P-100 & 200 Series Ozone Systems
INSTALLATION INSTRUCTIONS & PRODUCT MANUAL

C-M-P.COM/DEL

4-2266-01 Rev.C

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SECTION 6 Operation

SECTION 7 Maintenance & Service

READ & FOLLOW ALL INSTRUCTIONS

- Read this manual completely before attempting installation, operation, or service.
- Install in accordance with the installation instructions.
- Follow all applicable electrical and plumbing codes.
- **⚠WARNING** For indoor use only (units with suffix -01 or -03). For indoor/outdoor use (units with suffix -02 or -04), ozone generator only, when equipped with optional protective parts.
- **⚠WARNING** This product is provided with one or more door interlock switch(s). If the door is opened while the unit is running, the unit should stop operating immediately. If the product fails to operate in this manner, there is a possibility of a problem. Disconnect the power until the fault has been identified and corrected.
- **⚠WARNING** To reduce the risk of injury, do not permit children to use this product unless they are closely supervised at all times.
- **⚠WARNING** Risk of Electric Shock. Install at least 5 feet (1.5 m) from water.
- **⚠WARNING** Electric shock hazard. Be sure to disconnect from power source before any service work is performed. Failure to do so could result in serious injury or death.
- Hazardous voltages may still be present inside the enclosure when the power source disconnect switch is off.
- Do not power or operate with any panels or covers removed or with any enclosure door open.
- A wire connector is provided on this unit to connect a minimum 8 AWG (8.4mm^2) solid copper conductor between this unit and any metal equipment, metal enclosures of electrical equipment, metal water pipe, or conduit within 5 feet (1.5 m) of the unit.
- At least two lugs marked “BONDING LUGS” are provided on the external surface or on the inside of the supply terminal box or compartment. To reduce the risk of electric shock, connect the local common bonding grid in the area of the hot tub or spa to these terminals with an

insulated or bare copper conductor not smaller than No. 6 AWG.

- A green-colored terminal or a terminal marked G, GR, Ground, grounding or the ⏚ symbol is located inside the supply terminal box or compartment. To reduce the risk of electric shock, this terminal must be connected to the grounding means provided in the electric supply service panel with a continuous copper wire equivalent in size to the circuit conductors supplying this equipment.
- Hazardous levels of ozone may be trapped in the system after a fault condition or when power is turned off during operation. Always ensure ozone has been purged by allowing the Ozone System to complete its shutdown sequence before servicing.
- **⚠WARNING** Short term inhalation of high concentrations of ozone and long term inhalation of low concentrations of ozone can cause serious harmful physiological effects. Do not inhale ozone gas produced by this device.
- A spontaneous and violent ignition may occur if oil, grease, or contaminants come in contact with oxygen under pressure. Keep these substances away from oxygen regulators, cylinder valves, tubing and connections and all other oxygen equipment.
- Do not store or use gasoline, chemicals, or other flammable liquids or vapors near this or any other appliance.
- When ordering parts, please specify model and serial number. Use only identical replacement parts.

SAVE THESE INSTRUCTIONS!

ALL Genesis™ CD Ozone Generators are NSF listed.

1A. Description

DEL Ozone Platinum series ozone systems provide ozone gas for various applications. Advanced system controls allow for highly automated operation including proportional ozone dosing control, advanced safety features, and compatibility with many industrial control standards. Utility features include Human-Machine Interface (HMI) automated touch screen control panel, remote monitoring, remote control of system functionality and data logging, including diagnostics for system health. The system is energy efficient, helping to comply with green and sustainable practices.

1B. Specifications

Refer to ***APPENDIX A: UNIT SPECIFICATIONS*** for complete ozone system specifications.

Below are short descriptions of some of the installation requirements of the ozone system (hereafter called "unit"). For complete installation requirements refer to ***APPENDIX A: UNIT SPECIFICATIONS***, and ***APPENDIX D: INSTALLATION DIAGRAMS***

2A. Location

The unit should be installed in an indoor climate-controlled location that provides access to electrical power. If mounted in an enclosed area, the room must have a minimum of four air exchanges per hour while the unit is in operation. This is required for thermal management and to ensure adequate levels of ambient oxygen in the room.

2B. Mounting

The unit is intended to be wall mounted. Accessory brackets are included for wall mounting both the ozone generator and the oxygen concentrators. Optional floor mounting feet are available for the ozone generator. The system components should be mounted in a way that the ozone generator is in the center and there are up to two oxygen concentrators on either side while maintaining the minimum required spacing.

2C. Electrical

A pulling elbow (trade size 1/2") and enclosure power switch are included for field wiring to main power source. Wire the unit to a properly sized power disconnect in accordance with electrical codes using only copper conductors. Power wires and conduit should be routed as to maintain distance from unit signal wires. Power disconnect should be mounted within 5 feet of the unit. The bottom of the ozone generator has four IEC C14 type outlets intended to power 1-4 oxygen concentrators. On units equipped with optional remote access routers, the unit is supplied with two RJ-45 industrial inline couplers for connection to Internet (required) and Ethernet (optional). An enclosure signal wire conduit knock-out (trade size 3/4") and terminal blocks are included for field wiring to various external signals. Communication and signal wires and conduit should be routed as to maintain distance from unit power wires.

3A. Commissioning

Upon completing all of the connections outlined in SECTION 2, complete ***APPENDIX E: PRE-COMMISSIONING CHECKLIST*** and fax to DEL Industries at 805-541-8459. It can also be scanned and emailed to: service@delozone.com. Once the form has been sent, call DEL Customer Service at 800-676-1335 to schedule commissioning.

4A. System Overview Diagrams

Refer to figures 1-6.

