping lock for sc analyzer | LZY147 |
| 6 | Fence, includes screws M3 x 6 | LZY157 |
| 7 | Compressor switchable 115 V/230 V | LZY149 |
| 8 | Air tubing for compressor, includes non-return valve, fitting | LZY151 |
| 9 | Fan for incoming air | LZY152 |
| 10 | Collecting tray, for sc analyzer | LZY146 |
| 11 | Hinge, includes screws | LZY155 |
| 12 | Gasket for door of sc analyzer | LZY187 |
| 13 | Door lock sc analyzer | LZY188 |
| 14 | Mounting plate for sc analyzer | LZY161 |
| 15 | Analyzer panel of PHOSPHAX sc, measurement range: 0.05–15 mg/L | on request |
| 16 | Analyzer panel of PHOSPHAX sc, measurement range: 1–50 mg/L | on request |
| 17 | Measuring cell, PHOSPHAX sc, measurement range: 0.05–15 mg/L | LZY185 |
| 18 | Measuring cell, PHOSPHAX sc, measurement range: 1–50 mg/L | LZY186 |
| 19 | Valve block, PHOSPHAX sc, includes valves; measurement range: 0.05–15 mg/L | LZY183 |
| 20 | Valve block, PHOSPHAX sc, includes valves; measurement range:: 1–50 mg/L | LZY160 |
| 21 | Valve block, PHOSPHAX sc, measurement range: 0.05–15 mg/L | LZY271 |
| 22 | Valve block, PHOSPHAX sc, measurement range:: 1–50 mg/L | LZY272 |
| 23 | Upper part of valve block | LZY174 |
| 24 | Upper part of valve block with valve | LZY175 |
| 25 | Valve 2/2 ways | LZY168 |
| 26 | Tubing 3.2 mm (2 m), sc analyzer | LZY195 |
| 27 | Set of fittings 3.2 mm, (4 pieces) | LZY111 |
| 28 | Fitting for tubing DN4/6 | LZY134 |
| 29 | Blind plug | LZY193 |
| 30 | Valve block 2-channel switch, includes valve for sc analyzer | LZY267 |
| 31 | Valve block 2-channel switch for sc analyzer | LZY172 |
| 32 | Valve 3/2 ways | LZY171 |
| 33 | Conversion kit from 1-channel > Filter Probe sc analyzer, AMTAX sc/PHOSPHAX sc | LZY242 |
| 34 | Bottom part of overflow vessel | LZY165 |
| 35 | Upper part of overflow vessel | LZY166 |
| 36 | Upper part of overflow vessel includes valve | LZY167 |
| 37 | Locking screw | LZY150 |
| 38 | Conversion kit from Filter Probe sc > 1-channel sc analyzer, AMTAX sc/PHOSPHAX sc | LZY241 |
| 39 | Upper part of overflow vessel for 1 or 2-channel instrument | LZY268 |
| 40 | Overflow vessel for 2-channel instrument | LZY269 |
| 41 | Safety plate for sc analyzer | LZY179 |
| 42 | Insulation cover for photometer, PHOSPHAX sc measurement range: 0.05–15 mg/L | LZY225 |
| 43 | Insulation cover for photometer, PHOSPHAX sc measurement range: 1–50 mg/L | LZY226 |
| 44 | Holder for piston pump | LZY180 |
| 45 | Pump head for air pump, 10 mL | LZY181 |

## 8.4 Replacement parts (continued)

(Refer to Figure 20 on page 56–Figure 24 on page 60)

| Item | Description 1 | Cat. No. |
|---|---|---|
| 46 | Piston pump for sc analyzer | LZY177 |
| 47 | Cover for reagent pump | LZY178 |
| 48 | Set of fittings, 1.6 mm, (4 pieces) | LZY192 |
| 49 | Tubing, 1.6 mm (2 m), sc analyzer | LZY194 |
| 50 | Reagent pump, for sc analyzer (valve pump) | LZY176 |
| 51 | Fan for air recirculation for sc analyzer | LZY153 |
| 52 | Heating for analyzer enclosure, includes connectors | LZY156 |
| 53 | Cover | LZY270 |
| 54 | Cover for processor card | LZY159 |
| 55 | Cover for power supply | LZY158 |
| 56 | Power supply, 100-240 VAC | YAB039 |
| 57 | Amplifier card for PHOSPHAX sc | YAB045 |
| 58 | Processor card for sc analyzer | YAB099 |
| 59 | Set of seals for PHOSPHAX sc measuring cell (4 O-rings) | LZY197 |
| 60 | Sealing for valve block | LZY199 |
| 61 | Sealing for overflow vessel | LZY198 |
| 62 | Card with temperature sensor, AMTAX sc/PHOSPHAX sc | YAB089 |
| 63 | Air filter | LZY493 |
| 64 | Check valve | LZY470 |
| 65 | T-fitting | LZY133 |
| 66 | Protective cover for compressor | HAH041 |
| 17+19+42 | Conversion kit PHOSPHAX sc from HR to LR | LZY313 |
| 18+20+43 | Conversion kit PHOSPHAX sc from LR to HR | LZY312 |
| 30+40 | Conversion kit from 1-channel into 2-channel sc analyzer | LZY170 |

