

PLASER

by **RoboVent**®

*Plaser 3 Series (PL-)
Cartridge Collectors*



Owner's Manual

**Installation, Operation
& Maintenance**

Revised 11-03-20



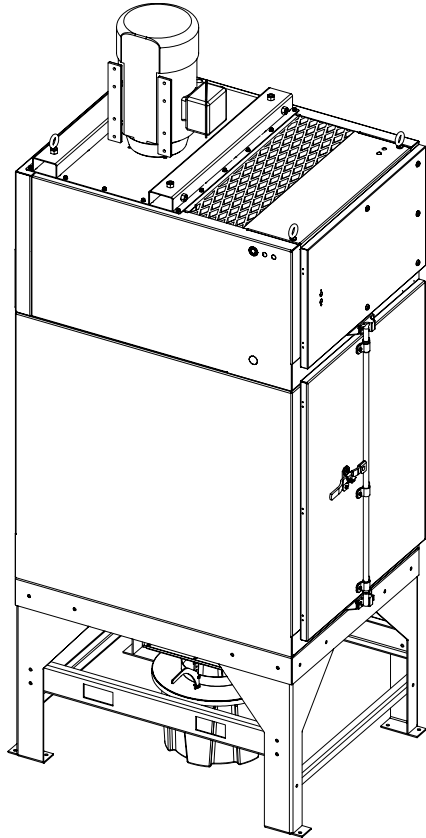
Owner's Manual

Installation, Operation & Maintenance

Plaser 3 Standard Models:

PL-3000-2
PL-4000-3
PL-5000-4
PL-8000-6
PL-10000-8
PL-13000-10
PL-16000-12
PL-21000-16
PL-26000-20
PL-32000-24
PL-39000-30

Note: Information also typically pertains to OEM specific model configurations.



Manufactured by:

RoboVent

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Congratulations!

Dear Customer,

Thank you for purchasing a Plaser 3 Series Collector. This manual will help you use the many features available to customize the unit to your specific needs.

When your Plaser 3 Series unit needs scheduled maintenance, keep in mind that RoboVent has specially trained staff in servicing our smoke, fume and particle collectors. We would be pleased to set up a preventative maintenance program or answer your questions and concerns.

At Plaser we are committed to making your facility a safe and healthy environment for your workers. Please take time to read this manual thoroughly before installing and operating the unit.



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Important Safety Instructions



Failure to follow all instructions may result in electric shock, bodily injury and/or destruction of the unit.



Use of controls, adjustments, or performance of procedures other than those specified herein, may result in electrical shock.

IMPORTANT SAFETY INSTRUCTIONS

1. Read all instructions thoroughly.
2. Heed all warnings.
3. Do not block intake or exhaust vents. Keep the exhaust vent free from debris and materials that could restrict airflow. Prolonged restriction could damage the motor and electrical components. Any blockage of the air flow will decrease efficiency of this unit.
4. Refer all service matters to qualified service personnel. Servicing is required when the unit is damaged in any way including the control panel, supply wiring or in the case of excessive filter loading.



5. **Risk of serious personal injury or death!**
Use extreme care to make sure you are never in a position where your body (or any item you are in contact with, such as a screwdriver or test instrument) can accidentally touch the blower wheel.



6. **Disconnect power before working on the motor or blower wheel. The motor or blower wheel should be disassembled only by a factory authorized technician.**



7. If welding stainless steel, special safety measures need to be followed when maintaining collector. Consult your Safety Director for further information and see **Appendix J: OSHA's Hexavalent Chromium Standards.**

Features of the Plaser 3 Series Collectors

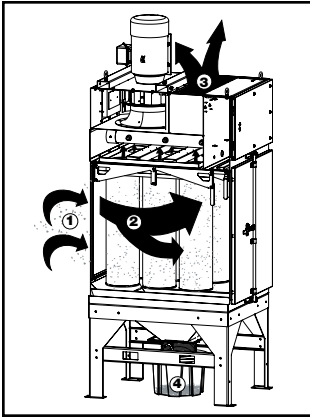


FIGURE 1

1. Filtration System

The Plaser 3 Series cartridge collectors utilize a horizontal airflow into vertical cartridge filters as shown in Figure 1, maximizing airflow near the top of the cartridge plenum. This design helps overcome re-entrainment of the dust back onto the filter cartridge after it has been removed by the Dynamic Pulse Filter Cleaning System. Air is brought in through the intake (1) and evenly distributed throughout the cartridge plenum (2). After passing through the Endurex Cartridge Filters, clean air is then returned to the plant through the exhaust vent (3). Formed dust cakes are pulsed off the high efficiency media and captured into the particulate containment below (4).

2. Vertical Filter Design

Vertically aligned filters allow the dust to shed off the filter and fall directly down into the containment system. The unique vertical design increases filter life by 30% to 40% over traditional horizontal filter placement.

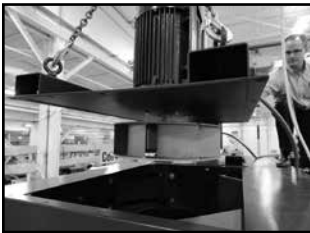


FIGURE 2

3. High Performance Blower Design

Each Plaser 3 Series Collector comes with a high output airfoil blower and direct drive motor. This highly efficient blower design and direct drive system maximizes the airflow (CFM) delivered by the motor power requirements. (see Figure 2).

4. Dynamic Pulse Filter Cleaning System

Plaser systems utilize the state-of-the-art Dynamic Pulse System, a very powerful self-cleaning system that operates with a computer synchronized pulse sequence for unmatched filter cleaning efficiency. The Dynamic Pulse can be programmed to best fit your specific applications.

5. Pulse Cleaning Cones and Nozzles

The Plaser 3 Series Collectors utilize a special cleaning cone and nozzle combination which optimizes the cleaning pulse by ensuring that the developed overpressure in the filter is even throughout the filter element. (see Figure 3).



FIGURE 3

Features of the Plaser 3 Series Collectors



FIGURE 4

6. Control Panel

The built-in Control Panel of the Plaser 3 Series contains all the electrical control devices, including the motor starter with thermal overload relay, on/off selector switch and service disconnect switch. Extra space is available for the optional E-Drive VFD and environmentally-friendly Fire Suppression System, Supprex-200. (see Figure 4).



FIGURE 5

8. e-Pad Touch Screen Controller (option)

The Plaser e-Pad Controller is a touch screen panel that allows control of all aspects of the system's function including the blower, filter differential pressure and Dynamic Pulse System. It provides constant monitoring with in-plant systems, tracks maintenance history, and includes a built-in diagnostic feature. (see Figure 5).



FIGURE 6

9. Sturdy 11 GA Reinforced Collector Housing Construction

This heavy-duty construction secures a lifetime of industrial use. Seams are robotic welded and sealed to assure there are no leaks or cracks that could contaminate the facility air system. Each unit is pre-tested for air leaks during construction and again before installation.



FIGURE 7

10. Large Capacity Dust Tray

Plaser 3 Series Collectors are also available with the Dust Tray option for limited height installation locations (see Figure 6). The Hopper and Short Drum are standard on Plaser collectors, to provide longer periods between particulate clean out, and longer filter life. Both the Dust Tray and the Hopper are designed to capture and store particulate pulsed off the filter cartridges and minimize "re-entrainment." (Re-entrainment is the term used for picking up dust that has already been removed from the filter and re-depositing it on the filter.)

Features of the Plaser 3 Series Collectors

**FIGURE 8**

11. SnapLock Front Load System

Plaser's SnapLock Front Load System uses a specially designed lift mechanism and a front load track that locks the cartridge filter in place with a single action lever. Plaser's SnapLock System allows filters to be loaded and unloaded in the fraction of time of conventional systems. (See Figure 7)

12. Acoustic Motor Plenum

High-density sound materials and Bass Trap Acoustics have been implemented as part of the blower compartment. The acoustically designed plenum greatly reduces motor and blower noise levels and decreases ambient noise into the facility.

**FIGURE 9**

13. Front Door Filter Access

Cartridge filters are easily accessible through an oversized front door. Filter replacement is made easy and requires less time and effort than traditional side loading systems. (see Figure 8).

14. SafeSensor Particulate Monitoring Device

The SafeSensor particulate monitoring device detects a leak past your filters. If a leak occurs, the system shuts the equipment down and sets off an alarm. The SafeSensor also monitors smoke, in case of a fire, and will automatically shut down the motor, blower and all electrical controls and will activate a high intensity horn strobe signal. (see Figure 9).

**FIGURE 10**

15. E-Drive Auto VFD (option)

The E-Drive system uses a sensor that constantly monitors the airflow. Using a VFD, it automatically adjusts the RPM of the motor to compensate for filter loading. This reduces energy peaks, resulting in 20%-30% energy savings, and extending filter life. The eDrive is key for a system that is quieter, can operate at maximum operating efficiency and saves you money. (see Figure 10).

Features of the Plaser 3 Series Collectors



FIGURE 11

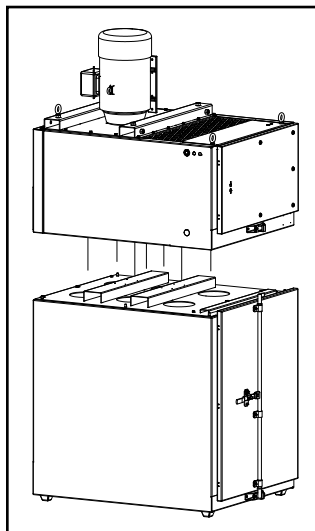


FIGURE 12

16. AutoSaver Auto On/Off (option)

The AutoSaver feature (if equipped) allows your Plaser 3 Series air filtration system to rest when not needed, saving energy dollars. The AutoSaver turns the system on when cutting, welding, or process operations start and turns it off after the specified duration of being idle.

17. Supprex-200 Fire Suppression System (option)

The Supprex-200 Fire Suppression System is engineered to our exacting high standards for safety and effectiveness. Supprex is a dual stage system activated by smoke and heat. If heat is detected, FM-200 gas is released to extinguish the fire. With the Supprex-200 System there is little or minimal clean-up after a fire, should one occur. (see Figure 11).

18. Built-In Fork Pockets for Simple and Safe Moving

Fork Pockets have been added to each Plaser 3 Series Collector for ease of installation. This function allows the collector to be quickly moved and re-installed quickly and safely. (see Figure 12).

Receiving & Inspection

Receiving

Plaser equipment is typically shipped on skids or in crates. The number of skids/ crates will vary, depending on the type, size and accessories ordered. These skids/ crates are too heavy to lift by hand, and will need to be unloaded by an industrial fork-truck or similar equipment.

Inspection

A visual inspection of your equipment should be performed before it is removed from the truck. Dents, scratches, and other damages should be noted on the shipping documents, and also photographed. The structural integrity of the housing can be adversely affected by large dents. Plaser should be immediately notified of any structural damage to your equipment. It is the purchaser's responsibility to file shortage reports and damage claims with the carrier and with your Plaser Representative. The carrier is responsible for any damage to the equipment while it is in transit unless specific arrangements are made otherwise.

Compare the number of items received against the carrier's bill of lading. Inspect all items for apparent damage. Immediately report any shortages or obvious damage to the carrier and to your local Plaser Representative, call the factory at 1-(888)-762-6836, or email: customer.service@plaservent.com.

When all skids are completely unpacked and uncrated, check all items received against the packing lists. Further inspect the unit and components for hidden damage. Again, report any shortage or damage to the carrier and to your local Plaser Representative.

The filter cartridges are typically shipped installed in your collector. Be sure to check them for alignment, as they may have shifted during transit. If they have shifted, it is possible that damage may have been done. Remove all filter cartridges and inspect thoroughly.

Note: Do not return any damaged components without first contacting your Plaser Representative to obtain a Returned Goods Authorization (RGA).

Small Parts

Carefully inspect all packing material before it is discarded, to be sure that no small parts have been missed.

General Description: Plaser 3 Series



FIGURE 13

The Plaser 3 Series Collectors are compact, self-contained units specifically designed for industrial dust collection systems. Every feature has been engineered for optimal performance in a high demand environment. Each self contained unit comes outfitted with an internal high-efficiency blower and a built-in electrical system. See Figure 13.

General Operation

Smoke, dust and sparks first enter the collector via the intake plenum where dust laden air is then drawn through the Premium efficiency Endurex Filters and returned into the facility as clean air. (See Figure 14)

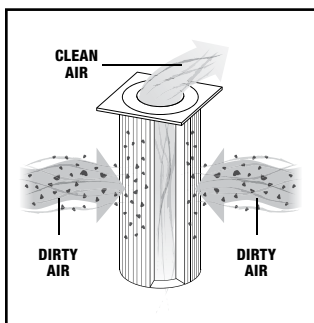


FIGURE 14

Particulate and by-product contamination is immediately stopped in its tracks by the Endurex media where it is retained until pulsed off by the Dynamic Pulse Filter Cleaning System. This reverse pulsing system uses a sophisticated electronic controller to send synchronized high pressure pulses into the core of each cartridge filter. Stubborn dust cakes are dislodged from the filter media to fall into the containment area where it is stored for removal.

The vertical filter design of the Plaser 3 Series enhances this cleaning process by allowing the dust to shed off the filter and fall directly into the containment bin rather than on another filter as in a horizontal configuration.

Clean, totally filtered air travels upward through a path of high and low frequency sound traps where motor and blower noise is reduced up to 70%. This makes the Plaser 3 Series the industry's safest and most environmentally-friendly dust collector.

SECTION 500

Installation



FIGURE 15

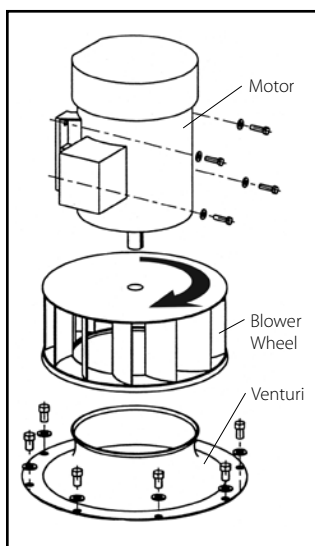


FIGURE 16

To ensure a long and problem free life for your Plaser 3 Series Collector, you must first make sure that all components of your system are installed properly. Use Section 500 of this manual as a checklist after installation to make sure your collector is operating at its maximum potential

Electrical Hook-Up

The Plaser 3 Series Collectors require a 3 phase, electrical feed should be connected to the top of the electrical disconnect inside the control panel as shown in Figure 15 (refer to the Specification Sheet for your exact model for specific voltage and amperage requirements). An electrical service knock-out access hole is provided on each Plaser 3 Series unit. Electrical connections should only be done by a licensed electrician and in accordance with NEC and all applicable local codes.

Electrical Panel Certification

Where specified, the complete enclosure of the Plaser unit is CSA certified. The control panel and all electrical mechanical components are UL certified and NEMA 4X rated. CSA and UL certification numbers are located on each component and or on the control panel door and the cartridge filter door. If further documentation is needed for CSA or UL certification, contact the Plaser Service Department at 800-470-3430.

Blower Rotation

IMPORTANT! Blower rotation of the unit is checked by jogging the motor. Rotation can be checked by either removing the blower access panel or by using a flashlight to look down into the motor cooling fan. Blower rotation should be **CLOCKWISE** when viewed from above the unit, also indicated by the rotation decal on the outside of the units' motor compartment. The blower will still draw air if the motor is running backward but the air draw will only be a fraction of what it should be! (Refer to Figure 16). A visual inspection will verify that the motor is turning clockwise when viewed from above the unit.

**FIGURE 17****Compressed Air Hook-Up**

IMPORTANT! Refer to the Specification Sheet for your exact model to determine the size of compressed air line, and capacity required for your collector. Ensure the air compressor has the capacity to produce the rated SCFM stated for your model. Your Plaser 3 Series unit needs a clean, dry, compressed air source. Many problems can be traced back to the presence of either oil or water in the compressed air stream. If contamination is present, both the filter cartridges and cleaning system will suffer.

The Plaser 3 Series come complete with an air regulator and accumulator as shown in Figure 17. In most cases the provided accumulator will trap a low volume of oil and water in your compressed air supply lines.

On the top or the rear of the unit is a $\frac{3}{4}$ " or 1" NPT pipe for connecting the provided air regulator. After running the Plaser 3 Series unit for 50 hours, unscrew the filter element from the accumulator housing and examine the element. If the element already shows excessive contamination, a larger accumulator will need to be installed. A dryer may also need to be placed in the line before the accumulator to avoid permanent damage to the solenoids, pulse valves and filter cartridges.

IMPORTANT! The provided regulator must be set to a maximum of 85 psi. Damage will result to the Dynamic Pulse Filter Cleaning System if this is exceeded.

**FIGURE 18****Accessories**

Your Plaser 3 Series collector is supplied with several accessories that are pre-wired and programmed into the eTech/ePad/ePadXE controller.

AutoSaver Auto On/Off (option)

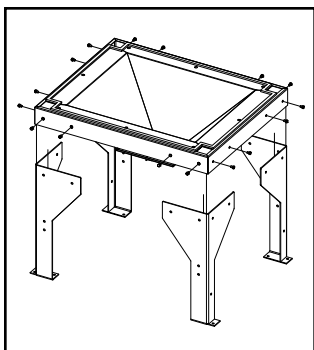
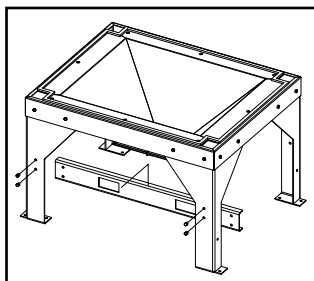
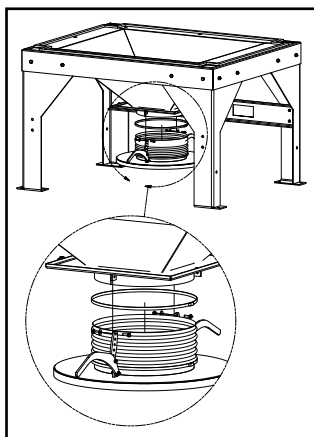
For the Automatic Operation Option, the supplied current sensor must be positioned around one of the power conductors to the power supply of the cutting or welding machine (or other application machine), and secured so as to avoid physical damage. This usually involves disconnecting the conductor, installing the current sensor, and then re-connecting the system. Alternately, a 24 Volt DC signal may be provided from the application equipment's controls.

Supprex-200 Fire Suppression System (option)

Your Plaser 3 Series equipment comes standard with the patented "Smoke Detection Shut-Down" system. This equipment will shut down the blower and ePad Controller but will not extinguish a fire. The optional Supprex-200 Fire Suppression System uses a FM-200 agent to suppress a fire which is released at the closest point to the heat. Extra controls shut off the exhaust plenum to stop airflow. This system is wired into the control panel when purchased with the equipment. (see Figure 18).

**FIGURE 19****E-Drive Auto VFD (option)**

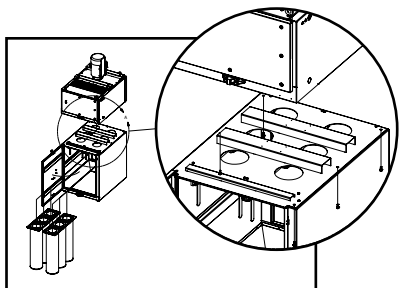
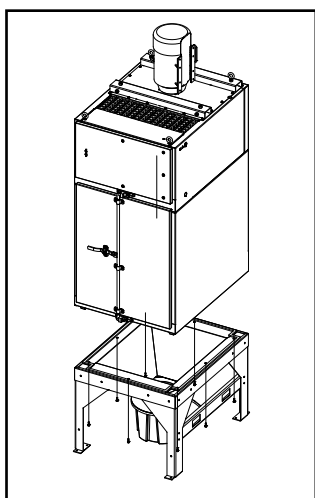
The E-Drive (VFD) Option is available on Plaser 3 Series Collectors. VFD's and sensors are pre-wired into the control panel and the 3 Series Collector. (see Figure 19).

**FIGURE 20****FIGURE 21****FIGURE 22**

Assembly of your Plaser 3 unit will depend on the exact model and options ordered. For example, what type of particulate containment is required (e.g. Dust Tray, Hopper Short Drum, Hopper Long Legs). Forklift or Overhead crane will be needed, ensure they have adequate lifting capacity, and that all safety procedures are followed in their operation.

