

μ ·PLASMA O₃[®]

MICROPLASMA OZONE TECHNOLOGY[®]

MPO3 Ozone Systems

MP5Air

MP5O2

MP10

Operation Manual



MicroPlasma Ozone
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IMPORTANT SAFETY INSTRUCTIONS

- **Read all sections of this manual completely before installing and operating these ozone systems. Improperly following the instructions could void warranty and result in injury and/or death.**
- **WARNING** – Inhalation of high concentrations of ozone gas can cause serious harmful physiological effects. **DO NOT** directly inhale the ozone gas produced by this unit.
- Do not ignore any warning signs displayed on the Ozone Generator.
- Never use metal tubing with the device and be sure that the Teflon[®] tubing is not severely bent or damaged.
- If the unit is ever dropped or severely damaged, contact the installer before resuming operation as the impact may cause internal damage.
- A licensed electrician must install all electrical components of the entire ozone system.
- All electrical connections must be connected to a Ground Fault Circuit Interrupter (GFCI) protected circuit.
- Do not attempt to service and/or open the unit. This will void the warranty and expose the user to potentially dangerous electrical connections.
- To reduce the risk of electric shock, ensure that the unit is mounted in such a way that it is inaccessible to a person in the pool.
- Do not permit children to use this product unless properly supervised.
- Make sure that all connections are securely fastened before using the system.
- Install the unit and Oxygen Concentrator (if used) at least 5 feet (1.5 meters) from the wall of the pool using non-metallic tubing. Both **MUST** be installed in a protected, outdoor location or an indoor location.
- **DO NOT** directly expose the ozone generator to water either through outside or inside plumbing.
- Be sure to unplug the unit(s) before attempting any routine maintenance or cleaning.
- Follow all applicable electrical codes and be sure that all the electrical wiring is correct and secure. There is a lug on the external surface of all electrical equipment labeled “BONDING LUG” that must be used to properly bond the unit to the equipotential bonding grid.
- Do not store or use gasoline, chemicals, or other flammable liquids/vapors near the unit.

SAVE THESE INSTRUCTIONS

MPO3 OZONE SYSTEM PRE-START-UP CHECKLIST

	Checklist - Ensure the following are successfully completed (See Manual Page for Each Item)	Page	✓
1	MPO3 Ozone Generator and Oxygen Concentrator (if used) is(are) securely installed on a clean, vertical surface	9, 26, 28	
2	Ozone System and Oxygen Concentrator (if used) is(are) protected from wind, driving rain and direct sun (awning or indoors)	9, 26	
3	Ozone System and Oxygen Concentrator (if used) is(are) wired correctly with proper GFCI and breaker into the main pool system controls	9, 26	
4	The entire Ozone System is bonded to Equipotential Bonding Grid (#8 AWG solid copper wire)	10, 25, 26, 28	
5	ORP Probe is securely installed in the supplied tee or tapped directly into the plumbing (45° up-facing angle and the <u>probe tip centered in the tee or pipe</u>) NOTE: Save the ORP Probe protective bottle for future storage or for any time the probe is removed from the water. <u>Allowing the ORP probe to dry out will cause irreversible damage to the probe.</u>	22, 25	
6	ORP cable is securely installed to Ozone Generator (BNC connector has a secure connection and protective cap is secure)	21, 22	
7	Be sure the ORP cable is not in close proximity to electrical noise sources such as pump controllers. Secure cable to a solid surface over entire length.	21, 22	
8	Teflon ozone gas supply tubing is coiled (<u>not cut</u>) and securely installed in the compression fittings. <u>Use only the compression fittings supplied.</u>	21, 22	
9	Teflon oxygen or air supply tubing is securely installed in the original (supplied) compression fittings between injector and the inlet of the ozone generator	26	
10	For Oxygen-fed systems, be sure to set the AirSep at 5 LPM <u>prior</u> to connecting the ozone supply tubing from the injector to the ozone generator. Adjusting the AirSep flow meter while connected to the ozone generator may damage the AirSep	9, 26, 28	
11	Injector Bypass Assembly or Manifold is installed correctly and follows the manual's diagram	10-15, 21, 22	
12	Degas/Destruct is secured to equipment pad (bonded to Equipotential Grid with #8 AWG Solid copper wire for Thermal Catalytic Destruct and the two (2) SS check valves) and plumbed properly	16-19, 21, 22	

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NOTE: All drawing dimensions are in inches

1 GENERAL INFORMATION

1.1 Description

The MP5/10 Series MPO3 Ozone Systems are ozone water purification systems primarily used for water disinfection. They are smart ozone systems that are NSF Standard 50 validated and listed for use in commercial swimming venues, but are uniquely suited for the typical residential pool, offering the same features of commercial systems in a smaller package. All MPO3 ozone systems are adaptable for any application where a smart ozone system is required in their size range. This manual covers basic ozone system installation instructions for swimming pool installations. They are comprised of the following sub-units:

MP5/10 Ozone Generator	Degas & Destruct System	Oxygen Concentrator
MP5Air – 050-0040 MP5O ₂ – 050-0045 MP10 – 100-0205	Air System – 870-0010 O ₂ System – 870-0015	MP5O ₂ and MP10 ONLY AirSep O ₂ Concentrator – 880-0005
Side-Stream Venturi Assembly 2” Kit	Side-Stream Venturi Assembly 2.5” Kit	Full Flow Venturi Manifold
Air Injector Kit Bypass 2” – 860-0010 O ₂ Injector Kit Bypass 2” – 860-0011	Air Injector Kit Bypass 2.5” – 860-0020 O ₂ Injector Kit Bypass 2.5” – 860-0021	Single Speed Air/O ₂ Injector Manifold 2” – 860-0015

The MP5/10 Ozone Generator produces the ozone, and the Venturi Manifold or Venturi Assembly ensures that the ozone is properly introduced into the water. The Degas & Destruct System efficiently degasses and destroys undissolved ozone off-gas and ensures that the area is free from gaseous ozone and the pool is free from air bubbles.

1.2 Specifications

Ozone Output/Concentration:

MP5Air	MP5O ₂	MP10
2 g/hr	5 g/hr	10 g/hr
0.3 wt%	1.5 wt%	2.5 wt%

Vacuum Air/Oxygen Optimum Gas Flow Rates:

MP5Air	MP5O ₂	MP10
10 LPM	5 LPM	5 LPM

Minimum gas flow for MP5Air is 5 LPM and Maximum gas flow is 14 LPM

Minimum gas flow for the MP5O₂ and MP10 is 2.5 LPM and Maximum gas flow is 5 LPM

Ozone Generator Weights:

MP5Air	MP5O ₂	MP10
14 lbs	14 lbs	16 lbs

Power Requirements for Ozone Generator:

Domestic & International: 100 – 240VAC, 50 – 60Hz, 1Φ

	Voltage	Average Power	Kistler™
MP5Air	100-240V; 50/60 Hz	90 Watts	40 Watts
MP5O ₂		90 Watts	
MP10		160 Watts	
AirSep Topaz	120VAC	600 Watts	
Thermocatalytic Ozone Destruct	120VAC	30 Watts	

MP5O₂ and MP10 require an external oxygen concentrator; AirSep Topaz

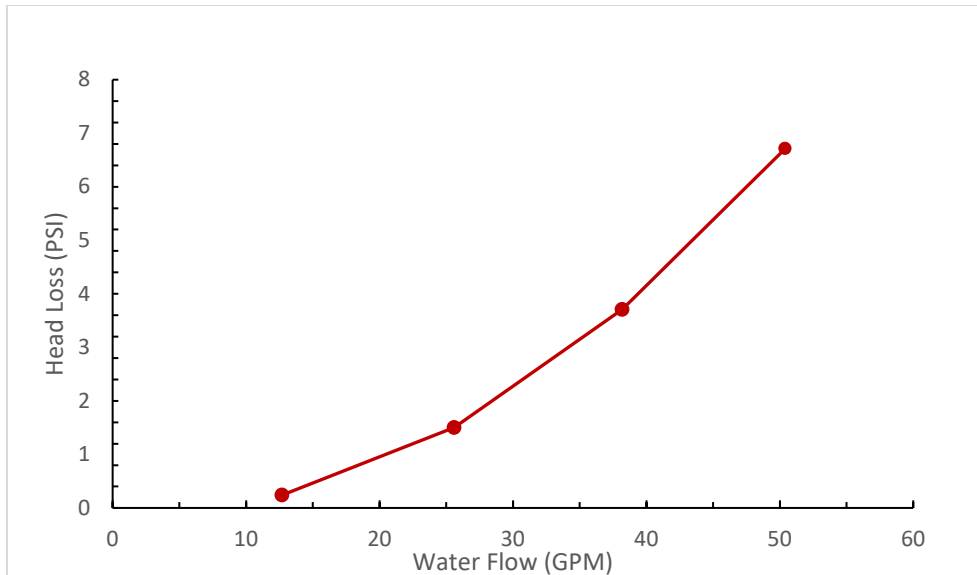
Recirculating Loop Water Requirements (Venturi System):

Full Flow Venturi Manifold Water Flow: 30 GPM minimum and 60 GPM maximum

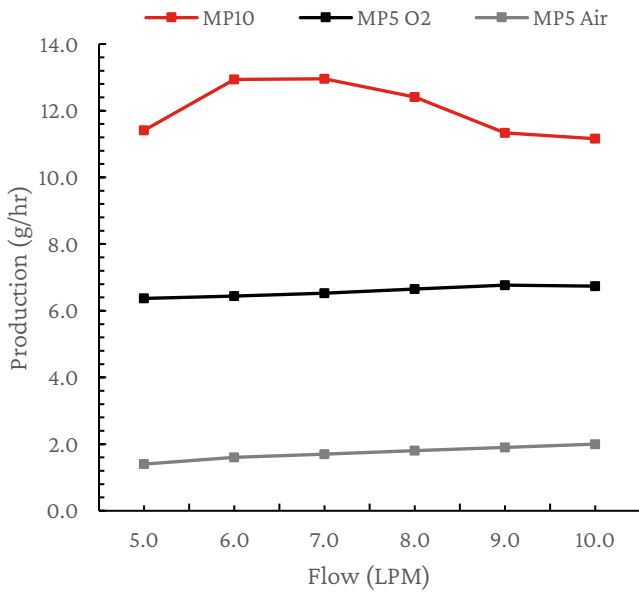
Side-Stream for 2” Bypass Venturi Assembly Water Flow: 30 GPM minimum and 100 GPM maximum

Side-Stream for 2.5” Bypass Venturi Assembly Water Flow: 30 GPM Minimum and 110 GPM maximum

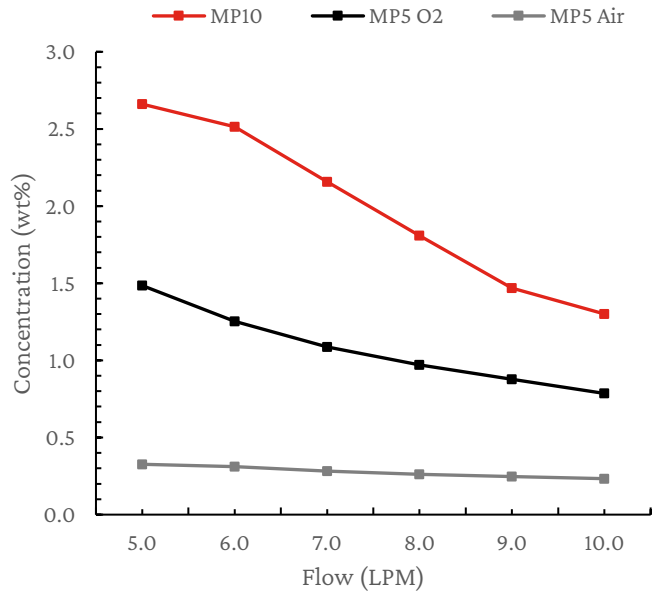
Water Flow Head Loss Chart:



Ozone Generator Performance Curves:



Ozone Production (g/hr) vs. Flow (LPM)



Ozone Concentration (wt%) vs. Flow (LPM)

All ozone generators that utilize ambient air as the feed gas may experience a decrease in ozone production as the relative humidity (RH) increases. At high relative humidity levels, the ozone output of the MP5Air ozone system (without RH control) may reduce to 1.6 grams per hour. NSF disinfection efficacy tests were validated at 1.6 grams per hour.

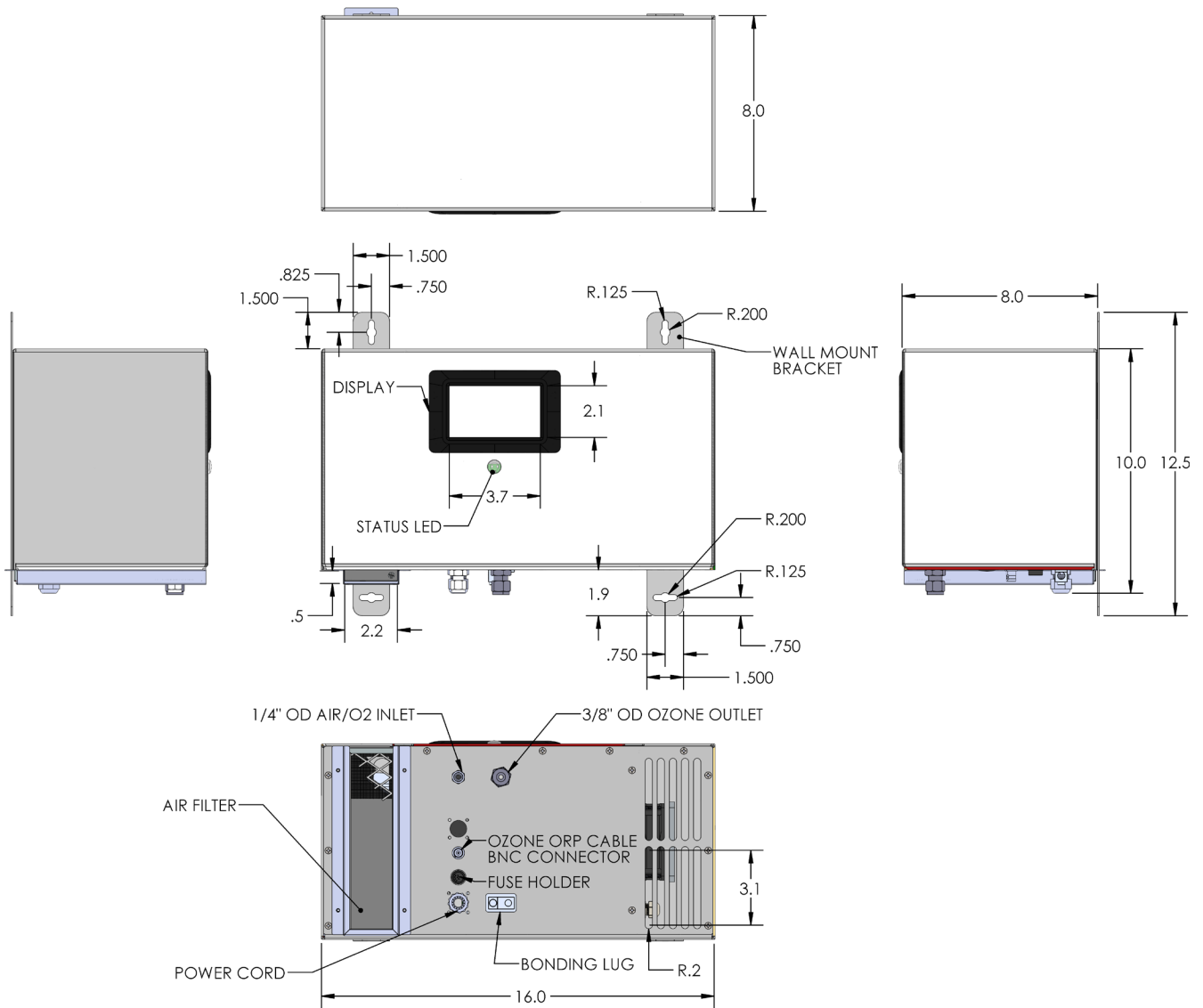
To avoid reduced ozone output during times of high relative humidity, the patent pending Kistler™ Solid State Electronic Dehumidifier (SSED) automatically controls the ambient air feed gas humidity to below 50%, which will maintain the MP5Air’s NSF rated and verified ozone output of 2 grams per hour, regardless of the ambient relative humidity. This feature is exclusive to MicroPlasma Ozone systems. All MP5Air systems include the Kistler™ as standard feature.

The Kistler™ SSED will maintain impeccable ozone performance, while protecting the ozone generating cell from water exposure which significantly reduces any nitric acid build-up, and greatly prolongs the ozone generating cell life.

2 MAIN COMPONENTS

2.1 MP5/10 Series Ozone Generator

<p>MP5Air 050-0040 MP5O₂ 050-0045 MP10 100-0205</p>



The MP5/10 is an ozone generator that produces ozone gas in a mixture of air or oxygen. This mixture is efficiently injected into a water stream through a venturi where ozone dissolves readily into the water. Undissolved ozone is separated from the water in the Gas Separator (Degas) and the ozone is destructed to prevent off-gas of the ozone into the environment. The MP5/10 Ozone Generator may be used for gaseous or aqueous applications.

2.1.1 Ozone Generator Module

The MP5/10 utilizes patented microchannel plasma technology to produce ozone.

2.1.2 HMI Display

The 4.3” LCD resistive touchscreen display (480 x 272) is used for user interaction, real time monitoring, and error warnings. The display shows the values for Ozone Gas Flow (L/min), Temperature (°F), Humidity (%RH), and Ambient Ozone Gas (ppm). The user can also set their desired ORP value (mV). The recommended value range is 650 – 950 mV.

NOTE: ORP control is used for commercial applications or when ORP limitation is desired. Residential pools should operate in Monitor Mode only.