## Exploded view drawings

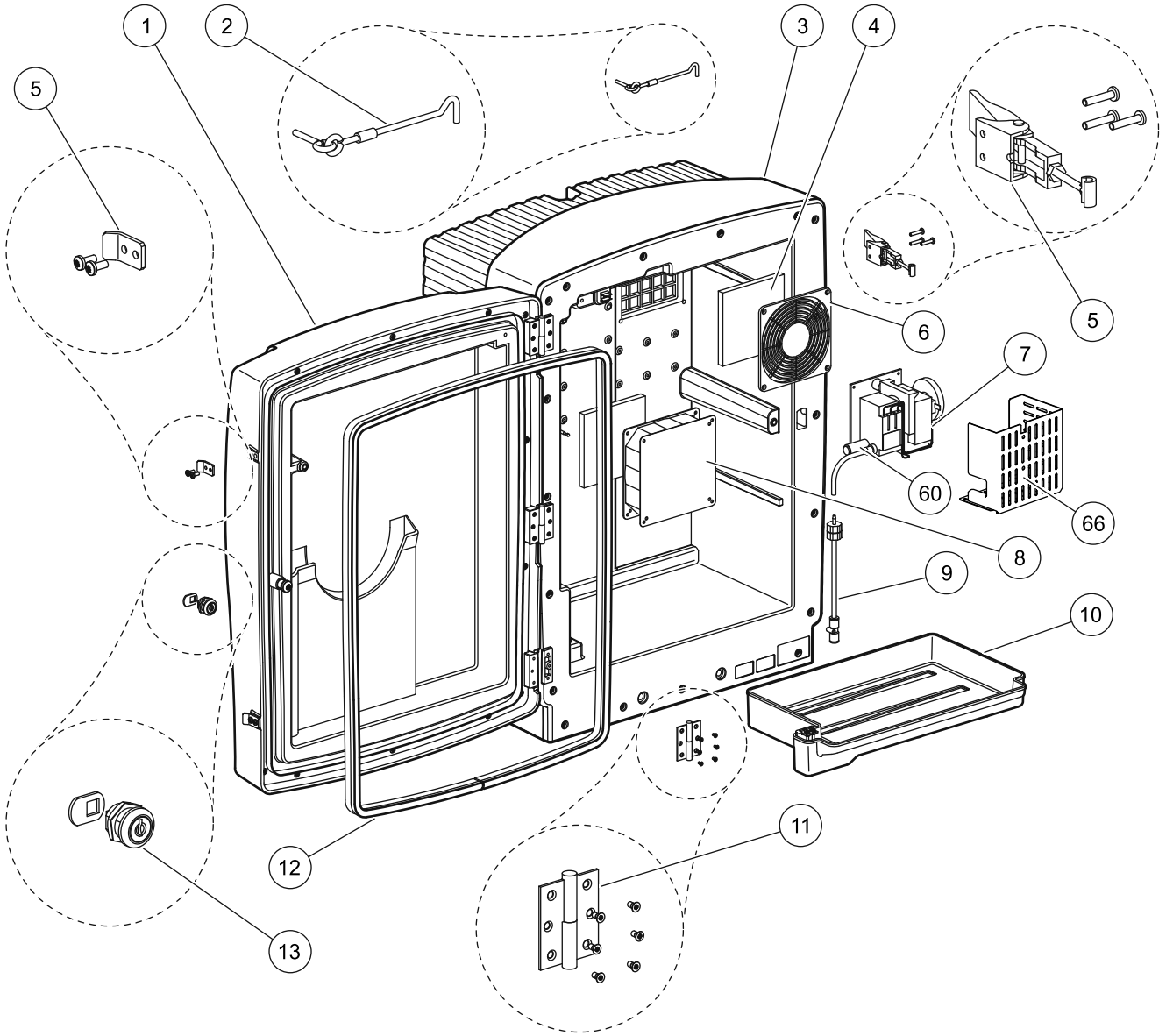



Figure 20 Analyzer enclosure PHOSPHAX sc

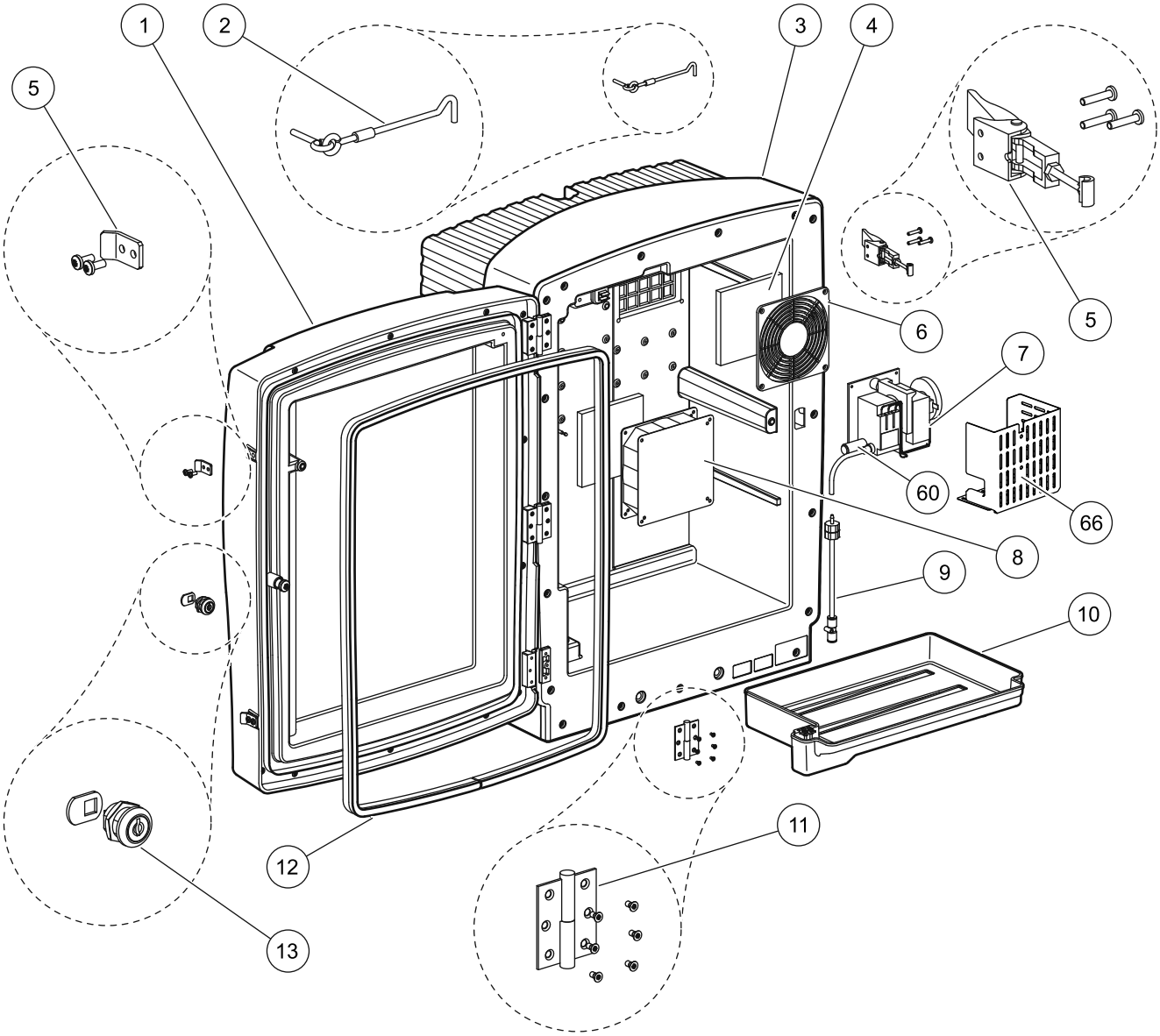



Figure 21 Analyzer enclosure PHOSPHAX indoor sc

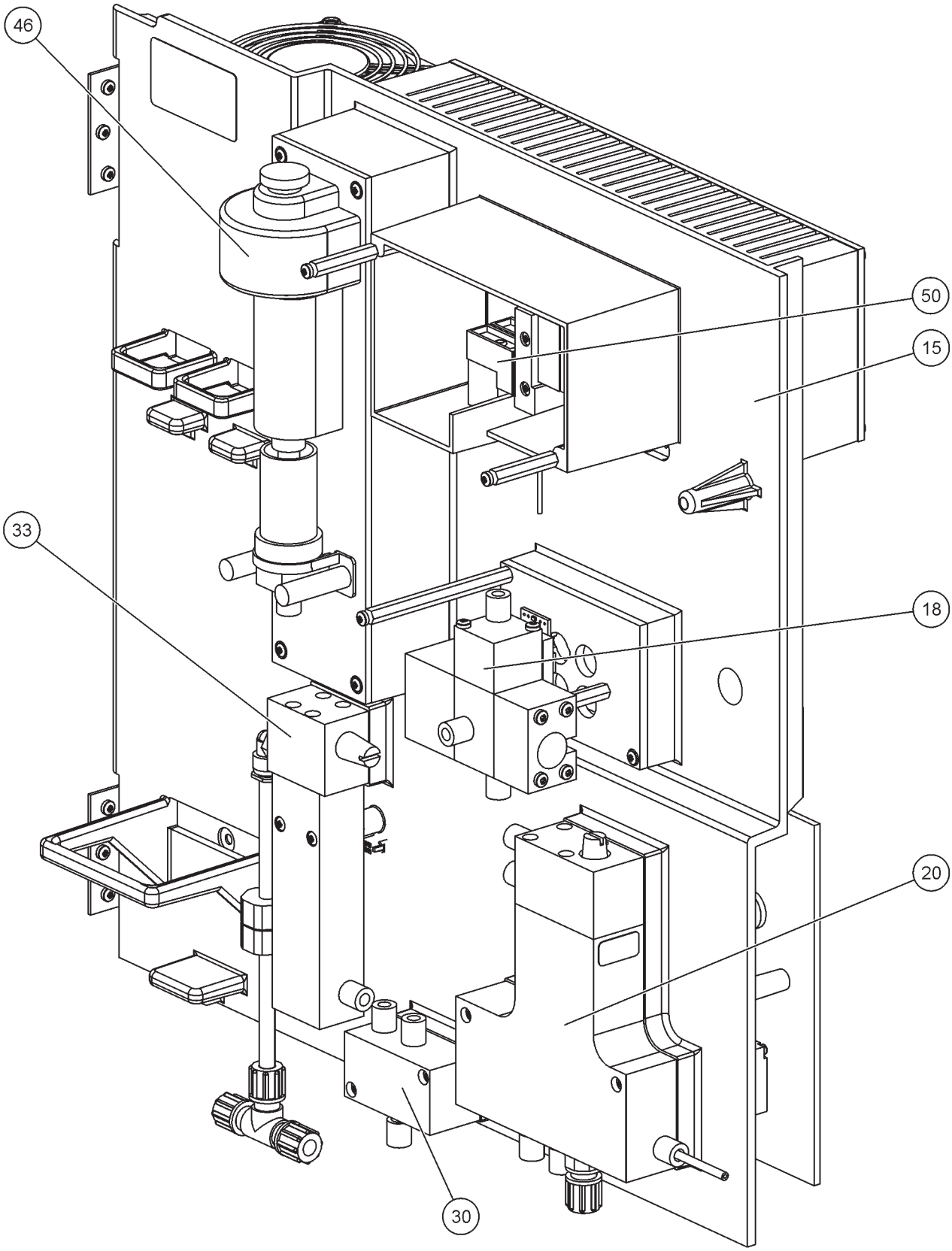



Figure 22 Analyzer panel overview

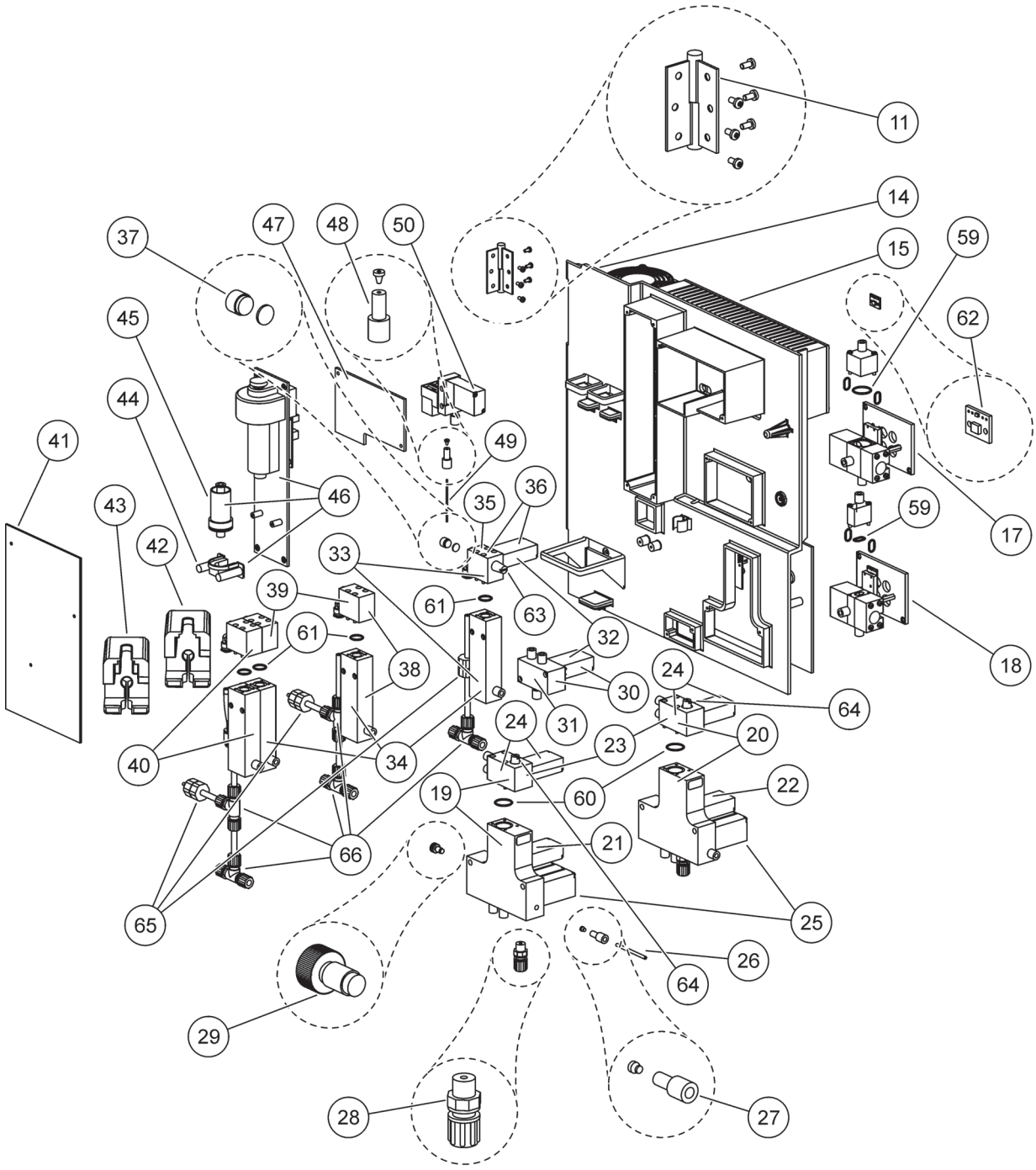



Figure 23 Analyzer panel front view details

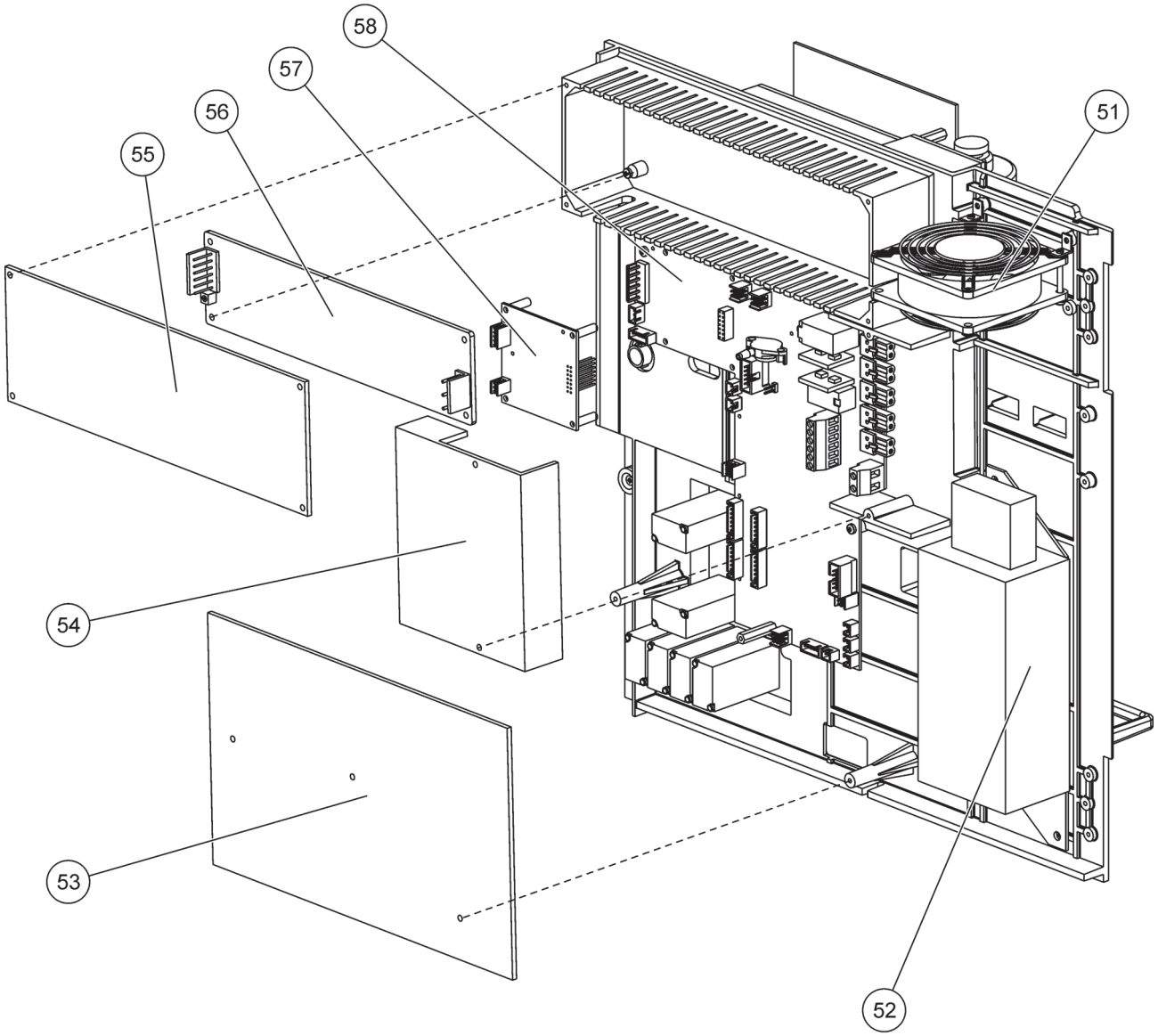



Figure 24 Analyzer panel back view details

# Section 9 Limited Warranty

Hach Company warrants its products to the original purchaser against any defects that are due to faulty material or workmanship for a period of one year from date of shipment unless otherwise noted in the product manual.

In the event that a defect is discovered during the warranty period, Hach Company agrees that, at its option, it will repair or replace the defective product or refund the purchase price excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product, such as, but not limited to, lamps and tubing.

Contact Hach Company or your distributor to initiate warranty support. Products may not be returned without authorization from Hach Company.

## Limitations

This warranty does not cover:

• Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction

• Damage caused by misuse, neglect, accident or improper application or installation

• Damage caused by any repair or attempted repair not authorized by Hach Company

• Any product not used in accordance with the instructions furnished by Hach Company

• Freight charges to return merchandise to Hach Company

• Freight charges on expedited or express shipment of warranted parts or product

• Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by Hach Company in connection with its products. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Hach Company.

## Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Hach Company be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.

# Appendix A Plumbing and connection options

## A.1 Safety information

When making any plumbing or wiring connections, the following warnings must be adhered to, as well as, any warnings and notes found throughout the individual sections. For more safety information, refer to Safety information on page 10.

***DANGER***
***Always disconnect power to the instrument when making any electrical connections.***

***CAUTION***
***The enclosure may tip forwards if it has not been fixed in place. Only open the enclosure if the enclosure is properly mounted to prevent tipping.***

### A.1.1 Electrostatic Discharge (ESD) Considerations

***Important Note:*** *To minimize hazards and ESD risks, maintenance procedures not requiring power to the analyzer should be performed with power removed.*

Delicate internal electronic components can be damaged by static electricity, resulting in degraded instrument performance or eventual failure.

The manufacturer recommends taking the following steps to prevent ESD damage to the instrument:

- Before touching any instrument electronic components (such as printed circuit cards and the components on them) discharge static electricity. This can be accomplished by touching an earth-grounded metal surface such as the chassis of an instrument, or a metal conduit or pipe.
- To reduce static build-up, avoid excessive movement. Transport static-sensitive components in anti-static containers or packaging.
- To discharge static electricity and keep it discharged, wear a wrist strap connected by a wire to earth ground.
- Handle all static-sensitive components in a static-safe area. If possible, use anti-static floor pads and work bench pads.

## A.2 2-parameter configuration

The 2-parameter configuration is required for Options 4, 6, 8b, 9b, 10b, and 11b.

When using a continuous sample the PHOSPHAX sc can measure one parameter: $PO_4^{3-}$. To operate a second parameter with the same continuous sample (i.e. ammonium measured by the AMTAX sc) the sample line must be connected to the overflow vessel of the first instrument in the row. For this purpose, the first instrument must be modified to the 2-parameter variant.

***Note:*** *The 2-parameter configuration applies to outdoor and indoor options and to one and two-channel options (Ch1 + Ch2).*

Refer to Figure 25 and following instructions to connect a 2-parameter configuration.

1. Remove the small blind plug (item 1, Figure 25) from the top hole on the overflow vessel. Remove the large fitting (item 2) from the bottom hole on the overflow vessel. Discard the plug and fitting.
2. Slide the small fitting (union and ferrule, item 3) over the tubing (item 5). Cut the tubing flush with the ferrule.
3. Install the small fitting to the top hole on the overflow vessel to take the sample to the second analyzer.
4. Close the bottom hole with the large blind plug and sealing washer (item 4).

   ***Note:*** *Always connect the front overflow vessel for the first instrument to the front overflow vessel for the second instrument.*

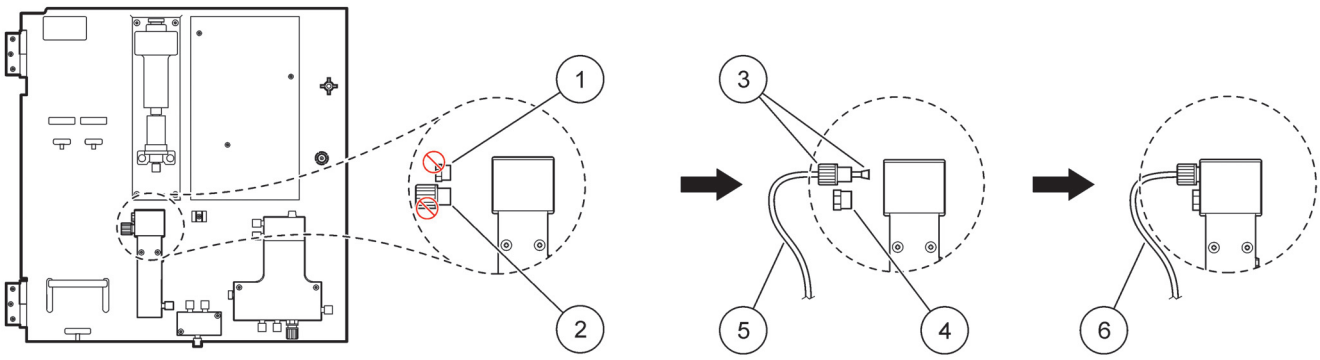



Figure 25 Modify the first instrument to a 2-parameter option

| | | | |
|---|---|---|---|
| **1** | Small plug | **4** | Large plug LZY193 |
| **2** | Large fitting | **5** | Tubing LZY195 |
| **3** | Small fitting and ferrule LZY111 | **6** | To second analyzer |

### A.2.1 Remove the T-fitting

When using the 2-parameter configuration, the T-fitting from the first analyzer drain tube must be removed and reused to connect the drain tube from the first analyzer to the second analyzer.

The T-fitting is used to connect the drain tube. To remove the T-fitting refer to Figure 26 and the following steps:

1. Remove the drain tube from both ends of the T-fitting.
2. Remove the drain tube assembly.
3. Reconnect the T-fitting as described in Options 4, 6, 8b, 9b, 10b, and 11b.

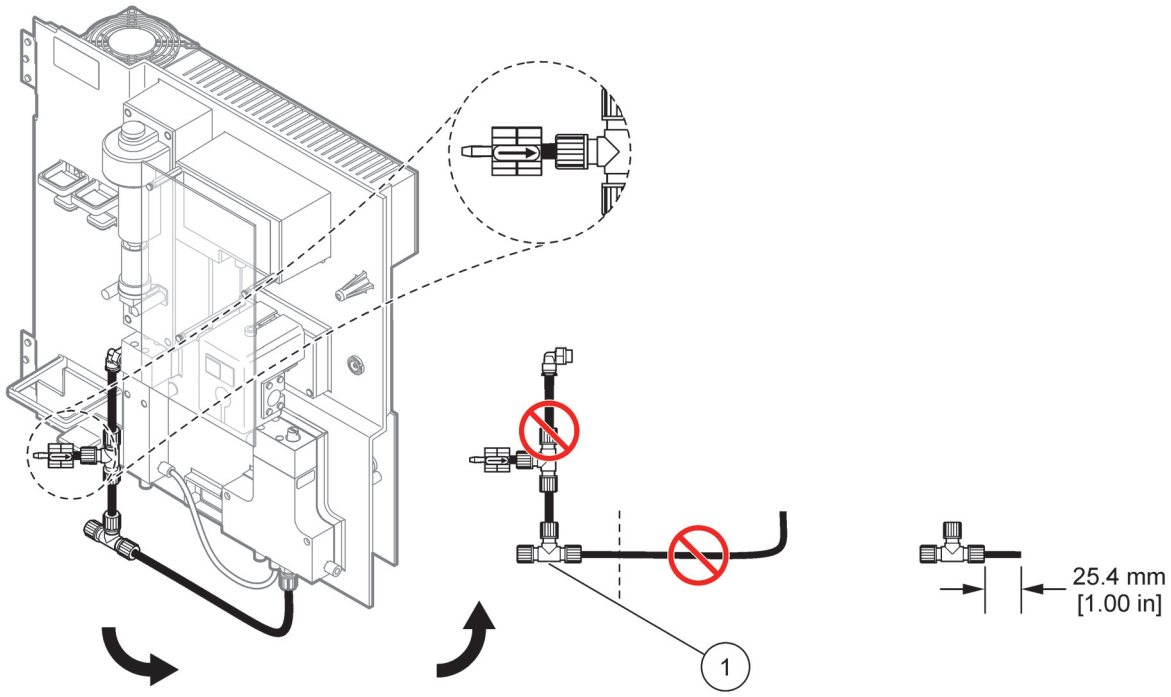



Figure 26 Remove the T-fitting

| | |
|---|---|
| **1** | T-fitting to be removed |

## A.3 Drain line considerations

Always place the drain tubing so that there is a continuous fall (minimum 3°) and the outlet is clear (not pressurized). Make sure the drain tubing is no longer than 2 meters.

## A.4 Tubing considerations

The PHOSPHAX sc uses four different tubing types for plumbing connections. The type of tubing used depends on the instrument configuration:

- Ø 3.2 mm: sample line tubing
- Ø 6 mm: unheated drain tubing
- Ø 22 mm: heated drain tubing
- Ø 32 mm: tubing for the Filter Probe sc

## A.5 Option 1 plumbing and connections

Option 1 is used with an sc analyzer and the Filter Probe sc. The waste from the analyzer is discharged back into the basin using the Filtration Kit. Use the drain tube inside the Filter Probe sc or the optional heated drain tube to discharge the waste stream from the sc analyzer.

Refer to Figure 27 and the following instructions for Option 1:

1. Install the Filter Probe sc into the sample stream. Refer to the Filter Probe sc User Manual for more information.
2. Feed the Filter Probe sc hose (sample lines, electrical cables, and drain tube) through the analyzer opening (Figure 27, item 5). Use Seal Plug #2 to secure.
3. Seal the unused openings with Seal Plug #3.
4. Connect the Filter Probe sc data cable and power connections. Refer to section 3.5.4 on page 28.
5. Connect the air tube to the compressor (item 3).
6. Connect the drain tube to the Filter Probe sc.
7. Connect the sample line to the sample inlet on the overflow vessel using the fittings.

