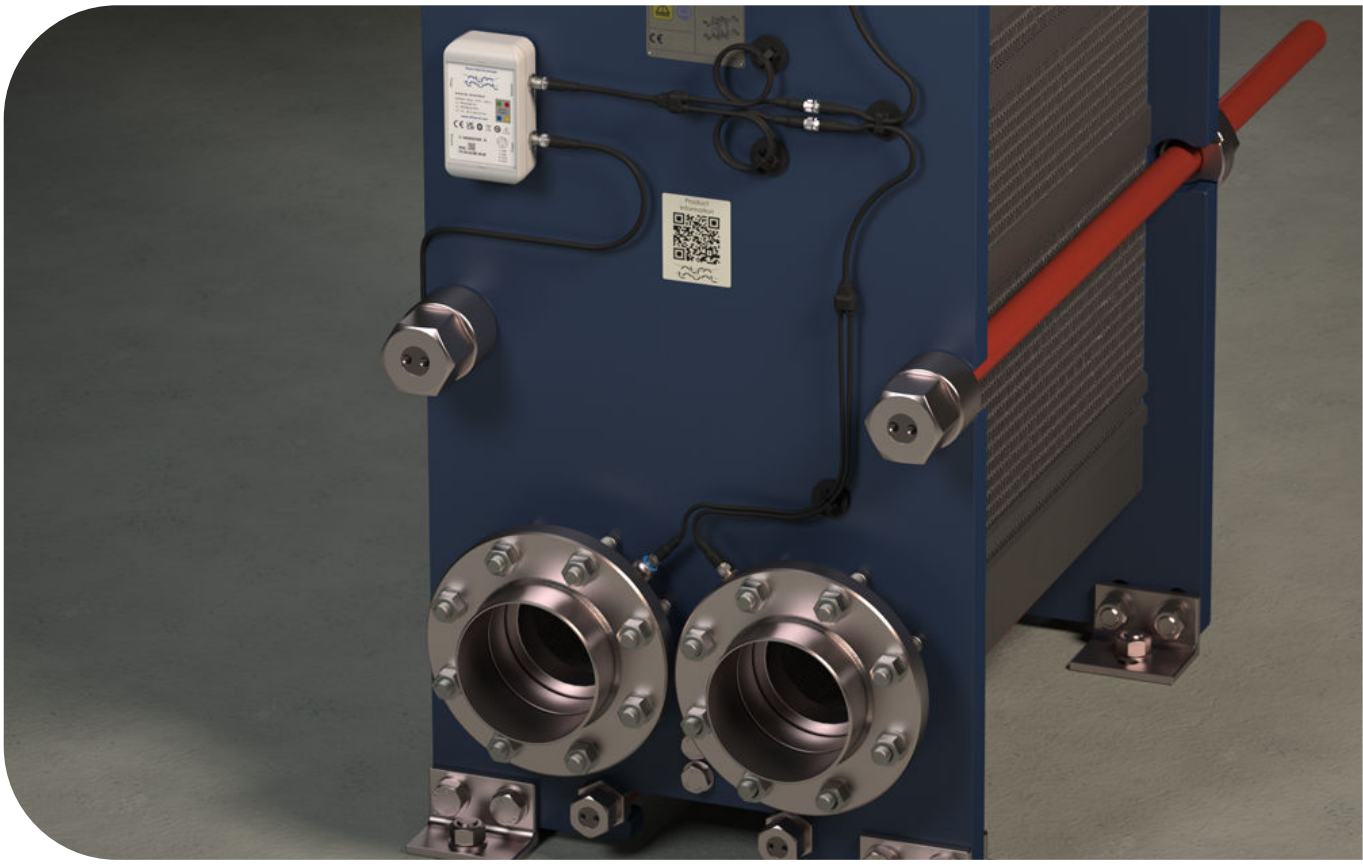
Smart Heat Exchanger

Installation Manual for Connectivity Sensor Kit



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Installation Manual

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English

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Contents

1 Introduction

When prepared as smart units Alfa Laval plate heat exchangers are utilising the benefits from the currently evolving digitalisation technologies, Internet of things (IoT), and state of the art condition monitoring, in order to offer the user optimal energy efficiency and cost optimisation. The smart approach and the connected plate heat exchanger also offer other customer values such as service planning and tools for preventive maintenance, based on data analysis to avoid unplanned production stops.

The smart system set-up is an infrastructure that provides the possibility for new features and tools to be introduced over time, based on continuous learning and development from the collected data.

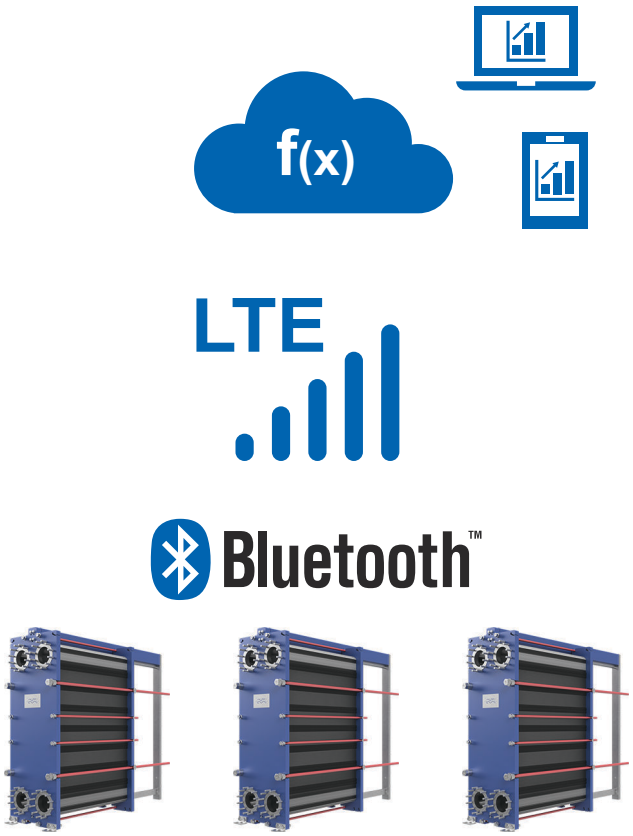

Figure 1: Communication set-up

1.1 Intended use

The intended use of this equipment is to log data from heat exchangers for asset health monitoring purposes, in combination with an online Alfa Laval service.

All other use is prohibited. Alfa Laval will not be held responsible for injury or damage if the equipment is used for any other purpose than the intended use described above.

1.2 Declaration of Conformity

Scan the QR code to find the signed EU Declaration of Conformity.

1.3 Environmental compliance

If operating Alfa Laval´s heat exchangers in an optimal way and following the maintenance recommendations, this will maximize the energy savings and minimize the operational expenses (OPEX).

Waste management

Separate, recycle, or dispose all material and components in a safe, and environmentally responsible way according to national legislation or local regulations. If there is any uncertainty regarding what material a component is made of, contact the local Alfa Laval sales company.

Unpacking

Packing material consists of wood, plastics, cardboard boxes and, in some cases, metal straps.

- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

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2 Safety

2.1 Safety considerations

The plate heat exchanger shall be used and maintained in accordance with Alfa Laval's instructions in this manual. Incorrect handling of the plate heat exchanger may result in serious consequences with injuries to persons and/or property damage. Alfa Laval will not accept responsibility for any damage or injury resulting from not following the instructions in this manual.

The plate heat exchanger should be used in accordance with the specified configuration of material, media types, temperatures and pressure for the specific plate heat exchanger.

2.2 Definitions of expressions

WARNING **Type of hazard**

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

CAUTION **Type of hazard**

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTE

NOTE indicates a potentially hazardous situation which, if not avoided, may result in property damage.

2.3 Personal protective equipment

Protective shoes

Shoes with reinforced toe cap. Minimize foot injuries caused by dropped articles.

Protective helmet

Helmet designed to protect the head from accidental injury.

Protective goggles

Tight-fitting eyeglasses worn to protect the eyes from hazards.

Protective gloves

Gloves that protect the hands from hazards.

2.4 Working at height

WARNING **Risk of falling.**

For any kind of work at height, always ensure that safe means of access is available and used. Follow local regulations and guidelines for work at height. Use scaffolds or a mobile work platform and a safety harness. Create a safety perimeter around the working area and secure tools or other objects from falling.

If the installation requires working at a height of two meters or higher, safety arrangements must be taken in consideration.