2.1.3 ORP Sensor

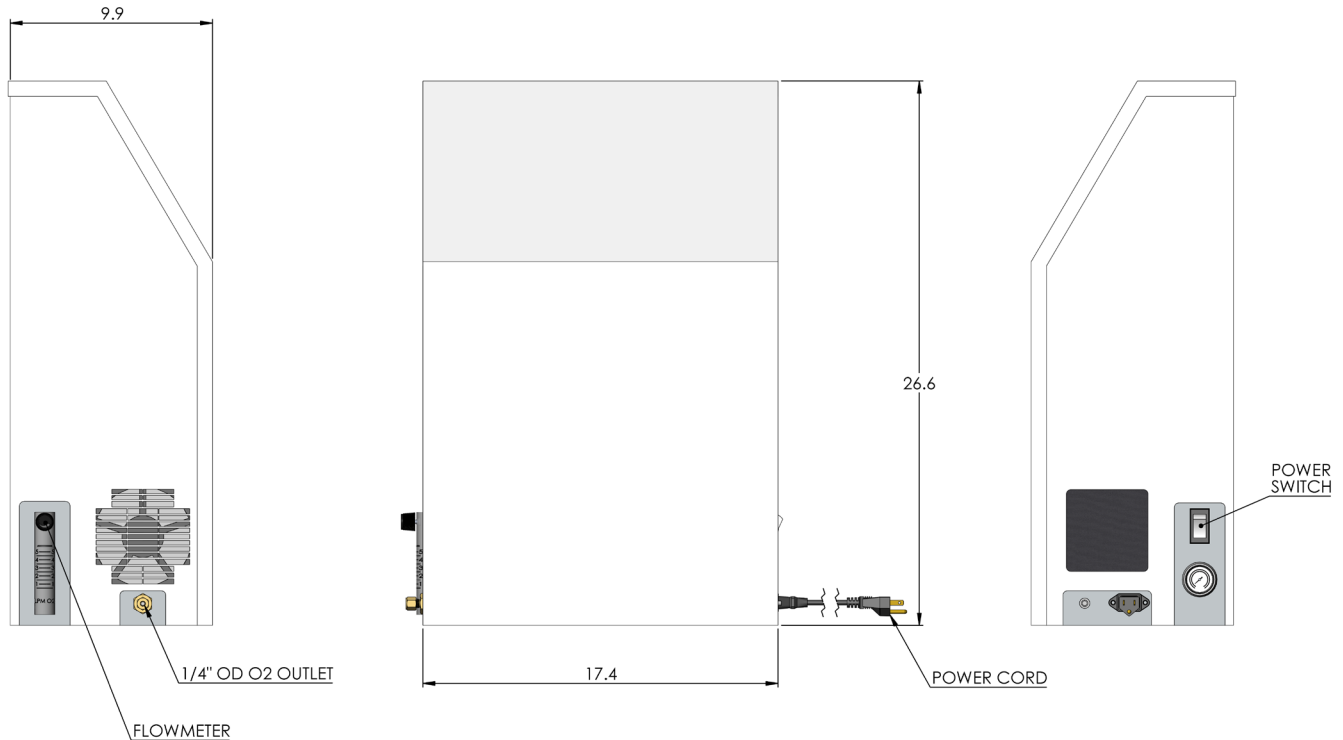
For commercial applications, the built-in ORP monitor/controller automatically adjusts ozone production by monitoring the ORP signal in the water line in real time. It has a range of 0 – 1500 mV and the PID controller cycles the ozone up and down based on ORP set point.

Included in the MPO3 Ozone System is a SXORP Platinum Tip ORP Probe that connects from the Ozone Generator to the main return line. Detailed instructions on proper probe usage can be found in Section 5.3.

2.1.4 Solenoid Water Backflow Protection

The MP5/10 has a built-in internal solenoid valve that protects the Ozone Generator from inadvertent water backflow through the ozone gas line. (This solenoid is in lieu of the traditional ozone gas line check valve, however, if you choose to add a check valve in the gas line make sure that it is ozone resistant and does not reduce gas flow). In the event the system is running, and the Venturi is not pulling a vacuum (or a system failure creates water pressure instead of vacuum in the ozone feed-gas line), the solenoid valve will create a hard stop, protecting the system from water ingress, and will not reopen until the proper vacuum is resumed.

2.1.5 Oxygen Concentrator (P/N: 880-0005)



The MP5O₂ and MP10 require an oxygen concentrator (AirSep Topaz Model No. As013-105) to generate a minimum ozone concentration of 5 g/hr and 10 g/hr, respectively.

The oxygen concentrator is required to operate and meet parameter requirement of 92% purity at -73°C dew point and output of 5 LPM gas flow.

The dimensions for the AirSep oxygen concentrator are: 15" W X 10" D X 27" H. The weight is 53 lbs.

The AirSep is not rated for harsh outdoor weather exposure. Mount the AirSep in an indoor location or in a protected outdoor location where it is shielded from rain, dust, direct sunlight, or freezing. A protective awning may be used. Install the unit on a clean and suitable vertical surface (such as a wall), and make sure the unit is mounted upright and level, with the control accessible. Use No.8 rounded stainless steel screws that are suitable for the intended mounting location surface, such as wood, metal, concrete, plastic or composite so that the unit is secure. This area must remain dry and free of standing water.

2.2 Injector Manifold and Injector Bypass Assemblies (Venturis)

For optimum performance, keeping any ozone system at steady-state is the goal. Installing the ozone in a side-stream and allowing the main flow to function as a bypass, is always recommended to ensure the ideal ozone mass transfer and ease of system operation. Inlet water flow through the bypass is automatically restricted by the spring check valve so that the proper amount of water flows through the venturi injector side-stream to provide the optimum gas flow through the ozone generator at variable pump RPM and variable water flow rates (GPM). It supports highly efficient mass transfer of the ozone gas into the water.

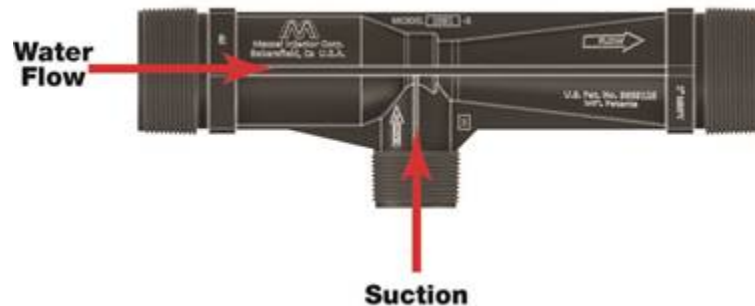
NOTE: The check valves supplied with the Air/O₂ venturi injector assembly kits, the Air/O₂ venturi injector manifold, and the degas tank for backpressure are stainless steel. Some local codes may require that they be bonded. This can be accomplished by installing a bonding clamp around each check valve and connecting an 8 AWG solid copper wire or larger to the equipotential bonding grid. Check with the local authority for local code requirements.



Check Valve with a Bonding Clamp

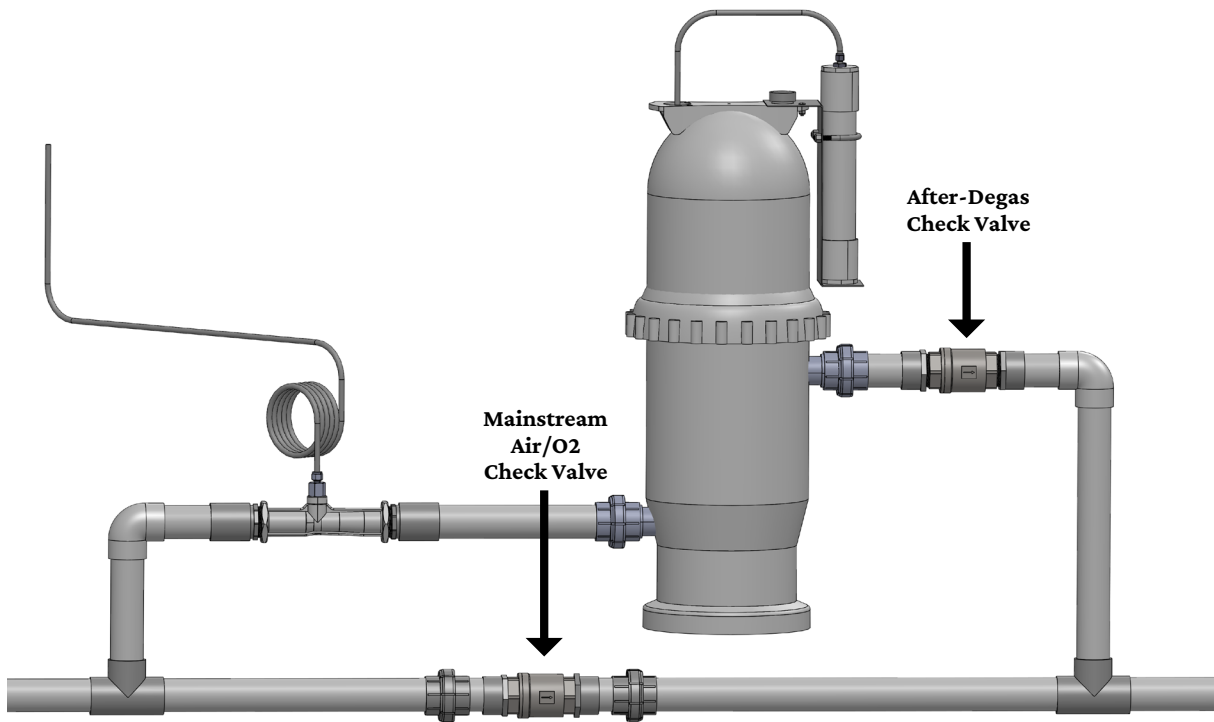
NOTE: The check valves utilized in all systems may look all alike, but the internal springs are very different. There are 3 different spring tensions, and the check valves will have stickers on them to help differentiate. The 3 types of check valves are Mainstream (Air or O₂), and After-Degas. They are pointed out on all of the drawings.

NOTE: The venturi injector is directional, and it is very important to plumb it the correct way. The venturi injector has an arrow molded on to the side of the body, indicating the correct water flow direction.



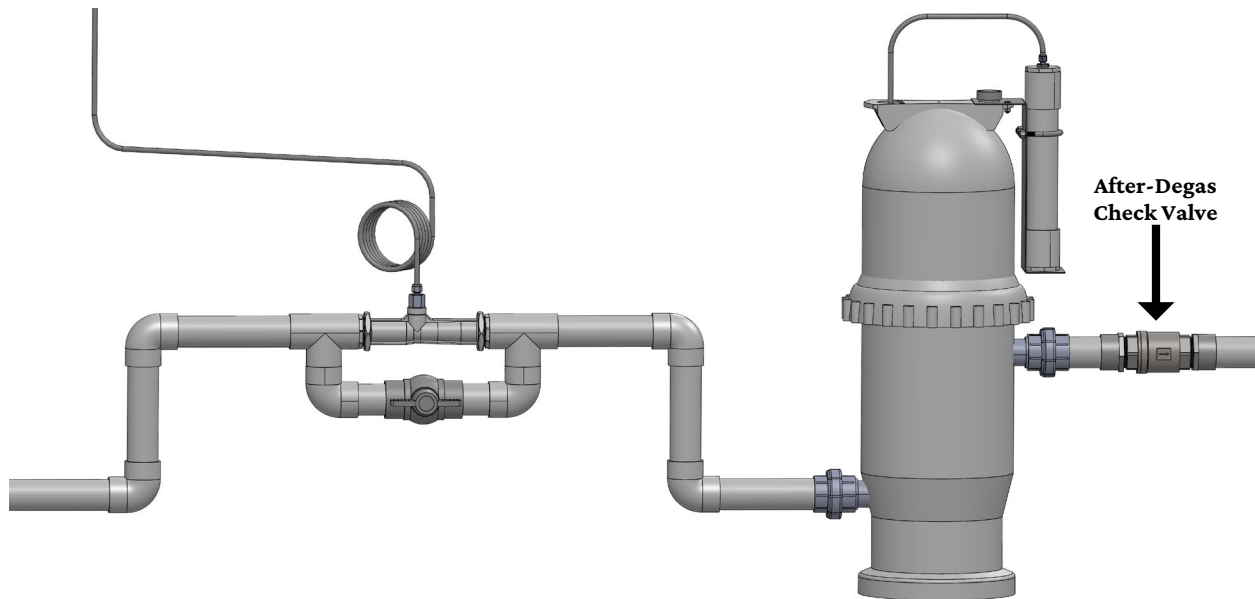
Venturi Injector with Correct Flow Direction

Below is the ozone side-stream and main flow bypass schematic with the Degas/Destroy System in place:



Side Stream Installation

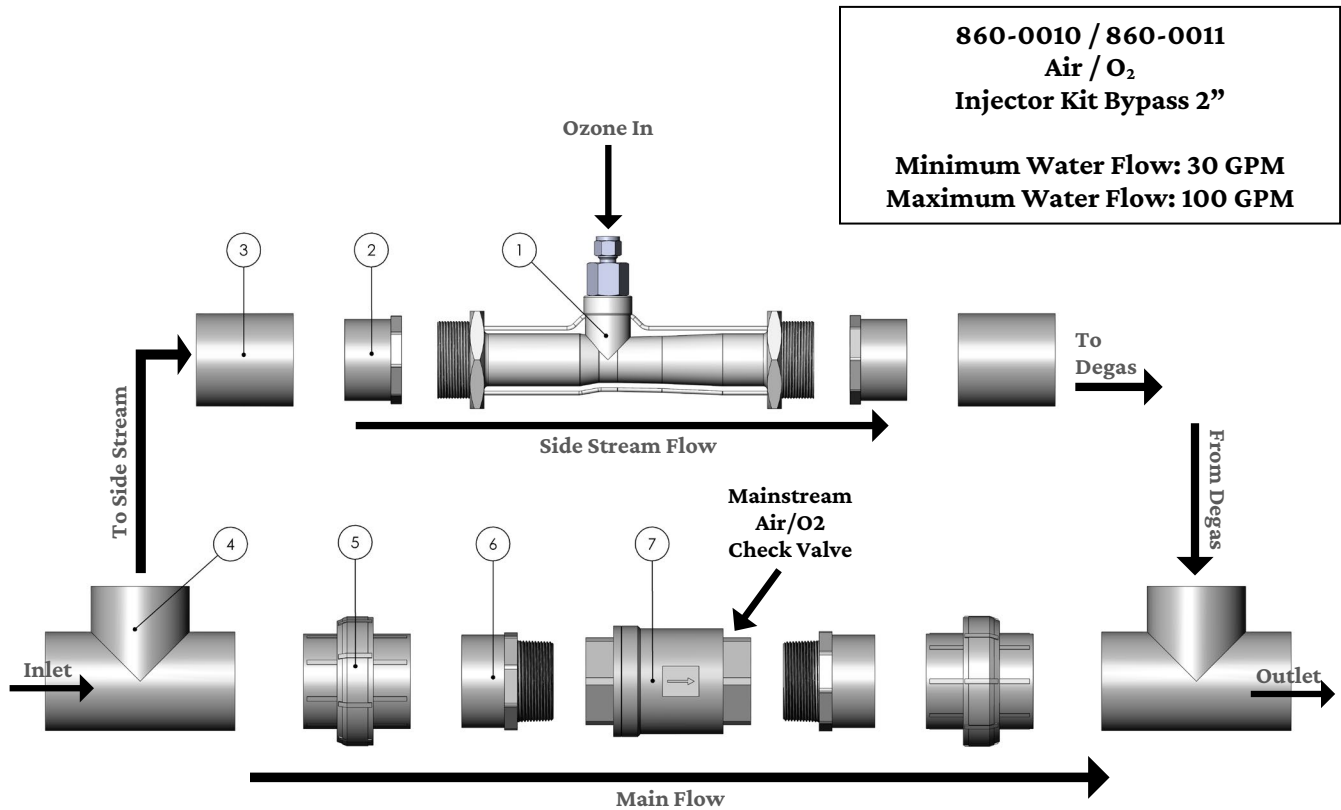
Image is with 2" side stream kit and air Degas/Destroy



Full Flow Installation

Image is with single speed venturi manifold and air Degas/Destroy; maximum water flow through the full flow system is 60 GPM.

2.2.1 Side-Stream Venturi Injector Bypass Kit for Variable Speed Pumps

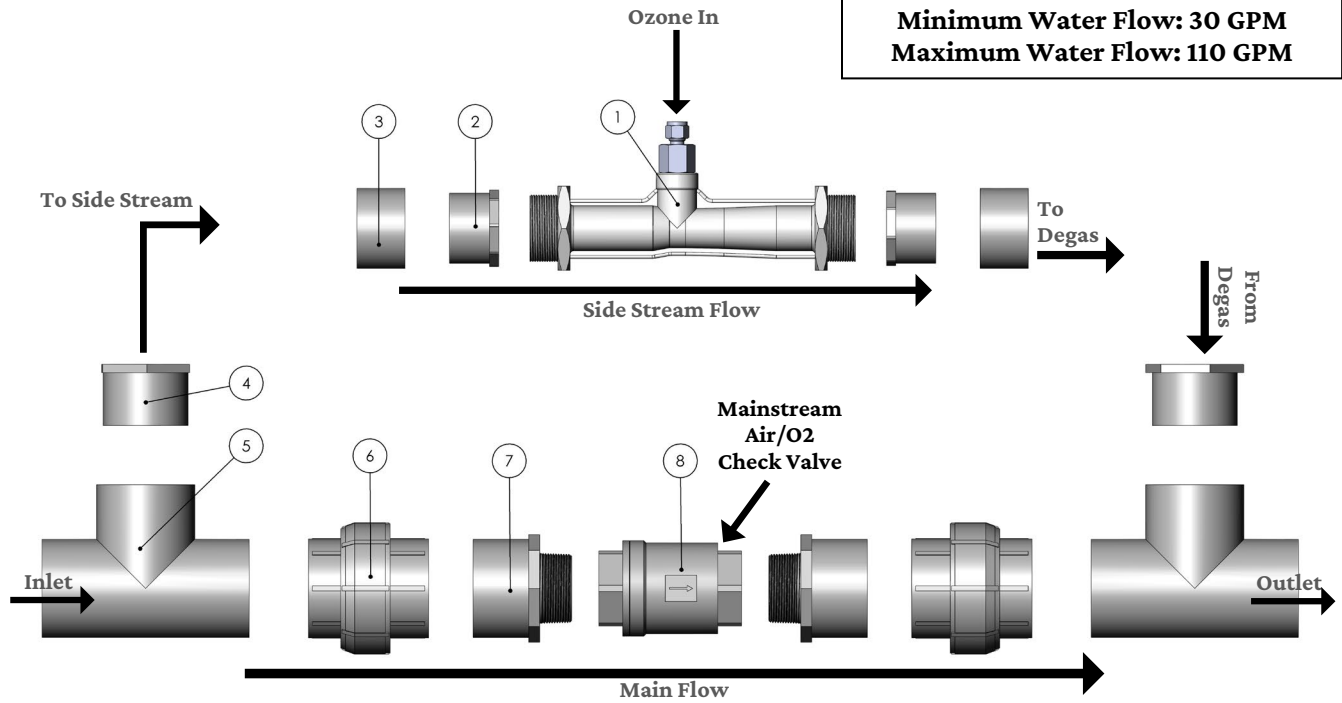


Item Number	Description	Quantity Provided
1	Mazzei 1-1/2" Venturi PVDF	1
2	2"x1.5" FPT Sch40 PVC Bushing	2
3	2" Sch40 PVC Coupler	2
4	2" Sch40 PVC Tee	2
5	2" PVC Union Socket	2
6	2" Socket Female x 2 NPT Male	2
7	Side Stream SS CV w/ Lg Spring	1

NOTE: Minimum flow is 30 GPM and maximum flow is 100 GPM. Horizontal installation recommended. Venturi can be installed vertically with the flow upward (i.e. outlet up), however this may impact performance. Ensure there is a minimum of 9" of 2" straight PVC pipe before and after the Mazzei. Do not install the Mazzei directly into the degas tank.

