

# MIS Series

Mini Injection System

**Model: MIS-10**

## **Installation & Operations Manual**



Base skid shown



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# Table of Contents

## **SECTION 1**

Safety Precautions .....	4
Theory of Operation .....	4, 5

## **SECTION 2**

Component Diagram .....	6
Components Description .....	7
Specifications .....	8
Installation Guidelines.....	8

## **SECTION 3**

Start-Up Procedures .....	9
Operator Startup.....	11

## **SECTION 4**

Warranty .....	10
Contact Information.....	10

## **SECTION 6**

Appendix A - MSDS.....	11
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**IMPORTANT SAFETY INSTRUCTIONS READ AND FOLLOW ALL INSTRUCTIONS.**

Read this manual completely before attempting installation.

**SAVE THESE INSTRUCTIONS!**



# SECTION 1

## Safety Precautions

If you use this skid with ozone, ozone is a powerful oxidizing agent. Observe strict operating procedures while using ozone equipment. **It is imperative that only ozone compatible materials are used in conjunction with this ozone skid.**

**Note:** If the operator has asthma, he or she must not enter an airspace that has a significant ozone concentration. Ozone can induce an asthma attack.

Ensure that the Ozone Generator is in a well-ventilated area. Do not allow rain or condensation to contact the Ozone Generator. The unit must be operated indoors or in an enclosure in a non-condensing environment.

Carefully review and familiarize yourself with the following important safety information concerning the Ozone Generator which might be used in conjunction with this pumping skid:

1. Ozone is an extremely aggressive and powerful oxidizer. The Occupational Safety and Health Administration (OSHA) 8-hour exposure limit is 0.10-PPM. The OSHA 15-minute exposure limit for ozone is 0.3 PPM. Above 0.3 PPM, there is the risk of damage to respiratory tissues.
2. People who have no sense of smell should not operate this equipment.
3. Never attempt to verify ozone production by directly breathing or smelling the ozone outlet or the ozone-tubing outlet.
4. The Ozone Generator contains high voltages. Unauthorized entry can result in serious injury or death. For service instructions, contact Ozone Solutions.
5. Make sure all tubing connections between the Ozone Generator and the injection point are secure and in good working condition. Failure to do so could result in the discharge of ozone into an undesired space.

## Theory of Operation

This Injection skid is a engineered water pumping skid that is designed to make a void or additional space in the fluid (namely water) as to add a gas such as oxygen or ozone.

This product is made with materials which are compatible with ozone gas, such as stainless steel (304 & 316L grade), Kynar, Viton, FEP/PTFE Teflon tubing.

If this pump skid is used with some or all of our available options or your existing machinery, you will need to refer to appropriate manuals for those components or products.

Each of the available options for this base skid are described in this manual.

The ozone or oxygen gas which can be added/dissolved into the water is using an “Ozone Injection” method.

This method consists of using a Venturi Injector which when having a suitable pressure drop across the injector, will make the additional space needed to add the desired gas into the fluid.

The water pump is used to increase the water pressure going into the venturi. The pressure coming out of the injector should be at least 20 PSI lower than the inlet pressure. The amount of gas which can be added into the fluid is dependent upon the efficiency of the injector, and other variables.

This forceful action along with the added mixing vanes in the venturi injector provides for an extremely efficient method of dissolving the gas into the water.

Naturally, any undissolved gas must be removed from the water. The removal of this gas starts in the contact tank.