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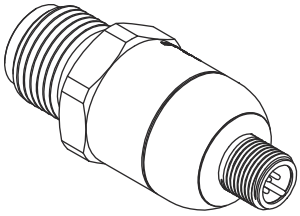
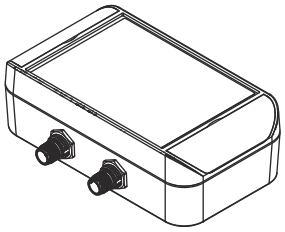
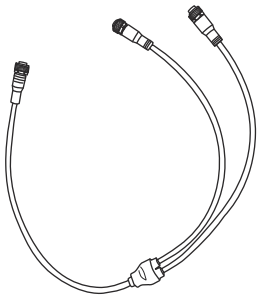
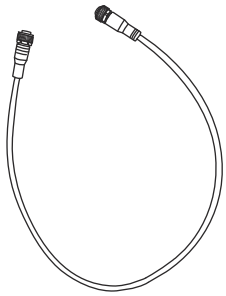
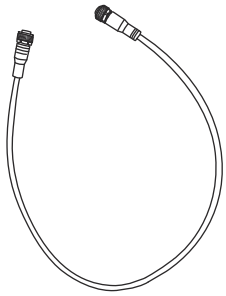
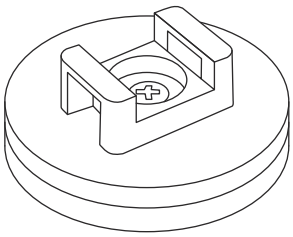
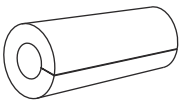
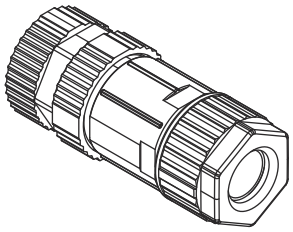
3 Components

The installation consists of the connectivity sensor kit and the gateway. See Chapter *Technical data* for detailed information.

3.1 Connectivity sensor kit

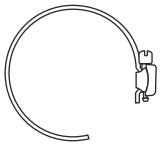
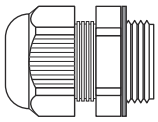
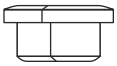
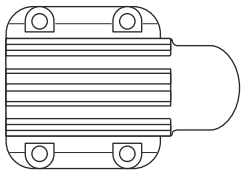
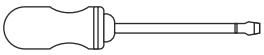
The connectivity sensor kit consists of the components listed in the table below.

Denomination	Design	Amount
Sensor		4
Communication box		1
Y connection cable		3
Extension cable 0.6 m		1
Extension cable 1.0 m		1

Cable holder		5
Cable ties		5
Sensor insulation		4
Power cable connector		1

3.2 Gateway

The gateway consists of the components listed in the table below.

Denomination	Design	Amount
Router		1
Pole mounting strap		2
Extra top screw cover		2
Cable gland		2
USB hole silicone plug		1
Mounting bracket		1
Slotted screwdriver		1
Anchor		4
Screw		4
Quick start guide	N/A	1

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4 Installation process

The installation of a connectivity sensor kit should be performed in the sequence:

1. Shut down the media flow to the plate heat exchanger. See the plate heat exchanger instruction manual.
2. Drain the plate heat exchanger. See the plate heat exchanger instruction manual.
3. Make sure that the instrument flanges are correctly positioned. See Section *Installation*.
4. If there are no instrument flanges, prepare the pipes. See Section *Connectivity sensor kit - Install on pipes*.
5. Install the connectivity sensors. See Section *Connectivity sensor kit*.
6. Install the communication box. See Section *Installation*.
7. Connect the sensors with the communication box. See Section *Installation*.
8. Connect power supply to the communication box. See Section *Installation*.
9. Perform the commissioning. See Section *Commissioning*.

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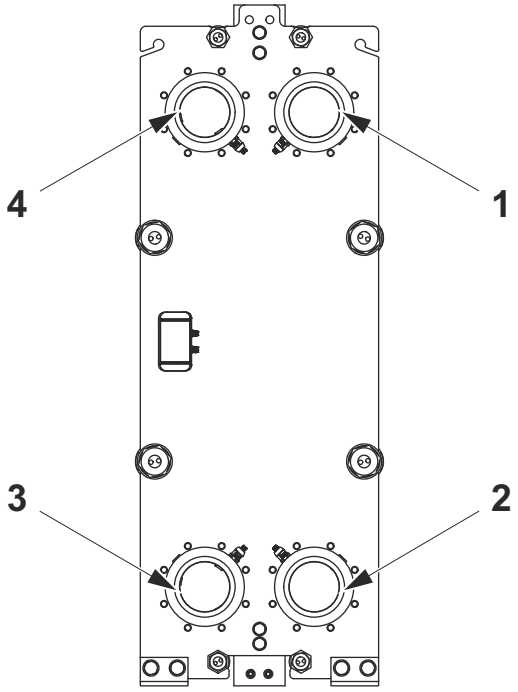
5 Installation

Position

The sensors are marked 1, 2, 3, and 4. They must be installed at the corresponding connection:

- Sensor marked 1 — colour red — at connection (1) — marked S1 on the plate heat exchanger
- Sensor marked 2 — colour yellow — at connection (2) — marked S2 on the plate heat exchanger
- Sensor marked 3 — colour blue — at connection (3) — marked S3 on the plate heat exchanger
- Sensor marked 4 — colour green — at connection (4) — marked S4 on the plate heat exchanger

The illustration shows the preferred position of the connectivity sensors and the connectivity communication box.



Each sensor can be oriented in any direction except straight up or straight down according to the illustrations below. The accepted orientation angles are within the areas marked with a check mark.

NOTE **Risk of bad functionality**

A sensor must be installed with the tip as close to level with the inside of the pipe as possible. If this is not possible the distance should be maximum 50 mm according to the illustrations.

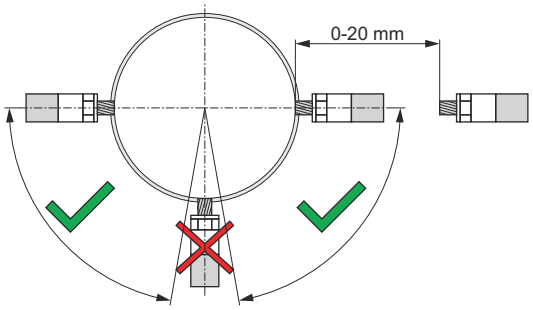


Figure 2: Top ports S1 and S4 — Sensor marked 1 and sensor marked 4

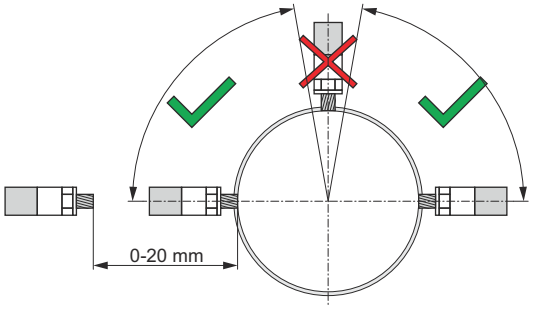
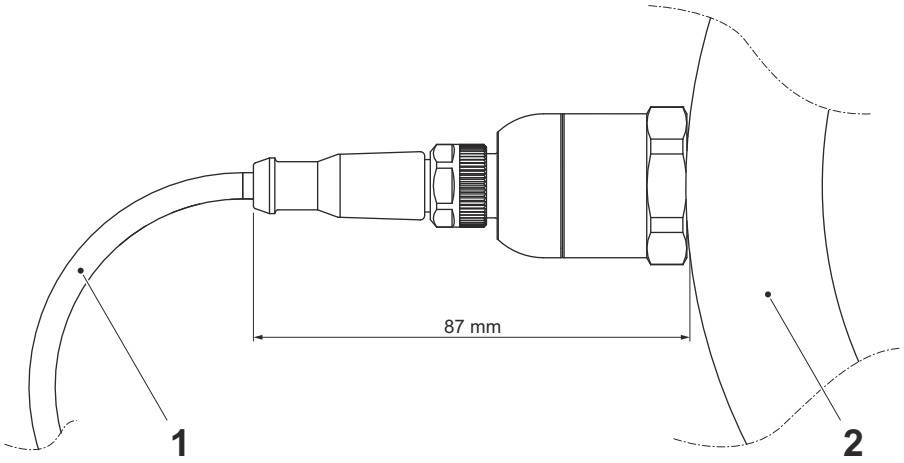


Figure 3: Bottom ports S2 and S3 — Sensor marked 2 and sensor marked 3

Space requirements

The sensor with cable builds approximately 87 mm (3.42”) from the instrument flange or pipe (2) so you must make sure that all four sensors fit in your installation. You must also take in consideration that the cable (1) cannot be bent in a sharp angle so the cable will demand space.



