Blue-Zone Technologies
SUSTAINABLE ANESTHESIA RECOVERY™

Blue-Zone Deltasorb® Phoenix Anesthesia Recovery System

Passive and Active Configurations

Instructions for Use

Version A

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Definitions:

- **Active System Configuration:** A Phoenix System setup that integrates the Deltasorb® unit with Deltaflow to capture and collect VA from WAG while working in tandem with an external active WAGS/AGSS.
- **Anesthetic Gas Machine (AGM):** A medical device used to deliver a controlled mixture of VAs and oxygen to patients during medical and surgical procedures.
- **Anesthetic Gas Scavenging System (AGSS) / Waste Anesthetic Gas Scavenging (WAGS):** A system designed to collect and remove WAG from operating rooms and other medical areas to protect healthcare personnel from exposure to these potentially harmful gases.
- **DeltaAI:** The AI-based electronics used to monitor VA capture and Deltasorb® canister status.
- **Deltaclean:** The specific absorbent material used inside the Deltasorb® canister.
- **DeltaDry:** The connection between the AGM and Phoenix which incorporates an integrated water trap that captures condensed water droplets from the hose, preventing them from entering the system and potentially causing back pressure.
- **Deltaflow Bracket:** A mounting bracket that encompasses a frame, a Deltaflow reservoir, and a flow-sensor module.
- **Deltaflow reservoir:** A proprietary ORS and protection assembly enabling the System to function efficiently in conjunction with an active AGSS/WAGS.
- **Deltaflow unit:** An integrated assembly that combines a bracket, the Deltaflow reservoir, the Deltaflow enclosure, and the corresponding inlet and outlet adapters.
- **Deltahold:** A mounting bracket that encompasses a frame, Deltasorb® canister and the DeltaAI module.
- **Deltasorb® canister:** The proprietary canister designed to adsorb VAs as part of the System.
- **Deltasorb® unit:** An integrated assembly that combines the Deltahold, the Deltasorb® canister, the DeltaAI sensor module, and the corresponding inlet and outlet adapters.

- **Open Reservoir System (ORS):** A system to protect the WGE of an AGM against sub-atmospheric pressure generated by an active AGSS/WAGS by allowing exhaled gases to be vented out of the system and allowing room air to enter into the pathway of the active AGSS/ WAGS.
- **Passive System Configuration:** A Phoenix System setup in which the Deltasorb® unit captures and collects VA from WAG streams without the need for an external AGSS/WAGS.
- **Phoenix:** A program focused on developing VA capture and recovery.
- **Phoenix Anesthesia Recovery System (The System):** A Blue-Zone proprietary VA capture and recovery system. Employing a combination of various components and sensors. The System is available in two configurations: an active system configuration that integrates with the hospital's existing WAGS/AGSS, and a passive system configuration for hospitals or other medical or surgical facilities that do not have active WAGS/AGSS.
- **Volatile Anesthetics (VAs):** A class of anesthetic agents, including Sevoflurane, Isoflurane, and Desflurane, administered via inhalation. These agents are vaporized for the induction and maintenance of general anesthesia, inducing loss of consciousness and analgesia. VAs do not include Nitrous Oxide.
- **Waste Anesthetic Gases (WAG):** Any VAs that escape the patient circuit or are exhaled by patients during administration of VAs.
- **Waste Anesthetic Gas Exit (WGE):** The port of an AGM where waste anesthetic gas exits.

Introduction

1.1 Intended Use

The Phoenix Anesthesia Recovery System is designed for use in hospital operating rooms and other healthcare facilities where VAs are administered to capture and collect WAG, thereby reducing occupational exposure for healthcare personnel and minimizing environmental impact.

When connected to the WGE of an AGM, the System channels the exhaust stream through a Deltasorb® canister. The Deltaclean in the canister selectively captures VAs.

On the Deltasorb® unit, a visual LED indicator and audible alarm provide clear notification when the Deltasorb® canister requires replacement to ensure continuous protection and effective operation.

Note: The System is intended for use only by trained healthcare professionals familiar with AGMs and VA handling.

1.2 Phoenix System Configurations

The System is available in two configurations:

- Passive System Configuration (figure 1):
  A self-contained setup in which the Deltasorb® unit removes VA from WAG without an active AGSS/WAGS. Integrated sensors provide continuous monitoring and alert users when the canister must be replaced. The image on the left demonstrates where the System is connected to a non-active AGSS/WAGS, and the image on the right demonstrates where the System is not connected to any exhaust system.

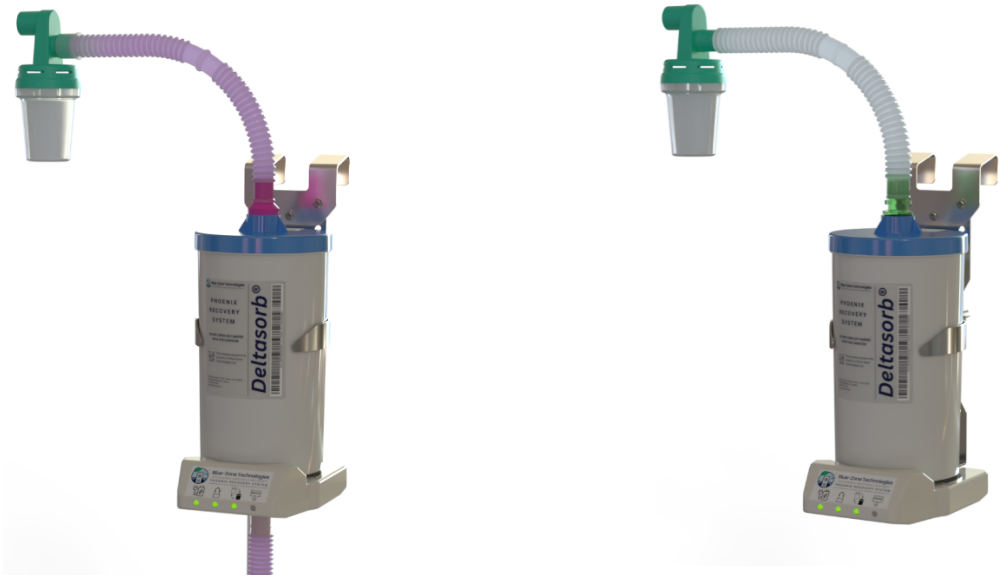


Figure 1. Passive System Configuration

- Active System Configuration (figure 2):
  A setup in which the Deltasorb® unit (as described above in a Passive System Configuration) is paired with the Deltaflow unit and connected to an external active AGSS/WAGS. The Deltasorb® unit captures VA while the Deltaflow manages evacuation flow and protects the AGM from backpressure. The Deltaflow unit provides continuous AGSS/WAGS flow monitoring and user alerts.