860-0020 / 860-0021
Air / O₂
Injector Kit Bypass 2.5"

Minimum Water Flow: 30 GPM
Maximum Water Flow: 110 GPM

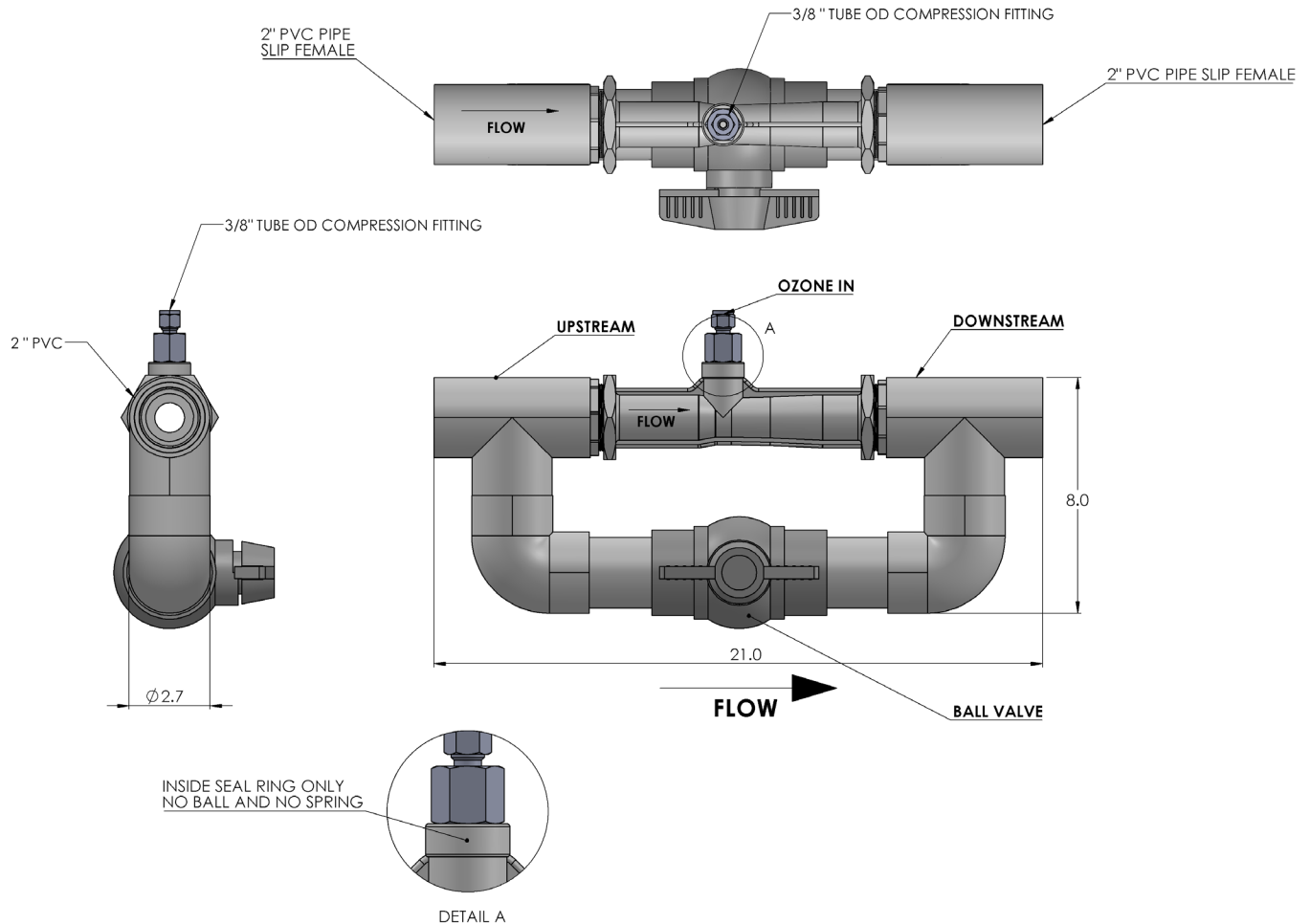


Item Number	Description	Quantity Provided
1	Mazzei 1-1/2" Venturi PVDF	1
2	2"x1.5" FPT Sch40 PVC Bushing	2
3	2" Sch40 PVC Coupler	2
4	2.5"x2" Bushing	2
5	2.5" Sch40 PVC Tee	2
6	2.5" PVC Union Socket	2
7	2" Socket Female x 2 NPT Male	2
8	Side Stream SS CV w/ Lg Spring	1

NOTE: Minimum flow is 30 GPM and maximum flow is 100 GPM. Horizontal installation recommended. Venturi can be installed vertically with the flow upward (i.e. outlet up), however this may impact performance. Ensure there is a minimum of 9" of 2" straight PVC pipe before and after the Mazzei. Do not install the Mazzei directly into the degas tank.

2.2.2 Full Flow Venturi Injector Manifold for Single Speed Pumps

860-0015
Air and O₂
Single Speed Injector Manifold 2"



Venturi

If a side-stream and bypass installation is impossible, the venturi installed in a pre-plumbed 2" PVC manifold with a ball valve to accommodate single speed water flow may be used for low flow systems.

Ball Valve

Inlet water flow through the bypass is restricted by manually adjusting the ball valve so that the proper amount of water flows through the venturi injector to provide the optimum gas flow through the ozone generator. This system is for single-speed pumps only and cannot be used with variable-speed pumps. It supports highly efficient mass transfer of the ozone gas into the water at one speed only.

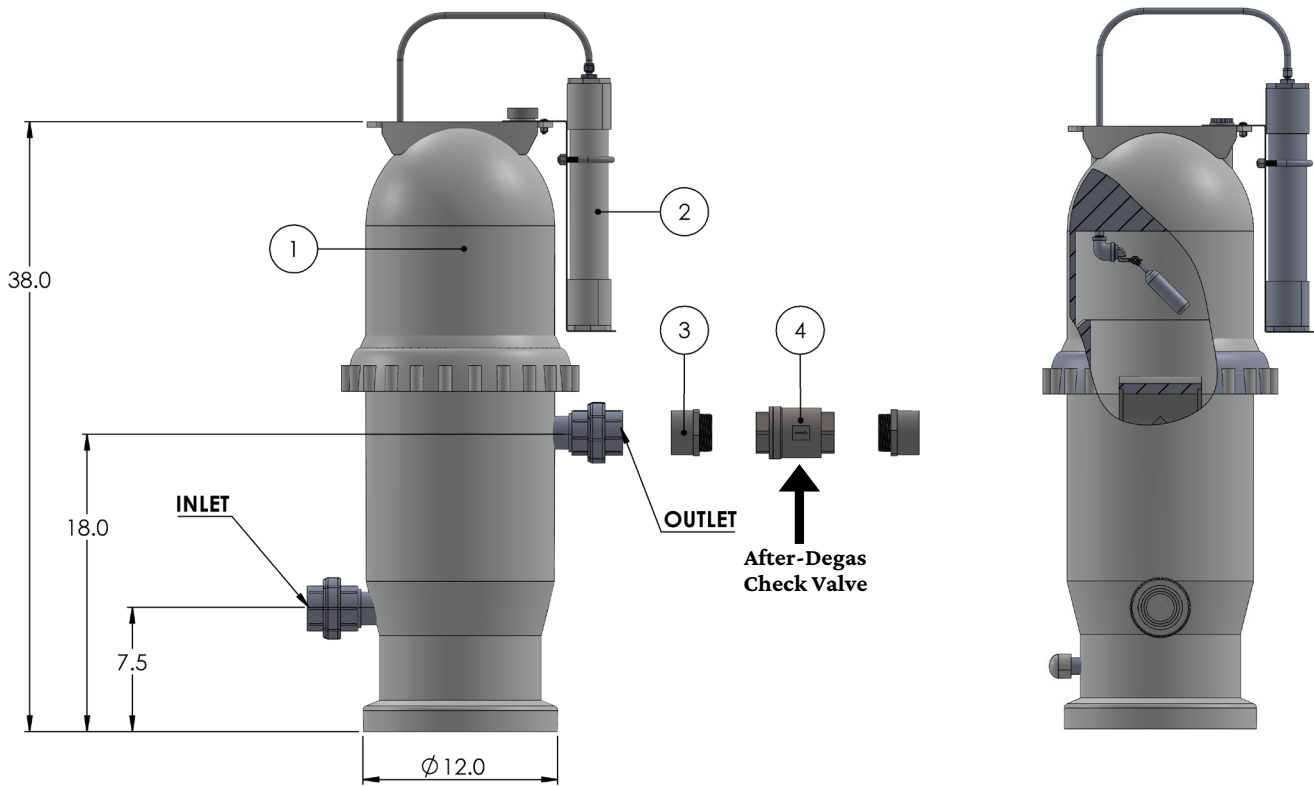
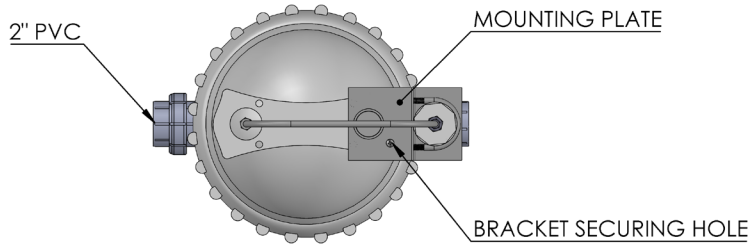
NOTE: Minimum flow is 30 GPM and maximum flow is 50 GPM. Horizontal installation recommended. Venturi can be installed vertically with the flow upward (i.e. outlet up), however this may impact performance. Ensure there is a minimum of 9" of 2" straight PVC pipe before and after the Mazzei.

2.2.3 Specifications

	Injector Bypass Kit 2” Air/O ₂ 860-0010/860-0011	Injector Bypass Kit 2.5” Air/O ₂ 860-0020/860-0021		Single Speed Manifold 2” Air or O ₂ 860-0015
Materials	SCH40 PVC, PVDF (Venturi)			
Minimum Flow Rate	30 GPM			
Maximum Flow Rate	100 GPM	110 GPM	50 GPM	
Inlet and Outlet	2” PVC Pipe			
Minimum Venturi Suction Flow Rate	5 liters per minute (LPM)			
Optimum Venturi Suction Flow Rate	5 liters per minute (LPM) O ₂ Systems 10 liters per minute (LPM) Air only Systems			

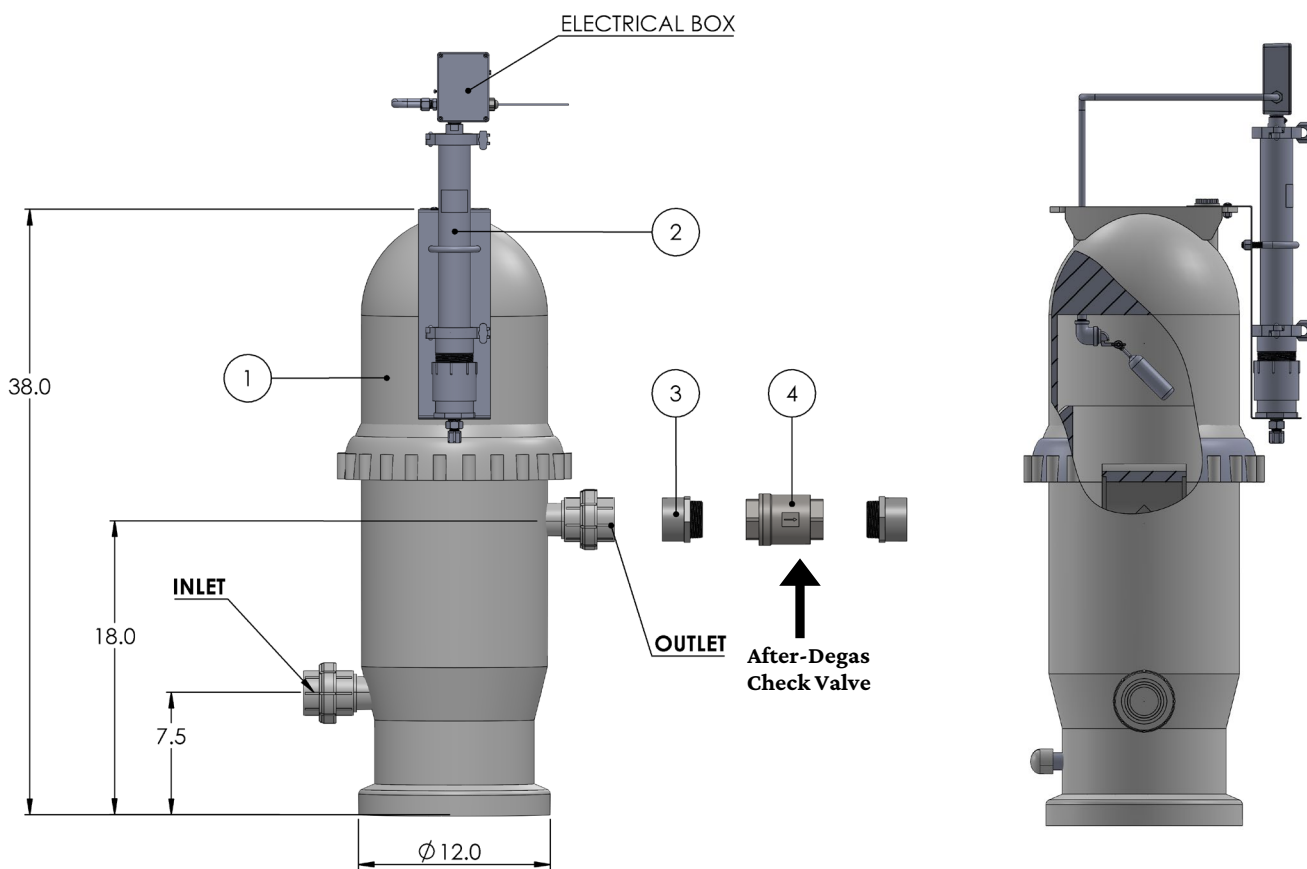
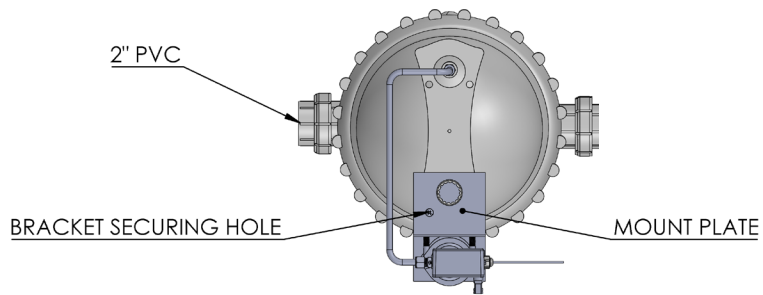
2.3 Ozone Degas and Destruct System

870-0010
Air Degas & Destruct System



Item Number	Description	Quantity Provided
1	Degas Tank	1
2	GAC Ozone Destruct	2
3	2" Socket Female x 2 NPT Male	2
4	2" SS Check Valve	1

870-0015
O₂ Degas & Destruct System



Item Number	Description	Quantity Provided
1	Degas Tank	1
2	Thermocatalytic Ozone Destruct	2
3	2" Socket Female x 2 NPT Male	2
4	2" SS Check Valve	1

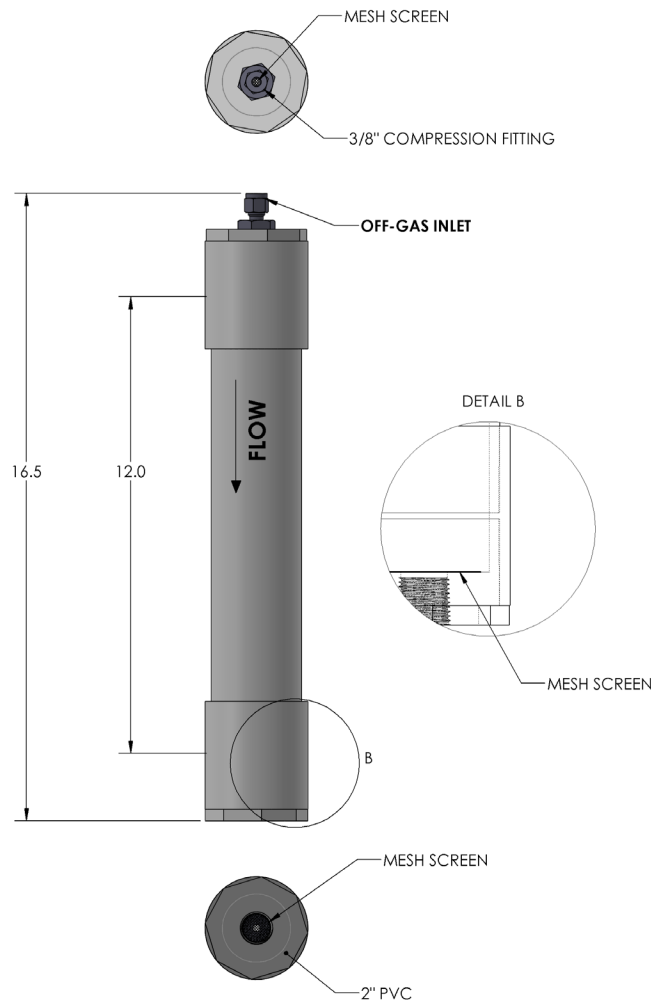
2.3.1 Degas Vessel

The built-in degassing valve (located inside of the Degas Vessel lid) efficiently removes undissolved ozone and air from the water and passes it through the GAC/Carulite[®].