5.1 Connectivity sensor kit

There are two installation options:

- Installation on a plate heat exchanger equipped with instrument flanges prepared with holes for sensors. See Section *Install on instrument flanges*.
- Installation on the pipe, when the plate heat exchanger is not equipped with instrument flanges prepared with holes for sensors. See Section *Install on pipes*.

Follow the instruction suitable for your plate heat exchanger.

5.1.1 Connectivity sensor kit — Install on instrument flanges

The communication box and the cable holders are magnetic and can easily be positioned and moved in any desired way.

NOTE

The socket wrench size of the sensor is 27 mm. Use an extender if necessary.

NOTE **Risk of equipment not functioning**

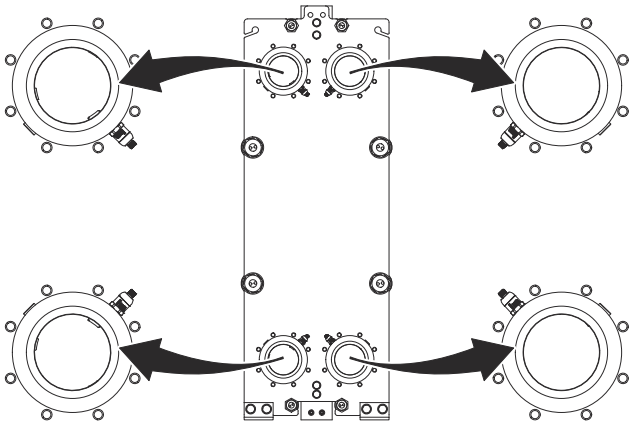
The communication box can be run on the batteries for a period of time but it is highly recommended to install a fixed power supply cable to ensure continuous functionality of the system.

A power supply cable is not included in the kit.

NOTE **Risk of damage to equipment**

Use grease compatible with nitrile butadiene rubber (NBR) and fluorocarbon rubber (FKM).

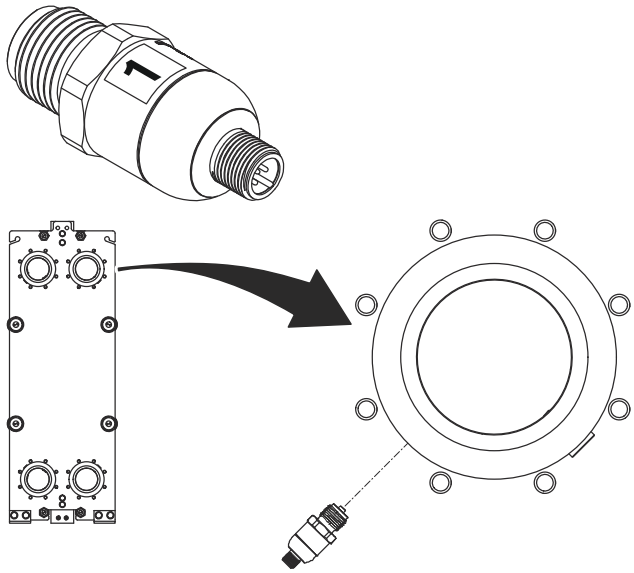
1. Check that the instrument flanges are oriented in a way that makes it possible to position the sensors in the correct way. See the illustration. If necessary adjust any instrument flange.



2. Remove the blind plugs where the sensors will be installed.

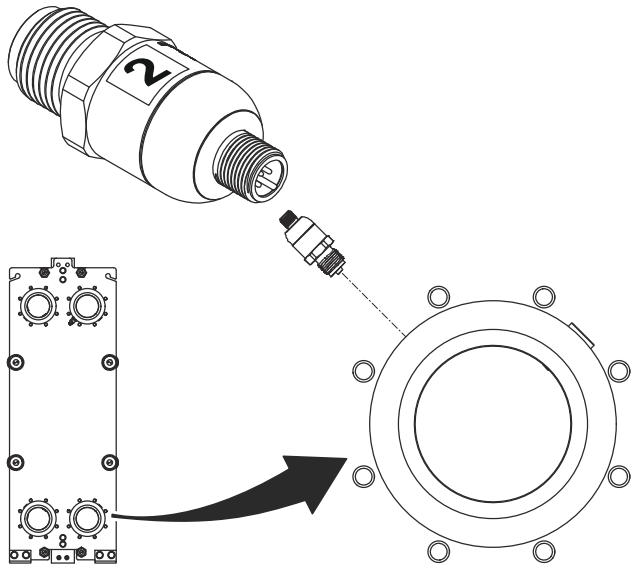
3. Put grease on the threads of the sensor marked 1.

4 Fit and tighten the sensor marked 1 on the instrument flange on the S1 port. Tighten to torque 70 Nm (51 lb-ft).



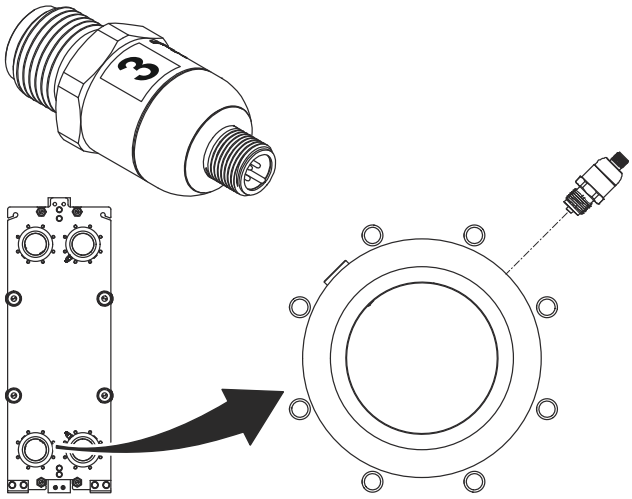
5 Put grease on the threads of the sensor marked 2.

6 Fit and tighten the sensor marked 2 on the instrument flange on the S2 port. Tighten to torque 70 Nm (51 lb-ft).



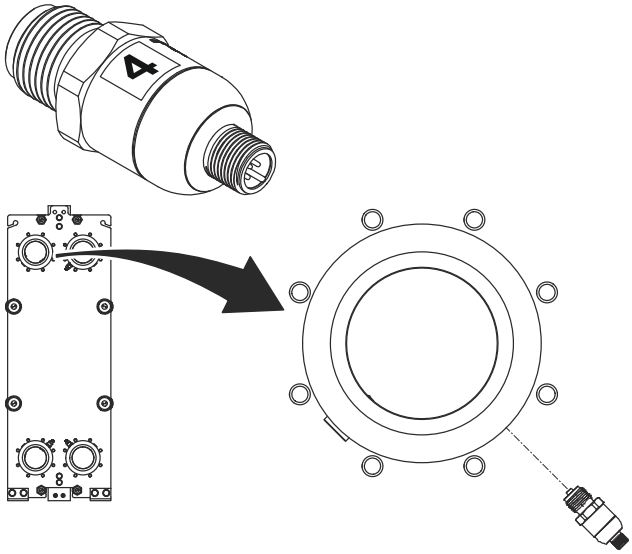
7 Put grease on the threads of the sensor marked 3.

8 Fit and tighten the sensor marked 3 on the instrument flange on the S3 port. Tighten to torque 70 Nm (51 lb-ft).

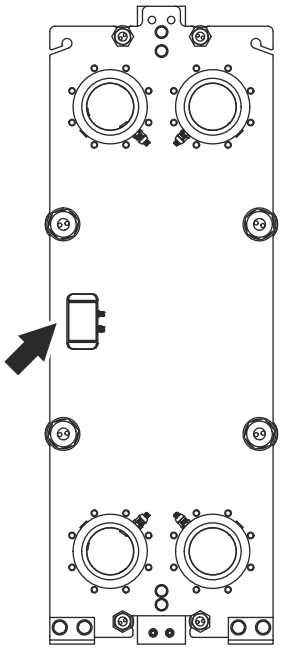


9 Put grease on the threads of the sensor marked 4.

10 Fit and tighten the sensor marked 4 on the instrument flange on the S4 port. Tighten to torque 70 Nm (51 lb-ft).



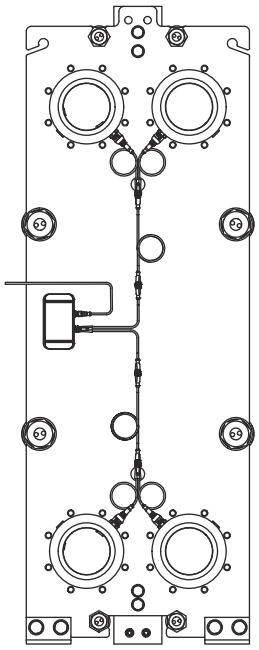
11 Place the communication box where suitable. Preferably somewhere centrally on the frame plate, between the sensors.