General Assembly

1. Locate the unit sub-assemblies adjacent to the required installation position. Ensure you have adequate room and access for all items
2. If unit is on Hopper Short Drum or Hopper Long Legs;
 - A. Lift the hopper section, and bolt the legs underneath. (see Figure 20).
 - B. Bolt in the cross-brace beams between the legs. (see Figure 21).
 - C. Attach the Drum Lid and mechanism by bolting thru the linkage arm and the hopper attachment lug. Multiple holes are provided in the linkage arm to provide for compensation when installing on uneven surfaces. Dry fit the lid on top of the Drum to determine is the correct hole to use. Do not over tighten the nuts and bolts as this will restrict the quick release handles from operating freely. Then align the flexible pipe around the hopper outlet ring, and clamp around with the supplied hose clamp. (see Figure 22).
 - D. Anchor and secure the legs to the floor in the unit's correct installation location.
3. Install the Motor Cabinet onto the Filter Cabinet; (see Figure 23).
 - A. Open Filter Cabinet door, and remove all Cartridge Filters

**FIGURE 23****FIGURE 24****FIGURE 25**

B. Lower the Motor Cabinet onto the top of the Filter Cabinet. *Ensure the Filter Cabinet Door is open during this process.*

C. From inside the Filter Cabinet, install (6) 1/2" bolts (supplied) to connect the Motor Cabinet, engaging with the pre-installed weld nuts to make sure both cabinets are aligned exactly on all sides before tightening.

D. Reload the Cartridge Filters into the Filter Cabinet. Ensure filters are aligned correctly in the SnapLock rails, to give an air-tight seal when the gasket is compressed.

4. If unit is on Hopper Short Drum or Hopper Long Legs, lift the unit onto the Hopper, and align the sides so they are flush all around. Bolt through the underside of the Hopper lip, into the preinstalled weldnuts in the Filter Cabinets. (see Figure 24).
5. If the unit is on a Dust Tray pedestal, anchor and secure the footpads to the floor in the unit's correct installation location.
6. If the units control screen box (eTech, ePad or ePadXE) is on a extension whip, mount the box using self drilling screws at the required location for ready access to the screen.
7. If the unit is located outside, all joints must be sealed with Vulkem, including around the lifting eyes.
8. Connect the pressure regulator and air line to the threaded nipple on the top (or the rear in 2, 3 and 4 Filter units) of the Motor Cabinet
9. Connect the power supply to the connection terminals. (see Figure 25).

Note: For assembly of units with 24 filters and larger, refer to the supplementary instructions included with the unit.

Operation (ePad Controller)



FIGURE 26

Before operating your Plaser 3 Series Dust Collector, double check the following items:

1. Be sure all electrical connections are secure and wired properly.
2. Double check blower rotation. (see Figure 16).
3. Check the compressed air connection.

Plaser 3 Series collectors come complete with full electrical controls and automatic pulsing system. The entire contents of the control systems are installed inside the electrical enclosure.

The Electrical Control Panel inside the equipment cabinet contains the Service Disconnect, Motor Starters and Controller. With the Service Disconnect in the "ON" position press the "SYSTEM START" button on the touch screen (this may either be remote, or mounted on the unit) to energize the control system, then continue through the "MAN FAN" and "LIGHTS" and/or "START MODE" screens (if these options are applicable) to the "BLOWER CONTROL" to engage the Motor Starters and start the system blower.

AutoSaver

If your system is equipped with the AutoSaver Feature, a "START MODE SELECTOR" screen will appear during the above process (see Figure 23). Touch the selector switch image to toggle between HAND and AUTO. In the "AUTO" mode, the blower is cycled automatically when triggered by welder operation and automatically turns the unit off after approximately 3 minutes of inactivity. To adjust this duration, refer to **"Appendix B - ePad Instructions", System Settings, Remote Start Adjust.** The "HAND" position overrides this function and the blower operates continuously.

Operation (ePad Controller)

ePad Automatic Pulse Controller

Plaser 3 Series Collectors come equipped with the Plaser ePad controls, which includes automatic control of all pulse cleaning functions. The Controller constantly measures the pressure across the filter surface and provides a display in both kilopascals (kPa) and inches of Water (in. WC). This Pressure Differential value shows the pressure drop across the filters, helping to gauge filter life. Once the pressure across the filter has risen by a pre-set factor, the Dynamic Pulse Filter Cleaning System will begin to operate. (see **APPENDIX B**).

On-Line Cleaning vs Off-Line Cleaning

The On-Line Cleaning Cycle pulses the equipment while it is running by a pre-set time programmed into the controller. (see **APPENDIX B**). The on-line default setting is 90 seconds. Once the differential pressure between the clean and dirty sides of the filters has reached a pre-determined pressure, a signal will be sent to one of the pressure valves and compressed air will back-flush that line of cartridges. This helps keep the dust loose so that the off-line cleaning can remove the dust from the filter.

Off-line cleaning happens automatically every time the system is shut down. This is the most effective means of removing the dust from the filters. The duration and frequency of this cleaning cycle is programmed into the controller. (see **APPENDIX B**).

Andon Light

The andon light is located on the control panel door of the Fusion 3 collector. The andon light displays the following:

1. **Solid Green** – Motor is running
2. **Flashing Green** – Machine is on but motor is NOT running
3. **Flashing Orange** – Maintenance Alert on the ePad
4. **Flashing Red with Audible Alarm** – SafeSensor Tripped meaning either a fire or Particulate blow-by in the collector; or Estop is tripped.

IMPORTANT!

The off-line cleaning cycle is extremely important for extended filter life! Therefore, it is important that power to the ePad Controller is not disconnected via the main disconnect switch on the control panel. The unit should be powered on via the ePad touch screen. Turn off the main disconnect only when servicing the unit.

A record of this pressure differential should be recorded periodically and kept for future reference. During use of your Plaser 3 Series Collector the differential pressure will increase as the filters load up. (Cartridge filters should be replaced when the gauge reads approximately 2.7 kPa. to 3.4 kPa.) To change cartridges follow the procedure for **"Cartridge Filter Maintenance"**.

Note: 1 kPa is equivalent to approximately 4 inches of water gauge.

Standard Maintenance Procedure

Note: To be performed while there are no operations occurring

1. Record ΔP /Static pressure reading from the controller while the unit is operating
2. Turn off the system (Blower motor only!)
3. If the unit is fitted with a Spark Arrestance Plenum, remove and replace Spark Arrestance filters. (Metallic Baffle and metal mesh filter at the inlet area)
 - A. Clean the entire inlet plenum to include:
 - i. Spark deflector plate
 - ii. Spark arrestor filter (metallic filter) tracks and cover door
 - iii. Inlet Plenum Box (inside and outside)

Note: Dry dust and particulate can usually be vacuumed out; however, if it is high in oil content, it will tend to smear. If smearing occurs then a commercial degreaser can be used to assist in cleaning. The cleaning does not have to return the system to new condition, but should be void of pockets of particulate.

4. Replace all metallic metal mesh and baffle filters in the inlet areas inlets with clean ones.
5. Set the controller to Maintenance/Pulse mode for filter cleaning. Filters will be continuously pulsed to discharge captured particulate.

Note: The amount of cleaning is directly proportional to the time devoted. A minimum of 1/2 hour is necessary. There is no maximum time limit.

6. Set the controller to Automatic to stop the pulsing (**DO NOT** start the motor.)
7. Empty the dust tray or hopper drum and leave them out of the collector. Clean residual dust and particulate out of the hopper or dust tray base.
8. Replace the cleaned dust trays or drums.
9. Turn on the collector and record the new ΔP /Static Pressure.
10. Open the petcock valve on the solenoid accumulator and verify that there is no moisture in the compressed air stream.

IMPORTANT IMPORTANTE

**BAFFLE
REPLACEMENT
REPUESTO PARA
DEFLECTOR**

A 2' X 2' BAFFLE
CUP TO OUTSIDE
PART #FB-24242

2' X 2' BOQUILLA DEL
DEFLECTOR HACIA A FUERA
NUMERO #FB-24242

B 2' X 2' METAL MESH
PART #MM-24242

2' X 2' MALLA METALICA
NUMERO #MM-24242

ROBOVENT PRODUCT GROUP
1-866-ROBOVENT

11. Check for excessive motor/blower vibration.
12. Check overall system for any loose bolts or screws, and also door latches, hinge wear.
13. Verify that compressed air pressure is set to 80 PSI
14. Clean off any dirt or smudges on the exterior of the machine.
15. Clean up any fallen debris from the system service.
16. For welding, metal cutting or grinding operations, observe the process when possible and determine if sparks are getting near the inlet.

Notes:

- Any single spark has the potential to cause a fire. Observation is always the best way to determine if potential exists or if something has changed.
- If welding parameters change, (i.e. weld wire size, shielding gas mixture, new parts or supplier) then we should verify spark containment away from the inlets.



Welding stainless steel creates a hexavalent chromium (hex chrome) dust which is a carcinogen (causes cancer). Special care including wearing a respirator and wearing a Tyvek suit is necessary when performing maintenance like changing filters, emptying barrels, etc. **See Appendix I: OSHA's Hexavalent Chromium Standards** for further information.

Filter Change Maintenance Procedure

Note: To be performed while there is no operations occurring

1. Record ΔP /Static pressure reading from the controller while the unit is operating
2. Turn off the system (Blower motor only!)
3. Turn off the main power disconnect.
4. Open the dust collector filter door.
5. Empty the Dust Tray or Hopper Drums and replace.
6. Remove the Endurex (pleated media) Cartridge Filters.
7. Access the filter cabinet to clean the unit. The goal is to remove all pockets of built up particulate.

Note: Regular monitoring of the Dust Tray or Hopper Drum is necessary to verify that it is not overflowing.

8. Close and secure the filter door.
9. Turn on the main power disconnect.

Note: Anytime that the filter access door is open, the main power disconnect should be turned off. This is to prevent random solenoid firing of the compressed air through the cleaning mechanism.

10. Turn on the collector and record the new ΔP /Static Pressure.
11. Open the petcock valve on the solenoid accumulator and verify that there is not moisture in the compressed air stream.

Note: Any oil visible in the accumulator will be blown into the system and onto the filters causing premature filter failure. Water, though not preferred is less damaging and will evaporate over time. A lot of water may necessitate shutdown of the collector so as to not damage the paper filter pleats.

12. Check for excessive motor/blower vibration.
13. Check overall system for any loose bolts or screws, include door latches and hinge wear.
14. Verify that compressed air pressure is set to 80 PSI
15. Clean off any dirt or smudges on the exterior of the machine.
16. Clean up any fallen debris from the system service.
17. For welding or metal cutting or grinding operations, observe the process when possible and determine if sparks are getting near the inlet.

VFD Maintenance Procedure

Periodic Inspection of VFD

Check the following items during periodic maintenance:

- The motor should not be vibrating or making unusual noises.
- There should be no abnormal heat generation from the Drive or motor.
- The ambient temperature should be within the Drive specification (-10°C to 40°C (14°F to 104°F)).
- The output current value shown in parameter U1-03 should not be higher than the motor rated current for an extended period of time.
- The cooling fan in the Drive should be operating normally.

Always turn OFF the input power before beginning inspection. Confirm that the digital operator indicators on the front cover have all turned OFF, and then wait an additional five minutes before beginning the inspection. Be sure not to touch terminals immediately after the power has been turned off. Doing so can result in electric shock.

WARNING: Prior to removing any protective cover or wiring any part of the Drive, remove all power sources, including main input power and control circuit power. Wait a minimum of 5 minutes after power removal, before removing any cover. The charge lamp located within the Drive should be off prior to working inside. Even if the charge lamp is off, one must measure the AC input, output, and DC Bus potential to insure safe levels prior to resuming work. Failure to adhere to this warning may result in personal injury or death.

Table 8.1 Periodic Inspection With NO Power Applied		
ITEM	INSPECTION	CORRECTIVE ACTION
External terminals, mounting bolts, connectors, etc.	Are all screws and bolts tight?	Tighten loose screws and bolts firmly.
	Are connectors tight?	Reconnect the loose connectors.
Cooling fins	Are the fins dirty or dusty?	Clean off any dirt and dust with an air gun using clean and dry air at a pressure between 55-85 psi.
Control PCB Terminal PCB Power PCB Gate Drive PCBs	Is there any conductive dirt or oil mist on the PCBs?	Clean off any dirt and dust with an air gun using clean and dry air at a pressure between 55-85 psi. Replace the boards if they cannot be made clean.
Input Diodes IPMs Output Transistors	Is there any conductive dirt or oil mist on the modules or components?	Clean off any dirt and dust with an air gun using clean and dry air at a pressure between 55-85 psi.
DC bus capacitors	Are there any irregularities, such as discoloration or odor?	Replace the capacitors or Drive.

Apply power to the Drive and conduct the following inspection.

Table 8.2 Periodic Inspection With Power Applied		
ITEM	INSPECTION	CORRECTIVE ACTION
Cooling fan(s)	Is there any abnormal noise or vibration, or has the total operating time exceeded 20,000 hours. Check UI-40 for elapsed cooling fan operation time.	Replace Cooling Fan

VFD Maintenance Procedure (continued)

Preventative Maintenance of VFD

Table 8.3 Preventative Maintenance				
INSPECTION POINT	ITEM	CHECK POINTS	EVERY 3-6 MONTHS	YEARLY
General	Environment	Ambient Temperature Humidity Dust Harmful Gas Oil Mist	X X X X X	
	Equipment	Abnormal vibration or noise	X	
	AC Power Supply	Main circuit & control voltage	X	
AC Power Circuit & Devices	Conductors & Wire Connections	Loose lugs, screws & wires Hot spots on parts Corrosion Bent conductors Breakage, cracking or discoloration Check spacing		X X X X X X
	Transformers & Reactors	Discoloration or Noise	X	
	Terminal Blocks	Loose, damaged		X
	DC Bus Capacitors	Leakage Ruptures, broken, expansion Capacitance & insulation resistance		X X X
	Relays & Contactors	Noisy Contact discoloration		X X
	Soft Charge Resistors	Cracked Discoloration		X X
Control Circuits	Operation	Speed reference voltage/current I/O contact operation		X X
Cooling System	Cooling Fans/Fins & Heatsink	Abnormal fan noise Loose connections Free of accumulation	X X	X
Keypad/Display	Digital Operator	LEDs Monitor display values Key functionality Clean	X X	X X

If the Drive is used under the following conditions, it may be necessary to inspect more often:

- High Ambient temperatures, humidity or altitudes above 3,300 feet
- Frequent starting and stopping
- Fluctuations of the AC power supply or load
- Excessive vibration and/or shock loading
- Poor environment, including dust, metal particles, salt, sulfuric acid, chlorine

SECTION 900

Motor Greasing Guide



SECTION 900

Motor Greasing Guide

Your RoboVent unit will have one of four motor manufacturers installed: **TECO**, **Marathon**, **Weg**, or **Baldor**.

These motors are created with anti-friction, grease-lubricated bearings. Grease is essential to your motor bearings because it creates an oil film that counteracts the abrasive metal-to-metal contact that can occur between rotating elements. Follow RoboVent’s Motor Greasing Guidelines to properly lubricate your electric motor.

Manual Grease Gun

Heavy Duty Lever Grease Gun w/ 18"
Hose Ext & Coupler
Fastenal Part No. (SKU) 0425881



DELIVERY RATE = 1 OZ PER 28 PUMPS

Grease Conversion Chart for use with this grease gun

OUNCES (OZ)	GRAMS (G)	GREASE GUN PUMPS
0.1 oz	2.835 g	2.8 pumps
1 oz	28.35 g	28 pumps
2 oz	56.70 g	56 pumps
3 oz	85.05 g	84 pumps
4 oz	113.40 g	112 pumps
5 oz	141.75 g	140 pumps

NOTE: 1 Pump = 1 gram of grease

Teco Motor Greasing Guidelines

Lubrication Procedure

It is advisable to re-grease when the motor is running to allow the new grease to be evenly distributed inside the bearing. Before re-greasing, the inlet fitting should be thoroughly cleaned to prevent any accumulated dirt from being carried into the bearing with the new grease. The outlet of grease drainage should be opened to allow the proper venting of old grease. Use a grease gun to pump grease through grease nipple into the bearings. After re-greasing, operate the motor for 10-30 minutes to allow any excess grease to vent out.

Approved Greases

- All motors with ZZ bearings will have SHELL Alvania R3 (lithium base grease).
- All motors with open bearings will have Polyrex EM (polyurea base grease).
- Certain T-frame models will utilize special grease and will be noted on the lubrication nameplate.

Relubrication Time Interval & Amounts

*Fill new grease until it overflows and the old grease is entirely replaced.

Relubrication Time Interval

BEARING SIZE	MOTOR HP	GREASE AMOUNT IN GRAMS	1800 RPM – HOURLY CHANGE INTERVAL	3600 RPM – HOURLY CHANGE INTERVAL
All motors listed are ODP				
DE & NDE: 6306ZZ	5	30 grams	3000 hours	2000 hours
DE & NDE: 6306ZZ	7.5	30 grams	3000 hours	2000 hours
DE: 6308ZZ	10	30 grams	3000 hours	2000 hours
DE: 6310ZZ	20	40 grams	3000 hours	2000 hours
DE: 6311ZZ & DE: 6212C3	30	40 grams	3000 hours	2000 hours
DE & NDE: 6213 & DE: 6212C3	40	50 grams	3000 hours	2000 hours
DE & NDE: 6213 & DE & NDE: 6213C3	50	50 grams	3000 hours	1000 hours
DE: 6314, NDE: 6213, DE: 6313C3 & NDE: 6213C3	75	80 grams	3000 hours	1000 hours
DE & NDE: 6317, DE: 6313C3 & NDE: 6213C3	100	120 grams	2000 hours	1000 hours
DE & NDE: 6317 & DE & NDE: 6313C3	125	120 grams	2000 hours	1000 hours

Marathon Motor Greasing Guidelines

Lubrication Procedure

1. Stop motor. Disconnect and lock out of service.
2. Remove contaminants from grease inlet area.
3. Remove filler and drain plugs.
4. Check filler and drain holes for blockage and clean as necessary.
5. Add proper type of amount of grease. See the relubrication amounts table for volume of grease required.
6. Wipe off excess grease and replace filler and drain plugs.
7. Motor is ready for operation.

Approved Greases

- Chevron SRI #2
- Rykon Premium #2
- Exxon Polyrex EM
- Texaco Polystar RB

Service Types

- **Seasonal Service:** The motor remains idle for a period of 6 months or more.
- **Standard Service:** Up to 16 hours of operation per day, indoors, 100° F max ambient temp.
- **Severe Service:** Greater than 16 hours of operation per day. Continuous operation under high ambient temp (100 to 150° F), dirty moist locations, high vibration, heavy shock loading or where shaft extension end is hot.

SECTION 900

Motor Greasing Guide

Relubrication Time Interval

SERVICE CONDITIONS	NEMA FRAME SIZE (IN RPMs)					
	140-180		210-360		400-510	
	1800 RPM OR LESS	OVER 1800 RPM	1800 RPM OR LESS	OVER 1800 RPM	1800 RPM OR LESS	OVER 1800 RPM
Standard	3 yrs	6 months	2 yrs	6 months	1 year	3 months
Severe	1 yr	3 months	1 yr	3 months	6 months	1 month
Seasonal	The motor remains idle for a period of 6 months or more					

Relubrication Amounts

NEMA FRAME SIZE	MOTOR HP	VOLUME OF GREASE
140	5 HP	4 grams
180	7.5 HP	8 grams
210	10 HP	12 grams
250	20 HP	16 grams
280	30 HP	19.5 grams
320	40 HP-50 HP	23.5 grams
360	60 HP-75 HP	27.5 grams
400	100 HP	34 grams
440	125 HP	42.5 grams

Weg Motor Greasing Guidelines

Lubrication Procedure

Machines without Grease Nipples

Motors up to frame size 215T are normally fitted without grease fittings. In these cases the regreasing shall be done during preventive maintenance service paying attention to the following aspects:

1. Take motor apart carefully.
2. Take all the grease out.
3. Wash the bearing with kerosene or diesel.
4. Dry the bearings
5. Regrease the bearing immediately.

Motors Fitted with Grease Fitting

It is strongly recommended to grease the machine while running. This allows the grease renewal in the bearing housing. When this is not possible due to rotating parts by the grease device (pulleys, bushing, etc.) that offer some risk to physical integrity of the operator, proceed as follows:

1. Clean the area near the grease nipple.
2. Put approximately half of the total grease and run the motor for 1 minute at full speed.
3. Then turn off the motor and pump in the rest of the grease.

Note: The injection of all the grease with the motor in standstill can make the grease penetrate into the motor, through the bearing housing inner seal.