2.3.2 GAC Ozone Destruct (855-0020) – Air Units Only

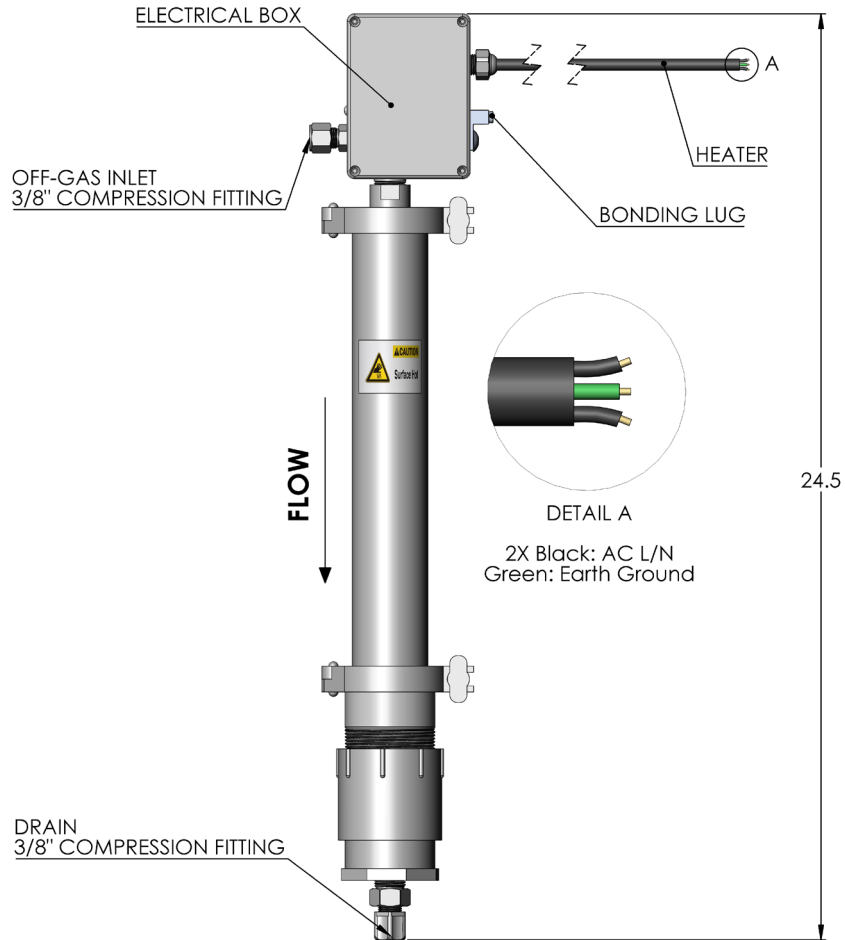
Off-gas from undissolved ozone in water decomposes with granular activated carbon (GAC). After the off-gas passes through the ozone destruct, the ozone off-gas level is below 0.08 ppmv.

NOTE: It is perfectly acceptable (and expected) for a small amount of moisture to exit the bottom of the GAC Destruct cannister. Any pliable clear 3/8" PVC tubing may be attached to the Kynar[®] compression fitting located on the bottom of the destruct to move any moisture away from the equipment pad to a discreet location. Ensure that the end of the tubing stays clear of debris. NOTE: Debris can cause a flow restriction that will back up the whole system.



2.3.3 Thermocatalytic Ozone Destruct (855-0015) – Oxygen Units Only

Off-gas from undissolved ozone in water decomposes with the Carulite® catalyst material; the insertion heater also decomposes ozone gas as well as helps to keep the catalyst dry in the destruct. After the off-gas passes through the ozone destruct, the ozone off-gas level is below 0.08 ppmv. The Thermocatalytic Ozone Destruct is water resistant and consumes 30 Watts.



2.3.4 Specifications Degas/Destruct Assemblies

Part Number	870-0010 (Air)	870-0015 (O ₂)
Materials	SCH40 PVC Granular Activated Carbon (GAC)	Stainless Steel Carulite®
Minimum Water Flow Rate	30 gallons per minute (GPM)	
Maximum Water Flow Rate	60 gallons per minute (GPM)	
Ozone Destruct Inlet and Outlet	3/8" compression fitting	
Ozone Off-Gas Flow Rate	< 20 liters per minute (LPM)	
Operation Temperature	40-110 °F	

2.4 Kistler™ Solid State Electronic Dehumidifier

For use with the MP5Air (included standard equipment)

Patent-pending automatic humidity regulator removes moisture from ambient air to assure that the MP5Air ambient air-fed MicroPlasma Ozone system maintains its validated rated ozone output performance of 2 grams per hour, at any level of relative humidity.

2.4.1 Plumbing

There must not be any exposed electric circuits below the Kistler™. Trapped water will drop due to gravity.

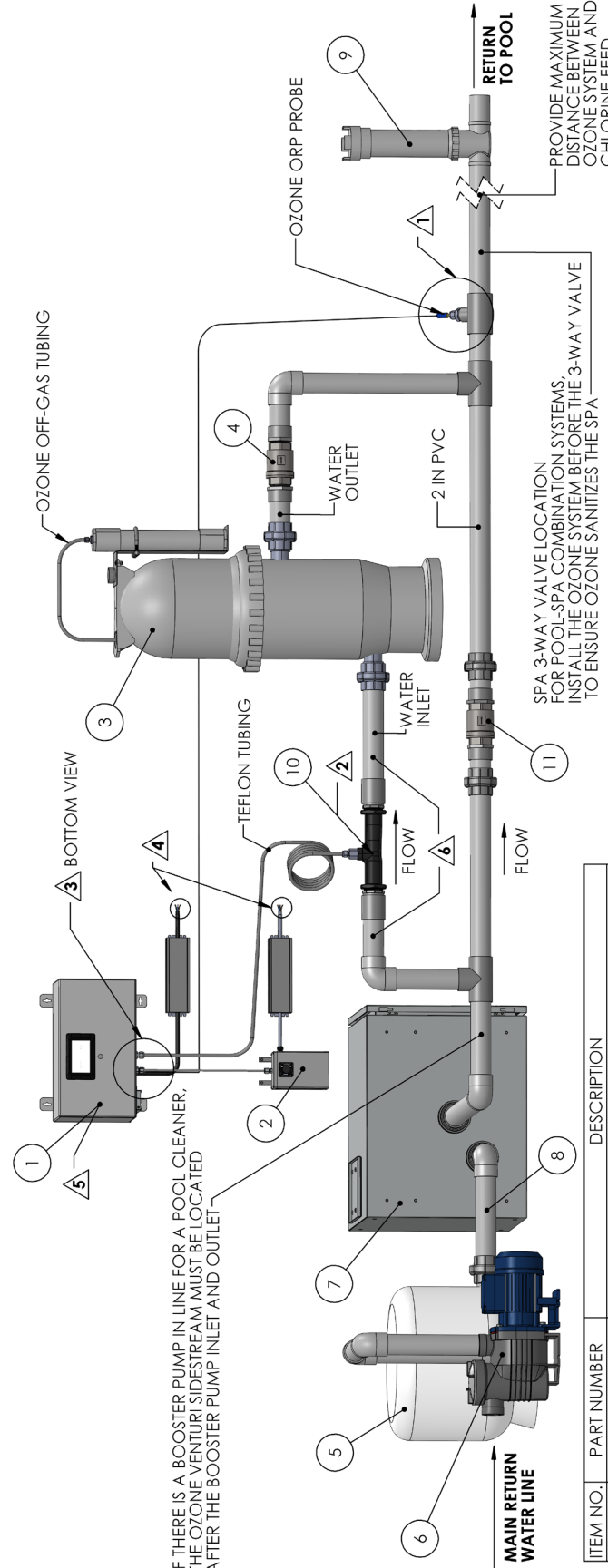
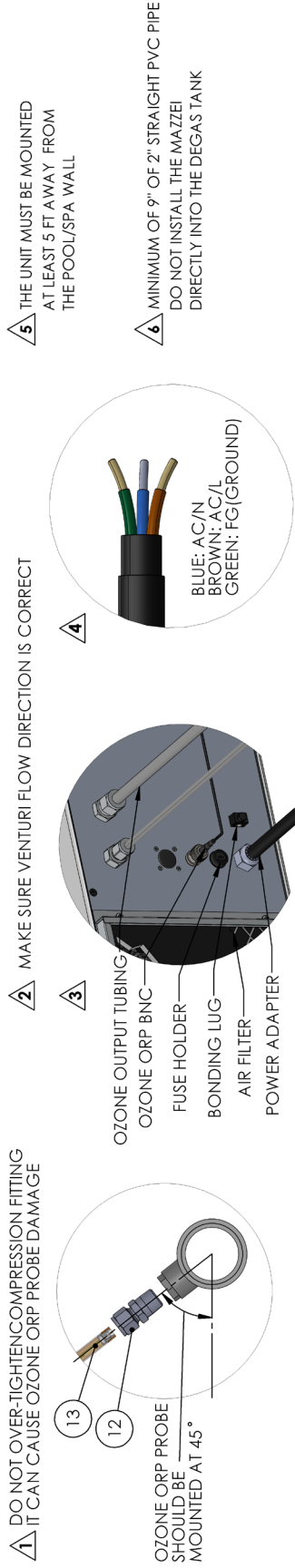
2.4.2 Electrical Hook-up

The Kistler™ must be used with only the provided AC adapter and be wired into the same timer control system that controls the MP5Air (should always be connected with the main recirculating pump controller).

2.4.3 Specifications

Part Number	875-0105
Material	ABS
Voltage / Power	120V; 50/60 Hz / 35 Watts
Tubing Size	1/4" OD Teflon [®] tubing

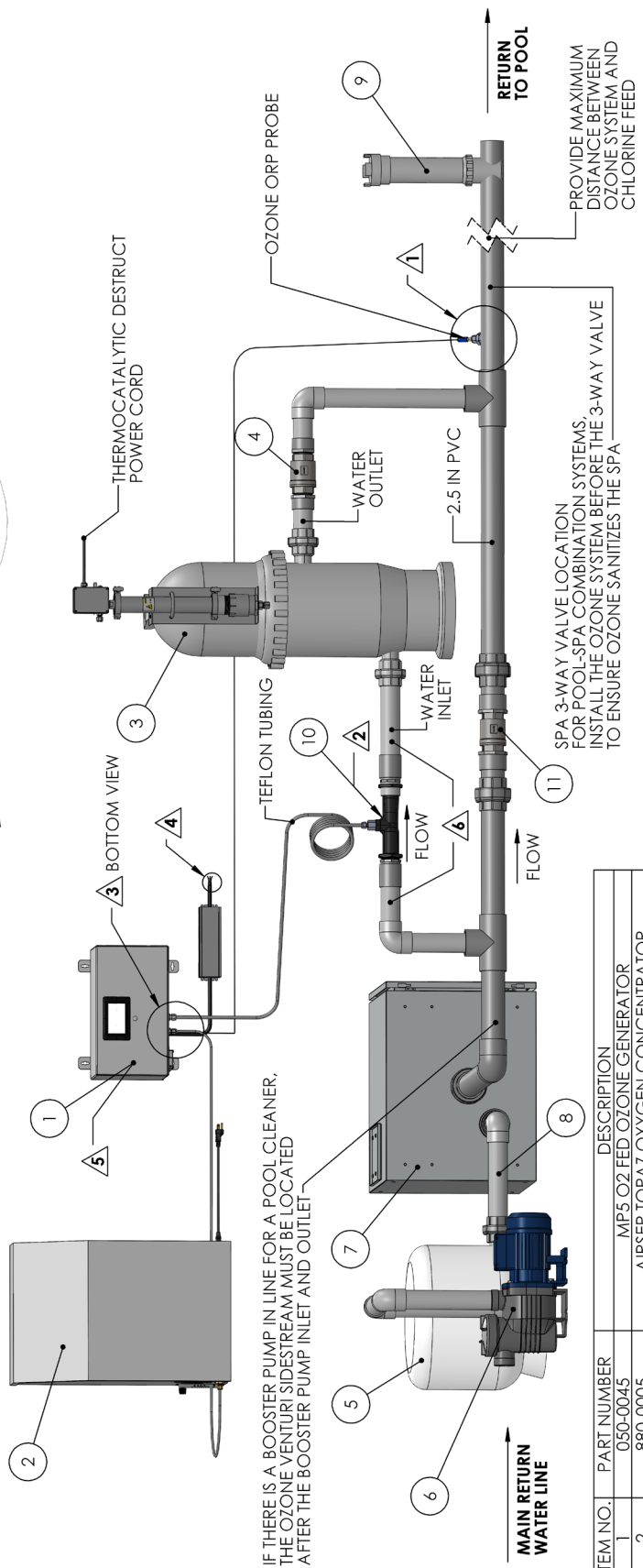
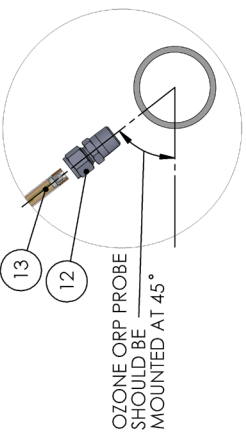
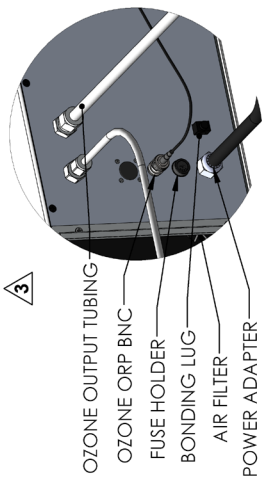
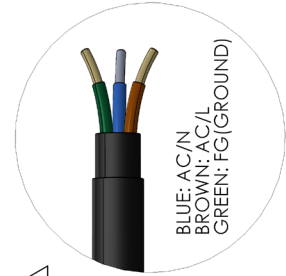
3 INSTALLATION



NOTE: Drawing depicts the GAC Destruct for an air-fed MP5 and 2" plumbing

ITEM NO.	PART NUMBER	DESCRIPTION
1	050-0040	MP5 AIR FED OZONE GENERATOR
2	870-0010	KISTLER™
3	870-0010	AIR DEGAS AND DESTRUCT SYSTEM
4	870-0010	2" SS SPRING CHECK VALVE
5	870-0010	WATER FILTER
6	870-0010	WATER PUMP
7	870-0010	HEATER
8	870-0010	LOCATION FOR CHLORINE ORP PROBE (IF USED)
9	870-0010	CHLORINE FEEDER (OPTIONAL)
10	870-0010	MAZZEI 1-1/2" VENTURI PVD/F
11	870-0010	CHLORINE FEEDER (OPTIONAL)
12	870-0010	SIDE STREAM SS CV W/ LG SPRING
13	870-0010	1/2" COMP ADAPTER FOR SX ORP
14	870-0010	SX ORP PLATINUM TIP ORP PROBE

- 1 DO NOT OVER-TIGHTEN COMPRESSION FITTING IT CAN CAUSE OZONE ORP PROBE DAMAGE
- 2 MAKE SURE VENTURI FLOW DIRECTION IS CORRECT
- 3 THE UNIT MUST BE MOUNTED AT LEAST 5 FT AWAY FROM THE POOL/SPA WALL
- 4 MINIMUM OF 9" OF 2" STRAIGHT PVC PIPE DO NOT INSTALL THE MAZZEI DIRECTLY INTO THE DEGAS TANK



NOTE: Drawing depicts the Thermocatalytic Destruct for an Oxygen-fed MP5/10 and 2.5" plumbing

ITEM NO.	PART NUMBER	DESCRIPTION
1	050-0045	MP5 O2 FED OZONE GENERATOR
2	880-0005	AIRSEP TOPAZ OXYGEN CONCENTRATOR
3	870-0015	O2 DEGAS AND DESTROY SYSTEM 2" SS SPRING CHECK VALVE
4		WATER FILTER
5		WATER PUMP
6		HEATER
7		LOCATION FOR CHLORINE ORP PROBE (IF USED)
8		CHLORINE FEEDER (OPTIONAL)
9		MAZZEI 1-1/2" VENTURI PVDF
10		SIDE STREAM SS CV W/LG SPRING
11		1/2" COMP ADAPTER FOR SXORP
12		SXORP PLATINUM TIP ORP PROBE
13		

3.1 Parts List

- MP5/10 Ozone Generator
 - AC Adapter (MP5/10)
 - Extra replacement fuse
 - 15' 3/8" OD Teflon[®] ozone gas supply tubing (compression fittings pre-installed on both ends)
 - ORP probe with 15' M-F BNC cable and PVC adapter
 - 6' 1/4" OD Teflon[®] oxygen gas supply tubing (MP5O₂/MP10 only, compression fitting pre-installed on the end that attaches to the ozone generator)
 - Kistler[™] (for MP5Air only)
 - 1/4" OD Teflon[®] air supply tubing – 18" long (compression fitting pre-installed on the end that attaches to the ozone generator)
 - 1/4" OD Teflon[®] air supply tubing – 6" long (use to attach the inline air filter between the Kistler and the ozone generator)
 - Inline Air Filter
 - AC Adapter (Kistler)
 - Oxygen Concentrator (for MP5 Oxygen and MP10 only)
 - AirSep Topaz Model No. AS013-105 (MPO₃ P/N: 880-0005)
 - Oxygen Concentrator Parameters:
 - 93% Purity at -73°C Dew Point
 - 5 LPM Gas Flow
- Air or Oxygen System Injector Side-Stream Assembly Kit for 2" or 2.5" Bypass or Injector Manifold (single speed, when a Side-Stream cannot be used) for low flow systems only
- Degas and Destruct System (O₂ system version and Air system version)
 - 2" spring Check Valve

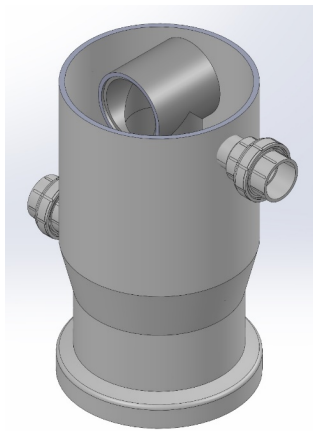
Recommended parts (not included):

- Assorted Schedule 40 PVC elbows, sweeps and unions as needed
- 3/8" Tube OD Stainless Steel Needle Valve (MPO₃ P/N: 19080101)
- 2" PVC Schedule 40 pipe as needed and PVC cleaner/glue
- Wall/floor anchors or suitable hardware to attach the degas tank and ozone generator to mounting surfaces, preferably stainless steel
- Concrete pads for stable mounting surfaces

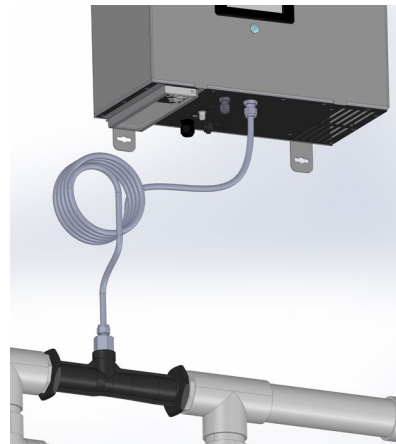
NOTE: Plumbing parts should be installed by a qualified technician and electrical connections should be made by a licensed electrician.