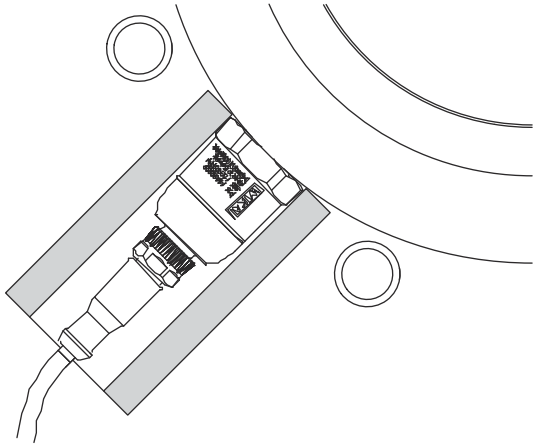
12 Connect the signal cables from the top sensors to the communication box. The extension cables and the Y connection cables can be configured in the most suitable combinations for a nice installation.

13 Connect the signal cables from the bottom sensors to the communication box.

14 Use the magnetic cable holders and the cable ties to arrange the Y connection cables properly.



15 Fit a piece of sensor insulation over each sensor and connection pipe. If necessary cut off the sensor insulation.



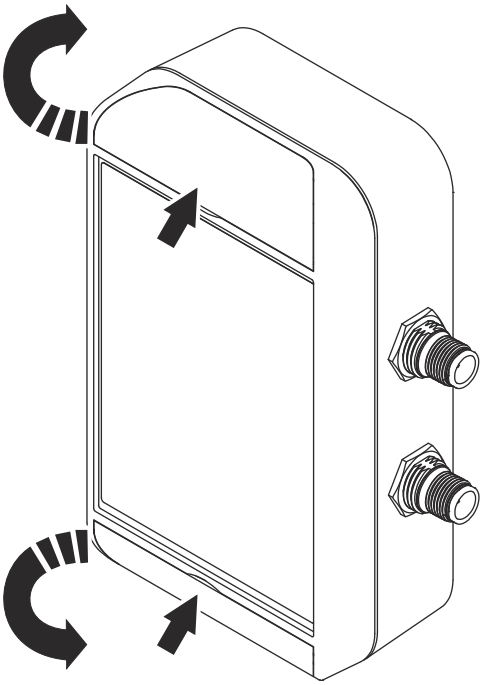
16

NOTE

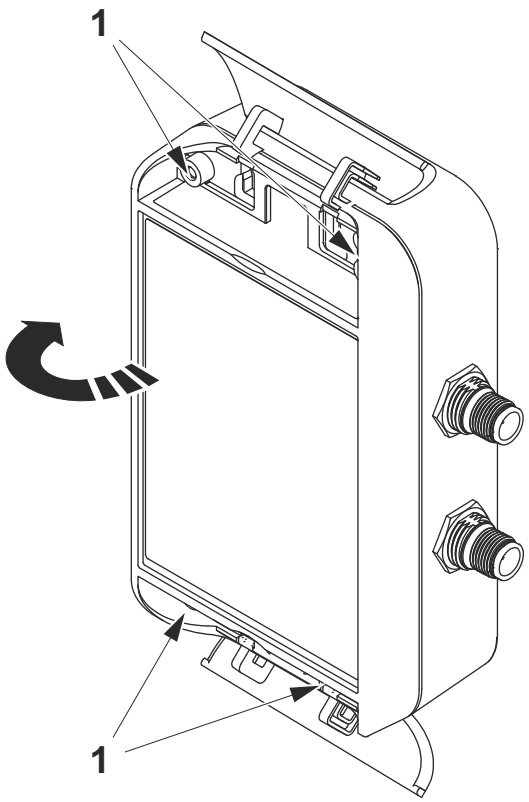
It is recommended to install batteries even if they are not included in the kit.

For battery type see Section *Technical data*.

Fold up the top and bottom flaps on communication box.



17 Loosen the four screws (1) and swing out the communication box lid.



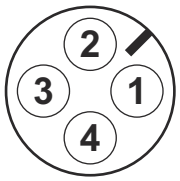
18 Put the batteries in place. A blue led should flash one time.

19 Close the communication box lid.

20 Tighten the four screws.

21 Fold the top and bottom flaps back.

22 Connect a power supply cable. See also Chapter *Technical data* or the communication box sign for correct power configuration.



Position	Cable
1	UB+
2	UB+
3	Gnd
4	Gnd

23 Use a magnetic cable holder and the cable tie to arrange the power supply cable properly.

5.1.2 Connectivity sensor kit — Install on pipes

When the connectivity sensors are installed on the pipes connected to the plate heat exchanger, a preparation of the pipes must be made.

If the connectivity sensors should be installed on a plate heat exchanger in operation, the flow through the plate heat exchanger must be stopped. It is also recommended to drain the plate heat exchanger.

1

> **NOTE**
>
> If the pipes are connected to the plate heat exchanger start with step 1, otherwise go to step 2.

> **NOTE**
>
> **Risk of equipment not functioning**
>
> The communication box can be run on the batteries for a period of time but it is highly recommended to install a fixed power supply cable to ensure continuous functionality of the system.
>
> A power supply cable is not included in the kit.

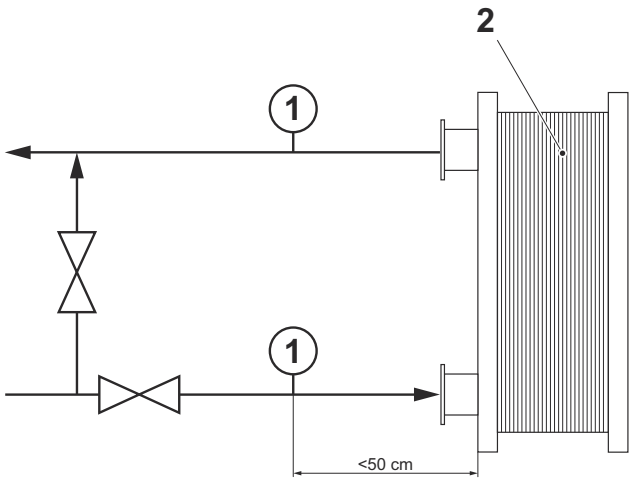
> **NOTE**
>
> **Risk of damage to equipment**
>
> Use grease compatible with nitrile butadiene rubber (NBR) and fluorocarbon rubber (FKM).

Remove the pipes from the plate heat exchanger.

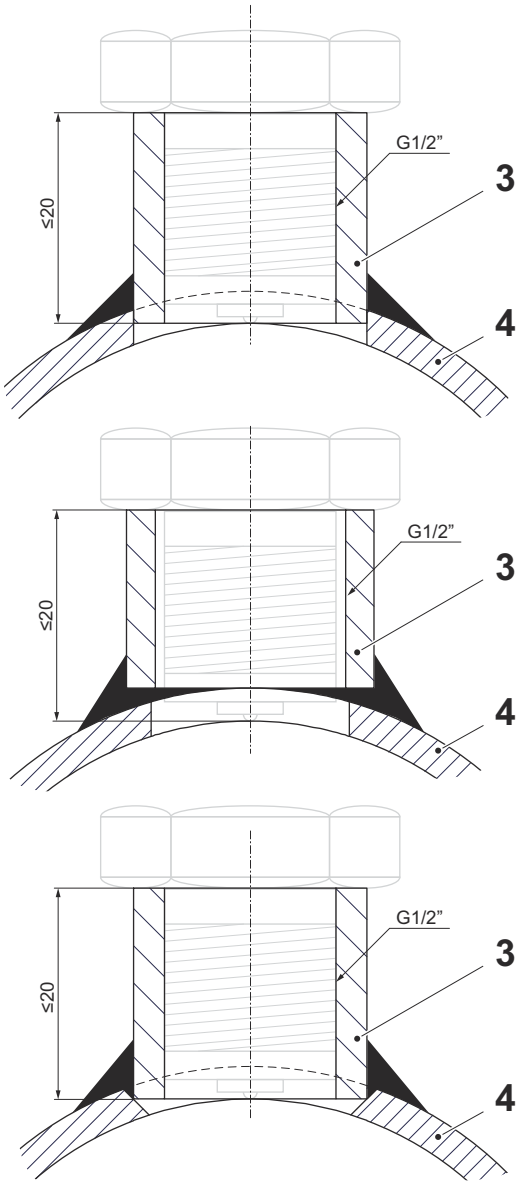
2

There are three ways to assemble a socket to a pipe. Weld a socket to each pipe and make sure that the distance from the pipe to the end of the socket is as short as possible and no longer than 20 mm. The sockets must be placed in a way on the pipes so that the sensors cannot collide. They must overlap each other.