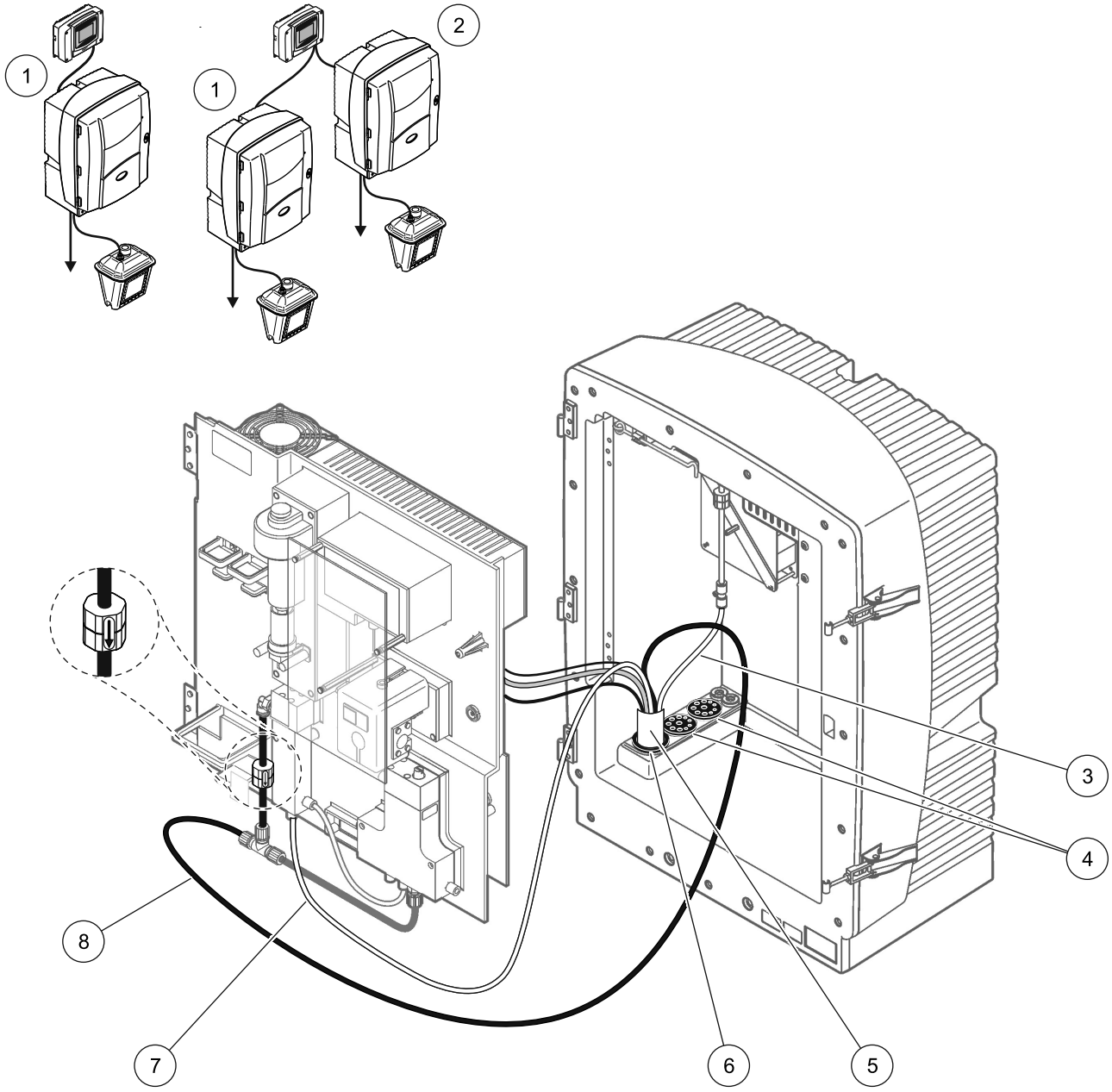



Figure 27 Option 1 setup

| | | | |
|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **5** | Filter Probe sc hose |
| **2** | AMTAX sc analyzer | **6** | Seal plug #2 |
| **3** | Air tube | **7** | Sample line to overflow vessel |
| **4** | Seal plug #3 | **8** | Drain tube |

## A.6 Option 2 plumbing and connections

Option 2 uses an sc analyzer with the Filter Probe sc. The waste from the analyzer is discharged back into the drain through the optional heated drain hose LZY302 (230V) or LZY303 (115V).

Refer to Figure 28 and the following instructions for Option 2:

1. Install the Filter Probe sc into the sample stream. Refer to the Filter Probe sc User Manual for more information.
2. Feed the Filter Probe sc hose (sample lines, electrical cables, drain tube) through the analyzer opening (Figure 28, item 9). Use Seal Plug #2 to secure.

   ***Note:*** *The drain tube from the Filter Probe sc is not used .*
3. Feed the heated drain hose through the analyzer opening (item 7). Use Seal Plug #1 to secure.

   ***Note:*** *The two samples lines of the heated drain hose are not used.*
4. Seal the remaining opening with Seal Plug #3.
5. Connect the Filter Probe sc data cable and power connections. Refer to section 3.5.4 on page 28.
6. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
7. Connect the air tube to the compressor (item 5).
8. Connect the Filter Probe sc heated drain tube to the sample outlet T-fitting.
9. Connect the sample line to the sample inlet on the overflow vessel using the fittings.

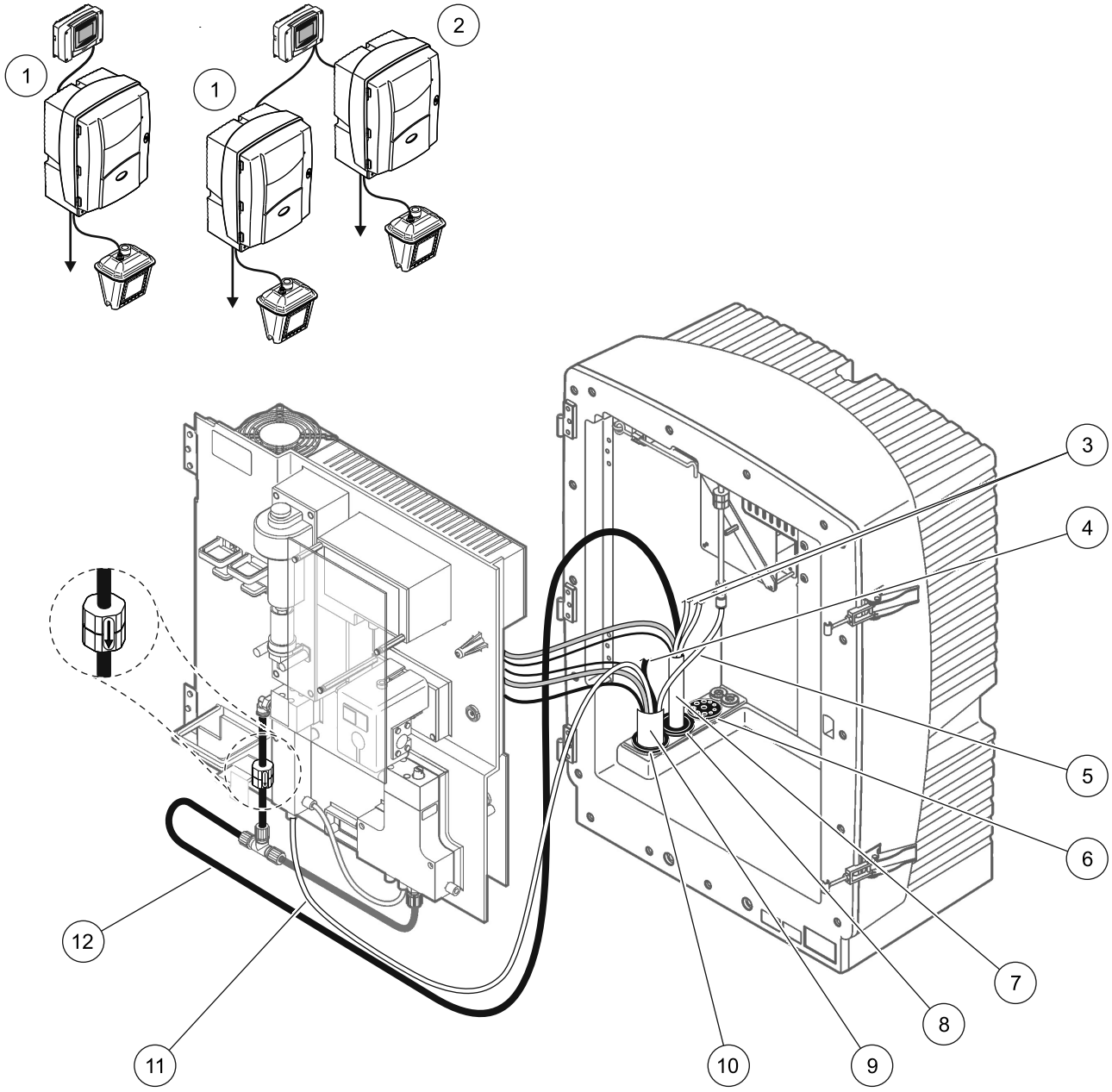



Figure 28 Option 2 setup

| | | | |
|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **7** | Heated drain tube |
| **2** | AMTAX sc analyzer | **8** | Seal plug #1 |
| **3** | Unused heated drain sample lines | **9** | Filter Probe sc hose |
| **4** | Unused Filter Probe sc drain tube | **10** | Seal plug #2 |
| **5** | Air tube | **11** | Filter Probe sc sample line |
| **6** | Seal plug #3 | **12** | Heated drain |

## A.7 Option 3 plumbing and connections

Option 3 uses an sc analyzer with the FILTRAX. The waste from the analyzer is discharged back into the drain through the optional heated drain hose LZY302 (230V) or LZY303 (115V).

Refer to Figure 29 and the following instructions for Option 3:

1. Install the FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Feed the heated hose from the FILTRAX through the analyzer opening (Figure 29, item 5). Use Seal Plug #1 to secure.
3. Feed the heated drain hose through the analyzer opening (item 3). Use Seal Plug #1 to secure.

   ***Note:*** *The two samples lines of the heated drain hose are not used.*
4. Seal the remaining opening with Seal Plug #3.
5. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
6. Connect the heated drain tube to the sample outlet T-fitting.

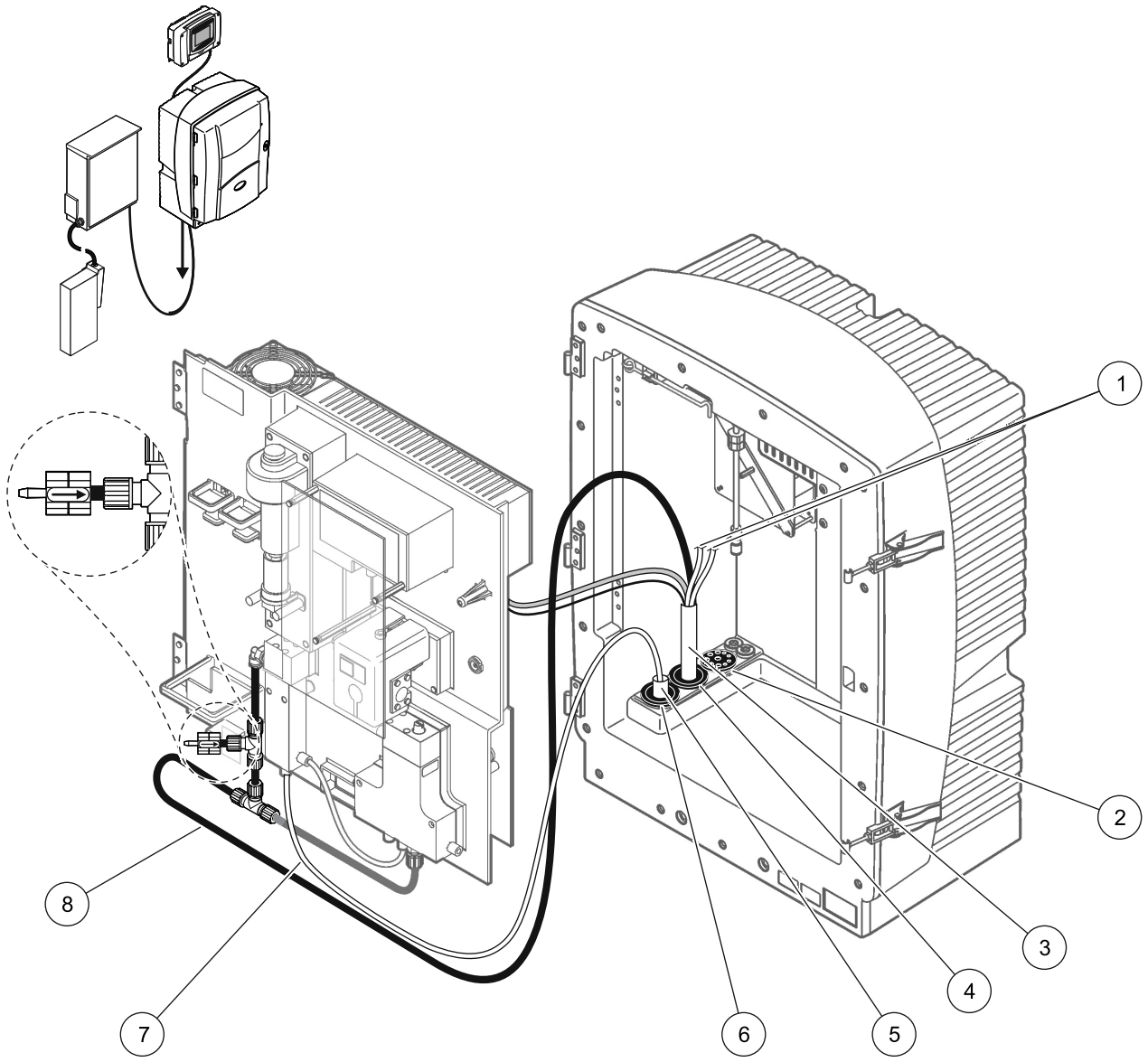



Figure 29 Option 3 setup

| | | | |
|---|---|---|---|
| **1** | Unused heated drain sample lines | **5** | FILTRAX heated hose |
| **2** | Seal plug #3 | **6** | Seal plug #1 |
| **3** | Heated drain hose | **7** | FILTRAX sample line |
| **4** | Seal plug #1 | **8** | Heated drain tube |

## A.8 Option 4 plumbing and connections

Option 4 uses two sc analyzers with the FILTRAX. The sample from the FILTRAX goes to the first analyzer which needs to change to a 2-parameter configuration (see 2-parameter configuration on page 64). The heated drain hose connects both sc analyzers.The waste from both analyzers is discharged back into a drain through the second heated drain hose.

Refer to Figure 30 and the following instructions for Option 4:

1. Install the FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Install the first sc analyzer (Analyzer 1):
   a. Feed the heated hose from the FILTRAX through the analyzer opening (Figure 30, item 15). Use Seal Plug #1 to secure.
   b. Feed the heated drain hose though the analyzer opening (item 17). Use Seal Plug #1 to secure.
   c. Seal the remaining opening with Seal Plug #3.
   d. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
   e. Remove the pre-installed drain tube attached to the valve block and remove the T-fitting from the drain tube (item 7). Retain for reuse with Analyzer 2.
   f. Connect the heated drain tube to the valve block connector.
   g. Connect the sample line from the FILTRAX to the bottom inlet on the overflow vessel using the fittings.
   h. Change the analyzer to the 2 parameter configuration. Refer to 2-parameter configuration on page 64.
   i. Connect one of the sample lines from the heated drain to the overflow vessel.
3. Install the second sc analyzer (Analyzer 2):
   a. Feed the heated drain hose from Analyzer 1 through Analyzer 2 (item 12). Use Seal Plug #1 to secure.
   b. Feed the second heated drain hose through Analyzer 2 (item 11). Use Seal Plug #1 to secure.
   c. Seal the remaining opening with Seal Plug #3.
   d. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
   e. Cut 25 mm from the drain tube that was removed from Analyzer 1. Connect the 25 mm piece of tubing to the T-fitting on Analyzer 2. Connect the other end of the tubing to the T-fitting that was removed from Analyzer 1. Refer to Figure 26 on page 65 for T-fitting removal.
   f. Connect the drain tube from Analyzer 1 and the drain tube from Analyzer 2 to the T-fitting.
4. Connect the sample line from Analyzer 1 to the bottom inlet on the overflow vessel.