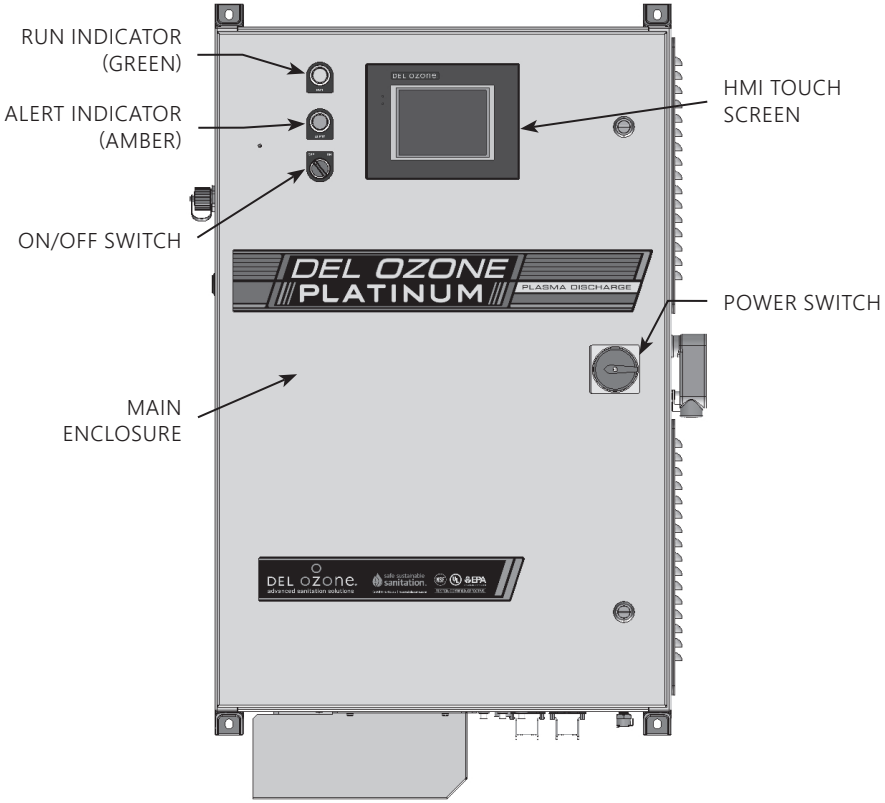


Figure 1: Front

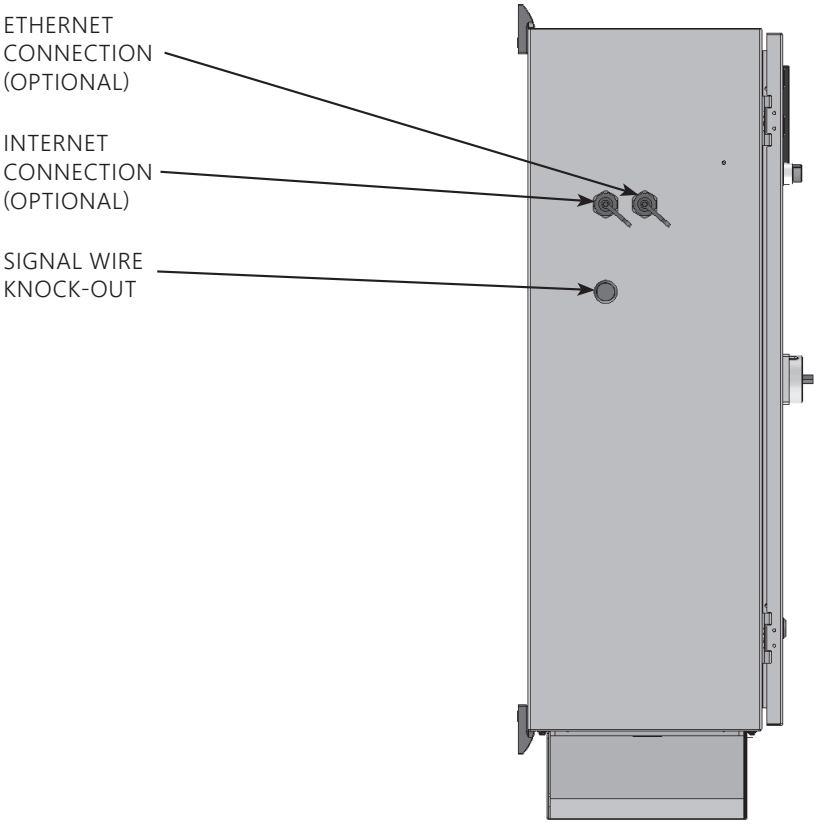


Figure 2: Left

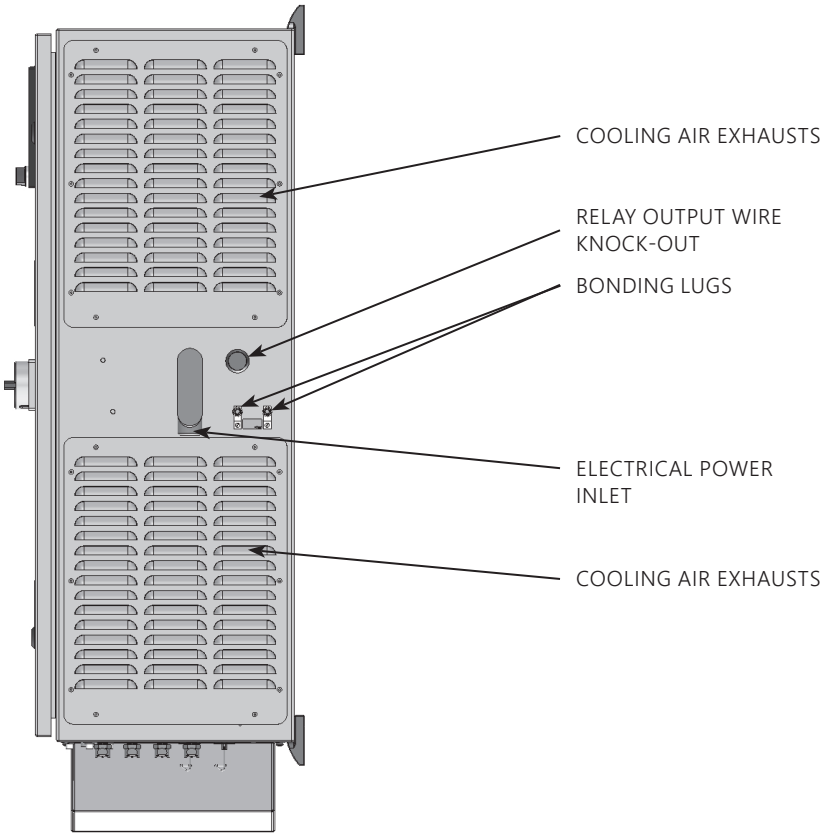


Figure 3: Right

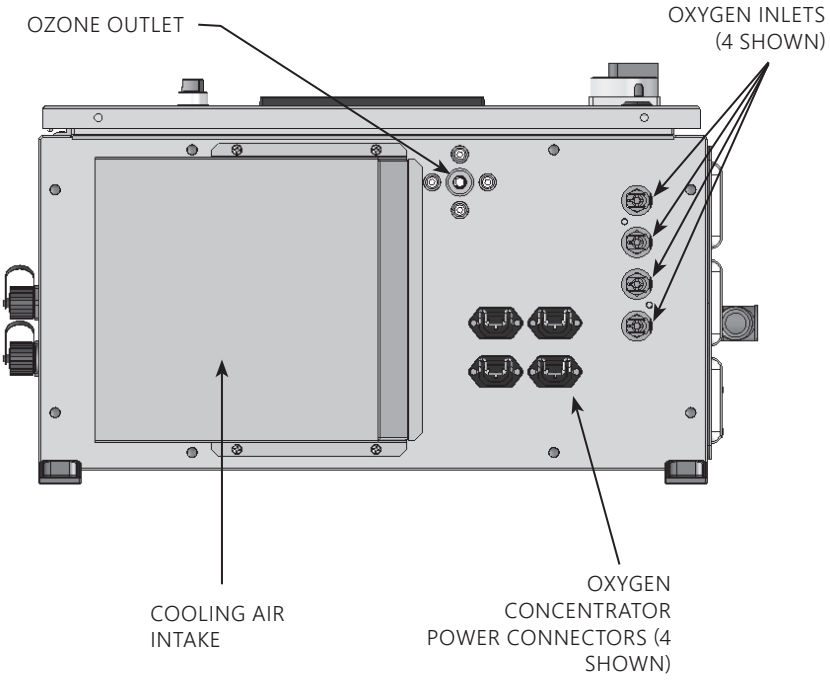


Figure 4: Bottom

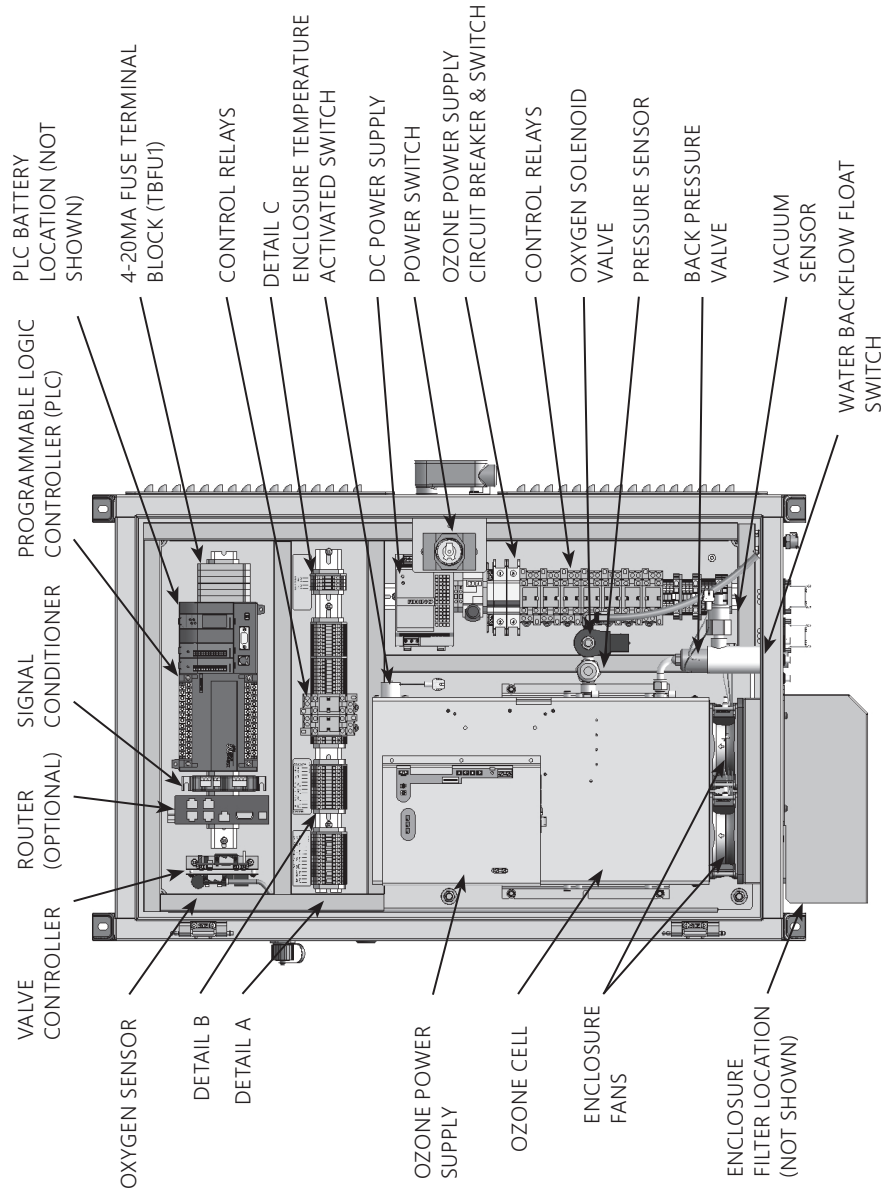
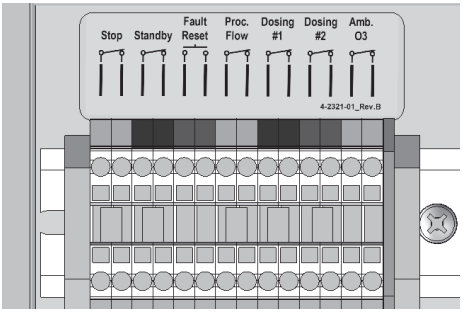


Figure 5: Enclosure Internals



DETAIL A: Discrete Connections (TBACC1)

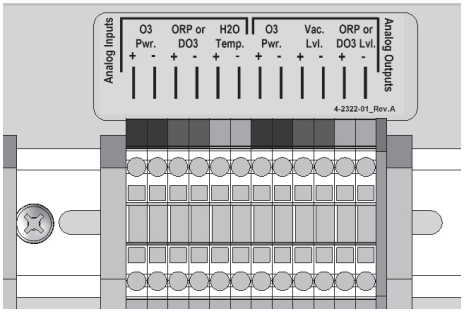
Detail A: Discrete Connections (TBACC1):

All discrete user I/O signals will have unique messaging on the HMI panel so an operator can determine the current status of the unit. For all normally closed signals, the jumper must be removed from the specific terminal block for the signal input to become active.

1. Stop: Dry contact, normally closed, this contact is used to put the generator in a shutdown mode
2. Standby: Dry contact, normally closed, this contact is used to put the unit in a standby mode.
3. Fault Reset: Dry contact, momentary, this contact is used to reset any faults or alerts that have since been corrected.
4. Proc. Flow: Dry contact, normally closed, this contact will temporarily disable ozone production and is meant to connect to a process flow switch.
5. Dosing #1: Dry contact, normally closed, this contact is used to turn ozone production on and off, typically connected to ORP or other controllers that use simple on/off output control.
6. Dosing #2: Dry contact, normally closed, this contact is used to turn ozone production on and off, typically connected to a secondary ORP or other controllers that use simple on/off output control.
7. Amb. 03: Dry contact, normally closed, this contact is used to connect to an ambient ozone monitor which will immediately halt ozone production upon activation. This contact will be logged and time stamped in the alarm history.

External Contacts Minimum Ratings

VOLTAGE	24 VDC
CURRENT	100 mA



DETAIL B: Analog Connections (TBACC2)

Detail B: Analog Connections (TBACC2):

Standard 2-wire 4-20mA analog inputs and outputs are provided in the unit. All analog inputs are passive and require external power. A brief description of each is provided, as follows:

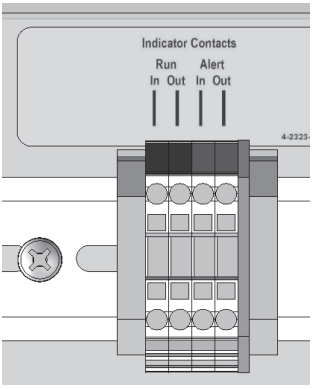
1. O3 Pwr.: Analog 4-20mA Input, this signal directly controls ozone output of the unit. Specifically, it varies the PDM output of the ozone power supply. This signal input is configured in the O3 Mode Screen on the HMI (the 4-20mA option).
2. ORP or DO_3: Analog 4-20mA Input, this signal is a measurement input signal from either an ORP meter or Dissolved Ozone Monitor that outputs a 4-20mA measurement signal. This signal input is configured in the O3 Mode screen on the HMI and provides the process variable measurement when using the closed-loop setpoint control.
3. H_2O Temp: Analog 4-20mA Input, This signal is a measurement input signal typically from a Dissolved Ozone Monitor that is a temperature measurement. It is used for information and logging purposes only.
4. O3 Power: Analog 4-20mA Output, this signal is used to indicate the output level of the ozone power supply, 0-100%. This output is independent of the control input type used to vary the ozone output level.
5. Vac. Level: Analog 4-20 mA Output, this signal is a measurement of the vacuum level at the unit,-14.5-0psi.

20mA Analog Input

INPUT IMPEDANCE	375 Ω
MAX CURRENT	30 mA
FUSE RATING	FAST-ACTING 31 mA

1. Connect the 2-wire 4-20mA signal wiring to the desired + and - terminals at TBACC2.
2. Use shielded wire. Ground the shield at the transmitter source only -- do not ground the shield at the terminal block input.
3. Used the shortest wire path possible while routing cable away from noise sources such as motors, high current switches, transformers, and AC wires.
4. The input signal must not exceed a maximum of 30mA. Install a series resistor as needed to match the 4-20mA transmitter output voltage and impedance to the input impedance.
5. The 4-20mA input signal is interpreted as follows:

CURRENT(MA)	RESULT
<4	SIGNAL LOSS
4-20	0-100% OF RANGE
21-30	100% OF RANGE
>30	MAX INPUT EXCEEDED. FUSE WILL OPEN AND RESULT IN SIGNAL LOSS FAULT.



DETAIL C: Relay Output Connections (TB2)

Detail C: Relay Output Connections (TB2):

Two relay outputs are provided to indicate the status of the ozone system. These signals may be run to a remote status display, for example, or connected to signal lights. External power is required and must meet the following ratings:

Relay Output Ratings

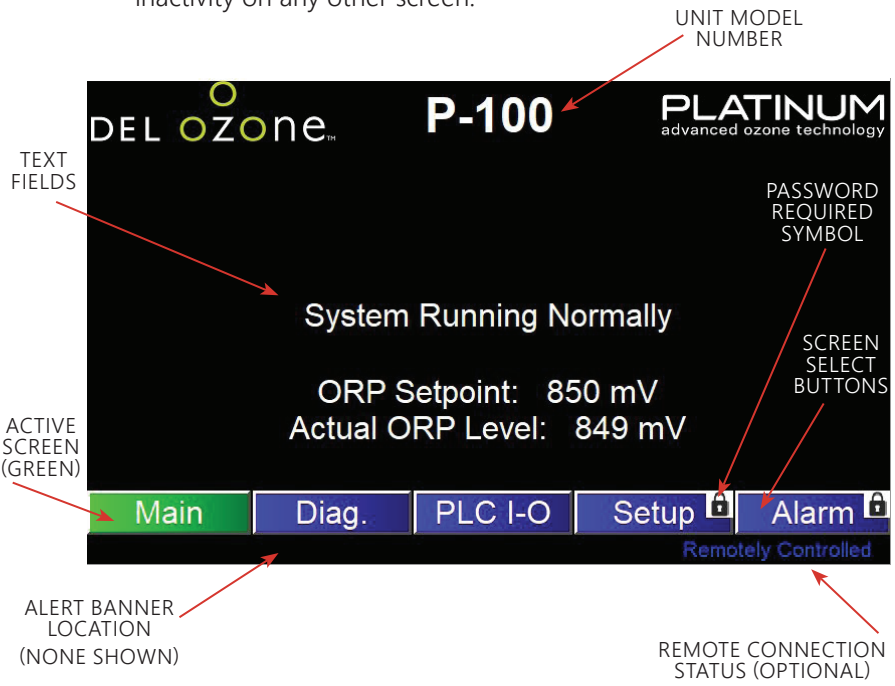
	AC	DC
MAX RESISTIVE LOAD (P.F. = 1.0)	10 A @ 100 VAC	10 A @ 24 VDC
MAX INDUCTIVE LOAD (P.F. = 0.4)	7.5 A @ 110 VAC	5 A @ 24 VDC
MAX OPERATING VOLTAGE	250 VAC	135 VAC
MINIMUM REQUIRED LOAD	--	100 MA @ 5 VDC

4B. Control Interface Overview

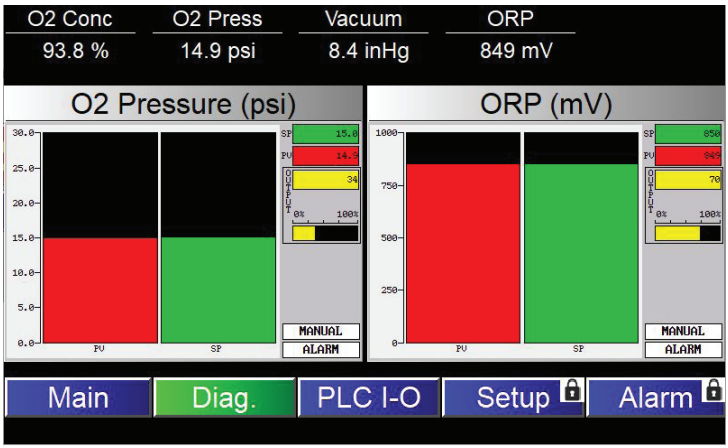
HMI Touch Screen: This touch sensitive LCD display provides the unit Human-Machine Interface (HMI). It includes status indicators and text fields that inform the operator of real-time functional conditions of the Ozone System. It also provides a means to make changes to the operational state (start, standby & stop) or the user settings of the unit -- either locally or remotely. Digital I/O is accomplished between the HMI and PLC via wired connection. Lastly, the HMI stores historical data and alerts to USB memory.

4B-1. HMI Touch Screen Settings & Menu

- Main Screen: Contains most of the information that is important to view during normal operation, including: text fields for unit operational status, feedback reading (ORP or dissolved ozone if equipped) & set point (if enabled). Message alerts and fault reset pop-up buttons will also be found on this screen. The unit will automatically return to the main screen after five minutes of inactivity on any other screen.

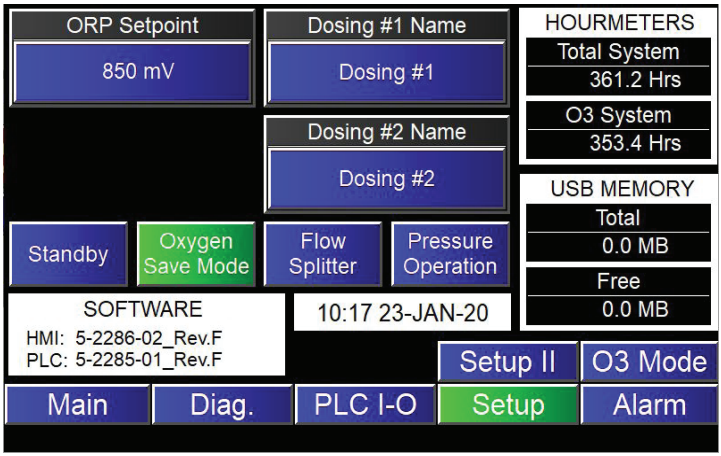


- Diagnostics Screen: Contains a list of the electronic sensors and real-time measurements from these sensors. These data fields form the list of parameters that are data logged to the USB memory drive. The current state of the control output for the back pressure valve is also displayed here. If the system is configured to utilize external ORP or Dissolved Ozone measurements, those process variables along with the outputs will be displayed.