Approved Grease

- Mobile Polyrex EM Grease

Special Note

The table below is specifically intended for relubrication with MOBIL Polyrex EM grease and bearing absolute operating temperature of:

- 70°C (158°F) for 254/6T to 324/6T frame size motors
- 85°C (185°F) for 364/5T to 586/7T frame size motors
- For every 15°C (59°F) above these limits, relubrication intervals must be reduced by half.
- Shielded bearing (ZZ) are lubricated for bearing life as long as they operate under conditions and temperature of 70°C (158°F).

*****When motors are used on the vertical position, their relubrication interval is reduced by half if compared to horizontal position motors.*****

On applications with high or low temperatures, speed variation etc., the type of grease and relubrication intervals is given on an additional nameplate attached to the motor.

Motor Greasing Guide

Relubrication Time Interval & Amount of Grease

FRAM SIZE	MOTOR HP	GREASE AMOUNT IN GRAMS	3600 RPM	1800 RPM
254 / 6T	20 HP	13 grams	15700 hours	20000 hours
284 / 6T	30 HP	18 grams	11500 hours	20000 hours
324 / 6T	40 HP	21 grams	9800 hours	20000 hours
364 / 5T	60 HP	27 grams	3600 hours	9700 hours
404 / 5T	100 HP	27 grams	3600 hours	9700 hours
444 / 5TS	125 HP	27 grams	3600 hours	9700 hours

**RELUBRICATION
INTERVALS IN HOURS**

324 / 5T	40 HP	21 grams	9800 hours	20000 hours
364 / 5T	60 HP	27 grams	4800 hours	9700 hours
404 / 5T	100 HP	34 grams	3000 hours	6000 hours
444 / 5T	125 HP	45 grams	2300 hours	4700 hours

Motor Greasing Guide

Baldor Motor Greasing Guidelines

Lubrication Procedure

*****Lock off and tag out power at the disconnect before servicing*****

***** Motor should be warm prior to greasing*****

1. Locate the grease inlet, clean the area, replace the pipe plug with a grease fitting.
2. Remove grease drain plug.
3. Add recommended amount of grease. Stop when new grease appears at shaft hole in the endplate or grease outlet plug.
4. Replace grease inlet plug and run the motor for 15 minutes.
5. Replace the grease drain plug.

Correct Grease Gun Procedures

1. Use hand-operated grease gun, not a pneumatic grease gun. Pump grease slowly, taking 10 to 12 seconds to complete each stroke.
2. Apply quantity of grease called for. Over-lubrication can be as damaging as under-lubrication.
3. Do not over-lubricate motors. Over-lubrication of a motor can seriously damage it by forcing grease into motor windings. Over-lubrication of the extract motor can force grease into the centrifugal switch causing it to malfunction.

Approved Grease

- Shell Dolium R (factory installed)
- Chevron SRI (standard service conditions)
- Darmex 707 (high temp conditions)
- Arrowsell 7 (low temp conditions)

Motor Greasing Guide

Service Types

SEVERITY OF SERVICE	HOURS OF OPERATION PER DAY	MAX AMBIENT TEMP	ATMOSPHERIC CONTAMINATION	INTERVAL MULTIPLIER
Standard	8	104 F (40 C)	Clean, little corrosion	1
Severe	16 +	122 F (50 C)	Moderate dirt, corrosion	0.5
Extreme	16 +	>122F (>50 C) (NOTE 1)	Severe dirt, abrasive dust, corrosion	0.1
Low Temp		-22 F (-30 C) (NOTE 2)		1

Note 1: Use high temp grease

Note 2: Use low temp grease

Relubrication Time Interval

NEMA (IEC) FRAME SIZE	MOTOR HP	3600 RPM	1800 RPM	1200 RPM	900 RPM
Up to 125 (132)	5 HP	5500 hours	12000 hours	18000 hours	22000 hours
254 to 286 (160-180)	25 HP-30 HP	3600 hours	9500 hours	15000 hours	18000 hours
324 to 365 (200-225)	40 HP-50 HP	2200 hours	7400 hours	12000 hours	15000 hours
404 to 5000 (280-315)	100 HP-125 HP	2200 hours	3500 hours	7400 hours	10500 hours

Note: For vertically mounted motors and roller bearings, divide the relubrication interval by 2.

Relubrication Amounts

NEMA (IEC) FRAME SIZE	MOTOR HP	LARGEST BEARING IN SIZE CATEGORY	OD D MM	WIDTH B MM	VOLUME OF GREASE
Up to 215 (132)	5 HP-15 HP	6307	80	21	4.5 grams
254 to 286 (160 - 180)	25 HP-30 HP	6311	120	29	9 grams
324 to 365 (200 - 225)	40 HP	6313	140	33	12 grams
404 to 5000 (280 - 315)	100 HP-125 HP	NU322	240	50	31.5 grams

Troubleshooting

Plaser unit is making excessive noise. Check the following:

1. Check for correct blower rotation, (see “Blower Rotation.”)
2. Make sure the blower wheel is not hitting the venturi.
3. Check that all venturi bolts are securely tightened.
4. Make sure motor bearings are good. (Amperage rating will be higher than normal.)
5. If the noise is an electrical hum in the control panel, it could be a defective motor starter relay.
6. Blower wheel could be out of balance. If the blower wheel has gone out of balance, there will be excessive vibration. In this case, please contact the Plaser Technical Department at 1-888-762-6836.

Dynamic Pulse Filter Cleaning System not operating. Check the following:

1. Verify that the airline is connected to the air tank and that there are no pinched or clogged airlines.
2. Check air tank pressure. The PowerFlex works best when pressurized at 80 PSI.
3. Check settings of ePad Controller. See **Appendix B**.
4. Check diaphragm on solenoid valve. If optimized pressure is supplied to the air tank and the timers are operational then a problem may exist with the solenoid diaphragm. See **Appendix K** and order a new diaphragm kit from Plaser Service Department.

Little or no suction at intake. Check the following:

1. Check motor rotation. When the unit is powered down note the rotation of the motor shaft. Motor rotation should be clockwise when viewed from above unit.
2. Cartridge filters are loaded. Check the ePad Controller reading. Any reading of 3.00 kPa or greater signals that the baffles and/or cartridge filters could be loaded. Initiate a manual cleaning cycle (see “Appendix B”) before replacing cartridges.

Cartridge filters load up but no dust in the dust tray. Check the following:

1. Check that the Dynamic Pulse Filter Cleaning System is working properly.
2. Check for oil or moisture on the filter media. If oil or moisture exists in the air supply it will transfer to the cartridge.
3. In some cases very high oil content is present on the surface of the steel stock, and the cutting process may cause the oil to vaporize. This will cause the cartridge filters to load up prematurely. In this situation the best solution is to remove most of the oil from the steel before it is processed. Call the Plaser Service Department at 1-888-762-6836 for more information.

ePad Controller display reads "0" or has a consistently low reading on Filter Condition Graph.

1. Check that the clear tubing from the Controller has not come loose from either of the barbed ends on the pressure transducer.
2. Check for a pinched line in the clear plastic tubing from the Controller.

ePad Controller consistently displays a high reading.

1. Check for a pinched line in the clear plastic tubing from the Controller.
2. Filters are loaded and need changing.

APPENDIX A

RoboVent eTell App & HMI - Instruction Manual



eTell App Operator Instructions

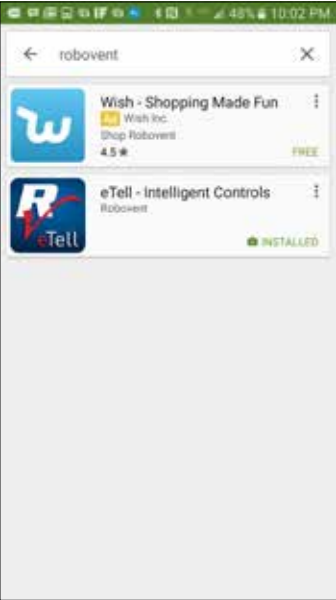


FIGURE A1

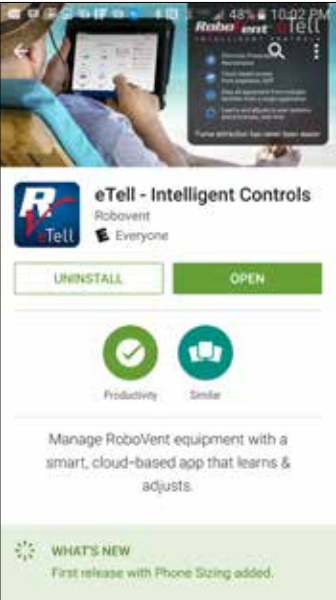


FIGURE A2

Downloading App

1. Download the app from the Google Play Store onto your phone or tablet. Search for "RoboVent eTell" or "RoboVent" when looking for the app (see Figure A1 & A2).

eTell App Operator Instructions

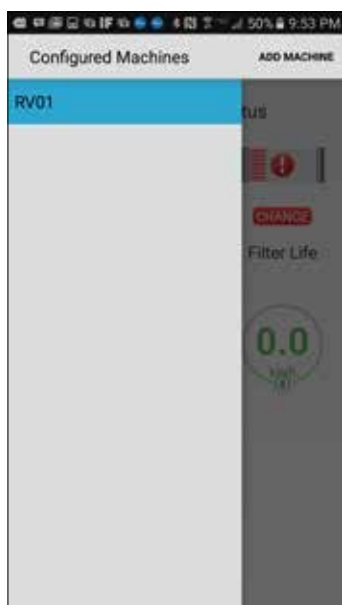


FIGURE A3

Adding a Collector

1. Once the app has been downloaded and opened, a message indicating you have no machines setup will appear in the center of your screen.
2. Swipe or Pull from the left edge to open the machine setup window (see Figure A3).
3. Tap the "Add Machine" to bring up the dialog box (see Figure A4).
4. For Display Name **A** enter a unique name for your machine that will help you remember it.
5. For IP address **B**, enter 192.168.2.1xx using the last 2 digits of the Serial # in place of the "xx". The Serial Number Tag is located on the control panel door or access panel.
6. Press save to keep this machine profile
7. When the RoboVent is powered search and connect to the eTell WiFi network. Password for the eTell Network is "robovent".
8. Once Connected to the network open the configured machines menu and tap the desired machine in the menu. The RoboVent will connect and read the information from the machine.

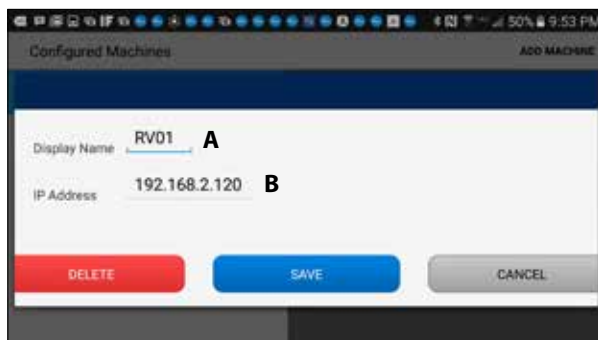


FIGURE A4

eTell App Operator Instructions

**FIGURE A5**

eTell Main Screen

1. This is the primary screen for the eTell App (see Figure A5). It will be the screen that you refer to for the majority of your operations.

A System is turned on/Off from the slide bar.

B Blower is turned on/Off from the second slide bar.

C Menu is located in the top right corner next to the help button.

D System Alerts show any problems that are detected by the RoboVent with an Icon.

APPENDIX A

eTell App Operator Instructions



FIGURE A6



FIGURE A7

eTell Machine Settings

1. The eTell Machine Settings are accessed through the Menu Tab (see Figure A6). Each setting is configurable and set at the factory.

RoboVent only recommend that 2 settings be changed: "Asset#" and "PLC Time Sync". PLC Time Sync simply allows the PLC time to sync with the current time on your phone/tablet.

Problems and errors in readings can occur if settings deviate from the factory installed settings.

eTell Time Clock Menu

1. The eTell PLC Time Clock can be setup from the Time Clock Menu (see Figure A7).

Each day can have a number of on or off events to match changing schedules.

- A** A 0:00 setting will deactivate that individual operation.
- B** Clear will set the line to 0:00.
- C** All settings are in 24hr format.

eTell App Operator Instructions

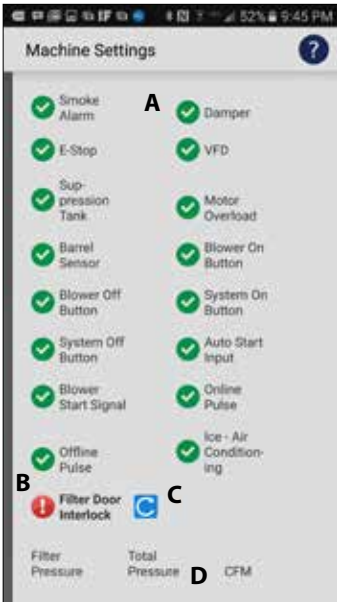


FIGURE A8

RoboVent eTell Diagnostic

1. Each of the collector's functions/options is monitored and displayed on the Diagnostic screen (see Figure A8).

A In a normal state with the machine off in a ready to run situation all boxes will be green.

B If an operation is functioning or active then a yellow alarm triangle or a red exclamation point will show up along with a blue reset button.

C The Blue reset button is provided to allow an error to be reset to try to clear the alarm if an error has occurred . If the Alarm is active the indicator will continue to show.

D CFM, Filter Pressure and Total pressure are provided for any diagnosis involving these measurements.

Alarms will be shown as in the examples shown in Figures A9 and A10. Immediate action needs to be taken when an alarm is active.

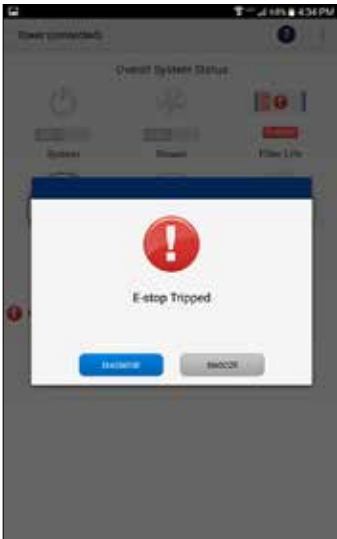


FIGURE A9

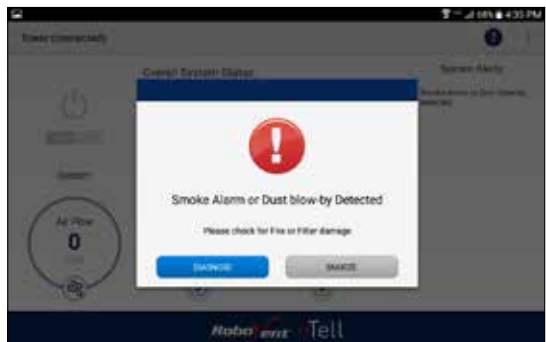


FIGURE A10

eTell HMI Operator Instructions



FIGURE A11

eTell HMI Main Screen

1. This is the primary screen for the eTell HMI (see Figure A11). As in the App it will be the screen that you refer to for the majority of your operations.
 - A System On/Off:** System is turned On/Off from the slide bar
 - B Blower On/Off:** Blower is turned on/Off from the second slide bar
 - C Filter Life Display:** Displays filter status and estimated number of days till replacement
 - D** Menu is located in the top right corner next to the help button
 - E** System Alerts show any problems that are detected by the RoboVent with an icon
 - F** Machine name—Set in "Machine Settings"
 - G** Serial #

eTell HMI Operator Instructions



FIGURE A12

1. This Pop-Up box (see Figure A12) allows you to access further functions to give you greater insight into the functions and operation of the RoboVent.

- A** Menu escape
- B** Settings Login (see Figure A13)
- C** Diagnostics Page link
- D** Factory Settings Page Link

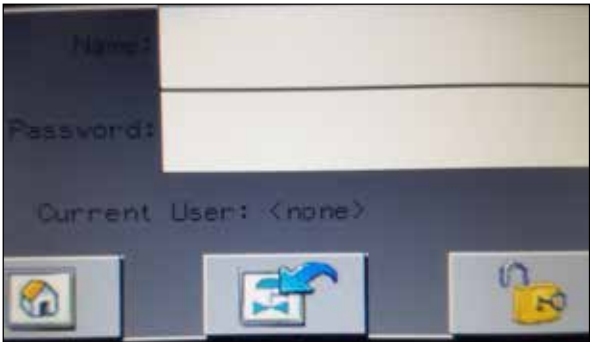


FIGURE A13

APPENDIX A

eTell HMI Operator Instructions

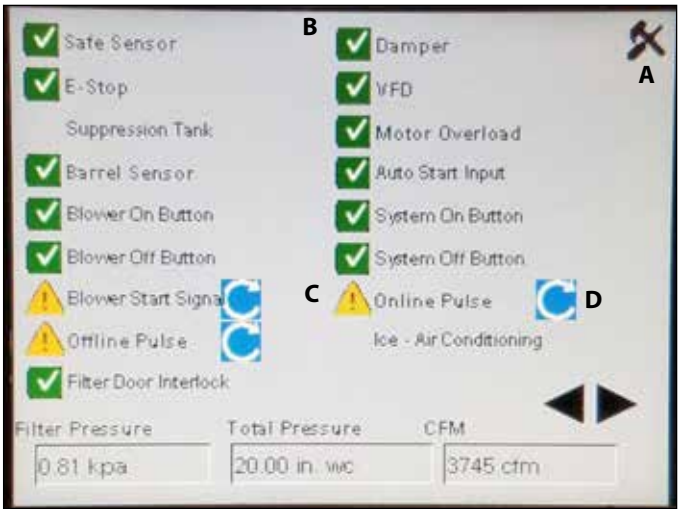


FIGURE A14

Diagnostics Screen (Figure A14)

- A** Next Diagnostic Page Button
- B** Green check—Function is available and normal
- C** Yellow Triangle—Function is active or needs attention
 - Red Exclamation—Alarm
- D** Blue Circle—Reset Button. Will attempt to reset function if needed or operate function
- E** PLC Inputs—Wires / Circuit functioning
- F** Previous Screen / Home Page
- G** PLC Functions Status



eTell HMI Operator Instructions

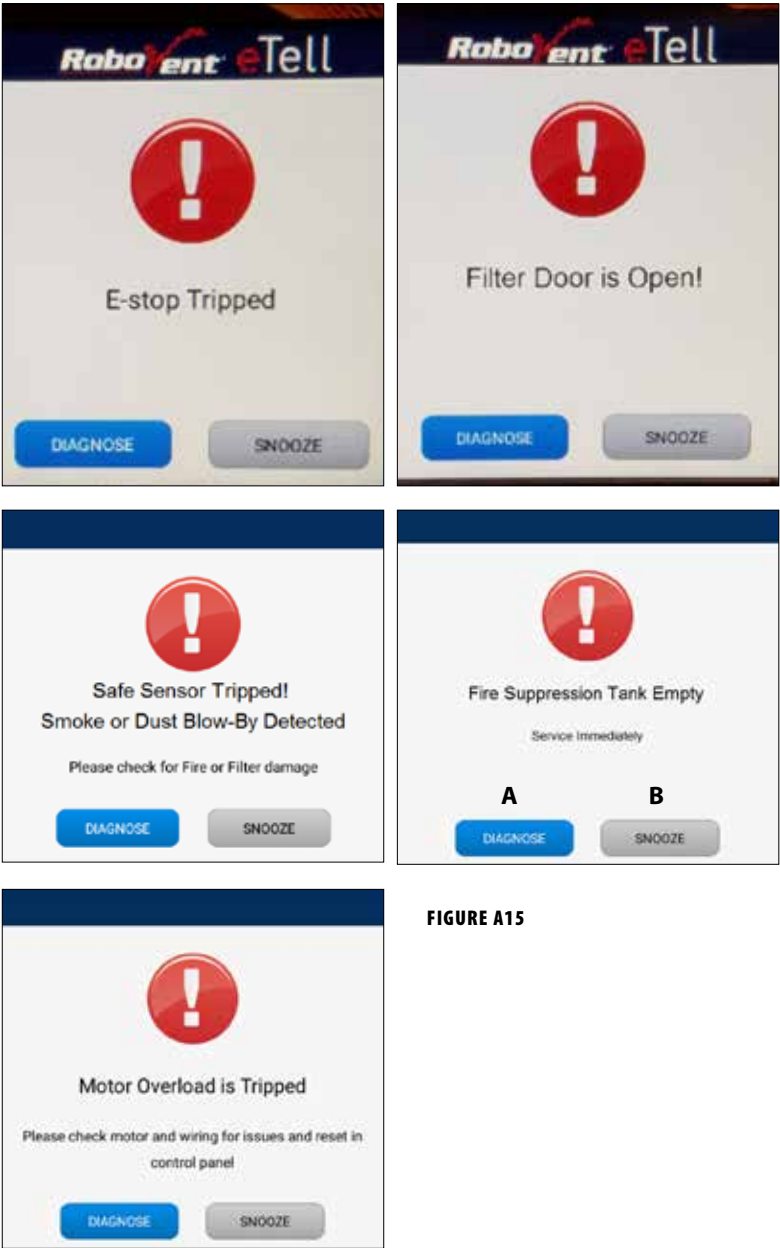


FIGURE A15

Alarm Screens (see Figure A15)

1. Alarms will be shown as in the examples. Immediate action needs to be taken when an alarm is active.
2. The "Diagnose" and "Snooze" buttons help identify and correct any problems.