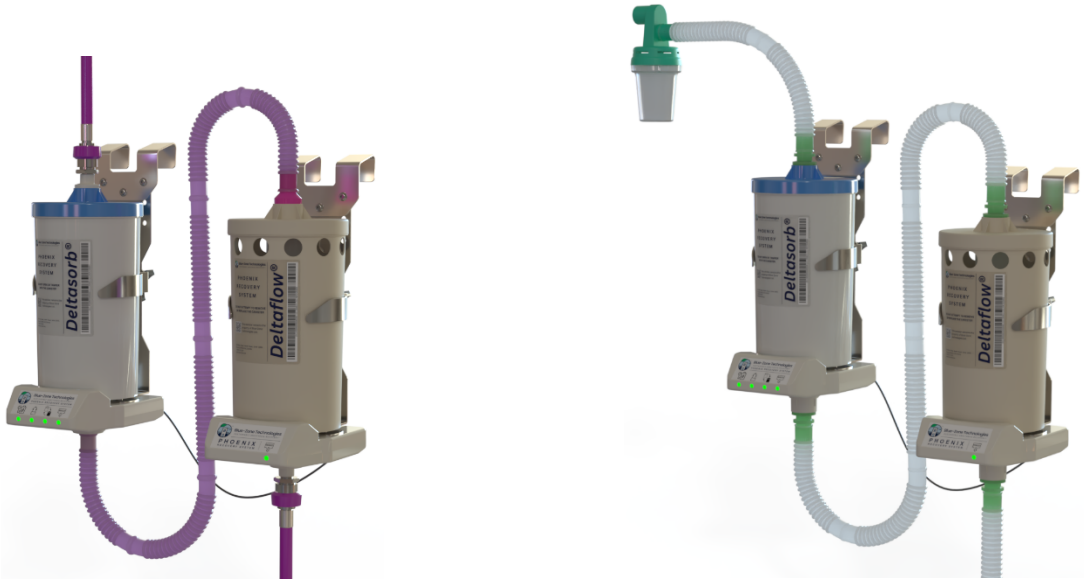


Figure 2. Active System Configuration

1.3 Terminology

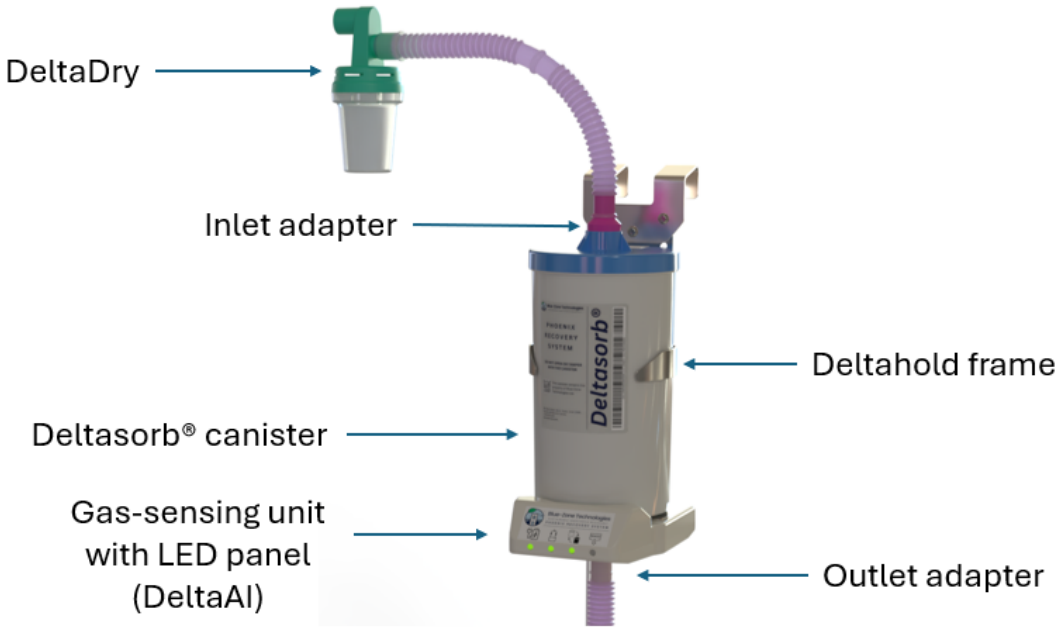


Figure 3. Deltasorb® Unit

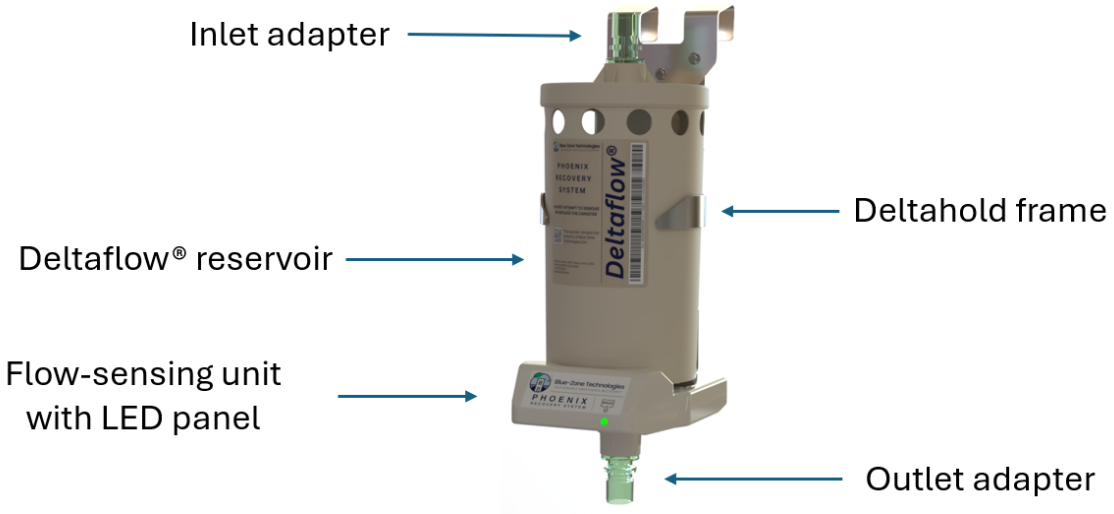


Figure 4. Deltaflow Unit

1.4 Areas of Use

The System is intended for use in operating rooms and surgical suites and other locations where VAs are administered, including hospitals and clinics. The System is compatible with most AGMs and can be configured for use with both passive and active gas scavenging systems.

