

Hess Machine International Installation Instructions

1. Installation Instructions
Title Page
2. Ozone Generator
Installation Instructions
3. Injection Tank
Installation Instructions
4. Operating Parameters
5. Ozone Injection Tank
Top View
6. Ozone Injection Tank
Side View/Plumbing



Thank you for the purchase of a Hess Machine International ozone disinfection unit.

This booklet contains instructions pertaining to the installation of your generator and ozone injection tank. Proper installation is the first step in achieving overall satisfaction and long life of your unit. Please carefully note the sections highlighted with a **Caution**. The sections are highlighted to indicate some of the peculiarities of ozone and its effects. It will also serve as a guide to help avoid some common errors that may be harmful to the equipment or the serviceworker.

Hess Machine International
PO Box 639

Ephrata, PA 17522

Phone 1-800-7354377 / (717) 733-0005

Fax (717) 733-2255

E-mail ozone@hessmachine.com / www.hessmachine.com

Hess Machine International

Ozone Generator

Installation Instructions

1. Uncrate and check for damages. If any damages are noticed report immediately to Hess Machine International and the freight company.
2. Ozone generator should be located in cool dry area. **Caution-***The generator electrical and pneumatic systems are not designed to be in an ozone enriched environment and may be detrimental to the life expectancy of certain components.*
3. Connect main power. **Caution-** *check for proper grounding and connect in accordance with local electrical codes.*
4. Connect cooling water supply line on the solenoid valve side of the connection manifold, on the back of the unit (omit for H-25). **Caution-** *cooling water must maintain a chlorine residual of 0.*
5. Connect cooling water drain line to the connection manifold, on the back of the unit and run to drain(omit for H-25).
6. Connect ozone line at the connection manifold, on the backside of the unit. The line should be run vertical for a distance of 5 feet, at that point install the ozone check valve, with arrow pointing up. Continue to run the line in a vertical direction until it is at a higher point than the highest point of the ozone injection tank. This is done to insure no water will be able to siphon back to the ozone generator. **Caution-***ozone line must be made of ozone resistant materials.*
7. Install glass dielectric and contact brush into stainless steel dielectric shell.
8. If your unit has a factory installed air compressor you may omit this step. If you do not have a factory installed air compressor connect air supply line on the back side of the air dryer, this will be the fitting adjacent to the high pressure gauge. **Caution-***air supply must be oilfree and dry.*
9. With all of the above steps complete you are ready to power up the unit, set the gauges, and check for proper operation.
 - Turn on main power
 - Set high pressure at 80 PSI
 - Set low pressure at 13 PSI
 - Set air flow meter in accordance with the size unit you have: (H-25-15SCFH, H-50-30SCFH, H-100-60SCFH, H-200-120SCFH, H-300-180SCFH, H-400-240SCFH)
 - Turn on cooling water and set in accordance with the size unit you have: (.5lppd-5gph, 1lbpd-10gph, 2lbpd-20gph, 3lbpd-25gph, 4lbpd-25gph) Note:H-25 has no cooling water. Due to the dissimilar temperatures of cooling water, the gph units expressed are a starting point. For optimum performance, dial variable transformer to the desired setting, after the unit has run for 20 minutes adjust water flow until the dielectric outer shell is slightly warm to the touch (app. 100°F). Do not allow the shell to condensate or get hot.
 - **Caution-***All doors must be closed and cooling water flow turned on before turning on high voltage.*
 - Dial variable transformer to the desired setting.
 - Check ozone residual
 - **Caution-***Disconnect main power before servicing unit.*

Hess Machine International

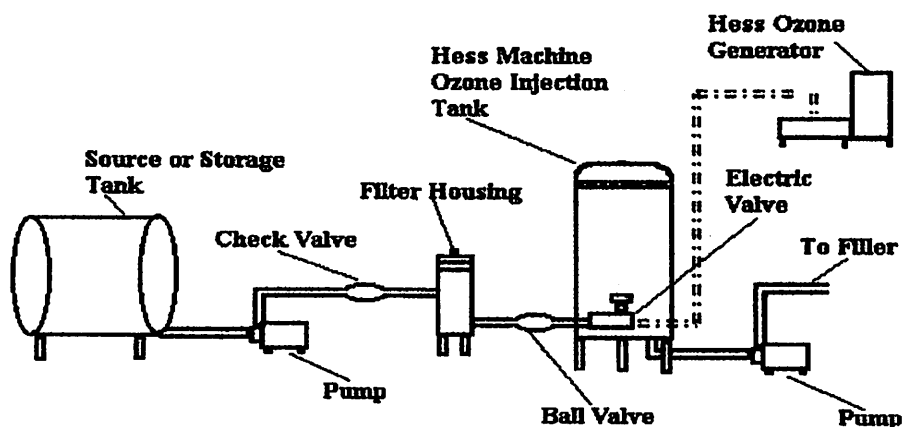
Ozone Injection Tank

Installation Instructions

- Uncrate and check for damages. If damages are noticed report immediately to Hess Machine International and the freight company.
- The ozone injection tank should be the last treatment before bottling
- The ozone injection tank can be operated in two different ways.
 - a. Placed above the filler, utilizing gravity flow to the filler.
 - b. Placed on the floor, utilizing a pump to convey the water to the filler.
- Install a ball valve on the inlet side of the line feeding the injection tank. This is done in order to fine-tune the volume of flow that is filling the tank. **Caution**-The infeed flow should be slightly higher than the maximum usage of the filler.
- Install ozonated product water discharge line, located on bottom of tank.
- Install drain line, located on bottom tank.
- Install off gassing vent line. Located on top of the tank the fitting is 1" or 1 ½", depending on the size of tank that you have purchased. Install tank vent filter as shown in (figure 3).
Caution-The filter should be installed in a warm area. This will keep any trapped condensation from freezing and blocking off the vent. It is also advisable to mount the filter as shown (figure 3) in order to keep any condensation trapped in the filter from dripping back into the tank.
- Install the overflow line, located on the backside of tank near the top, it is a 2" fitting (figure3).
Caution-The Installation of a water trap here will allow the tank to overflow in a situation where the level control is not working properly; also it does not allow gas to flow into the room.

Typical Installation

Figure 1



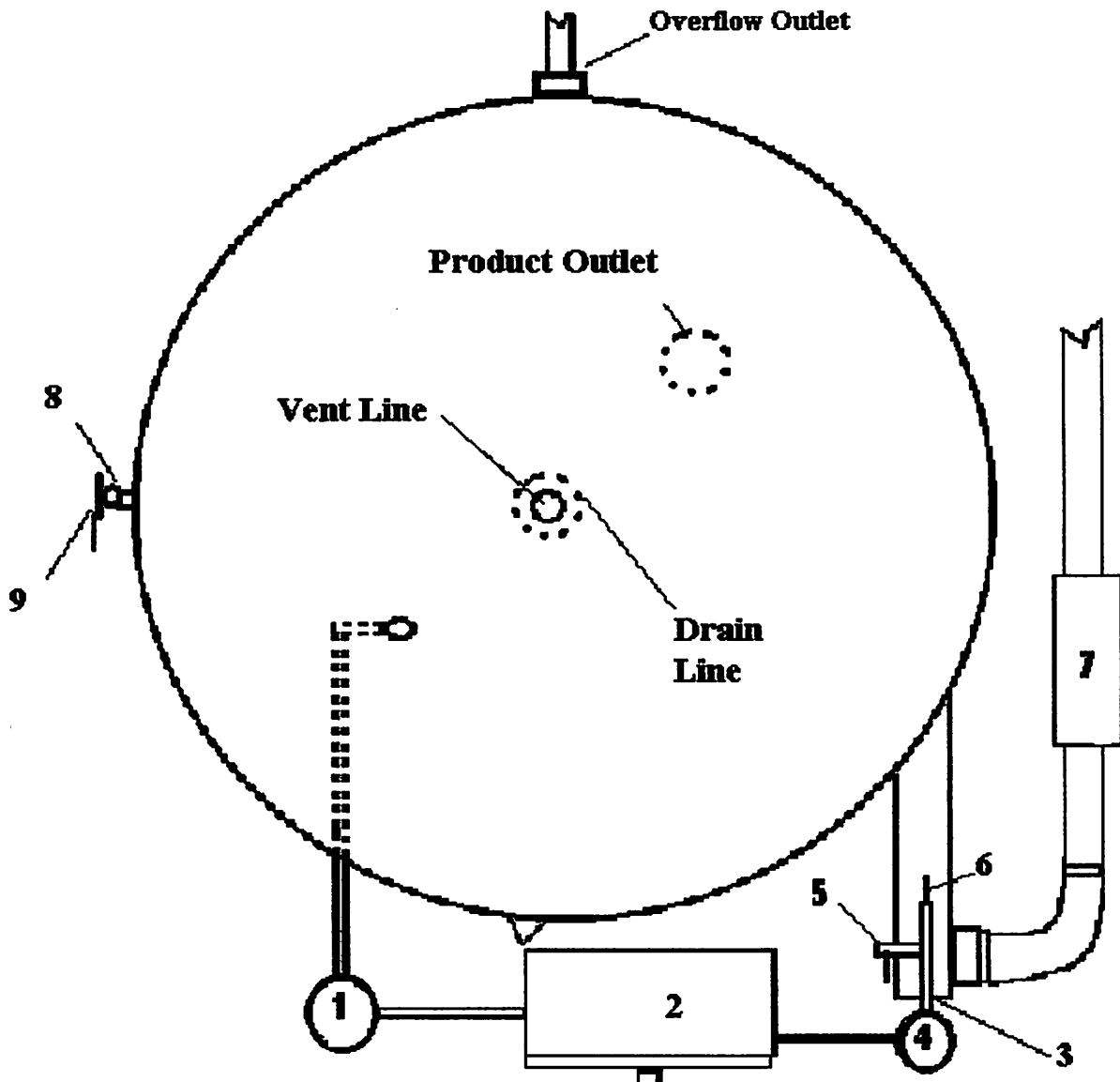
Hess Machine International

Proper Operating Parameters

Ozone Generator/Inline Injection Tank

Once your ozone generator has been installed, this guide will help you determine that your generator is operating properly and help insure it has a long trouble free life.