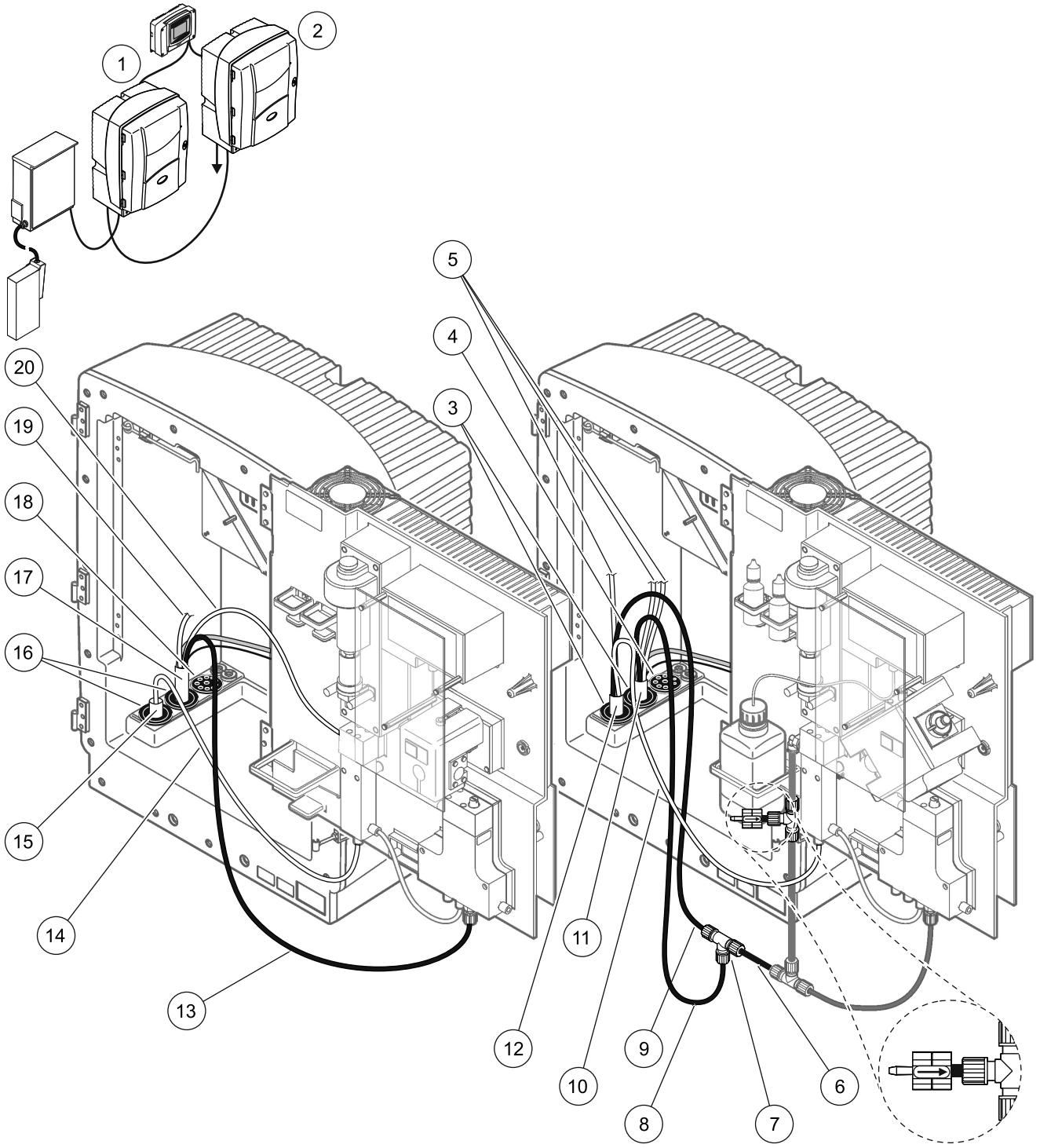



Figure 30 Option 4 setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **8** | Heated drain tube | **15** | FILTRAX heated hose |
| **2** | AMTAX sc analyzer | **9** | Heated drain tube from analyzer 1 | **16** | Seal plug #1 |
| **3** | Seal plug #1 | **10** | Sample line from analyzer 1 | **17** | Heated drain hose |
| **4** | Seal plug #3 | **11** | Heated drain hose | **18** | Seal plug #3 |
| **5** | Unused heated drain sample lines | **12** | Heated drain hose from analyzer 1 | **19** | Unused heated drain sample line |
| **6** | Drain tube cut from analyzer 1 | **13** | Heated drain tube | **20** | Heated drain sample line |
| **7** | T-fitting from analyzer 1 | **14** | FILTRAX sample line | | |

## A.9 Option 5 plumbing and connections

Option 5 uses an sc analyzer as a 2-channel analyzer with two FILTRAX (FILTRAX 1 and FILTRAX 2), supplying two continuous sample streams. The waste from the analyzer and both FILTRAX is discharged back into the drain through the optional heated drain hose LZY302 (230 V) or LZY303 (115 V).

Refer to Figure 31 and the following instructions for Option 5:

1. Install both FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Feed the heated hose from FILTRAX 1 through the analyzer opening (Figure 31, item 7). Use Seal Plug #1 to secure.
3. Feed the heated hose from FILTRAX 2 through the analyzer opening (item 6). Use Seal Plug #1 to secure.
4. Feed the heated drain hose through the analyzer (item 5). Use Seal Plug #1 to secure.

   ***Note:*** *The two samples lines of the heated drain hose are not used.*
5. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
6. Connect the heated drain tube to the T-fitting (item 8).
7. Connect the sample line from FILTRAX 1 to the bottom inlet on Overflow Vessel 1 using the fittings (item 11).
8. Connect the sample line from FILTRAX 2 to the bottom inlet on Overflow Vessel 2 using the fittings (item 12).

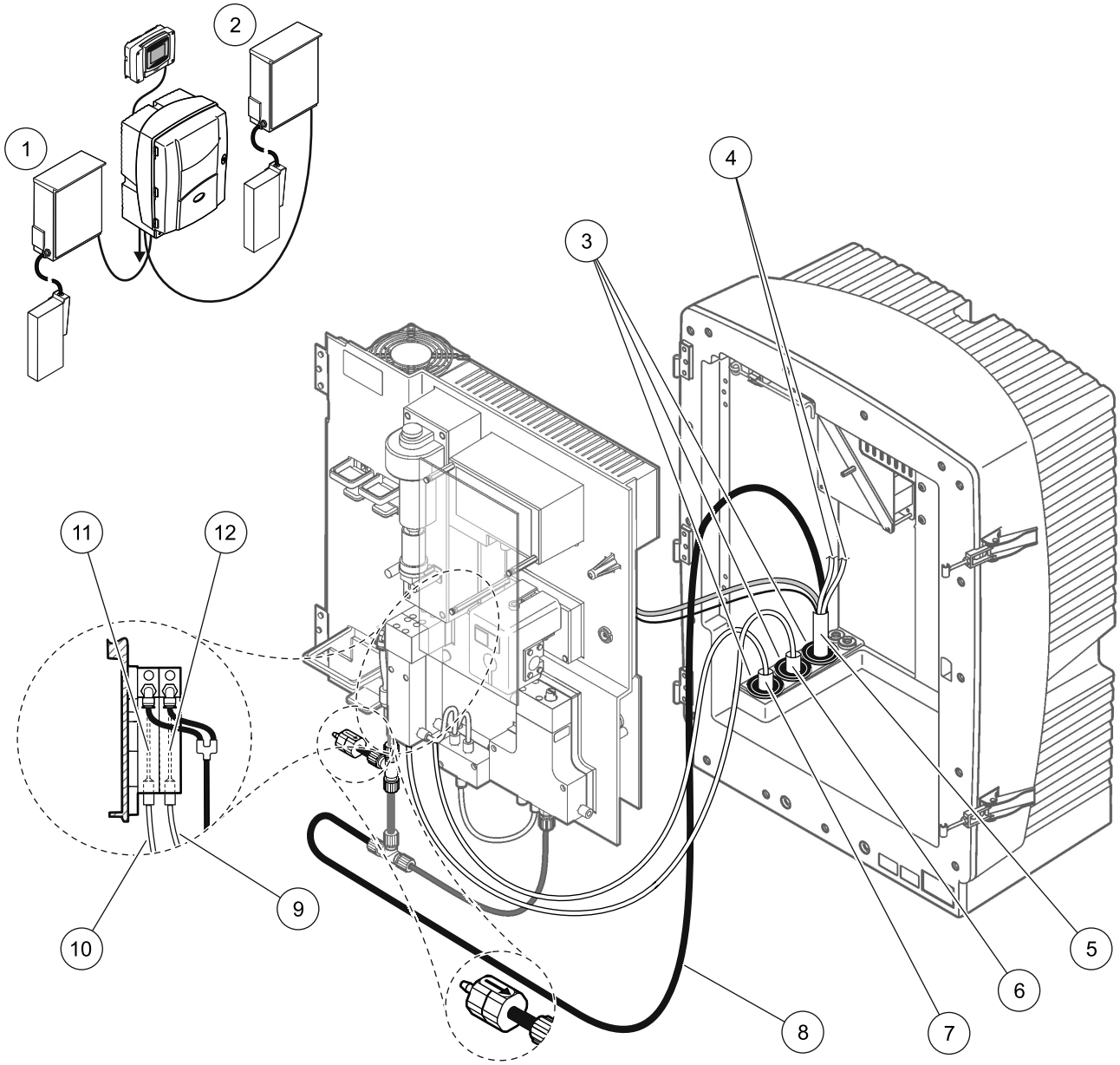



Figure 31 Option 5 setup

| | | | |
|---|---|---|---|
| **1** | FILTRAX 1 | **7** | FILTRAX heated hose 1 |
| **2** | FILTRAX 2 | **8** | Heated drain tube |
| **3** | Seal plug #1 | **9** | FILTRAX 2 sample line |
| **4** | Unused heated drain sample lines | **10** | FILTRAX 1 sample line |
| **5** | Heated drain hose | **11** | Overflow vessel 1 |
| **6** | FILTRAX heated hose 2 | **12** | Overflow vessel 2 |

## A.10 Option 6 plumbing and connections

Option 6 uses two sc analyzers with two FILTRAX (FILTRAX 1 and FILTRAX 2). Samples from both FILTRAX are going into Analyzer 1 using the 2-parameter configuration. The heated drain hose connects both sc analyzers. The waste from both analyzers is discharged into a drain through the heated drain hose.

Refer to Figure 32 and the following instructions for Option 6:

1. Install both FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Install the first sc analyzer (Analyzer 1):
   a. Feed the heated hose from FILTRAX 1 through the analyzer (Figure 32, item 25). Use Seal Plug #1 to secure.
   b. Feed the heated hose from FILTRAX 2 through the analyzer (item 27). Use Seal Plug #1 to secure.
   c. Feed the heated drain hose through the analyzer (item 28). Use Seal Plug #1 to secure. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
   d. Remove the pre-installed drain tube attached to the valve block and remove the T-fitting from the drain tube. Retain for reuse with Analyzer 2.
   e. Connect the heated drain tube to the valve block connector.
   f. Connect the sample line from FILTRAX 1 to the bottom inlet on Overflow Vessel 1 using the fittings (item 20).
   g. Connect the sample line from FILTRAX 2 to the bottom inlet on Overflow Vessel 2 using the fittings (item 19).
   h. Change the analyzer to the 2-parameter configuration. Refer to 2-parameter configuration on page 64.
   i. Connect Sample Line 1 from the heated drain to Overflow Vessel 1. Connect Sample Line 2 from the heated drain to Overflow Vessel 2.
3. Install the second sc analyzer (Analyzer 2)
   a. Feed the heated drain hose from Analyzer 1 through Analyzer 2 (item 13). Use Seal Plug #1 to secure.
   b. Feed the heated drain hose through the analyzer (item 8). Use Seal Plug #1 to secure. Connect the heated drain power connections. Refer to section 3.5.5 on page 29.
   c. Seal the remaining opening with Seal Plug #3.
   d. Cut 25 mm from the drain tube that was removed from Analyzer 1. Connect the 25 mm piece of tubing to the T-fitting on Analyzer 2. Connect the other end of the tubing to the T-fitting that was removed from Analyzer 1. Refer to Figure 26 on page 65 for T-fitting removal.
   e. Connect the drain tube from Analyzer 1 and the drain tube from Analyzer 2 to the T-fitting.
4. Connect Sample Line 1 from Analyzer 1 to Overflow Vessel 1 using the fittings (item 16). Connect Sample Line 2 from Analyzer 1 to Overflow Vessel 2 using the fittings (item 17).

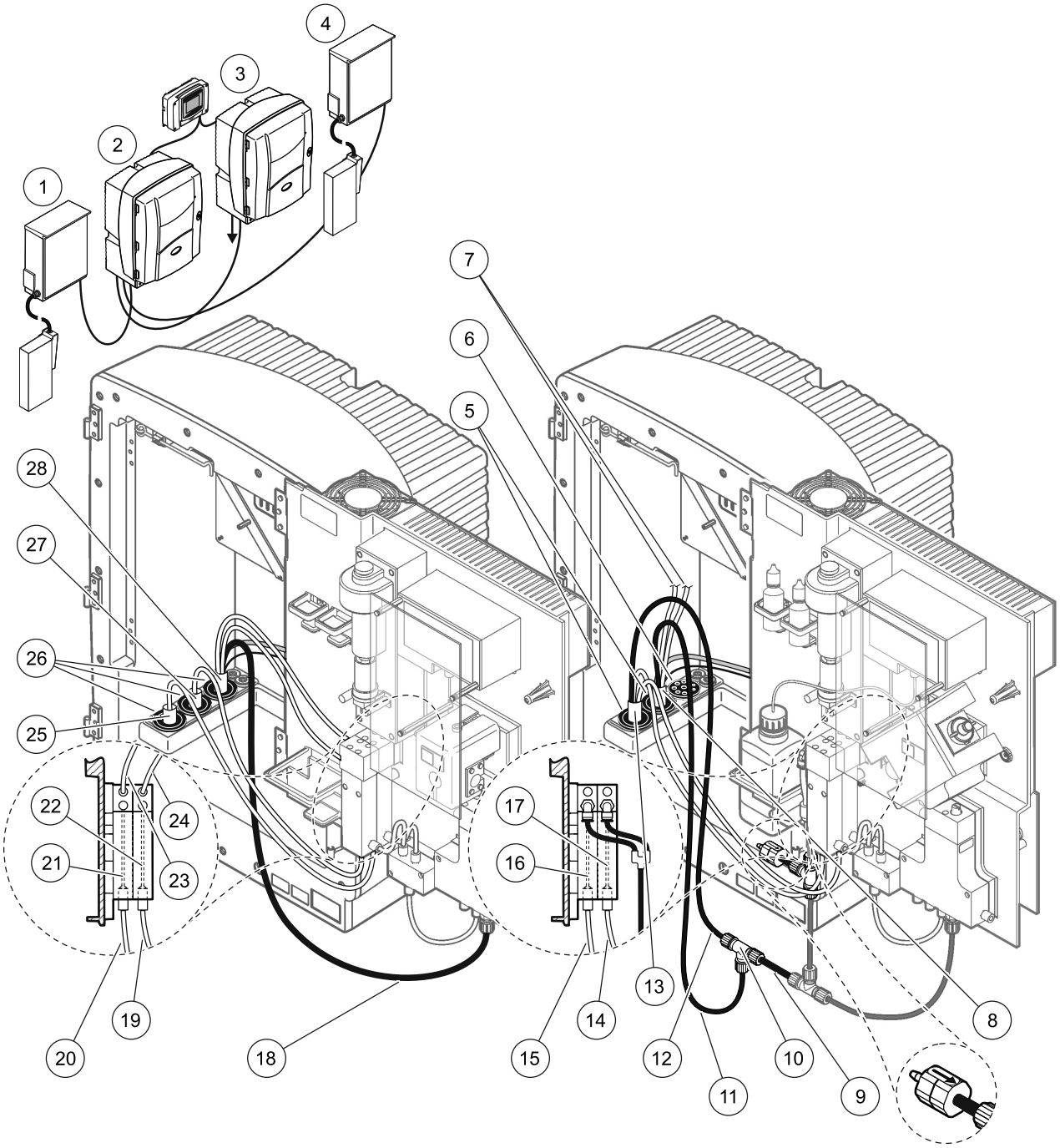



Figure 32 Option 6 setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | FILTRAX 1 | **11** | Heated drain tube | **21** | Overflow vessel 1 |
| **2** | PHOSPHAX sc analyzer | **12** | Heated drain tube from analyzer 1 | **22** | Overflow vessel 2 |
| **3** | AMTAX sc analyzer | **13** | Heated drain tube from analyzer 1 | **23** | Heated drain 1 sample line |
| **4** | FILTRAX 2 | **14** | Heated drain sample 2 from analyzer 1 | **24** | Heated drain 2 sample line |
| **5** | Seal plug #1 | **15** | Heated drain sample 1 from analyzer 1 | **25** | FILTRAX 1 heated hose |
| **6** | Seal plug #3 | **16** | Overflow vessel 1 | **26** | Seal plug #1 |
| **7** | Unused heated drain sample lines | **17** | Overflow vessel 2 | **27** | FILTRAX 2 heated hose |
| **8** | Heated drain hose | **18** | Heated drain tube | **28** | Heated drain hose |
| **9** | Drain tube cut from analyzer 1 | **19** | FILTRAX 2 sample line | | |
| **10** | T-fitting from analyzer 1 | **20** | FILTRAX 1 sample line | | |

## A.11 Option 7 plumbing and connections

Option 7 is used with an sc analyzer and the Filter Probe sc. The waste from the analyzer is discharged back into the basin using the Filtration Kit. Use the drain tube inside the Filter Probe sc or the optional heated drain tube to discharge the waste stream from the sc analyzer.

Refer to Figure 33 and the following instructions for Option 7:

1. Install the Filter Probe sc into the sample stream. Refer to the Filter Probe sc User Manual for more information.
2. Feed the Filter Probe sc hose (sample lines, electrical cables, drain tube) through the analyzer opening (Figure 33, item 6). Use Seal Plug #2 to secure.
3. Seal the unused openings with Seal Plug #3.
4. Connect the Filter Probe sc data cable and power connections. Refer to section 3.5.4 on page 28.
5. Connect the air tube to the compressor (item 4).
6. Connect the drain tube and feed it out the analyzer through Seal Plug #3 to a drain.
7. Connect the sample line to the sample inlet on the overflow vessel using the fittings (item 8).