3 The sensors (1) must be positioned less than 50 cm from the plate heat exchanger (2).



4 Drill and thread a G1/2” straight internal thread hole through the socket (3) and the pipe (4).



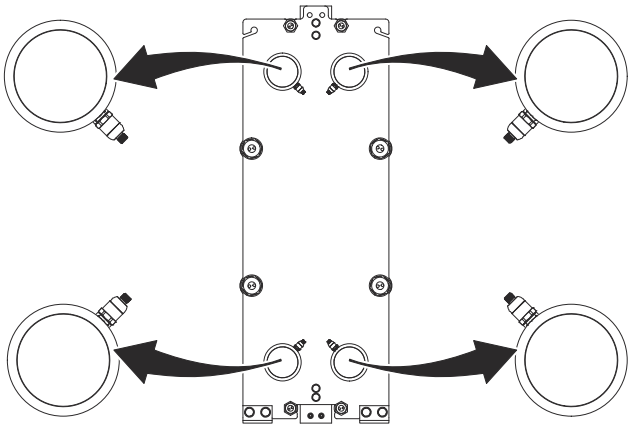
5

> **NOTE**
>
> **Risk of damage to equipment**
>
> Metal splints can cause damage to the plate heat exchanger.
>
> Clean the inside of the pipe thoroughly from metal splints.

Make sure that there are no metal splints on the inside of the pipe. Clean thoroughly.

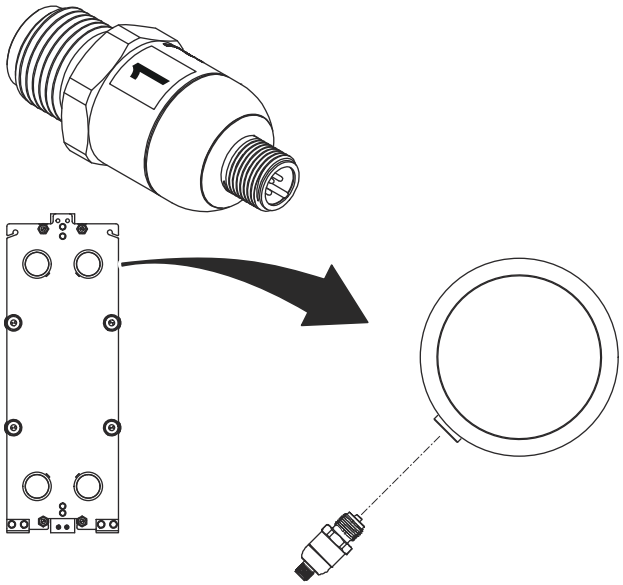
6 Fit the pipes to the plate heat exchanger.

7 Make sure to orient the sockets so that the connectivity sensors can be positioned correctly according to the illustration.



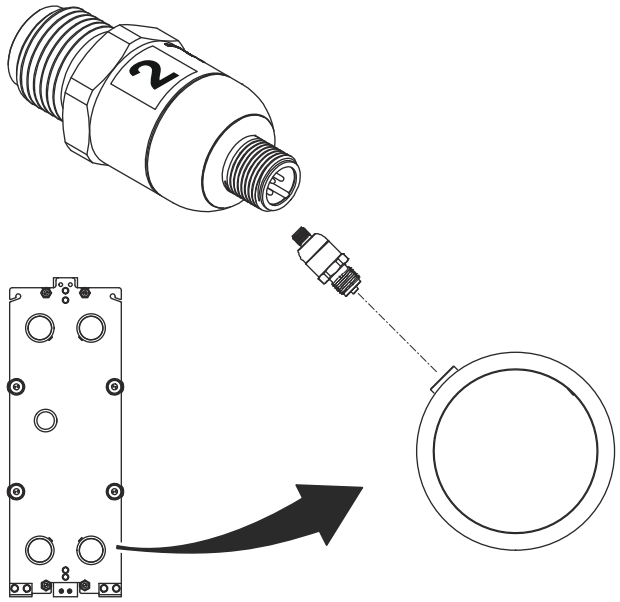
8 Put grease on the threads of the sensor marked 1.

9 Fit and tighten the sensor marked 1 on the socket of the pipe connected to the S1 port. Tighten to torque 70 Nm (51 lb-ft).



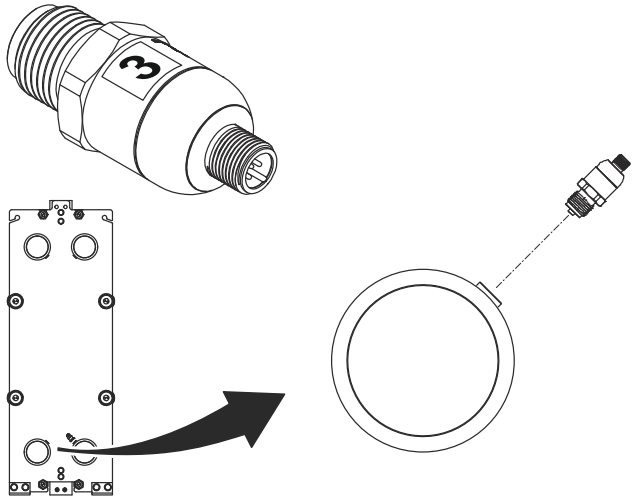
10 Put grease on the threads of the sensor marked 2.

11 Fit and tighten the sensor marked 2 on the socket of the pipe connected to the S2 port. Tighten to torque 70 Nm (51 lb-ft).



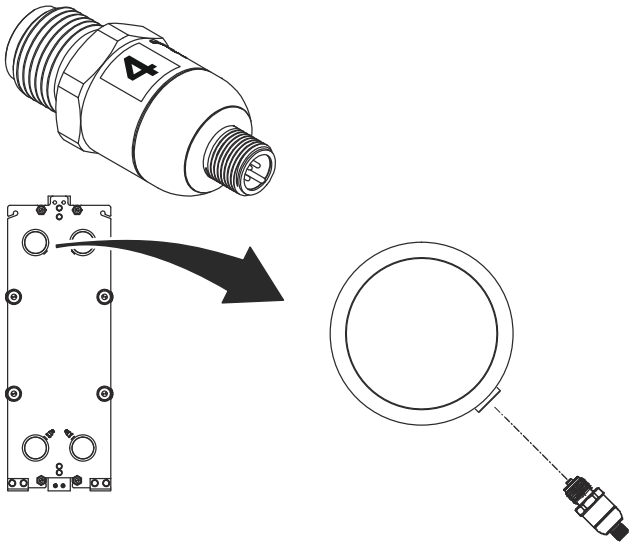
12 Put grease on the threads of the sensor marked 3.

13 Fit and tighten the sensor marked 3 on the socket of the pipe connected to the S3 port. Tighten to torque 70 Nm (51 lb-ft).

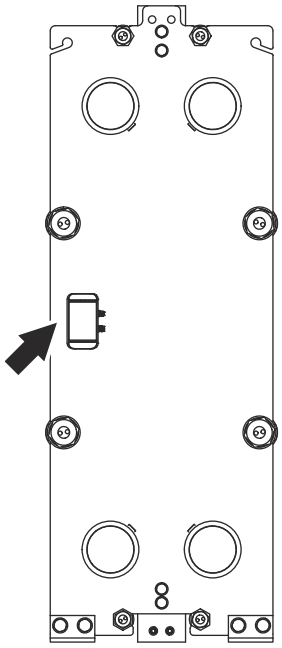


14 Put grease on the threads of the sensor marked 4.

15 Fit and tighten the sensor marked 4 on the socket of the pipe connected to the S4 port. Tighten to torque 70 Nm (51 lb-ft).