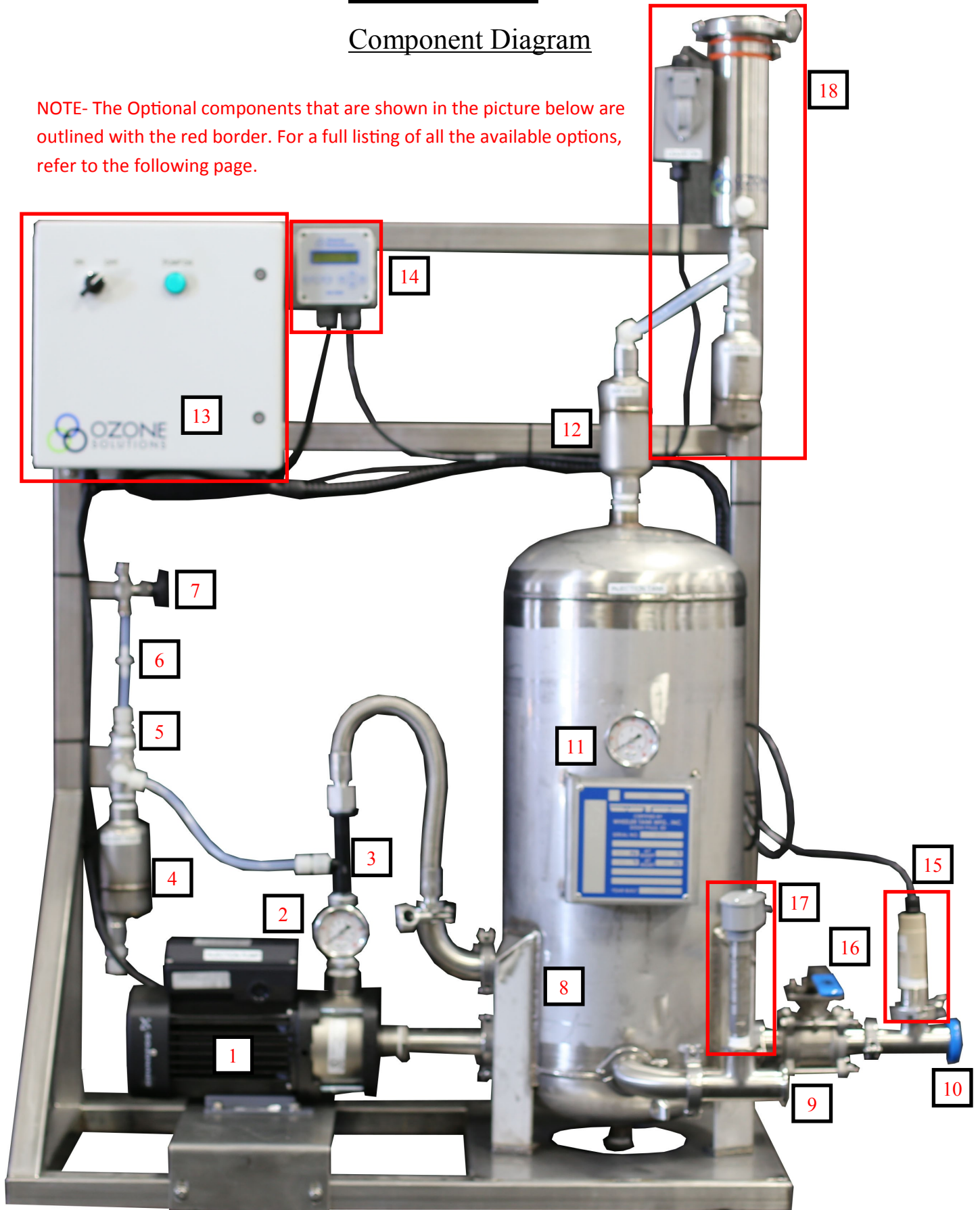
All of the undissolved gas is removed through the air vent on the top of the contact tank so that it can be safely destroyed or removed from the location.

The water passing through the Ozone Injection System is unimpeded by the removal of the undissolved gas and will flow at the desired rate based on the point of usage.

## SECTION 2

### Component Diagram

NOTE- The Optional components that are shown in the picture below are outlined with the red border. For a full listing of all the available options, refer to the following page.



## Components Description

**1. Water Pump:** This pump creates the pressure differential necessary across the **venture injector** for ozone injection.

**2. Pressure Gauge: Injector Inlet:** Indicates water pressure on the inlet side of the **venturi injector**.

**3. Venturi Injector:** A Venturi Injector is designed to add additional material into the fluid stream. This is done by creating a vacuum. Maintaining a 20 PSI pressure drop across the injector will offer good performance. The injector outlet pressure will be equal to the **Tank Pressure Gauge**.

