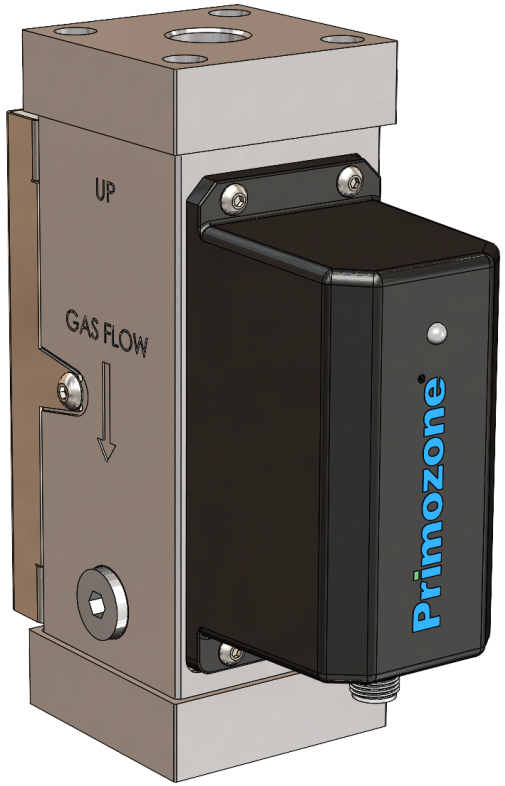
Primozone®

OPERATION & INSTALLATION MANUAL

BFP 2.0
BACK FLOW PROTECTOR



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NOTE: Check your local regulations for any restrictions on ozone generators, power connections/regulation etc.

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www.primozone.com/support

CE Declaration

Declaration of Conformity

CE Primozone®

EC Declaration of Conformity

We, **Primozone Production AB, Terminalvägen 2, S-246 42 Sweden**

herewith declare that the Ozone Installation

Product: Back flow protector 2.0

Brand name: Primozone BFP 2.0

Item number: 110167

to which this declaration relates is in conformity with the provisions of the following EC Directives:

- **Machine Directive 2006/42/EC**

and that the standard and/or technical specifications referenced overleaf on page 2 have been applied.

The signatories are acting on behalf of and with the power of the attorney of the company management.

Löddeköpinge, June 26, 2023

Jonas Augustinson

Technology Manager

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Declaration of Conformity

Manufacturer: Primozone Production AB

Product: Back flow protector 2.0

Type: BFP 2.0

Reference of standards and/or technical specifications applied for this EC Declaration of Conformity, or parts thereof:

Harmonized standards:

Standard No	Subject	Supporting document
SS-EN 61511-3	Functional safety - Safety instrumented systems for the process industry sector	BOM_lista 110167#_00 BFP 20.xlsx BFP 2.0 risk assessment_rev 0.2.docx

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Table of Contents

1 Safety Precautions

1.1 Working Precautions

All personnel must read and understand the safety precautions before installing or operating ozone systems, i.e. ozone generator modules (GM) and GM peripherals.

NOTE! In addition to the instructions and guidelines in this manual, make sure to follow all local safety regulations.

1.1.1 Warning Signs Related to Work Safety

This manual contains precautionary messages of two different levels of severity: warning and caution. The following examples display the appearance of these two messages, respectively:

WARNING

It is mandatory to follow the instructions of a warning message. Failure to do so may cause severe injury or death to personnel.

CAUTION

It is mandatory to follow the instructions of a caution message. Failure to do so may cause injury to personnel or severe damage to the equipment.

1.2 Electricity

WARNING: HIGH VOLTAGE

Unauthorized personnel may not touch the inner components of the GM. Physical contact with electrical parts can cause severe injury or death.

Personnel trained in installation by Primozone may perform work on the inner components of the GM. The lockable main power switch must be locked in the 0 position during installation.

WARNING: TURN OFF THE LOCKABLE MAIN POWER SWITCH

Do not open the door of the ozone generator unless the main power switch has been turned OFF and locked.

Lock the main power switch in OFF position before any work on the electrical components is started.

Figure 1 | Main Power Switch

CAUTION
Do not open the ozone generator unless trained by Primozone personnel or in possession of written authorization.

1.3 Chemical Precautions

WARNING: OXIDIZING

May cause or intensify fire; oxidizer.
May cause fire or explosion; strong oxidizer.