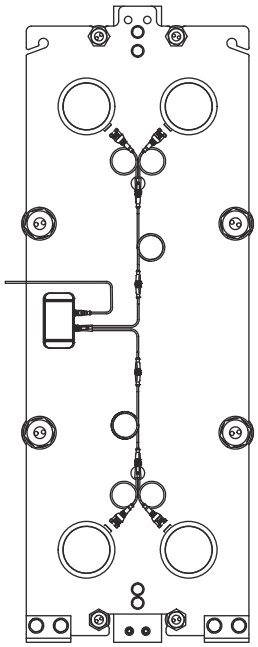
16 Place the communication box where suitable. Preferably somewhere centrally on the frame plate, between the sensors.



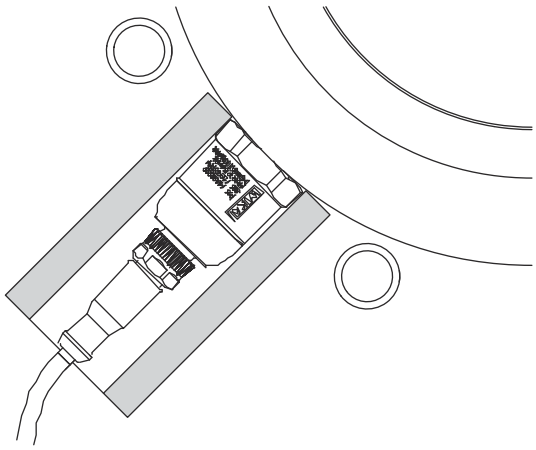
17 Connect the signal cables from the top sensors to the communication box. The extension cables and the Y connection cables can be configured in the most suitable combinations for a nice installation.

18 Connect the signal cables from the bottom sensors to the communication box.

19 Use the magnetic cable holders and the cable ties to arrange the Y connection cables properly.



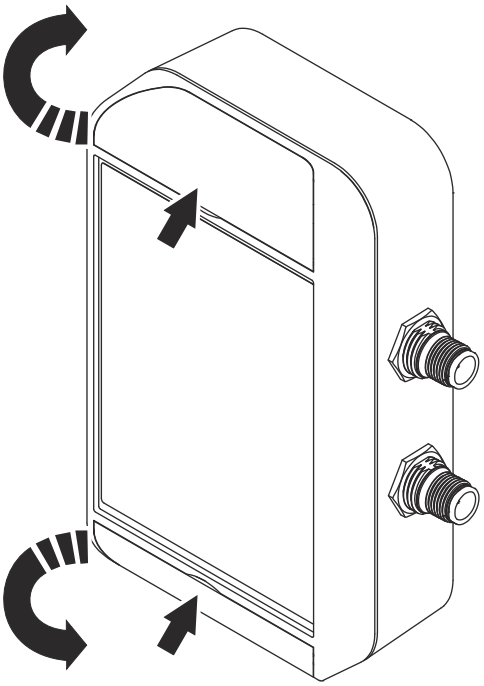
20 Fit a piece of sensor insulation over each sensor and connection pipe. If necessary cut off the sensor insulation.



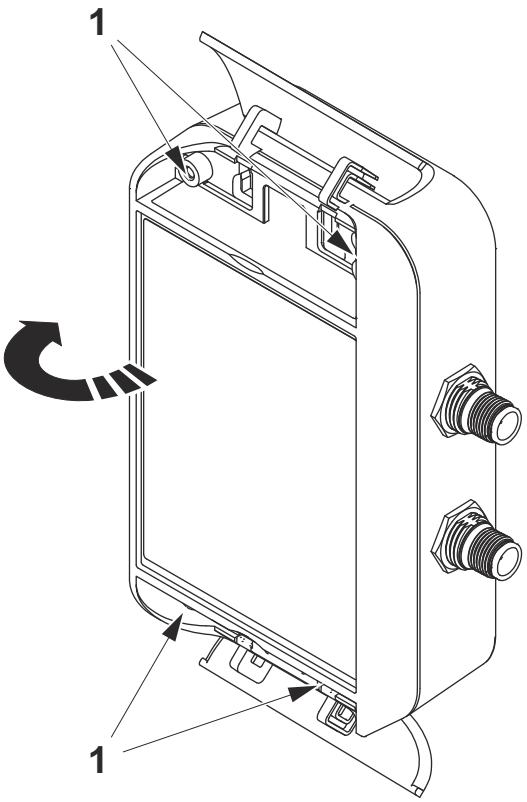
21

> **NOTE**
>
> **It is recommended to install batteries even if they are not included in the kit.**
>
> For battery type see Section *Technical data*.

Fold up the top and bottom flaps on communication box.



22 Loosen the four screws (1) and swing out the communication box lid.



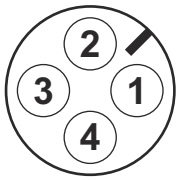
23 Put the batteries in place.

24 Close the communication box lid.

25 Tighten the four screws.

26 Fold the top and bottom flaps back.

27 Connect a power supply cable. See also Chapter *Technical data* or the communication box sign for correct power configuration.



Position	Cable
1	UB+
2	UB+
3	Gnd
4	Gnd

28 Use a magnetic cable holder and the cable tie to arrange the power supply cable properly.

5.2 Gateway

- The gateway can be installed on a flat surface or a pole. Follow the suitable instruction.
- A connectivity sensor kit installation requires one installed gateway.
- One gateway can handle several connectivity sensor kits.
- The gateway should be placed within 40–50 meters (44–55 yards) from all installed connectivity sensor kits.
  The distance can be greater if some demands on the positioning are fulfilled. Please consult Alfa Laval.
- The gateway should be installed in an area where there is possibility for good connection with surrounding mobile networks.
- The most favourable position for the gateway is on an elevated point, above the height of the heat exchangers if possible. The reading range is best at an angle under the gateway.

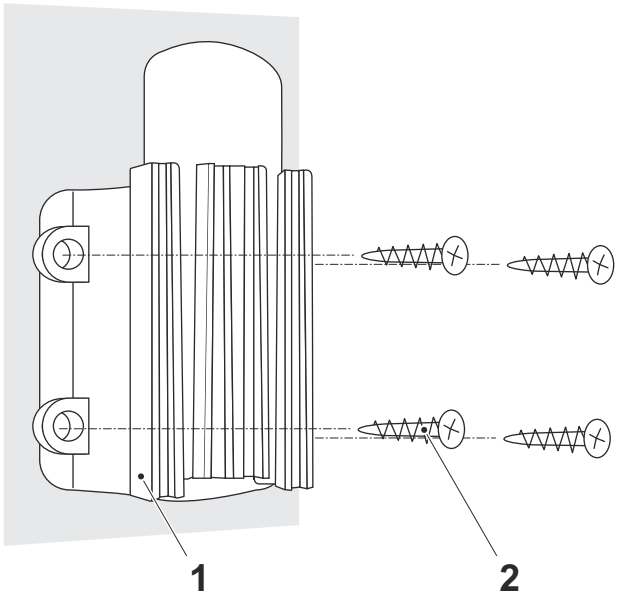
5.2.1 Gateway — Install on a flat surface

NOTE **Risk of personal injury**

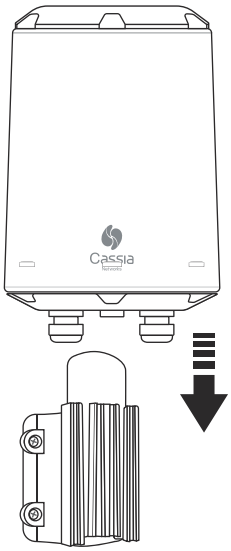
The mounting bracket has sharp edges that can cause personal injury.

Use protective gloves when handling the mounting bracket.

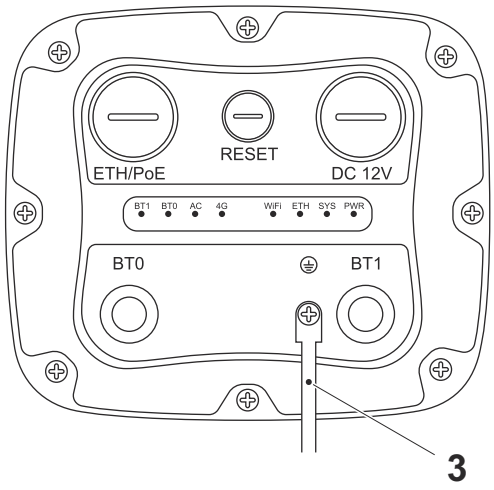
1. Assemble the mounting bracket (1) using the screws (2). If necessary use the delivered anchors or other anchors suitable for the wall material.