**4. Water Trap:** These components prevent water from flowing with the gas stream to the ozone destruct unit, and potentially the **ozone generator** (in a reverse flow situation). Any water will fall into the bowl and can be drained out by way of attaching a length of 3/8 inch ID tubing and pipe it to a floor drain.

**5. High Pressure Check Valve:** This check valve is to keep water from getting back to the machinery which is supplying the gas to the injector.

**6. Low Pressure Check Valve:** This check valve is a secondary to the high pressure check valve should the high pressure valve fail.

**7. Needle Valve:** This valve can be used to limit the flow rate of the gas entering the system.

**8. Contact Tank:** This 15 gallon stainless steel (304L grade) tank mixes the gas with the fluid.

**9. Water Inlet:** Connection for incoming water. This Ozone Injection System will not operate effectively with water pressures exceeding 50 PSI.

**10. Water Outlet:** Connection for effluent water.

**11. Pressure Gauge: Contact Tank:** The value read on this gauge represents the pressure in the system. This value is also equal to the outlet pressure of the **Venturi Injector**.

**12. Air Vent:** Allows the undissolved gas to be vented out of the contact tank.

## OPTIONAL COMPONENTS BELOW;

**13. Control Box:** It provides you an On/Off switch which controls the main electrical power to the skid. It also powers up the water pump and will illuminate the green indicator lamp on the control box.

**14. Dissolved Ozone Monitor: AS-500 Main Body:** Please read the included manual for the setup, etc. instructions.

**15. Dissolved Ozone Monitor: AS-500 Sensor Probe:** Measures the dissolved ozone level exiting the contact tank. The black cap needs to be pulled off of the tip for it to work. Read and understand the provided sensor instructions which should have been provided to you if you purchased this option. The manual will inform you of the maintenance and calibration of this probe.

**16. Manual Ball Valve: (added with the Dissolved Ozone Monitor Option):** When the handle is parallel with the piping, it allows the water to travel to the point of usage. exit the skid be recirculated through the water pump. Closing this valve will allow the water to be re-circulated through the water pump and contact tank.

**17. Water Flow Switch:** This switch will become activated by the movement of fluid, 5-6 GPM. This switch when activated, will allow the water pump to be energized.

**18. Ozone Destruct Unit:** Safely destroys ozone gas with a catalytic process. The exiting gas should be only oxygen, which can then be placed back into the operating environment or for additional safety, piped to the outdoors. The electrical heater band is used to maintain the internal media by removing any possible moisture which might have condensed onto the media. The electrical switch allows you to turn the heater band on or off. Warning; when powered on, the canister can become quite hot.

**Not shown- Remote Ozone Monitor: ES-600:** This monitor is to display an ozone reading measured from the ambient air. It features a sensor head assy. which can be located remotely from the main monitor body.

**Not shown- 50Hz. Water Pump:** This water pump allows this product to work with 50Hz. power sources.

## Specifications

Model	Fluid Flow Rate	Weight	Dimensions	Current (Amps)	Voltage (Volts)
MIS-10	15—30 GPM	198 lbs. with most of the options.	Std. Skid: 37"W x 18.5"D x 48"H. With options: 47"W x 20"D x 59"H	20 amp is needed. Run amps, less than 10.	120 3 wire Single-phase

### Installation

**IMPORTANT:** Keep in mind that the intake of the pump (s) must be flooded with water (water level above pump head) since they are not self-priming. Operating the pumps dry will cause damage.

**IMPORTANT:** Proper floor drainage is required to prevent water damage in case of water leak or overflow.

**Ventilation:** The system should be installed in a well-ventilated area, in accordance with the environmental specifications outlined in the individual Operation Manuals associated with this system.

### Location and Mounting

The Ozone Injection System should be installed in such a way that all components of the system are accessible for future maintenance. Working area required around the system must be made available on three sides. A minimum working area of 30 inches should be available at the front of the skid. Consider allowing work areas on the other sides as well.