WARNING: ACUTE TOXICITY

Toxic if swallowed.
Toxic in contact with skin.
Toxic if inhaled.

WARNING: HEALTH HAZARD

May cause respiratory, reproductive or organ toxicity that causes damage over time (a chronic, or long-term, health hazard).

1.3.1 Oxygen

Oxygen (ICSC no. 0138) is a colorless, odorless and tasteless gas. The risk of fire is increased if there is a leakage of oxygen from the system. If an oxygen leak is detected, make sure to minimize the risk of sparks or open flames, ventilate the area, and seek service personnel.

High oxygen concentration can cause oil and grease to spontaneously combust.

WARNING: OXIDIZING

May cause fire or explosion; strong oxidizer. Keep away from open flames and combustible materials.

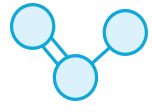
1.3.2 Ozone

Ozone (ICSC no. 0068) is a pale blue gas with a characteristic odor. It is highly reactive and can cause harm to the skin and respiratory organs. An Ozone Material Safety Data Sheet can be found at:

www.primozone.link/o3safety

WARNING: TOXIC GAS

Ozone is a toxic gas. Do not inhale ozone. Do not eat, drink or smoke when using ozone equipment.



WARNING: OXIDIZING

May cause fire or explosion; strong oxidizer. Keep away from open flames and combustible materials.

WARNING: HEALTH HAZARD

Ozone causes damage to the lungs through prolonged or repeated exposure if inhaled.

The human nose can detect ozone in the air at concentrations above 0.02 ppm. At 5 ppm, ozone may be directly lethal. Any off-gas from an ozonation process, that potentially could contain ozone, should be taken care of responsibly by installing a Primozone ozone destruct system, or equivalent.

If breathing issues arise in presence of ozone, please:

- Seek medical assistance.
- Ensure that the affected person has access to fresh air and remains at rest in a comfortable position for breathing.

2 Introduction

2.1 Manual contents

This manual covers installation and daily operation of the Back Flow Protector (BFP), which is a part of the Primozone ozone system.

Personnel should read and understand the instructions in this manual before installing, operating, or performing maintenance on the BFP. Usage permissions are displayed in *Table 1* ▶ 9.

Table 1 | Usage permissions of the BFP.

	1	2	3	4
Training	✓	✗	✗	✗
Service	✓	✗	✗	✗
Installation	✓	✓	✗	✗
Operation	✓	✓	✓	✗

1. *Personnel approved in Service training by Primozone*
2. *Personnel approved in Commissioning training by Primozone*
3. *Personnel approved in Operation training by Primozone (Operators)*
4. *Untrained personnel*

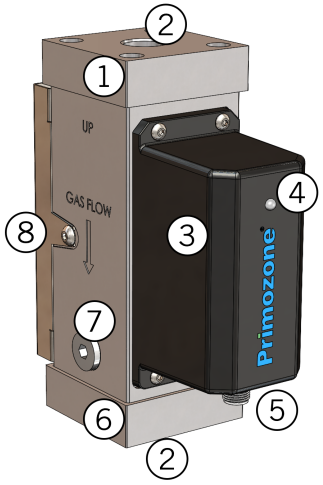
2.2 Description

2.2.1 Purpose

The purpose of the BFP is to prevent water from flowing backward into the GM. The ozone reactor inside the GM is a highly sensitive piece of equipment and may short circuit upon contact with liquid. The BFP has a fast response time and a high level of reliability and will immediately shut off the GM upon detection of water.

It is, however, important to know that the BFP should not serve as the primary means of protection from process water during downtime. The process should be equipped with an additional shut-off valve downstream from the BFP.

2.2.2 BFP overview



1. Top cover
2. Adapters with BSP ½" internal thread
3. Plastic housing
4. Status indicator diode
5. Connector to GM
6. Bottom cover
7. Inspection plug
8. Wall bracket

Figure 2 | BFP overview

2.2.3 BFP Function

A schematic of the BFP is displayed in *Figure 3* ▶ 10.