3.2 Venturi and Degas Tank Plumbing

1. Upon unpacking the Degas tank, unscrew and open up the top half dome to make sure that the float valve is vertically aligned and that the openings of the standing PVC tee are perpendicular to the INLET/OUTLET fittings. Reattach the top and secure it tightly. See images below.
2. Mount the Venturi Assembly and the Degas tank at least 5 feet away from the pool return, using 2" diameter schedule 40 PVC pipe. Use long-sweep elbows when possible. Follow the plumbing schematic and procedures located in this manual that match your exact system.
3. Fasten the Degas tank to the floor or concrete pad using mounting holes and suitable fasteners (not included) ensuring that that it is level, vertical and stable.
4. Make sure the arrow on the Venturi and venturi accessories match the water flow direction and that it is mounted horizontally. The Venturi can be installed vertically with the flow upward, but this may impact performance. Follow the plumbing schematic and procedures located in this manual that match your exact system.
5. **Do not cut the provided 15' 3/8" OD Teflon[®] tubing for ozone output to the Venturi. Loop the tubing as shown in the image below instead (may be secured with zip ties).**
6. The Degas tank OUTLET is higher up on the cartridge than the INLET and is marked.
7. If there is a chlorine feeder, install it at least 5 feet downstream of the Degas tank. Always install the Degas tank **before** the chlorine feeder. Refer to the general plumbing schematic located in this manual.
8. If there is a booster pump for a pool cleaner, it must be installed **before** the Venturi or Venturi Side-Stream and the chlorine feeder. Refer to the general plumbing schematic located in this manual.



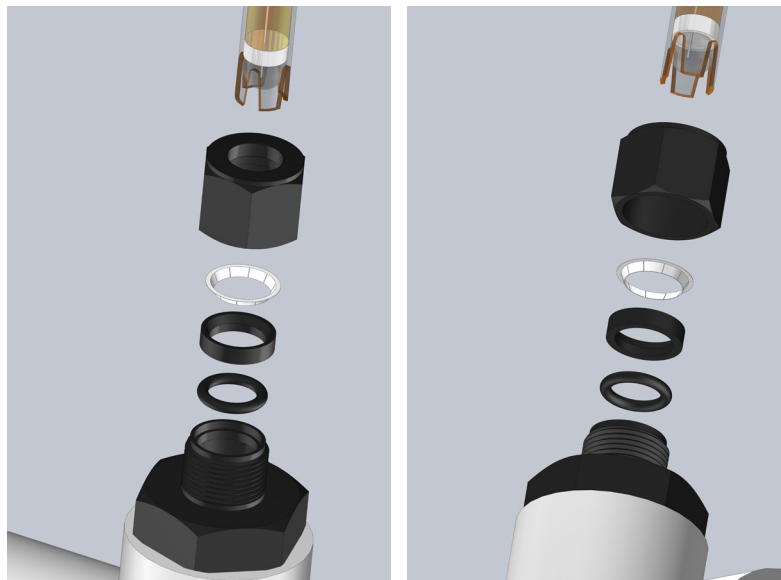
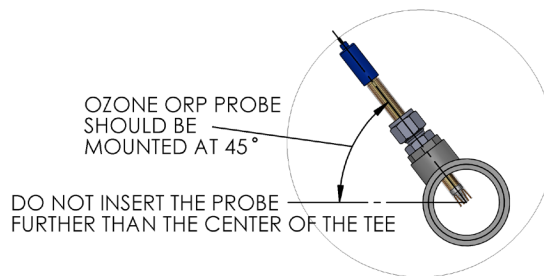
Standing PVC tee perpendicular to INLET/OUTLET



15' 3/8" OD Tubing Loop

3.3 ORP Probe Installation

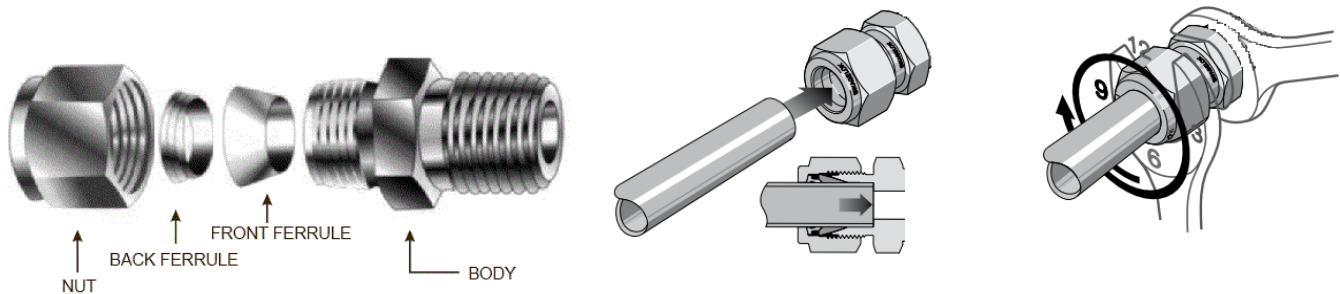
1. Ensure that all of the ozone system components are securely bonded to the pool's equipotential bonding grid prior to installing the ORP probe to the tee and connecting it to the BNC connector of the ozone generator.
2. Install the PVC adapter for the ORP probe in the main plumbing line after the ozone side-stream reconnects to the main flow and ensure that the ORP probe is 45° above horizontal. **Do not over-tighten the ORP probe. Do not install the probe too deep into the tee; pushing it too far against the opposite side of the pipe may damage the electrodes.**
3. The ORP probe can also be installed directly into the return water line. Unscrew the black adapter from the PVC tee and tap a 1/2" MPT hole at 45° above horizontal. Use thread sealant when installing the ORP probe into the return water line. **Do not over-tighten the ORP probe. Do not install the probe too deep into the tee; pushing it too far against the opposite side of the pipe may damage the electrodes.**
4. **NOTE: Save the ORP probe protective bottle for future storage, or for any time the probe is removed from the water. Allowing the ORP probe to dry out may cause irreversible damage to the probe. For initial installation, keep the probe protected in the bottle until right before filling the pool with water.**



NOTE: Ensure the ozone generator has been properly bonded with the 8 AWG solid copper wire to the swimming pool's equipotential bonding grid **prior** to connecting the ORP probe cable to the ozone generator. Failure to do so may cause stray current interference and can damage the ORP probe and the ORP monitor or create an erratic or false ORP reading.

3.4 MP5/10 Ozone Generator Mounting

1. Unpack the MP5/10 from its custom-designed packaging and become familiar with the contents. Save the complete packaging for re-use in the event any potential return to the factory for service is required.
2. Mount the MP5/10 where it is protected from driving rain or direct sunlight. A protective awning may be used. Install the unit on a clean and suitable vertical surface (such as a wall), and make sure the unit is mounted upright and level, with the screen accessible. Use No.8 rounded stainless steel screws that are suitable for the intended mounting location surface, such as wood, metal, concrete, plastic or composite so that the unit is secure. This area must remain dry and free of standing water.
3. The unit should be mounted at least 5 feet away from the pool/spa wall.
4. The unit should be a minimum of 5 feet away from the Degas tank.
5. A minimum of 8 AWG solid copper wire or larger must be connected to the bonding lug and properly bonded to the equipotential bonding grid.
6. Mount the Kistler™ on the same vertical surface as the MP5Air below the MP5Air using the included 18" tubing to the input of the MP5Air
7. Both the MP5Air and the Kistler™ must be electrically connected to the pool's existing controls (timer, etc.), to ensure operation in conjunction with the main pool pump.
8. All electrical connections must be connected to an auto-fault checking Ground Fault Circuit Interrupter (GFCI) protected circuit. Recommended Class C GFCI with 20 mA trip level.



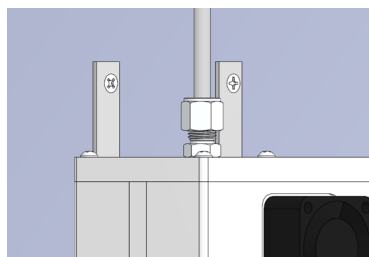
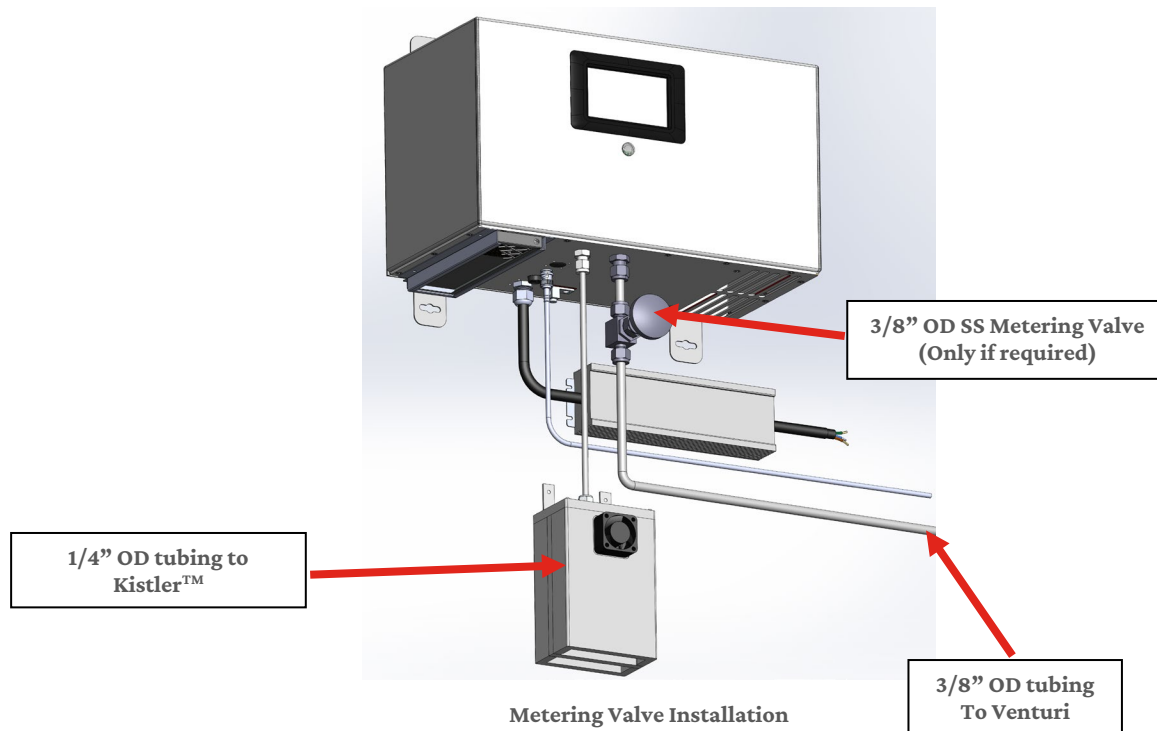
Gas Fitting Installation

3.5 Ozone Gas Plumbing (MP5Air Only)

1. Using the provided 3/8" OD Teflon[®] tubing, connect the OUTPUT fitting from the Ozone Generator to the Venturi.
2. The tubing cannot be kinked or bent at extreme angles or the unit will not function.
3. Always use a backing wrench when tightening compression fittings to avoid twisting the entire fitting which can ruin the seal. Avoid over tightening fittings.
4. Insert the provided 6" X 1/4" OD Teflon[®] tubing as far as it will go into the elbow compression fitting on the top of the Kistler and tighten the compression fitting. Do not use excessive force while tightening the compression fitting. Hand tight is sufficient.

5. Slide the push-fit inline filter onto the other end of the tubing. Push it in as far as possible and it will lock the tubing in place. Make sure the arrow on the inline filter points in the direction of the flow to the ozone generator.
6. Attach the supplied 18" X 1/4" OD Teflon[®] air supply tubing (with compression fitting pre-installed on the end that attaches to the ozone generator) into the open end of the inline filter and connect the Kistler™ to the Input of the Ozone Generator.
7. The tubing cannot be kinked or bent at extreme angles or the unit will not function.
8. Always use a backing wrench when tightening compression fittings to avoid twisting the entire fitting which can ruin the seal. Avoid over tightening fittings.
9. In the event that high vacuum is creating too much gas flow through the MP5Air, the addition of a needle valve (metering valve) downstream of the ozone generator (between the ozone generator and the point of injection into water), may be required. **This is only required if the vacuum is higher than necessary.**

NOTE: All MP5/10 Ozone systems have a gas flow sensor, a vacuum sensor, and a vacuum relief valve. It is unlikely, but if the gas flow overcomes the vacuum, the system will not operate, so pay close attention to the flow-to-vacuum adjustment.



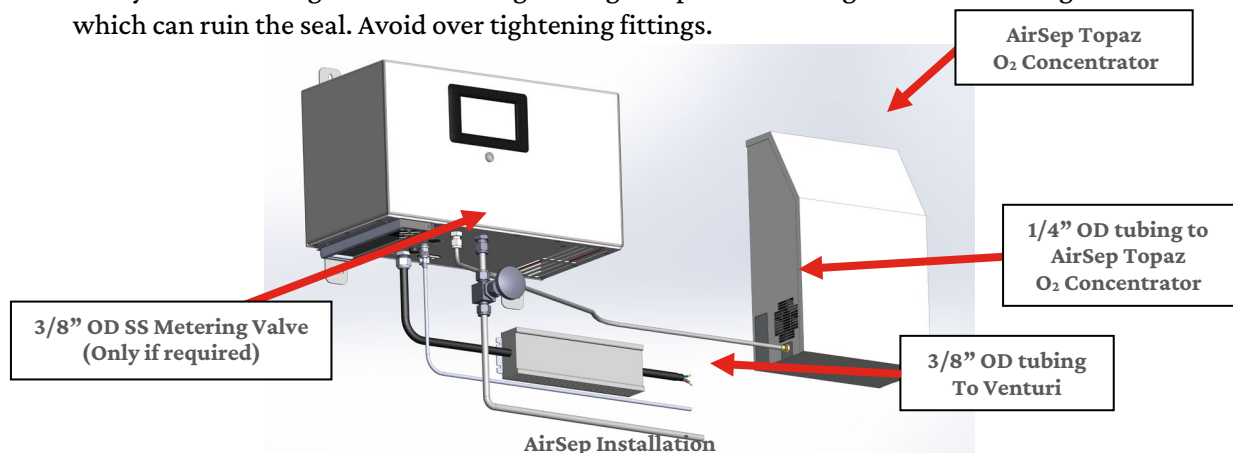
Kistler™ Installation

3.6 Oxygen Feed Gas and Ozone Gas Plumbing (MP5O₂ and MP10 Only)

1. The MP5O₂ (050-0045) and the MP10 (100-0205) can **only** operate with oxygen feed gas. The MP5Air (050-0040) utilizes the Kistler™ SSED and is not used with oxygen.
2. Care must be taken to provide the proper oxygen system for the MP5O₂ and MP10. Use the recommended model or ensure that an oxygen concentrator meets the parameters in Section 3.1.
3. Install the AirSep Topaz according to the manufacturer’s instructions (for an online manual: <http://files.chartindustries.com/MNO12-2c%20Topaz,Topaz-,Topaz%20Ultra%20March%202012.pdf>) and set the gas flow accordingly **before** connecting to the Ozone Generator. Operating the AirSep unit far from the recommended values will damage the AirSep unit. Both the MP5O₂ (or MP10) and the AirSep must be electrically connected to the pool’s existing controls (timer, etc.), to ensure operation in conjunction with the main pool pump.

For the AirSep Topaz, according to the AirSep Manual page A1, the flow should be set to **5 LPM (at the center of the ball)** **before** hooking up to the Ozone Generator (when connected, normal flow will range from **4-5 LPM**). **NEVER ADJUST THE AirSep FLOW METER WHILE CONNECTED TO OZONE SYSTEM. ALWAYS ADJUST IT WHILE RUNNING INDEPENDENTLY.**

10. The AirSep gas flow meter valve is normally all that is required to operate the system in its optimal parameters. However, some installations may require the addition of a needle valve (metering valve) downstream of the ozone generator (between the ozone generator and the point of injection into water); this is usually only required if the vacuum is higher than necessary, or if greater fine-tuning is desired. **NOTE: All MP5/10 Ozone systems have a gas flow sensor, a vacuum sensor and a vacuum relief valve. It is unlikely, but if the gas flow overcomes the vacuum, the system will not operate, so pay close attention to the flow-to-vacuum adjustment. Flow restriction in the oxygen gas line may cause a system fault. See Section 5.2.4**
4. With the Ozone Generator power disconnected, install a 3/8” SS needle valve, referred to as “metering valve”, on the Ozone Generator’s ozone gas output tubing line. It is best to install the metering valve within several inches from the bottom of the Ozone Generator.
The input side of the metering valve should go to the Ozone Generator, and the output side of the metering valve should go to the Venturi. Utilize only the supplied 3/8” OD Teflon[®] tubing.
5. Connect the AirSep Topaz oxygen generator to the Input of the Ozone Generator using 1/4” OD Teflon[®] tubing and power up both the AirSep unit and the Ozone Generator. Adjust the metering valve (**NOT** the AirSep flow control) so that the flow on the AirSep unit matches the value it was set to in Step 3.
6. The tubing cannot be kinked or bent at extreme angles or the unit will not function.
7. Always use a backing wrench when tightening compression fittings to avoid twisting the entire fitting which can ruin the seal. Avoid over tightening fittings.



3.7 GAC Ozone Destruct (Air Only)

This will come pre-installed on the Degas tank

1. Mount the Destruct mounting plate on the Degas tank and attach the Destruct unit which is held in place with a U-bolt. Finger-tighten bolts.
2. Verify all tubing is tightly connected and no tubing can easily pull out of its fitting.