1.5 Supply

Electrical Supply

- Input voltage: 5 V_{DC}
- Power consumption 5W
- Max current: 1 A_{DC}

Gas Flow Supply (Active version only)

- Compatible with standard waste anesthetic gas flow rates
- Required AGSS flow: 35 ± 5 l/min

1.6 Principle of Operation

The System functions by directing WAG of an AGM through an adsorption/filtration pathway.

In the passive configuration, gas flows through the Deltasorb® canister, where VAs are adsorbed. The Deltasorb® unit, equipped with gas sensing technology, monitors usage and alerts the user with LED indicators and an audible signal when the canister requires replacement.

In the active configuration, the Deltasorb® unit is paired with a Deltaflow unit to operate in series to capture VAs within the Deltasorb®, while non-captured waste gases are evacuated through the AGSS. At the same time, the Deltaflow protects the AGM from backpressure and incorporates a flow sensor that continuously monitors evacuation flow.

1.7 Symbols on the Product

Symbol	Definition
	Manufacturer
	Manufacturing Date
	Serial Number
	Part Reference Number
	Advice “Do not dispose of in general waste”

Caution: Indicates that the user should consult the instructions for use to review important safety information, including warnings and precautions.

Indicates that the user must read the manual or safety instructions before using the System.

Human Presence / Trained Personnel Symbol

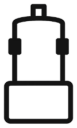
Connection to Deltaflow

Connection to Deltasorb®

Service/Communication

Power Supply

Power and Battery Charging Status



Deltasorb® Status

Canister Replacement Status

WAGD Flow Status

2 Safety

2.1 Safe Operation

To ensure safe and proper use of the System, it must be operated strictly in accordance with these Instructions for Use (IFU) and its setup and use as described in Section 3. Operators should read and understand the contents of this IFU before using the System.
The IFU should always remain readily accessible for reference and can be accessed by scanning the QR code on the System.
Users must adhere to the IFU and comply with applicable laws and regulations.

2.2 Mounting

The System must be mounted vertically in close proximity to the WGE of the AGM. The mounting structure or surface must be capable of supporting at least 10 kg to ensure stability and prevent accidental detachment. The brackets should be positioned so that the System does not interfere with the AGM or any adjacent equipment, while maintaining clear visibility of all LED indicators and unobstructed access for canister installation and removal. For safety and consistency, only Blue-Zone approved mounting hardware and guidelines should be used when positioning the device. Incorrect or insecure mounting may compromise System performance and pose a safety risk to patients and staff.

2.3 Connected Devices

The System is designed to interface seamlessly with AGMs and AGSS/WAGS using standard connectors.

Deltasorb® and Deltaflow brackets can be configured to be compatible with standard 19 mm, 30 mm, WAGD DISS, and VAC DISS fittings to allow flexible integration into various clinical setups.

Use only adapters and connectors supplied by the manufacturer. Using unauthorized components may impair system performance and create safety risks for both patients and clinical staff.

2.4 Patient and User Safety

Trained Personnel Only

The System must be operated exclusively by personnel that have reviewed and understand this IFU. Understanding the System's functions, installation requirements, and safety indicators as described in the IFU or by the manufacturer is essential to prevent misuse that could compromise patient care or user safety.

Unobstructed Gas Flow

All gas pathways must remain free of obstructions. Blockages in the gas flow can lead to backpressure, system inefficiency, or WAG release. Users should inspect all connections before each use to confirm that gas can flow without restriction. A safety test to ensure unobstructed gas pathways is mandatory before operating the System.

Timely Canister Replacement

LED indicators and audible alert notifications must be monitored (see Section 3.5) for alerts, including required change out to a new Deltasorb® canister. Delayed replacement can lead to unnecessary WAG release.

Handling of Used Canisters

Used canisters will contain VAs, which can be harmful with prolonged or repeated exposure. Used Deltasorb® canisters should be capped with manufacturer's plugs and inserted into plastic bags when not in use to avoid escape of captured anesthetic agents.

General Safety Awareness

All users should be aware that improper handling of the System or ignoring warning indicators can result in exposure to waste anesthetic gases, which may pose health risks. To ensure safe and proper use, operators should always follow the guidelines provided in this Instructions for Use (IFU). In case of uncertainty or unusual system behavior, users should refer to the IFU for clarification before proceeding.

2.5 System Malfunction

The System is equipped with self test capabilities, starting at each power up by the DeltaAI. If the self test indicates a malfunction by a red LED and an audible alarm, do not use the System and immediately contact appropriate service or technical support within your institution.

2.6 System Modification

Any modification or alteration of the System, including the brackets, sensors, adapters, or canisters, may compromise System safety and performance.

Qualified personnel authorized by the manufacturer or distributor may make modifications or alterations when required. Please contact appropriate technical or service support within your institution if you have any questions concerning the proper use or installation of the System or any modification to the System.

2.7 Parts and Accessories

Only components and accessories supplied or approved by the manufacturer should be used with the System.
For a complete list of available adapters, accessories, and replacement parts, refer to Section 8 – Accessories.
To order replacement parts or accessories, please contact Blue-Zone Technologies:

- Phone: (+1) 905-761-1224
- Email: health@blue-zone.ca

2.8 Service and Maintenance

Users should routinely inspect the System. During these checks, users should confirm that connections are tight and there is no external damage to the System.
Manufacturer's inspection and maintenance will be performed in accordance with System requirements and your institution's policies.

3 Setup and Use

3.1 Initial Setup

The System may be configured generally as follows:

- a Passive version, consisting of the Deltasorb® unit.
- an Active version, consisting of the Deltasorb® unit and the Deltaflow unit.

The two versions differ in setup and operation. Before setup verify your system version to install.

Passive Configuration

Each AGM requires an appropriate hose that has been identified and validated by the System manufacturer for use between the AGM WGE and the System. Only use the approved connection hose to ensure safe and effective operation.

Select the appropriate dedicated connection hose (available in 19mm and 22mm) and integrated water trap. Attach the connection hose securely to the AGM WGE (figure 5).