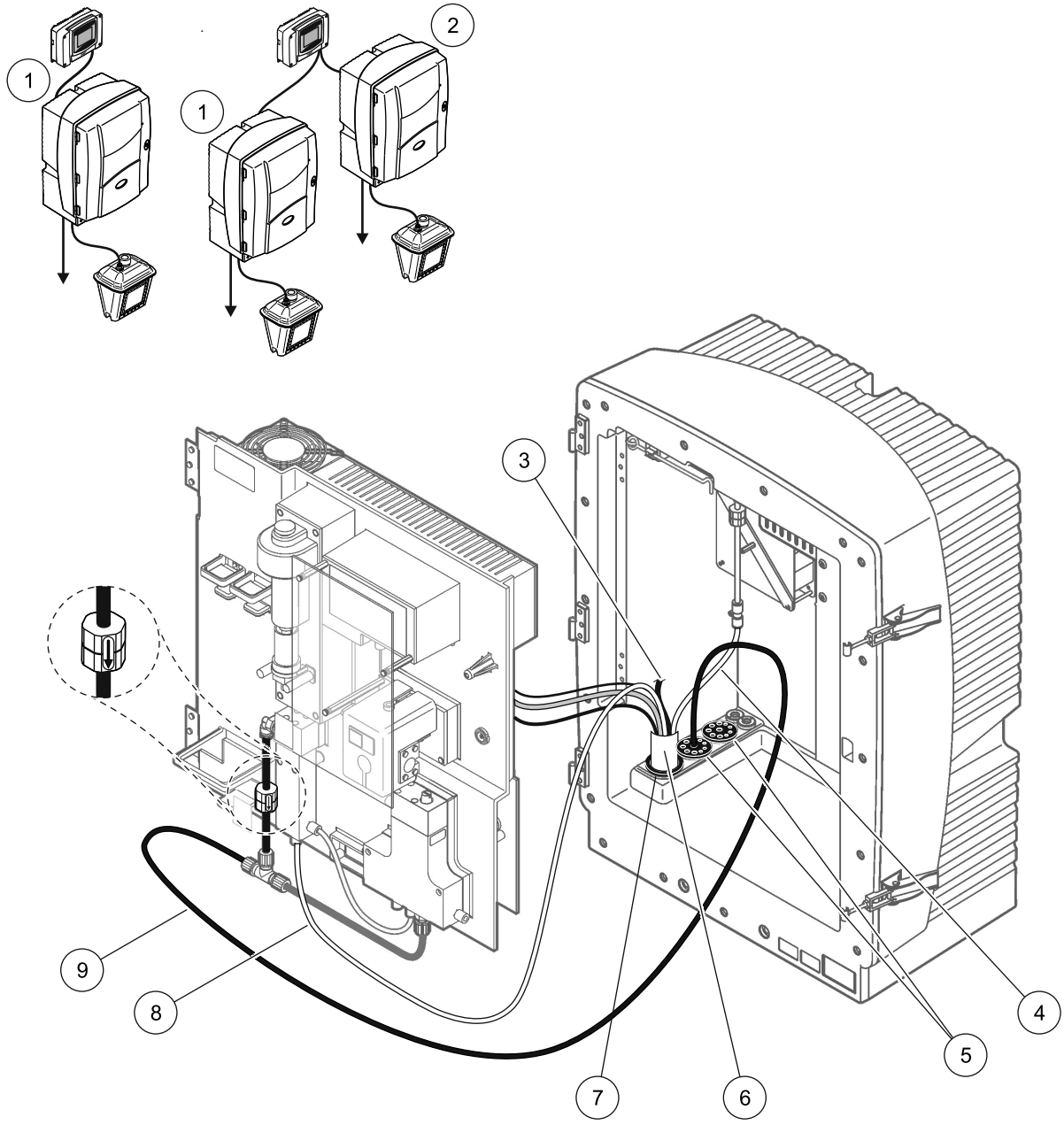



Figure 33 Option 7 setup

| | | | |
|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **6** | Filter Probe sc hose |
| **2** | AMTAX sc analyzer | **7** | Seal plug #2 |
| **3** | Unused Filter Probe sc drain tube | **8** | Sample line to overflow vessel |
| **4** | Air tube | **9** | Drain tube |
| **5** | Seal plug #3 | | |

## A.12 Option 8a plumbing and connections

Option 8a uses an sc analyzer with the FILTRAX. The waste of the analyzer is discharged back into an open drain.

Refer to Figure 34 and the following instructions for Option 8a:

1. Install the FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Feed the heated hose from the FILTRAX through the analyzer opening (Figure 34, item 3). Use Seal Plug #1 to secure.
3. Feed the drain tube through the analyzer opening (item 5). Use Seal Plug #3 to secure.

   ***Note:*** *Tubes can be pushed through prepared holes on Seal Plug #3.*
4. Connect the drain tube to the T-fitting.
5. Connect the FILTRAX sample line to the bottom inlet on the overflow vessel using the fittings (item 4).
6. Feed the drain tube to a lower drain (maximum 2 m/6.5 ft).

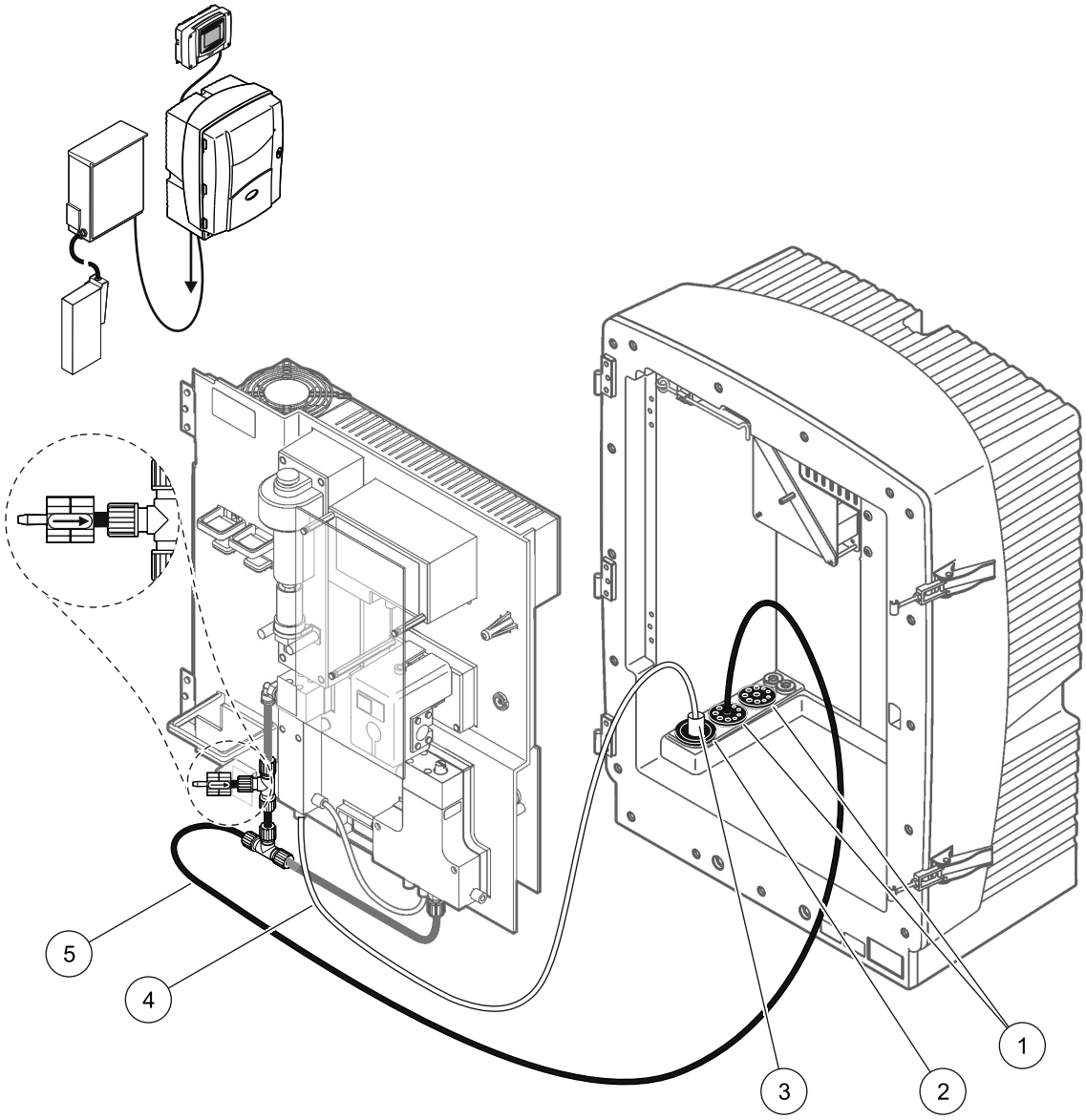



Figure 34 Option 8a setup

| | |
|---|---|
| **1** | Seal plug #3 |
| **2** | Seal plug #1 |
| **3** | FILTRAX heated hose |
| **4** | FILTRAX sample line |
| **5** | Drain tube: Feed to a lower drain (maximum 2 m/6.5 ft) |

## A.13 Option 8b plumbing and connections

Option 8b uses two sc analyzers with the FILTRAX. The sample of the FILTRAX goes to the first sc analyzer. This analyzer must use the 2-parameter configuration (see A.2 on page 64). Each sc analyzer discharges waste into an open drain.

Refer to Figure 35 and the following instructions for Option 8b:

1. Install the FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Install the first sc analyzer (Analyzer 1):
   a. Feed the heated hose from the FILTRAX through the analyzer opening (Figure 35, item 8). Use Seal Plug #1 to secure.
   b. Feed the drain tube through the analyzer opening (item 6) and to an open drain below Analyzer 1. Use Seal Plug #3 to secure.
   c. Change the analyzer to the 2-parameter configuration. Refer to 2-parameter configuration on page 64.
   d. Connect the reworked overflow of the overflow vessel to deliver the sample to Analyzer 2.
   e. Feed the overflow vessel tubing (item 11) through Analyzer 1 to Analyzer 2. Use Seal Plug #3 to secure.
   f. Remove the drain tube with the T-fitting from the valve block connector. This drain tube is not used.
   g. Connect the drain tube to the valve block connector (item 6).
   h. Connect the FILTRAX sample line to the bottom inlet on the overflow vessel using the fittings (item 7).
3. Install the second sc analyzer (Analyzer 2):
   a. Feed the sample line from Analyzer 1 through Analyzer 2 (item 4). Use Seal Plug #3 to secure.
   b. Feed the drain tube through Analyzer 2 to an open drain below. Use Seal Plug #3 to secure.
   c. Use Seal Plug #3 to seal any unused openings.
   d. Connect the drain tube to the T-fitting (item 5).
   e. Connect the sample line from Analyzer 1 to the bottom inlet on the overflow vessel using the fittings.

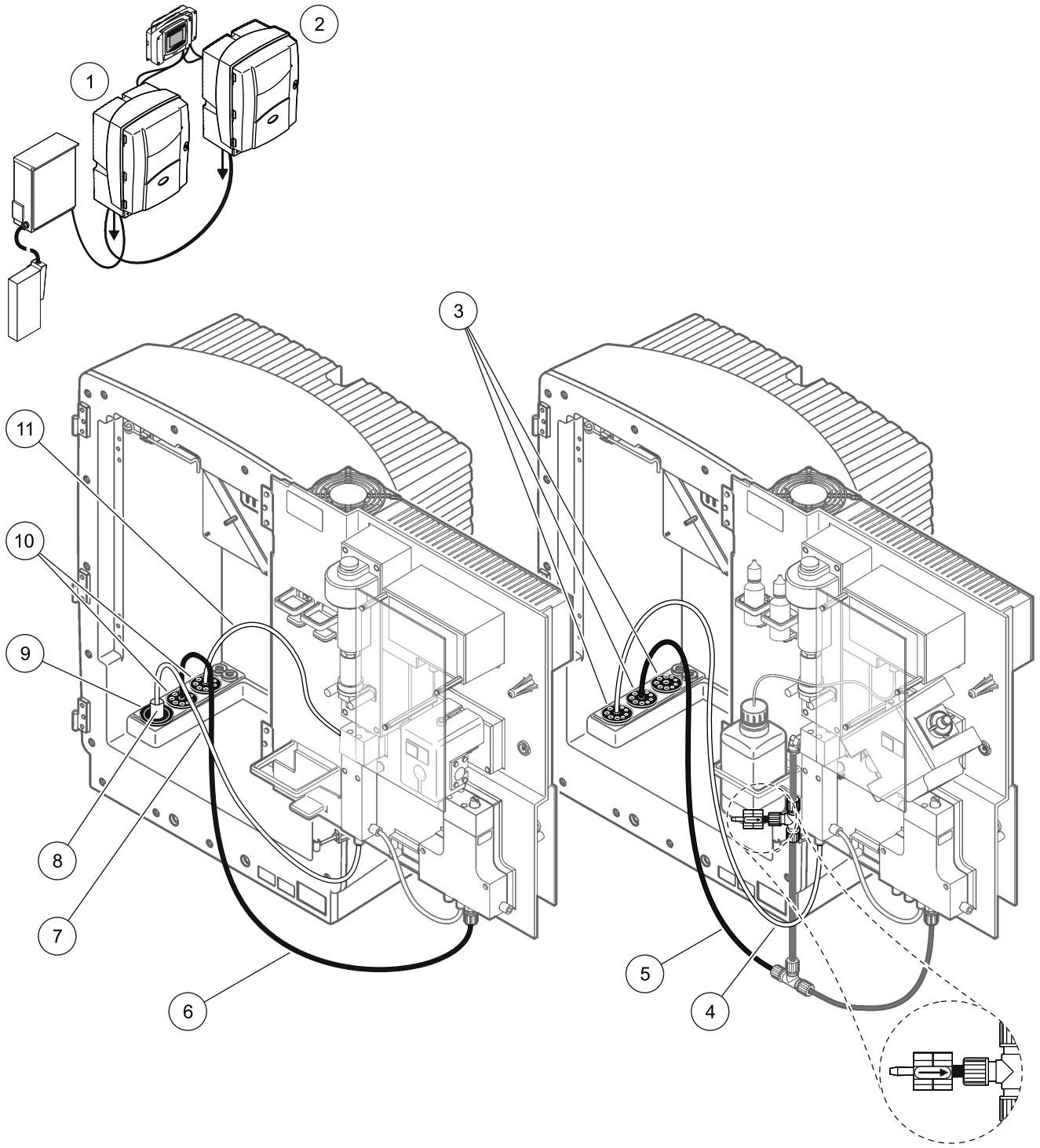



Figure 35 Option 8b setup

| | | | |
|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **7** | FILTRAX sample line |
| **2** | AMTAX sc analyzer | **8** | FILTRAX heated hose |
| **3** | Seal plug #3 | **9** | Seal plug #1 |
| **4** | Sample line from analyzer 1 (maximum. 2 m/6.5 ft) | **10** | Seal plug #3 |
| **5** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **11** | Overflow vessel tube |
| **6** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | | |

## A.14 Option 9 plumbing and connections

Option 9a uses an sc analyzer as a 2-channel analyzer with two FILTRAX (FILTRAX 1 and FILTRAX 2). The waste of the analyzer and both FILTRAX is discharged into an open drain.

Refer to Figure 36 and the following instructions for Option 9a:

1. Install both FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Feed the heated hose from FILTRAX 1 through the analyzer (Figure 36, item 6). Use Seal Plug #1 to secure.
3. Feed the heated hose from FILTRAX 2 through the analyzer (item 5). Use Seal Plug #1 to secure.
4. Feed the drain tube through the analyzer (item 7). Use Seal Plug #3 to secure.
5. Connect the drain tube to the T-fitting.
6. Connect the sample line from FILTRAX 1 to Overflow Vessel 1 using the fittings. Connect the sample line from FILTRAX 2 to Overflow Vessel 2 using the fittings.

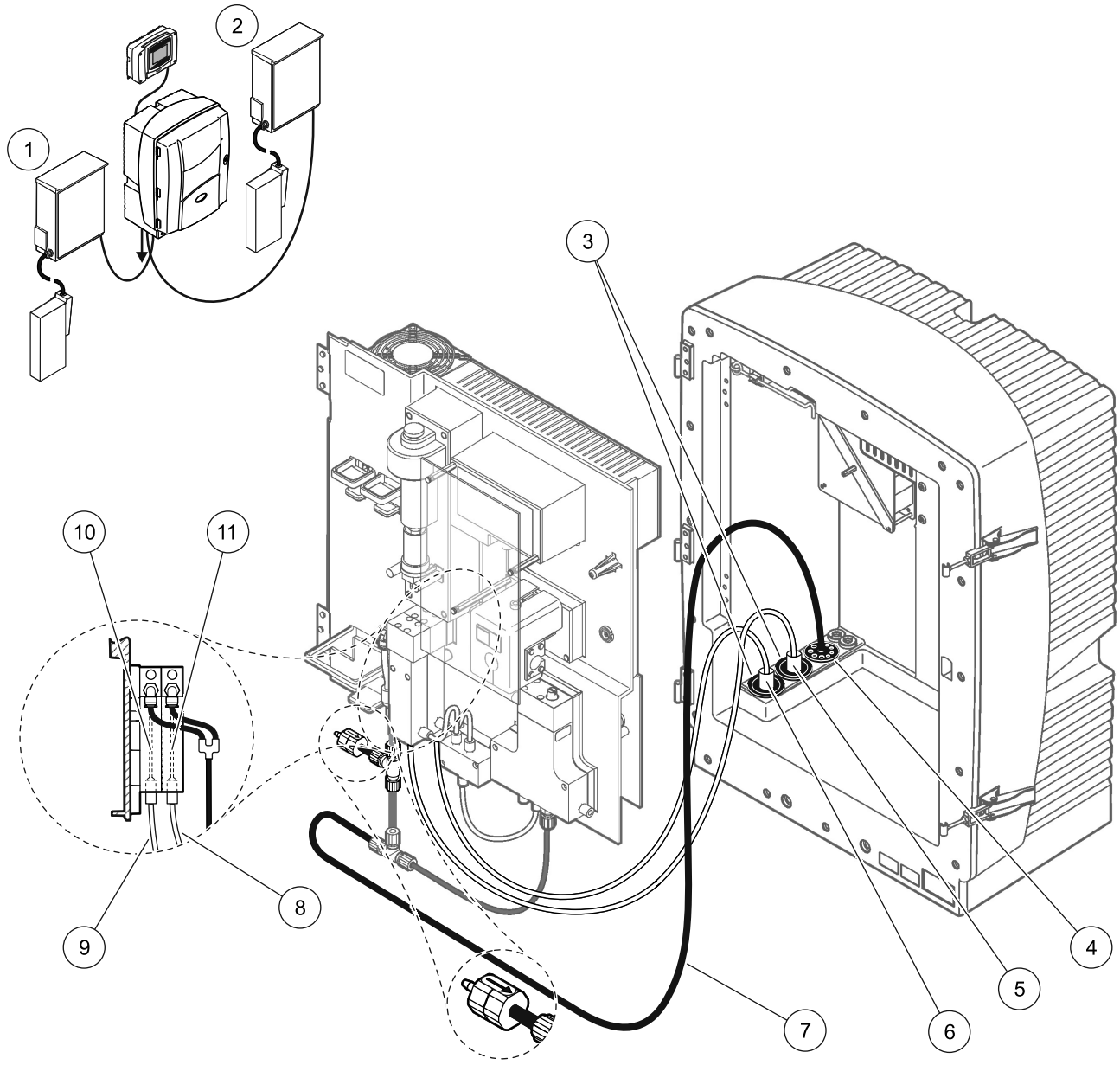



Figure 36 Option 9a setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | FILTRAX 1 | **5** | FILTRAX 2 heated hose | **9** | FILTRAX 1 sample line |
| **2** | FILTRAX 2 | **6** | FILTRAX 1 heated hose | **10** | Overflow vessel 1 |
| **3** | Seal plug #1 | **7** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **11** | Overflow vessel 2 |
| **4** | Seal plug #3 | **8** | FILTRAX 2 sample tube | | |

## A.15 Option 9b plumbing and connections

Option 9b uses two sc analyzers with two FILTRAX (FILTRAX 1 and FILTRAX 2). The samples of both FILTRAX go into the first sc analyzer. This analyzer must change to the 2-parameter configuration (see 2-parameter configuration on page 64). Two sample lines are going to both sc analyzers. Each sc analyzer is discharging waste to an open drain.