3.8 Thermocatalytic Ozone Destruct (O₂ Only)

This will come pre-installed on the Degas tank

1. Mount the Destruct mounting plate on the Degas tank and attach the Destruct unit which is held in place with a U-bolt. Finger-tighten bolts.
2. Verify all tubing is tightly connected and no tubing can easily pull out of its fitting.
3. Plug the Destruct into a grounded 120VAC outlet. Do not touch the surface of the Destruct as it will become hot.
4. A minimum of 8 AWG solid copper wire or larger should be connected to the bonding lug and properly bonded to the equipotential bonding grid.

3.9 Below Grade and Underground Vault Installation

MPO3 Ozone systems may be installed below the water level, providing the following parameters are met:

1. **The environment complies with numbers 1 through 7 in section 3.4 of this manual.**

For underground vault installation, MPO3 Ozone systems may be installed below the water level, providing the following parameters are met:

1. **The environment complies with number 1 through 7 in section 3.4 of this manual.**
2. The vault must be within a temperature range of 40°F to 122°F
3. The unit needs to be protected from freezing
4. Must have adequate ventilation (not less than 6 air changes per hour)
5. It must meet building code parameters for an underground utility vault
6. Vault needs to be accessible for observation of the performance of the ozone system

4 OZONE SYSTEM SIZING

All MicroPlasma Ozone Systems are listed by NSF International under NSF/ANSI Standard 50 for use as a Supplemental Treatment for commercial swimming venues. System sizing for **commercial applications** (validated to provide greater than 99.9999% reduction of *pseudomonas aeruginosa* and *enterococcus faecium*) is listed below.

4.1 Commercial Pool Sizing

MP5Air at 1.6 grams/hour ozone output is rated up to 50 GPM for commercial swimming venues.

MP5O₂ at 5 grams/hour ozone output is rated to 150 GPM for commercial swimming venues.

MP10at 10 grams/hour ozone output is rated to 300 GPM for commercial swimming venues.

There are other deciding factors that determine the ozone sizing for commercial swimming venues. Please call MPO3 to help decipher these factors and provide the correct sizing for commercial applications.

The built-in ORP monitor on each ozone generator measures ozone's performance in the water with a read-out greater than 750 mV, which is measured directly after the ozone side-stream remixes in the main water flow.

4.2 Residential Pool Sizing

Residential pools have substantially lower oxidation and sanitation requirements than commercial pools. The MP5Air produces an ozone output of 2 grams per hour. This dose may be appropriate for residential pools up to 50,000 gallons and provide much better water quality and significantly reduced chlorine consumption. However, for optimum performance, impeccable water quality and the most reduction of chlorine requirements, the following dose chart is applicable:

Up to 20,000 gallons	MP5Air
20,000 - 40,000 gallons	MP5O ₂
Over 40,000 gallons	MP10

Following this sizing chart will provide the best performance and water quality with the absolute minimum of required chlorine and other pool chemicals. **However**, beyond the minimum ozone sizing listed above, it is perfectly acceptable and advantageous to determine the desired outcome of the use of ozone in a residential pool based on pool owner preference. In this case, bigger is better. Any of the MPO3 ozone system sizes can be installed on a much smaller pool than listed above. None are too large, and the determining factor is water quality and chemical reduction. As an example, an MP10 can be used on a 15,000-gallon residential pool and the water quality is spectacular and the chlorine use is brought down to an absolute minimum.

5 MP5 OZONE GENERATOR OPERATION

5.1 Unit Start-Up and Home Page

Upon powering up the MP5/10, the user will be greeted with the MicroPlasma Ozone logo. After a few seconds, the screen will automatically proceed to the Home Page.

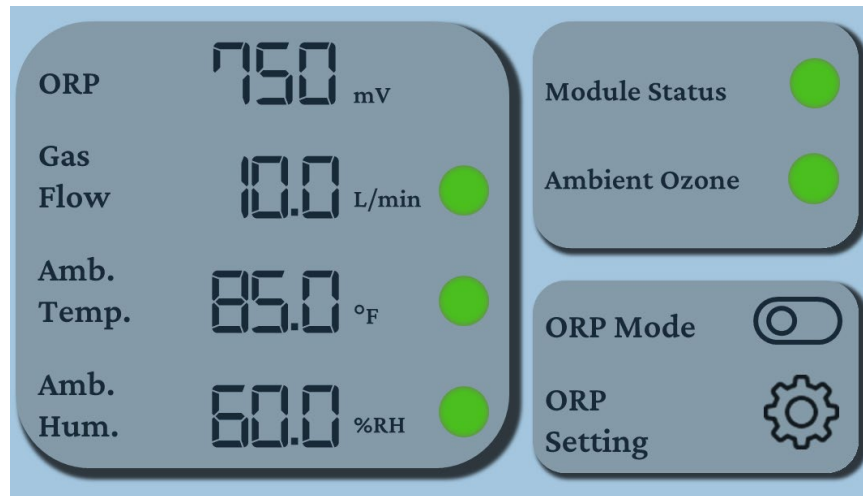


Example: Start-Up Screen

The Home Page is the default page when the unit is running and shows all the relevant information for system operation. Once the unit detects the vacuum generated by the venturi, ozone production will automatically start. If there is no flow detected, there will be no ozone produced.

During normal start-up when the main timer activates the pool system (which must include the MicroPlasma Ozone system and the Kistler[™]), there is a five-minute warm-up for the ozone system start which is facilitated by the systems control electronics. This ensures the ozone system has reached steady state and is ready to operate. During this five-minute warm-up, the Home Screen will still show all information for system operation, and all indicators will be GREEN although ozone is not being produced. After five minutes, the system will automatically start producing ozone as long as all the parameters are met.

NOTE: If the ambient humidity is very high, the system will delay start-up for a longer time period. This time range is commensurate to the potential level of moisture to be removed. The delay characteristics require that the system waits for one-minute intervals and attempts to start; this process continues every minute until steady state has occurred. Once the system becomes operational, the whole system will stay protected from humidity ingress by the Kistler[™] or oxygen concentrator. During times of heavy rain, especially while the system is not operating (based on timer settings), moisture may build up in the ozone generating cell. The system may take longer to start during these times. It is important to know that operating any ozone system while there is excessive moisture, will diminish the ozone output. In addition, it will also contribute to fouling the ozone generating cell, which significantly diminishes its functionality. The MicroPlasma Ozone system while protected by the Kistler[™] or oxygen concentrator will always provide the rated ozone output of 2 grams per hour (5 grams for the MP5O₂ and 10 grams for the MP10).



Example: Home Page with ozone production

On the Home Page the user will be able to control the following:

- ORP Mode On/Off – Activates ORP Mode (details in Section 4.3)
 - *Leave ORP Mode ON to control the ozone set-point (this setting is normally only for commercial pools; residential pools will benefit by leaving the control mode to the “Off” position, which will provide the optimum ozone production, further reducing chlorine use)*

The following information will be displayed as well:

- ORP (mV)
- Gas Flow Rate (L/min)
- Unit Temperature (°F)
- Relative Humidity (% RH)
- Ozone Module Status
- Ambient Ozone Concentration (ppm)
 - *This is a safety measure for gaseous ozone leak potential inside the unit*

5.2 Error Indicators

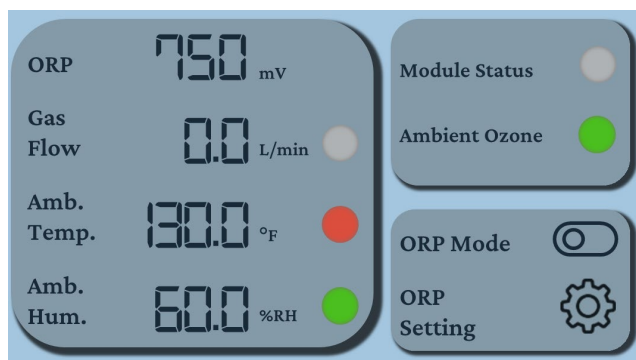
There are small circle indicators to the right of Temperature, Ambient Ozone, Ambient Humidity, Gas Flow, and Ozone Module Status. For the first two, (excluding Ambient Humidity, Gas Flow, and Ozone Module Status) the indicator will either be **GREEN** or **RED**. For Ambient Humidity, the indicator will ALWAYS be **GREEN**. For the last two (Gas Flow and Ozone Module Status), the indicator could be **GRAY**, **GREEN** or **RED**.

GREEN indicates that the unit's operating conditions are normal, **GRAY** indicates that the unit is on standby for operating conditions to be met, and **RED** indicates that one or more of the following conditions have occurred:

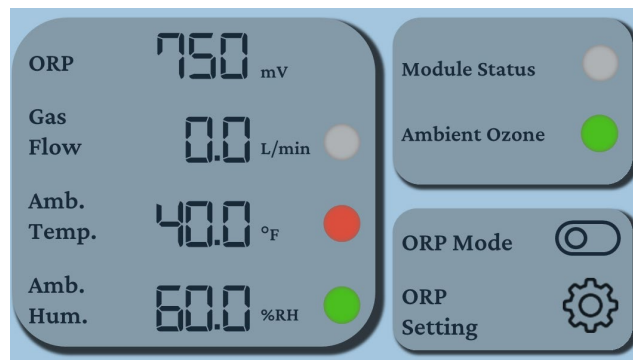
Gas Flow	Blockage causing gas flow restriction or low Venturi suction (vacuum)
Amb. Temp.	Temperature greater than 122°F or below 40°F (auto-reset at 45°F)
Ambient Ozone	Ambient ozone concentration greater than 1.0 ppm (gas ozone leak)
Ozone Module Status	Module cooling fan error or module error or wet module

If any of those 3 thresholds are crossed, the unit will automatically **STOP** ozone production. The user *must reassess the unit's working condition before resuming proper operation*. Refer to the Troubleshooting Table in Section 6.1 for guidelines on how to bring the operating conditions back to normal to resume ozone production.

5.2.1 Ambient Temperature Interlock



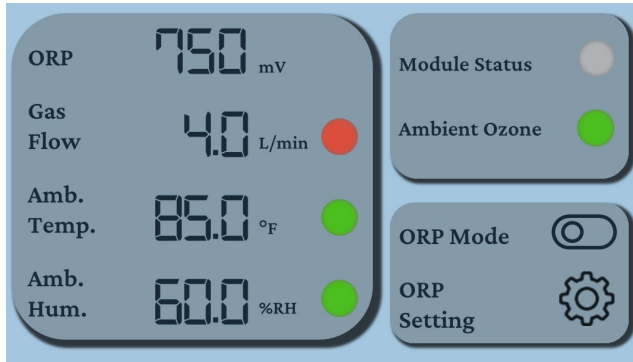
Example: High Ambient Temperature Interlock



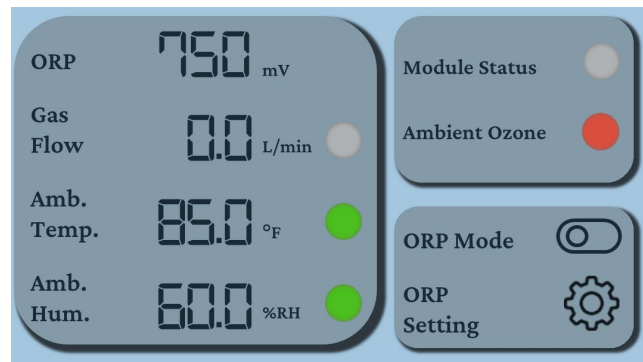
Example: Low Ambient Temperature Interlock

If the ambient temperature is above 122°F or below 40°F, the Ambient Temperature indicator will turn **RED** and stop ozone production. If temperature is high, cooling fan will keep running and the unit will start producing ozone again when the temperature drops below 122°F. Once the temperature drops below 40°F and the unit stops producing ozone, the temperature has to reach **45°F** before the unit starts producing ozone again.

5.2.2 Gas Flow and Ambient Ozone Interlock



Example: Gas Flow Interlock

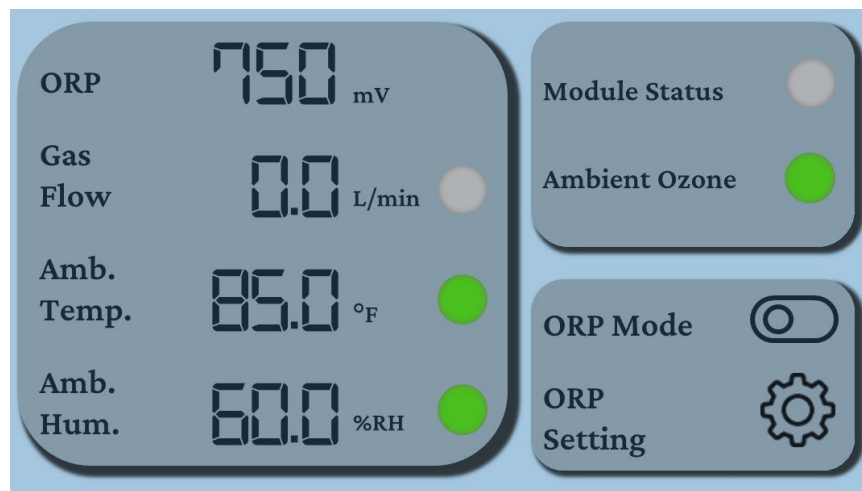


Example: Ambient Ozone Interlock

If the gas flow is lower than 5.0 L/min for MP5Air or 2.5 L/min for MP5O₂/MP10, the gas flow indicator will turn **RED** and stop ozone production. It will automatically start producing ozone again when the pump speed is adjusted and the flow rate is 5.0 L/min (2.5 L/min for MP5O₂/MP10) or greater.

If there is an ozone gas leak and ozone gas is detected in the ambient air, the unit will stop producing ozone and the Ambient Ozone indicator will turn **RED**.

5.2.3 Vacuum Interlock



Example: No Vacuum

If vacuum is not detected, the gas flow and module status indicator will both be **GRAY**. If the water pump is not on or is on very low flow rate, the vacuum is not created in the venturi. In this case, the pump will need to be turned on or up. For MP5O₂/MP10 units that run with an oxygen concentrator, if input oxygen gas flow overcomes the vacuum, then the vacuum will also not be detected and be put on standby until either oxygen concentrator flow is reduced or vacuum is increased.

5.2.4 Module Error Codes



Example: Module status in interlock mode

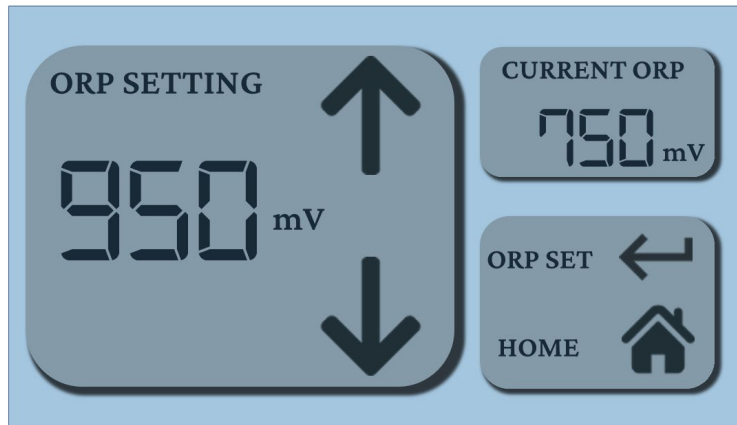
If the module status indicator is **RED**, an error code of either 1, 2, or 3 will be displayed, as shown above.

- **Error code 1** indicates that the ozone cell is being protected. If a high level of Ambient Humidity is sustained for a long period of time while the ozone system is off (on timer), the ozone module can be saturated with moisture, which could damage the ozone cell when powered. Therefore, the Ozone Module Status indicator may turn **RED** (even after the RH has dropped below 50%) because the Ozone Generator is waiting for the ozone cell to dry out. Once the ozone cell is dry, the Ozone Generator will automatically restart. Contact **factory authorized service** if Error Code 1 is still displayed after more than six hours.

For MP5/10 O₂ units, it is possible for **error code 1** to display when there is a gas flow balance error which can be caused by a block in the input tubing or if the oxygen concentrator is not supplying 5 LPM flow. It is important to check that the tubing is not kinked and the oxygen concentrator flow is at least 5 LPM (causing a high vacuum fault). High vacuum is detrimental to the health of the module; therefore, it protects itself from any high vacuum event.

- **Error code 2** indicates that the module cooling fan has an error. Contact **factory authorized service** as the cooling fan will need to be repaired.
- **Error Code 3** indicates that the driver board is overheating. Power down the system for driver to cool, and restart the system. If driver keeps overheating, contact **factory authorized service**.

5.3 ORP Setting



Example: ORP Setting Page

In the ORP Setting page, the user will be able to define the operational ORP value (mV) within +/- 50mV.

To enter the ORP Setting page, press the gear icon on the lower right corner of the Home Page. Use the arrows to set the desired ORP value (0 – 1500 mV) and press the SET button to accept the value. The recommended ORP range is **850 – 950 mV**.

Then, return to the Home Page and turn the ORP Mode switch on (indicated by a green circle) and the unit will automatically adjust the ozone output to maintain the set ORP value.

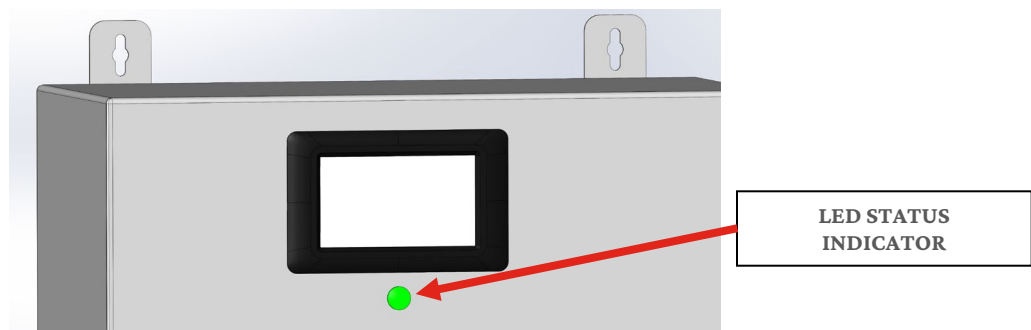
To change the desired ORP value simply re-enter the ORP Setting page and repeat the procedure.

NOTE: The unit will still produce ozone whether ORP Mode is on or off. The ORP value will still be displayed on the Home Page when ORP Mode is off. For use in residential pools, it is not necessary nor recommended to use the ORP control mode. Simply leave it in continuous operation mode for maximum ozone dosing in the residential pool.