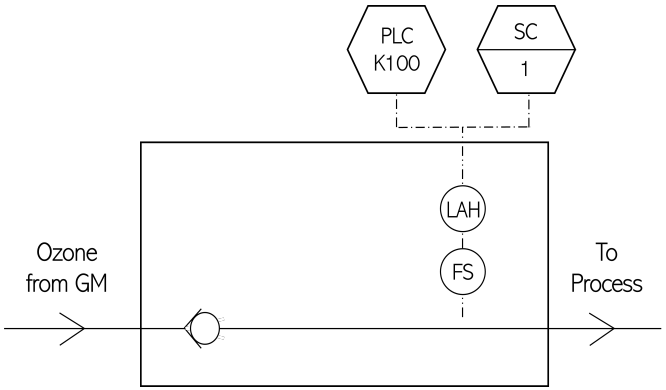


Figure 3 | BFP schematic, sensors and regulators.

The BFP requires a GM with a programmable logic controller (PLC K100) or another control system (SC 1).

The diode indicator on the front of the BFP shows the status of the BFP as follows:

- Green: power but no production signal
- Blue: normal production or purge
- Red: float sensor activated (water detected)

The BFP closes because of negative pressure differential between the inlet and the outlet, and an LAH (Level Alarm High) is signaled when the float sensor is activated. The operator must then assess the problem and purge the system before restarting operation. See "1 Resuming Operation after Water Detection" ▶ 1 .

2.2.4 Typical installation

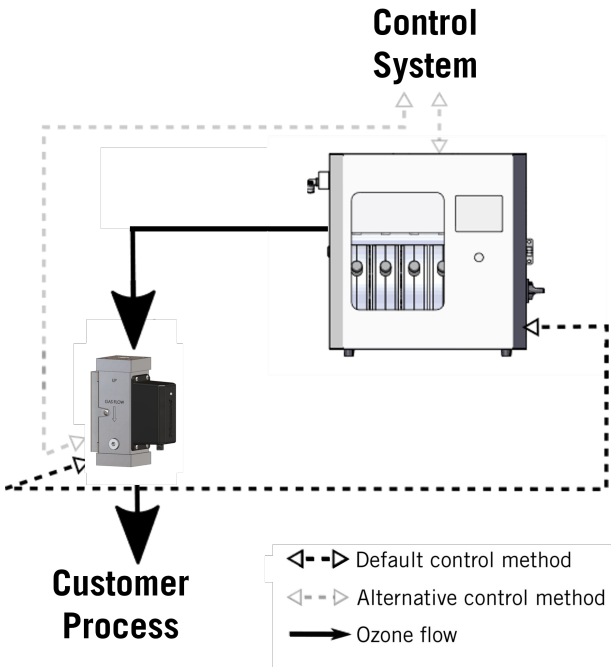


Figure 4 | Typical BFP installation

3 Installation

3.1 Mechanical installation

The GM to which the BFP is connected must be powered off during installation.

The BFP should be mounted to a sturdy, flat, vertical surface. Position the BFP so that there is at least 150 mm / 5.9 inches of free space to its left and to its right. If multiple BFPs are installed, there should be 150 mm / 5.9 inches of space between the units, see *Figure 5* ▶ 11.

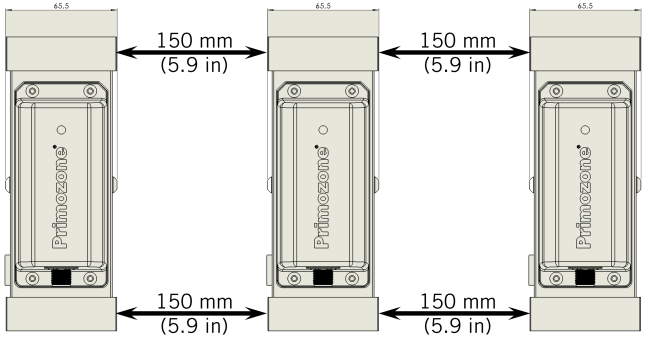


Figure 5 | Distance between units

To mount the BFP, loosen and remove the bracket and attach it to the surface. Ensure that the bracket will allow the BFP to be secured in vertically, with the arrow pointing downwards and with "UP" at the top, as illustrated in *Figure 6* ▶ 11. The engraved arrow indicates the direction of the gas flow. Screws for attachment are not included.

Connect the inlet gas fitting to the top connector and the pipe to the process to the bottom connector.