Refer to Figure 37 and the following instructions for Option 9b:

1. Install both FILTRAX into the sample stream. Refer to the FILTRAX User Manual for more information.
2. Install the first sc analyzer (Analyzer 1):
   a. Feed the heated hose from FILTRAX 1 through the analyzer (Figure 37, item 18). Use Seal Plug #1 to secure.
   b. Feed the heated hose from FILTRAX 2 through the analyzer (item 20). Use Seal Plug #1 to secure.
   c. Feed two sample lines and one drain tube through the analyzer. Use Seal Plug #3 to secure.
   d. Remove the drain tube with the T-fitting from the valve block connector.
   e. Connect the drain tube to the valve block connector.
   f. Connect the sample line from FILTRAX 1 to the bottom inlet on Overflow Vessel 1 using the fittings (item 13).
   g. Connect the sample line from FILTRAX 2 to the bottom inlet on Overflow Vessel 2 using the fittings (item 12).
   h. Change the analyzer to the 2-parameter configuration. Refer to 2-parameter configuration on page 64.
   i. Connect Sample Line 1 to the reworked overflow of Overflow Vessel 1. Connect Sample Line 2 to the reworked overflow of Overflow Vessel 2.
3. Install the second sc analyzer (Analyzer 2):
   a. Feed the two sample lines from the two overflow vessels of Analyzer 1 through Analyzer 2. Use Seal Plug #3 to secure.
   b. Feed the drain tube though Analyzer 2 (item 6). Use Seal Plug #3 to secure.
   c. Use Seal Plug #3 to seal the unused opening.
   d. Connect the drain tube to the T-fitting.
   e. Connect Sample Line 1 from Analyzer 1 to the bottom inlet on Overflow Vessel 1 using the fittings.
   f. Connect Sample Line 2 from Analyzer 1 to the bottom inlet on Overflow Vessel 2 using the fittings.

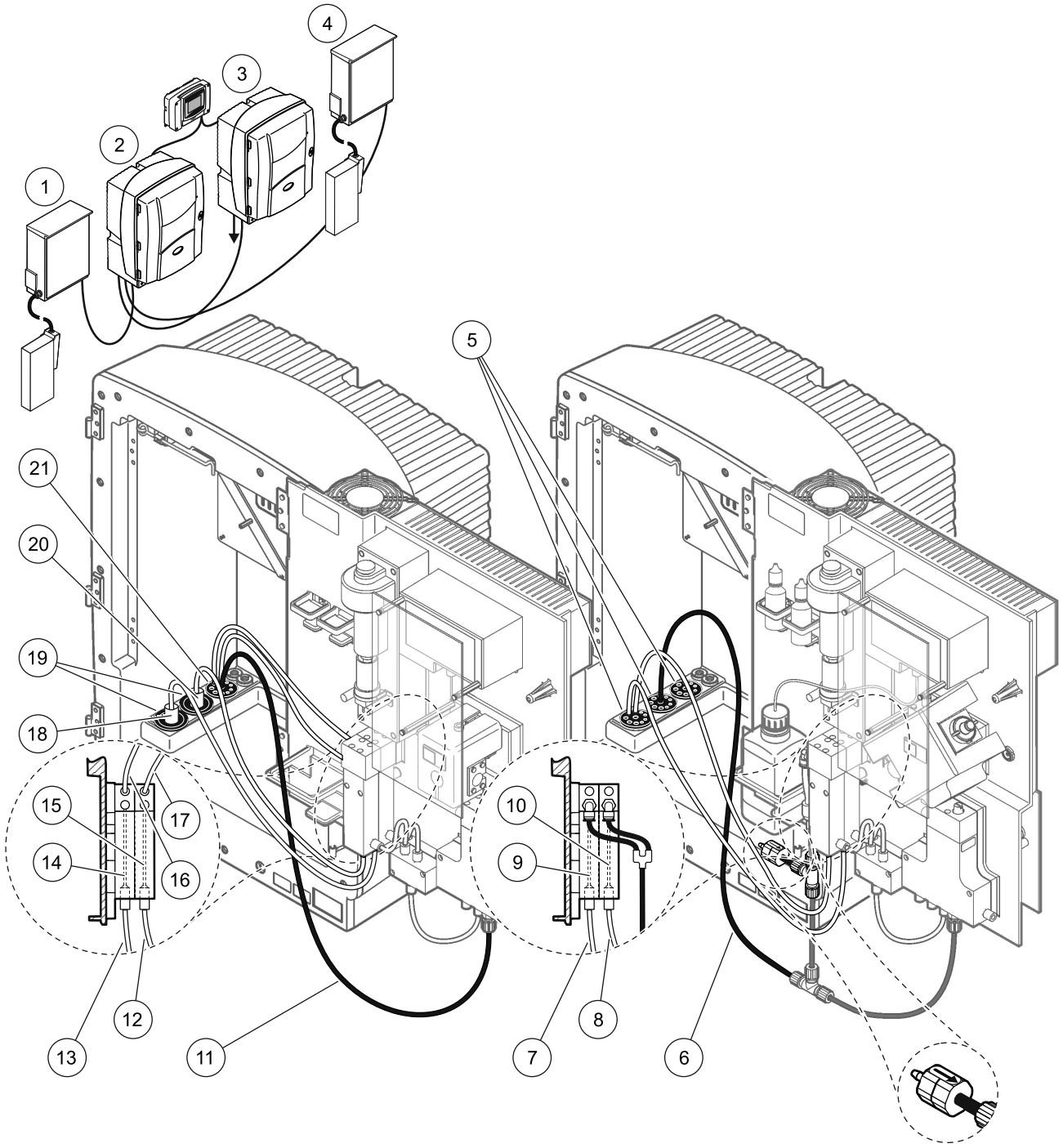



Figure 37 Option 9b setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | FILTRAX 1 | **8** | Overflow vessel 1 tube from analyzer 1 | **15** | Overflow vessel 2 |
| **2** | PHOSPHAX sc analyzer | **9** | Overflow vessel 1 | **16** | Overflow vessel 1 tube |
| **3** | AMTAX sc analyzer | **10** | Overflow vessel 2 | **17** | Overflow vessel 2 tube |
| **4** | FILTRAX 2 | **11** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **18** | FILTRAX 1 heated hose |
| **5** | Seal plug #3 | **12** | FILTRAX 2 sample line | **19** | Seal plug #1 |
| **6** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **13** | FILTRAX 1 sample line | **20** | FILTRAX 2 heated hose |
| **7** | Overflow vessel 1 tube from analyzer 1 | **14** | Overflow vessel 1 | **21** | Seal plug #3 |

## A.16 Option 10a plumbing and connections

Option 10a uses an sc analyzer with any type of sample preparation that delivers a continuous sample stream that cannot be pressurized. The waste of the analyzer is discharged into an open drain.

Refer to Figure 38 and the following instructions for Option 10a:

1. Install the sample preparation unit.
2. Feed the sample line from the sample preparation unit through the analyzer (Figure 38, item 2). Use Seal Plug #3 to secure.
3. Feed the drain tube through the analyzer (item 3). Use Seal Plug #3 to secure.

   ***Note:*** *Tubes can be pushed through prepared holes on Seal Plug #3.*
4. Seal any unused holes with Seal Plug #3.
5. Connect the drain tube to the T-fitting.
6. Connect the sample line from the sample preparation to the bottom inlet on the overflow vessel using the fittings.

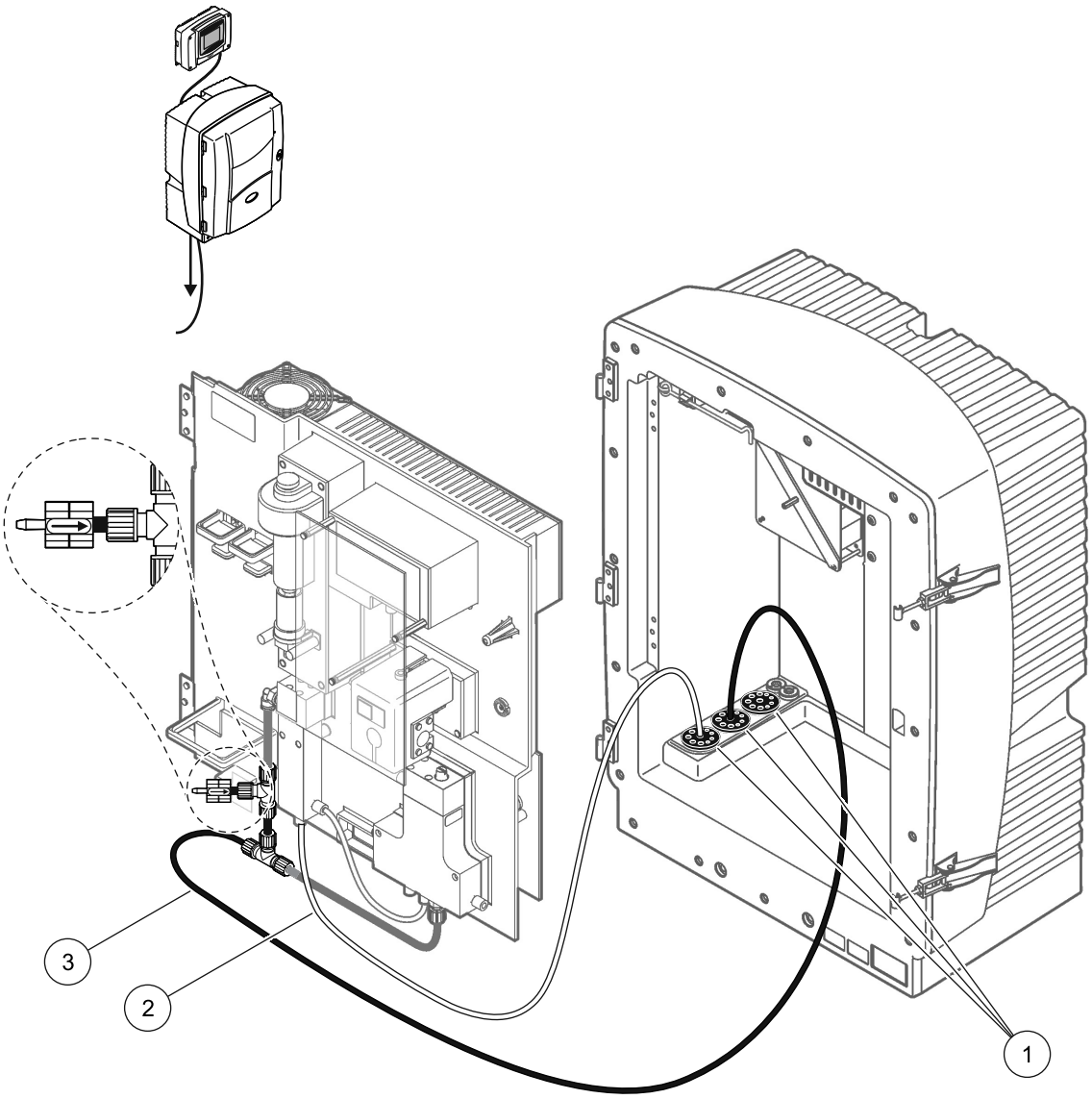



Figure 38 Option 10a setup

| | |
|---|---|
| **1** | Seal plug #3 |
| **2** | Sample line |
| **3** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) |

## A.17 Option 10b plumbing and connections

Option 10b uses two sc analyzers with one sample preparation delivering a continuous sample stream that cannot be pressurized. The samples of the sample preparation is going into Analyzer 1. This analyzer must change to the 2-parameter configuration (see A.2 on page 64). The sample line runs between both analyzers. Each sc analyzer discharges waste into an open drain.

Refer to Figure 39 and the following instructions for Option 10b:

1. Install the sample preparation unit.
2. Install the first Analyzer (Analyzer 1):
   a. Feed the sample line from the sample preparation unit through the analyzer (Figure 39, item 7). Use Seal Plug #3 to secure.
   b. Feed the drain tube through the analyzer (item 6). Use Seal Plug #3 to secure.
   c. Remove the drain tube from the valve block connector.
   d. Connect the sample line from the sample preparation unit to the overflow vessel (bottom inlet) using the fittings.
   e. Change the analyzer to the 2-parameter configuration. Refer to 2-parameter configuration on page 64.
   f. Connect the sample line to the reworked overflow with the overflow vessel. Refer to 2-parameter configuration on page 64.
3. Install the second Analyzer (Analyzer 2):
   a. Feed the sample line from the overflow vessels on Analyzer 1 through Analyzer 2. Use Seal Plug #3 to secure.
   b. Feed the drain tube through Analyzer 2. Use Seal Plug #3 to secure.
   c. Connect the drain tube to the T-fitting.
   d. Connect the sample line from Analyzer 1 to the bottom inlet on the overflow vessel of Analyzer 2 using the fittings.

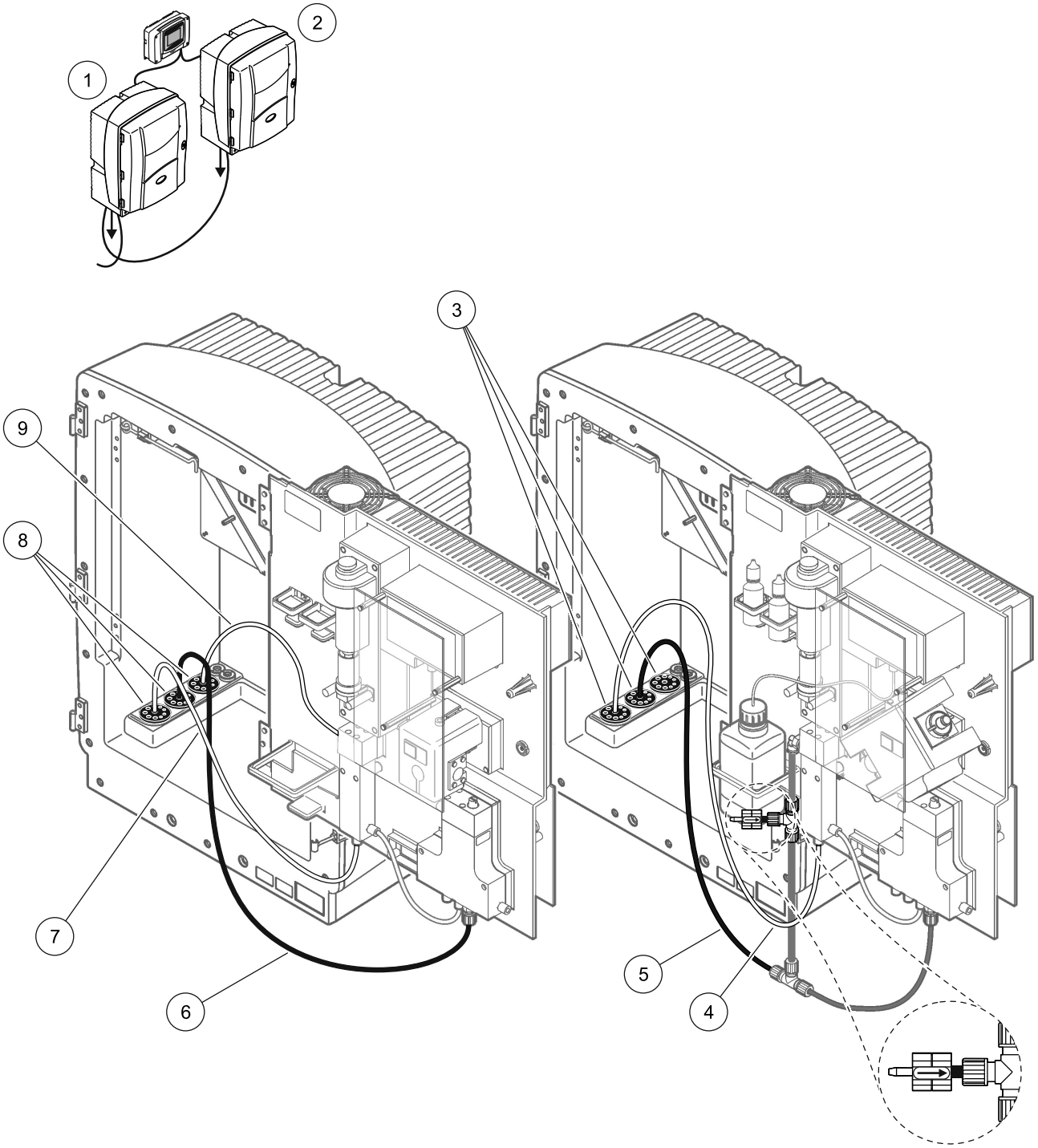



Figure 39 Option 10b setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **4** | Sample line from analyzer 1 | **7** | Sample line |
| **2** | AMTAX sc analyzer | **5** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **8** | Seal plug #3 |
| **3** | Seal plug #3 | **6** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **9** | Overflow vessel tube |

## A.18 Option 11a plumbing and connections

Option 11a uses two units of any type of sample preparation that delivers a continuous sample stream. The waste of the analyzer is discharged to an open drain.