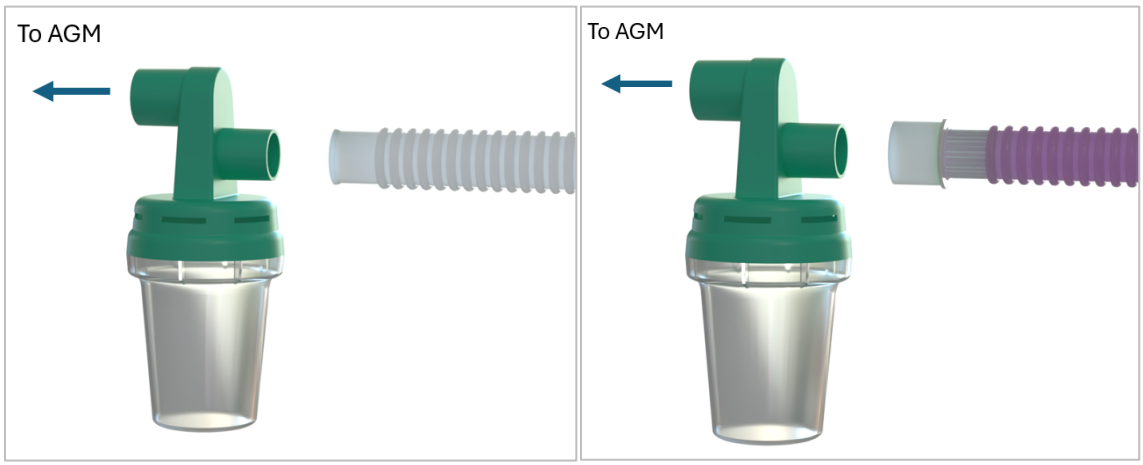


Figure 5.

Connect the opposite end of the hose to the System using the appropriate adapter for the hose size (figure 6).

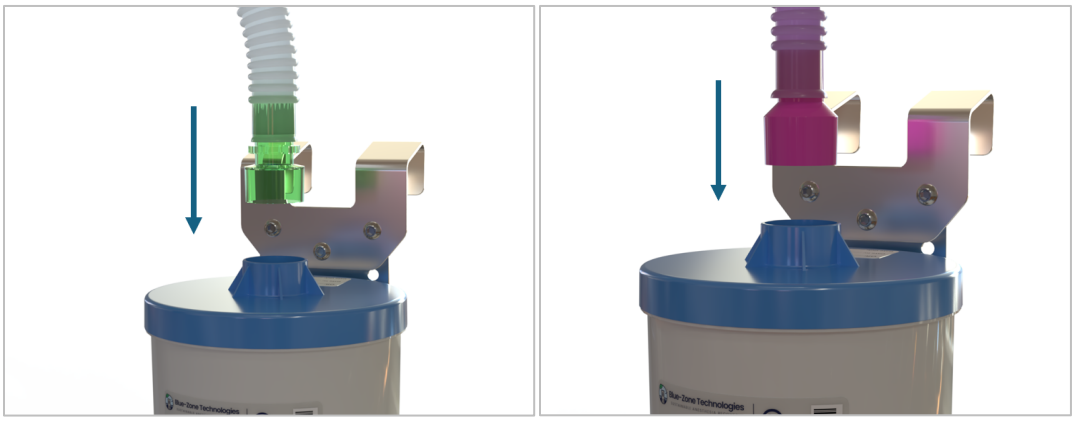


Figure 6.

If the WGE outlet hose connects to an exhaust system, connect the hose to the DeltaAI unit as show in figure 7.

Figure 7.

Active Configuration

Insert the communication cable into the ports on both the Deltasorb® and Deltaflow brackets. Ensure the connectors are fully seated and secure (figure 8).

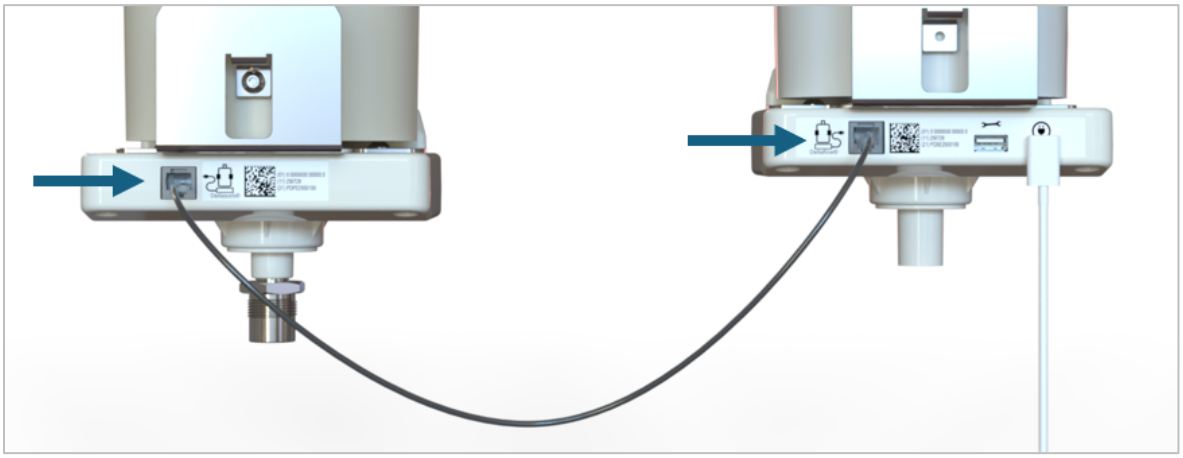


Figure 8.