5.4 LED Status Indicator

The LED indicator below the 4.3” screen is there so that the user can quickly see the status of the ozone generator. The LED indicates three different colors for three different states:

- **BLUE** – **Idle State:** When the unit is on but not producing ozone due to error
- **GREEN** – **Ozone State:** When the unit is producing ozone
- **RED** – **Interlock State:** When there is a critical interlock



6 MAINTENANCE

6.1 Pool Water Maintenance

6.1.1 General

Clean the pool and all filters before installing and operating the MPO3 Ozone System. If the pool is exceptionally dirty, run pool filtration system continuously for 24 hours before starting the Ozone Generator. Reduce chlorine level in pool to 0.5 – 1.0 ppm. Test and adjust the pH to 7.4 – 7.6 and the total alkalinity should be between 80 – 120 ppm. The use of water clarifiers, super-chlorinating, or shocking the pool is not necessary. A mineral supplement such as a Zodiac Nature2 will work well in conjunction with ozone. Pool Enzymes such as Orenda Technologies CV-600 also work well with ozone and can be an added benefit as they are also eco-friendly.

Once the pool is properly prepared and the Ozone Generator is ready to be turned on, let the system run continuously for 24 – 48 hours to help rid the pool water of chlorine-based contaminants.

The MP5Air makes 2 grams of ozone per hour (MP5O₂ = 5 grams and MP10 = 10 grams). It will be very effective when used with a residual of 0.5 PPM free available chlorine in residential pools. The ozone will efficiently break down and destroy the organics that, 1) contribute to the destruction of chlorine, and 2) create the more common version of chlorine that is referred to as chloramine (or combined chlorine). This is the form of chlorine that smells awful, burns your eyes, and can turn light-colored hair or light-colored swimwear green, and is a very poor disinfectant.

Ozone and chlorine work synergistically in the backyard pool. The addition of ozone will lower the level of chlorine residual required, as well as keep the chlorine active in the pool for much longer, resulting in far less chlorine consumption. Plus, ozone acts as a micro-flocculent by partially oxidizing organics and inorganics in the water and aiding in filtration efficiency. The result is crystal clear water which is free of harmful microorganisms and has no chlorine smell or feel in the water. Ozone is on average about 200 times more effective than chlorine (this will range from 10 to 15,000 times stronger, depending on the microorganism); this is well-documented, published and peer-reviewed in the literature.

The question of whether ozone can act alone in a residential pool is dependent on several factors. Since it does not leave a long-lasting and measurable residual, one would have to operate the recirculation pump 24/7 to continually add ozone to the pool water, to ensure there is always protection of the pool water from the constant contaminants brought into the pool by people, birds, insects, and the surrounding environment, which includes algae spores. In the shallow area of the pool, and especially in direct bright sunlight, these spores can get a foothold and begin to vegetate. Ozone will certainly kill any spores, but only if it can get to them. Once they have a foothold, they need to be vigorously brushed away and in severe cases, be subjected to a dose of chlorine (or maintain a 0.5 PPM residual of chlorine). It may be possible to have chlorine-free pools with ozone, but this is generally in the milder months of summer and is dependent on the quality and quantity of the pool's filtration as well as the size of the ozone generator commensurate to the pool water volume. In fact, a dirty filter will easily harbor and nourish algae spores, and contribute to continued algae blooms in any pool. Regular cleaning of the pool's filter will greatly inhibit the formation of algae in any pool. During very hot months and higher use, it is imperative to keep an eye on the filter and clean it regularly.

An additional advantage of ozone as an antimicrobial oxidizer is that about half of the ozone converts to a free radical (Hydroxyl) phase under normal swimming pool pH levels (7.4 – 7.6). Hydroxyl radicals are the most reactive oxidizers possible and work in conjunction with dissolved ozone which has tremendous disinfection capability as well as oxidation capability. The Hydroxyl radical reaction occurs in fractions of a second; the more ozone there is in solution the more Hydroxyl radicals will be available.

The MP5Air, MP5O₂ and MP10 have been validated under strict testing procedures by NSF International under NSF/ANSI Standard 50 for recreational swimming water. They have been certified by NSF International to provide a minimum 99.9% kill of harmful microorganisms that can be found in pool water. This study was performed without the addition of any chlorine; it utilized ozone only. This NSF certification is based on a 650mV reading on the ORP. Actual test results were greater than 6-log (99.9999%).

For Commercial Recreational Water Applications

NSF/ANSI Standard 50 efficacy validation is for supplemental sanitation and the two required microorganisms studied are *pseudomonas aeruginosa* and *enterococcus faecium*. In commercial applications specific residual levels of EPA registered disinfecting chemicals may be required by the regulatory agency having authority.

6.1.2 Understanding ORP

The term ORP (also known as Redox) stands for Oxidation Reduction Potential. ORP is a measurement of the cleanliness of the water, the water's ability to break down contaminants, and the antimicrobial potential of the water. This oxidation is measured by the ORP Monitor in millivolts (mV).

A positive ORP reading indicates that a substance is an oxidizing agent. The higher the reading, the more oxidizing it is. A negative ORP reading indicates that a substance is a reducing agent, (significant contamination). In general, tap water has an ORP of about 200 mV. If it is chlorinated, the ORP can be 600 mV. Multiple studies performed since the 1960s provide data supporting that water with an ORP of 650 mV or greater cannot harbor harmful pathogens.

When an ORP Monitor/Controller is used for the ozone system, it can control the ozone dose in the water. Once the desired ORP level is set on the controller, the system will automatically regulate the ozone output to meet the setpoint. However, the more ozone is allowed in the water, the less Chlorine is required to maintain a Chlorine residual of 0.5 PPM, and the greater the protection of the water from harmful contaminants.

In swimming pools, the oxidizer can be any combination of Oxygen, Ozone or Chlorine. The ORP Monitor will read the cumulative total of the three (ozone providing the highest ORP potential). In other words, ORP is measuring the effectiveness of the disinfectant(s) in the water.

6.1.3 Water Chemistry

Regular chlorine testing should be performed as usual. Ozone will eliminate a majority of the contaminants so maintain a residual level of 0.5 – 1.0 ppm chlorine or less. Do not use bromine with ozone per Model Aquatic Health Code (MAHC) guidelines. Also, do not use BAQACIL® in conjunction with ozone. Do not use Ascorbic Acid products with ozone. Ascorbic Acid products will create an extremely high ozone demand and deplete the ozone and reduce the ORP reading. If Ascorbic Acid products are inadvertently added to the pool water, it will take one to two days for the ozone to oxidize the demand and the ORP to return to normal. Since ozone is pH neutral and does not contribute any contaminants in the water affecting the pH, there is reduced need for pH adjustments once the MPO3 Ozone System is in place.

For commercial pool/spa applications, the system should be used with an EPA registered disinfection chemical to impart a measurable residual concentration in the water, or as may be required by the regulatory agency having authority.

Water Chemistry Parameters With Ozone

FAC	0.5-1.0 PPM
pH	7.4-7.6
TA	100-120 PPM
Calcium Hardness	200- 400 PPM
TDS	Under 2,000 PPM
Phosphate	125 PPB (or less)
Nitrate	10-25 PPM (or less)
CYA	Maximum 30 PPM Indoor Pools 0 PPM

NOTE: Phosphates can be removed with available commercial products; Nitrates can only be removed by dilution.

6.1.4 Range Chemistry verses Langelier Saturation Index (LSI)

Although utilizing minimum and maximum ranges (from the water chemistry items listed in the table above) may be considered the norm in pool water chemistry and balance, the swimming pool industry is increasingly embracing the use of Langelier Saturation Index (LSI) for proper water balance. Developed in the 1970s, the LSI water balance formula takes the above listed items under consideration and helps to make the pool water balance more stable and at equilibrium.

An easy way to accomplish a balanced LSI is to download the free Orenda Pool Dosing Calculator App <https://www.orendatech.com/pool-dosing-calculator>



QR Code to Apple Store



QR Code to Google Play

6.1.5 Winterizing Procedure

If the pool will not be in use during the winter months and the MPO3 Ozone System will be exposed to freezing temperatures, the following steps MUST be taken to prevent damage to the system.

1. Remove the Ozone Generator and store away in a cool, dry place away from sunlight.
2. Drain the system and proceed with standard winterizing procedure for wetted parts.
3. Store ORP probe according to instructions in Section 6.3.4.

6.2 Ozone Generator Maintenance

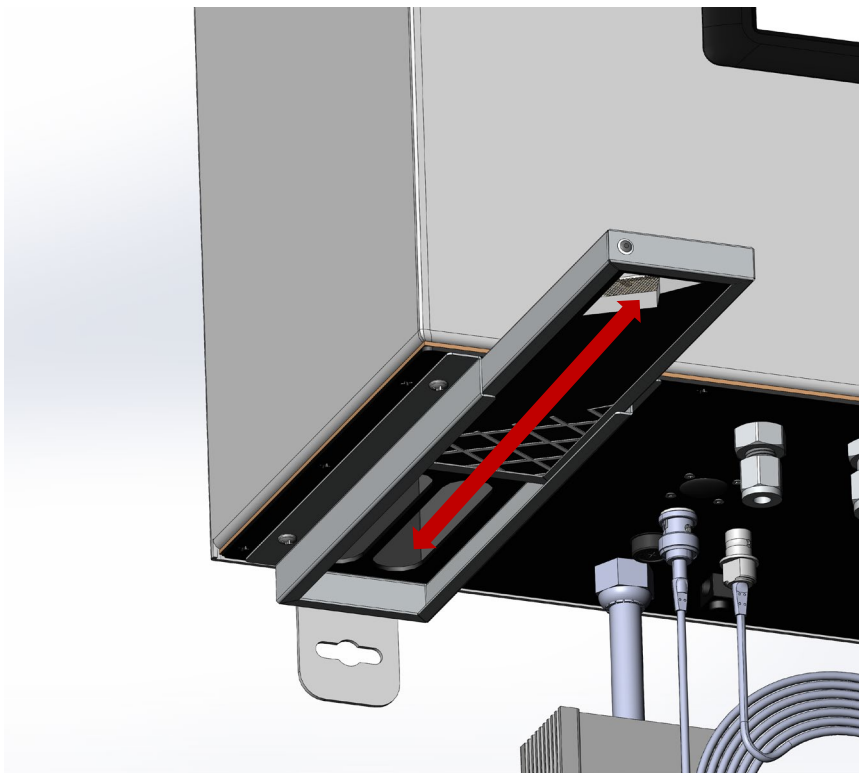
6.2.1 Suggested Cleaning/Maintenance

Please regularly check the condition of the ozone system to make sure there is no dust debris or insects on or around the intake ports

6.2.2 Intake Filter

There is a removable filter on the bottom left of the Ozone Generator that is used to prevent dust and debris from entering into the unit. It is critical that the filter is in place when the unit is in operation as the intake cooling fans are always on when the unit is powered on.

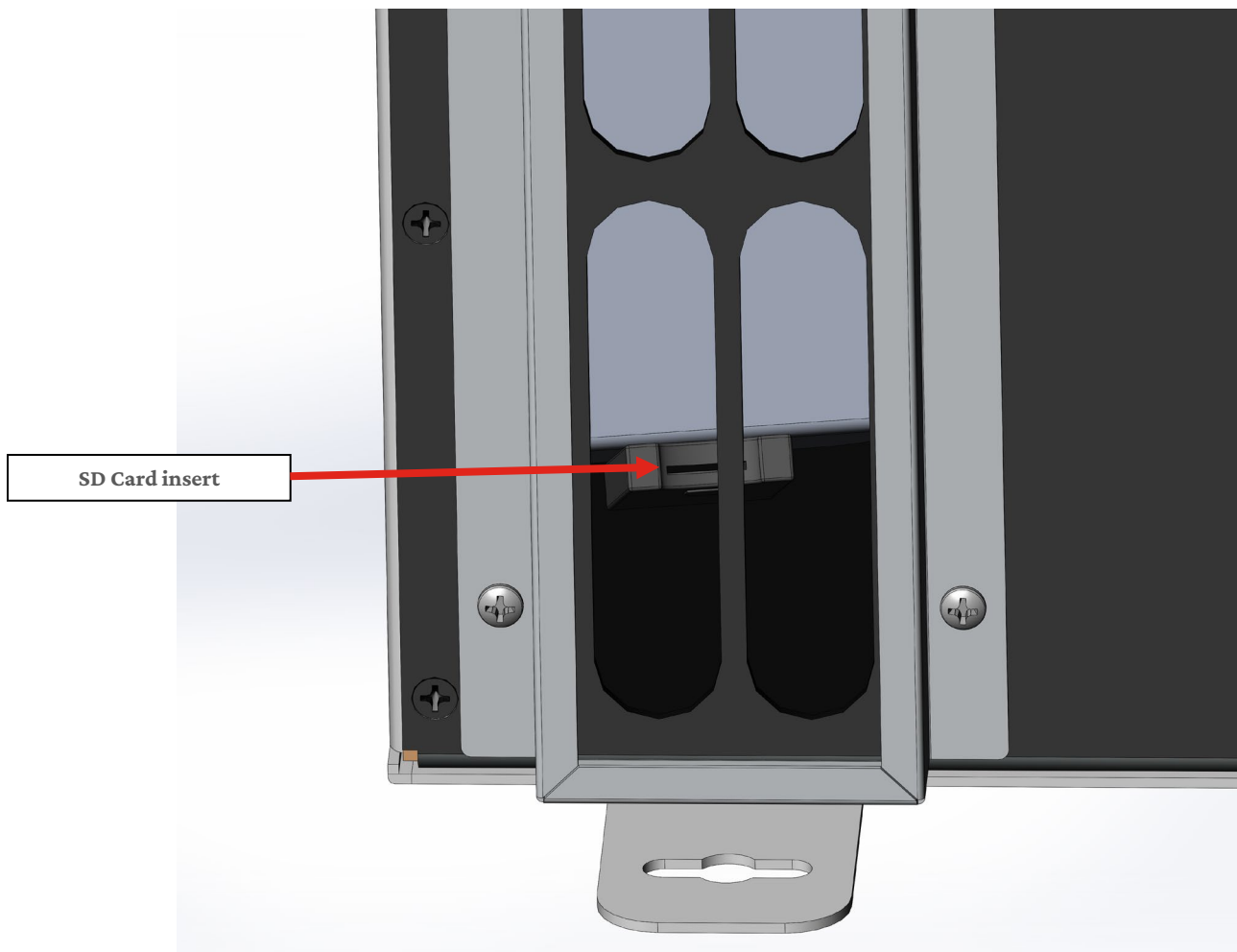
The filter is designed to be reusable, and the user may periodically (every 1-3 months or as needed) clean the filter by removing it and gently rinsing with water and drying. Please take note of the air flow direction arrows on the filter and be sure that the arrow is pointing towards the unit when inserting the filter in position.



6.2.3 Micro SD Card (Onboard Diagnostics)

There is a micro-SD card inside the unit that logs data for the Ozone Generator including the error codes, date, time, and working parameters such as system temperature, gas flow, ORP, onboard sensors and system operation. The card is easily accessible and detachable without removing the ozone system from its mounted position or opening the cabinet. An online Service Request portal is available on the MPO3 website www.mpo3tech.com for authorized service technicians to upload the micro-SD card data for evaluating system health and system history. To access the micro-SD card, follow these steps:

1. Disconnect unit power; the micro-SD card should not be accessed while the system has power.
2. Remove the air intake filter located on the underside of the cabinet.
3. Look through the louvers and locate the micro-SD card's protective black plastic holder which is attached to an extender ribbon cable inside this section of the cabinet. See image below.
4. To access the micro-SD card, reach inside the cabinet and press on the micro-SD card. The micro-SD card will be released from the holder. Small plastic tweezers or delicate needle nose pliers may be used. **BE SURE TO PRESS ON THE CARD TO RELEASE IT BEFORE TRYING TO PULL OUT THE CARD. DO NOT PULL UNLESS THE CARD IS RELEASED.**
5. Open the authorized service portal on MPO3 website from any computer, laptop, or tablet and insert the micro-SD card into a micro-SD card reader. Follow the instructions in the portal.
6. Micro SD card **MUST** be reinstalled into the Ozone generator prior to resuming operation of the system.
7. To reinstall the micro-SD card, simply insert the card back into the micro-SD card holder until it clicks, in the same orientation it was when removed, with the metallic bands facing up and towards you.



6.2.4 ORP Probe Instructions

NOTE: The MP5/MP10 built-in ORP Monitor/Controller is factory calibrated. It is a solid-state electronic monitor/controller and does not require calibration in the field. If there is a significant drift in the ORP value, remove and clean the probe.

ELECTRODE STORAGE (ORP/Redox)

When the ORP probe is not in use (such as during cold weather), the electrode can be stored in the protective bottle that it was shipped in. If you have poured out the soaking solution, simply refill the bottle with plain water. THE ORP probe can NEVER be allowed to dry out. THE ORP probe must be protected from freezing. If the ORP probe is exposed to freezing temperatures or allowed to dry out, it will sustain irreparable damage and will require replacement.

ELECTRODE CLEANING (ORP/Redox)

Coating of the platinum sensing surface can prevent samples from reaching that surface and is a primary cause of erroneous readings. Materials that coat the reference junction can also cause reading errors and coatings must be removed if accurate results are to be obtained.

The type of coating determines the type of cleaning technique.

Soft Coatings can be removed by vigorous stirring, by use of a squirt bottle or, very carefully, by gently wiping with a soft, clean non-abrasive paper or cloth.

Hard Coatings should be chemically removed. The chemical used to remove the coating should be the least harsh chemical that dissolves the coating in 1 or 2 minutes and does not attack the electrode's materials of construction. For example, a calcium carbonate coating might be removed with 5% HCl (muriatic acid).

Oily or Organic Coatings are best removed with detergents or an appropriate solvent that does not attack the electrode's materials of construction. For example, isopropyl alcohol might be used but acetone should be avoided if the electrode's body is made of CPVC.

NOTE: WHEN USING CHEMICALS OR SOLVENTS CARE SHOULD BE TAKEN AND APPROPRIATE EYE, FACE, HAND, BODY AND/OR RESPIRATORY PROTECTION SHOULD BE USED.

Abrading or sanding a pH electrode's surface should never be done. However, the measuring surface of an ORP/REDOX electrode may be gently abraded by use of 600 grade wet silicon carbide paper, jeweler's rouge or very fine steel wool, but try to clean chemically before abrading with 600 paper.