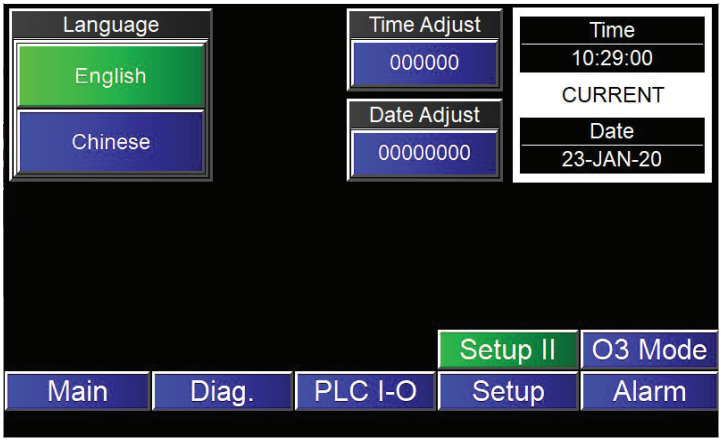


- PLC I/O Screen: Contains a list of the discrete PLC input and output channels, a title for each that is used, and a status indicator. Viewing this window is equivalent to looking at the physical PLC LEDs.

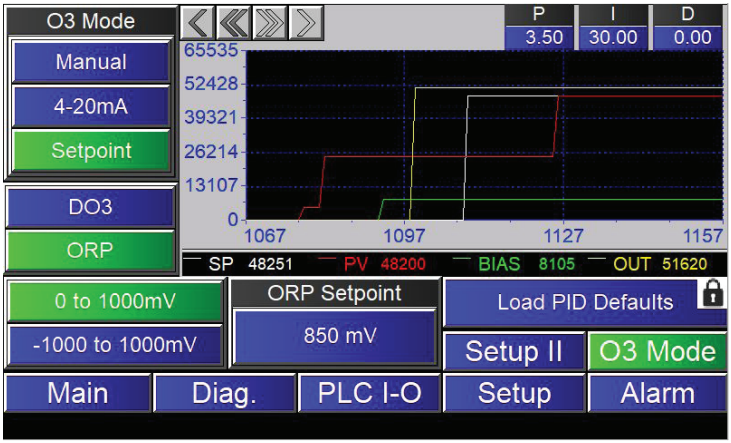
- Setup Screen: Contains the information that is typically accessed and selected during initial setup of the unit as well as system hour meters and software revision information. This screen is password protected. If enabled for external DO3 and ORP measurement signal, the setpoint can be changed here. Dosing contacts can be named as well for messaging purposes. Setup II and O3 Mode screens can also be accessed from this screen.



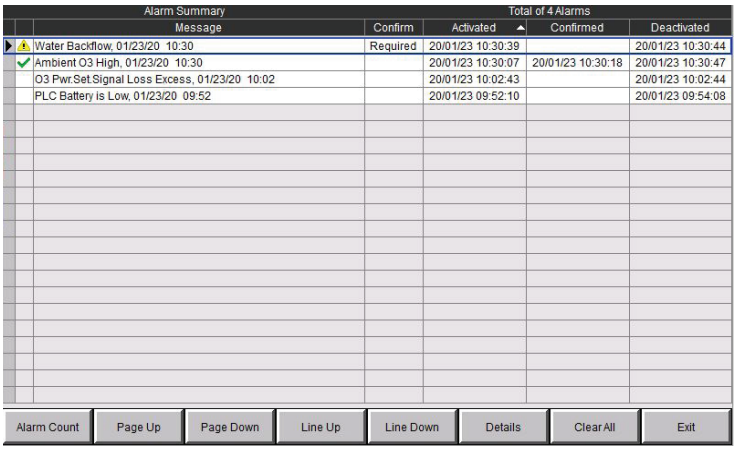
- Setup II Screen: Allows changing of the language displayed on the HMI and adjusting the current date and time.



- O3 Mode Screen: Allows configuration of the ozone output level. PID parameters which determine the response characteristics of the ozone control loop can be modified. This screen also displays plotted historical setpoint and actual control values to aid in tuning the control loop.



- Alarm Screen: Contains a list of alarms/alerts for the unit. These can be viewed chronologically or numerically. These alarms/alerts are also logged into USB memory. This screen is password protected.



- Alert Banner: Located on the bottom of all screens, this field will provide alert messages relative to the real-time operation of the unit.
- Remote Connection Status (if equipped with optional remote access router): Located on the bottom right of all screens, this field will indicate when an operator is remotely connected and whether that operator is viewing or controlling the unit. Refer to ***SECTION 5E. Remote Operation & Data Logging*** for more information.

4B-2. Run Indicator (green):

This light indicates when the unit is in running (solid) or in a start-up or shut down sequence (flashing).

4B-3. Alert Indicator (amber):

This light indicates when the unit requires attention to check or clear a fault condition. A solid light indicates a latched fault has occurred and the unit will require operator intervention before restart is possible. A flashing light indicates an unlatched fault has occurred — this typically will place the unit in a standby condition and may not require immediate operator intervention. In either case, the HMI will provide details of the specific fault and the method to clear and restart the unit, if necessary

4B-4. On/Off Switch:

Initiates start-up or shut-down sequence.

4B-5. Power Switch:

Disconnects main incoming power for the unit.

⚠ DANGER There may still be hazardous voltages present in the enclosure, even with the switch in the off position. An external disconnect switch is required to be installed within 5 feet of the unit to provide a primary means of removing power from the unit.

4C. Control System Components

1. Programmable Logic Controller (PLC): The controller and operating software have been designed to control and report all generator functions. Safety interlocks ensure proper activation/shut-down sequences of system functions and are reported through the HMI. Analog I/O is analyzed and also reported though the HMI. Digital I/O is accomplished between the PLC and Router (optional) via wired connection. External ambient ozone contacts or analog signals are tied to this controller as well.
2. DC Power Supply: Supplies 24 VDC power to control system components. All control relay coils, sensors, indicators, and safety interlocks are powered from this DC source.
3. Control Relays: These relays provide 230 VAC power to the oxygen concentrators and oxygen solenoid valve. One also provides power to the valve controller. Another is used to turn ON/OFF the ozone power supply and enclosure fans. These are controlled by the PLC and provide a green LED indicator when active.
4. Router (optional): The primary device for enabling communication between the PLC, HMI, and Router via local area network within the unit. The router also allows secure remote machine support for the unit through internet VPN tunneling connection. This provides remote Authorized Customer Service access to the unit without access to the customer network.

4D. System Interlocks & Sensors

1. Water Backflow Float Switch: Unit is plumbed into the ozone outlet line. Water reaching this point will raise the float switch initiating a fault condition with immediate shutdown of the ozone cells and closing of the back pressure valve. This will isolate the gas and liquid sides of the ozone system. A fault message is displayed on the HMI. The fault condition remains until the operator has drained water from the ozone plumbing. **NOTE:** Water backflow faults occur when the check valve(s) at the injector and/or ozone output has failed. Prior to restarting the unit, the check valve(s) must be repaired or replaced.

2. Enclosure Temperature Activated Switch: If the internal temperature of the enclosure rises above the 130 °F set point, a switch opens initiating a fault condition and message on the HMI.
3. Ozone Power Supply Circuit Breaker Switch: If the ozone power supply circuit-breaker trips, the switch will open initiating a fault condition and message on the HMI.
4. Ozone Power Supply Fault: The ozone power supply has its own internal protective functions. When one of these has been triggered the ozone power supply will shutdown, initiating a fault condition and message on the HMI.
5. Oxygen Sensor: Indicates oxygen gas concentration through a 4-20mA signal to the PLC. If concentration falls below 80% it initiates a fault condition and message on the HMI. It will also alert to a low oxygen concentration when between 80-85%.
6. Pressure Sensor: Indicates the oxygen pressure to the ozone cell through a 4-20mA signal to the PLC. If the pressure is below 5psi or above 25psi it initiates a fault condition and message on the HMI. It will also alert to a high pressure when between 23-25psi.
7. Vacuum Sensor: Indicates vacuum level at the ozone outlet through 4-20mA signal to the PLC. If running vacuum becomes less than -1 in Hg it initiates a fault condition and message on the HMI. It will also alert for a high vacuum level when above -20 in Hg.

4E. System Closed-Loop Driven Components

1. Back Pressure Valve: This is a proportionally controlled solenoid valve that, during normal operation, throttles the outlet of the ozone cell to maintain pressure within the cell. By regulating this pressure, it allows the ozone cell to operate with its highest efficiency throughout a very wide range of oxygen flow rates. When Flow Splitter is enabled, this valve maintains vacuum level after the valve to compensate for varying vacuum levels and flows. This valve is controlled through a 4-20mA signal from the PLC. The feedback for controlling this valve is provided by the signal from the pressure sensor or vacuum sensor.
2. Dissolved Ozone/ORP: When used with an external dissolved

ozone or ORP monitor to provide a process measurement, the unit can provide an internal control loop to proportionally vary the ozone output based on the setpoint value which is set on the HMI. The external measurement signal is 4-20mA with a range that can be defined during setup of the unit.

4F. Other Main System Components:

1. Oxygen Concentrators: These perform the essential task of preparing high oxygen concentration feed gas to assist in efficient ozone production. Each receives power directly from the ozone generator through a control relay. The modular nature of the system design allows for the use of 1-4 oxygen concentrators.
2. Oxygen Solenoid Valve: This valve stops flow from the oxygen source when the unit is in a powered down condition. It also prevents a vacuum source (venturi injector) from pulling air through the oxygen concentrator(s) when they are not powered, which can damage the oxygen concentrator(s).

5A. Setting the Control Type

The Platinum series ozone generators have several methods of controlling the ozone output. These can be configured under the O3 Mode Screen.

1. Manual: The manual setting is a 0-100% output setting that will vary the ozone cell output from a 0-100% based on this value. This setting is typically used when the ozone output rarely needs to be varied, or when the unit is being controlled by a system with discrete contacts (on/off type ORP controllers)
2. 4-20mA: This setting relies on an external control signal that will vary the ozone output directly relative to this input signal.
3. Setpoint:
    a. ORP: This setting requires an ORP monitor with an analog measurement signal output (4-20mA) connected to the unit. The scaling and setpoint are set in the O3 Mode screen. Once

setup, the internal control loop will vary the ozone output of the ozone power supply to maintain the ORP setpoint.

b. DO3: This setting requires a dissolved ozone monitor with an analog measurement signal output (4-20mA) connected to the unit. The scaling and setpoint are set in the O3 Mode Screen. Once setup, the internal control loop will vary the ozone output of the ozone power supply to maintain the dissolved ozone setpoint.

5B. Other Options

1. Standby: When active, the unit will operate as normal except ozone will not be generated.
2. Oxygen Save Mode: When active, the unit will turn off oxygen concentrator(s) when in a standby mode. This is typically used for applications that may have extended times between enabling the ozone system.
3. Flow Splitter: When this operating mode is enabled, the unit will prioritize maintaining vacuum by adjusting the back pressure valve. This mode should be enabled when the unit is used with a Flow Splitter, as in when the ozone output line is shared between more than one vacuum source. In addition, any vacuum source that varies enough to consistently cause both low vacuum faults and high vacuum alerts may benefit by using this mode. The steps to start up the system when using this mode are slightly different as noted in Section 6D. Detailed System Start-Up.
4. Pressure Operation: ⚠**WARNING** Operating in this mode is not recommended as it can create dangerous level of ozone gas very quickly. This option is password-protected and causes the unit to ignore the minimum vacuum level on the ozone outlet as a requirement for operation.
5. Dosing #1 & #2 Name: Allows custom names to be entered for these two contacts.
6. Language: English and Chinese can be selected for display languages.

6A. Quick System Start-Up

This presumes that the unit has already been in regular use in its present application and is powered on. Refer to ***SECTION 6D. Detailed System Start-Up*** for information on starting the unit for the first time or after an extended shut-down.

1. Rotate the power switch to the ON position. This will power up the unit, and the HMI will provide information on what stage of the power up sequence the unit is in.
2. Rotate the On/Off switch to the ON position. This will initiate the startup sequence and begin producing ozone when all required running conditions are met.

6B. Shut-Down

1. Rotate the On/Off switch to the off position. At this point the unit will immediately halt ozone production and initiate the shut-down sequence.

6C. Emergency Shut-Down

1. Rotate the power switch to the OFF position. At this point the unit will immediately power off, bypassing the normal shut-down sequence. This type of shut-down is to be used in emergency situations only as it circumvents shut-down steps that over time improve reliability of the unit.

6D. Detailed System Start-Up

Read completely before starting the system. This presumes that commissioning by DEL authorized service technician has already been performed.

1. Verify proper electrical and plumbing connections are in place and that no leaks are present. Verify that all external oxygen concentrators are connected to the main unit with both electrical and pneumatic connections.

2. Verify that all unit panels and covers are installed and that all enclosure doors are closed.
3. Verify that all oxygen concentrator power switches are in the ON position. Included oxygen concentrators will not power on until the main unit powers up and is in a running condition. If a centralized oxygen source is used, verify that it is active and supplying to specified requirements.
4. Ensure that an ambient ozone monitor(s) have been installed and are operating correctly in all occupied areas near the ozone system.
5. Switch the external power service disconnect on.
6. Rotate the power switch to the ON position.
7. Verify that the unit powers up and that after a short delay the HMI displays the main screen.
8. Ensure the System Configuration (see ***SECTION 5***) has been completed.
9. Rotate the ON/OFF switch to the ON position. This will initiate the startup sequence and begin producing ozone when all required running conditions are met. A vacuum needs to be maintained at the ozone outlet for the system to begin producing ozone.
10. Once the system is running, check that the oxygen concentrator(s) is operating at no more than 9 lpm as indicated on the flow meter on the side of the unit. Use the flow meter knob to adjust as necessary. For units with more than one oxygen concentrator, ensure that flows are the same on each.
11. Flow splitter mode enabled: All vacuum sources should be turned on and adjusted to preferred flow ratio. During this process, continue to monitor and adjust oxygen concentrators described in step 10, while also monitoring oxygen pressure as shown on the diagnostics screen. Adjust vacuum sources to achieve 15psi oxygen pressure (increasing vacuum settings will lower oxygen pressure and vice versa). Once this is complete, the system will now be prepared to compensate as vacuum sources decrease as much as 80% of the initial setting.

NOTE: In the event of a system alert or fault, follow the HMI instructions to reset the fault and try again. If a problem persists, refer to ***SECTION 6D*** to troubleshoot, identify, and correct the root cause.

6E. Remote Operation (optional) & Data Logging

If the unit is equipped with a remote access router, operation of the unit can be performed by connection to the HMI Touch Screen through the LAN from a laptop or similar device. There are two levels of remote access, either "view only" access or "control" access. The HMI Touch Screen also performs data logging by storing log files to a solid-state USB memory stick located in the back of the HMI.