A "Diagnose" will take you to the Diagnostic page

B "Snooze" will simply take you to the Home Screen to try again.



Alarm Active Example

eTell HMI Operator Instructions



FIGURE A16

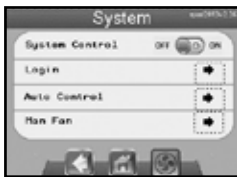
HMI Wiring & Connection (Figure A16)

- A** One Leg of the power must run through the Current Transducer
- B** This provides the measurements needed to calculate the electricity usage and the savings.
- C** The Ethernet cable must be plugged into the “LAN” port. This is important as the “POE” port has 24vdc power and can damage electronics. The Ethernet Cable needs to be routed from the “LAN” port to the Ethernet Switch to allow the



APPENDIX B

ePad Electronic Programmable Controller - Instruction Manual



System Control Page



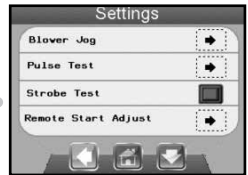
Blower Control Page



Pulsing Control Page



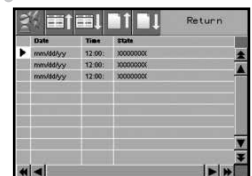
Unit Hours Page



System Settings Page



Service Message Page



Alarm Log Page

ePad Operator Instructions



System Control Page

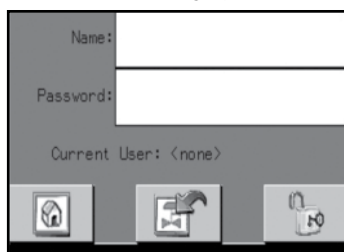


System Control

Enables/Disables the system for blower control. "Off" is under security. A login is required to turn unit off.

Login

Allows customers to login with their provided User Name and Password to change parameters.



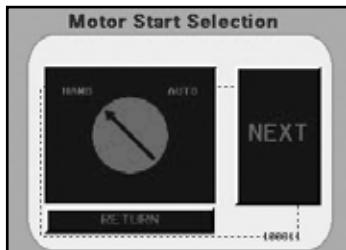
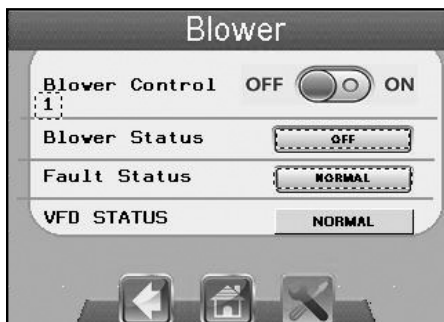
Auto Control

Enables RoboVent unit to be turned on or off from a connected machine.





Blower Control Page



Blower Control

Enables/Disables the blower to run the collector.

Blower Status

Message box which shows the current status of the blower.

Fault Status

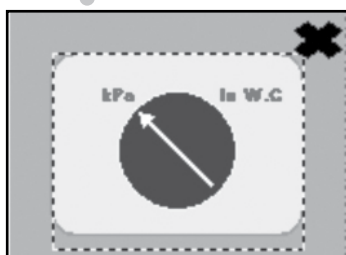
Message box which shows the current condition for the Motor overload.

VFD Status

Message box which shows the current condition of the Variable Frequency Drive (VFD). Also allows user to reset when there is a fault.



Pulsing Control Page



Maint. Pulse Select

Allows User to switch from automatic pulsing and maintenance pulse down mode.

Auto Online Pulse

Message box which shows the current status of the Auto Online Pulse Cycle (On/Off).

Auto Offline Pulse

Message box which shows the current status of the Auto Offline Pulse Cycle (On/Off).

Filter Pressure

Message box which shows the current status of Filter Pressure in the collector.

*Use the Arrow button to change readout from kPa in W.C.



Unit Hours Page



Total Machine Hours

Display showing the accumulated machine hours.

Hours Since Service

Display showing the accumulated machine hours since service has been conducted on the collector.

Service Hours Reset

Service Hours reset button. When pushed resets the Service Hours Meter to zero.



**Service
Messages
Page**



Filter Service Message

Informs the operator that the filters need maintenance.

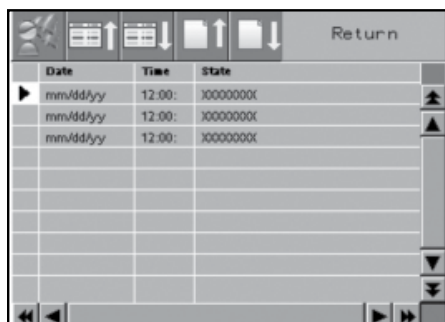
Suppression Tank Message

Informs the operator that the Suppression Tank needs to be serviced.

Collection Drum Message

For optional barrel sensor, informs the operator that the collection drum is full and needs to be emptied.





Acknowledge all current alarms that are active.

Allows for scrolling up and down by alarm and page.

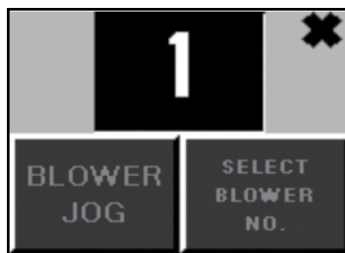
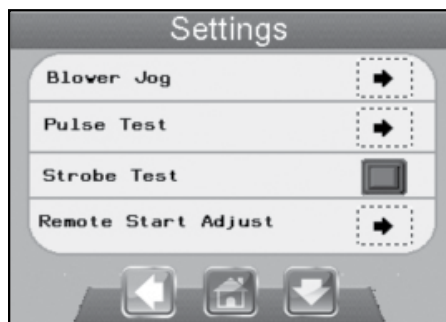
Date: Shows current month, day and year.

Time: Shows time when alarm was activated.

State: Shows the current state of the alarm (active, deactivate and acknowledged).

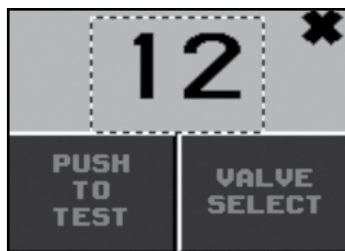


System Settings Page



Blower Jog

Momentary contact to test blower rotation, etc.



Pulse Test

Momentary contact that energizes pulse valve. Helpful for diagnostics.

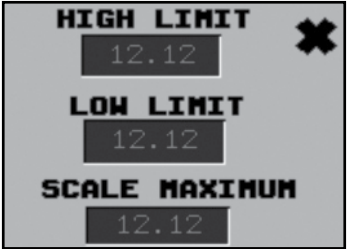


Shut Down Delay

Amount of Time (in minutes) equipment continues to run after the remote start signal ends.



**System
Settings
Page**



Bar Graph Control

High Limit: Controls the position of the top pointer.

Low Limit: Controls the position of the lower pointer

Scale Maximum: Sets the overall range of the display. Usually set at 4.00.



System Settings Page



Pulse Control Settings

There are (3) different Pulse Modes. Online (while running), Offline (after shutdown) and maintenance (at select times to maximize filter life).

Online: Filters are pulsed while unit is running.

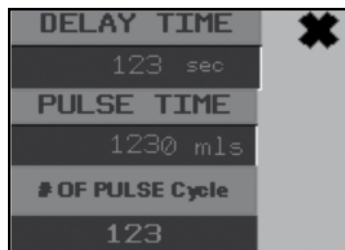
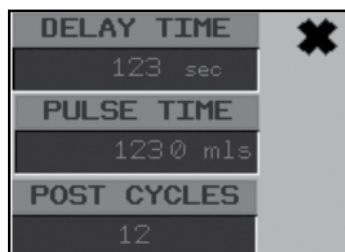
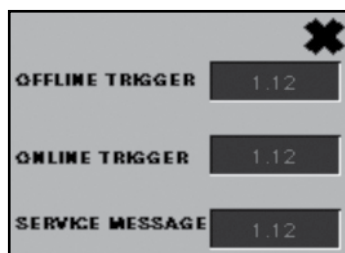
Offline: Filters are pulsing after the blower(s) are shut down

Maintenance: Filters are pulsed for an extended period, for maximum cleaning.

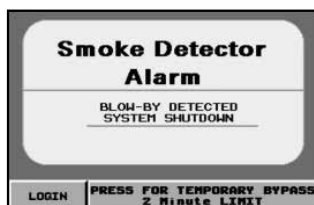
Delay Time: Amount of time (in seconds) between pulses.

Pulsing Time: Amount of time (in milliseconds) that pulse valve is open. Usually set at 200 msec. (Note: The right hand zero is fixed, so enter 200 for 200).

Post Cycles: Number of times each filter bank is pulsed after blower shutdown.



Warning and Alert Messages



Alarm Screen- Blow-By Detected

This feature is very important. It detects both when filters are 'leaking' as well as if there is smoke present.

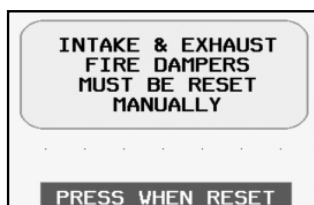
Temporary Bypass: Provides for unit operation, Bypasses detector for two minutes.



Alarm Screen- Optional Equipment

Indicates the fire suppression tank is low or empty. Unit will operate without tank being full but it is not advised.

Proceed Without Servicing: When proceed without servicing button is pressed, screen is switched to screen #2.



Alarm Screen- Optional equipment

Indicates the fire dampers have been deployed.

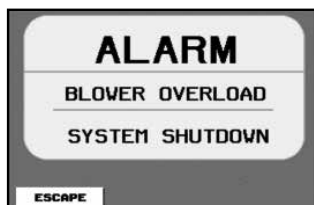
Unit will NOT operate properly until dampers are reset.

Only press **RESET** button when dampers have been reset.



Alarm Screen- Emergency Stop Tripped

Indicates tripping of an E-stop. Unit controls are completely shutdown.

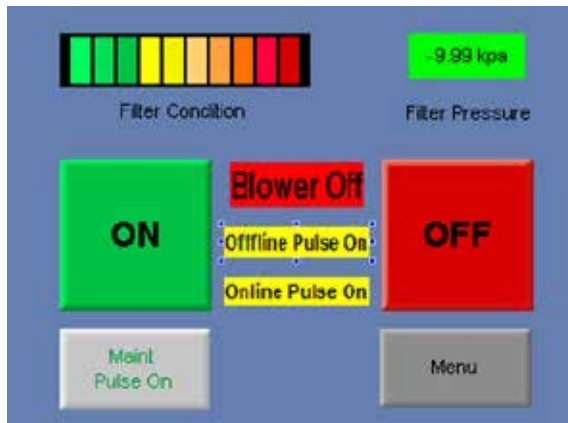


Alarm Screen- Blower Overload

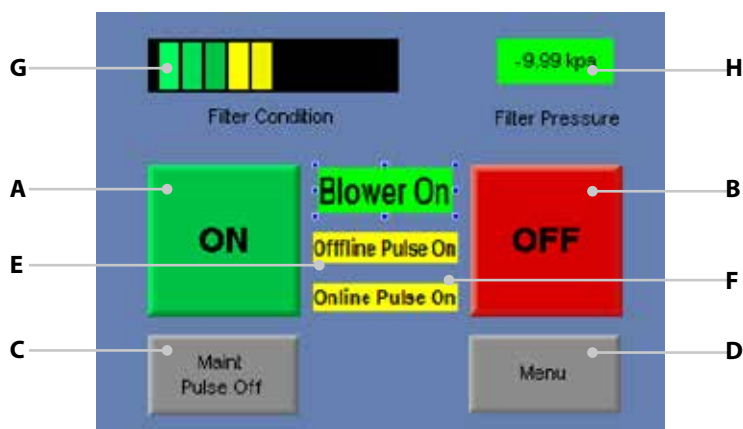
Electrical power overload Escape; transfers to screen #2.

APPENDIX C

eTech2 Electronic Programmable Controller - Instruction Manual



eTech2 Operator Instructions



Control Button Features: (Home Screen)

- A** Motor On Button: Press to start Motor and Blower Operation. Screen will read **"Blower On"** highlighted in green.
- B** Motor Off Button: Press to stop Motor and Blower Operation. Screen will read **"Blower Off"** highlighted in red.
- C** Maint Pulse Off: Press to start Maintenance Pulsing. Text will change to green and read **"Maint Pulse On"** to signal maintenance pulsing is on.
- D** Menu: Press to Open the Pulse and General Settings for your Unit.

Screen Display Features:

- E** Offline Pulse On: Signals that Offline pulsing is currently running. This message will not show if offline pulsing is not currently active.
- F** Online Pulse On: Signals that online pulsing is currently running. This message will not show if online pulsing is not currently active.
- G** Filter Condition Graph: Signals the current condition of the filters on a color scale; Green indicating filters are in good condition and red indicating that filters are either heavily loaded or in need of replacement.
- H** Filter Pressure: Indicates the current KPA of the filters

APPENDIX C

eTech2 Operator Instructions

Settings		Current
Pulse Duration - S.mm	9.99	99.99
Pulse Delay	99.99	99.99
Offline Pulsing Cycles	-99	-99
Maintenance Pulse Time	99.99	99.99
Online Threshold	9.99 kpa	
Offline Threshold	9.99 kpa	
Number of valves	9	
		

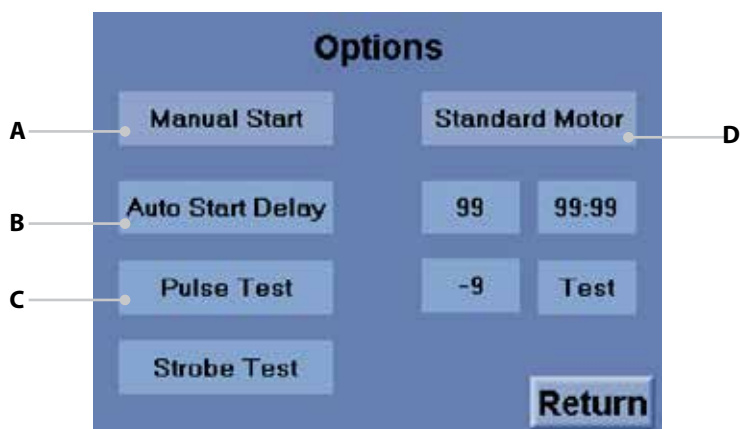
Clicking the **“Menu”** button the main screen will bring you to this screen. This is the pulse setting screen and allows you to adjust your unit’s pulsing operation to the required settings.

Pulse Setting Screen:

Default Settings are as follows:

- Pulse Duration:0.20 Seconds
- Pulse Delay:10 Seconds
- Offline Pulsing Cycles:....Preset to 15
- Maintenance Pulse Time: .Preset to 90 minutes
- Online Threshold: 1.2 KPA
- Offline Threshold: 1.0 KPA
- # of Valves:Varies per Unit; This will read the total number of Valves being operated by the eTech

eTech2 Operator Instructions



Clicking the Arrow on the Pulse Settings Screen will bring you to the **"Options"** Screen.

Options Screen:


- A** Manual Start: Press to employ auto start feature. Text will read "Auto Start" when this feature is active.
- B** Auto Start Delay: Adjustable time setting for auto start feature. This is the time the unit delays start once an auto start signal is received.
- C** Pulse Test: This feature is to test each pulse valve to ensure each one is working. Toggle between valves using the numeric field on the right side of the screen.
- D** Standard Motor: Press this to toggle between standard motor and VFD motor (If Equipped).

APPENDIX C

eTech2 Operator Instructions

Warning/Error Screens:


Blower Overload Tripped

A graphic of a rectangular switch with 'OFF' and 'ON' labels. A red and black diagonal bar indicates the switch is in the 'OFF' position.

Check and Reset

Return

Emergency Stop


A yellow triangular warning sign with a black exclamation mark in the center.

Tripped

Return

Warning/Error Screens: (if equipped)

VFD Faulted


A photograph of a vertical white VFD (Variable Frequency Drive) unit with a control panel.

Check and Reset

VFD Reset

Return

Safe Sensor Tripped

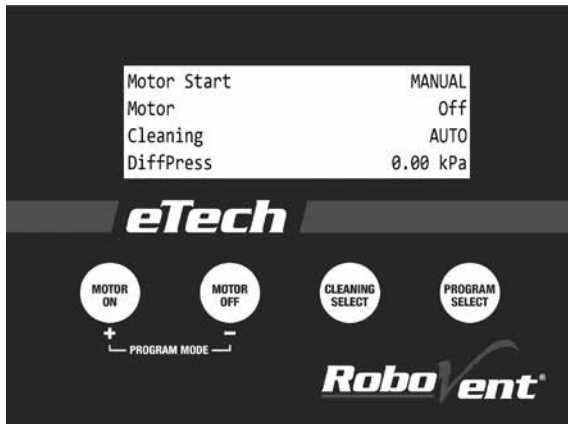
A graphic of three overlapping grey clouds.

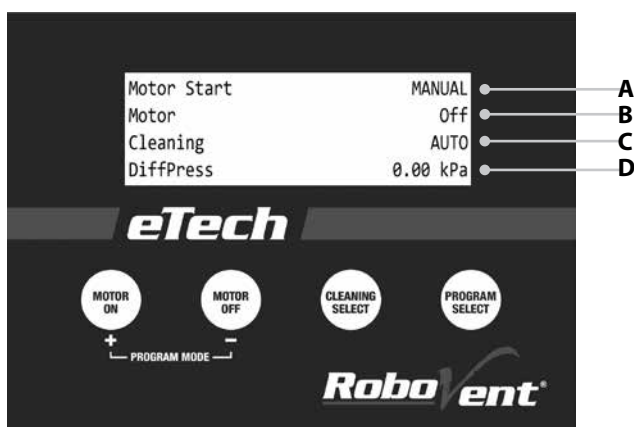
Check for Fire
or
Filter Blow-By

Return

APPENDIX D

eTech Electronic Programmable Controller - Instruction Manual



**Screen Display Features:****A** Motor Start Control Status:

MANUAL = Motor is started or stopped with Motor On or Motor Off buttons

AUTO = Motor is started or stopped by the AutoSaver sensor connected to production machinery to start and stop the unit simultaneously with production

B Current Motor Operation Status:

On = Motor and Blower Running

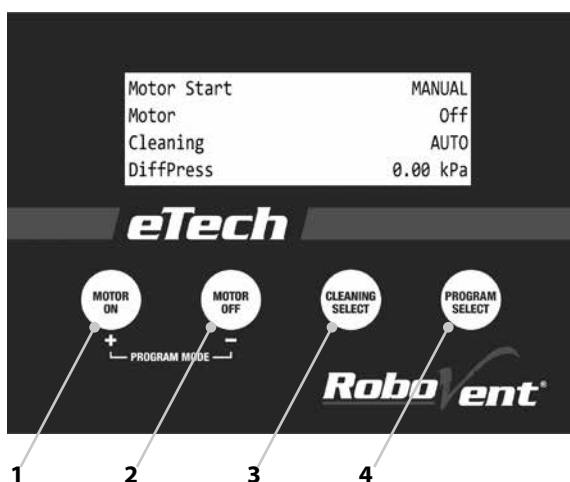
Off = Motor and Blower Stopped

C Filter Pulse Cleaning Operation Mode:

AUTO = Filter Pulse Cleaning will occur when Differential Pressure has increased to preset point, and when motor is stopped

MANUAL = The Manual (maintenance) Pulse Cleaning Cycle is currently in operation

D Reports the Differential Pressure present across the Filters - indicates how loaded the filters are and how much decrease in pressure is achieved by pulse cleaning (calculated by the difference in kPa (Kilopascals) from before, to after the pulse cleaning cycle). Filter cartridge/s are due for replacement when pulse cleaning does not decrease Differential Pressure significantly.