Each AGM requires an appropriate hose that has been identified and validated by the System manufacturer for use between the AGM WGE and the System. Only use the approved hose

Two connection options are available:

- 22mm hose with integrated water trap, see figure 9

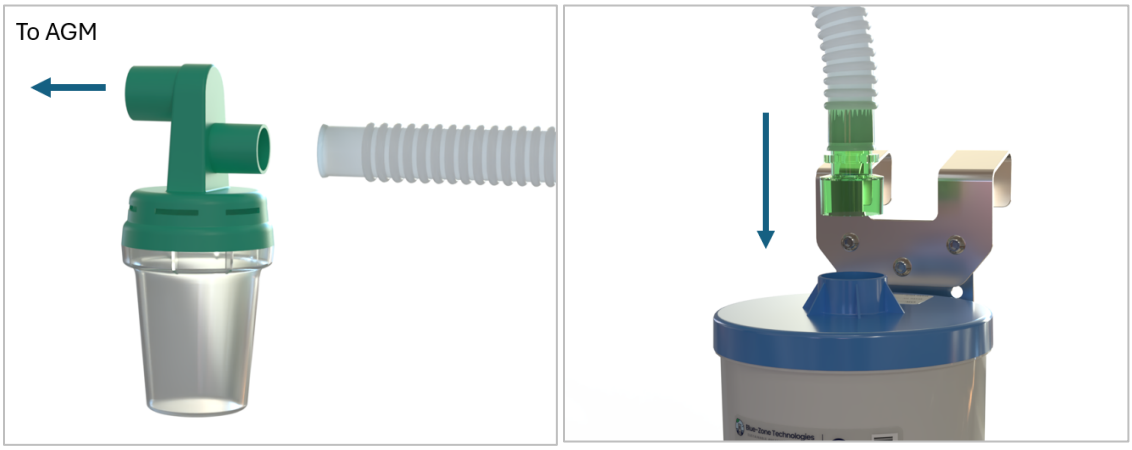


Figure 9.

- WAGD high-pressure hose (no water trap), see figure 10

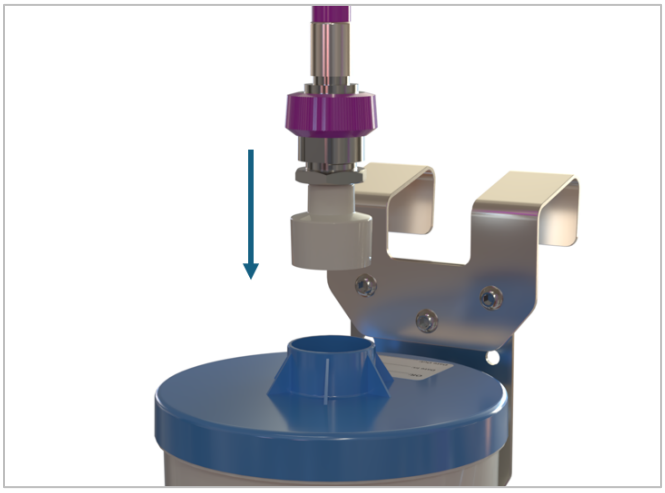


Figure 10.

Attach the selected dedicated hose to the AGM WGE. Connect the opposite end of the hose to the System using an appropriate adapter . (see section 8.1)

Select the appropriate adapter for your hose or evacuation system. (See section 8.2) Thread the adapters onto the bottom of the DeltaAI and flow sensing unit with LED panel (figure 11).

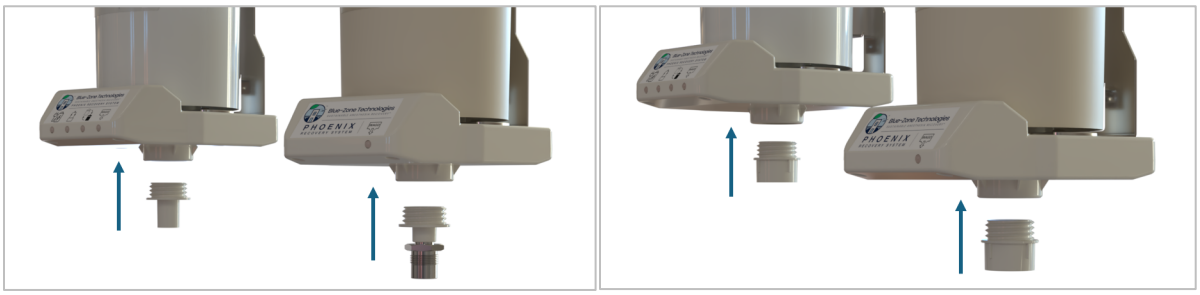


Figure 11.

Prepare the corrugated intermediate connection hose by securing the appropriate adapter(s) to its end(s) (figure12). (See section 8.1)

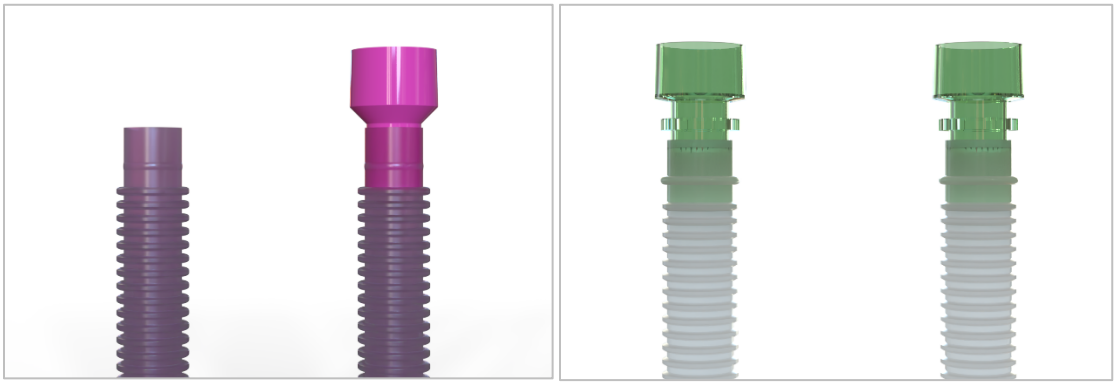


Figure 12.

Connect one end of the prepared hose to the bottom adapter of the DeltaAI (figure 13).

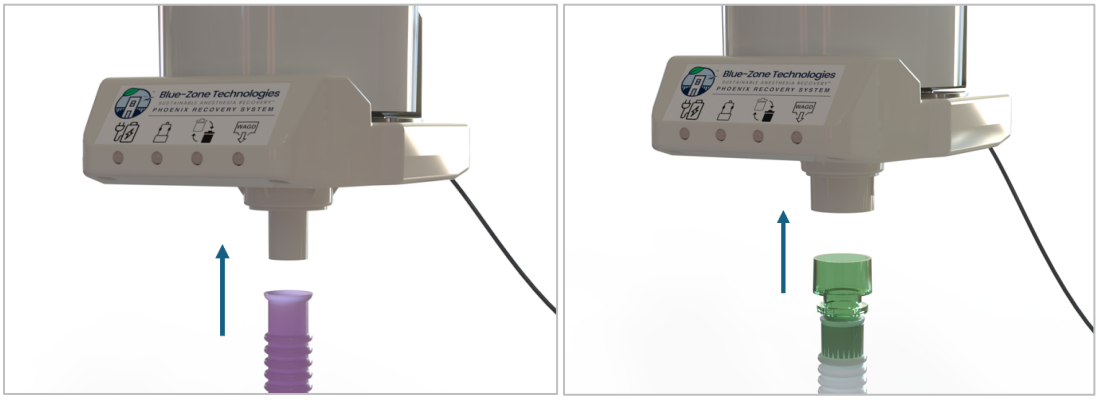


Figure 13.