1. Connect to the unit network
    a. Go to the TCP/IP properties in the network adapter settings and set the IP address to:

IP ADDRESS	192.168.99.40
SUBNET MASK	255.255.255.0
DEFAULT GATEWAY	192.168.99.150

    b. Be sure to connect to the LAN of the unit using the optional Ethernet connection port (refer to ***SECTION 2D. Electrical for Connection Locations***)
2. To access the HMI Touch Screen
    a. Launch an internet browser. In the URL field, enter the IP address 192.168.99.10
    b. The browser should now display the HMI remote screen (C-More).
    c. Click on the "Remote Access" link. This will prompt for a save or run. Either save then run, or just run the remote viewer app.
    d. To login, type the username and password:
        i. View only:

USERNAME	DelView
PASSWORD	(LEAVE BLANK)

        ii. Control:

USERNAME	DEL1
PASSWORD	1

e. The mouse cursor on the computer app should now function the same as using the HMI Touch Screen.

3. Access the logged data of the unit.

   a. The logged data that is stored on the USB drive can be accessed by first powering the unit down and opening the enclosure, this will allow access to the rear of the HMI panel where the drive is connected. The drive will contain text files which can easily be imported and manipulated in MS Excel. Remove necessary files and replace the drive into the HMI prior to restarting the unit.

7A. Preventative Maintenance Schedule

The preventative maintenance schedule has been established as a minimum guide for the unit that operates under normal conditions. If the unit operates in sever-duty conditions, such as dusty areas, it will require more frequent preventative maintenance.

⚠WARNING Electric shock hazard. Be sure to disconnect from power source before any service work is performed. Failure to do so could result in serious injury or death.

Daily:

1. Verify that no alert messages are displayed on the unit HMI and that, when running, the green unit run indicator is solidly lit.
2. Verify that the unit is able to maintain process set point (ORP or Dissolved Ozone if equipped).
3. Verify that unit enclosure fans are running when the ozone power supply is active.

Weekly:

1. Perform normal daily inspection.
2. Visually inspect unit enclosure filter. Clean or replace as needed.
3. If equipped, visually inspect unit oxygen concentrator filter(s). Clean or replace as needed (refer to the included oxygen concentrator manual for further information).

4. If equipped, verify that the unit oxygen concentrator pressure(s) and flow(s) are within specification and are balanced (refer to the included oxygen concentrator manual for further information).

Monthly:

1. Perform normal weekly maintenance.
2. Oxygen Concentrator maintenance, if equipped: clean each enclosure and check the performance of solenoid valves. Rebuild or replace, as necessary (refer to the included concentrator manual for further information).
3. Perform a function test of ambient ozone monitor (if installed).

Every Three Months:

1. Perform normal monthly service.
2. Check oxygen plumbing for evidence of chafing, and repair or replace as needed.
3. Test all PLC safety interlocks.

Every Six Months:

1. Perform normal three-month maintenance.
2. Perform general cleaning throughout the unit enclosures.
3. Inspect electrical system for corroded contacts or chafed wires or cables. Clean or repair as needed.
4. Rebuild or replace stainless steel check valve on the ozone outlet.

Every Year:

1. Perform normal six-month maintenance.
2. Rebuild the back pressure valve.
3. Replace the gasket at the water backflow float switch weldment (BFPD).
4. Replace PLC memory backup battery.
5. If equipped, rebuild or replace the air compressor in each oxygen concentrator (refer to the included concentrator manual for further information on maintenance intervals and this process).

7B. Replacement Parts & Ordering Information

For replacement parts call DEL Customer Service at 1-800-676-1335. Be prepared with the following information:

- Customer Name
- Customer Address
- DEL Model Number
- DEL Serial Number

7C. Troubleshooting

The Human-Machine Interface (HMI) Touch Screen will provide immediate text notification of all system alerts as detected by the PLC. The tables below list various system and PLC alerts that may be encountered during normal operation, along with typical causes and potential corrections. Other alert messages may occur that are not listed here. The HMI also maintains an alarm/alert history which can be accessed through the Alarm screen. Refer to ***SECTION 4B.1 HMI Touch Screen*** for more information. Contact DEL Customer Service for assistance in troubleshooting.

⚠WARNING Electric shock hazard. Be sure to disconnect from power source before any service work is performed. Failure to do so could result in serious injury or death.

1. Unit Will Not Start

Cause	Solution
No power	Verify that the main supply conductors are properly connected and that correct voltage is present.

2. Alert Message: Low Vacuum Fault

Cause	Solution
Process will not supply adequate vacuum levels	Increase injector inlet pressure, decrease injector back pressure, change injector size
Airflow of ozone system is too high	Reduce oxygen flow with the flow meters on the oxygen concentrators, keep all output flows balanced.
Ozone output line is restricted	Ensure there are no flow restrictions in the ozone line from the generator to the vacuum source.
Check valve(s) is installed backwards	Correct installation orientation.

3. Alert Message: Signal Loss (any)

Cause	Solution
Bad signal fuse(s)	Check 4-20mA signal fuse(s) inside enclosure at Terminal Block Fuse #1 (TBFU1). Replace as needed with fuse of same type and rating only.
Sensor wiring or cables disconnected or damaged	Verify wiring between sensor and PLC is connected and undamaged. Refer to wiring diagram label or ***Appendix C: Wiring Diagrams*** for more information.
Sensor failed or lost power	Replace or repair failed sensor.

4. Alert Message: Excess (any)

Cause	Solution
More than five unlatched faults of same type in 24 hours	Review specific fault history in the Alarm screen of the HMI. Find fault type and refer to specific troubleshooting table that applies.

5. Alert Message: Ambient O3 High

Cause	Solution
Ambient ozone monitor is detecting high levels of ozone in the air	Ventilate area until ambient ozone drops to safe level. Check all ozone plumbing lines for leaks, including those lines between the degas valve and ozone destruct. Verify that the ozone destruct granular catalyst is not wet. Restart unit. If ambient ozone alert reoccurs, turn off and lock unit and contact DEL Customer Service.
Ambient ozone monitor faulty	Refer to Ambient Ozone Monitor manual for instructions regarding sensor service/ calibration and troubleshooting of instrument.

6. Alert Message: Water Backflow

Cause	Solution
Water backflow detected	Rebuild or replace the check valve at ozone outlet fitting. Remove, clean, and thoroughly dry all gas plumbing exposed to water backflow. If water has reached the ozone cell do not restart unit. Contact DEL Customer Service.

7. Alert Message: Cabinet Temp High

Cause	Solution
Enclosure filter dirty	Clean or replace filter.
Enclosure fan(s) not operating	Check for fan rotation when ozone power supply is active. Replace fan(s) as needed.
Room temp. has exceed 105 °F	Reduce ambient temperature.

8. Alert Message: Ozone Power Supply Fault

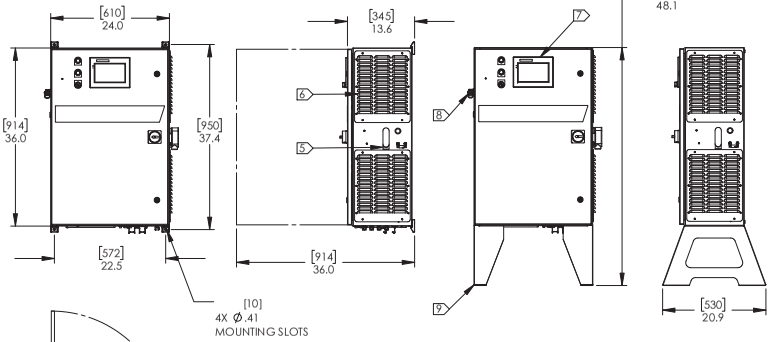
Cause	Solution
Ozone power supply in protection mode	The ozone power supply has its own internal protective functions. Contact DEL Customer Service for assistance.

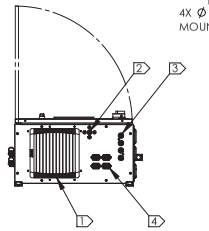
9. Alert Message: Oxygen Pressure/Concentration Low (any)

Cause	Solution
Oxygen pressure below 5psi or concentration below 85%	Check oxygen concentrator(s) for proper operation. Verify that running pressure(s) and flow(s) are within specification and are balanced (refer to included concentrator manual for further information). Verify that all oxygen and ozone plumbing is secure and is free of kinks, damage or leaks.

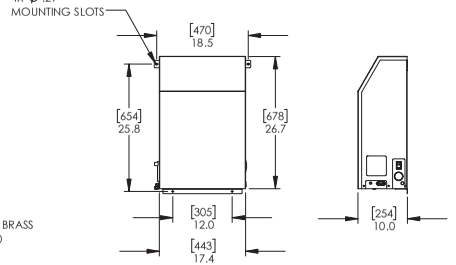
APPENDIX

OZONE GENERATOR





OXYGEN CONCENTRATOR (UP TO 4 UNITS WITH P-100)



1. COOLING AIR INTAKE
2. OZONE OUTLET, 3/8" TUBE COMPRESSION, 316SS
3. OXYGEN INLET (4), CPC QUICK CONNECT, NICKEL PLATED BRASS
4. OXYGEN CONCENTRATOR POWER CONNECTIONS, IEC320
5. POWER INLET, 1/2" FNPT
6. COOLING AIR EXHAUST
7. USER INTERFACE
8. NETWORK CONNECTION, ETHERNET (OPTIONAL)
9. FLOOR MOUNTING KIT (OPTIONAL)

STANDARD SPECIFICATIONS	
MODEL NUMBER	P-100-XX
CABINET SIZE	36" X 24" X 13"
POWER REQUIRED	240 VAC, 50HZ, 14.6A*
OZONE OUTPUT (+/- 10 %)**	2.4-6.2 LB./DAY (45-117G/HR), 3.8-5.8% BY WT CONCENTRATION, DEPENDENT ON OXYGEN FLOW
OPERATOR INTERFACE	7" COLOR TOUCHSCREEN
OPERATOR INTERFACE LANGUAGES SUPPORTED	ENGLISH, CHINESE
HEAT REJECTION	4950 BTU/HR (GENERATOR) + 2450 BTU/HR FOR EACH OXYGEN CONCETRATOR
POWER FACTOR	0.9 FULL LOAD
CONTROL SYSTEM	PLC
COOLING	FORCED AIR
OZONE TECHNOLOGY	PT1 PLASMABLOCK
AIR PREP	EXTERNAL, CONTROLLED & POWERED THROUGH GENERATOR
PNEUMATIC CONTROL	CLOSED LOOP, PROPORTIONAL SOLENOID VALVE
DATA LOGGING	REMOVABLE USB MEMORY
O2 MONITORING	PRESSURE & CONCENTRATION
VACUUM MONITORING	VACUUM LOSS DETECTION
AMBIENT TEMPERATURE REQUIREMENT	40°F-105°F
NEMA RATING	3R (OZONE GENERATOR ONLY, WHEN EQUIPPED WITH OPTIONAL PROTECTIVE PARTS)
NSF	LISTED STANDARD 50
BACKFLOW PREVENTION & DETECTION	INCLUDED STANDARD
OPTIONS	
STAINLESS STEEL ENCLOSURE (SHOWN)	
LOCAL NETWORK CONNECTIVITY & REMOTE SERVICE DIAGNOSTICS	
FLOOR MOUNTING KIT (PN. 9-1253-01)	
*RATING INCLUDES 4 OXYGEN CONCENTRATOR ASSEMBLIES	
**MEASURED AT 70°F AMBIENT TEMPERATURE AND 15PSI OXYGEN FEED PRESSURE	

USER INPUTS		
	DESCRIPTION	SIGNAL TYPE
ANALOG***	O3 POWER SETTING	4-20mA ANALOG
	DISSOLVED O3	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
	ORP	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
DISCRETE	STOP	DISCRETE CONTACT
	STANDBY	DISCRETE CONTACT
	PROCESS FLOW SWITCH	DISCRETE CONTACT
	FAULT RESET	DISCRETE CONTACT
	DOSING #1	DISCRETE CONTACT
	DOSING #2	DISCRETE CONTACT
	AMBIENT O3	DISCRETE CONTACT
DIGITAL	MODBUS	SERIAL
	LOCAL NETWORK (OPTIONAL)	ETHERNET
USER OUTPUTS		
ANALOG	O3 POWER SUPPLY SETTING	4-20mA ANALOG
	VACUUM LEVEL	4-20mA ANALOG
	ORP or DO3 LEVEL	4-20mA ANALOG
DISCRETE	RUN INDICATOR	DISCRETE DRY CONTACT
	STANDBY INDICATOR	DISCRETE DRY CONTACT
DIGITAL	LOCAL NETWORK (OPTIONAL)	ETHERNET

***ANALOG INPUTS ARE PASSIVE AND REQUIRE EXTERNALLY POWERED SIGNALS

ZONE	REV.	DESCRIPTION	ECN	DATE
	B	REVISE FOR 50 HZ ONLY, INCREASED FLOW RANGE	CMP01984	1/3/2020
	A	INITIAL RELEASE	5676	11/13/2015

REVISIONS

ALL DIMENSIONS IN INCHES [mm]
TOLERANCES:
x ±.1
.xx ±.02
.xxx ±.010
ANGLES ±1°
MATERIAL: NA
WEIGHT: NA

APPROVALS:	DATE:
DRAWN: J.WILSON	3/27/2015
ENGR. APPR: T.McNeil	
CHECKED:	
Q.A. APPR:	

DEL OZONE advanced sanitation solutions

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DWG. NO: 4-2324-01

REV.: B

SHEET: 1 OF 1

B FORMAT REV A

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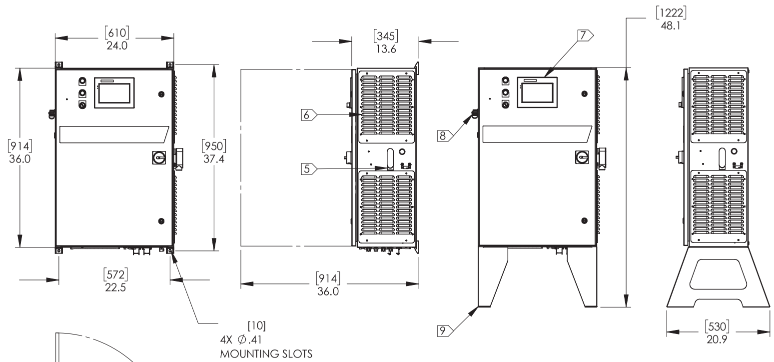
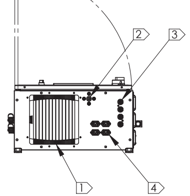
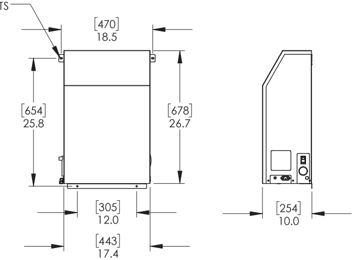
OZONE GENERATOR