The top and bottom connector thread sizes are BSP 1/2 inch.

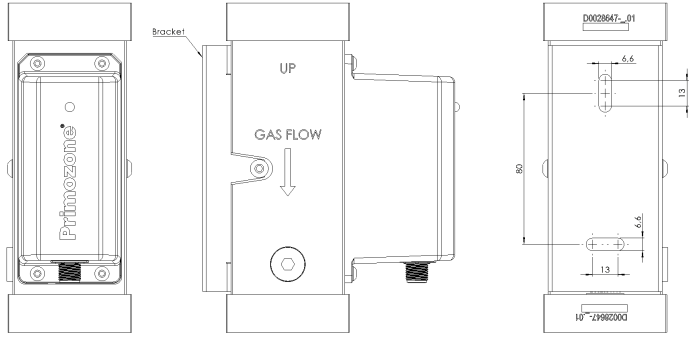


Figure 6 | BFP installation dimensions and placement

3.2 Electrical installation

The BFP has a 5-pin, M12 male connector. On GM1-4 machines, the port is located on the right side and is labeled BFP Port. On GM6-48 machines, the port is located on the underside of the control cabinet.

For further details, see "7 Electrical Wiring" ▶ 21.

3.3 Configuration and test

In the HMI of the GM6-48, log in as a technician through the Service menu, and select "Add-ons". In the HMI of a GM1-4, select

the cogwheel symbol on the Settings page.

Then check the box next to “Back flow protector”.

The functionality of a BFP should be verified by unplugging and then immediately plugging the BFP connector back in. If a connection has been established, the HMI should display a BFP alarm. The alarm can then be acknowledged.

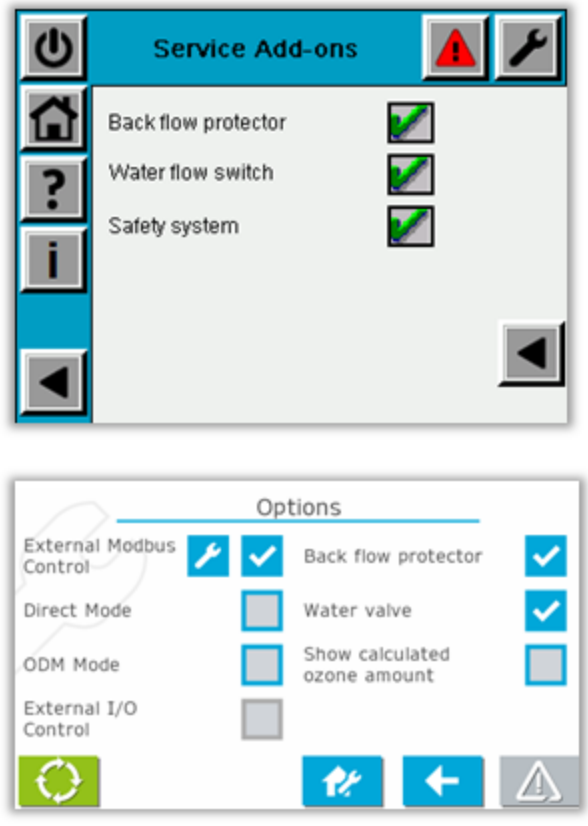


Figure 7 | Configure the GM for BFP (examples from GM6 at the top, GM4 at the bottom)

4 Operation

4.1 Starting and stopping

The BFP opens automatically when ozone production starts.

The BFP closes immediately upon a negative pressure difference between inlet and outlet.

If water is detected in the BFP, the “Water in back flow protector” alarm is triggered in the GM. This immediately deactivates the GM.

4.2 BFP Alarm Procedure

If the BFP alarm is activated, take the following steps:

1. Check to ensure that the BFP is receiving power (is LED indicator working?)
2. If the BFP is receiving power, check the process and close valves to ensure that no water can reach the GM.
3. Correct any error in the process line.
4. On the GM, start a purge and open the valves.
5. Make sure that the BFP diode indicator is not red.
6. After purging for 15 minutes, close down the system and close the valves before and after the BFP.
7. Open the inspection plug on the BFP. Ensure the float sensor can move freely as follows:
   - Move the float sensor up and make sure the BFP diode indicator turns red.
   - Release the float sensor and make sure the diode indicator turns green. If not, clean the BFP according to "4.3 Cleaning Instructions" ► 13.
8. Before reinserting the inspection plug and tightening it, inspect the ring gasket and replace the gasket if necessary.
9. Restart production.