Connect the opposite end of the hose of the receiving socket of the Deltaflow reservoir (figure 14).

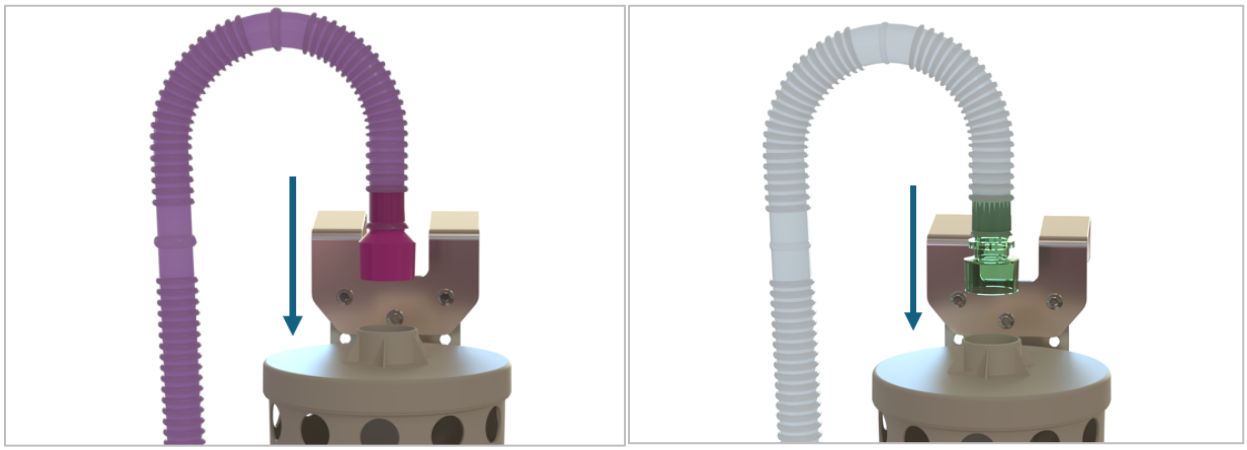


Figure 14.

Verify that both connections are fully seated and secured to ensure unobstructed gas flow.

Securely connect the evacuation hose to the installed adapter of the pressure-sensing unit (figure 15).

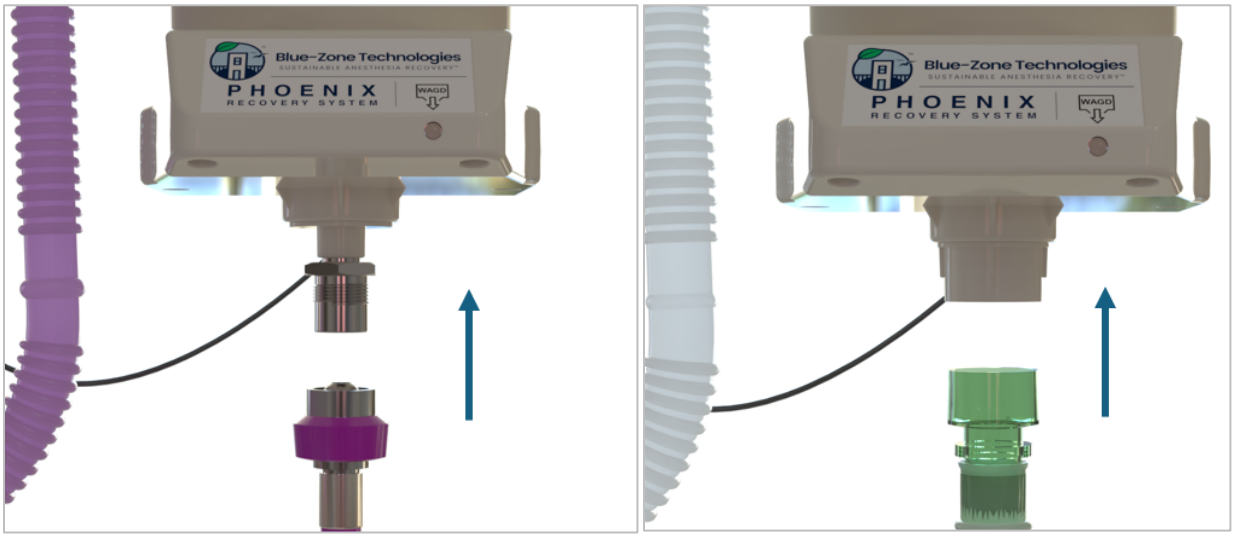


Figure 15.

3.2 Canister Installation/Changeout

When performing a canister replacement on the Deltasorb® unit, obtain a new Deltasorb® canister from inventory.

Remove both the top and bottom protective plugs from the fresh canister (figure 16). Retain the removed plugs and use to seal the used canister.

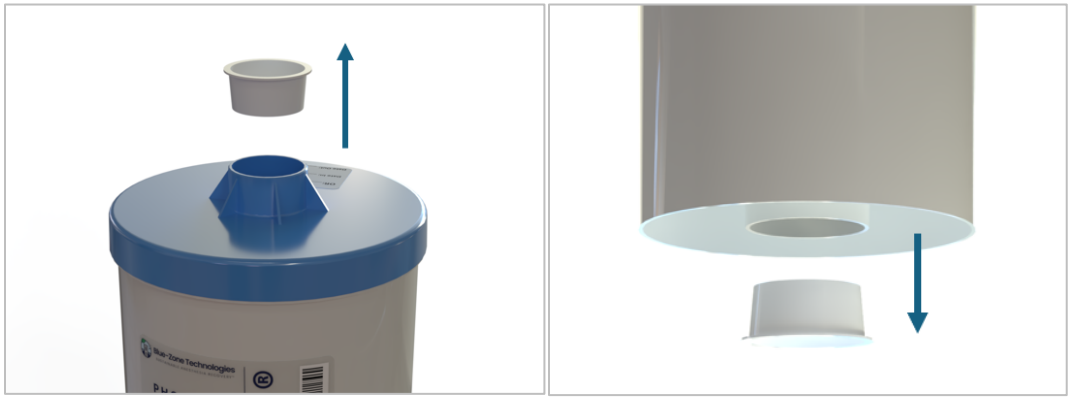


Figure 16.