**Control Button Features:**

- 1** Motor On Button: Press to start Motor and Blower Operation
- 2** Motor Off Button: Press to stop Motor and Blower Operation
- 3** Cleaning Select Button: Press to start the Manual (maintenance) Filter Pulse Cleaning Cycle. This is most effective at cleaning the filters when the Motor is not running, but can be selected during motor operation. Press the button again to stop the Manual Pulse Cycle.

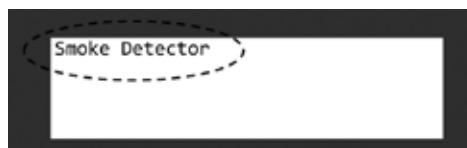
Note: This will temporarily override the factory settings which normally control the Filter Pulse Cleaning operations for optimum performance. This includes an Offline Cleaning Cycle once the motor has stopped to remove accumulated particulate, and when Differential Pressure across the filters has reached a pre-set point during unit operation, Online Pulse Cleaning will occur as the motor is running.

- 4** Program Select Button: Pressing this button accesses the password enter screen to allow editing of factory programmed settings for the optimum operation of the Dust Collector Unit. If unit is having issues such as filters not cleaning properly from pulse cycles, or pulse durations, intervals or other settings need to be adjusted, contact RoboVent Technical Support (586) 698-1800 for direction and guidance on how to log in to the setting programming screens and adjust the correct parameters.

Alarm/Fault Screens:



VFD Fault: when the Motor Status shows VFD Fault, the eDrive system needs to be reset, hold down the Motor Off button for 5 seconds to clear the fault.



Smoke Detector Alarm: The SafeSensor has been activated, due to the presence of smoke coming through the system (potentially a burning filter) or the presence of particulate (potentially a leaking filter) or the accumulation of particulate over time in the smoke detector, requiring it to be washed out. Rectify the cause of the Smoke Detector activation, and then press the Motor Off button to reset the alarm.

APPENDIX E

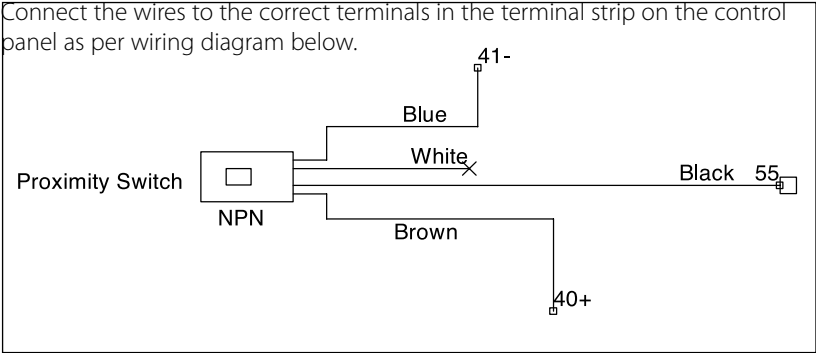
Barrel Level Sensor Instruction Manual

Barrel Level Sensor - Option

The addition of the Barrel Level Sensor option provides a much more visible notification and warning to the operator or maintenance personnel that the Collection Drum or Barrel under the hopper is becoming full of particulate and needs to be emptied out.

Field Connection / Installation:

1. The sensor cable is protected inside a Sealtite flexible conduit. Once the Collector is assembled and installed in its correct location, the Sealtite conduit needs to be connected to a knockout hole in the side of the control panel area
 - a. Remove the appropriate knockout hole from the side of the control panel area
 - b. Pass the sensor wires through the hole
 - c. Fasten the Sealtite elbow fitting to the hole to make a waterproof connection
2. Connect the wires to the correct terminals in the terminal strip on the control panel as per wiring diagram below.



Operation:

1. When dust and particulate builds up to the level of the sensor inside the Drum, the sensor sends a signal to the Controller, and the 'Collection Drum Full' message is displayed on the Service Messages page, on the ePad screen (HMI).

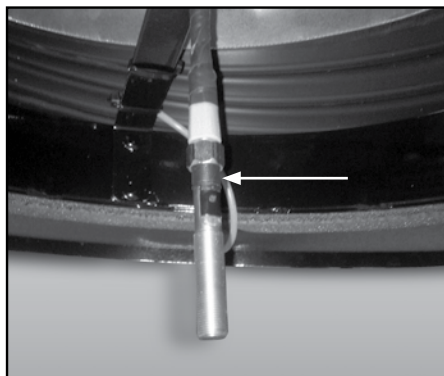


2. Once the Drum has been emptied out and replaced under the hopper, the message can be cleared by logging-in with the Username 'Service' and the associated password. Once logged in and on the Service Message screen, the 'Drum Reset' button will be displayed (see picture) which when pressed will clear and reset the 'Collection Drum Full' message.

**Adjustment:**

Due to the many different types of application and types and densities of dusts can be collected, a minor adjustment maybe required to the sensor to ensure reliable operation;

1. If the sensor is activated prematurely (not much dust in the drum), then the sensitivity of the sensor should be reduced, by turning the adjustment screw on the side of the sensor (see picture). Adjust in small increments until the correct operation is achieved.
2. If the sensor is not activated even when the dust has filled the drum and come in contact with the sensor, then the sensitivity of the sensor should be increased, by turning the adjustment screw on the side of the sensor (see picture). Adjust in small increments until the correct operation is achieved.

**Maintenance:**

Periodically inspect the following:

1. The sensor head is not damaged
2. There are no exposed electrical wires
3. The sensor is securely fastened in its quick-connect plug
4. There is not excess length of cord pulled through the mounting bracket inside the drum lid, causing the sensor to protrude too far into the collection drum
5. Fittings on the Sealtite connections are still tight and secure

APPENDIX F

General Wiring Diagrams

General Wiring Diagram - Single Blower; ePad Controls

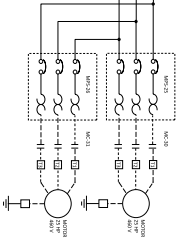
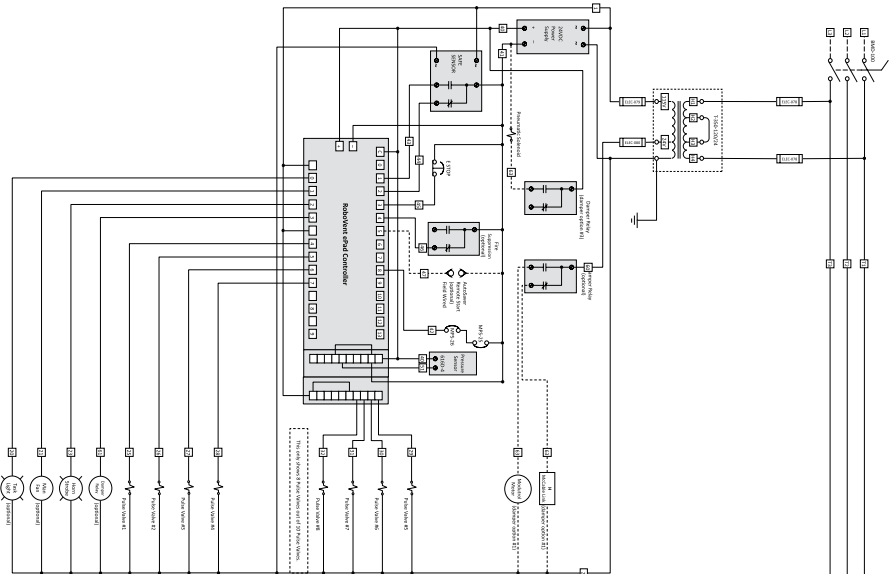
F-1



APPENDIX F

General Wiring Diagram - Double Blower; ePad Controls

Dual 25 HP 460V



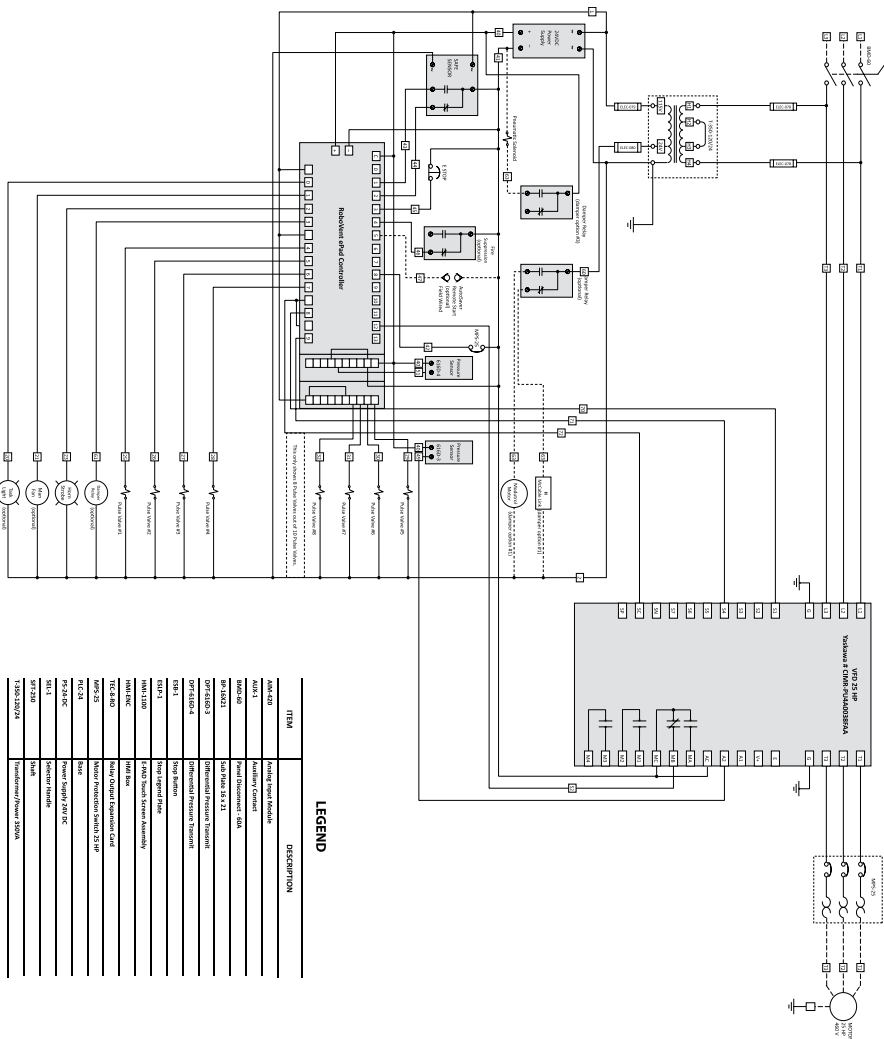
LEGEND

ITEM	DESCRIPTION
AW4-420	Awning Mount Bracket
AW4-1	Awning Mount Bracket
BP-300	Blower Pad - 300W
BP-300-1	Blower Pad - 300W
BP-300-2	Blower Pad - 300W
BP-300-3	Blower Pad - 300W
BP-300-4	Blower Pad - 300W
BP-300-5	Blower Pad - 300W
BP-300-6	Blower Pad - 300W
BP-300-7	Blower Pad - 300W
BP-300-8	Blower Pad - 300W
BP-300-9	Blower Pad - 300W
BP-300-10	Blower Pad - 300W
BP-300-11	Blower Pad - 300W
BP-300-12	Blower Pad - 300W
BP-300-13	Blower Pad - 300W
BP-300-14	Blower Pad - 300W
BP-300-15	Blower Pad - 300W
BP-300-16	Blower Pad - 300W
BP-300-17	Blower Pad - 300W
BP-300-18	Blower Pad - 300W
BP-300-19	Blower Pad - 300W
BP-300-20	Blower Pad - 300W
BP-300-21	Blower Pad - 300W
BP-300-22	Blower Pad - 300W
BP-300-23	Blower Pad - 300W
BP-300-24	Blower Pad - 300W
BP-300-25	Blower Pad - 300W
BP-300-26	Blower Pad - 300W
BP-300-27	Blower Pad - 300W
BP-300-28	Blower Pad - 300W
BP-300-29	Blower Pad - 300W
BP-300-30	Blower Pad - 300W
BP-300-31	Blower Pad - 300W
BP-300-32	Blower Pad - 300W
BP-300-33	Blower Pad - 300W
BP-300-34	Blower Pad - 300W
BP-300-35	Blower Pad - 300W
BP-300-36	Blower Pad - 300W
BP-300-37	Blower Pad - 300W
BP-300-38	Blower Pad - 300W
BP-300-39	Blower Pad - 300W
BP-300-40	Blower Pad - 300W
BP-300-41	Blower Pad - 300W
BP-300-42	Blower Pad - 300W
BP-300-43	Blower Pad - 300W
BP-300-44	Blower Pad - 300W
BP-300-45	Blower Pad - 300W
BP-300-46	Blower Pad - 300W
BP-300-47	Blower Pad - 300W
BP-300-48	Blower Pad - 300W
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BP-300-61	Blower Pad - 300W
BP-300-62	Blower Pad - 300W
BP-300-63	Blower Pad - 300W
BP-300-64	Blower Pad - 300W
BP-300-65	Blower Pad - 300W
BP-300-66	Blower Pad - 300W
BP-300-67	Blower Pad - 300W
BP-300-68	Blower Pad - 300W
BP-300-69	Blower Pad - 300W
BP-300-70	Blower Pad - 300W
BP-300-71	Blower Pad - 300W
BP-300-72	Blower Pad - 300W
BP-300-73	Blower Pad - 300W
BP-300-74	Blower Pad - 300W
BP-300-75	Blower Pad - 300W
BP-300-76	Blower Pad - 300W
BP-300-77	Blower Pad - 300W
BP-300-78	Blower Pad - 300W
BP-300-79	Blower Pad - 300W
BP-300-80	Blower Pad - 300W
BP-300-81	Blower Pad - 300W
BP-300-82	Blower Pad - 300W
BP-300-83	Blower Pad - 300W
BP-300-84	Blower Pad - 300W
BP-300-85	Blower Pad - 300W
BP-300-86	Blower Pad - 300W
BP-300-87	Blower Pad - 300W
BP-300-88	Blower Pad - 300W
BP-300-89	Blower Pad - 300W
BP-300-90	Blower Pad - 300W
BP-300-91	Blower Pad - 300W
BP-300-92	Blower Pad - 300W
BP-300-93	Blower Pad - 300W
BP-300-94	Blower Pad - 300W
BP-300-95	Blower Pad - 300W
BP-300-96	Blower Pad - 300W
BP-300-97	Blower Pad - 300W
BP-300-98	Blower Pad - 300W
BP-300-99	Blower Pad - 300W
BP-300-100	Blower Pad - 300W

APPENDIX F

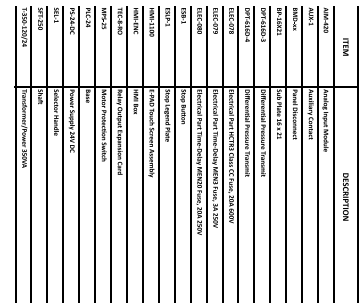
General Wiring Diagram - Single Blower; ePad Controls

25 HP 460V with VFD

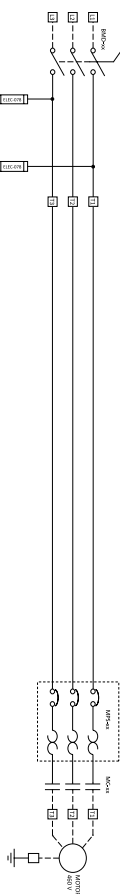


General Wiring Diagram - Double Blower; ePad Controls

PLASER 3 SERIES OWNER'S MANUAL



25 HP 460V



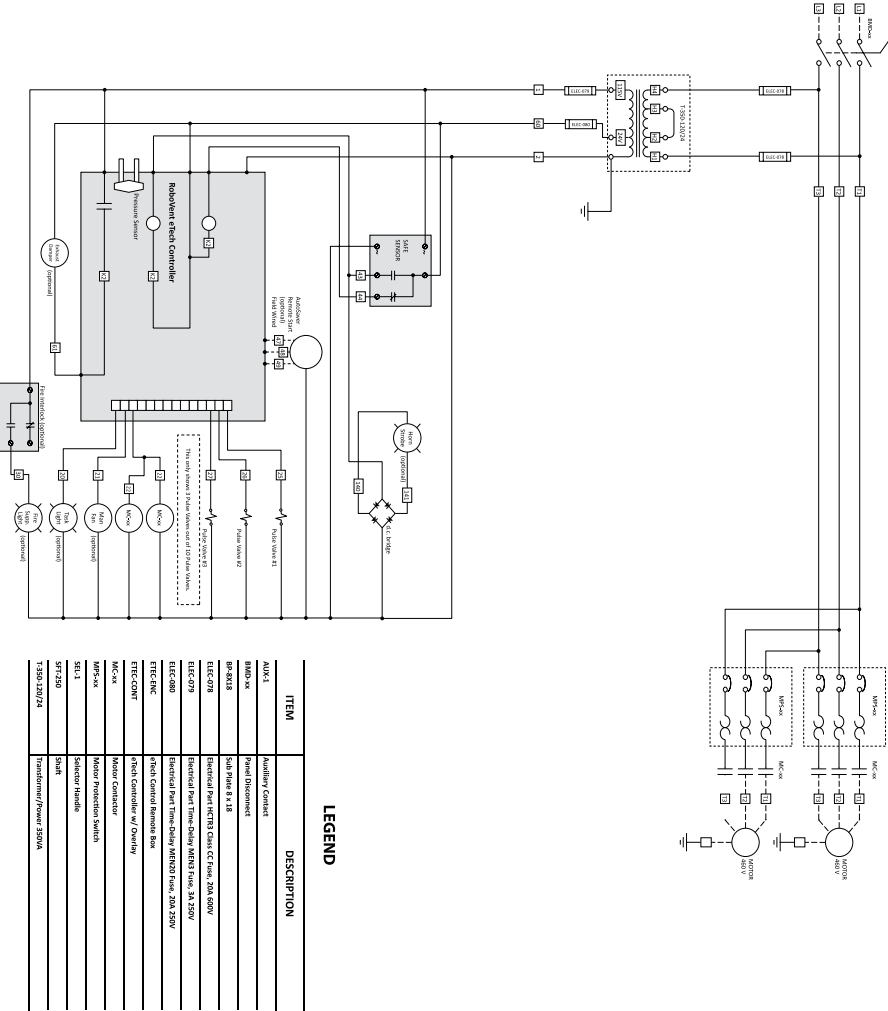
LEGEND

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APPENDIX F

General Wiring Diagram - Double Blower; eTech Controls

Dual 25 HP 460V



25 HP 460V with VFD

[illegible]

Dual 25 HP 460V with VFD



ITEM	DESCRIPTION
AUX-1	Auxiliary Circuit
BWD-Xx	Pneid Disconnect
BR AXL8	Solo Brake x 18
DPE-A6L0-J	Hollowmetal Pressure Transmits
ELEC-D79	Electrical Part Line Chg M/NH CC fuse, 2A/10kV
ELEC-D79	Electrical Part Line Chg M/NH fuse, 3A, 25KV
ELEC-B80	Electrical Part Line Chg M/NH fuse, 2A/10KV
ETEC-DNC	e-tech Control Remote Box
ETEC-DNC	e-tech Controller w/ Display
ETC-CRD-DMMD	MFD Cr Stand & CNC Controls
FY-S&K-DIC	Power Supply 24V DC
FMPR-Xxx	Motor Protection Switch
S&K-1	Selective Handle
SPJ-T250	Switch
TMSO-TM2T4	Transformer/Power 350VA

APPENDIX G

Explosion Protection Devices

Intrinsic Panel
(O-KB-NRV-CP02)
for No Return Valve
(KB-NRV00)

Explosion Protection Devices

INTRODUCTION

Thank you for purchasing the O-KB-NRV-CP02 control panel for use with the KB Duct line of No Return Valves (KB-NRV00). The Intrinsic panel (CP02) is built specifically to comply with NFPA 69-2014, OSHA combustible dust, and UL standards and guidelines.

Required Items for O-KB-NRV-CP02:

- KB-NRV00, No Return Explosion Isolation Valve.
- O-KB-NRV-MS, Micro-switch
- O-KB-NRV-DLS, Dust Level Sensor

Complimentary Products:

- KB-HSAG line of High Speed Abort Gates
- KB -FBS line of Firebreak Shutters
- KB -XV line of Explosion Vents
- KB -FCS Spark Detection and Extinguishment Systems
- KB -IMS line of Dust Monitoring (Emissions) Systems
- KB DUCT Line of Energy Management Control Systems

WARRANTY:

KB Duct warranties the workmanship and material supplied by them to be free from defects under proper usage for a period of 12 months from shipping date. The customer shall be responsible for remedies to problems with material and services, which they have furnished.