4.3 Cleaning Instructions

If necessary, before restarting the BFP, clean the BFP as follows:

1. Flush with clean water in the direction of the gas flow.
2. Check function by letting pressurized water into the BFP in the opposite direction of the gas flow and check for leakage.
3. If leakage is detected, disassemble the check valve and clean it thoroughly or replace it.
4. During BFP reassembly, replace all O-rings.

5 Maintenance

During maintenance of the BFP, ozone production must be shut off and the system must be purged with oxygen.

5.1 Replacing the check valve

The check valve should be replaced once a year. Use the following procedure to replace the check valve. See *Figure 8* ▶ 14.

1. Use an Allen wrench to remove the screws for the top cover on the BFP.
2. Remove the cover and the check valve.
3. Remove the O-rings from their slots and replace with them with new O-rings.
4. Insert the new check valve.
5. Replace the cover with care, ensuring that the O-ring in the lid does not fall out.
6. Insert all the screws in the cover, but do not add any torque. Adding torque in this step may result in leakage.
7. When all the screws are in place and the lid is flush against the BFP body, start adding torque to the screws crosswise.

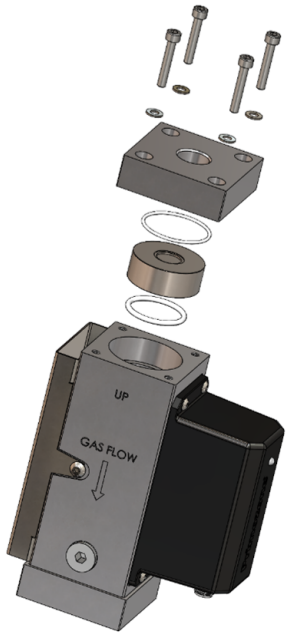


Figure 8 | Replacement of BFP check valve.

To test whether the new valve is working properly, introduce pressure at the top of the BFP to ensure that the valve opens, and then introduce pressure at the bottom of the BFP to ensure that the valve remains closed.

5.2 Replacing the float sensor

1. Use an Allen wrench to remove the screws for the plastic housing. See *Figure 9* ▶ 15.

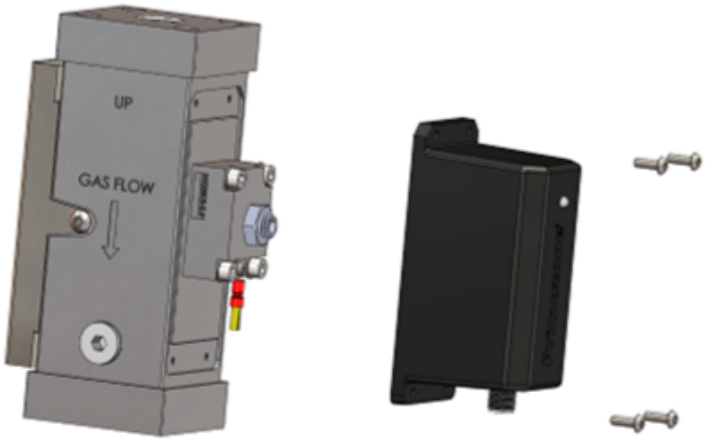


Figure 9 | Removing the screws for the plastic sensor housing.

2. Remove the plastic housing and detach the wires from the sensor and the grounding wire from the PCB card inside the plastic housing. See *Figure 10* ▶ 15.

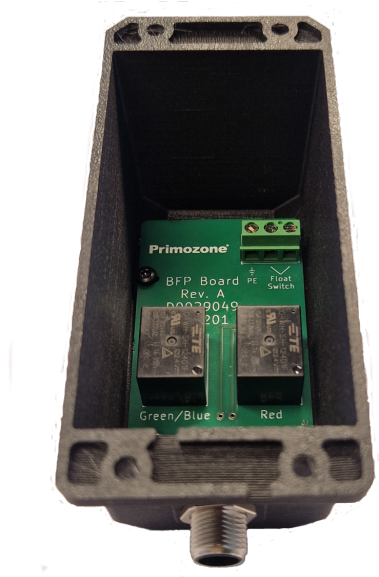


Figure 10 | PCB circuit board inside plastic housing.