Detach the inlet hose connection from the used canister by slightly twisting the adapter clockwise while pulling upward (figure 17).

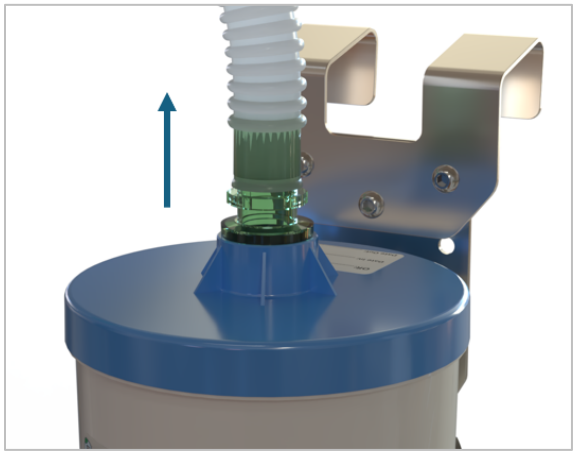


Figure 17.

Remove the used canister from the Deltasorb® bracket by twisting the canister clockwise while pulling upwards to detach the canister from the bracket. Figure 18

Figure 18.

Use the plugs from the replacement Deltasorb® canister on the respective entry and exit openings on the used canister (figure 19). Place the used Deltasorb® canister in the plastic bag provided and store the canister away for collection.

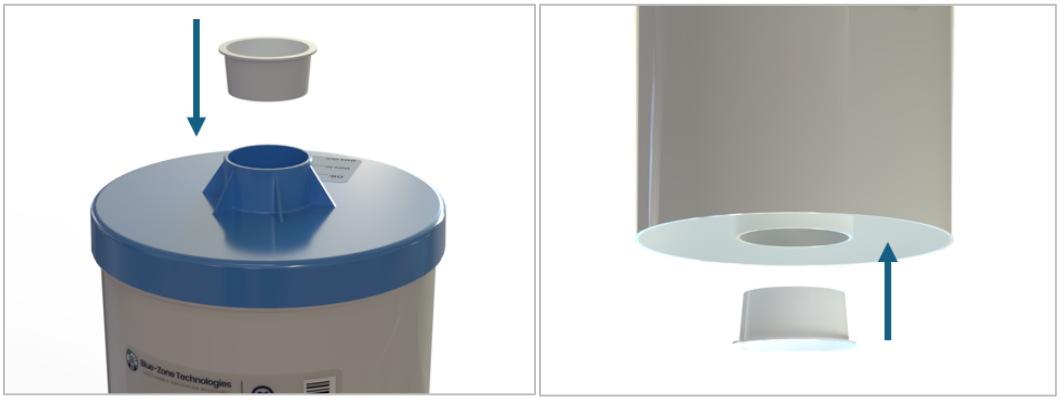


Figure 19.

Slide the fresh Deltasorb® canister onto the backet while ensuring proper alignment. Slightly twist the canister to securely connect to the bracket once inserted (figure 20).

Reconnect the inlet hose by inserting the adapter and slightly twisting clockwise until connection is secured (figure 20).

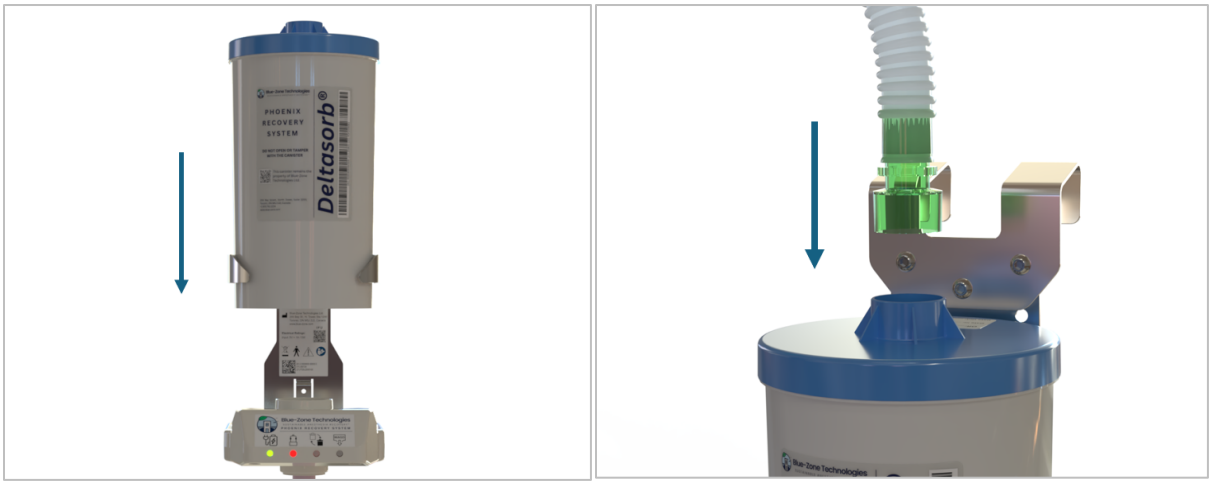


Figure 20.

3.3 Pre-operation safety test

Once the Deltasorb® canister is installed, perform an O_2 flush test in accordance with the AGM manufacturer's procedure.
Conduct this test only when it is safe to do so.
If back pressure exceeds 20 hPa at a flow of 75 L/min, verify all hoses and connections for kinks or obstructions and repeat the test. If the back pressure remains above 20 hPa at 75 L/min, contact the manufacturer for further instructions (see Section 8).
Note:

- The Deltaflow canister does not require replacement by the user and therefore is fixed on its bracket. Only authorized service staff shall replace the Deltaflow canister.
- For Dräger Perseus machines that perform overnight flush, or for Dräger Zeus machines that perform agent tank test, disconnect the inlet hose before this procedure and reconnect it once the overnight flush is completed.

3.4 Operation

Normal Operation

Monitor the LED status indicators on the DeltaAI to confirm both canister and device power status. Operate the system only when all LEDs are green: the first three LEDs from the left for passive setup, and all four LEDs for active setup (figure 21). If the second LED turns red, inspect and verify whether the canister is properly installed.