The Ozone Injection System is not rain or drip-proof, and therefore should be protected from rain and splashing water. Mounting the system in a clean, dry environment will offer you the longest lifespan of the product.

If the system is to be mounted in a mobile unit (such as a trailer or movable building), mechanical shock and vibration prevention measures need to be taken to protect the system from damage during transport of the mobile unit.

Depending on the options which were included with the skid, the equipment might do much better in a location that stays below 95°F and having a maximum relative humidity less than 85%. If the parameters above cannot be maintained, cooling and/or de-humidification equipment must be installed. There may be exceptions to the environmental guidelines for certain system configurations, contact Ozone Solutions if the environmental conditions are not as prescribed above, or otherwise in question.

### Mechanical Connections

#### Water In and Water Out

Connect water piping at the fittings provided at the edge of the skid. Ball valves (if not included) fastened to the fluid inlet and outlet are recommended, allowing isolation of the skid. Adding ball valves will be very beneficial for maintenance procedures.

**PROCESS WATER IN:** is the 1.5 inch sanitary fitting near the front-right of the system.

**PROCESS WATER OUT:** is the 1.5 inch sanitary fitting just behind the inlet connection. If different plumbing connections are required, adapters can be provided.

### Electrical Power Connections

The system power cord(s) will need to receive power from a 120 Volt, 4-wire, 20 Amp, 60 Hz single phase circuit.



## **Section 3**

### **Ozone System Initial Startup Procedure**

IMPORTANT: Read and understand the “Caution, Warnings and Hazards” section of this manual before operating the Ozone System!

1. Connect the needed utility connections (electricity, water, and water trap drain lines) to the skid.  
(If you purchased the optional ozone destruct unit assy., piping the exhaust of that unit to the outdoors is recommended).
2. Open your water inlet valve which will allow water to enter into the system. The Contact Tank is full when water is visible in the Air Vent. Water seen here also ensures that the pumps are primed with water. IMPORTANT: Do not start the system unless it is full of water, as equipment damage may result in the event of a dry start.
3. Depending on the options that you purchased, energize the electrical components.

4. Inspect all water connections for leaks.
5. Make sure the contact tank pressure gauge is between 10-50 PSI.

If you ordered any optional products, please refer to the manuals that were supplied to you for additional start-up instructions.

6. The Dissolved Ozone Level on the AS-500 (Dissolved Ozone Monitor) should be rising to within five (5) minutes of startup. NOTE: The dissolved ozone sensor will require time to stabilize in the process before full accuracy is reached. Normally this occurs within a few hours, but may require more time. Refer to the AS-500 Dissolved Ozone Monitor (AV88) and Sensor operation manuals for details, as you might need to enter/alter the settings.

## **Section 4**

### **Warranty**

**Ozone Solutions warrants all equipment assembled, manufactured, and sold to be free from defects in material and workmanship under normal use and service for a period of one (1) year after date of sale to the original purchaser.**

Some products may have a specific warranty period other than what is outlined in this document. For such products, the manufacturer warranty will supersede this warranty. Ozone Solutions will honor the manufacturer's warranty, but if and when advised by the manufacturer, may have the customer deal directly with the manufacturer.

This warranty covers all parts that are not outlined in a product maintenance schedule. This warranty will be void if any piece of the equipment is used in a manner other than what is explicitly outlined in the product manuals.

If any part of the equipment manufactured by Ozone Solutions proves to be defective during the warranty period, please contact Ozone Solutions at 1-888-892-0303, or [tech@ozonesolutions.com](mailto:tech@ozonesolutions.com).

Prior authorization is required before working on or shipping a product back to us. Failure to get prior authorization may result in denial of your claim. Once authorized, you may return the defective equipment to Ozone Solutions with the transportation charges prepaid. If Ozone Solutions finds the equipment to be defective, it will be repaired or replaced at our discretion, free of charge, to the original purchaser (F.O.B. factory).