- The high pressure feeding into the air dryer should read a constant 80-85 PSI.
- The air dryer should blow off out of the bottom of the unit every 30 seconds, alternating towers each cycle. After the blow off, there should only be a slight seepage from the bottom of the tower that just blew off, the opposing tower should have no seepage.
- The air dryer moisture indicator should be a blue/purple color after a couple hours of operation. If the moisture indicator turns white it is indicating a malfunction of the dryer.
- The low-pressure regulator should run at a constant 13 PSI, whether you have flow or not, showing no leakage at the weep hole.
- The SCFH gauge should be set at (30scfh/H-50, 60scfh/L-100, 120scfh/L-200, 180scfh/L-300, 240scfh/L-400), when the tank is filling. When the tank is full and not calling for ozone the SCFH gauge should read 0.
- The low pressure relief valve should start blowing off at 20PSI.
- When the circuit breaker on the front panel is energized the red light will come on.
- When dialing up the variable transformer you will notice a blue/purple corona when looking through the glass dome as the dial reaches approximately 50 as indicated on the dial. It is normal to see some arcing inside the dome as the dial approaches 100.
- With the variable transformer running at maximum, the transformer voltmeter should read 120V on a 120V machine and 240V on a 240V machine.
- With the variable transformer running at maximum, the amp meter on a 120V machine should read approximately as follows (H-50/5amp, L-100/8amp, L-200/17amp).
- With the variable transformer running at maximum, the amp meter on a 220V machine should read approximately as follows (L-100/5amp, L-200/10amp, L-300/15amp, L-400/20 amp).
- The safety circuit, will shut off the high voltage and the red light indicator, if one of the panel doors is opened or with the loss of infeed cooling water pressure.
- The cooling water flow rate should be set to allow the stainless steel dielectric outer shell to be slightly warm to the touch both winter and summer. Do not allow the tube to get hot or condensate.
- The injection tank infeed should be adjusted slightly faster than the filler is using water. For optimum performance the tank should not be starting and stopping quickly.
- The injection tank water and ozone should start and stop simultaneously.
- The green light is on when filling, the red light is on when full.

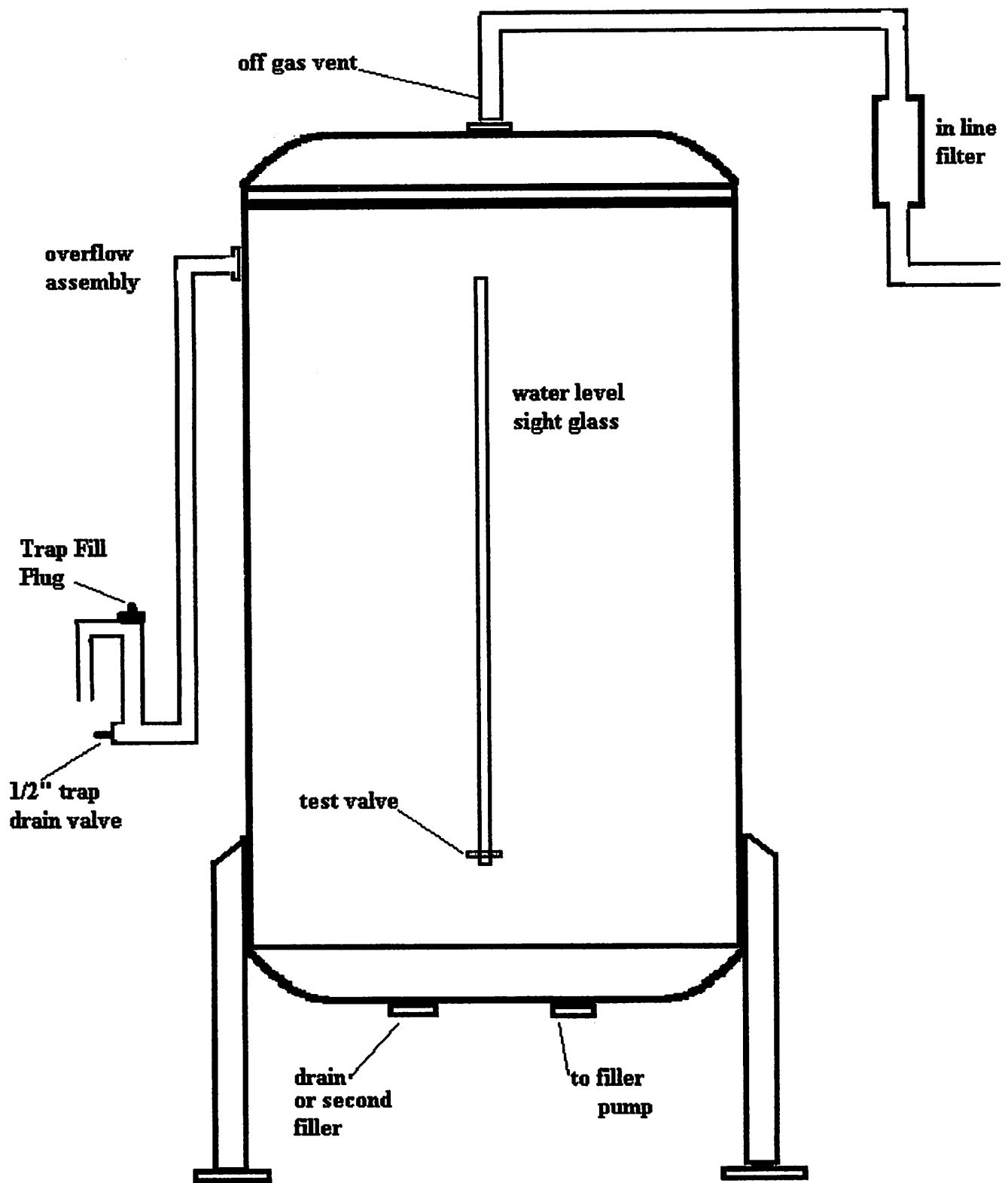


- 1 Level control
- 2 Control panel on/off
- 3 Ozone check valve
- 4 Ozone Solenoid Valve
- 5 Ozone purge Valve
- 6 Ozone infeed Fr. Gen
- 7 Product water solenoid valve
- 8 Sight glass
- 9 Ozone residual test valve

**Hess Machine International
T-150 / T-300
Ozone Injection Tank
Top View**

1/26/00 TDR

Figure 2



Hess Machine International
T-150 / T-300
side view 1/26/00 TDR
Figure 3

Section 2 – Operation

Start up procedure:

1. Turn on main electric supply, set pressure gauge to 80 psi and adjust the post drier pressure gauge to 13 psi.
2. To install, check the cooling water is operating and set the flow rate to the following approximate levels. Variation may be required depending upon incoming water temperature. (page 2)

Model	Gallons per Hour	Liters per Hour
H-50	5	19
L-100	10	38
L-200	20	76
L-300	25	95
L-400	35	133

3. Close ozone line purge valve (1/4" stainless steel ball valve) that is located next to the injection module on the injection tank.
4. Make sure all doors and panels are closed securely on the generator. Turn on the circuit breaker on front panel, which will also illuminate the red light.
5. Dial voltage regulator to appropriate level to achieve the desired ozone residual in the water.
6. Turn on product water and fill injection tank.
7. Check ozone residual in the product water at the following locations: the sight glass tube on the injection tank, at the line filler and after the product has been bottled.

Shut Down

1. Turn off product water.
2. Dial voltage regulation back to zero.
3. Turn off ozone circuit breaker switch.
4. Open 1/4" stainless steel ball valve to purge system.
5. Allow air compressor to run for an additional 3 to 4 minutes.
6. Check moisture bowls for proper drainage.

Section 3 – Maintenance

(Air Fed Ozone Generators)

(With short run or very humid conditions of operation, it may be necessary to clean the ozone generators more often.) Air coming into an ozonator contains roughly 89% nitrogen, 21% oxygen and trace amounts of dust, water vapor and other gases. The air preparation system (consisting of an air dryer, filters, etc.) is designed to remove dust and water vapor from the feed air. Air passes through the air preparation system and enters the ozone generator shell. In the shell some of the generated ozone reacts with nitrogen gas in the air to form nitrogen pentoxide (N₂O₅). Nitrogen pentoxide by itself is not a problem, but if the air is moist, it reacts with the water vapor to form nitric acid (HNO₃). The nitric acid then deposits on the generator shell and piping, causing corrosion of the metal surface and possible contamination of product water (raising conductivity).

1000 Operating Hours - (1) Disassemble and clean the ozone dielectric as described below. (2) Replace dome gaskets, (3) *May vary with conditions* -Clean or replace the air intake filters on the sides of the compressor, (4) Replace moisture bowl filter, (5) Replace dielectric spacers.

2000 Operating Hours - (1) Do all of the same items as described in the 1000 hour interval. (2) Replace Low-Pressure regulator diaphragm, inspect all other associated O-rings replace if needed, (3) Replace flow meter stem on bottom of SCFH gauge (4) Change solenoid valves at bottom of the heatless air dryer and poppet valves at the top of air dryer (5) Check dessicant cells on top of dryer, screen should not depress more than 1/4" and show no signs of dust.