KB Duct will repair or replace, at their option, defective materials for workmanship originally supplied by them. Said defective materials or workmanship shall be returned to KB Duct freight prepaid. Repaired or replaced materials will be returned to the customer freight prepaid.

KB Duct shall not be liable for damages, direct, indirect, foreseeable, consequential or special in connection with the design or suitability of this equipment for its intended use.

Equipment shall be installed in accordance with the National Electrical Code, NFPA guidelines, and local codes and ordinances.

**ALL KB DUCT O-KB-NRV-CP02 INTRINSIC PANELS ARE LABELED
UL S1861* INTRINSICALLY SAFE AND MADE IN THE USA**

SAFETY

ELECTRIC SHOCK HAZARD

**ONLY QUALIFIED PERSONNEL SHOULD INSTALL,
MAINTAIN OR WORK ON THIS EQUIPMENT!**

ALWAYS PERFORM WORK WITH THE POWER OFF!

ARC FLASH HAZARD

**APPROPRIATE PPE REQUIRED! FOLLOW ALL
REQUIREMENTS IN NFPA 70E**

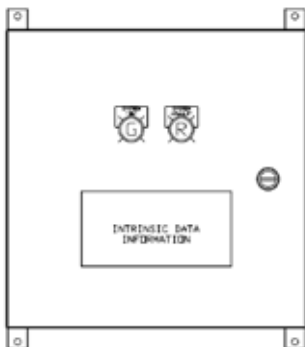
**ALWAYS MAINTAIN PROPER CONVEYING
VELOCITIES AS REQUIRED BY NFPA 654 FOR
COMBUSTIBLE DUSTS**

**WARNING! DO NOT SUBSTITUTE
COMPONENTS. SUBSTITUTION OF
COMPONENTS MAY IMPAIR INTRINSIC SAFETY.**

**IT IS THE INSTALLER'S RESPONSIBILITY TO VERIFY
THAT THEIR INSTALLATION COMPLIES WITH ALL
NATIONAL, LOCAL, NEC, NFPA, AND UL CODES**

KB DUCT O-KB-NRV-CP02

INTRINSIC PANEL SPECIFICATIONS



4 Models Available*

- Model: O-KB-NRV-CP02 (1 NRV)
- Model: O-KB-NRV-CP02X2 (Up-to 2 NRVs)
- Model: O-KB-NRV-CP02X3 (Up-to 3 NRVs)
- Model: O-KB-NRV-CP02X4 (Up-to 4 NRVs)

*Larger Panels are available on request

- All Models Feature the following:
 - NEMA 4 Enclosure
 - Status lights (Green = System OK / RED = System Trouble),
 - Terminals for Micro-switch
 - Intrinsic circuit with barrier and physical separation
 - Drawings
 - 120VAC Input Power
 - UL S1861* Intrinsically Safe Label

Required Sensors

- O-KB-NRV-MS: Microswitch for No Return Valve. (Shipped Loose)
- O-KB-NRV-DLS: Dust Level Sensor (Capacitive) to ensure the NRV is not compromised by a layer of dust accumulation. (Shipped Loose)

***ON REQUEST O-KB-NRV-CP02 COMPONENTS MAY BE BUILT INTO A
KB DUCT ENERGY CONTROL PANEL***

O-KB-NRV-CP02, Intrinsic Panel with NFPA Compliant Options



*Contains O-KB-NRV-DLS (Dust Level Sensor),
O-KB-NRV-MS (Microswitch) and Wiring Diagram*



APPENDIX G

Explosion Protection Devices

O-KB-NRV-MS (Microswitch) with
Mounting Bolts



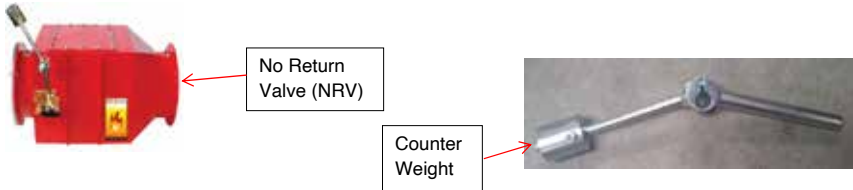
1. Remove screw
and rotate lever to
correct position

2. Line up
arrows



3. Insert
and tighten
screw

Mounting O-KB-NRV-MS (Microswitch) to KB Duct No Return Valve



1. Mount microswitch to locking mechanism using provided bolts



2. Remove bolt and washer to install counter weight



3. Slide counter weight onto shaft



4. Rotate counterweight arm into the locked position. Ensure arm is centered in the locking mechanism to avoid obstruction or rubbing. If not centered, the arm may not fully close or lock during an event.

****NOTE** Do Not Forget to Unlock Counter Weight Prior to Initial Start-up. The "System Fault" Light Will Turn On and System Will Not Start.**

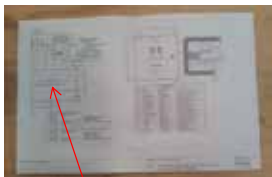


5. Tighten bolts on arm and re-insert bolt and washer to secure in place.

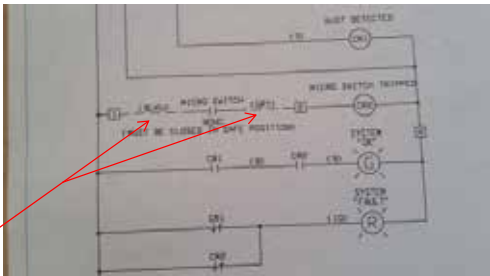
APPENDIX G

Explosion Protection Devices

Wiring O-KB-NRV-MS (Microswitch) to O-EM-NRV-CP02 Intrinsic Panel



1. When looking at the wiring diagram, you will notice only the black and grey wires are used for the microswitch connection.



3. Connect the grey wire to the terminal labeled 2

2. Connect the black wire to the terminal labeled 1.



APPENDIX G
Explosion Protection Devices

Mounting O-KB-NRV-DLS (Dust Level Sensor) to
KB Duct No Return Valve



O-KB-NRV-DLS
(Dust Level Sensor)
kit with drawing

**1. Remove bolt on bottom
side of the KB Duct No
Return Valve (NRV)**



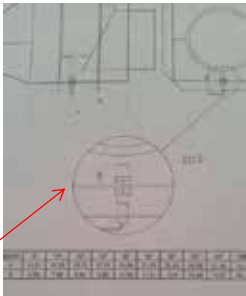
**2. Install first
mounting nut
on sensor.**



**3. Insert
sensor into
bottom side of
NRV in
existing hole.**



**4. Install second mounting nut on sensor and
adjust to required height described in drawing
provided. Tighten mounting nut to secure in place.**



APPENDIX G

Explosion Protection Devices

Wiring O-KB-NRV-DLS (Dust Level Sensor) to KB Duct No Return Valve



1. On the Wiring diagram you will notice the Dust Level Sensor will be installed inside the physical barrier in the control panel.

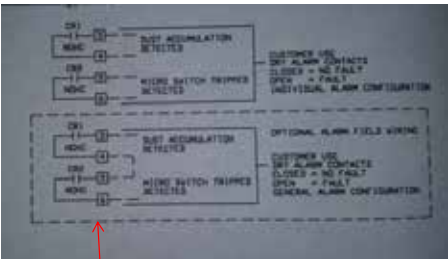


3. Connect blue wire to the terminal labeled 4.



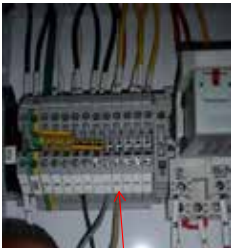
APPENDIX G
Explosion Protection Devices

Wiring the KB Duct O-KB-NRV-CP02 Intrinsic
Panel to your Main System Control Panel



1. On the wiring diagram you will notice there are two options provided to connect to the main system control panel. One is an individual alarm configuration and the other is a general alarm configuration. Choose the one that will work with your main system control panel. You will need to refer to your Main system wiring diagram to determine how the connection needs to be made.

OPTION #1



2. Connect low voltage control wire to terminal 3. Run wire to main system control panel and connect to dry alarm contact.



3. Connect low voltage control wire to terminal 4. Run wire to main system control panel and connect to dry alarm contact.



4. Connect low voltage control wire to terminal 5. Run wire to main system control panel and connect to dry alarm contact.

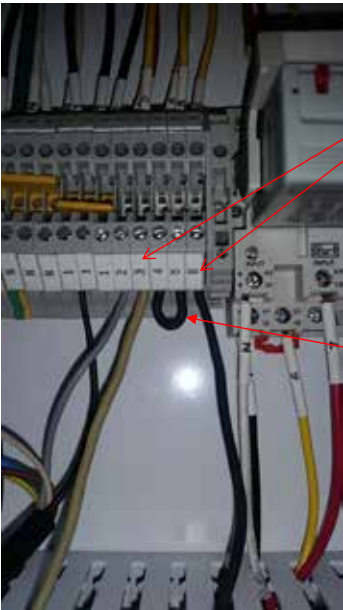


5. Connect low voltage control wire to terminal 6. Run wire to main system control panel and connect to dry alarm contact.

Explosion Protection Devices

Wiring the KB Duct O-KB-NRV-CP02 Intrinsic Panel to your Main System Control Panel

OPTION #2



1. Connect the low voltage control wire to the #3 and #6 terminals as described in option 1. Use a jumper to connect terminals #4 and #5.



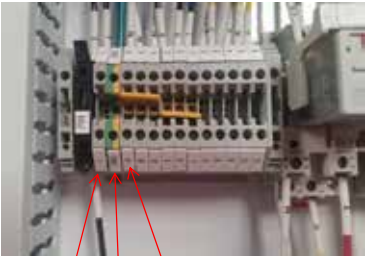
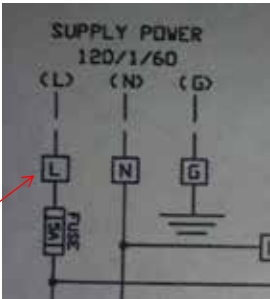
APPENDIX G

Explosion Protection Devices

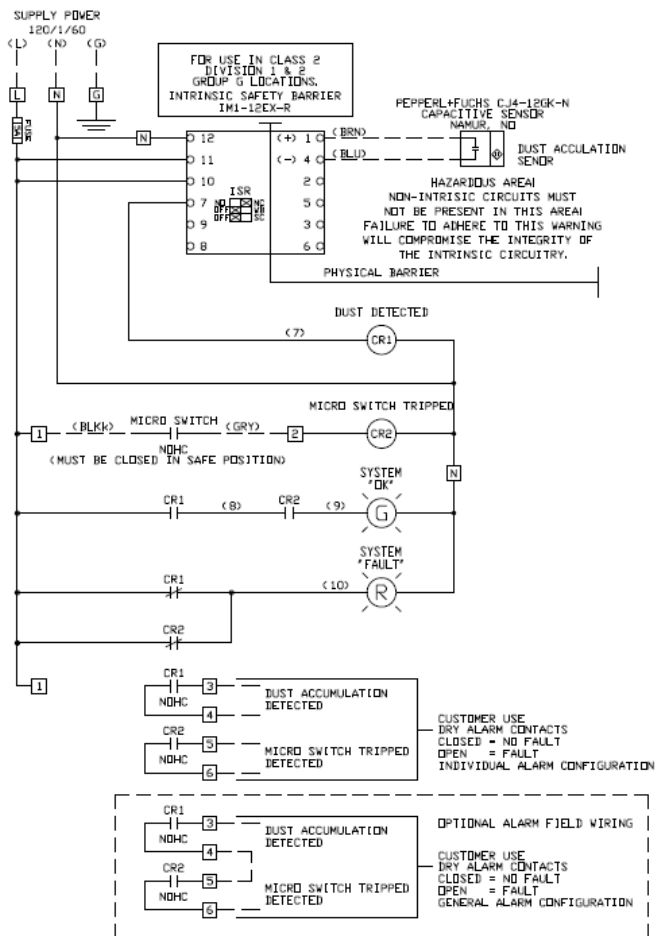
Wiring 120VAC Supply Power to the KB Duct O-KB-NRV-CP02 Intrinsic Panel



1. 120/1/60 supply power is required to power the panel. Connect to terminals as shown



L / GND / N



Installation Manual Use and Maintenance

**Devices of Explosion Outlet
Valve Not Return
Explosion Isolation Devices
Model SNR**



SUMMARY

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 - 1.1 Document's identification "INSTRUCTION" E-17
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 - 1.5 Identification's data of filtering system's manufacturer E-19
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1. Norms and general informations

The following symbols are used in the manual to draw the consumer's attention on :



: EXPLOSIVE ATMOSPHERES DANGER

This symbol lays the attention on prescriptions or indications relative to the directive ATEX 94/9/CE.

The operations drew from this symbology must be executed by highly qualified personal, competent in safety's thematic relative to zones characterized by presence of potentially explosive atmosphere.



: DANGER/ ATTENTION

This symbol is used for pointed out the operations that can cause damages to the operators. Follow carefully the information indicated beside this symbol before to proceed with the aforesaid operations.



: INDICATION

This symbol is used for pointed out the operations that need particular attention.

So respect the information indicated beside this symbol before to proceed with the aforesaid operations.



: CAUTION / PRUDENCE

This symbol is used to furnish useful indications in the execution of some operations of interesting information.

It is advisable to follow the furnished indications before to proceed with the aforesaid operations.

1.1 Document's identification "INSTRUCTION"

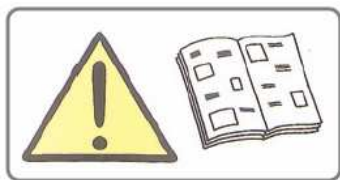
The instruction's manual is a document issued by KB Duct S.r.l. and it is integral part of protection's system. It is identified in univocal way to allow the traceable and possible following references.

All rights of reproduction and divulgation of the present manual and relative mentioned and/or attached documentation, are reserved. **Copyright by • • • • • S.r.l.**

Explosion Protection Devices

1.2 Document's purpose

The principal's purpose of manual's instructions is to furnish to the customer and to personnel to interact with the protection's system, the necessary information for the correct installation and use and maintenance in optimal conditions, with particular respect in order that this happens in the maximum safety's conditions. It is recommended the scrupulous observance of precautions for safety both during the installation that during the operative phases, of service, reparation and draining of outlet' panel.



Make sure that the safety's prescriptions are read, understand and executed by all personnel employed to the operation of protection's system and that become usual for everybody.

1.3 General instructions and limited responsibility of the manufacturer

Every operator's interaction – protection's system, in the ambit of expected use and the whole life's cycle of the same has been attentively ed thoroughly analyzed from • • • • • **S.r.l.** during the planning's phases, construction and layout of manual's instructions. Nevertheless is understood that nothing can replace the experience, the suitable training and the "good sense" of those people that who interact with the device.

These last requisites are essential whether in every operative phase inherent to the system, or during the reading of present manual.

The non-respect of precautions and specific warnings present in this manual, the improper use of all or part supply, the use of spare parts not authorized, the system's use from no-suitable personnel violate every safety's norm regarding the planning, the building and the use expected by the supply and release • • • • • **S.r.l.** from every responsibility in case of damages to people or things.

KB Duct S.r.l. doesn't retain responsible for the missed observance from the consumer of precautions for safety indicated in the present manual.

1.4 Maintenance of instruction's manual

The present document is integral part of system and has to be guarded and used for the whole operative life, also in case of transfer to outside parties.

Possibile requests for further copies of the present document must be regularize with the purchase's order to • • • • • **S.r.l.**

To the purpose to correctly preserve for a long time the present document it is recommended to :

APPENDIX G

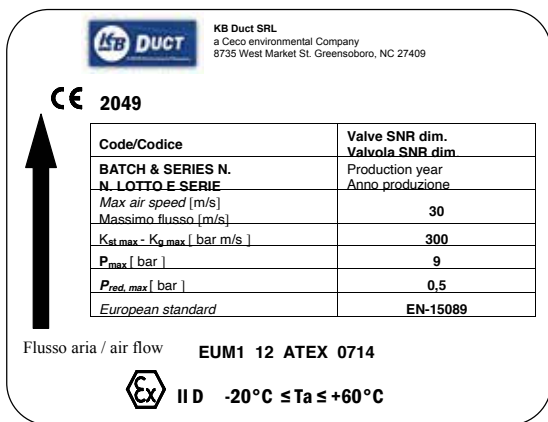
Explosion Protection Devices

- do not remove, tear or rewrite part of it. Possible copies have to be request to the building firm.
- preserve the manual in zone protected from humidity, heat and other environmental agents that can prejudice the integrity or duration of it.

1.5 Identification's data of filtering system's manufacturer

The identification of KB Duct S.r.l. as manufacturer of protection's system, happens in conformity with the current legislation by means of listed acts:

- Declaration of conformity according to second attached X point B – Directive ATEX 94/9/CE
- Marking's plate ATEX of outlet explosion device
- Instruction's manual



The identified data in the plate are refer to :

- 1) arrow indication air flow
- 2) identified data of builder
- 3) model of system's protection
- 4) internal assignment serial number
- 5) construction's year
- 6) identification of production's number batch
- 7) maximum air flow (m/s)

Explosion Protection Devices

- 8) constants of dust's explosion (K_{st}) and gas (K_G) (maximum derived from explosion's pressure in the time in $1m^3$ multiplied for $V^{1/3}$)
- 9) maximum pressure of an explosion not discharged
- 10) maximum pressure of reduced explosion
- 11) alpha-numerical string that identifies the I'O.N. that has executed the examination CE of typ

Marking's explanation:

- Group II;
- Explosive's atmosphere for presence of dusts or gas (**Gas or Dust**);

1.6 Warranty

Concerning the warranty's norms make reference to the sale general conditions draw up in contractual center.

1.7 Technical/maintenitive assistance of the instrument

In case of necessity of intervention from the builder, please contact **KB Duct S.r.l.**

In case the consumer doesn't respect what indicated in the present publication, we don't respond for inconveniences or anomalies on the good operation of the supplies.

2. Obligations and duties

2.1 Employer's duties

The employer is responsible of the present document's popularization and all personnel that will interact with the process where is installed the protection's system.

2.2 Obligations in case of intervention

The operators called to interact with the protection's system have the obligation to learn adequately themselves using the present manual before effecting any intervention, adopting the relative specific safety prescriptions.

2.3 Obligation of norms respect

The operators have to adopt and respect necessarily the general accident prevention prescriptions prescribed from community directives and of the destination's nation legislation.

2.4 Obligations in case of malfunctions and potential dangers

The operators have the to signal to their direct responsible every possible deficiency and/or potential dangerous situation that can verify. In case of necessity contact **KB Duct S.r.l.**

2.5 Consumer's obligation

The consumer has the obligation to inform in good time **KB Duct S.r.l.** if he founds defects and/or malfunctions, as well as any presumed danger's situation come to knowledge.

It is severely forbidden to the customer and/or third party (excluded **KB Duct S.r.l.** personnel duly authorized) bring whatever changes and entity to the not return valve , as well as to the present technical document.

In case of malfunctions and/or dangers, due to a missed respect than above, **KB Duct S.r.l.** doesn't answers any consequences.

It is suggested to ask for possible changes directly to **KB Duct S.r.l.**

3. Introduction to the ATEX directives

Explosive atmosphere

To the purpose to directive 94/9/CE it is intended for explosive atmosphere that constituted by a mixture :

- inflammable substances to the state of gas, vapours, fogs and dusts;
- with air;
- in definite atmospheric conditions ;
- in which, after the primer, the combustion is propagated to the whole mixture not burnt (it is necessary to notice that in presence of dust, not always the whole quantity of dust is consumed by the combustion).

A susceptible atmosphere to transform oneself in explosive atmosphere because of the local and/or operative conditions is defined potentially explosive atmosphere. It is just to this kind of potentially explosive atmosphere that are destined the products object of the directive 94/9/CE.

In reference to the presence of explosive atmosphere the European Union has emanated two directives, one related to the constructive safety's prescriptions of ATEX products 94/9/CE, the other related to the safety's prescriptions in job's environment ATEX 99/92/CE.

In operation of the probability of explosive's atmospheres presence , the job's environments are classified in zones, on which inside can be installed and used instruments conforming to the safety's requisites that the same zone requires.