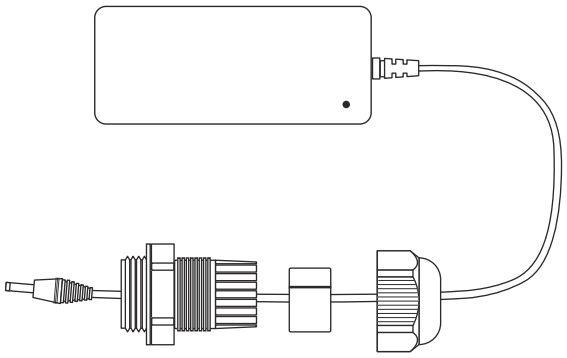
2. Assemble the router on the mounting bracket.



3 Connect a ground cable (3) to the router.



4 Assemble the cable gland on the 12 VDC power cable.



5 Connect the 12 VDC power cable to the router and tighten the cable gland.

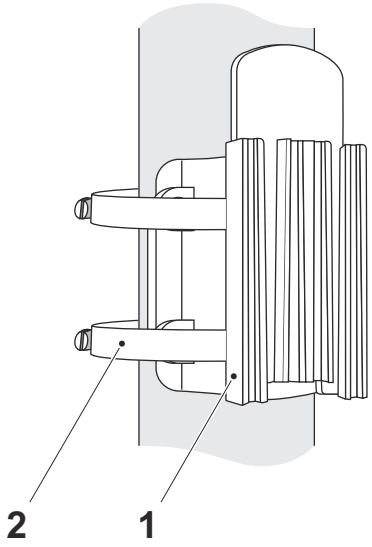
5.2.2 Gateway — Install on a pole

NOTE **Risk of personal injury**

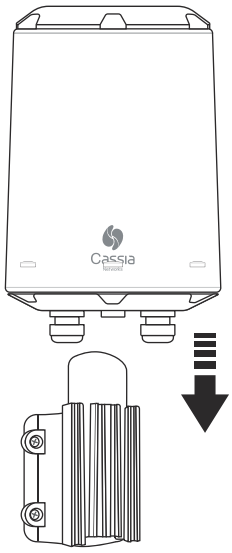
The mounting bracket has sharp edges that can cause personal injury.

Use protective gloves when handling the mounting bracket.

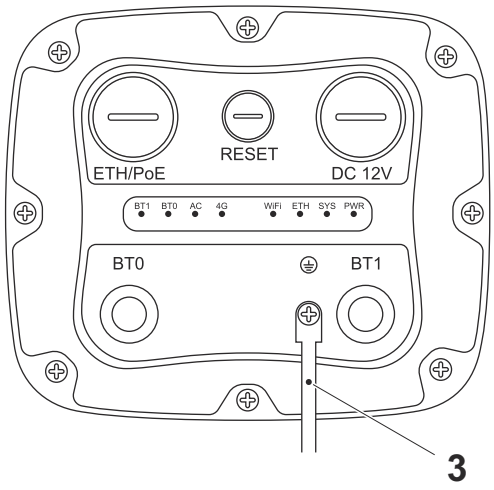
1. Assemble the mounting bracket (1) using the pole mounting straps (2).



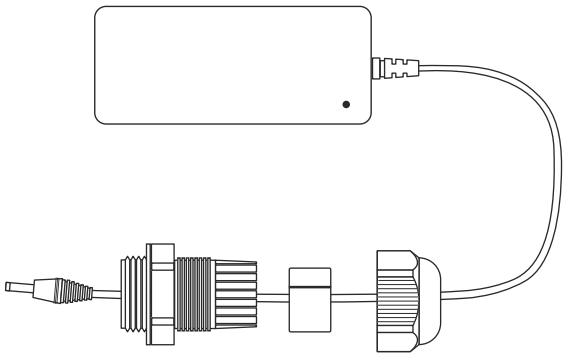
2. Assemble the router on the mounting bracket.



3 Connect a ground cable (3) to the router.



4 Assemble the cable gland on the 12 VDC power cable.



5 Connect the 12 VDC power cable to the router and tighten the cable gland.

6 Commissioning

When the installation is complete each connectivity sensor kit should be paired with the plate heat exchanger where it is installed. It is important to keep the connectivity sensor kit installed on the same plate heat exchanger.

1. Note the MAC address on the communication box (or take a photo).
2. Note the plate heat exchanger serial number (or take a photo).
3. Note the gateway MAC address (or take a photo) to be paired with the sensor kit and heat exchanger serial number.
4. Report both the communication box MAC address and the heat exchanger serial number, and the gateway MAC address to your Alfa Laval representative.
5. Now the connectivity sensor kit is paired with the plate heat exchanger and they should remain as a pair.

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7 Maintenance

This section describes all maintenance necessary for the components included in the kit.

7.1 Cleaning

All plastic parts should be wiped off using a lint-free cloth.

Normally there is no need to remove the sensors and clean them. If the reading stays flat during operation it is recommended to check the sensors the next time the plate heat exchanger is manually cleaned.

The sensors can be exposed to the same cleaning procedures as for the plate heat exchanger. Follow the instructions in the plate heat exchanger maintenance manual.

WARNING **Risk of damage to equipment.**

Be careful not to damage the threads of the sensors or the pipe when the sensors are removed.

Remove the sensors and do a visual inspection, if the sensors measurement inlet is partially or completely clogged, immerse first the sensors inlet in water, then remove the dirt gently with a needle. Carefully put the sensors back.

7.2 Batteries

NOTE **Batteries are not included in the kit**

This section is only valid if you have installed batteries in the communication box.

7.2.1 Batteries — Change

This instruction is only valid if you have installed batteries in the communication box. It is recommended to install batteries as a power backup if there is a power outage.

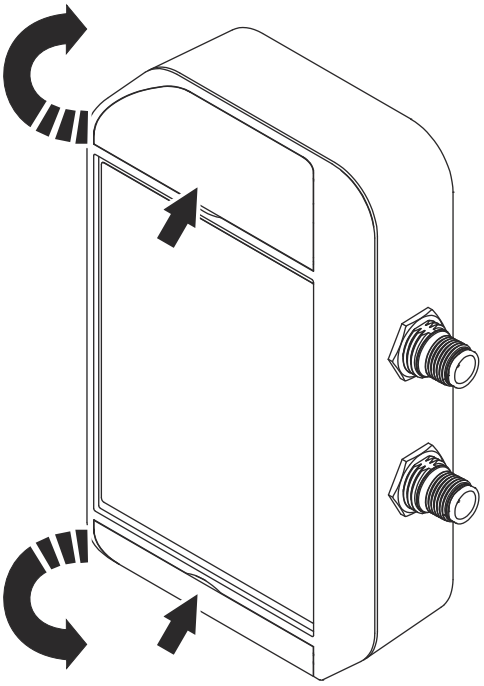
1

NOTE

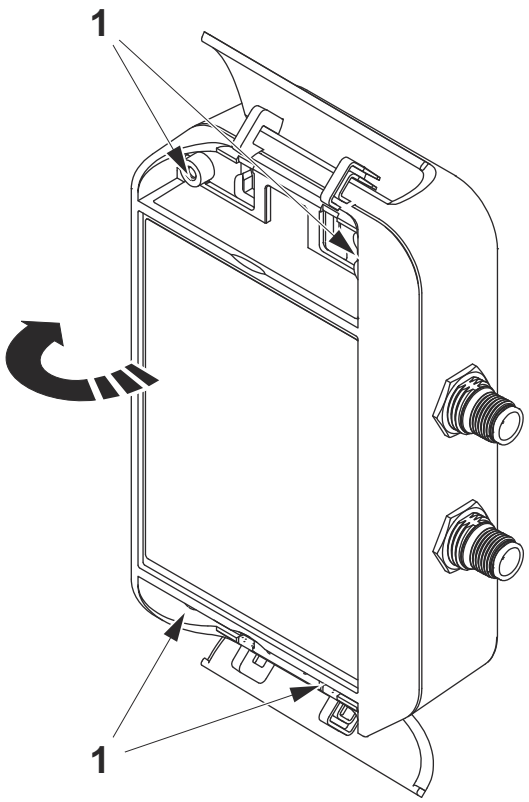
It is recommended to install batteries even if they are not included in the kit.

For battery type see Section *Technical data*.

Fold up the top and bottom flaps on communication box.