3. Use an Allen wrench to remove the screws from the bottom cover of the BFP. See *Figure 11* ▶ 16.

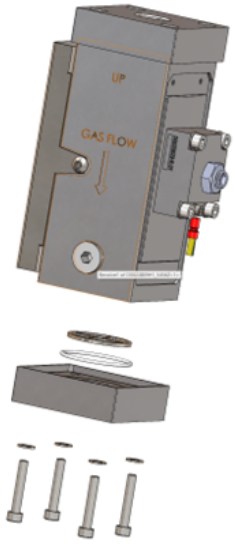


Figure 11 | Replacing the O-ring in bottom cover.

4. Remove the guide and the float.
5. Remove the O-ring from the bottom cover and replace it with a new O-ring.
6. Use an Allen wrench to loosen the screws securing the float sensor housing. Remove the housing and the float sensor.
7. Remove the nut from the float sensor and remove the sensor from the housing.

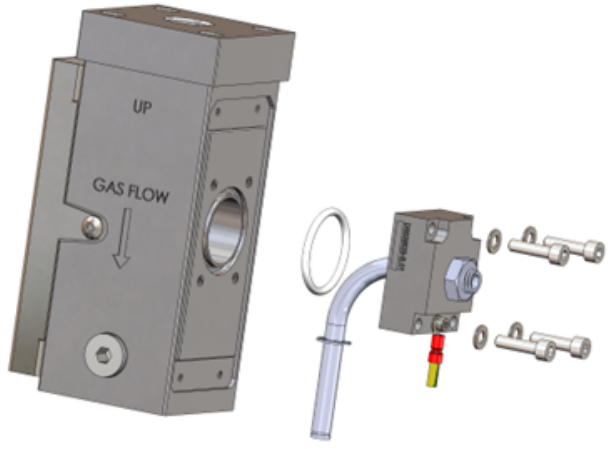


Figure 12 | Removing the screws securing the float sensor unit.

8. Remove the retaining ring and float from the new sensor, remove the nut from the new sensor, and insert the new sensor into the housing with a new ring gasket. Attach the nut but to do not tighten it.
9. Replace the O-ring in the groove in the body and insert the sensor into the body.
10. Attach the screws for the housing but do not tighten them.
11. Insert the float with the marking indentation towards the top of the BFP. See *Figure 13* ▶ 17.

Figure 13 | Marking indentation on float

12. Tighten the screws for the housing.
13. Insert the end of the sensor into the guide and push the guide into position in the body.
14. Hold the guide in place while tightening the nut to the sensor and the screws for the housing.
15. Replace the O-rings in the cover and replace the cover.
16. Tighten the cover screws.
17. Attach the wires from the new sensor and the grounding wire to the PCB card and replace the plastic cover.
18. Attach the cable to the GM and test for proper function as described in the cleaning instructions.

5.3 Replacing the PCB circuit board

1. Use an Allen wrench to remove the screws for the plastic housing.
2. Remove the plastic housing and detach the wires from the sensor and the grounding wire from the PCB card inside the plastic housing. See *Figure 10* ▶ 15.
3. Remove the screw and nut securing the circuit board to the plastic housing.
4. Remove the circuit board and replace it with the new circuit board.
5. Repeat Steps 1–3 in reverse order.

5.4 Leakage in the BFP

If leakage is found in the BFP, take the following steps:

- **If leakage occurs at the top of the BFP**:

1. Tighten the screws.
2. Ensure that the top cover is correctly mounted; the cover must be perpendicular to the BFP housing.
3. If the top cover is correctly positioned, replace the O-rings in the cover and under the check valve.

- **If leakage occurs at the bottom of the BFP**:

1. Tighten the bottom cover screws.
2. If the leak persists, replace the O-ring in the bottom cover.

- **Leakage underneath the plastic housing**:

1. Check for this leakage at lower part of the cover, where there is a small opening for detecting gas leakage.
2. Tighten the screws on the sensor housing and the sensor nut.
3. If leakage persists, replace the O-ring for the sensor housing and the ring gasket for the sensor.