Disassembly and Cleaning Dielectric:

1. Remove plug from electrical outlet or disconnect power to unit.
2. Remove high voltage connector on top of glass dome on dielectric. Take off top nut only.
3. Remove bolts holding dome-bearing ring to flange on dielectric shell.
4. Lift off dome and bearing ring together. Do this carefully. The contact rod should pull out of the plug on the brush assembly inside of the glass dielectric. If the dielectric comes out with the dome, lift dome until the dielectric can be held and pull them apart and remove dielectric from shell.
5. When the dielectric is removed it should have 4 spring spacers on it. If any of these remain in the shell remove them.
6. Use clean cloth moistened with warm soapy water to clean outer surface of dielectric and the inner surface of the stainless steel shell. Do not clean inside of glass dielectric beyond clear glass.
7. Clean inside and outside of glass dome, dome gasket, flange on end of shell and high voltage bushing on the transformer. (Hot water works very well.)

8. If water is used, all parts must be thoroughly dried. Moisture in the ozonator will reduce efficiency.
9. When dielectric is out of shell, check that the ozone outlet in the end of the shell is clear. If deposits have been carried into the ozone outlet line it will be necessary to remove lines and flush with hot water. Dry thoroughly before replacing. If deposits are excessive, replace with new tubing.

Reassembly:

1. With dielectric in shell, position new dome gasket on flange of shell and insert dome with dielectric brush on contact rod. Insert into die making sure contact rod and brush are connected and brush is in the coated area.
2. Secure dome with bolts and reconnect high voltage conductor. (*IMPORTANT*) When securing the dome, tighten the bolts gradually and evenly to prevent the dome from cracking.
3. Run compressor and check for air leaks.

Section 3 – Maintenance (Oxygen Fed Ozone Generators)

1000 Operating Hours (1) Replace particulate filter in the oxygen generator.

2000 Operating Hours (1) Replace particulate filter in the oxygen generator, (2) Replace dome gaskets, (4) Replace dielectric spacers, (5) Replace coalescing filter oxygen generator, (6) Replace Low Pressure regulator diaphragm, inspect all other associated O-rings replace if needed, (7) Replace flow meter stem on bottom of SCFH gauge, (8) Install new dome gaskets, (9) Clean dielectric, (10) Disassemble and clean the ozone dielectric as described below.

Disassembly and Cleaning Dielectric:

1. Remove plug from electrical outlet or disconnect power to unit.
2. Remove high voltage connector on top of glass dome on dielectric. Take off top nut only.
3. Remove bolts holding dome-bearing ring to flange on dielectric shell.
4. Lift off dome and bearing ring together. Do this carefully. The contact rod should pull out of the plug on the brush assembly inside of the glass dielectric. If the dielectric comes out with the dome, lift dome until the dielectric can be held and pull them apart and remove dielectric from shell.
5. When the dielectric is removed it should have 4 spring spacers on it. If any of these remain in shell remove them.
6. Use clean cloth moistened with warm soapy water to clean outer surface of dielectric and the inner surface of the stainless steel shell. Do not clean inside of glass dielectric beyond clear glass.
7. Clean inside and outside of glass dome, dome gasket, flange on end of shell and high voltage bushing on the transformer. (Hot water works very well.)
8. If water is used, all parts must be thoroughly dried. Moisture in the ozonator will reduce efficiency.
9. With dielectric out of the shell, check that the ozone outlet in the end of the shell is clear. If deposits have been carried into the ozone outlet line it will be necessary to remove lines and flush with hot water. Dry thoroughly before replacing. If deposits are excessive, replace with new tubing.

Reassembly:

1. With dielectric in shell, position new dome gasket on flange of shell and insert dome with dielectric brush on contact rod. Insert into die making sure contact rod and brush are connected and brush is in the coated area.
2. Secure dome with bolts and reconnect high voltage conductor. (*IMPORTANT*) When securing the dome, tighten the bolts gradually and evenly to prevent the dome from cracking.
3. Run compressor and check for air leaks.

Section 4 – Troubleshooting

- Short Circuit -** A short circuit occurring anywhere in the ozonator system will cause the ozonator circuit breaker to open and the red light to go out. Reset breaker by turning switch off, dialing voltage to zero and restarting equipment.
- Voltage Surge -** Occasionally the circuit breaker will trip on a starting surge, even when a short does not exist. To overcome this, put the variable voltage control in full counterclockwise (zero) position before starting ozonator, then turn control up to desired voltage.
- Circuit Breaker will not reset -** Check all safety latches on all doors. If the latches are not closed properly, the circuit will be broken.

Locating the trouble in Ozonator Circuit –

If the circuit breaker should be found tripped during normal operation, or if the breaker should trip repeatedly on starting, there is probably a short circuit in the system. NOTE: If the doors and top panels are open, special care should be taken that the unit is off and unplugged. The high voltage conductor and its connecting points carry approximately 15,000 to 20,000 volts.

1. Check primary circuit for shorts or grounds. If none are found, the trouble is probably in the high voltage circuit. If high voltage circuit is within 2" (5cm) of any metal part of machine, the high voltage current could be jumping to ground. Adjust conductor to maintain at least 2" (5cm) clearance from any grounded metal part.
2. To isolate trouble in ozonator circuit, first disconnect all ozone dielectrics from the transformer by removing high voltage conductor from the transformer and dielectrics. If circuit breaker trips without dielectric connected to transformer, then rheostat or transformer is defective. Remove primary side to transformer then test. If the circuit breaker does not trip, then the problem is not with the transformer, but it is with the rheostat. If circuit breaker does not trip the trouble is in the ozone dielectric. Connect 1 (one) dielectric to transformer. If circuit breaker trips and unit has more than 1 (one) dielectric, then trouble is in one of the other dielectrics. Follow this same procedure to isolate the bad dielectric.
 - A. Trouble inside the dielectric chamber is usually confined to either a cracked dielectric, or an excessive build-up of scale deposits.
 - B. Remove and examine all dielectrics closely for a crack throughout which could cause a grounding arc. A crack may only be slight or can appear as a pinhole and close inspection is necessary to detect it.

- C. Excessive build-up of deposits could be caused by operating the ozonator with moist air or by an excessively long time between cleanings. If cleaning schedule has been maintained, check drier for proper operation. The drier requires 80 psig to operate properly. Check pressure gauge on drier for proper pressure. If pressure is low, check all piping and equipment for leaks and check drier o-rings for proper operation. See drier manual for details.

Loss of Air Flow or Flow Control:

If air flow through unit drops off rapidly or cannot be controlled by the air regulator, check the following:

1. If the solenoid core assembly on the drier sticks or burns out, a large amount of air will be exhausted through the bottom of the solenoid valves on the drier. This can be checked by feeling the exhaust port in the bottom of each stem on each solenoid valve. Normal flow through these ports can just barely be felt. (Only one port is exhausting at a time – see dryer section.)
2. Check o-rings and examine for damage. (See dryer operating instructions.)
3. Check all piping, joints and gaskets with soapy water for leaks.
4. Check ozone outlet piping from the ozone chamber. If the deposit that builds up in the ozone dielectric shell is excessive, some of the deposit may be carried into the ozone lines and restrict or block them. Blocked lines can be cleaned with hot water under pressure. (If the line is completely blocked, the only outlet for the ozone will be through the pressure relief valve. This may damage the relief valve and may make it inoperative.) If cleaning schedule is maintained, the deposits will not build up to this extent unless the dielectric chamber is operating on moist air. (See dryer section.)
5. If trouble exists that cannot be located by any of the above procedures, contact the Service Department of Hess Machine International.

Section 5 – Accessories

**Puregas Heatless Air Dryer
Air Compressor**

Puregas Heatless Air Dryer

The heatless air dryer consists of two cells that alternate every 30 seconds. Each chamber then purges itself with an audible exhaust. DO NOT plug or restrict the air exhausts, and if orifices are replaced, they should be replaced in matched pairs. Under normal operation, the unit becomes warm, and does not indicate a malfunction.

Please refer to the following maintenance instructions, troubleshooting guide, parts list and diagram for more information about the Puregas Heatless Air Dryer:

- **Field Adjustments:**

No field adjustments are necessary after a Puregas Heatless Air Dryer has been installed in accordance with these instructions. No lubrication is required on the instrument.

- **6 Month Check:**

It is recommended that at six-month intervals the unit be thoroughly inspected. Inspection should include audible inspection for proper chamber reversal and purge, and visual inspection for excessive dirt or oil fouling and for desiccant attrition. This involves removal of the air manifold cover and of the desiccant chambers. Annual inspections should be more thorough, and should also include removal of the solenoid valves and the purge orifice glands to inspect for excessive wear or deterioration of valve parts or the check valve balls as well as for possible plugging of the purge orifice.

- **Purge Orifice:**

As the orifices are critical parts in determining the performance of a dryer, the user should not try to increase the orifice by drilling a larger hole. Instead, orifices of the proper size should be obtained from the factory.

Purge orifice glands are screwed into the manifold beneath the desiccant chambers. To change orifices, unscrew the chambers using a standard 7/8" socket wrench.

- **Cycle Timer:**

The cycle timer can be replaced in the field.

- **Desiccant:**
Improper packing of the desiccant chambers can cause channeling of the gas stream and improper purification. For this reason **NO ATTEMPT SHOULD BE MADE TO REPACK DESICCANT CHAMBERS IN THE FIELD.** Replacement chambers should be obtained from your local authorized distributor.
- **Replacement Parts:**
Contact your local authorized distributor for replacement parts. Refer to the Exploded View of the Puregas Heatless Dryer (page 21) and Parts Description Puregas Heatless Dryer (page 22) for corresponding numbers.