7 SERVICE

10.1 Troubleshooting

If you have any issues with the system or you think that it is not performing as it should, please use the Troubleshooting Table below for some quick solutions. If this table does not solve or does not address the issue that you are experiencing, please contact the Installer or factory.

Category	Problem	Possible Cause	Possible Solution
Ozone Generator	Ozone Generator will not power on	Fuse failure	Replace 5x20mm 250VAC fuse (5A for MP5, 8A for MP10) Extra fuse is included
		Cable failure	Check that the power cable is plugged in properly
			Check that the power cable is free of damage
	Inappropriate power source	Check that the power source is supplying the correct voltage and wattage	
	Cooling fan does not work	Contact factory authorized service	
Ozone Production	Low/no ozone production	High internal temperature (>122°F) (System will auto-restart when temperature falls below 122°F)	Keep unit away from heat sources
		Cold temperature (<40°F) (System will auto-restart when temperature rises above 45°F)	Ensure that cooling vents are not blocked
		Low flow <5 LPM for MP5Air <2.5 LPM for MP5O ₂ /MP10	Wait until weather warms
			Check the Output line for leaks or damage
			Check that the Venturi is creating vacuum
Ozone Module Failure	Check feed gas source is operating properly		
		Contact factory authorized service	

Category	Problem	Possible Cause	Possible Solution
Ozone Production Cont'd	Module Error Code 1	High moisture level in the ozone cells	Wait 2 – 6 hours for ozone cell to dry
		Blockage in the input tubing	Check for kinks or blockage in the input tubing
		Low flow from oxygen concentrator	Check that the oxygen concentrator is supplying 5 LPM of flow
	Module Error Code 2	Module fan error	Contact factory authorized service
	Module Error Code 3	Driver board overheating	Contact factory authorized service
HMI Screen	Screen does not power on	No power	Check that the power cable is plugged in properly
		LCD backlight is off	Contact factory authorized service
	Screen does not respond properly	Multiple touch points (fingerprints)	Ensure that screen is clean and user is only using a single finger
		Slow response	Turn the unit on and off
Sensors	Ambient Ozone sensor not functioning	Contact factory authorized service	
	Ozone sensor misreading		
	Temperature & Humidity sensor misreading	Defective sensors	Contact factory authorized service
	Flow sensor reading maximum value	Too much gas flow	Reduce the flow with a needle valve (be sure to maintain vacuum)
Ozone Leakage	Ozone leakage from the Output line	Tubing connection failure	Ensure the tubing connection and compression fitting is secure
			Replace nut and front & back Ferrule set
		Using non-recommended tubing	Replace with Teflon [®] tubing
	Internal ozone leakage	Contact factory authorized service	

8 Warranty

WARRANTY OPTIONS

STANDARD LIMITED TWO-YEAR WARRANTY

The limited warranty set forth below applies to products manufactured by MicroPlasma Ozone, 2105 W. Park Ct., Champaign, IL 61821, and sold by MicroPlasma Ozone or its factory authorized dealers. This limited warranty is given only to the first retail purchaser of such products and is not transferable to any subsequent owners or purchasers of such products. MicroPlasma Ozone warrants that it or its factory authorized dealers or factory authorized service companies will repair or replace, at MicroPlasma Ozone's option, any part of such products (except the ozone generating module), proven to be defective in materials or workmanship within two (2) years of the date of the original purchase receipt. Parts are covered under the two (2) year warranty only when the stated maintenance requirements are met. See owner's manual for complete maintenance details. **The ozone generating module(s) are warranted for one (1) year only.** The Kistler solid-state electronic dehumidifier is warranted for one (1) year only when the stated maintenance requirements are met. See owner's manual for complete maintenance details. This Warranty specifically excludes any components not manufactured by MicroPlasma Ozone that are external to the products covered, such as, oxygen concentrators, injectors, probes, tanks, or related components. MicroPlasma Ozone will assist with warranty claims for such components purchased through MicroPlasma Ozone; limited to the extent of the manufacturer's standard warranty. **ANY REPAIR OR REPLACEMENT WILL BE WARRANTED ONLY FOR THE BALANCE OF THE ORIGINAL TWO (2) YEAR WARRANTY PERIOD**
THIS LIMITED WARRANTY DOES NOT INCLUDE ANY OF THE FOLLOWING:

1. Any labor charges for troubleshooting, removal, or installation of such parts.
2. Any repair or replacement of such parts necessitated by faulty installation, improper maintenance, improper operation, misuse, abuse, negligence, accident, fire, flood, repair materials, and/or unauthorized accessories.
3. Any such products installed without regard to required local codes and accepted trade practices.
4. Any implied warranty of merchantability or implied warranty of fitness for particular purpose, and such warranties are hereby disclaimed.
5. MicroPlasma Ozone shall not be liable under any circumstances for loss of use of such product, loss of profits, direct damages, indirect damages, consequential damages, and / or incidental damages.

This warranty gives you specific legal rights. You may have other rights which vary from state to state.

TO OBTAIN WARRANTY SERVICE:

MicroPlasma Ozone

2105 W. Park Ct.
 Champaign, IL 61821
 (217) 693-7950

Email: support@mpo3tech.com

PROVIDE:

- 1. Customer name, mailing address, phone number and email**
- 2. Installer name**
- 3. Unit Part Number, Serial Number and date of purchase**
- 4. The date of failure**
- 5. A description of the failure**

After this information is provided, MicroPlasma Ozone may release a Return Materials Authorization Number (RMA). After receiving the RMA number, the part in question must be returned to MicroPlasma Ozone, freight prepaid, with the RMA number clearly marked on the outside of the package. All preauthorized defective parts must be returned to MicroPlasma Ozone within thirty (30) days. Under no circumstances may any product be returned to MicroPlasma Ozone without prior authorization. Returns without an assigned RMA number on the outside of the package will be refused and shipped back to the sender at sender's expense. Upon receipt of preauthorized returned goods, MicroPlasma Ozone will repair or replace, at their option, the defective product(s) and return them (freight prepaid for products under warranty). Buyer's acceptance of the product and use thereof constitutes acceptance of these terms.

9 OZONE OVERVIEW AND SAFETY

9.1 General Safety Information

Ozone (O₃) is a strong oxidizing gas with an acrid odor. There are health issues that could arise from overexposure to ozone gas including respiratory irritation, coughing, and pulmonary edema if exposed to extreme concentrations for significant periods of time. See SDS included in this manual.

To help avoid the possibility of ozone leaks, please ensure that tubing is not severely bent, kinked, or damaged in any way. Ensure that flow is not impeded or restricted in any way.

Do not tug or pull on output tubing as this could potentially damage the unit and cause an ozone leak.

Dropping or severely jarring the unit could cause internal system damage that may result in an ozone leak.

9.2 SDS

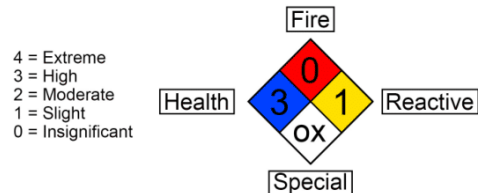
The following data sheets are attached below:

- MPO₃ SDS Gaseous Ozone
- MPO₃ SDS Aqueous Ozone

GASEOUS OZONE

Safety Data Sheet

NFPA 704 Designation
Hazard Rating



SECTION I: MATERIAL IDENTIFICATION

IDENTITY: OZONE (Gaseous)	ISSUED: February, 2010
FORMULA: O ₃	REVISED: August 20, 2019
<p>Description (origin/uses): Occurs in atmosphere from UV light action on oxygen at high altitude. Commercially obtained by passing air between electrodes carrying a high voltage alternating current. Also found as a by-product in welding areas, high voltage equipment, or UV radiation.</p> <p>Ozone is used as an oxidizing agent in air and water disinfection: for bleaching textiles, oils, and waxes; organic synthesis as in processing certain perfumes, vanillin, camphor; for mold and bacteria control in multiple applications.</p>	
<p>Cautions: A powerful oxidizing agent, ozone generally exists as a gas and is highly chemically reactive. Inhalation produces various degrees of respiratory effects from irritation to pulmonary edema (fluid in lungs) as well as affecting the eyes, blood, and central nervous system.</p>	
<p>Manufacturer/Supplier: On-site generation, equipment available from various suppliers, including: MicroPlasma Ozone 2105 W. Park Ct. Champaign, IL 61821 Phone: (217) 693-7950</p>	

SECTION II: INGREDIENTS AND HAZARDS

Ozone, CAS No. 10028-15-6: NIOSH RTECS No. RS8225000	
<p>1991 OSHA PELs 8-hr TWA: 0.1 ppm vol. (0.2 mg/m³) 15-min STEL: 0.3 ppm vol (0.6 mg/m³)</p> <p>1990 IDLH 10 ppm</p> <p>1990 NIOSH REL Ceiling: 0.1 ppm vol. (0.2 mg/m³)</p>	<p>1991-1992 ACGIH TLV Ceiling: 0.1 ppm (0.2 mg/m³)</p> <p>1990 DFG (Germany) MAK TWA: 0.1 ppm (0.2 mg/m³) Category 1: Local Irritant Peak Exposure Limit: 0.2 ppm 5 min momentary value, 8 per shift</p>
<p>Other Designations: Triatomic oxygen: CAS No. 10028-15-6, NIOSH RTECS No. RS8225000</p>	

SECTION III: PHYSICAL DATA

Boiling Point: -169° F	Melting Point: -315.4° F (-193° C)
Vapor Pressure: >1 ATM	% Volatile by Volume: 100%
Vapor Density (AIR = 1): 1.6	Molecular Weight: 48 Grams/Mole
Solubility in Water: 0.49 ml @ 32° F (0° C), 3 ppm @ 20 ° C	pH: Not Listed
	Critical Temperature: 10.22° F (-12.1° C)

Appearance and Odor: Colorless to blue gas (greater than -169° F); characteristic odor often associated with electrical sparks or lightning in concentrations of less than 2 ppm and becomes disagreeable above 1-2 ppm. CAUTION: Olfactory fatigue develops rapidly, so do not use odor as a preventative warning device.

SECTION IV: FIRE AND EXPLOSION HAZARD DATA

Flash Point: Nonflammable
Extinguishing Media: Use large amounts of water spray or fog to put out fires involving ozone. Use appropriate fire-fighting techniques to deal with surrounding material.
Special Fire Fighting Procedures: Wear a self contained breathing apparatus with full face pieces operated in a pressure-demand or other positive-pressure mode.
Unusual Fire/Explosion Hazards: Decomposition of ozone into oxygen gas, (O ₂), can increase strength of fire.

SECTION V: REACTIVITY DATA

Stability: Ozone is not stable. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Ozone is chemically incompatible with all oxidizable materials, both organic and inorganic.
Conditions to Avoid: Ozone is unstable at room temperatures and spontaneously decomposes to oxygen gas. Avoid ignition sources such as heat, sparks, and open flame. Keep away from strong reducing agents and combustible materials such as grease, oils, and fats.
Products of Hazardous Decomposition: Ozone spontaneously decomposes to oxygen gas, even at room temperatures.

SECTION VI: HEALTH HAZARD DATA

Carcinogenicity: Ozone is not listed as a carcinogen by the NTP, IARC, or OSHA.
Primary Entry: Inhalation
Target Organs: Respiratory system, eyes, blood.
Summary of Risks: There is no true threshold limit and so no exposure (regardless of how small) is theoretically without effect from ozone's strong oxidative ability. Ozone passes straight to the smallest bronchioles and alveoli and is not absorbed by mucous membranes along the way. Initial small exposure may reduce cell sensitivity and/or increase mucous thickness producing a resistance to low ozone levels. Short exposure to 1-2 ppm concentrations causes headache as well as irritation to the respiratory tract. but symptoms subside when exposure ends. High concentrations of ozone produce severe irritation of the eyes and respiratory tract. Exposure above the ACGIH/OSHA limits produce nausea, chest pain, coughing, fatigue, reduced visual acuity, and pulmonary edema. Symptoms of edema from excessive exposure can be delayed one or more hours. Inhalation of >20 ppm for an hour or more (>50 ppm for 1/2 hour) can be fatal.
Acute Effects: Acute damage from ozone appears to be mainly from its oxidizing effect on contact with tissue.
Chronic Effects: Respiratory disease. Deleterious effects on lungs and acceleration of tumors have been reported.
Medical Conditions Generally Aggravated by Long-Term Exposure: History of respiratory or heart disorders.
First Aid: Remove from ozone containing air, get prompt medical help*, administer oxygen if necessary. Eye Contact - Gently lift eyelids and flush eyes continuously with flooding amounts of water for 15 minutes or until transported to a medical facility*. Inhalation - Remove exposed person to fresh air, support breathing, administer humidified oxygen as needed, get medical help*. Ingestion - Highly unlikely since ozone is a gas until -169° F, * GET MEDICAL ASSISTANCE = APPROPRIATE IN-PLANT, PARAMEDIC, or COMMUNITY. Get prompt medical assistance for further treatment, observation, and support after first aid.

SECTION VII: PRECAUTIONS FOR SAFE HANDLING AND USE

Steps to be Taken in Case of Spill/Leak: <ol style="list-style-type: none"> 1. Discontinue production 2. Isolate and vent area 3. Immediately notify personnel 4. Deny entry 5. Follow applicable OSHA regulations
Disposal: Provide ventilation to dilute and disperse small amounts of ozone (below OSHA PELs) to outside atmosphere. Follow federal, state, and local regulations.
Handling/Storage Precautions: Ensure proper personnel training and establish emergency procedures.

SECTION VIII: CONTROL MEASURES

Respiratory Protection: High Level (>10 ppm) - Self Contained Breathing Apparatus: MISH/NIOSH approved. Low Level (0.3 - 10 ppm) - Canister Type (carbon) respirator may be used.
Eye Protection: Wear chemical safety goggles if necessary to work in high ozone (>10 ppm).
Skin Protection: Effects of ozone on skin are minimal to non-existent.
Ventilation: Provide general and local exhaust ventilation to dilute & disperse small amounts of ozone into outside atmosphere.

SECTION IX: SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Prevent ozone from coming into direct physical contact with strong acids or bases or with strong oxidizing/reducing agents.
Engineering Controls: Install ventilation systems capable of maintaining ozone to concentrations below the ACGIH/OSHA exposure limits (see sect. II). Install ambient ozone monitor(s) configured to shut down ozone equipment and turn high speed ventilation on.

Safety Data Sheet Cont.

Product Name **AQUEOUS OZONE SOLUTION**

IV HEALTH HAZARD DATA	
Threshold Limit Value	NOT DETERMINED
Route of Exposure	<input type="checkbox"/> Inhalation <input type="checkbox"/> Ingestion <input type="checkbox"/> Skin <input checked="" type="checkbox"/> Eye <input checked="" type="checkbox"/> Not Hazardous
Eye Contact Hazard	Exposure may cause mild eye irritation, but is not expected.
Ingestion Hazard	Not Hazardous
Inhalation Hazard	Inhalation is not likely to be a primary route of exposure but could become irritating if aerosols are exposed to individual for extended period of time.
Skin Contact Hazard	No skin irritation is expected from short term exposure.
Skin Absorption Hazard	No published data indicates this product is absorbed through the skin.
Effects of Acute Exposure	Mild skin or eye irritation.
Effects of Chronic Exposure	Repeated exposure of the skin to concentrated product should be avoided to prevent irritation and drying of the skin.
V EMERGENCY AND FIRST AID PROCEDURES	
Eye Contact	If exposure to water containing aqueous solution of ozone causes irritation to eyes, flush eyes with plenty of clean, ozone free, running water for at least 15 minutes, lifting the upper and lower lids occasionally. Remove contact lenses if worn. Seek medical attention if irritation persists.
Skin Contact	Not likely to become irritated unless repeatedly exposed to large volumes of material. If irritation develops, rinse affected area with ozone free potable water. If irritation continues seek medical advice.
Inhalation	Inhalation of mists could lead to irritation of lungs. If symptoms develop, move individual away from exposure and into fresh air. If symptoms persist, seek medical attention.
Ingestion	NA
VI REACTIVITY DATA	
Incompatibility (Materials to Avoid)	Natural rubber (may degrade, or "dry", rubber components over extended periods of exposure)
Conditions to Avoid	NONE KNOWN
Hazardous Decomposition	NONE
Stability	<input checked="" type="checkbox"/> STABLE <input type="checkbox"/> UNSTABLE Hazardous Polymerization <input type="checkbox"/> MAY OCCUR <input checked="" type="checkbox"/> WILL NOT OCCUR

Safety Data Sheet Cont.

Product Name **AQUEOUS OZONE SOLUTION**

VII SPILL OR LEAK PROCEDURES				
Steps To Be Taken If Material Is Released Or Spilled		NONE		
Waste Disposal Method		DISPOSE OF THE SAME AS POTABLE RINSE WATER		
VIII SPECIAL PROTECTIVE INFORMATION				
Respiratory Protection (Specify Type)		NOT REQUIRED FOR NORMAL USE OF THIS PRODUCT		
Ventilation	Local Exhaust	PREFERABLE	Special	NA
	Mechanical (general)	OK	Other	NA
Protective Gloves	NOT REQUIRED			
Eye Protection	NOT REQUIRED			
Other Protective Equipment	NOT REQUIRED			
IX SPECIAL PRECAUTIONS				
Precautionary Labeling	Certified testing of Ozone systems by NSF (National Sanitation Foundation) has shown that under normal conditions of use, aqueous solutions containing low levels of ozone gas dissolved in potable water do not present a safety hazard when contact to the individual is incidental. When used in a room with normal ventilation, levels of ozone gas being released into the air have been shown by NSF to be well below the periodic exposure levels established by OSHA for worker safety through the use of ozone management technology.			
Precautions To Be Taken In Handling	Aqueous solutions of ozone in potable water should not be sprayed as an aerosol (i.e. >20psi) to avoid releasing higher levels of ozone gas into the work area. The decay rate of ozone gas is a function of temperature and exposure to organic material. Certified testing has shown that when ozone gas has been properly dissolved in ambient temperature (or colder (33 – 70 °F)) potable water at a level not exceeding 2 mg/l (ppm) using industry ozone management technology, the rate at which ozone is released from the water as ozone gas is below the PEL established for gaseous ozone.			
Rev. Date 08/20/19				
This safety data sheet is provided as an information resource only. It should not be taken as a warranty or representation for which the preparer assumes legal responsibility. While we believe the information contained herein is accurate and compiled from sources believed to be reliable, it is the responsibility of the user to investigate and verify its validity. The buyer assumes all responsibility of using and handling the product in accordance with applicable federal, state, and local regulations.				