6 Miscellaneous

6.1 Spare parts

The spare parts described in *Table 2* ▶ 19 can be ordered from support@primozone.com.

Article No.	Description
510009	Sealing Kit (complete set of O-rings for BFP 2.0)
510010	Check Valve Replacement Kit (check valve + all O-rings needed for valve replacement)
510011	Level Sensor Replacement Kit (sensor + all O-rings needed for sensor replacement)

Table 2 | Spare parts list for BFP 2.0

6.2 Transportation, handling, and storage

Make sure that the following precautions are taken into consideration before moving, storing, or transporting the BFP:

- The electrical components must not be exposed to water, oil, or chemicals.
- The BFP must not be exposed to temperatures higher or lower than specified in *Table 1* ▶ 1 during handling, storage, or transportation.
- Before storing a BFP, disconnect it, make sure there is no water inside, and plug the inlet and the outlet. Store the BFP in an environment where the requirements in *Table 1* ▶ 1 are met.

6.3 Dismantling and scrapping

When the BFP is to be disposed of, the electrical components and other materials must be taken care of in accordance with local regulations for electronic and industrial waste.

The BFP does not contain any radiating or otherwise hazardous materials that require special destruction.

Follow local regulations when disposing of and recycling parts of the BFP.

6.4 Technical specifications

Table 3 | BFP technical data

	BFP 2.0
Length (L)	174 mm / 6.9"
Width (W)	65.5 mm / 2.6"
Depth (D)	135.5 mm / 5.4"
BSP internal threads	G ½"
Capacity	0 – 350 l/min / 0 – 741 ft^3/h
Max. overpressure	6 bar(g) / 87 psig
Working pressure	- 0.5 – 3 bar(g) / 7 – 43 psig
Ambient air temperature	5 °C to 40 °C / 41 °F to 104 °F
Ambient air quality	The air cannot contain salt particles, conductive materials (such as iron powder), or large amounts of dust

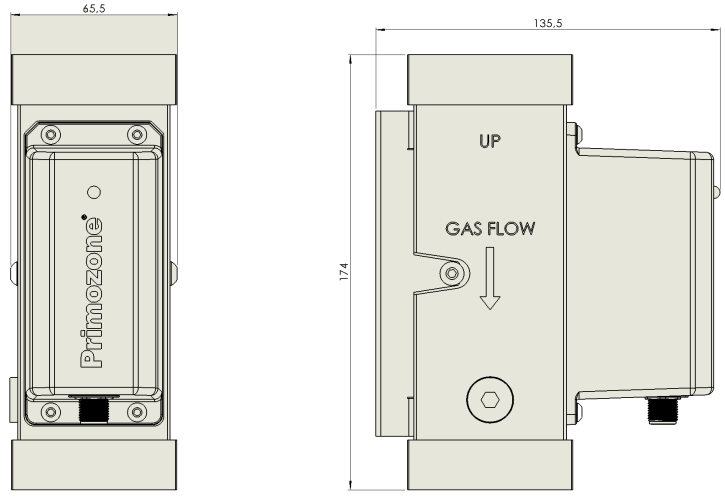


Figure 14 | BFP dimensions.

7 Electrical Wiring

Position	Color	
1	Brown	
2	White	
3	Blue	
4	Black	
5	Gray	
Gray	PE	
Blue	–	} Power supply
Brown	24 V DC	
Black	24 V DC output to PLC when system is OK	
White	24 V DC input from PLC when running system	

8 Glossary List

BFP

Back Flow Protector - A Primozone product which is used to prevent water from the site of dissolution from propagating back into the GM.

BSP

British Standard Pipe.

GM

Generator Module

HMI

Human Machine Interface

LAH

Level Alarm High.

LS

Level Sensor.

NC

Normally Closed.

PLC

Programmable Logic Controller.

PTFE

Polytetrafluoroethylene, a synthetic fluoropolymer of tetrafluoroethylene, for example Teflon.

SC

System Controller.

9 Version History

Hardware version	Date	Author	Changes
2.0	June 2023	PEOS	Initial version.
2.0	October 2023	PEOS	Added spare parts list and CE declaration; minor editorial updates
2.0	January 2024	PEOS	Updated instruction for replacing the float sensor; minor editorial updates