Puregas Heatless Air Dryer Troubleshooting

Unit delivers wet air:

- **Improper operating condition:**
Adjust operating conditions.
- **Solenoid core spring broken:**
Remove solenoid valve, inspect core assembly. Spring should be seated on core and not broken. Replace if necessary.
- **Purge orifice plugged:**
Remove, inspect and clean orifice. Do not force wires through critically drilled holes. Use air gun to clean.
- **Solenoid coil burned out:**
Remove cover, place iron or steel material (screwdriver or nail) on exposed end of solenoid base to feel the magnetic effect indicating proper operation.
NOTE: Each coil should be energized for 30 seconds.
- **Improper operation of cycle timer:**
 1. Check the power supply. If the correct voltage is not present between L1 and both of the L2 terminals, check the wiring and protective devices supplying power to the dryer.
 2. Dryers with DC solenoid valves should alternately have DC voltage between L2 and DC1 and between L2 and DC2. Replace the timer if voltage is present at either DC terminal continuously or not at all.

Timer Input 120 VAC/Timer Output 53 VDC.
Timer Input 240 VAC/Timer Output 106 VDC.
 3. Refer to Solid State Timers for timing cycle information.

- **Desiccant contamination or attrition:**
Inspect outlet airline for indication of excessive oil. Check operation of dropout filter. Remove chamber from manifold and depress perforated disc at open end of chamber. If it can be depressed more than ¼" from retaining ring, replace chamber or have it repacked.

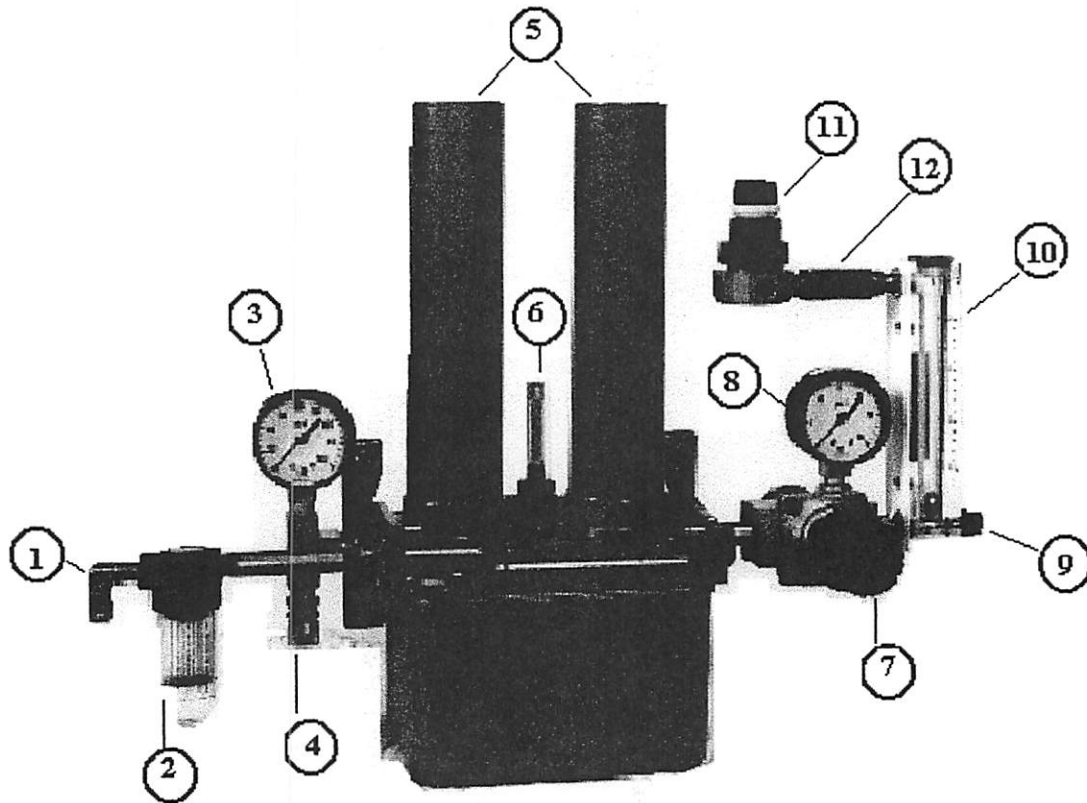
Excessive drop in outlet pressure:

- **Improper operating conditions:**
See remedy under "Unit delivers wet air".
- **Solenoid coil burned out:**
See remedy under "Unit delivers wet air".
- **Improper operation of cycle timer:**
See remedy under "Unit delivers wet air".
- **Check valve balls seated improperly:**
Remove check balls and springs and inspect for excessive wear or damage. Replace if necessary.
- **Plugged air passages:**
Check inlet and outlet air passages and piping for blockage.
- **Desiccant contamination or attrition:**
See remedy under "Unit delivers wet air".

Solenoid valve chatter:

- **Solenoid valve defective:**
Replace solenoid valve.

Puregas Heatless Air Dryer



1. Air Inlet
2. Moisture Bowl
3. High Pressure Gauge-Inlet-80psi
4. High Pressure Relief Valve
5. 2-Dessicant Drying Cells
6. Moisture Indicator
7. Low Pressure Regulator
8. Low Pressure Gauge-Outlet-13psi
9. SCFH Gauge-Flowmeter Stem
10. SCFH Gauge Indicator
11. Low Pressure Relief Valve
12. Air Flow to Ozone Generator

Note: Moisture Indicator, crystals change from blue to pink should air dryer deliver wet air, indicating improper operation.

Instrumentation

The primary purposes of instrumentation in the system are process control and troubleshooting. The instruments shown in the Recommended Installation Diagram are therefore in most cases optional, but their initial cost will be quickly justified through improved process stability and problem analysis.

A simple, inexpensive means of measuring the moisture content of the outlet air stream can be accomplished with a vial of color-changing crystals. PUREGAS offers such an accessory, which can be mounted directly to the dryer or adsorber. The crystals will change from a dark blue (dry) to pink (wet) depending on the moisture content in the air stream.

For sensitive or remote applications, PUREGAS manufactures an electronic humidity alarm, which continuously tracks moisture levels and helps prevent costly repairs caused by moisture damage. It features simultaneous audible and visual alarms, as well as open- and closed-circuit conditions for integration into a control system.

Electrical Connections and Timer

Before wiring, check the product label for electrical characteristics. Although standard electrical characteristics are 115 Volts, 50/60 Hz or 230 Volts, 50/60 Hz, most products are also available in 12 V_{DC} and 24 V_{DC}.

There is no electrical overload protection in the product and it should be wired into a protected circuit. While standard on some units, an 8-foot, 3-wire grounded power cord is available as an optional accessory for all products. The unit can be grounded by attaching a wire to a timer assembly bracket screw. Please see the Wiring Diagrams that follow.

As previously described, the solid state timer controls the switching of the solenoid valves, which in turn direct the air through the unit. All timers are designed with a one-hour memory; if power is interrupted, the dryer will resume operation at the same point in the cycle when the power is restored.

The standard timer for the **PHF and PHCA models** simultaneously switches the solenoid valves every 30 seconds (for a total cycle time of 1 minute). The timer used on the **PHFR, PCDA and PCME models** maintains the same cycle, but allows a repressurizing period of 3.75 seconds prior to switching chambers. Repressurizing

helps minimize the outlet pressure and flow variation, as well as desiccant shock as the flow switches from one chamber to the other.

The PCR model also utilizes a repressurizing timer. It maintains a 2-minute cycle, with a 20-second repressurizing period prior to switching towers. The PMD and TOC models follow a standard 1-minute cycle like the PHF300A model.

The timer wiring diagrams for all models are shown in Figure 8.

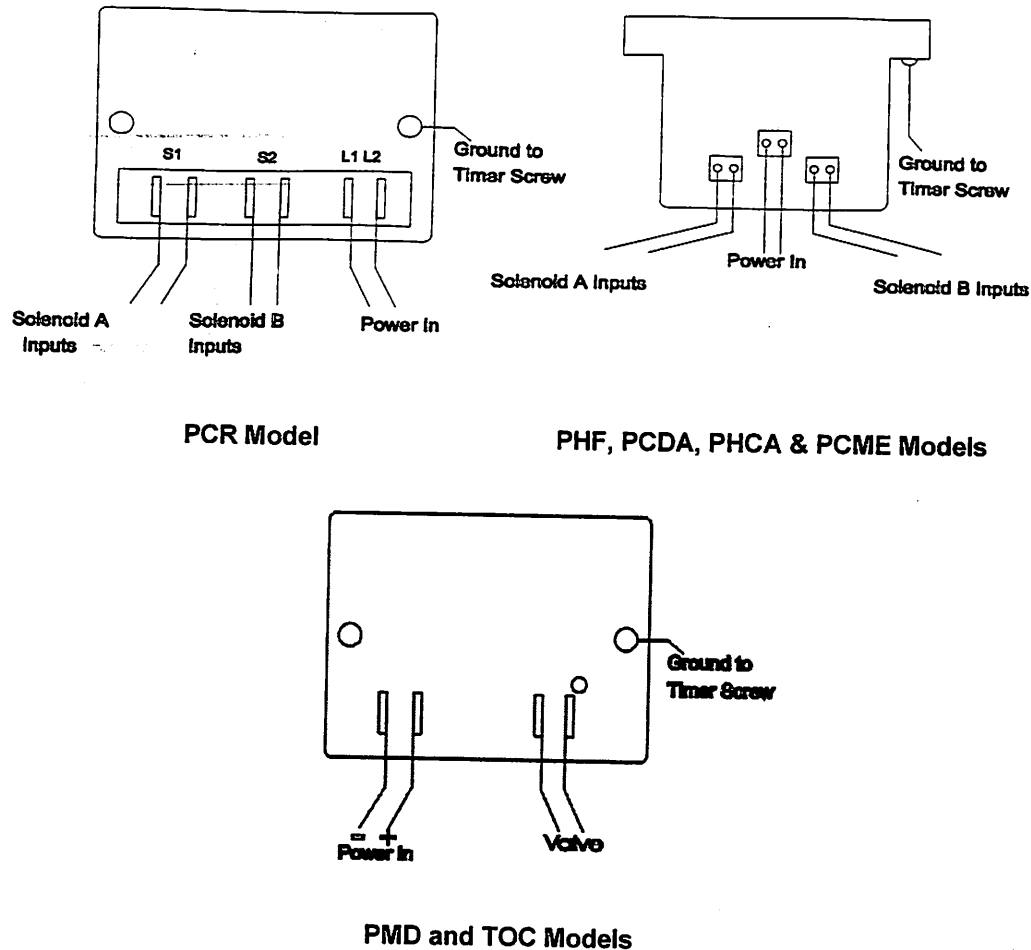


FIGURE 8: WIRING DIAGRAMS

Operating Pressure and Sizing

Most PUREGAS models are designed to operate at pressures up to a maximum of 150 psig. The only exceptions are the PMD and TOC models, which have a maximum operating pressure of 125 psig. It is important to note that all models based on PSA technology will achieve better performance at higher operating pressures. Therefore, any pressure regulation should be done downstream of the dryer or adsorber.