In the schedule below are indicated the product's category suitable to the installation's zones

ZONES		PROBABILITY OF EXPLOSIVE ATMOSPHERE'S FORMATION	PROTECTION LEVEL	PRODUCT'S CATEGORY	
GAS	DUSTS D			GROUP I	GROUP II
		Constant presence or for long periods	Very elevated	M1	
		Occasional in normal operation	Elevated	M2	
0	20	Constant presence or for long periods	Very elevated		1
1	21	Occasional in normal operation	Elevated		2
2	22	Very rare and/or short duration in normal operation	Normal		3





4. General accident prevention prescriptions



Is it made obligation to the consumer and operators the respect of accident prevention norms in force, both to legal level and business and particularly it is asked the respect of the following points :

- all working personnel doesn't have to be under the influence of sedatives, drugs or alcohol and must be perfectly aware of the operation's characteristics;
- it is absolutely forbidden to exclude and open or remove the not return valve during the operation ;
- connect the protection's system to the grounding's plant and maintain the equi-potentiality among the parts without interpose in the assembling of the same materials/components not expected from this manual;
- in case will be necessary a maintenance's operation , provide to stop the process'operation in which it is installed;
- always use the original spare parts or commercial parts completely compatibles with those mounted in the protection's system;
- during the maintenance's operations or anything else that ask the process plant's dissection on which the valve is installed it is obligatory to affix on the dissection's devices (interrupters, disconnecting switches, valves , etc) a special sign that prohibits to anybody the reactivation, if possible it is recommended to block these devices trough padlock.
-  It is allowed the protection's system use in plants where the lighting's risk of explosive atmosphere can't be brought to the minimum tolerable, according to directive 99/92/CE with presence of dusts or gas.
-  The operators in the classified areas must wear preferably anti-static clothes , possibly in natural fibre.
-  Possible interventions to be effected in classified area to explosion's risk , don't have to require the utensils use that can produce sparkling.
-  Do not use compressed air systems to clean the interstices because the only effect is to lift dust and create new deposits. Employ an aspiration's system.
-  The process structures where is installed the no return valve, must be connected to an efficient grounding's system , so to be able to disperse possible currents of electrostatic nature.

Explosion Protection Devices

-
-  The installation of protection's system has to happen respecting the safety norms to protect safety of things and people.
 -  Absolute prohibition to use free flames in proximity of process where is installed the protection's system and in general in every job's zone. .
 -  Prohibition to smoke.
 -  Prohibition to use cellular phones if not marked ATEX for the relative category of belonging with plant in operation in classified zone according to directive 99/92/CE.
 -

5. Residual risks

The accurate analysis of the risks developed by the builder and filed in the technical brochure, has allowed to remove the most greater part of risks connected to the not return valve condition of use. The builder recommends to meticulously follow the instructions, procedures and recommendations contained in this manual and to the safety norms in force. The residual risks tied to the application of outlet's panel can be :

Wrong interpretations risks of the safety pictograms

Following to the risks and their individuation, the builder firm has installed to the not return valve danger's label established in conformity with the related normative to the graphic symbols to use. The user is kept to replace immediately the safety's plates that can become illegible for usury or damage.

ATTENTION!



**IT IS ABSOLUTELY FORBIDDEN TO REMOVE THE SAFETY'S PLATES FROM THE VALVE.
THE BUILDER FIRM REFUSES ALL RESPONSIBILITY ON THE NOT RETURN VALVE SAFETY IN CASE OF NON-OBSERVANCE OF THIS PROHIBITION.**

6. Description of system's protection

The equalizer valves of not return for the explosion's insulation of the series "SNR" are projected from AIRCOM s.r.l., to be employed as systems of protection ATEX, in accordance with the vertical European Directive that disciplines them, as they are able to isolate, from the effects of a deflagrating, two systems of containment separated by connection's system.

Concerning the protection's system denominated equalizer valves of not return for the explosion's insulation "Series SNR", produced by Aircom s.r.l., the present document describes the followings points:

- **the evaluation of the risks associated to the use of the protection's system in potentially explosive atmosphere;**
- **the conformity of the protection's system to the least requisites in safety and health subject described in the directive 94/9/CE.**

For every typology of above indicated (series SNR), are distinguished twelve different measures of explosion insulation valve, which exclusively differentiates them for the section of passage.

The physic base of explosion's insulation, provides that the system has the aim to avoid the propagation of the pressure's wave and the flame produced by a deflagrating.

In such way it is possible to isolate in a process, systems of containment that for functional reasons they are among them continuous.

The system of protection, equalizer valve of not return, is a system of protection for the explosion's insulation passive type, that it doesn't need a system of survey, control and functional indication.

Such systems have to be dimensionated, as after all the pipelines or the ducts on which are installed, to bear the maximum pressure of explosion that can support (Pred).

When required the valve is equipped with diaphragm anti-opening blocking with the intervention of a burst in order to lock in the closed position the diaphragm and not to allow any possible backfire.

The distance between the containment's system that has to isolate and the closing's valve is directly dependent from the maximum speed of flame front propagation and from the answer's times of system's protection.

The main factors that influence the performances of a dissection's system are:

- characteristics of dust explosiveness ;
- type of protection against the explosion eventually adopted on the volume to protect and on the pipeline;
- diameter, length and mechanical resistance of the pipeline;
- speed of the mixture inside the pipeline;
- speed of the flame's front;
- closing's time of valve.

The speed of the flame's front, keeping in mind of the flow's speed inside the pipeline is:

$$VF = V_{air} + SF$$

where:

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Explosion Protection Devices

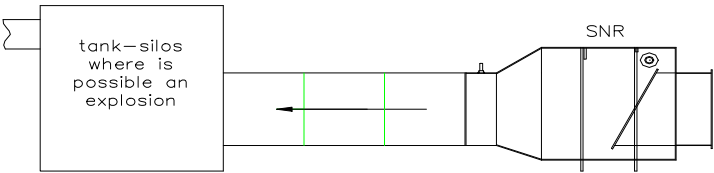
- VF total speed of flame’s front [m/s]
- V I_{flux} air speed of transport in pipeline [m/s]
- SF speed of flame’s front in absence of flow of transport [m/s]

The valves object of the present analysis, are structures in thickness for the closing and the insulation of containment’s systems; they are realized in carbon steel thickness 30/10 or 40/10 (in relationship to the dimension of the protection’ system).

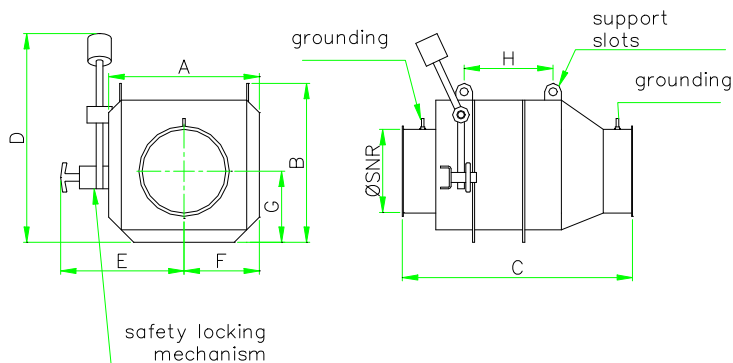
THE FOLLOWING SCHEDULE REPORTS THE TECHNICAL DATA OF VALVES OF NOT RETURN SERIE SNR: PICTURE 2 PAG. 14

MODEL	MAXIMUM PRESSURE OF EXPLOSION'S INSULATION P _{RED MAX} [BAR]]	DISTANCE FROM THE CONTAINMENT SYSTEM THAT IS TO ISOLATE FROM THE REST PART OF PRECESS [M]	KST MAX	A	B	C	D	E	F	G	H
SNR 160	0,500	2	CLASSE 3 - 300 [BAR M/S]	360	340	550	340	300	180	170	-
SNR 180	0,500	2	CLASSE 3 - 300 [BAR M/S]	360	340	550	340	300	180	170	-
SNR 200	0,500	2	CLASSE 3 - 300 [BAR M/S]	360	340	550	340	300	180	170	-
SNR 250	0,500	2	CLASSE 3 - 300 [BAR M/S]	410	390	600	390	325	205	195	-
SNR 300	0,500	2	CLASSE 3 - 300 [BAR M/S]	460	440	670	600	350	230	220	-
SNR 350	0,500	2	CLASSE 3 - 300 [BAR M/S]	510	490	720	650	375	255	245	-
SNR 400	0,500	2	CLASSE 3 - 300 [BAR M/S]	560	590	770	750	400	280	270	350
SNR 450	0,500	3	CLASSE 3 - 300 [BAR M/S]	610	640	820	845	425	305	295	400
SNR 500	0,500	3	CLASSE 3 - 300 [BAR M/S]	660	690	870	985	450	330	320	460
SNR 550	0,500	3	CLASSE 3 - 300 [BAR M/S]	710	740	920	950	475	355	345	500
SNR 600	0,500	3	CLASSE 3 - 300 [BAR M/S]	760	790	970	1045	500	380	370	550
SNR 700	0,500	3	CLASSE 3 - 300 [BAR M/S]	810	840	1020	1145	525	405	395	605

PICTURE 1



PICTURE 2



The environment conditions limit of job within the valve can be installed are of 60°C with 90% relative humidity. The valve is an object thermal passive, the maximum superficial temperature that can reach it depends only from the process within is installed.

7. Transport and storage of valves not return for the explosion's insulating KB Duct series "SNR"

Each valve is supplied inside its box.

To avoid damages during the transport, the valve is protected by opportune inserts in polystyrene and when necessary positioned on a pallet.

Before remove the valves from the package, verify its integrity from the same package and then, that the documentation corresponds to the order.

Open the package from a side and remove the valve having care not damage it

Verify the integrity removing all the polystyrene supports .

Verified the valve's integrity, put it back inside the package until the moment of use.

Preserve the valve so packed in dry place, to the shelter of atmospheric agents or from possible causes of damages.

8. Installation of valves of not return for explosion's insulation KB Duct series "SNR"

The protection's system called "valves of not return for explosion's insulation SNR" is fit to operate in the expected conditions and explicit on the plate fixed on the same valve and on the conformity declaration CE (static pressure's activation, characteristics of the external environment, nature and state of dusts or processed gas etc).





ATTENTION


**THE INSTALLATION OF PROTECTION'S SYSTEM MUST BE PERFORMED IN
ABSENCE OF POTENTIALLY EXPLOSIVE ATMOSPHERE TROUGH THE
PROCESS'S ARREST.**



WEAR INDIVIDUAL PROTECTION'S DEVICES

Sense of Installation

- ~~The sense of the air flow during the normal job has to respect the arrow brought in the technical label.~~
- ~~The inspection's door must be set always upward.~~
- From the diameters 400 mms, the valves are equipped of supporting's SLOTS (for the consistent weight).

 **IMPORTANT!** Position the counterbalance (where provided from Ø300 and upper) in opposite position to the diaphragm (with bar inserted into the anti-opening block of safety when provided) and to lock the bolts. (To reduce the bulk of packing in the phase of shipment the counterweight bar is disassembled and separated). The distance of installation from the containment's system to be isolated, is equal about to 2 meters for dusts having Kst included among 200 and 300, and about 1 meter for inferior Kst of 200. Distance for Ø up to 400 mm about 2 meters; Ø 450 up to the Ø 700: about 3 meters. The non-return valve can be installed where it is ensured that the maximum explosion pressure reduced by installation of explosion devices don't exceed the value Pred max of 0,5 bar on the label.

**IN PRESENCE OF ANTIOPENING BLOCK BEFORE STARTING THE SUCTION ENGEEN
RELEASE THE COUNTERWEIGHT FROM THE SAFETY ANTI-OPENING BLOCK.**

Explosion Protection Devices



To effect the connections of mass to earth of the valve of non return ,in the points taking the following pictogram.



THE PERSONNEL THAT PERFORMS THE INSTALLATION HAS TO USE ANTI-SPARK UTENSILS

ATTENTION

THE PERSONNEL THAT PERFORMS THE INSTALLATION MUST WEAR CLOTHES AND DISSIPATIVE FOOTWEARS.



Dissipative clothes : clothes constituted by a material with inferior superficial resistivity to $5 \times 10^{10} \Omega$.

Dissipative footwear : footwear that guarantees to a standing person on a conductive or dissipative floor a resistance towards earth superior to $10^5 \Omega$, but inferior to $10^8 \Omega$.

To the purpose to make more possible effective the insulation, the non return valve must be displaced in proximity of that it is considered the place or zone to be isolated.

Only the qualified personnel and opportunely educated on the content of this manual can install and do the maintenance of the non return valve KB Duct

The non return valve must be installed as according to expected from the manufacturer and in any way their parts have to be modified.

9. Control and periodic maintenance





Attention : before beginning any check's operation and intervention on the non return valve it is necessary that the protected equipment is not in pressure and at its internal there are no substances able to produce an explosive, toxic or harmful atmosphere.

The valve duration essentially depends on the use's conditions to which it is submitted once inserted in the system.

A visual check on the integrity's valve and its parts is not sufficient to determine the conditions of the same non return valve.

In all cases a visual check must be effected every month to individualize possible corrosion's phenomenon, breakings or deformation that can influence on the correct operation of the valve. Besides verify that there are no leaking traces from the seal's gasket, verifying the clamping couple of all screws of the valve.



ATTENTION

THE MAINTENANCE AND CLEANING OF VALVE MUST BE EXECUTE IN ABSENCE OF POTENTIALLY EXPLOSIVE ATMOSPHERE THROUGH THE ARREST'S PROCESS.

10. Controls

OPERATION TO EXECUTE	FREQUENCY	PROCEDURES
Verify state and camping of nuts		
Verify the state of valve		Visually check possible breakings, releases and vibrations during the operation.
Verify the ground's connection of protection's system		
Periodically verify that there are no excessive dust accumulation on the valve.		Check opening and closing with the equalizer, in case of doubts open the superior plug and inspect the inside of the valve. When finished operation, re-set and close the nuts with couple 40 Nm

11. Demolition and draining

In case of scrapping all the materials of valve must be disposed in suitable valve concerning to the legislation in force.

Before proceeding to the scrapping it is necessary to separate the plastic or rubber parts, from the metallic material.

The parts entirely constituted by material plastic, aluminium, steel, can be recycled if picked up from special centers.

Specifications

**No Return Isolation Valve Specs
Control Panel
Dust Level Sensor Installation**

Explosion Protection Devices

KB Duct No Return Isolation Valve Specs

Meet NFPA requirements* with the
KB Duct No Return Isolation Valve

* The installation of an Explosion Isolation Device on all suction side ducts that transport material with a K_{St} value above zero is an NFPA Requirement.



MODEL	DIAMETER	OVERALL LENGTH *	COUNTERWEIGHT OVERHANG	MINIMUM AIRFLOW (CFM) **	MAXIMUM AIRFLOW (CFM) ***	PRESSURE DROP ****	MINIMUM DISTANCE	MAXIMUM DISTANCE
EM-NRV07	7"	21.6"	-	533	1,603	0.35" H ₂ O	7 FT	23 FT
EM-NRV08	8"	21.6"	-	700	2,093			
EM-NRV10	10"	23.6"	-	1,090	3,270			
EM-NRV12	12"	26.3"	4.5"	1,370	4,710			
EM-NRV14	14"	28.3"	4.5"	2,140	6,415			
EM-NRV16	16"	30.3"	6.4"	2,750	8,380			
EM-NRV18	18"	32.2"	8.4"	3,535	10,600	0.63" H ₂ O	10 FT	
EM-NRV20	20"	34.2"	12.4"	4,365	13,090			
EM-NRV22	22"	36.2"	8.4"	5,280	15,840			
EM-NRV24	24"	38.1"	10.6"	6,285	18,850			
EM-NRV26	26"	40.1"	12.4"	7,370	22,110			
EM-NRV28	28"	42.1"	12.4"	8,550	25,050			
EM-NRV32	32"	52.3"	14.1"	11,160	33,490			
EM-NRV36	36"	56.2"	14.1"	14,130	42,390			
EM-NRV40	40"	60.2"	14.1"	17,445	52,330			

* Overall length dimension does not include counterweight overhang dimension.

** Minimum airflow is based on 2000 FPM velocity

*** Maximum airflow is based on 6000 FPM velocity

**** Pressure drop rating is based on velocity of 5905 FPM

Sizes 7" thru 28" are certified ATEX EN 16447:2014 & EN 15089:2009 0477 EUT 14 ATEX 1954 B D

Rating: CLASS 3 - MAX 400 bar m/s, max = 0.50 bar. Designed to withstand up to 200° H₂O

Sizes 7" thru 28" are certified ATEX EN 15089:2009 2049 EUM 12 ATEX 0714 B D

Rating: CLASS 2 - MAX 299 bar m/s, max = 0.25 bar. Designed to withstand up to 100° H₂O

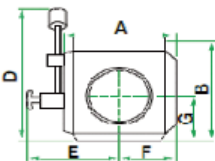
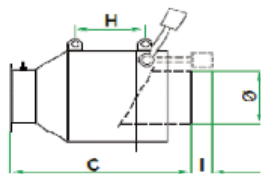
ATEX EN 16447 CERTIFICATION AND THE ADDITION OF SIZES 44"-48" ARE EXPECTED LATE 2015

All EM-NRV No Return Valves are rated from -4 F to +140 Deg. F Ambient Temperature

APPENDIX G

Explosion Protection Devices

No Return Valve (NRV) Dimensions (Sizes 7" to 28")

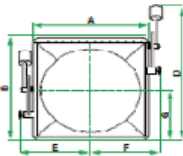
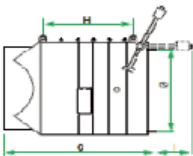


RATED FOR

Class ST 3 Applications
Kst max 400 bar m/s
P_{red} 0.50 bar

Ø	A	B	C	D	E	F	G	H	I	LBS
7"	14.1	13.3	21.6	13.3	11.8	7.0	6.6	—	—	45
8"	14.1	13.3	21.6	13.3	11.8	7.0	6.6	—	—	45
10"	16.1	15.3	23.6	15.3	12.7	8.0	7.6	—	—	56
12"	18.1	17.3	26.3	23.6	13.7	9.0	8.4	—	4.5	84
14"	20.0	19.2	28.3	25.5	14.7	10.0	9.6	—	4.5	100
16"	22.0	23.2	30.3	29.5	15.7	11.0	10.6	13.7	6.4	120
18"	24.0	25.1	32.2	33.2	16.7	12.0	11.6	15.7	8.4	150
20"	25.9	27.1	34.2	38.7	17.7	12.9	12.5	18.1	12.4	177
22"	27.9	29.1	36.2	37.4	18.7	13.9	13.5	19.6	8.4	221
24"	29.9	31.1	38.1	41.1	19.6	14.9	14.5	21.6	10.4	254
26"	31.8	33.0	40.1	45.0	20.6	15.9	15.5	23.8	12.4	276
28"	33.8	35.0	42.1	47.0	21.6	16.9	16.5	25.5	12.4	298

No Return Valve (NRV) Dimensions (Sizes 32" to 40")



RATED FOR

Class ST 2 Applications
Kst max 299 bar m/s
P_{red} 0.25 bar

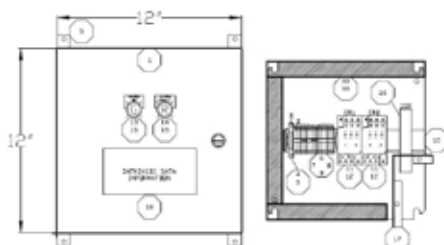
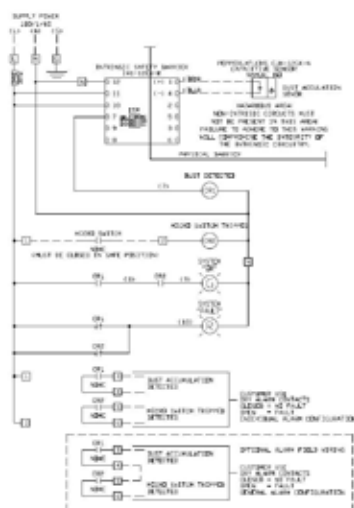
Ø	A	B	C	D	E	F	G	H	I	LBS
32"	38.5	40.1	52.3	56.4	25.9	25.9	18.8	28.1	14.1	728
36"	42.5	44.5	56.2	60.4	27.9	27.9	20.8	27.9	14.1	860
40"	46.1	48.0	60.2	64.3	29.9	29.9	22.8	35.8	14.1	999