OXYGEN CONCENTRATOR (UP TO 4 UNITS WITH P-200)



1. COOLING AIR INTAKE
2. OZONE OUTLET, 3/8" TUBE COMPRESSION, 316SS
3. OXYGEN INLET (4), CPC QUICK CONNECT, NICKEL PLATED BRASS
4. OXYGEN CONCENTRATOR POWER CONNECTIONS, IEC320
5. POWER INLET, 1/2" FNPT
6. COOLING AIR EXHAUST
7. USER INTERFACE
8. NETWORK CONNECTION, ETHERNET (OPTIONAL)
9. FLOOR MOUNTING KIT (OPTIONAL)

STANDARD SPECIFICATIONS	
MODEL NUMBER	P-200-XX
CABINET SIZE	36" X 24" X 13"
POWER REQUIRED	240 VAC, 50HZ, 20.4A*
OZONE OUTPUT (+/- 10 %)**	2.9-8.4 LB./DAY (54-158G/HR), 5.1-7.0% BY WT CONCENTRATION, DEPENDENT ON OXYGEN FLOW
OPERATOR INTERFACE	7" COLOR TOUCHSCREEN
OPERATOR INTERFACE LANGUAGES SUPPORTED	ENGLISH, CHINESE
HEAT REJECTION	6800 BTU/HR (GENERATOR) + 2450 BTU/HR FOR EACH OXYGEN CONCETRATOR
POWER FACTOR	0.9 FULL LOAD
CONTROL SYSTEM	PLC
COOLING	FORCED AIR
OZONE TECHNOLOGY	PTI PLASMABLOCK
AIR PREP	EXTERNAL, CONTROLLED & POWERED THROUGH GENERATOR
PNEUMATIC CONTROL	CLOSED LOOP, PROPORTIONAL SOLENOID VALVE
DATA LOGGING	REMOVABLE USB MEMORY
O2 MONITORING	PRESSURE & CONCENTRATION
VACUUM MONITORING	VACUUM LOSS DETECTION
AMBIENT TEMPERATURE REQUIREMENT	40°F-105°F
NEMA RATING	3R (OZONE GENERATOR ONLY, WHEN EQUIPPED WITH OPTIONAL PROTECTIVE PARTS)
NSF	LISTED STANDARD 50
BACKFLOW PREVENTION & DETECTION	INCLUDED STANDARD
OPTIONS	
STAINLESS STEEL ENCLOSURE (SHOWN)	
LOCAL NETWORK CONNECTIVITY & REMOTE SERVICE DIAGNOSTICS	
FLOOR MOUNTING KIT (PN. 9-1253-01)	
*RATING INCLUDES 4 OXYGEN CONCENTRATOR ASSEMBLIES	
**MEASURED AT 70°F AMBIENT TEMPERATURE AND 15PSI OXYGEN FEED PRESSURE	

USER INPUTS		
	DESCRIPTION	SIGNAL TYPE
ANALOG***	O3 POWER SETTING	4-20mA ANALOG
	DISSOLVED O3	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
	ORP	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
DISCRETE	STOP	DISCRETE CONTACT
	STANDBY	DISCRETE CONTACT
	PROCESS FLOW SWITCH	DISCRETE CONTACT
	FAULT RESET	DISCRETE CONTACT
	DOSING #1	DISCRETE CONTACT
	DOSING #2	DISCRETE CONTACT
	AMBIENT O3	DISCRETE CONTACT
DIGITAL	MODBUS	SERIAL
	LOCAL NETWORK (OPTIONAL)	ETHERNET
USER OUTPUTS		
ANALOG	O3 POWER SUPPLY SETTING	4-20mA ANALOG
	VACUUM LEVEL	4-20mA ANALOG
	ORP or DO3 LEVEL	4-20mA ANALOG
DISCRETE	RUN INDICATOR	DISCRETE DRY CONTACT
	STANDBY INDICATOR	DISCRETE DRY CONTACT
DIGITAL	LOCAL NETWORK (OPTIONAL)	ETHERNET

***ANALOG INPUTS ARE PASSIVE AND REQUIRE EXTERNALLY POWERED SIGNALS

ZONE	REV.	DESCRIPTION	ECN	DATE
	B	REVISE FOR 50 HZ ONLY, INCREASED FLOW RANGE	CMP01984	1/3/2020
	A	INTIAL RELEASE	5676	11/13/2015

REVISIONS

ALL DIMENSIONS IN INCHES [mm]
TOLERANCES: .x ± .1, .xx ± .02, .xxx ± .010, ANGLES±1°
MATERIAL: NA
FINISH: NA

APPROVALS:		DATE:
DRAWN:	J.WILSON	3/27/2015
ENGR. APPR:	T.McNeil	
CHECKED:		
Q.A. APPR:		

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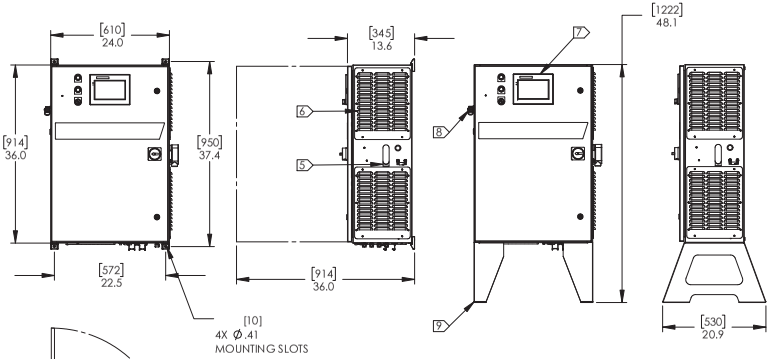
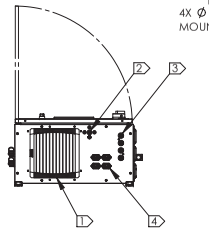
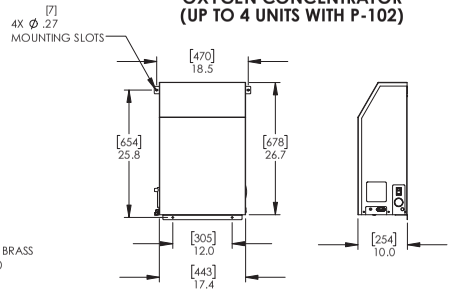
DWG. NO: 4-2324-02
REV.: B
SHEET: 1 OF 1
B FORMAT REV A

OZONE GENERATOR





OXYGEN CONCENTRATOR (UP TO 4 UNITS WITH P-102)



1. COOLING AIR INTAKE
2. OZONE OUTLET, 3/8" TUBE COMPRESSION, 316SS
3. OXYGEN INLET (4), CPC QUICK CONNECT, NICKEL PLATED BRASS
4. OXYGEN CONCENTRATOR POWER CONNECTIONS, IEC320
5. POWER INLET, 1/2" FNPT
6. COOLING AIR EXHAUST
7. USER INTERFACE
8. NETWORK CONNECTION, ETHERNET (OPTIONAL)
9. FLOOR MOUNTING KIT (OPTIONAL)

STANDARD SPECIFICATIONS	
MODEL NUMBER	P-102-XX
CABINET SIZE	36" X 24" X 13"
POWER REQUIRED	3 WIRE AC ONLY. 120/208Y VAC, 60HZ, 190A* 120/240 VAC, 60HZ, 16.5A*
OZONE OUTPUT (+/- 10 %)**	2.4-6.2 LB./D AY (45-117G/HR), 3.8-5.8% BY WT CONCENTRATION, DEPENDENT ON OXYGEN FLOW
OPERATOR INTERFACE	7" COLOR TOUCHSCREEN
OPERATOR INTERFACE LANGUAGES SUPPORTED	ENGLISH, CHINESE
HEAT REJECTION	4950 BTU/HR (GENERATOR) + 2450 BTU/HR FOR EACH OXYGEN CONCETRATOR
POWER FACTOR	0.9 FULL LOAD
CONTROL SYSTEM	PLC
COOLING	FORCED AIR
OZONE TECHNOLOGY	PTI PLASMABLOCK
AIR PREP	EXTERNAL, CONTROLLED & POWERED THROUGH GENERATOR
PNEUMATIC CONTROL	CLOSED LOOP, PROPORTIONAL SOLENOID VALVE
DATA LOGGING	REMOVABLE USB MEMORY
O2 MONITORING	PRESSURE & CONCENTRATION
VACUUM MONITORING	VACUUM LOSS DETECTION
AMBIENT TEMPERATURE REQUIREMENT	40°F-105°F
UL	LISTED E339927
NEMA RATING	3R (OZONE GENERATOR ONLY, WHEN EQUIPPED WITH OPTIONAL PROTECTIVE PARTS)
NSF	LISTED, STANDARD 50
BACKFLOW PREVENTION & DETECTION	INCLUDED, STANDARD
OPTIONS	
STAINLESS STEEL ENCLOSURE (SHOWN)	
LOCAL NETWORK CONNECTIVITY & REMOTE SERVICE DIAGNOSTICS	
FLOOR MOUNTING KIT (PN. 9-1253-01)	
*RATING INCLUDES 4 OXYGEN CONCENTRATOR ASSEMBLIES	
**MEASURED AT 70°F AMBIENT TEMPERATURE AND 35PSI OXYGEN FEED PRESSURE	

USER INPUTS		
	DESCRIPTION	**SIGNAL TYPE**
ANALOG***	O3 POWER SETTING	4-20mA ANALOG
	DISSOLVED O3	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
	ORP	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
DISCRETE	STOP	DISCRETE CONTACT
	STANDBY	DISCRETE CONTACT
	PROCESS FLOW SWITCH	DISCRETE CONTACT
	FAULT RESET	DISCRETE CONTACT
	DOSING #1	DISCRETE CONTACT
	DOSING #2	DISCRETE CONTACT
	AMBIENT O3	DISCRETE CONTACT
DIGITAL	MODBUS	SERIAL
	LOCAL NETWORK (OPTIONAL)	ETHERNET
USER OUTPUTS		
ANALOG	O3 POWER SUPPLY SETTING	4-20mA ANALOG
	VACUUM LEVEL	4-20mA ANALOG
	ORP or DO3 LEVEL	4-20mA ANALOG
DISCRETE	RUN INDICATOR	DISCRETE DRY CONTACT
	STANDBY INDICATOR	DISCRETE DRY CONTACT
DIGITAL	LOCAL NETWORK (OPTIONAL)	ETHERNET

***ANALOG INPUTS ARE PASSIVE AND REQUIRE EXTERNALLY POWERED SIGNALS

ZONE	REV.	DESCRIPTION	ECN	DATE
	B	REVISE FOR INCREASED FLOW RANGE	CMP01984	1/3/2020
	A	INTIAL RELEASE	CMP01772	7/31/2019

REVISIONS

ALL DIMENSIONS IN INCHES [mm]
TOLERANCES:
x ± .1
.xx ± .02
.xxx ± .010
ANGLES ± 1°
MATERIAL: NA
WEIGHT: NA

APPROVALS:	DATE:
DRAWN: J.WILSON	3/27/2015
ENGR. APPR: T.McNeil	
CHECKED:	
Q.A. APPR:	

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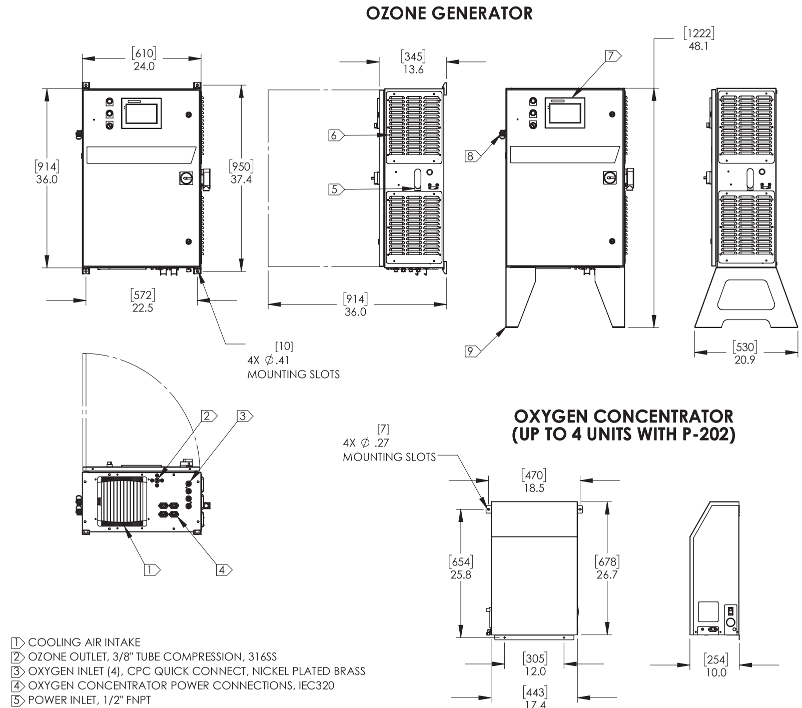
SIZE: B

TITLE: SPECIFICATION,DRAWING,P-102
DWG. NO: 4-2324-03
REV.: B
SHEET: 1 OF 1

B FORMAT REV A

OZONE GENERATOR



1 COOLING AIR INTAKE
2 OZONE OUTLET, 3/8" TUBE COMPRESSION, 316SS
3 OXYGEN INLET (4), CPC QUICK CONNECT, NICKEL PLATED BRASS
4 OXYGEN CONCENTRATOR POWER CONNECTIONS, IEC320
5 POWER INLET, 1/2" FNPT
6 COOLING AIR EXHAUST
7 USER INTERFACE
8 NETWORK CONNECTION, ETHERNET (OPTIONAL)
9 FLOOR MOUNTING KIT (OPTIONAL)