Passive Configuration

Active Configuration

Figure 21.

Canister Replacement Status

If the Canister Replacement LED turns red in a passive setup or yellow in an active setup, replace the Deltasorb® canister according to section 3.2 (figure 22). In case of a canister replacement during the use of an AGM be aware that for the time of replacement amounts of WAG can be emitted into the room.

Passive Configuration

Active Configuration

Figure 22.

Active WAGD Flow Status

The following applies for the Phoenix **Active** Version only.
If the active WAGD Flow control LED turns red,

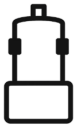
- inspect the AGSS / WAGD wall outlet to be activated
- inspect the AGSS / WAGD connection hose to be properly inserted in the wall outlet
- inspect all hoses and tubing to ensure the flow path is clear and free from any kinks or obstructions.

If the active WAGD indicator light remains red after completing the inspection, contact the manufacturer for further assistance, see figure 23.
WARNING! DO NOT PROCEED IF THE WAGD FLOW CONTROL LED IS RED.

Deltasorb® Unit

Deltaflow Unit

3.5 Symbols and Indications

Symbol	LED Color/Action	Description
 **Power and Battery Charging Status**	Green – Steady	device is powered by mains supply, and battery charge is more than 90%
	Green – Slow flashing	device is powered by mains supply, and battery charge is between 25% and 90% and battery is in charging mode
	Red – Slow flashing	device is not powered by mains supply and run on battery
 **Deltasorb® Detection Status**	Green – Steady	Deltasorb® canister properly inserted and system is in regular operation and filtering
	Red – Slow flashing	Deltasorb® canister not properly inserted or missing
	Green – Steady	Deltasorb® canister is filtering

 **Canister Replacement Status**	Yellow – Slow flashing	Deltasorb® needs replacement (Active Configuration)
	Red – Slow flashing	Deltasorb® needs replacement (Passive Configuration)
 **WAGD Flow Status**	Green – Steady	Active WAGD/AGSS flow sufficient
	Red – Slow flashing	Active WAGD/AGSS flow insufficient, do not use the device

4 Cleaning

Standard cleaning agents may be used for cleaning the System by wiping down the surfaces for disinfection.

	Type	Description
⚠	**CAUTION**	**Injury or equipment issues from incorrect use of cleaners** Only clean the device in the same manner as similar equipment including the AGM. Always follow the directions provided by the cleaning product manufacturers.
⚠	**NOTICE**	**Damage from using the wrong cleaning products** Do not use harsh chemicals such as solvents, petroleum-based products, acetone, or glass cleaners.
⚠	**NOTICE**	**Scratches or wear from abrasive materials** Do not use abrasive tools or materials like steel wool, silver polish, or rough sponges.
⚠	**NOTICE**	**Damage from high heat or steam** None of the components are designed for sterilization.
⚠	**NOTICE**	**Internal damage from liquid entry** Liquid should not enter the inside of any component of the System.

5 Safety Check

5.1 General Information

This section outlines when and how to perform routine safety checks to ensure the device remains safe and fully functional.

	Type	Description
⚠	**WARNING**	**Risk of Injury or Equipment Damage** Only qualified personnel should perform safety checks to ensure accurate assessment and to prevent harm. A safety check must be carried out prior to operation and should include: • Verifying that all documentation, including the Instructions for Use, is complete and available. • Ensuring all labels and markings are present, readable, and undamaged. • Testing the device to confirm proper operation.

6 Life Cycle Information

After 10 years of use, the System must be removed from the clinical environment and returned to the manufacturer for proper maintenance and/or disposal. For guidance on decommissioning the device, please contact the manufacturer.

7 Specifications

Physical Dimensions

Dim: ca. 140mm × 190 mm × 375 mm
Deltasorb® Unit Weight: 2.1 kg
Deltaflow Unit Weight: 1.3 kg

Environmental Conditions

Operation
Temperature range: +10 to +40C
Humidity range: 10 to 90% relative, non-condensing

Storage
Temperature range: -20 to 50C
Humidity range: 10 to 90% relative, non-condensing

Transport
Temperature range: -20C to 70C
Humidity range: 10 to 90% relative, non-condensing

Alert Noise: ≥ 75dB

Classification:

USA: non medical device

Canada: non medical device

EU: medical device Class I

Mechanical Interface

VAC Connection: DISS 1220
Waste Gas Connection: DISS 2220

Display

Type: LED Indication
Modes of Operation: See Section 3.3

Active AGSS / WAGD flow

Suction flow: 35 ± 5 LPM

Performance

Filter efficacy: ≥ 92 % @FGF 1l/min
Filter capacity: ≥ 255 ml fluid VA

8 Accessories

To order replacement parts or accessories, please contact Blue-Zone Technologies:

- Phone: (+1) 905-761-1224
- Email: health@blue-zone.ca

8.1 Deltasorb®/Deltaflow Adapters

Description	Part Number
WAGD (F) Deltasorb® Adapter	P2-DA-A-001
VAC/SUC (F) Deltasorb® Adapter	P2-DA-A-002
WAGD (M) Deltasorb® Adapter	P2-DA-A-003
VAC/SUC (M) Deltasorb® Adapter	P2-DA-A-004
19mm (M) Phoenix adapter	P2-DA-P-004

8.2 Phoenix Adapters

Description	Part Number
19mm (M) Phoenix Adapter	P4-PA-P-001
30mm (M) Phoenix Adapter	P4-PA-P-002
30mm (F) Phoenix Adapter	P4-PA-P-003
WAGD/AGSS (M) Phoenix Adapter	P4-PA-A-001
VAC/SUC (M) Phoenix Adapter	P4-PA-A-002
WAGD/AGSS (F) Phoenix Adapter	P4-PA-A-003
VAC/SUC (F) Phoenix Adapter	P4-PA-A-004

8.3 DeltaDry and Inlet Hoses

Description	Part Number
DeltaDry	P4-DD-P-001
19mm Corrugated Tubing	P4-PH-P-007
22mm Corrugated Tubing	P4-PH-P-008

8.4 Replacement Parts

Description	Part Number
Phoenix Power Supply	P4-PC-P-001
Deltaflow Bracket Cable	P4-PC-P-002

Address: 200 Bay Street, North Tower, Suite 1200, Toronto, Ontario, M5J 2J2
Website: https://www.blue-zone.com
Phone number: (+1) 905-761-1224
Email: health@blue-zone.ca

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