2 Loosen the four screws (1) and swing out the communication box lid.



3 Remove the old batteries.

4 Put the new batteries in place. A blue led should flash one time.

5 If the LED is not lit when installing the batteries, remove them and wait for one minute before re-installing.

6 Close the communication box lid.

7 Tighten the four screws.

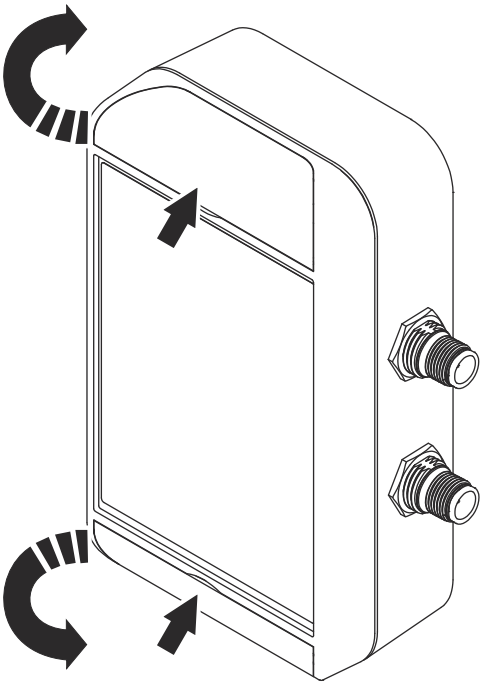
8 Fold the top and bottom flaps back.

9 Wait for 5 minutes and then log in to the monitoring system and acknowledge the low battery alarm.

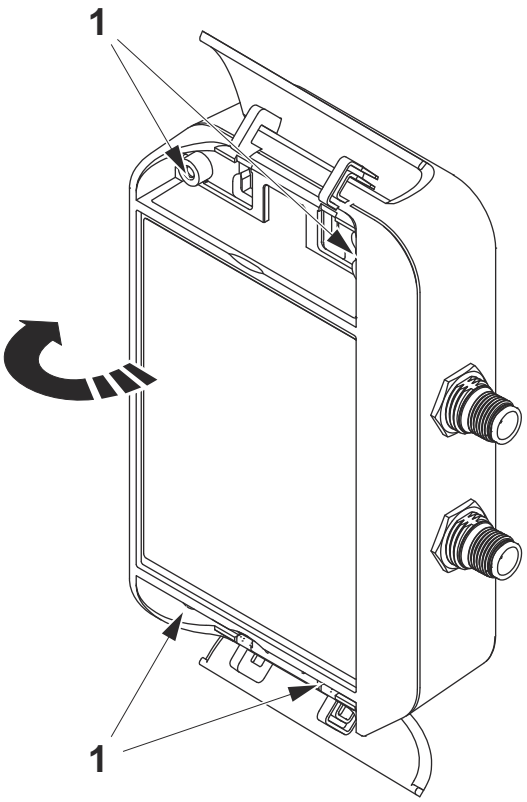
7.3 Communication box

7.3.1 Communication box — Reset

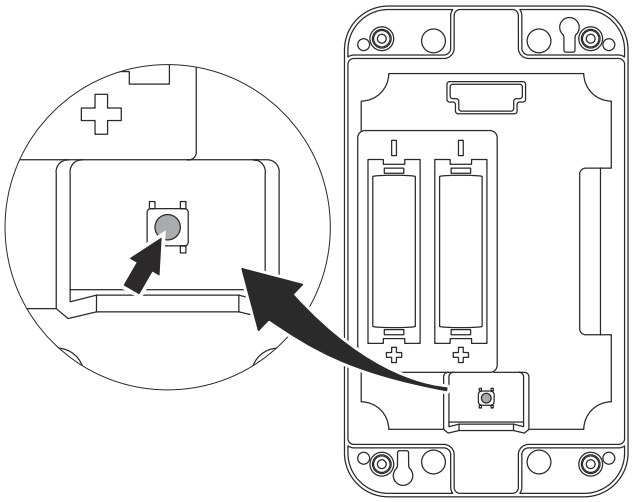
1. Fold up the top and bottom flaps on communication box.



2. Loosen the four screws (1) and swing out the communication box lid.



3. Press the reset button.



4. Close the communication box lid.
5. Tighten the four screws.
6. Fold the top and bottom flaps back.

7.4 Sensor

7.4.1 Sensor — Clean

The sensors should normally be cleaned at the same time as the plate heat exchanger is cleaned. The instruction assumes that cleaning of the plate heat exchanger is ongoing according to the instruction in the plate heat exchanger maintenance manual. That is that the plate heat exchanger is drained and it is safe to remove the sensors.

NOTE **Risk of damage to equipment**

Use grease compatible with nitrile butadiene rubber (NBR) and fluorocarbon rubber (FKM).

1. Remove one of the sensors.
2. Clean the sensor tip using a moist lint-free cloth. The electrical connection must not come into contact with moisture.
3. Clean the threads of the hole in the instrument flanges or the pipes.
4. Clean the sealing area and make sure that it is flat.
5. Put grease on the threads of the sensor.
6. Fit and tighten the sensor to torque 70 Nm (51 lb-ft).
7. Repeat the sequence on the remaining sensors.
8. Check that all sensors are correctly positioned (the correct number and colour in the correct port) according to Section *Installation*.

8 Technical data

8.1 Sensor kit (per unit)

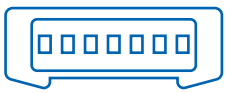
- Combined sensors for temperature and pressure measurement (4 pieces)
- Stainless 1.4404 (316L) sensor bodies
- G½" straight threads (not NPT) sensor connection
- Temperature range -40 ºC to +120 ºC (5 ºF to +248 ºF)
- Pressure range 0 bar to +25 bar (0 psi to +362.6 psi)
- Wireless sensor data communication box
- Data communication to Gateway: Wireless (BLE)
- Y connection cables and installation kit
- Communication box and wiring fixation: Magnetic (no drilling required)
- Communication box power supply: 10–30 VDC, max. 0.25 mA single point connection/plate heat exchanger
- Battery AA 3.6 V Li-$SOCl_2$ (2 pieces) — Not included in the kit

8.2 Gateway (per area)

- 1x IoT Gateway / site or area
- Sensor Kit communication: Wireless BLE
- Wireless range (depending on the area): BLE range typically 50 m (54 yards)
- Cellular Connection; 2G, 3G, or 4G LTE
- SIM card & program for global connection included
- Power Supply: 100 – 240 VAC 50/60 Hz

8.3 Cloud solution and security

Alfa Laval Cloud provided via MS Azure.

The device	The connection	The cloud
		
• Designed to reduce the risk of attacks and breaches • Tamperproof hardware • Only outbound connections • Secure deployment, provisioning, and upgrades • Secure authentication • Event log • Firewall	• Secure connection • Safe message delivery • Durable message delivery	• Azure Assume breach • Azure Global incident response • Azure intrusion detection • Azure active directory • Multi-factor authentication • Secure device provisioning and authentication • Azure IoT Hub identity registry

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9 Troubleshooting

If you experience problem with your equipment, try the following solutions.

Problem	Cause	Actions to solution
Low battery alarm.	No power supply connected.	1. Check that the power supply connector is properly connected. 2. Verify that there is power to the power supply cable.
	Battery charge low.	1. Change the batteries. See Section *Batteries - Change*. 2. Log in to the monitoring system. 3. Acknowledge the alarm.
No communication from the sensor kit.	No power supply to the communication box.	1. Check that the power supply connector is properly connected. 2. Verify that there is power to the power supply cable. 3. Check that the batteries are charged.
	Sensor box need a reset.	1. Follow instruction in Section *Communication box — Reset*.
	No communication with the gateway.	1. Check that the gateway is online. See gateway documentation. 2. Check that the gateway is within the maximum distance from the plate heat exchanger. 3. Check that the gateway and the communication box are correctly configured. Correct MAC-address.
	Communication box malfunction	1. Check that the gateway and the communication box are correctly configured. Correct MAC-address. 2. Replace the communication box.

Problem	Cause	Actions to solution
No communication from one or several sensors.	Cable connection.	1. Check that the cable arrangement is properly connected. 2. Check that there are no visual damages to the cables. 3. Replace the cables.
	Sensor box need a reset.	1. Follow instruction in Section *Communication box — Reset*.
	Misplaced sensor.	1. Check that the sensor has the correct colour and number coding. 2. Check that there is no other sensor with the same colour and number coding installed. 3. Replace the sensor.
Leakage from a sensor.	Sensor not tightened properly.	1. Tighten the sensor to torque 70 Nm (51 lb-ft).
	Problem with the sealing.	1. Check the sealing for wear or damage. 2. Check that the sealing areas are clean and flat. 3. Clean the sealing area. 4. Replace the gasket.