STANDARD SPECIFICATIONS	
MODEL NUMBER	P-202-XX
CABINET SIZE	36" X 24" X 13"
POWER REQUIRED	3 WIRE AC ONLY, 120/208Y VAC, 60HZ, 24.8A* 120/240 VAC, 60HZ, 22.3A*
OZONE OUTPUT (+/- 10 %)**	2.9-8.4 LB./DAY (54-158G/HR), 5.1-7.0% BY WT CONCENTRATION, DEPENDENT ON OXYGEN FLOW
OPERATOR INTERFACE	7" COLOR TOUCHSCREEN
OPERATOR INTERFACE LANGUAGES SUPPORTED	ENGLISH, CHINESE
HEAT REJECTION	6800 BTU/HR (GENERATOR) + 2450 BTU/HR FOR EACH OXYGEN CONCETRATOR
POWER FACTOR	0.9 FULL LOAD
CONTROL SYSTEM	PLC
COOLING	FORCED AIR
OZONE TECHNOLOGY	PTI PLASMABLOCK
AIR PREP	EXTERNAL, CONTROLLED & POWERED THROUGH GENERATOR
PNEUMATIC CONTROL	CLOSED LOOP, PROPORTIONAL SOLENOID VALVE
DATA LOGGING	REMOVABLE USB MEMORY
O2 MONITORING	PRESSURE & CONCENTRATION
VACUUM MONITORING	VACUUM LOSS DETECTION
AMBIENT TEMPERATURE REQUIREMENT	40°F-105°F
UL	LISTED E139927
NEMA RATING	3R (OZONE GENERATOR ONLY, WHEN EQUIPPED WITH OPTIONAL PROTECTIVE PARTS)
NSF	LISTED STANDARD 50
BACKFLOW PREVENTION & DETECTION	INCLUDED STANDARD

OPTIONS

- STAINLESS STEEL ENCLOSURE (SHOWN)
- LOCAL NETWORK CONNECTIVITY & REMOTE SERVICE DIAGNOSTICS
- FLOOR MOUNTING KIT (PN. 9-1253-01)

*RATING INCLUDES 4 OXYGEN CONCENTRATOR ASSEMBLIES
**MEASURED AT 70°F AMBIENT TEMPERATURE AND 15PSI OXYGEN FEED PRESSURE

USER INPUTS

	DESCRIPTION	SIGNAL TYPE
ANALOG***	O3 POWER SETTING	4-20mA ANALOG
	DISSOLVED O3	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
	ORP	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
DISCRETE	STOP	DISCRETE CONTACT
	STANDBY	DISCRETE CONTACT
	PROCESS FLOW SWITCH	DISCRETE CONTACT
	FAULT RESET	DISCRETE CONTACT
	DOSING #1	DISCRETE CONTACT
	DOSING #2	DISCRETE CONTACT
	AMBIENT O3	DISCRETE CONTACT
DIGITAL	MODBUS	SERIAL
	LOCAL NETWORK (OPTIONAL)	ETHERNET

USER OUTPUTS

	DESCRIPTION	SIGNAL TYPE
ANALOG	O3 POWER SUPPLY SETTING	4-20mA ANALOG
	VACUUM LEVEL	4-20mA ANALOG
	ORP or DO3 LEVEL	4-20mA ANALOG
DISCRETE	RUN INDICATOR	DISCRETE DRY CONTACT
	STANDBY INDICATOR	DISCRETE DRY CONTACT
DIGITAL	LOCAL NETWORK (OPTIONAL)	ETHERNET

***ANALOG INPUTS ARE PASSIVE AND REQUIRE EXTERNALLY POWERED SIGNALS

ZONE	REV.	DESCRIPTION	ECN	DATE
	A	INTIAL RELEASE	CMP01984	1/3/2020

REVISIONS

ALL DIMENSIONS IN INCHES [mm]
TOLERANCES: .x ± .1, .xx ± .02, .xxx ± .010; ANGLES±1°
MATERIAL: NA
FINISH: NA

APPROVALS:		DATE:
DRAWN:	T.MCNEIL	1/3/2020
ENGR. APPR:	T.McNeil	
CHECKED:		
Q.A. APPR:		

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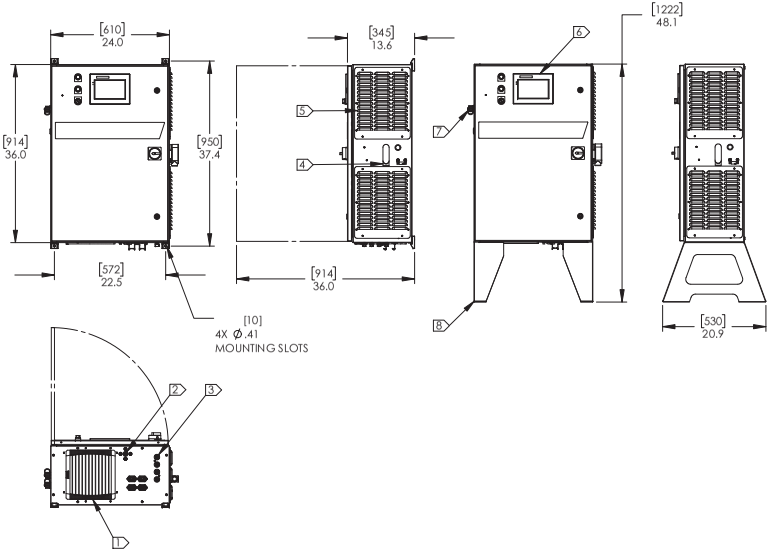
DEL OZONE advanced sanitation solutions
INTERPRET DRAWING PER ANSI Y14.5-1994
SCALE: 1:16
DO NOT SCALE DRAWING
SIZE: B
TITLE: SPECIFICATION,DRAWING,P-202
DWG. NO: 4-2324-04
REV.: A
SHEET: 1 OF 1
B FORMAT REV A

OZONE GENERATOR



STANDARD SPECIFICATIONS	
MODEL NUMBER	P-201-XX
CABINET SIZE	36" X 24" X 13"
POWER REQUIRED	240 VAC, 50/60HZ, 12.3A
OZONE OUTPUT (+/- 10 %)*	2.9-8.4 LB /DAY (54-158G/HR), 5.1-7.0% BY WT CONCENTRATION, DEPENDENT ON OXYGEN FLOW
OPERATOR INTERFACE	7" COLOR TOUCHSCREEN
OPERATOR INTERFACE LANGUAGES SUPPORTED	ENGLISH, CHINESE
HEAT REJECTION	6800 BTU/HR
POWER FACTOR	0.9 FULL LOAD
CONTROL SYSTEM	PLC
COOLING	FORCED AIR
OZONE TECHNOLOGY	PTI PLASMABLOCK
FEED GAS REQUIREMENTS	OXYGEN, AT LEAST -60°F DEWPOINT AND 93% CONCENTRATION OR MORE, 15 PSI AT RATED FLOW
PNEUMATIC CONTROL	CLOSED LOOP, PROPORTIONAL SOLENOID VALVE
DATA LOGGING	REMOVABLE USB MEMORY
O2 MONITORING	PRESSURE & CONCENTRATION
VACUUM MONITORING	VACUUM LOSS DETECTION
AMBIENT TEMPERATURE REQUIREMENT	40°F-105°F
UL	LISTED E139927
NEMA RATING	3R (OZONE GENERATOR ONLY, WHEN EQUIPPED WITH OPTIONAL PROTECTIVE PARTS)
NSF	LISTED STANDARD 50
BACKFLOW PREVENTION & DETECTION	INCLUDED STANDARD
OPTIONS	
STAINLESS STEEL ENCLOSURE (SHOWN)	
LOCAL NETWORK CONNECTIVITY & REMOTE SERVICE DIAGNOSTICS	
FLOOR MOUNTING KIT (PN. 9-1253-01)	
*MEASURED AT 70°F AMBIENT TEMPERATURE AND 15PSI OXYGEN FEED PRESSURE	

USER INPUTS		
	DESCRIPTION	**SIGNAL TYPE**
ANALOG***	O3 POWER SETTING	4-20mA ANALOG
	DISSOLVED O3	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
	ORP	4-20mA W/ INTERNAL CLOSED LOOP PROPORTIONAL SETPOINT CONTROL (0-5V, 0-10V, 0-20mA SIGNALS CAN ALSO BE ACCOMMODATED)
DISCRETE	STOP	DISCRETE CONTACT
	STANDBY	DISCRETE CONTACT
	PROCESS FLOW SWITCH	DISCRETE CONTACT
	FAULT RESET	DISCRETE CONTACT
	DOSING #1	DISCRETE CONTACT
	DOSING #2	DISCRETE CONTACT
	AMBIENT O3	DISCRETE CONTACT
DIGITAL	MODBUS	SERIAL
	LOCAL NETWORK (OPTIONAL)	ETHERNET
USER OUTPUTS		
ANALOG	O3 POWER SUPPLY SETTING	4-20mA ANALOG
	VACUUM LEVEL	4-20mA ANALOG
	ORP or DO3 LEVEL	4-20mA ANALOG
DISCRETE	RUN INDICATOR	DISCRETE DRY CONTACT
	STANDBY INDICATOR	DISCRETE DRY CONTACT
DIGITAL	LOCAL NETWORK (OPTIONAL)	ETHERNET

***ANALOG INPUTS ARE PASSIVE AND REQUIRE EXTERNALLY POWERED SIGNALS

1. COOLING AIR INTAKE
2. OZONE OUTLET, 3/8" TUBE COMPRESSION, 316SS
3. OXYGEN INLET (4), CPC QUICK CONNECT, NICKEL PLATED BRASS
4. POWER INLET, 1/2" FNPT
5. COOLING AIR EXHAUST
6. USER INTERFACE
7. NETWORK CONNECTION, ETHERNET (OPTIONAL)
8. FLOOR MOUNTING KIT (OPTIONAL)

ZONE	REV.	DESCRIPTION	ECN	DATE
	A	INITIAL RELEASE	CMP01984	1/3/2020

REVISIONS

ALL DIMENSIONS IN INCHES [mm]
TOLERANCES:
x ± .1
.xx ± .02
.xxx ± .010
ANGLES ± 1°
MATERIAL: NA
FINISH: NA

APPROVALS:	DATE:
DRAWN: T.MCNEIL	1/3/2020
ENGR. APPR: T.McNeil	
CHECKED:	
Q.A.: APPR:	

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DEL OZONE advanced sanitation solutions

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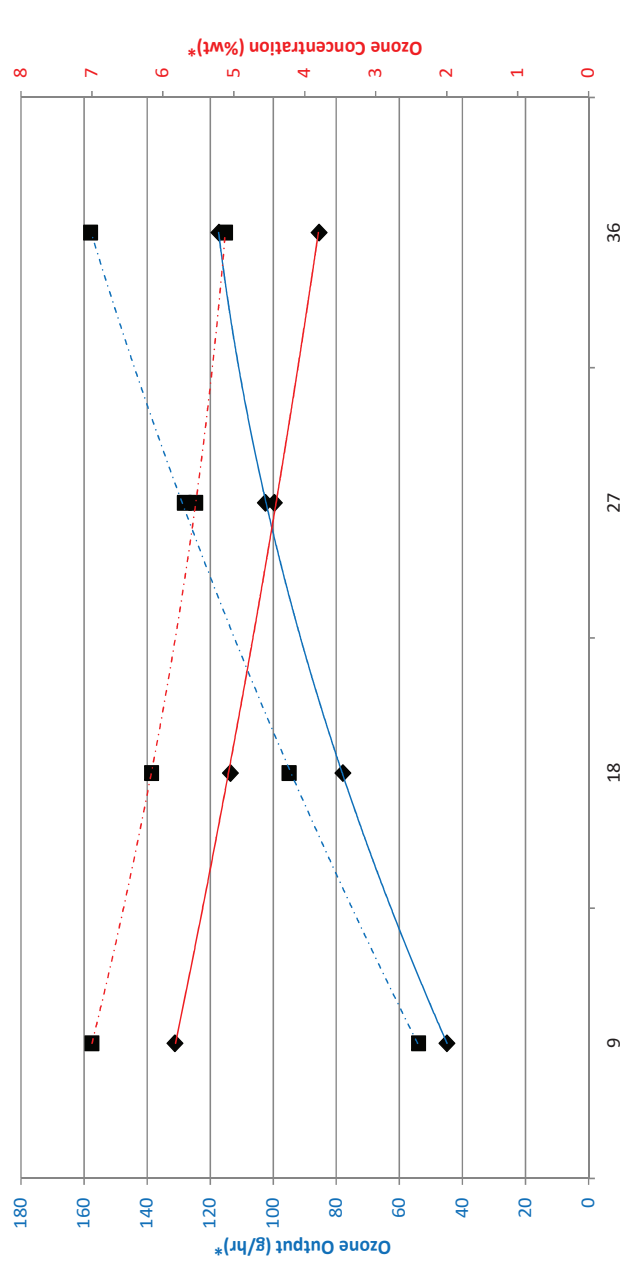
SCALE: 1:16
DO NOT SCALE DRAWING