Refer to Figure 40 and the following instructions for Option 11a:

1. Install the sample preparation units.
2. Feed the two sample lines from each sample preparation unit through the analyzer. Use Seal Plug #3 to secure.
3. Feed the drain tube through the analyzer using Seal Plug #3 (Figure 40, item 2).

   ***Note:*** *Tubes can be pushed through prepared holes on Seal Plug #3.*
4. Seal the unused opening with Seal Plug #3.
5. Connect the drain tube to the T-fitting.
6. Connect the sample line from Sample Preparation 1 to the bottom inlet on Overflow Vessel 1 using the fittings (item 4 and item 5).
7. Connect the sample line from Sample Preparation 2 to the bottom inlet on Overflow Vessel 2 using the fittings (item 3 and item 6).

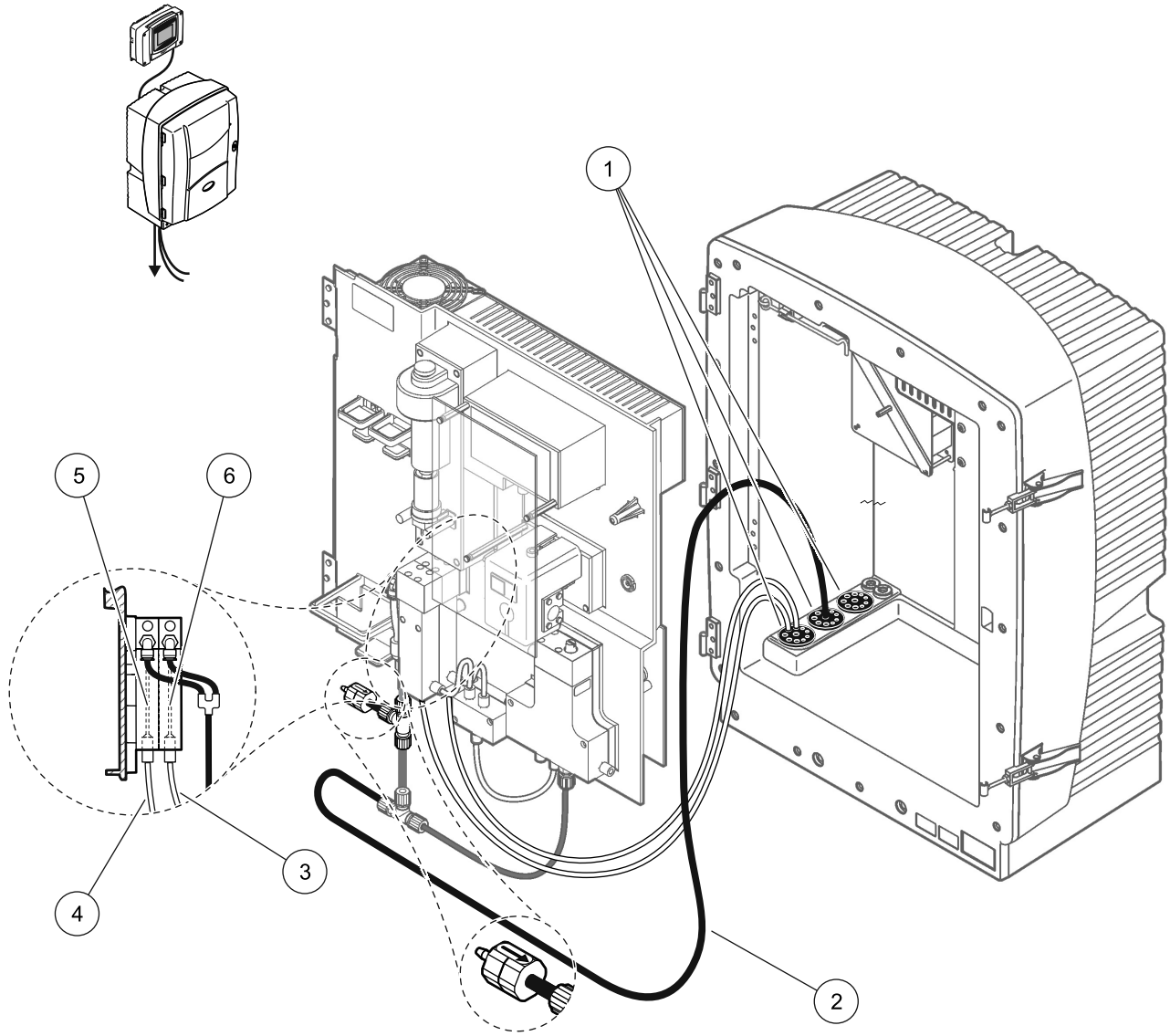



Figure 40 Option 11a setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | Seal plug #3 | **3** | Sample line preparation 2 | **5** | Overflow vessel 1 |
| **2** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **4** | Sample line preparation 1 | **6** | Overflow vessel 2 |

## A.19 Option 11b plumbing and connections

Option 11b uses two sc analyzers with two sample preparation units delivering continuous sample streams that cannot be pressurized. The samples of each sample preparation unit goes to the first analyzer. The analyzer must be changed to the 2-parameter configuration (see 2-parameter configuration on page 64). The sample lines are going from Analyzer 1 to Analyzer 2. Each analyzer discharges waste into an open drain.

Refer to Figure 41 and the following instructions for Option 11b:

1. Install the sample preparation units.
2. Install the first Analyzer (Analyzer 1):
   a. Feed the two sample lines from each sample preparation unit through the analyzer. Use Seal Plug #3 to secure.
   b. Feed the two sample lines out from Analyzer 1. Use Seal Plug #3 to secure.
   c. Feed the drain through Analyzer 1. Use Seal Plug #3 to secure.
   d. Remove the drain tube with the T-fitting from the valve block connector. Connect the drain tube to the valve block connector. Discard the T-fitting.
   e. Connect Sample Line 1 from Sample Preparation Unit 1 to the bottom inlet on Overflow Vessel 1 using the fittings.
   f. Connect Sample Line 2 from Sample Preparation Unit 2 to the bottom inlet on Overflow Vessel 2 using the fittings.
   g. Change the analyzer to the 2-parameter configuration. Refer to 2-parameter configuration on page 64.
   h. Connect Sample Line 1 to the reworked overflow to Overflow Vessel 1. Connect Sample Line 2 to the reworked overflow of Overflow Vessel 2.
3. Install the second Analyzer (Analyzer 2):
   a. Feed the two sample lines from the overflow vessels of Analyzer 1 through Analyzer 2. Use Seal Plug #3 to secure.
   b. Feed the drain tube through Analyzer 2. Use Seal Plug #3 to secure.
   c. Seal the unused openings using Seal Plug #3.
   d. Connect the drain tube to the T-fitting.
   e. Connect Sample Line 1 from Analyzer 1 to the bottom inlet on Overflow Vessel 1 of Analyzer 2 using the fittings.
   f. Connect Sample Line 2 from Analyzer 1 to the bottom inlet on Overflow Vessel 2 of Analyzer 2 using the fittings.

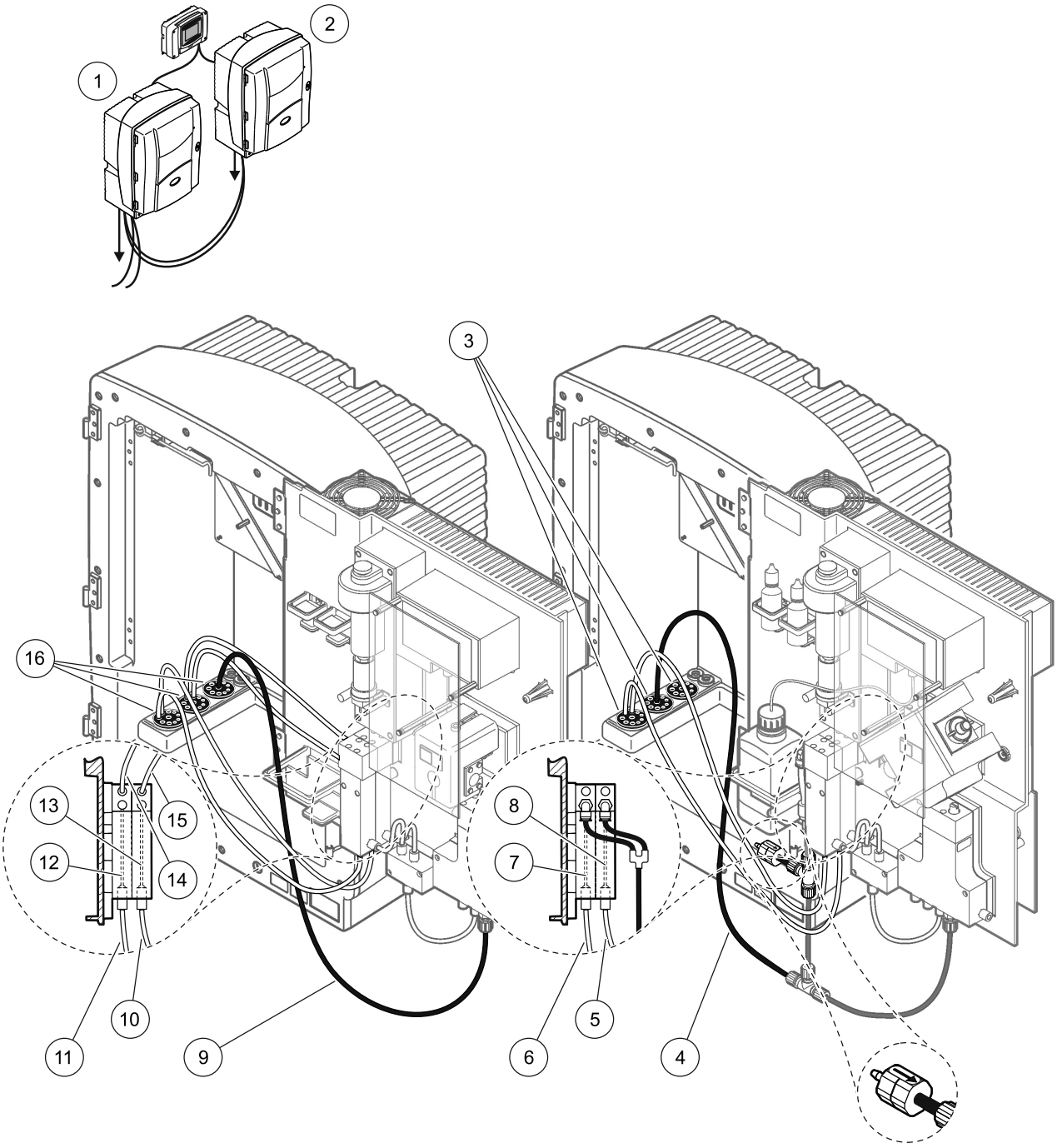



Figure 41 Option 11b setup

| | | | | | |
|---|---|---|---|---|---|
| **1** | PHOSPHAX sc analyzer | **7** | Overflow vessel 1 | **13** | Overflow vessel 2 |
| **2** | AMTAX sc analyzer | **8** | Overflow vessel 2 | **14** | Sample line to analyzer 2, overflow vessel 1 |
| **3** | Seal plug #3 | **9** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **15** | Sample line to analyzer 2, overflow vessel 2 |
| **4** | Drain tube: Feed to a lower drain (maximum. 2 m/6.5 ft) | **10** | Sample line preparation #2 | **16** | Seal plug #3 |
| **5** | Sample line from analyzer 1, overflow vessel 2 | **11** | Sample line preparation #1 | | |
| **6** | Sample line from analyzer 1, overflow vessel 1 | **12** | Overflow vessel 1 | | |

# Appendix B Fieldbus

For general information about field bus control refer to the appropriate controller manuals and to the register list (Table 8 on page 99). A configuration file is needed for the use with an OPC server. Contact the manufacturer for further information.

## B.1 Fieldbus control

To start the field bus control select
MAINTENANCE>TEST/MAINT>FIELDBUS>ENABLED.

***Note:*** *For safety reasons the field bus control is temporarily disabled, when the analyzer is set to the service state in the menu system. To enable again the field bus control , select START in the SERVICE menu.*

When the service state of the instrument is activated through the field bus, the field bus control remains active.

***Important Note:*** *Make sure that no one is working on the analyzer when an action through the field bus will be started!*

The field bus control registers (40071 to 40078) will be set to FFFFh (65635dec) if the field bus is disabled for any reason.

To initiate an action: enter "1" to the register for the required action (40072 to 40078), then enter "1" to the control register 40071. The requested action is accepted when both registers return to "0". When the instrument is waiting between measurements (long measuring intervals) a measurement can be forced by entering "1" to register 40072 and 40071. The measurement will be initiated by 5 minutes.

***Note:*** *Ongoing internal processes like cleaning are interrupted by a forced measurement. The interrupted process will be started again after the forced measurement. A discharged value will be discarded before the measurement. A forced measurement during a calibration process possibly have higher deviations from the true value than during a normal operation.*

***Important Note:*** *Do not change the listed register addresses or other values, otherwise the instrument may malfunction or become inoperable.*

## B.2 Remote controlled measurement series

To take remote controlled measurement series (no automatic measurement with fixed interval) start the following procedure.

1. Select MAINTENANCE>TEST/MAINT>FIELDBUS>ENABLED to enable the START BY BUS feature.
2. Select CONFIGURE>MEASURING>START BY BUS>YES.

   Refer to menu system for other options. It is recommended to set AVERAGE either to "1" or to an even divider of NUMBER OF MEAS or to the same number as NUMBER OF MEAS to avoid measurements which are not averaged.

***Note:*** *For safety reasons the field bus control and START BY BUS are temporarily disabled, when the analyzer is set to service state in the menu system. To enable again START BY BUS select MAINTENANCE>TEST/MAINT>START.*

When the service state of the instrument is activated through the field bus, the field bus control remains active.

***Important Note:*** *Make sure that no one is working on the analyzer when an action through the field bus will be started!*

***Important Note:*** *Do not try to change the listed register addresses, otherwise the instrument may malfunction or become inoperable.*

The FIELDBUS register contains FFFFh (65536dec) when the feature is disabled for any reason.

A measurement series is initiated with entering "1" to register 40128 (Enter "2" for 2 channel instruments to start measurements on channel 2). The register will return to "0" after the measurement series is done. The measurement results can be found at 40001 (channel 1) and 40062 (channel 2).

A value will appear every AVERAGE and at end of series if remind measurement(s) exist. **Example:** NUMBER OF MEAS is set to 5 and AVERAGE to 2. The result are 3 values, the 1st is the average of measurement 1 and 2, the second is the average of value 3 and 4, the last one is the reminding value of the 5th measurement

***Note:*** *Internal processes like cleaning will be interrupted from measurement series.The interrupted process will start again after the end of the measurement series. To use the START BY BUS feature, the sample has to be available at any time for cleaning and rinsing purposes. An ongoing measurement series will not be interrupted by internal processes.*

## B.3 External trigger contact, control by external signal

If the controller board is equipped with an external input terminal (optional board version), measurements can be issued by applying an external DC voltage of 15V to 30V to the terminal for longer than 1 second. When the field bus control is activated, the input will issue a forced measurement as described within Fieldbus control.

When the START BY BUS feature is activated, the external input will issue a measurement series as described within the START BY BUS section.