SECTION 4 - MAINTENANCE

General Information

When properly installed and operated, PUREGAS compressed air dryers and adsorbers are designed to deliver years of reliable service without minimal attention. Most recommended maintenance procedures can be easily and quickly performed in the field without the need for specialized tools or skills.

Annual Inspection

Although optional, an annual inspection of the dryer or adsorber is recommended for critical processes to anticipate potential failures. This inspection should include the following checks:

- **Cycle Timer:** Listen for proper desiccant tower cycling. See the **Electrical Connections and Timer** section of this manual for information on the timing cycle of your model.

IMPORTANT!

Shut-off the air supply and depressurize the system before attempting the following maintenance checks.

- **Desiccant Towers:** Remove the desiccant towers and visually inspect their inlets for excessive dirt or oil fouling, which would indicate possible contamination of the desiccant chambers. If contaminated, replace the desiccant chambers or return them to PUREGAS (or an authorized distributor) for repacking. Please note that repacking the towers is not available for all products. No attempt should be made to repack the chambers in the field, since improper packing can cause channeling of the air stream and lead to reduced performance.

NOTE!

Removal and inspection of the desiccant chambers should NOT be necessary for at least 3-5 years, if the system includes properly functioning and maintained inlet particulate and coalescing filters with automatic drains.

- **Solenoid Valves:** For the PHF, PCDA, PHCA and PCME models only, inspect the sealing surface on the solenoid valve plunger. This requires unscrewing the solenoid valves from the bottom of the manifold. A deteriorated surface will lead to air leakage and reduced performance. If necessary, replace the plunger and base of the solenoid valve assembly by requesting a solenoid valve kit from PUREGAS (or an authorized distributor).

- **Purge Mufflers:** Remove the mufflers from the solenoid valves and check for excessive pressure drop by blowing through the muffler. The muffler should be replaced if significant back-pressure is sensed.
- **Filtration:** Inlet and outlet filters must be kept clean for efficient filtering. A visible coating of dirt on the element's surface or an excessive pressure drop (greater than 5-6 psig), indicate that replacement is needed. See the **Replacement Parts** section in this manual for information on replacement elements for all current filters. For older filters, please see the *Product Support* section of the PUREGAS website (www.puregas.com) for more information.

Maintenance Schedule

The following preventive maintenance schedule is recommended to ensure the optimum performance of the unit and to prevent the inconvenience of a sudden, unexpected failure. Please reference the exploded view drawings in the **Replacement Parts** section to identify specific part numbers for your model.

- **Replace Filter Elements:** Replace the inlet and outlet filter elements every 6-12 months depending on the quality of the compressed air source. PUREGAS stocks replacement elements for all of the filters offered with its products.
- **Solenoid Valves on PHF, PCDA, PHCA and PCME Models:** Replace the plunger and base of the solenoid valves every two (2) years. PUREGAS offers a Solenoid Repair Kit (P200498S) for this procedure. Two (2) kits are required for each dryer or adsorber being serviced.
- **Replace or Repack Desiccant Towers:** Replace or repack the desiccant towers every five (5) years. Please see the following exploded view drawings to determine the tower part number required. Please note that the repack option is only available for the **PHF, PCDA, PHCA and PCME** models. Replacement towers are available for all other models.
- **Check Valve and O-rings on PHF, PCDA, PHCA and PCME Models:** Replace the check ball, check spring, and o-rings for **PHF, PCDA, PHCA and PCME** models every 6 years. PUREGAS offers a Maintenance Kit (P200499S) for this procedure. One (1) kit is required per dryer or adsorber. This kit contains two Solenoid Repair Kits, two check balls, two check springs, and an assortment of o-rings.

The sizing of the purge orifice is also important to the performance of a PSA system. The orifice must be large enough to admit sufficient air to purge the off-line tower, but not too large to be wasteful of the dry or purified air. Please note that the operating pressure is closely associated with the orifice sizing, since both the orifice aperture dimension and pressure determine the quantity of purge air.

The purge orifice size of a particular unit is indicated by the last 2-3 digits of the model number (found on the product label). The orifice number for the **PHF**, **PCDA**, **PHCA** and **PCME** models is also stamped on the top of the purge orifice itself. For the **PCR**, **PMD**, and **TOC** models, the orifice size is stamped on the outlet shuttle valve body.

The outlet flow should be regulated with a throttle valve and measured with a flow meter to ensure the capacity of the dryer or adsorber is not being exceeded. PUREGAS offers flow meters with built-in flow control valves for this purpose.

IMPORTANT!

Each compressed air dryer and adsorber is sized for specific operating conditions. If additional flow is required or the operating pressure decreases, the output performance will be negatively affected unless the orifice diameter is changed appropriately. Depending on the magnitude of the change, the size of the desiccant chambers may also need to be increased. Please consult the product sizing charts or contact the factory for more information.

Other Operating Issues

At the beginning of each purge cycle, there will be an audible exhaust through the solenoid valve. This sound can be made quieter by the use of purge mufflers (standard on most models) or a sound suppression kit for virtually noiseless operation. Please contact PUREGAS for more information on this option.

The exhaust stream may also be piped to a remote location. If this is done, it is important that the exhaust piping is oversized to prevent back-pressure on the purge stream; restricting the purge flow will prevent full regeneration of the desiccant chamber and lead to reduced performance.

The heat of adsorption and the operation of the solenoid valves will cause the unit to become warm to the touch. This is normal.

To prevent potential electrical shock, the timer cover should not be removed for maintenance until power is disconnected from the unit. Likewise, the unit should be completely depressurized prior to service.

Problem A: Expected outlet dewpoint or purity is not met.

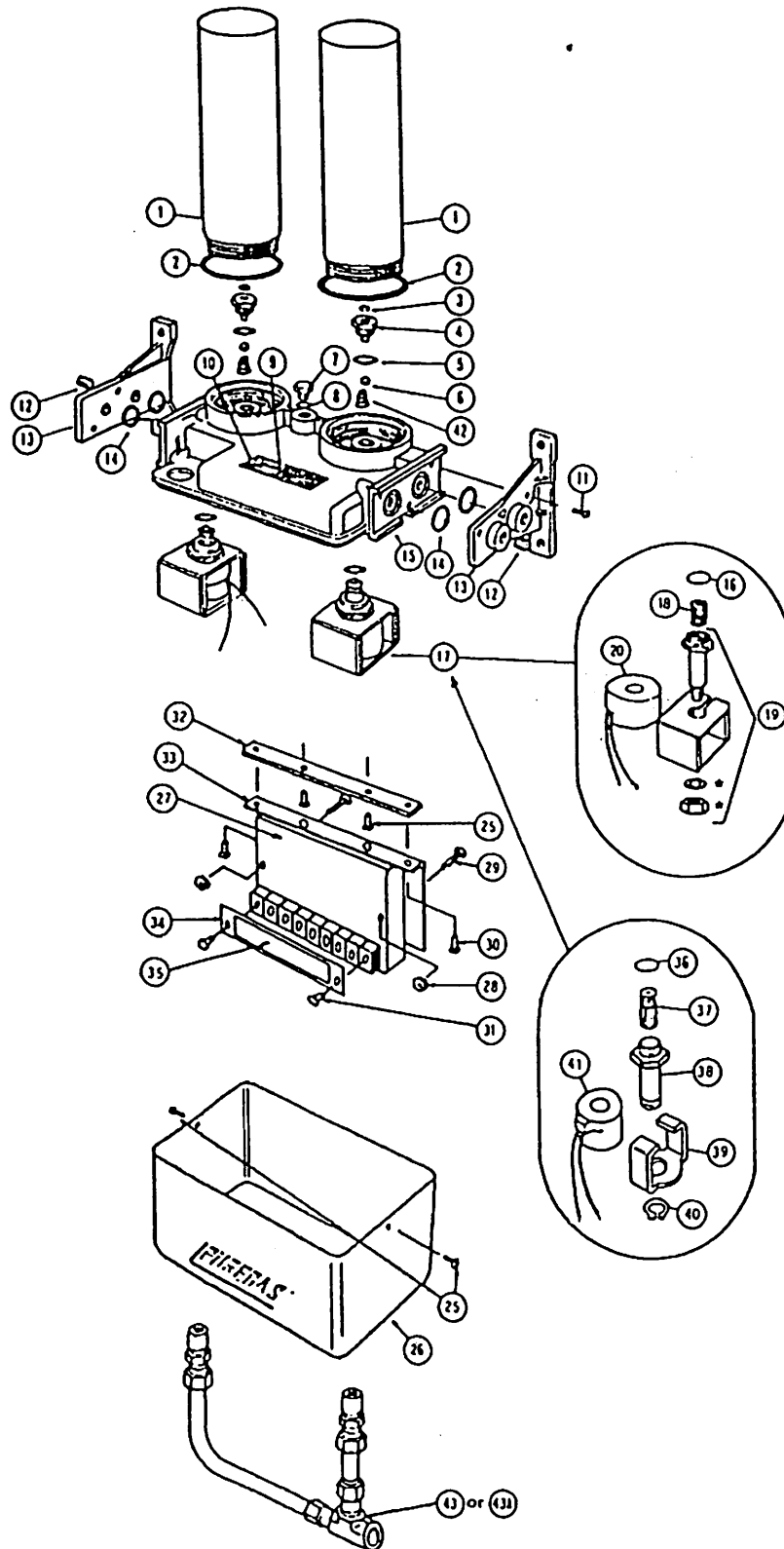
Model	Potential Cause	Verification	Corrective Action
A1	All Current operating conditions do not match the unit's specifications.	Verify that the actual operating pressure and inlet/outlet flow rates match the specified performance of the unit. Contact the factory if you require sizing data for your model.	Reduce the outlet flow requirements, increase the operating pressure, or resize the dryer by increasing the orifice size and/or the size of the desiccant towers.
A2	PHF PCDA PCME PHCA Sealing surface of solenoid valve core deteriorated, resulting in air leakage.	Remove and inspect solenoid valve core by unscrewing valve assembly from bottom of manifold.	Purchase solenoid repair kit from PUREGAS and replace solenoid core and base.
A3	All Desiccant tower contamination.	Check inlet filtration for proper operation and inspect outlet air line for evidence of oil.	Replace or repack desiccant towers. Replace or install proper inlet filtration. See <i>Maintenance Section</i> for details.
A4	PHF PCDA PCME PHCA Desiccant tower attrition.	Remove chamber and depress perforated disc at open end of tower.	If perforated disc can be depressed more than 1/4" from the retaining ring, replace or repack desiccant towers.
A5	All Solenoid coil burned out.	Listen for a distinctive "click" when the solenoid is energized.	Contact PUREGAS for a replacement solenoid valve assembly.
A6	All Inlet air temperature exceeds specified maximum.	Inlet air temperature should not exceed maximum for operating conditions (usually 70°F or 100°F).	Reduce inlet air temperature or resize dryer.
A6	All Dirty or obstructed inlet air filter element.	Check service life indicator on top of filter (if equipped) or inspect filter element surface for coating of dirt or condensate.	Replace filter element.
A7	All Purge orifice plugged.	Remove and inspect purge orifice.	Clean hole of debris using an air gun. Do not force a wire through the critically drilled orifice.
A8	All Timer defective.	Measure the output voltage from the timer, as per the cycle and voltage of your model. See <i>Maintenance Section</i> for more information.	Replace timer if defective.
A9	All Purge flow restricted.	Check mufflers or purge piping for excessive back-pressure.	Replace mufflers or oversize piping for purge (if so equipped).