TITLE: SPECIFICATION,DRAWING,P-201

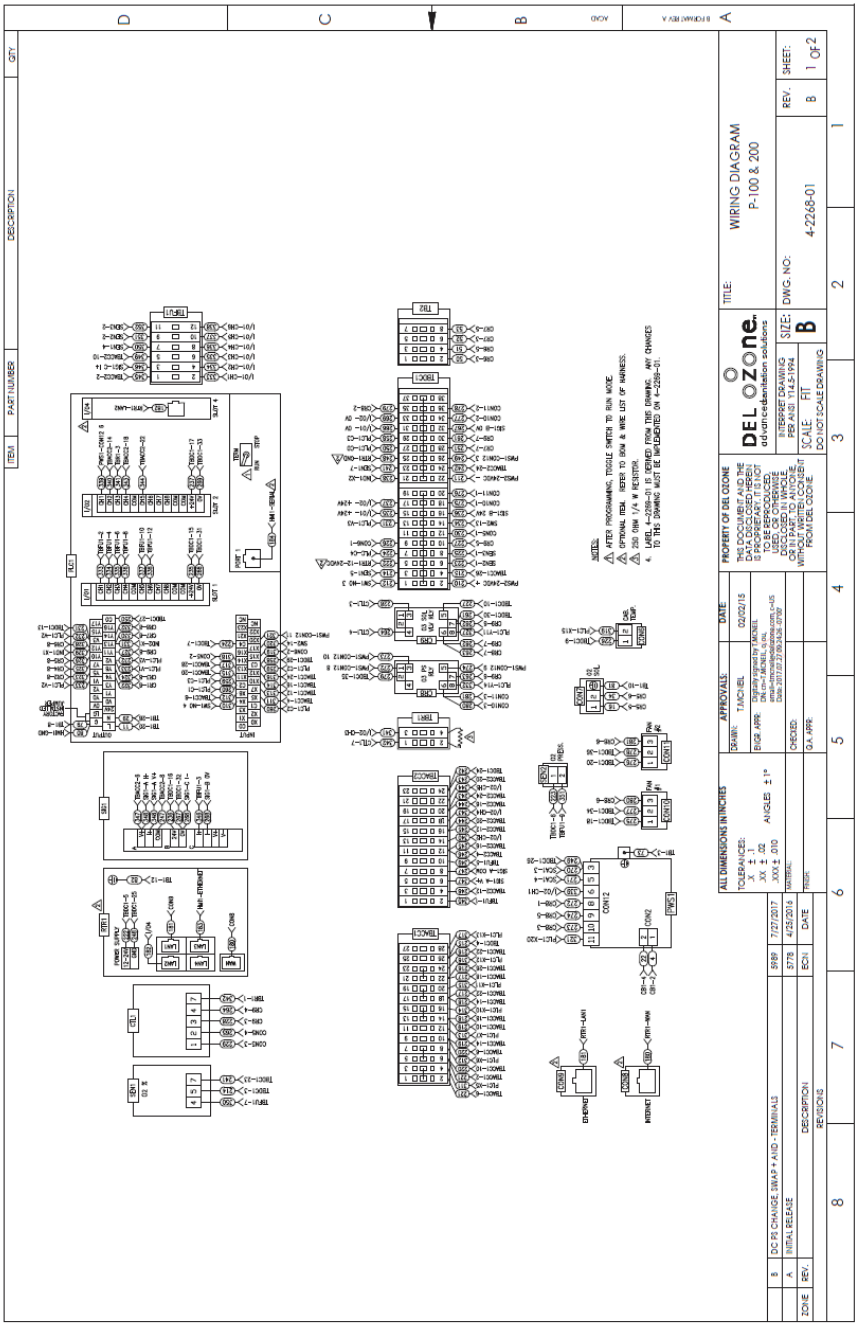
SIZE: B
DWG. NO: 4-2324-05
REV.: A
SHEET: 1 OF 1

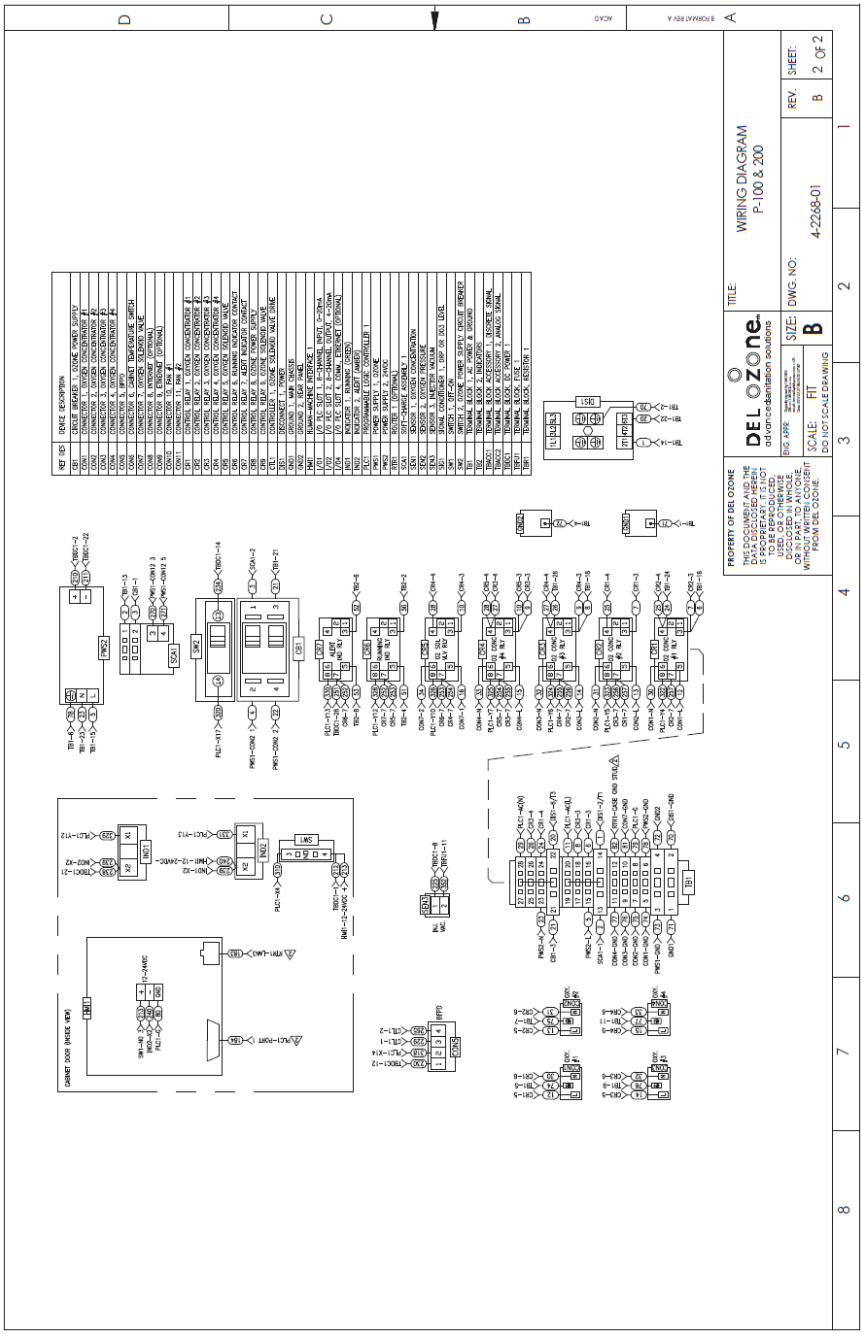
B FORMAT REV A



*Ozone output ±10% when measured at 70°F ambient temperature and 15psi oxygen feed pressure. Output will be reduced at higher ambient temperatures and lower oxygen feed pressure.

APPENDIX C Wiring Diagrams




WIRING DIAGRAM
P-100 & 200
DWG. NO: 4-2268-01
REV. B
SHEET: 2 OF 2
SIZE: B
SCALE: DO NOT SCALE DRAWING
DEL ozone
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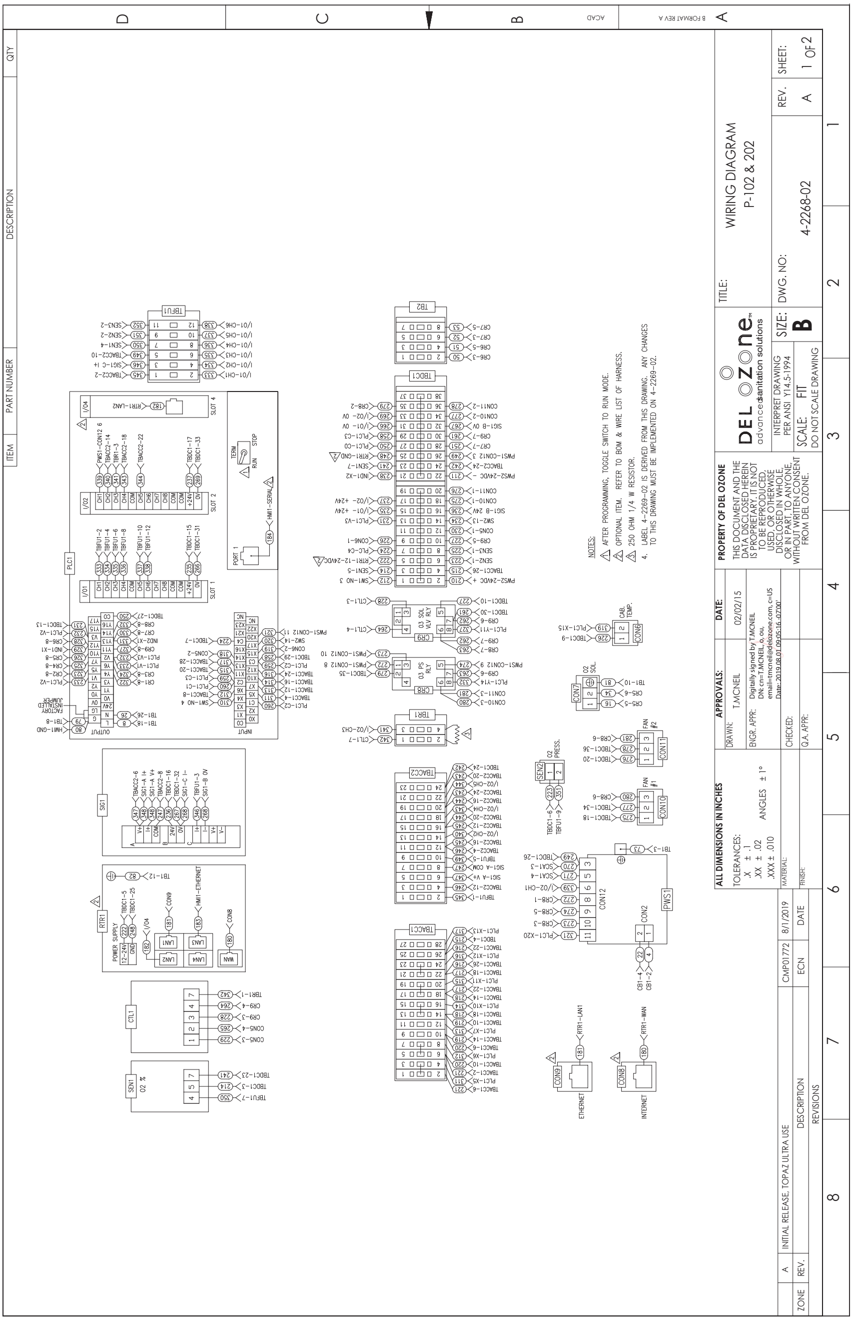
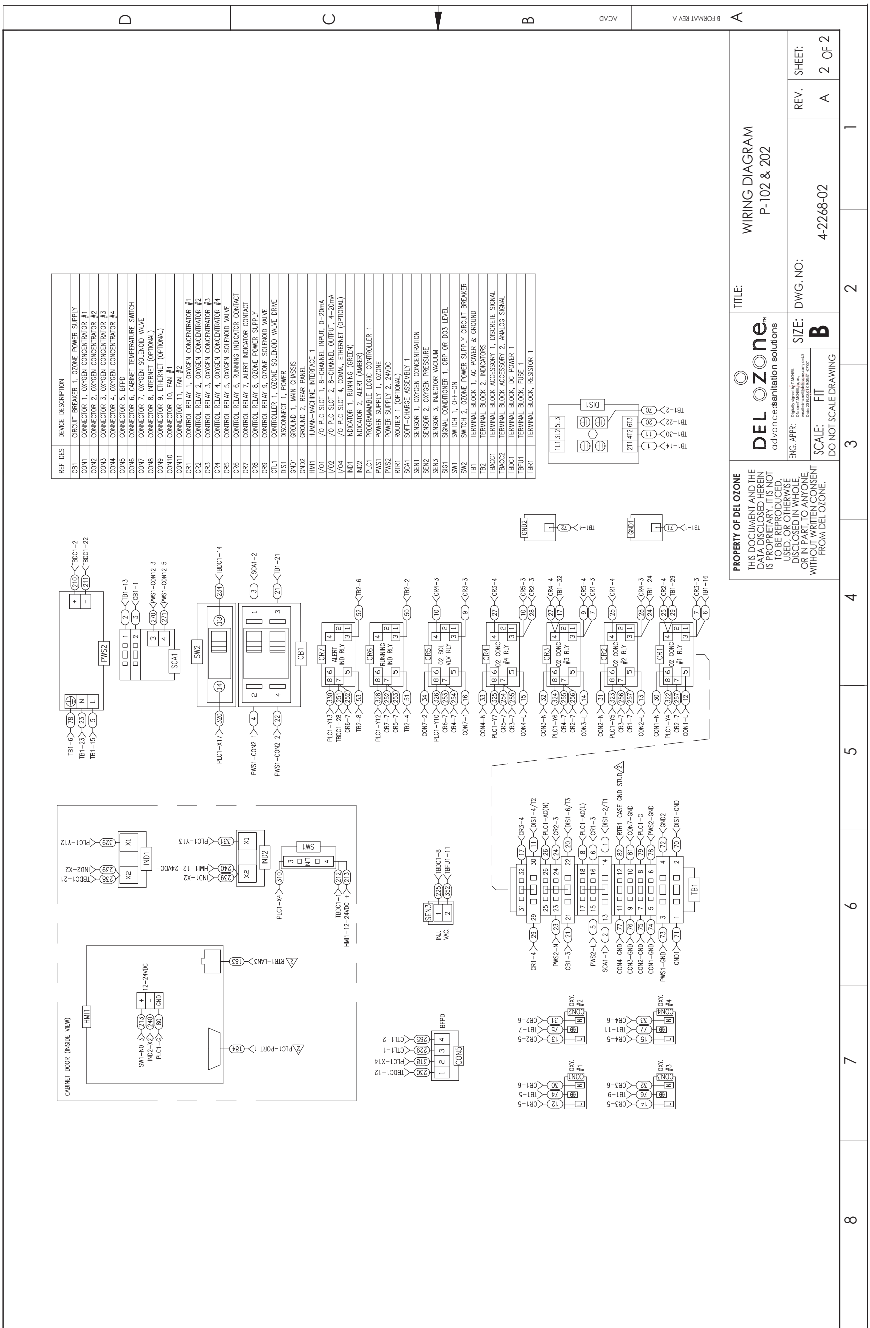
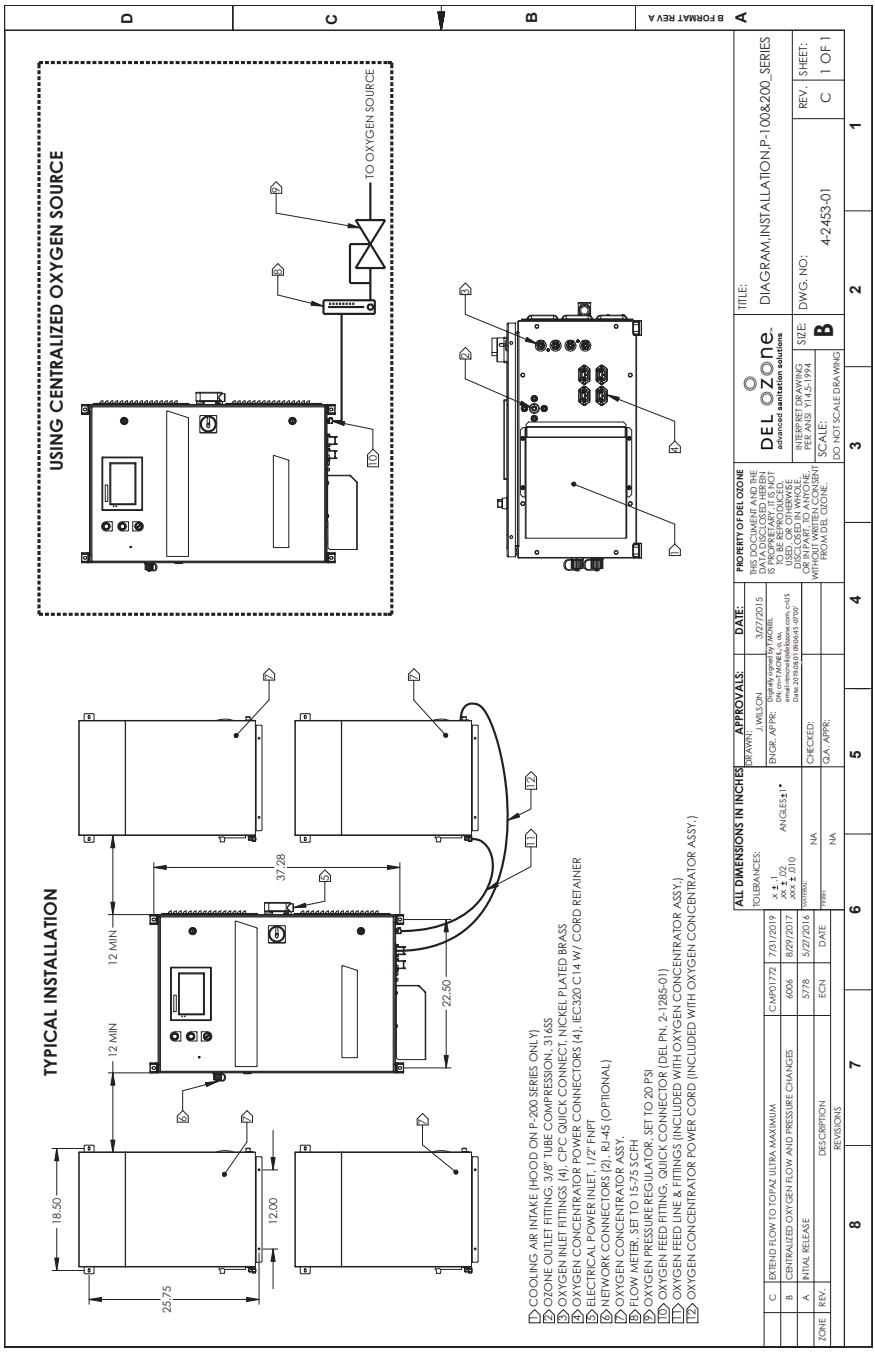