This warranty shall not place any liability on Ozone Solutions for any transportation charges, labor, or cost for, or during the replacement of any parts. The replaced part (s) or product will then continue the original warranty duration. The replaced parts will not start a new one (1) year coverage period.

The purchaser by acceptance of the equipment will assume all liability for the consequences of its use or misuse by the purchaser, employees, or others. This warranty shall not apply to any piece of equipment, or part thereof sold by this company which has been subject to any accident caused in transit, alterations

This warranty shall constitute the entire warranty and/or agreement between Ozone Solutions and the original purchaser, and in lieu of all other warranties, expressed or implied, either oral or written, including the warranty of merchantability and fitness for a particular use and of all other obligations or liabilities on our part. Ozone Solutions neither assumes nor authorizes any other person or entity to assume for us any liability associated with the sale of its products or equipment.

The term "original purchaser," as used in this warranty, means whom the product was originally sold to by Ozone Solutions or by an authorized dealer.

Ozone Solutions reserves the right to make changes in its products without notice. Because of this, Ozone Solutions is not obligated to replace warranty defective part (s) and/or product with the same original part or product.

### **Contact Information**

Ozone Solutions, Inc.

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# Appendix A - OSHA



## SAFETY DATA SHEET [formerly MSDS]

Page 1 of 1

1. PRODUCT IDENTIFICATION	
<b>Product Name:</b> OZONE	
<b>Common Names/Synonyms:</b> Triatomic Oxygen, Trioxigen,	
<b>Ozone Generator Manufacturer/Supplier</b>	
Ozone Solutions, Inc.	<a href="http://www.ozonesolutions.com">www.ozonesolutions.com</a>
451 Black Forest Rd.	<a href="mailto:tech@ozonesolutions.com">tech@ozonesolutions.com</a>
Hull, IA 51239	
712-439-6880	
<b>Product Use:</b> This SDS is limited to ozone produced in gaseous form on site by an ozone generator, in varying concentrations, in either air or aqueous solution, for the purposes of odor abatement, oxidation of organic compounds, or antimicrobial intervention, in a variety of applications.	

2. HAZARD IDENTIFICATION		
GHS Classifications:		
Physical:	Health:	Environmental:
Oxidizing Gas	Skin Irritation – Category 3 Eye Irritation – Category 2B Respiratory System Toxicity – Category 1 (Single & Repeated)	Acute Aquatic Toxicity – Category I
NOTE: Severe respiratory toxicity will develop before skin or eye irritation go beyond listed categories. <i>Anyone with chronic pulmonary problems, especially asthma, should avoid exposure to ozone.</i>		
WHMIS Classifications (Workplace Hazardous Materials Information System, Canada): C, D1A, D2A, D2B, F		
Source: CCOHS CHEMINFO Record Number 774		

3. COMPOSITION	
Chemical name	Ozone
Common names	Triatomic oxygen, trioxigen
Chemical Formula	O <sub>3</sub>
CAS Registry Number	10028-15-6

4. FIRST AID MEASURES			
Route of Entry		Symptoms	First Aid
Skin Contact	YES	Irritation	Rinse with water
Skin Absorption	NO	NA	NA
Eye Contact	YES	Irritation	Rinse with water, remove contacts
Ingestion	NO	NA	NA
Inhalation	YES	Headache, cough, heavy chest, shortness of breath	Remove to fresh air, provide oxygen therapy as needed
For severe cases, or if symptoms don't improve, seek medical help.			

5. FIRE FIGHTING MEASURES
Ozone itself is not flammable. As a strong oxidant it may accelerate, even initiate, combustion, or cause explosions. Use whatever extinguishing agents are indicated for the burning materials.

6. ACCIDENTAL RELEASE MEASURES
Turn off the ozone generator, and ventilate the area. Evacuate until ozone levels subside to a safe level (<0.1 ppm).