Problem B: Excessive purge flow or blowdown.

Model	Potential Cause	Verification	Corrective Action	
B1	All	The purge orifice size is larger than what is required for the current operating conditions.	Verify that the orifice size corresponds to the actual operating pressure and flow rate. Contact the factory if you require sizing data for your model.	Resize the dryer by replacing the orifice(s) with a smaller size.
B2	PCR PMD TOC	Inlet or outlet shuttle disc not shifting.	Verify that the actual operating pressure and inlet/outlet flow rates match the specified performance of the unit. Contact the factory if you require sizing data for your model.	Line pressure too low at inlet: Increase the operating pressure or resize the purge orifice for the new conditions.
B3	PCR PMD TOC	Inlet or outlet shuttle disc not shifting.	Depressurize the system, remove shuttle valve assembly, and check for damage or contamination of inside the valve body.	Replace or clean valve body and disc. Check condition of inlet filtration (A6) and desiccant (A3).
B4	All	Timer not operating properly.	Check for incoming voltage fluctuations caused by inductive devices (eg. electric motors) on the same circuit.	Supply line voltage from another source.
B5	All	Timer defective.	Measure the output voltage from the timer, as per the cycle and voltage of your model. See <i>Maintenance Section</i> for more information.	Replace timer.
B6	All	Air leaks.	Remove electrical power from unit while it is pressurized. Check purge ports and joints for significant leaks using soapy water.	Repair as necessary using Teflon tape or thread sealer.
B7	PHF PCDA PCME PHCA	Check valve ball not seated properly.	Remove desiccant towers, orifice plugs, and inspect condition of check ball and spring for excessive wear or damage.	Replace check ball and spring.

Problem C: Excessive pressure drop across unit.

Model	Potential Cause	Verification	Corrective Action
C1	All Current operating conditions do not match the unit's specifications.	Verify that the maximum flow rate for the unit is not being exceeded. Contact the factory if you require sizing data for your model.	Reduce the outlet flow rate.
C2	All Dirty or obstructed filter element.	Check service life indicator on top of filter (if equipped) or inspect filter element surface for coating of dirt or condensate.	Replace filter element.
C3	All Desiccant tower contamination.	Check inlet filtration for proper operation and inspect outlet air line for evidence of oil.	Replace or repack desiccant towers. Replace or install proper inlet filtration.
C4	All Plugged air passages.	Check inlet and outlet air passages and piping for blockages.	Clear restrictions.
C5	All Solenoid coil burned out.	Listen for proper purge cycle. Once removed from the unit, the magnetic field from coil can also be checked with a screw driver or nail.	Contact PUREGAS for a replacement solenoid valve assembly.
C6	PHF PCDA PCME PHCA Check valve ball not seated properly.	Remove desiccant towers, orifice plugs, and inspect condition of check ball and spring for excessive wear or damage.	Replace check ball and spring.
C7	All Timer defective.	Measure the output voltage from the timer, as per the cycle and voltage of your model. See <i>Maintenance Section</i> for more information.	Replace timer.



Exploded View, Puregas Heatless Dryer
Figure 6

Code:	A	B	C	D	E	F	G
Model:	ALL	HF200A	HF204A	HF300A	HF300B	HF304A	HF304B

PARTS DESCRIPTION - PUREGAS HEATLESS DRYERS

ITEM NO.	PART NUMBER	USED ON DRYER	QTY. PER DRYER	PART DESCRIPTION
1	P-200-403-6	A	2	Desiccant Chamber 6" Length (includes item 2)
	P-200-403-9	A	2	9" Length-Painted
	P-200-403-12	A	2	12" Length-Painted
	P-200-403-20	A	2	20" Length-Painted
2	P-400-312-924	A	2	O-ring - 1.720 I.D x 0.118 W.
3	P-400-313-110	A	2	O-ring - 0.362 I.D x 0.103 W.
4	P-200-404(-) *	A	2	Purge Orifice assy. (includes items 3 & 5)
5	P-400-312-908	A	2	O-ring - 0.644 I.D. x 0.087 W.
6	P-400-375	A	2	Ball, Check Valve
7	P-400-307-4	A	1	Plug, Hex
7A	P-200-405	A	1	Moisture Indicator (includes item 8), optional
8	P-400-312-904	A	1	O-ring - 0.351 I.D. x 0.072 W.
9	P-300-737	A	1	Nameplate
10	P-400-322-1	A	2	Drive Screw #4 x 3/6" Type U rnd. hd., st. st.
11	P-400-361-2	A	6	Screw, #10-24 x 5/8", pan. hd.
12	P-400-320-3	A	2	Pipe Plug, 1/4" - 18 socket hd.
13	P-300-497P	A	2	Mounting Bracket - Painted
14	P-400-313-116	A	4	O-ring - 0.731 I.D. x 0.103 W.
15	P-300-495P	A	1	Air Manifold-Painted
16	P-400-313-018	B,C	2	O-ring - 0.739 I.D. x 0.70 W.
17	P-400-308-DC1	B,C	2	Solenoid Valve - 53 VDC (120 V., 50/60 Hz dryers)
	P-400-308-DC2	B,C	2	Solenoid Valve-106 VDC (240 V., 50/60 Hz dryers)
	P-400-589-DC1	D,F	2	Solenoid Valves - 53 VDC (120 V., 50/60 Hz dryers)
	P-400-589-DC2	D,F	2	Solenoid Valves-106 VDC (240 V., 50/60 Hz dryers)
	P-400-590-DC1	E,G	2	Solenoid Valve - 53 VDC (120 V., 50/60 Hz dryers)
	P-400-590-DC2	E,G	2	Solenoid Valve-106 VDC (240 V., 50/60 Hz dryers)
R18	P-400-308-12	B,C	2	Core Assembly
19	P-400-308-13	B,C	2	Base Assembly
20	P-400-308-DC11	B,C	2	Coil 53 VDC
	P-400-308-DC12	B,C	2	Coil 106 VDC
25	P-400-361-1	A	4	Screw #6-32 x 8/8" pan. hd.
26	P-300-505-2P	B,C,D,F	1	Air manifold cover - Painted
26A	P-300-640-P	E,G	1	Air manifold cover - Painted
27	P-06521-F1	B,D,E	1	Solid State Timer - 120 V., 50/60 Hz
	P-06521-F2	B,D,E	1	Solid State Timer - 240 V., 50/60 Hz
	P-06500-F1	C,F	1	Solid State Timer - 120 V., 50/60 Hz
	P-06500-F2	C,F	1	Solid State Timer - 240 V., 50/60 Hz
	P-06501-F1	G	1	Solid State Timer - 120 V., 50/60 Hz
	P-06501-F2	G	1	Solid State Timer - 240 V., 50/60 Hz
28	H-NK01-OHC-R5	A	2	Nut -Keps 8-32
29	H-SB83-OHC-10	A	2	Screw 8-32 x 1" BH
30	H-SB83-OFC-04	A	2	Screw 6-32 x 1/4" BH
31	H-SB83-OFC-02	A	2	Screw 6-32 x 1/2" BH
32	P-06496	A	1	Plate-Adapter-SS Timer Brkt.
33	P-06497	A	1	Bracket-Mtg-SS Timer
34	P-06499	A	1	Cover Terminal
35	P-06498	A	1	Decal-Terminal Cover
36	P-06723	D,E,F,G	2	O-Ring - 0.850 I.D. x 0.045 W.
37	P-400-589-12	D,F	2	Core Assembly
	P-400-590-12	E,G	2	Core Assembly
38	P-400-589-13	D,E,F,G	2	Base Assembly
39	P-400-589-DC14	D,E,F,G	2	Frame
40	P-400-396-1	D,E,F,G	2	Rings-Retaining
41	P-400-589-DC11	D,E,F,G	2	Coil 53 VDC
	P-400-589-DC21	D,E,F,G	2	Coil 106 VDC
42	P-300-507	A	2	Spring-Check Ball
43	P-200-489-4	E,G	1	Inlet Manifold Assembly
44	P-400-398 **	B,C	2	Purge Muffler (optional)
44A	P-400-399 **	D,F	2	Purge Muffler (optional)
44B	P-200-492-2 **	E,G	1	Purge Muffler Assembly (optional)

When ordering parts, always state the dryer Model Number and Serial Number.