WIRING DIAGRAM
P-102 & 202
DEL OZONE
advanced sanitation solutions
4-2268-02
DO NOT SCALE DRAWING
PROPERTY OF DEL OZONE
INITIAL RELEASE, TOPAZ ULTRA USE



REF DES	DEVICE DESCRIPTION
CB1	CIRCUIT BREAKER 1, OZONE POWER SUPPLY
CON1	CONNECTOR 1, OXYGEN CONCENTRATOR #1
CON2	CONNECTOR 2, OXYGEN CONCENTRATOR #2
CON3	CONNECTOR 3, OXYGEN CONCENTRATOR #3
CON4	CONNECTOR 4, OXYGEN CONCENTRATOR #4
CON5	CONNECTOR 5, BFPD
CON6	CONNECTOR 6, CABINET TEMPERATURE SWITCH
CON7	CONNECTOR 7, OXYGEN SOLENOID VALVE
CON8	CONNECTOR 8, INTERNET (OPTIONAL)
CON9	CONNECTOR 9, ETHERNET (OPTIONAL)
CON10	CONNECTOR 10, FAN #1
CON11	CONNECTOR 11, FAN #2
CR1	CONTROL RELAY 1, OXYGEN CONCENTRATOR #1
CR2	CONTROL RELAY 2, OXYGEN CONCENTRATOR #2
CR3	CONTROL RELAY 3, OXYGEN CONCENTRATOR #3
CR4	CONTROL RELAY 4, OXYGEN CONCENTRATOR #4
CR5	CONTROL RELAY 5, OXYGEN SOLENOID VALVE
CR6	CONTROL RELAY 6, RUNNING INDICATOR CONTACT
CR7	CONTROL RELAY 7, ALERT INDICATOR CONTACT
CR8	CONTROL RELAY 8, OZONE POWER SUPPLY
CR9	CONTROL RELAY 9, OZONE SOLENOID VALVE
CTL1	CONTROLLER 1, OZONE SOLENOID VALVE DRIVE
DIS1	DISCONNECT 1, POWER
GND1	GROUND 1, MAIN CHASSIS
GND2	GROUND 2, REAR PANEL
HMI1	HUMAN-MACHINE INTERFACE 1
I/01	I/O PLC SLOT 1, 8-CHANNEL INPUT, 0-20mA
I/02	I/O PLC SLOT 2, 8-CHANNEL OUTPUT, 4-20mA
I/04	I/O PLC SLOT 4, COMM., ETHERNET (OPTIONAL)
IND1	INDICATOR 1, RUNNING (GREEN)
IND2	INDICATOR 2, ALERT (AMBER)
PLC1	PROGRAMMABLE LOGIC CONTROLLER 1
PWS1	POWER SUPPLY 1, OZONE
PWS2	POWER SUPPLY 2, 24VDC
RTR1	ROUTER 1 (OPTIONAL)
SCA1	SOFT-CHARGE ASSEMBLY 1
SEN1	SENSOR 1, OXYGEN CONCENTRATION
SEN2	SENSOR 2, OXYGEN PRESSURE
SEN3	SENSOR 3, INJECTOR VACUUM
SIG1	SIGNAL CONDITIONER 1, ORP OR DO3 LEVEL
SW1	SWITCH 1, OFF-ON
SW2	SWITCH 2, OZONE POWER SUPPLY CIRCUIT BREAKER
TB1	TERMINAL BLOCK 1, AC POWER & GROUND
TB2	TERMINAL BLOCK 2, INDICATORS
TBACC1	TERMINAL BLOCK ACCESSORY 1, DISCRETE SIGNAL
TBACC2	TERMINAL BLOCK ACCESSORY 2, ANALOG SIGNAL
TBDC1	TERMINAL BLOCK, DC POWER 1
TBFU1	TERMINAL BLOCK, FUSE 1
TBR1	TERMINAL BLOCK, RESISTOR 1


USING CENTRALIZED OXYGEN SOURCE
TO OXYGEN SOURCE
TYPICAL INSTALLATION
18.50
12.00
25.75
12 MIN
12 MIN
37.28
22.50
1 COOLING AIR INTAKE (HOOD ON P-200 SERIES ONLY)
2 OZONE OUTLET FITTING, 3/8" TUBE COMPRESSION, 316SS
3 OXYGEN INLET FITTINGS (4), CPC QUICK CONNECT, NICKEL PLATED BRASS
4 OXYGEN CONCENTRATOR POWER CONNECTORS (4), IEC320 C14 W/ CORD RETAINER
5 ELECTRICAL POWER INLET, 1/2" FNPT
6 NEWORK CONNECTORS (2), RJ-45 (OPTIONAL)
7 OXYGEN CONCENTRATOR ASSY.
8 FLOW METER, SET TO 15-75 SCFH
9 OXYGEN PRESSURE REGULATOR, SET TO 20 PSI
10 OXYGEN FEED FITTING, QUICK CONNECTOR (DEL PN: 2-1285-01)
11 OXYGEN FEED LINE & FITTINGS (INCLUDED WITH OXYGEN CONCENTRATOR ASSY.)
12 OXYGEN CONCENTRATOR POWER CORD (INCLUDED WITH OXYGEN CONCENTRATOR ASSY.)
ALL DIMENSIONS IN INCHES
TOLERANCES:
x ± .1
xx ± .02
xxx ± .010
ANGLES ± 1°
APPROVALS:
DRAWN: T. WILSON
DATE: 3/27/2015
ENGR. APPR:
CHECKED:
NA
Q.A. APPR:
NA
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DEL OZONE
advanced sanitation solutions
INTERPRET DRAWING PER ANSI Y14.5-1994
SCALE: DO NOT SCALE DRAWING
SIZE: B
TITLE: DIAGRAM,INSTALLATION,P-100&200_SERIES
DWG. NO: 4-2453-01
REV. C
SHEET: 1 OF 1
ZONE
REV.
DESCRIPTION
REVISIONS
C EXTEND FLOW TO TOPAZ ULTRA MAXIMUM CMP01772 7/31/2019
B CENTRALIZED OXYGEN FLOW AND PRESSURE CHANGES 4006 8/29/2017
A INTIAL RELEASE 5778 5/27/2016
ECN
DATE
A
B
C
D
B FORMAT REV A

APPENDIX E Pre-Commissioning Checklist

Customer: _____

Job Name:_____

Location: _____

Date:_____

Model #: _____

Serial No.: _____

Please complete one checklist for each ozone generator to be commissioned. Checklist is located on the back of this page. Initial all items, note any exceptions/deviations observed including related item numbers and detail of any corrective action taken or recommended. Use the space provided below for notes if necessary.

✓	
	1. Ozone Generator
	a. Properly anchored to mounting surface.
	b. Correct voltage supplied and connected.
	c. Cooling water supply and return connected from proper source.
	d. Ozone line (St. steel or Teflon) connected to outlet fitting.
	e. Flow switch (or pump interlock) connected.
	2. Injector(s)
	a. Correct orientation with water flow direction.
	b. Ozone line (St. steel or Teflon) connected with st. steel ball valve and check valve at or near injector.
	3. Ozone Destruct(s)
	a. Securely mounted
	b. Inlet, vent, and drain connections correct.
	c. 110 VAC outlet provided (catalytic destruct only).
	4. ORP (or other)
	a. Sensor probes are properly installed in accessible location for maintenance. Cable connected to ORP controller.
	5. Ambient ozone monitor(s)
	a. Properly installed and interlocked with ozone generator.
	b. Sensor installed per manufacturers instructions
	6. Contact Tank(s) or Mixing Tower(s) Properly mounted and plumbed.
	7. Degas valve(s) installed properly and plumbed to ozone destruct inlet.
	8. Main circulation system in working order including pumps, filters, heater, ...
	9. Booster pump operational and ozone side-stream plumbing complete and in proper operating order.

Signed:_____

OZONE

Material Safety Data Sheet

NFPA 704 Designation
Hazard Rating

SECTION I: MATERIAL IDENTIFICATION

IDENTITY: OZONE (Gaseous)	**ISSUED: February, 1992**
FORMULA: O_3	**REVISED: August 8, 2017**

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.

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 cold storage.

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.

Manufacturer/Supplier: On-site generation, equipment available from various suppliers, including:
DEL Ozone
3580 Sueldo Street, San Luis Obispo, CA 93401
(800) 676-1335

SECTION II: INGREDIENTS AND HAZARDS

Ozone, CAS No. 10028-15-6: NIOSH *RTECS* No. RS8225000

1991 OSHA PELs
8-hr TWA: 0.1 ppm vol. (0.2 mg/m^3)
15-min STEL: 0.3 ppm vol (0.6 mg/m^3)

1990 IDLH
10 ppm

1990 NIOSH REL
Ceiling: 0.1 ppm vol. (0.2 mg/m^3)

1991-1992 ACGIH TLV
Ceiling: 0.1 ppm (0.2 mg/m^3)

1990 DFG (Germany) MAK
TWA: 0.1 ppm (0.2 mg/m^3)
Category 1: Local Irritant
Peak Exposure Limit: 0.2 ppm
5 min momentary value, 8 per shift

Other Designations: Triatomic oxygen: CAS No. 10028-15-6, NIOSH *RTECS* No. RS8225000

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.

4-0697_ Rev.E

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:
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.

4-0697_ Rev.E

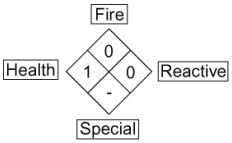
Material Safety Data Sheet

This MSDS complies with OSHA's Hazardous Communication Standard 29 CFR 1910.1200 and OSHA form 174.

DEL Ozone
3580 Sueldo Street
San Luis Obispo, CA 93401
Product Information (800) 676-1335

NFPA 704 Designation
Hazard Rating

4 = Extreme
3 = High
2 = Moderate
1 = Slight
0 = Insignificant



Product Name	**AQUEOUS OZONE SOLUTION**
Chemical Name	DISSOLVED OZONE GAS IN WATER 0 TO 2 PPM
Product Description	AQUEOUS SOLUTION OF OZONE DISSOLVED IN POTABLE WATER
D.O.T. Shipping Classification	NON REGULATED

I PHYSICAL DATA

Boiling Point	212 F	Freezing Point	32 F
Specific Gravity	1.0	Solubility in Water	COMPLETE
Evaporation Rate	APPROX 1	Physical Form	LIQUID
Appearance & Odor	COLORLESS (CLEAR) WATER WITH FRESH, ASEPTIC ODOR		

II HAZARDOUS INGREDIENTS

MATERIAL	HAZARD	CAS #	% BY WT	ACGIH TLV	OSHA PEL
None					

III FIRE AND EXPLOSION HAZARD DATA

Flash Point	NA Method NA	Auto Ign. Temp.	NA
Flammable Limits in Air	NON APPLICABLE	Lower NA	Upper NA
Extinguishing Media	NON APPLICABLE		
Unusual Fire & Explosion Hazards	NONE		
Special Fire Fighting Procedures	NONE		

4-1444-01_Rev.E

Material Safety Data Sheet Cont.

Product Name **AQUEOUS OZONE SOLUTION**

IV HEALTH HAZARD DATA	
Threshold Limit Value	NOT DETERMINED
Route of Exposure	☐ Inhalation ☐ Ingestion ☐ Skin ☒ Eye ☒ 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	☒ STABLE ☐ UNSTABLE	Hazardous Polymerization	☐ MAY OCCUR ☒ WILL NOT OCCUR

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Material 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 DEL 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 DEL's 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 DEL's ozone management technology, the rate at which ozone is released from the water as ozone gas is below the PEL established for gaseous ozone.

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CMP, LLC
36 HERRING ROAD, NEWNAN, GA 30265
WWW.C-M-P.COM

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