7. HANDLING AND STORAGE
Ozone must be contained within ozone-resistant tubing and pipes from the generation point to the application point.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION
OSHA Permissible Exposure Limit: 8 hour TWA 0.1 ppm
ANSI/ASTM: 8 hour TWA 0.1 ppm, STEL 0.3 ppm
ACGIH: 8 hour TWA 0.1 ppm; STEL 0.3 ppm
NIOSH: ELCV 0.1 ppm light; 0.08 ppm moderate; 0.05 ppm, heavy
Light, moderate, heavy work TWA <= 2 hours: 0.2 ppm
Immediately Dangerous to Life or Health (IDLH) 5 ppm
Respiratory Protection: Use full face self-contained breathing apparatus for entering areas with a high concentration of ozone.
Engineering control: Use ozone destruct unit for off gassing of ozone.

9. PHYSICAL AND CHEMICAL PROPERTIES			
Physical state	Gas	pH	NA
Molecular Weight	48.0	Decomposition temperature	NA
Appearance	Clear at low concentration, blue at higher concentration	Evaporation rate	NA
Odor	Distinct pungent odor	Flash point	NA
Odor threshold	0.02 to 0.05 ppm; exposure desensitizes	Auto-ignition temperature	NA
Melting point	-193°C/-315°F	Relative density	NA
Boiling point	-112°C/-169°F	Partition coefficient	NA
Vapor pressure	> 1 atm	Flammability	NA
Vapor density	1.6 (air = 1)	Explosive limits	NA
Solubility in water	570 mg/L @20°C & 100% O <sub>3</sub> ; 0.64 @0°C	Viscosity	NA

10. STABILITY AND REACTIVITY
Ozone is highly unstable and highly reactive. Avoid contact with oxidizable substances. Ozone will readily react and spontaneously decompose under normal ambient temperatures.

11. TOXICOLOGICAL INFORMATION	
Likely routes of exposure: inhalation, eyes, skin exposure.	
Effects of Acute Exposure: Discomfort, including headache, coughing, dry throat, shortness of breath, pulmonary edema; higher levels of exposure intensify symptoms. Possible irritation of skin and/or eyes.	
Effects of Chronic Exposure: Similar to acute exposure effects, with possible development of chronic breathing disorders, including asthma.	
LC50: mice, 12.6 ppm for 3 hours; hamsters, 35.5 ppm for 3 hours	
Irritancy of Ozone	YES
Sensitization to Ozone	NO
Carcinogenicity (NTP, IARC, OSHA)	NO
Reproductive Toxicity, Teratogenicity, Mutagenicity	Not Proven
Toxicologically Synergistic Products	Increased susceptibility to allergens, pathogens, irritants

12. ECOLOGICAL INFORMATION
The immediate surrounding area may be adversely affected by an ozone release, particularly plant life. Discharge of ozone in water solution may be harmful to aquatic life. Due to natural decomposition, bioaccumulation will not occur, and the area affected will be limited.

13. DISPOSAL CONSIDERATIONS
Off-gassing of ozone should be through an ozone destruct unit which breaks ozone down to oxygen before release into the atmosphere.

14. TRANSPORT INFORMATION
NOT APPLICABLE, as ozone is unstable and either reacts or decomposes, and must be generated at the location and time of use.

15. REGULATORY INFORMATION
SARA Title III Section 302 EHS TPQ: 100 lbs.
SARA Title III Section 304, EHS RQ: 100 lbs.
SARA Title III Section 313: > 10,000 lbs. used/year.
Source: EPA List of Lists

16. OTHER INFORMATION
Half-life of ozone in water at 20°C = 20 min; in dry still air at 24°C = 25 hr; decreases significantly with increase in humidity, presence of contaminants, air movement, and/or increase in temperature.
Preparer: Dave Kuiper, Ozone Solutions
Date of Preparation: 5/1/2015

Disclaimer: Ozone Solutions provides this information in good faith, but makes no claim as to its comprehensiveness or accuracy. It is intended solely as a guide for the safe handling of the product by properly trained personnel, and makes no representations or warranties, express or implied, of the merchantability or fitness of the product for any purpose, and Ozone Solutions will not be responsible for any damages resulting from the use of, or reliance upon, this information.



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