* Orifice number must be specified. This can be obtained from existing unit or from sizing chart

** Not illustrated

Section 6 – Diagrams

The following section contains:

- **Ozone Generator Specification Sheet**
- **Ozone Injection Tank Specification Sheet**
- **HMI Dielectric Shell and Dome Assembly**
- **Asco Tank Pressure Switch**

Ozone Generator Specification Sheet

Generator	Model	Model	Model	Model	Model	Model
	H-50	L-100	L-200	L-200	L-300	L-400

Injection Tank System Number	T-150	T-150	T-150	T-300	T-300	T-300
	HT-50	LT-100	LT-150	LT-200	LT-300	LT-400

Flow Rates

Gallons per minute	30	60	90	120	180	240
Gallons per hour	1800	3600	5400	7200	10800	14400
Gallons per 8 hours	14400	28800	43200	57600	86400	115200
Gallons per 24 hours	43200	86400	129600	172800	259200	345600

Liters per minute	114	227	341	454	681	908
Liters per hour	6813	13626	20439	27252	40878	54504
Liters per 8 hours	54504	109008	163512	218016	327024	436032
Liters per 24 hours	163512	327024	490536	654048	981072	1308096

Yield

Ozone yield (lb/day)	0.5	1	2	2	3	4
Ozone yield (g/hour)	9.5	19	38	38	57	76

Dimensions (Inches)

Generator width	16	28	30	30	31	31
Generator length	37	60	68	68	61	61
Generator height	45	44.5	48	48	45	45
Generator weight	210	260	365	365	535	705

Shipping width	24	32	40	40	42	42
Shipping length	42	70	72	72	72	72
Shipping height	50	48	54	54	65	65
Shipping weight	360	470	550	550	750	920

Electric

Volts	120/220	120/220	120/220	120/220	220	220
Cycle (Hz)	60/50	60/50	60/50	60/50	60/50	60/50
Current (amp)	10	15	20	20	20	40
Phase	1	1	1	1	1	1
Plug in Elec. Cord	yes	yes	no	no	no	no
Elec. Fused disconnect	no	no	yes	yes	yes	yes
High current brk (amp)	5	10	20	20	30	(2) 25
High volt. Trans (kVA)	0.5	1	2	2	4	4

Air

Max air flow (scfm)	0.05	1	2	2	3	4
Max air flow (scfh)	30	60	120	120	180	240
Dryer Infeed (PSI)	80	80	80	80	80	80
Dryer outfeed (PSI)	13	13	13	13	13	13
Air compressor (HP)	0.5	0.75	1	1	1.5	1.5
Dessicant cell (In)	6	6	9	9	12	12
Moisture indicator	Yes	Yes	Yes	Yes	Yes	Yes

Cooling water

Required flow (gph)	5	10	20	20	25	25
---------------------	---	----	----	----	----	----

Ozone Injection Tank Specification Sheet

Injection Tank

Model T-150			Model T-300	
Matching Ozone Generator Combined Model Number			L-300	L-400
H-50	L-100	L-200	LT-200	LT-300

Tank Volumes Gal
Liters

150	300
568	1,136

Maximum Flow Rates

Gallon per minute
Gallon per hour
Gallon per 8 hours
Gallon per 24 hours

90	240
5,400	14,400
43,200	115,200
129,600	345,600

Liters per minute
Liters per hour
Liters per 8 hours
Liters per 24 hours

340	908
20,439	54,504
163,512	436,032
490,536	1,308,096

Dimensions

Tank Diameter (in)
Tank Diameter w/valve (in)
Tank Height (in)
Tank weight (lb)

31	44
35	50
85	85
375	510

Shipping width (in)
Shipping length (in)
Shipping height (in)
Shipping weight (lb)

40	60
85	90
40	55
655	680

Electric

(volts)
Cycle (Hz)
Current(amp)
Phase

110/220	110/220
60/50	60/50
10	10
1	1

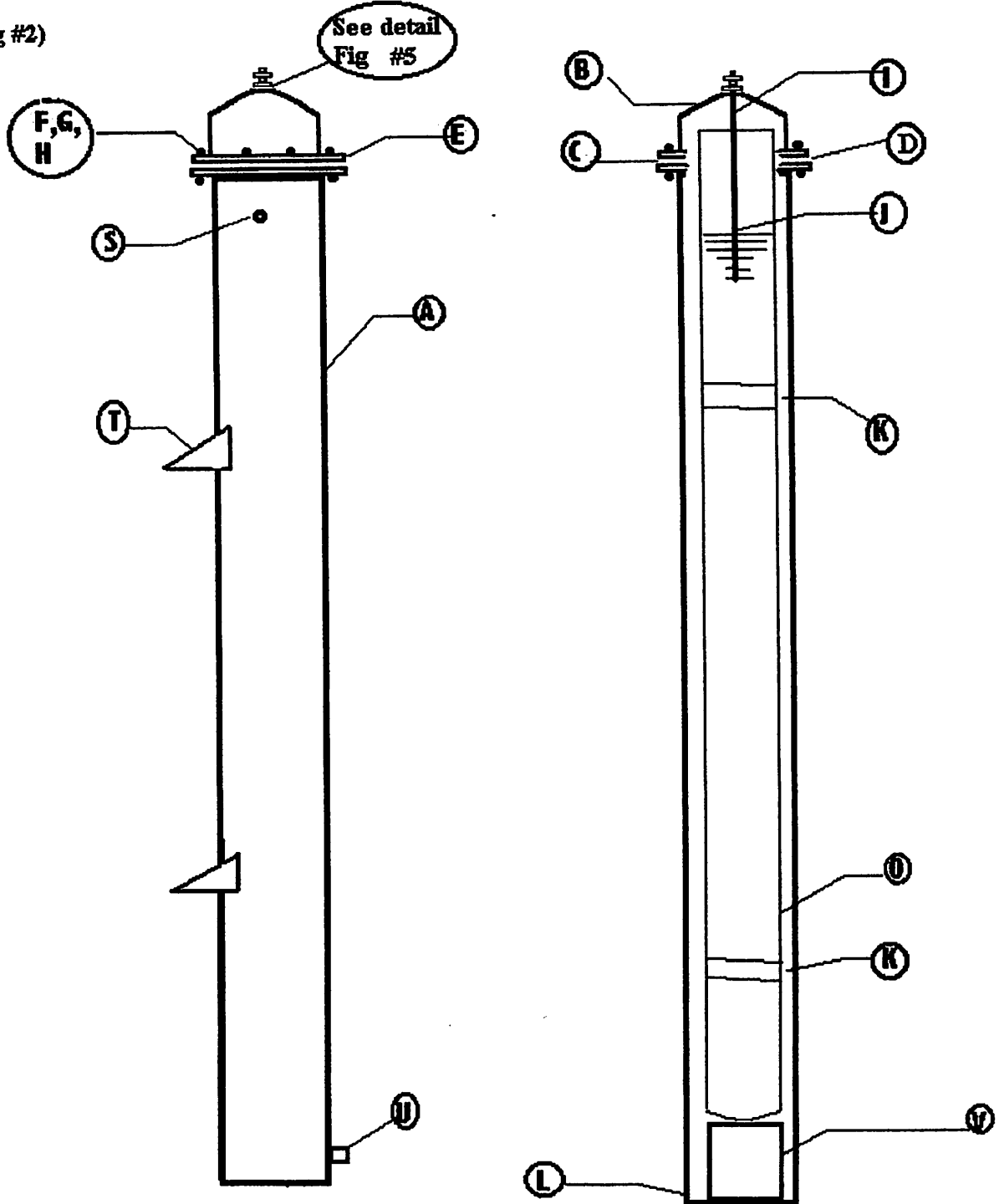
Plumbing

Untreated water inlet FMIP (in)
Treated water outlets FMIP (in)
Overflow Outlets FMIP (in)
Off-Gas Vent FMIP (in)

1.5	2
2	2&3
2	2
1	1.5

Hess Machine International H-25 Dielectric Assembly

(fig #2)