***Note:*** *Only measurements on channel 1 can be started with the external contact on 2 channel instruments.*

## 9.1 Modbus register information

**Table 8 Sensor modbus registers**

| Tag Name | Register # | Data Type | Length | R/W | Discrete Range | Min/Max Range | Description |
|---|---|---|---|---|---|---|---|
| MEASURE VALUE 1 | 40001 | Float | 2 | R | | | actual measurement value from channel one |
| LOCATION 1 | 40005 | String | 8 | R/W | | | Name of LOCATION 1 (see menu system) |
| MEAS. | 40013 | Float | 2 | R | | 0/99999.9 | measuring value ; photometer data |
| MEAS. ZERO | 40015 | Float | 2 | R | | 0/99999.9 | measuring zero; photometer data |
| OFFSET MEAS. | 40017 | Float | 2 | R | | 0/99999.9 | offset measuring; photometer data |
| REF | 40019 | Float | 2 | R | | 0/99999.9 | reference value; photometer data |
| REF ZERO | 40021 | Float | 2 | R | | 0/99999.9 | reference zero; photometer data |
| OFFSET REF | 40023 | Float | 2 | R | | 0/99999.9 | offset reference; photometer data |
| AMPLIFY MEAS. | 40025 | Integer | 1 | R | | -100/100 | amplification of measurement channel |
| AMPLIFY REF | 40026 | Integer | 1 | R | | -100/100 | amplification of reference channel |
| COOLING | 40027 | Unsigned Integer | 1 | R | | 0/100 | percentage of cooling fan power |
| HEATING | 40028 | Unsigned Integer | 1 | R | 0/1 | | status off heating for sample tube; 0=OFF, 1=ON |
| HUMIDITY PROBE | 40029 | Unsigned Integer | 1 | R | | 0/100 | humitity filtration probe in percent |
| ENCLOSURE TEMP | 40030 | Float | 2 | R | | 0/99.9 | the temperature inside the analyzer |
| ACTUAL VALUE | 40032 | Float | 2 | R | | | actual measurement value from channel one |
| LOCATION 2 | 40034 | String | 8 | R/W | | | location for the measuring channel two where the sample is coming from |
| CONTENT | 40042 | Unsigned Integer | 1 | R | | 0/65535 | the entry is for the device driver file;shows the version |
| REMAINING TIME | 40043 | Unsigned Integer | 1 | R | | 0/65535 | remaining time of the current process |
| CUVETTE TEMP. | 40044 | Float | 2 | R | | 0/99.99 | actual cuvette temperature |
| PO4-P VALUE 1 | 40046 | Float | 2 | R | | | measurement value for channel one as PO4-P |
| PO4-P VALUE 2 | 40048 | Float | 2 | R | | | measurement value for channel two as PO4-P |
| PO4 VALUE 1 | 40050 | Float | 2 | R | | | measurement value for channel one as PO4 |
| PO4 VALUE 2 | 40052 | Float | 2 | R | | | measurement value for channel two as PO4 |
| P2O5 VALUE 1 | 40054 | Float | 2 | R | | | measurement value for channel one as P2O5 |

**Table 8 Sensor modbus registers (continued)**

| Tag Name | Register # | Data Type | Length | R/W | Discrete Range | Min/Max Range | Description |
|---|---|---|---|---|---|---|---|
| P2O5 VALUE 2 | 40056 | Float | 2 | R | | | measurement value for channel two as P2O5 |
| DEXT LAST VALUE | 40058 | Float | 2 | R | | -9.99999/ 9.99999 | last extinction value |
| HEATING ON | 40060 | Unsigned Integer | 1 | R/W | 0/1/2/3/4/ 5/6/7/8/9/ 10/11/12 | | sets the month when the sample line heating is switched ON; 0=alway OFF, 1=January, 2=Febraury to 12=December |
| HEATING OFF | 40061 | Unsigned Integer | 1 | R/W | 1/2/3/4/5/ 6/7/8/9/1 0/11/12 | | sets the month when the sample line heating is switched OFF;1=January, 2=Febraury to 12=December |
| MEASURE VALUE 2 | 40062 | Float | 2 | R | | | actual measurement value from channel two |
| EXT MESS 1 | 40064 | Float | 2 | R | | -9.99999/ 9.99999 | the current measuring extinction from channel one |
| EXT MESS 2 | 40066 | Float | 2 | R | | -9.99999/ 9.99999 | the current measuring extinction from channel two |
| EXT REF | 40068 | Float | 2 | R | | -9.99999/ 9.99999 | the current reference extinction |
| ANALYZER HEATING | 40070 | Unsigned Integer | 1 | R | | 0/100 | the heating of the analyzer |
| BUSACTION ACTIVE | 40071 | Unsigned Integer | 1 | R/W | | 0/1 | write a one to this register to start a bus action (see Field bus control) |
| BUS ANALY.START | 40072 | Unsigned Integer | 1 | R/W | | 0/1 | you can start the analyzer about the bus |
| BUS SERVICE | 40073 | Unsigned Integer | 1 | R/W | | 0/1 | you can start the service mode about the bus |
| BUS CLEANING | 40074 | Unsigned Integer | 1 | R/W | | 0/1 | you can start the cleaning mode about the bus |
| BUS PREPUMP REA. | 40075 | Unsigned Integer | 1 | R/W | | 0/1 | you can prepump reagent about the bus |
| BUS PREPUMP CLEA | 40076 | Unsigned Integer | 1 | R/W | | 0/1 | you can prepump cleaning solution about the bus |
| BUS PREPUMP PRO. | 40077 | Unsigned Integer | 1 | R/W | | 0/1 | you can prepump the probe about the bus |
| BUS PREPUMP ALL | 40078 | Unsigned Integer | 1 | R/W | | 0/1 | you can prepump all about the bus |
| PROBE P. MIN | 40079 | Float | 2 | R | | 0/2.0 | integrated value of pressure at filtration probe, if not yet calculated: nan |
| PROBE PRESSURE | 40081 | Float | 2 | R | | 0/2.0 | actual value of pressure at filtration probe, if not yet calculated: nan |
| GAIN CORR. 1 | 40083 | Float | 2 | R/W | | 0.01/ 100.00 | Gain correction for channel one |
| DISCHARGE CLEAN. | 40096 | Unsigned Integer | 1 | R/W | | 0/10 | discharged values after a cleaning |

**Table 8 Sensor modbus registers (continued)**

| Tag Name | Register # | Data Type | Length | R/W | Discrete Range | Min/Max Range | Description |
|---|---|---|---|---|---|---|---|
| SET OUTMODE CLE. | 40097 | Unsigned Integer | 1 | R/W | 0/1 | | Set output mode for cleaning; 0=HOLD, 1= TRANSFER VALUE |
| SET OUTMODE SER. | 40098 | Unsigned Integer | 1 | R/W | 0/1 | | Set output mode for service mode; 0=HOLD, 1= TRANSFER VALUE |
| SOFTWARE PROBE | 40099 | Float | 2 | R | | 0/3.40282 347E+38 | the softwareversion of the filtration probe |
| STATUS MODULES | 40101 | Float | 2 | R | | 0/100 | the state of the modules as float in percent; nan if not yet calculated |
| MEAS.UNITS 1 | 40103 | Unsigned Integer | 1 | R/W | 0/2 | | Measurement units for channel one 0=mg/l, 2=ppm |
| APPL. | 40104 | Float | 2 | R | | 0/3.40282 347E+38 | the entry is for the application file;shows the version |
| TYPE | 40106 | String | 6 | R | | | name of the item/analyzer |
| STATUS MODULES | 40112 | Unsigned Integer | 1 | R | | 0/100 | the state of the modules as integer in percent |
| CLEANING MODULES | 40113 | Time2 | 2 | R/W | | | Date of last filter module cleaning |
| INTERVAL | 40115 | Unsigned Integer | 1 | R/W | 0/1/2/3/4/ 5/6/7/8/9/ 10/11/12/ 13/14/15/ 16/17/18/ 19/20/21/ 22/23 | | measuring intervall; 0=5 minutes, 1=10minutes, 2=15 minutes to 23=120 minutes, 33=3h, 45=4h, 57=5h, 69=6h, 81=7h, 93=8h, 105=9h, 117=10h, 129=11h, 141=12h, 153=13h, 165=14h, 177=15h, 189=16h, 201=17h, 213=18h, 225=19h, 237=20h, 249=21h, 261=22h, 273=23h, 285=24h |
| START | 40117 | Unsigned Integer | 1 | R/W | 0/1/2/3/4/ 5/6/7/8/9/ 10/11/12/ 13/14/15/ 16/17/18/ 19/20/21/ 22/23 | | it describes when the analyzer starts the cleaning (24 hour format) 0=0 o`clock to23=23o´clock |
| SET INTERVAL | 40118 | Unsigned Integer | 1 | R/W | 0/1/3/6/8/ 12/24 | | cleaning intervall ; 0=OFF, 1=1h, 3=3h, 6=6h, 8=8h, 12=12h, 24=24h |
| NEW MODULES | 40119 | Time2 | 2 | R | | | date of the last filter module exchange |
| SET PARAMETER 1 | 40121 | Unsigned Integer | 1 | R/W | P15/14/1 6 | | Parameter for channel 1; 15=PO4P, 14=PO4, 16=P2O5 |
| GAIN CORR. 2 | 40122 | Float | 2 | R/W | | 0/100.00 | Gain correction for channel two |
| SET PARAMETER 2 | 40125 | Unsigned Integer | 1 | R/W | P15/14/1 6 | | Parameter for channel 2; 15=PO4P, 14=PO4, 16=P2O5 |
| MEAS.UNITS 2 | 40126 | Unsigned Integer | 1 | R/W | U0/2 | | Measurement units for channel two, 0=mg/l, 2=ppm |

**Table 8 Sensor modbus registers (continued)**

| Tag Name | Register # | Data Type | Length | R/W | Discrete Range | Min/Max Range | Description |
|---|---|---|---|---|---|---|---|
| HUMIDITY ANALY | 40127 | Unsigned Integer | 1 | R | | 0/100 | humidity analyzer in percent |
| FIELDBUS | 40128 | Unsigned Integer | 1 | R/W | | 0/2 | triggers a measurement serie in START BY BUS mode (see Start by bus) |
| START BY BUS | 40129 | Unsigned Integer | 1 | R/W | 0/1 | | sets the analyzer to START BY BUS mode ( see Start by bus) |
| EXTINCTION 2 | 40130 | Float | 2 | R | | -9.99999/ 9.99999 | the curent extinction from the measurement channel two |
| PROCESS STATE | 40132 | Unsigned Integer | 1 | R | 0/1/2/3/4/ 5/6/7/8/9/ 10/11/12/ 13/14/15/ 16 | | the process/state of the analyzer, coded as enum list; enum value 0=service mode, enum value 1=measuring 1..., interval, initialisation, serv.in proc., cleaning, warm up phase, measuring 2..., prepump reag., prepump clean., prepump probe, flushing, start by bus, calibrate, test procedure, prepump.sample, enum value 16=validation |
| NUMBER OF MEAS. | 40133 | Unsigned Integer | 1 | R/W | | 1/100 | Number of measurements in a START BY BUS measurement series (see Start by bus) |
| AVERAGE | 40134 | Unsigned Integer | 1 | R/W | | ? | The number of measurement values that result in an average value in a START BY BUS measurement series. |
| NO.OF VALUES CH1 | 40135 | Unsigned Integer | 1 | R/W | | 0/100 | 2 channel mode: how often is channel 1 measured before switching to channel 2 |
| | | | | | | | |
| NO.OF VALUES CH2 | 40136 | Unsigned Integer | 1 | R/W | | 0/100 | 2 channel mode: how often is channel 2 measured before switching to channel 1 |
| | | | | | | | |
| DISCHARGE VAL1 | 40137 | Unsigned Integer | 1 | R/W | | 0/3 | number of discharged values when switching from channel 1 to channel 2 |
| DISCHARGE VAL2 | 40138 | Unsigned Integer | 1 | R/W | | 0/3 | number of discharged values when switching from channel 2 to channel 1 |
| DISCHARGE BUS | 40140 | Unsigned Integer | 1 | R/W | | 2/10 | discharge values at the beginning of a START BY BUS series |
| SENSOR NAME | 40143 | String | 8 | R | | | User-assigned name for a sensor |
| REAG. WARNING | 40151 | Unsigned Integer | 1 | R/W | 0/1 | | warning if the level of reagent is low; 0=OFF, 1=ON |
| WARNING | 40152 | Unsigned Integer | 1 | R/W | 20/15/10/ 5 | | Reagent warning level in percent |
| REAGENT LEVEL | 40155 | Unsigned Integer | 1 | R | | 0/100 | the level of reagent in percent |

**Table 8 Sensor modbus registers (continued)**

| Tag Name | Register # | Data Type | Length | R/W | Discrete Range | Min/Max Range | Description |
|---|---|---|---|---|---|---|---|
| CLEAN SOLU LEVEL | 40158 | Unsigned Integer | 1 | R | | 0/100 | cleaninig solution level in percent |
| AIR FILTER DISPL | 40160 | Integer | 1 | R | | -32768/ 32767 | days until next cleaning/exchange of air filter pads. Negative values show a cleaning which is overdue |
| PUMP DISPLAY | 40163 | Integer | 1 | R | | -32768/ 32767 | days left until exchanging piston of pump, negative values show that exchange is overdue |
| STRUCTURE | 40172 | Unsigned Integer | 1 | R | | 0/65535 | the entry is for the device driver file;shows the version |
| FIRMWARE | 40173 | Unsigned Integer | 1 | R | | 0/65535 | the entry is for the device driver file;shows the version |
| LOADER | 40174 | Float | 2 | R | | 0/3.40282 34663852 9E+38 | the entry is for the application file;shows the version of the boot file |
| OPERATING HOURS | 40176 | Unsigned Integer | 2 | R | | 0/999999 99 | operating hours of analyzer |
| PUMP MEMBR.DISP. | 40180 | Integer | 1 | R | | -32768/ 32767 | remaining days for pump membrane in filter probe |
| COMPRESSOR | 40189 | Integer | 1 | R | | -32768/ 32767 | remaining days for air compressor |
| LAST CHA.FACTOR1 | 40198 | Time2 | 2 | R | | | the date of the last correction factor for channel one |
| LAST CHA.FACTOR2 | 40200 | Time2 | 2 | R | | | the date of the last correction factor for channel two |
| SAMPLE DETECTION | 40211 | Unsigned Integer | 1 | R/W | 0/1/2 | | output if sample detection detects low sample amount; 0=Warning, 1=Error, 2=OFF |
| ACTUAL MEAS.TIME | 40216 | Time2 | 2 | R | | | time of actual measurement value |
| LAST TIME | 40218 | Time2 | 2 | R | | | time of last measurement value |
| 2.ND LAST TIME | 40220 | Time2 | 2 | R | | | 2.ND LAST TIME |
| 3.RD LAST TIME | 40222 | Time2 | 2 | R | | | 3.RD LAST TIME |
| 4.TH LAST TIME | 40224 | Time2 | 2 | R | | | 4.TH LAST TIME |
| 5.TH LAST TIME | 40226 | Time2 | 2 | R | | | 5.TH LAST TIME |
| 6.TH LAST TIME | 40228 | Time2 | 2 | R | | | 6.TH LAST TIME |
| 7.TH LAST TIME | 40230 | Time2 | 2 | R | | | 7.TH LAST TIME |
| 8.TH LAST TIME | 40232 | Time2 | 2 | R | | | 8.TH LAST TIME |
| 9.TH LAST TIME | 40234 | Time2 | 2 | R | | | 9.TH LAST TIME |
| LAST VALUE | 40236 | Float | 2 | R | | | LIST OF VALUES |
| 2.ND LAST VALUE | 40238 | Float | 2 | R | | | LIST OF VALUES |
| 3.RD LAST VALUE | 40240 | Float | 2 | R | | | LIST OF VALUES |
| 4.TH LAST VALUE | 40242 | Float | 2 | R | | | LIST OF VALUES |
| 5.TH LAST VALUE | 40244 | Float | 2 | R | | | LIST OF VALUES |
| 6.TH LAST VALUE | 40246 | Float | 2 | R | | | LIST OF VALUES |
| 7.TH LAST VALUE | 40248 | Float | 2 | R | | | LIST OF VALUES |

**Table 8 Sensor modbus registers (continued)**

| Tag Name | Register # | Data Type | Length | R/W | Discrete Range | Min/Max Range | Description |
|---|---|---|---|---|---|---|---|
| 8.TH LAST VALUE | 40250 | Float | 2 | R | | | LIST OF VALUES |
| 9.TH LAST VALUE | 40252 | Float | 2 | R | | | LIST OF VALUES |
| STATUS MODUL.ERR | 40256 | Unsigned Integer | 1 | R/W | 14/10/8/0 | | configure the level of error for the state of the modules |
| STAT. MODUL.WAR. | 40257 | Unsigned Integer | 1 | R/W | 40/30/15 | | configure the level of warning for the state of the modules |
| EXHAUST CONTROL | 40258 | Unsigned Integer | 1 | R/W | 0/1 | | the analyzer is checking the exhaust whether it is blocked; 0=OFF, 1=ON |
| REF | 40260 | Unsigned Integer | 1 | R/W | 0/1 | | to switch the ref measuring on or off |
| BUBBLE REJECT | 40264 | Unsigned Integer | 1 | R/W | 0/1 | | it's possible to set the function bubble reject |
| SEL ADJ METHOD | 40271 | Unsigned Integer | 1 | R/W | 0/1 | | it's possible to set the measuring interval as dry or wet |
| ENCLOSU.TEMP. MIN | 40273 | Float | 2 | R | | -50/200.0 | the minimum temperature inside the analyzer during the last 24 hours, intervall starts with power on |
| ENCLOSU.TEMP. MAX | 40275 | Float | 2 | R | | -50/200.0 | the maximum temperature inside the analyzer during the last 24 hours, intervall starts with power on |
| ERROR LIST | 40277 | Unsigned Integer | 2 | R | | | " Errors coded bit wise, bit0=TEMP. < 0 °C/ 32°F?, bit1=ANALYZ. TO COLD, COOLING FAILED, HUMIDITY ANALY, HUMIDITY PROBE, PROBE MISSING, NO HEAT UP, CUVSENSOR DEFECT, TEMPSENS DEFECT, CUVHEAT DEFECT, CUV TOO HOT, PHOTO LEVEL LOW, PHOTO LEVEL HIGH, MODULES CONTAM., PHOTO LEVEL2 LOW, PHOTO LEVEL2 HIGH, DRAIN BLOCKED, SAMPLE1, bit18=SAMPLE2" |
| WARNING LIST | 40279 | Unsigned Integer | 2 | R | | | "Warnings, coded bit wise, bit0=WARMUP PHASE, bit1=COOLING DOWN, SERVICE MODE, REAGENT LEVEL, CLEAN SOLU LEVEL, ANALYZER TO COLD, ANALYZER TO WARM, CUV TOO COOL, MODULES CONTAM., PHOT LEVEL LOW, SAMPLE1, PHOT LEVEL2 LOW, bit12=SAMPLE2" |
| EDIT NAME | 40281 | String | 8 | R/W | | | Name of LOCATION (see menu system) |

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