Hess Machine International

H-50 Dielectric Shell

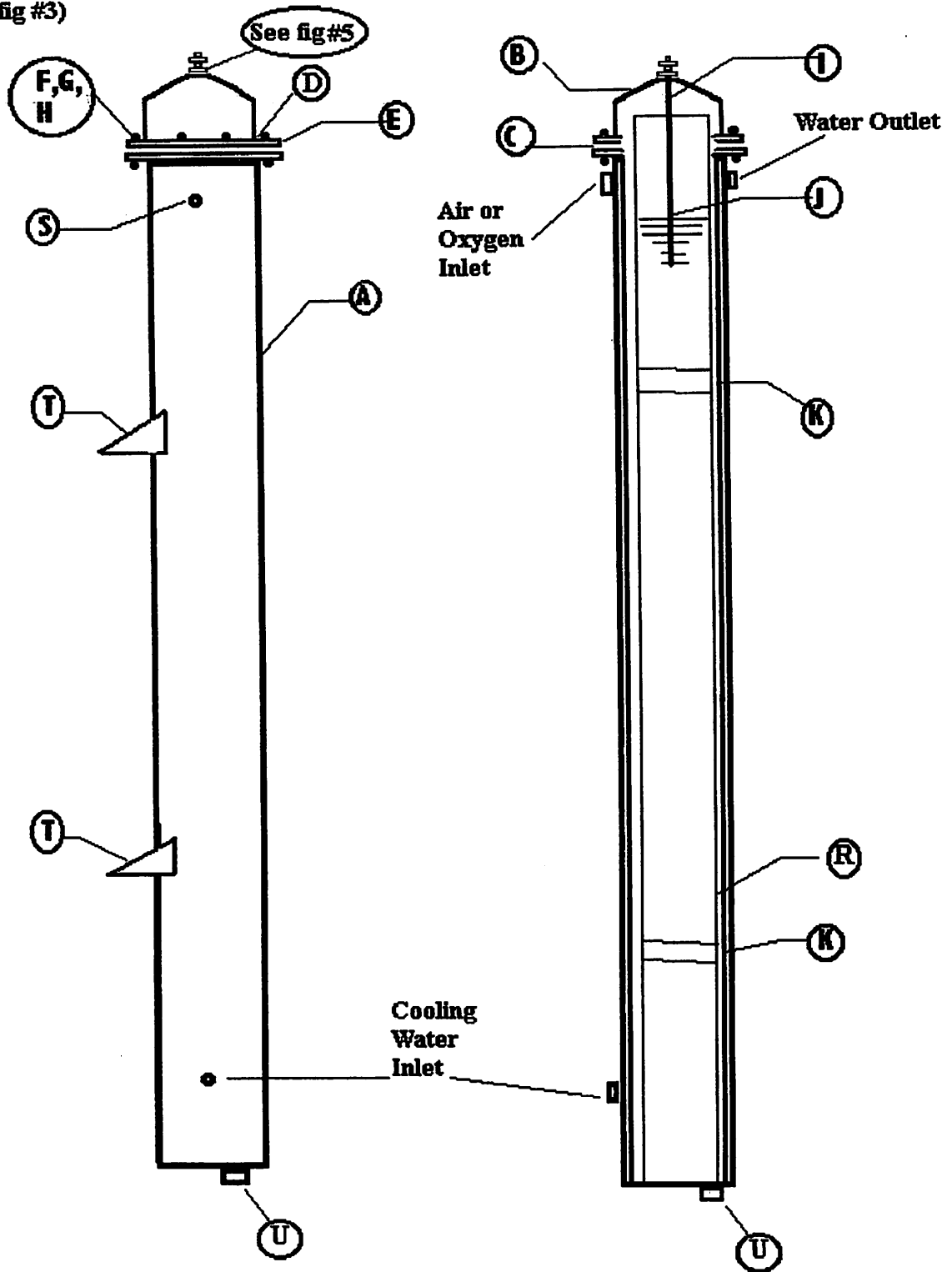
H-100
H-200 (fig #3)

L-100

L-200

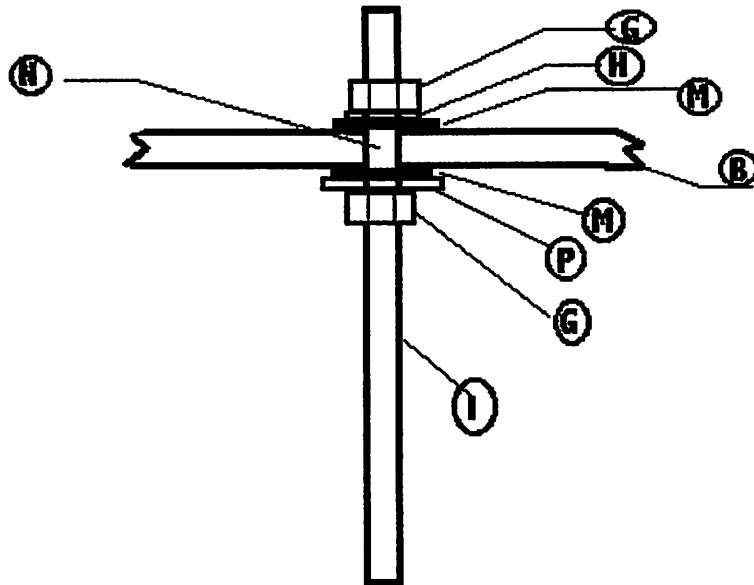
L-300

L-400



Hess Machine International
Dome Assembly for H&L Series
(fig #1)

Dome/Contact Rod Detail



Parts List-H & L Series

<u>Part</u>	<u>Nomenclature</u>	<u>QTY</u>
A.	Ozonator Shell	1
B.	Glass Dome	1
C.	Clamping Ring Gasket	1
D.	Dome Gasket	1
E.	Clamping Ring	1
F.	1/4 x 20x1 1/2 " Hex.SS bolt	6
G.	1/4 x 20 Hex SS Nut	8
H.	1/4 Flat Washer	7
I.	Contact Rod	1
J.	Brush Contact	1
K.	Dielectric Spacer	4
L.	Dielectric Cushion (H-series)	1
M.	5/8 OD X 3/16 ID x 1/8 Koro Seal Gasket	2
N.	5/16 OD x 3/16 IDx 1/4 Tygon-Bushing	1
O.	Dielectric Electrode Typed :H-50, H-100, H-200	1
P.	1/4" Stainless Steel Washer	1
Q.	1/4" x 20 Hex nut SS	1
R.	Dielectric Electrode Typed L-100, L-200, L-300, L-400	1
S.	Air/oxygen inlet	1
T.	Mounting Bracket	2
U.	Ozone outlet	1
V.	PVC spacer (dome type, H-25 only)	1

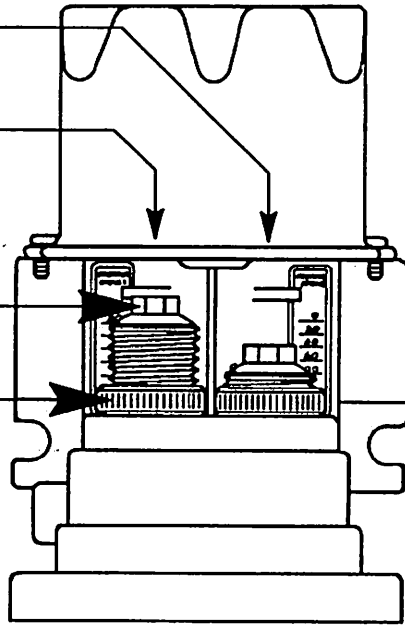
Enlarged Isometric View Showing
Adjusting Nut And Lock Ring

Right side, high signal
adjusting nut set at 80 psig

Left side, low signal
adjusting nut set at 20 psig

adjusting nut
(7/16" wrench)

lock ring
(tightened securely)



Front View Looking Directly
At Adjustable Deadband Switch
(Pressure Scales Shown)

CAUTION
Adjusting nut will turn
easily until it hits a stop.
DO NOT OVERTORQUE

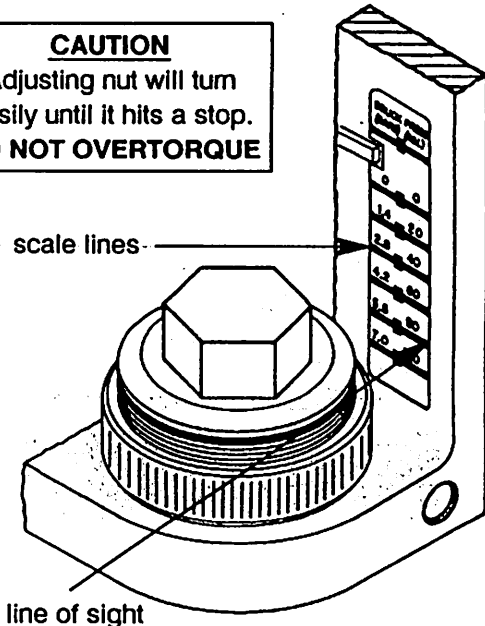
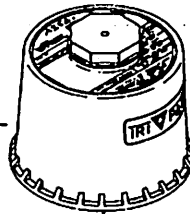


Figure 2. Adjustment (Signal Setting) of Adjustable Deadband Switch

Explosionproof
Switch Enclosure
Shown

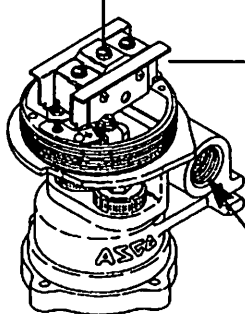
switch cover



IMPORTANT
The third digit in Catalog No.
on the switch unit and transducer
unit must be identical.
See example below.

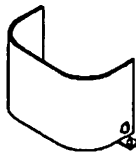
Torque switch cover to
135±10 in-lbs [15,3 ±1,1 Nm]

adjustable deadband
switch unit
example
Catalog No. SA □ 2D

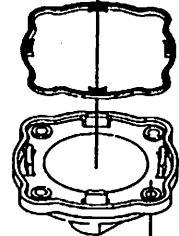


3/4" NPT for conduit
connection both ends

adjusting nut cover
(optional)



transducer gasket
(used on Watertight or
Explosionproof Construction only)



transducer unit
example
Catalog No. TE □ 0A42

Torque bolts(4) in a
crisscross manner to
80±10 in-lbs [9,0 ±1,1 Nm]

bolts (4)

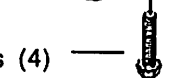


Figure 3. Switch Unit and Pressure Transducer Unit to be Assembled.