NRV Pressure Drop for Sizes 7" to 14" is 0.39" / Sizes 16" to 40" is 0.63"

APPENDIX G

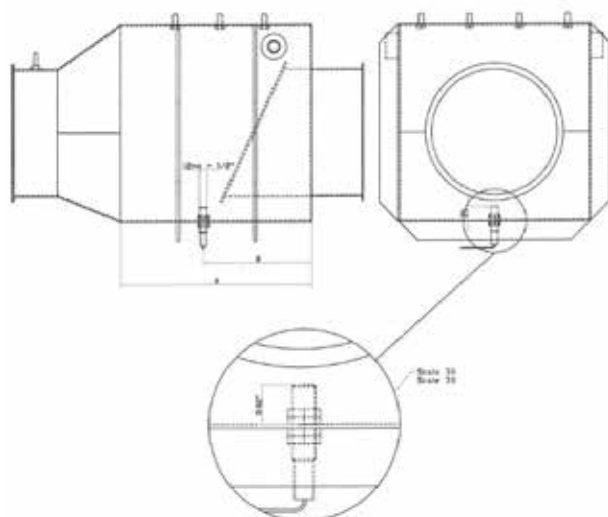
Explosion Protection Devices

Control Panel

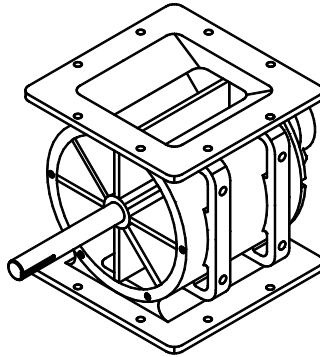


BILL OF MATERIAL			
ITEM	QTY	BRAND	PART NUMBER DESCRIPTION
1	1	HOFFMAN	C5012125 Wall-Mount Type 4/12 Ends
2	1	HOFFMAN	CP1212 Panel, 10.25x12.25
3	1	HOFFMAN	CMR1 Mounting Tool Kit (Qty 6)
4	1	ALLEN BRADLEY	1492-WFB4350 FUSED TERMINAL/TERMINAL BLOCK
5	1	BUSCHMANN	GMA-4A MINATURE GLASS FUSE
6	1	ALLEN BRADLEY	1492-963 TERM 30-120V/60V GROUND TB
7	12	ALLEN BRADLEY	1492-13 TERM 25 AMP 600V GRAY
8	1	ALLEN BRADLEY	1492-EBU3 END BARRIER 1/2
9	2	ALLEN BRADLEY	1492-EBU3 1/2 SCREWLESS END STOP
10	1	PHOENIX	0801-793-FT DIN RAIL 8507 5MM FT
11	2	AUTOMATION DIRECT	783-3C-125A SPOT 15A RELAY 125AC
12	2	AUTOMATION DIRECT	783-3C-54T SPOT 15A RELAY SOCKET
13	1	ALTECH	PLUR-120 PILOT LIGHT, PLUS GRN 120V
14	1	ALTECH	PLUR-120 PILOT LIGHT, PLUS RED 120V
15	2	ELECTRO PAC	ENGRAVE PLUS NP PLASTIC NAME PLATES
16	1	TURCK	150-127X-8 ISR M744126
17	1	ELECTRO PAC	BARRIER-1A ISOLATE INTRINSIC RELAYS
18	1	ELECTRO PAC	UL LABEL 51861*

Dust Level Sensor Installation



25NR	8"	10"	12"	14"	16"	18"	20"	22"	24"	26"
A	11.81	13.78	15.75	17.72	19.69	21.66	23.62	25.59	27.56	29.53
B	6.69	7.98	9.26	10.54	11.81	13.09	14.37	15.65	16.93	18.21



Rotary Feeders

Installation/Operation and Maintenance Manual

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SECTION 1: INTRODUCTION

1.1 Manual Overview

This manual describes the Prater Rotary Airlock Feeder and its installation, operation and maintenance. To insure the reliable operation and long service life of this equipment as well as personal safety, it is important that this manual is understood and referenced.

1.2 Safety Notices

Throughout this manual safety notices are provided to call out important safety concerns. As with all mechanical devices, basic safety considerations as well as proper tools, methods and training, should be used with the Prater Rotary Airlock Feeder.

Examples of the three types of safety notices (Warnings, Cautions, and Notes) in this manual are listed below.

WARNING: INDICATES A SITUATION IN WHICH PERSONAL INJURY MAY OCCUR.



CAUTION: INDICATES A SITUATION IN WHICH DAMAGE TO EQUIPMENT OR MATERIAL MAY OCCUR.



NOTE: Provides helpful information for proper operation of the Rotary Airlock Feeder.

1.3 Safety Precautions

The safety checklist below and warnings provide basic guidelines for operation, but the precautions listed in this manual may not be all-inclusive. Specific operations, environments, and industries may introduce special safety concerns of which it is the responsibility of those involved with this equipment to observe.

WARNING OPERATORS MUST BE INSTRUCTED NOT TO PUT HANDS, FINGERS OR OTHER FOREIGN OBJECTS IN THE MACHINE, AND NOT TO REMOVE ANY COVER, DOOR, HATCH OR OTHER PROTECTIVE DEVICE. COVERS, DOORS, HATCHES AND OTHER PROTECTIVE DEVICES ARE PLACED ON THIS MACHINE FOR THE SAFETY OF THE OPERATOR. ANY ATTEMPT TO DEFEAT THESE DEVICES COULD RESULT IN SERIOUS INJURY.



WARNING ELECTRICAL SERVICE TO THE MACHINE MUST BE LOCKED OUT WHILE ANY REPAIRS OR ADJUSTMENTS ARE BEING MADE OR WHILE ANY COVER, DOOR, HATCH OR OTHER PROTECTIVE DEVICE IS NOT IN PLACE.



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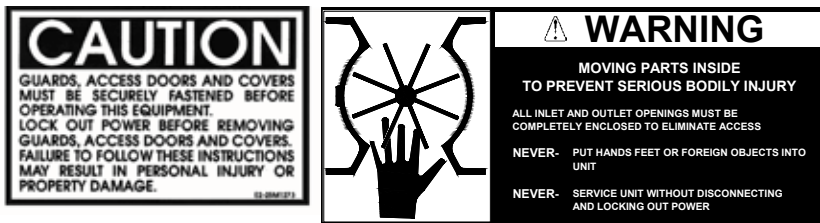
Explosion Protection Devices

1.4 SAFETY CHECKLIST

- _ **ALWAYS** operate Rotary Airlock Feeder in accordance with instructions in this manual.
- _ **ALWAYS** have a clear view of unit loading and unloading points and all safety devices.
- _ **ALWAYS** allow unit to stop naturally. **DO NOT** attempt to artificially brake or slow motion of unit.
- _ **KEEP** area around unit, drive and control station free of debris and obstacles.
- _ **AVOID** poking or prodding into unit openings with bar or stick
- _ **DO NOT** open inspection doors while unit is in motion.
- _ **DO NOT** use the Rotary Airlock Feeder for processing of material other than the specific application for which it was designed.
- _ **NEVER** work on unit and related components unless electric power and motor drive have been locked out and tagged. The National Electrical Code requires a manually operable disconnect switch located within sight of motor, or a controller disconnecting means capable of being locked if not within sight of the motor.
- _ **NEVER** operate unit without guards and all safety devices in position and functioning.
- _ **NEVER** put your hand near, on, or in the inlet or outlet of the airlock while it is operating or stalled.

Illustration A-A shows safety labels installed on the Rotary Airlock Feeder. These labels should be understood by all personnel, and not removed or covered under any circumstance.

Illustration A-A



APPENDIX G

Explosion Protection Devices

1.5 Contact Information

If any questions or uncertainties arise concerning the Rotary Airlock Feeder please contact Prater Industries customer service.

Customer Service (800) 323-5735
 (800) 799-1902

Sales (800) 451-6958
Airlock Sales (877) 247-5625

Notes:

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SECTION 2: AIRLOCK UNIT OVERVIEW

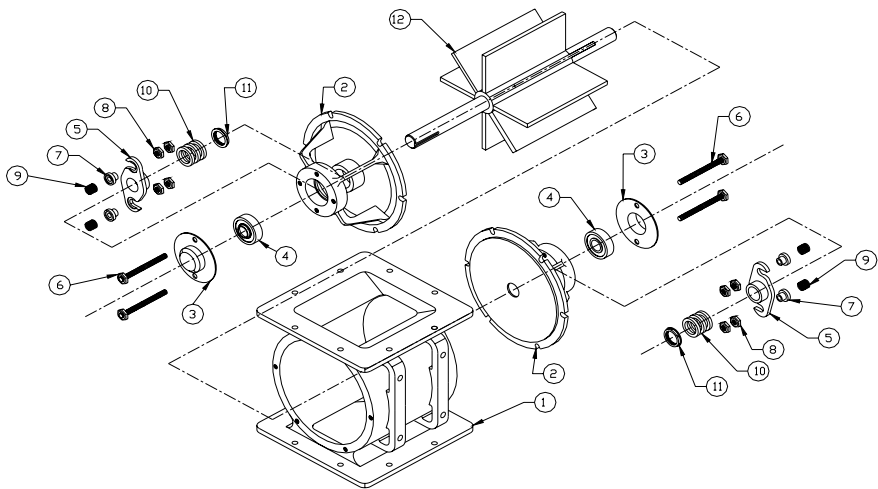
2.1 Field of Operation

Prater Rotary Airlock Feeders are primarily used to perform three basic functions:

- 1. Feed free flowing material from a bin or hopper.
- 2. Deliver fines from a collector while sealing against air loss.
- 3. Feed free-flowing material into or out of a pneumatic conveying system against pressure or vacuum.

2.1.1 Unit Design

Exploded View



NO.	DESCRIPTION	NO.	DESCRIPTION
1.	HOUSING	7.	SPRING RETAINER
2.	END PLATE	8.	SPRING RELEASE NUT
3.	BEARING CAP	9.	SPRINGS
4.	BEARING	10.	PACKING
5.	PACKING GLAND	11.	LANTERN RINGS (OPTIONAL)
6.	SOCKET SET SCREWS	12.	8 BLADE OPEN ROTOR

Explosion Protection Devices

2.1.2 Materials/Coatings

Prater heavy-duty airlock housings and end plates are made of cast iron and/or 316L stainless steel. Coatings that are available for the housing & endplates are chrome, tungsten carbide, teflon, & electro nickel. Coatings that are available for the rotor are chrome, tungsten carbide, teflon, & stellite.

2.2 Rotor Overview

The eight-blade rotor is the standard on all heavy-duty airlocks. Rotors could have several options.

Beveled Rotor Blades: used for materials that have a tendency to smear or pack

Bolt-On Wear Bars: used in excessive wear applications.

Closed End Rotor: used to reduce air leakage and to contain material

Shallow Pocket Rotors: used to reduce the capacity of a rotor.

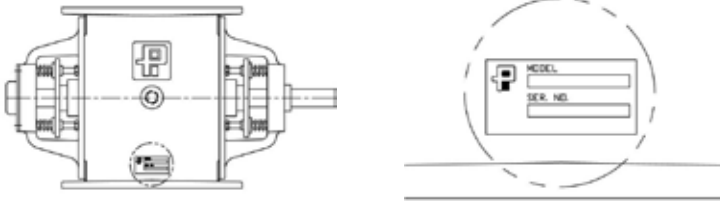
2.2.1 Rotor Speed

Rotor speeds and airlock sizes will determine the volume of material passing through an airlock. Standard design for airlocks is to run at 15 RPM. Airlocks can be set up to run between 5 and 25 RPM. Running over 25 RPM may result in the pockets not filling properly and could result in excess wear. Which would reduce the life expectancy of your airlock.

2.3 I.D. Tag

The I.D. tag can be found on the return side of the unit see figure B-B. The model number and serial number will be found on the I.D. tag.

Figure B-B



2.4 Operating Principle

The Prater Rotary Airlock Feeder has been manufactured with the upmost quality, materials, and workmanship, and if given reasonable care, will perform perfectly with minimum maintenance. Each part has been machined to close tolerances to assure the best fit between all components as well as interchangeability.

APPENDIX G
Explosion Protection Devices

2.5 Specifications

2.5.1 Standards and Weights

Table C-C
Airlock Standards and Weights

PAV	6	8	10	12	14	16	1420	1824	2830
Rotor Speed (RPM)	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30	10-30
Motor Size (HP)	1/2	3/4	1	1-1/2	1-1/2	2	1-1/2	2	5
Weight (Lbs)	98	143	225	495	650	760	540	1275	3450
Weight w/ Drive (Lbs)	170	250	350	560	775	1095	625	1400	3825
Std. Blades Config	8	8	8	8	8	8	8	8	10
Other Blade Config's	6	6	6	6	10	10	10	10	--

2.5.2 Capacities

Table D-D
Airlock Capacity Chart (cubic feet per minute) @ 80% of Maximum

Size	RPM				
	5	10	15	20	25
PAV 6	0.60	1.20	1.80	2.40	3.00
PAV 8	1.20	2.40	3.60	4.80	6.00
PAV 10	2.10	4.20	6.30	8.40	10.50
PAV 12	3.80	7.60	11.40	15.20	19.00
PAV 14	--	11.80	17.70	23.60	29.50
PAV 16	--	18.40	27.60	36.80	46.00
PAV 1420	--	10.40	15.60	20.80	--
PAV 1824	--	24.00	36.00	--	--
PAV 2830	--	78.00	117.00	--	--

Explosion Protection Devices

SECTION 3: INSTALLATION

3.1 Introduction

The installation of Prater's Rotary Airlock Feeder is critical in providing both efficient and productive operation of the unit, and longevity of the unit.

3.2 Receiving the Unit

When your shipment arrives, thoroughly inspect the Rotary Airlock Feeder and all related equipment. In the event of shipping damage, note the problem on the bill of lading or freight bill and make sure you obtain the driver's signature for possible claim against delivering carrier.

NOTE It is the receiver's obligation to file claims for shipping damage.

3.3 Before Installation

Be sure the installation crew is aware of installation requirements. If there is any question or uncertainty clarify the matter to avoid improper installation. Personnel responsible for installation should be familiar with all the procedures and information in this manual.

In preparing for installation, make sure you provide for all appropriate safety devices. Prater Industries Inc. does not install your machine, thus it is your responsibility to provide lockout switches, guards, and other safety devices and safety procedures to protect the machine operator or maintenance personnel.

3.4 Location

There are two essential considerations for the Rotary Airlock Feeder location: the foundation below the machine and the free clearance around it.

3.4.1 Foundation

The Rotary Airlock Feeder must be supported in a strong stable vibration free location. The Rotary Airlock Feeder should never be located where it is supporting other equipment, hoppers, or other structural loading. Additional weight applied to the airlock can distort the housing causing binding of the rotor.

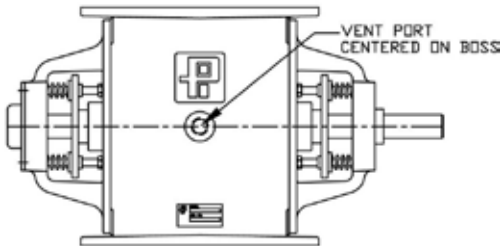
3.4.2 Clearance

There should be sufficient open space in all directions around the Rotary Airlock Feeder to allow access for maintenance operations.

3.5 Pneumatic Line

When used in a pressure system Rotary Airlock Feeders may need a gasket between the mounting surfaces to prevent any leakage of product or air. A pocket vent is used to relieve the pockets of any pressure on the return side of the airlock. It could be discharged to either the atmosphere or a dust collector system. We recommend running it to a dust collector system for optimal operation.

Explosion Protection Devices



POCKET VENT AND PORT SIZES	
AIRLOCK	PORT SIZE
AV-6	1/2"
PAV-8	1/2"
PAV-10	3/4"
PAV-12	1-1/2"
PAV-14	1-1/2"
PAV-16	1-1/2"
PAV-1420	1-1/2"
PAV-1824	1-1/2"
PAV-2830	2"

3.6 Leveling

The Base of the unit must be level to prevent vibrations that will accelerate wear. Before tightening the fastening bolts, check for correct unit leveling at corners of the Airlock Feeder.

To correct level:

1. Insert shims for proper alignment.
2. Re-check level at corners of Rotary Airlock Feeder.
3. Tighten all fastening bolts.

3.7 Vibration

The Prater Rotary Airlock Feeder is constructed to run without noticeable vibration. Vibration indicates a problem that must be found and corrected immediately. Left uncorrected, vibration will cause the following:

- Rotary Airlock Feeder damage
- Structural damage

There are several conditions that cause vibrations, including:

- Uneven base
- Loose motor fasteners
- Defective motor or Rotary Airlock Feeder bearings (See Section 5)
- Other equipment transferring vibration thru contact with the Rotary Airlock Feeder.
- Foreign material in the Airlock Feeder.
- Material temperature higher than specified.
- Vibration of the Airlock Feeder's motor.
- Chain to Sprocket not aligned

Explosion Protection Devices

3.8 Drive

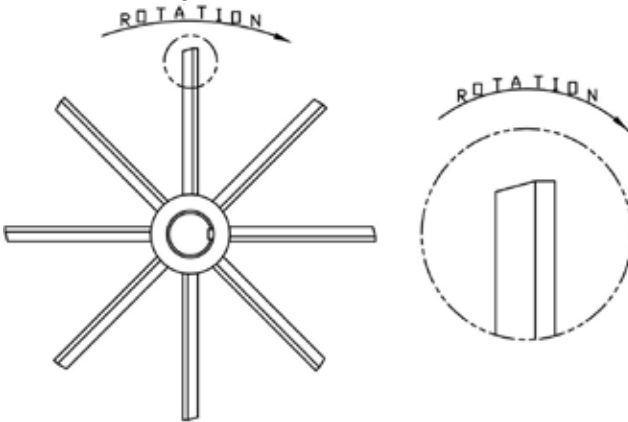
The Rotary Airlock Feeder has been supplied with the proper drive and is properly mounted. A chain guard will be provided with all Rotary Airlock Feeders, unless the customer requests, in writing, that the guard need not be provided. The guard is built to rigid specifications to our standard center distances and locations. "OSHA" requirements mandate guarding all drives, and the customer MUST supply an approved design guard if he requests Prater Companies not to supply one. Exposed chains are a HAZARDOUS condition.

3.9 Beveled Rotors

The rotary Airlock Feeder may be equipped with a rotor having the trailing edges and tips beveled. This is done to provide a relief angle to prevent material from smearing or catching between the endplate and rotor.

In this instance, it is important that the rotation of the rotor be in such a manner so that the square edge of the rotor leads and the beveled edge trails. This will result in a clockwise rotation of the rotor when viewed from the drive end of the airlock as shown in Figure G-G

Figure G-G Beveled Rotor Orientation



3.10 Air Purge Seals

Under certain operating conditions, especially when the feeder is handling abrasive dust, it may be desirable to purge the packing gland with compressed air or inert gas (Do not operate the rotary airlock feeder with optional air purge seals without pressurized clean and dry air stream or inert gas flow). This is accomplished by installing a lantern ring in place of the innermost ring of the packing, immediately adjacent to the rotor side of each end plate. The ring is so designed as to distribute the air or inert gas evenly in a thin film around the shaft. Both end plates have a 3/8" NPT for connecting a compressed air line to the seals. Purge air pressure should be 2-5 PSI or 3-5 PSI above conveying system pressure if installed in a pneumatic conveying line. The purge air loss will be about 1 SCFM. If the air pressure is set too low or is not properly connected, material will not be properly cleaned from the air purge lantern ring and will damage the ring and seals, requiring replacement.

3-3

Explosion Protection Devices



CAUTION: DO NOT OPERATE ROTARY AIRLOCK FEEDER WITH OPTIONAL AIR PURGE SEALS WITHOUT PRESSURIZED CLEAN AND DRY AIR STREAM OR INERT GAS FLOW.

3.11 Electrical Requirements

Install connections to meet all national local electrical codes. Consult with your local power company before installation.

NOTE: The National Electrical Code requires a manually operable disconnect switch located within sight of the motor, or a controller disconnecting means capable of being locked if not within sight of the motor.

Effective October 31, 1989, OSHA requires that all energy disconnect devices be capable of accepting a lock-out/tag-out device. This requirement is mandatory for any new equipment being installed or for replacement, repair or modification of older equipment. The employer must:

- Produce a written program explaining the procedure.
- Conduct an annual inspection to verify compliance.
- Provide documented employee training in these procedures.

3.11.1 Gearmotor Electrical Connections

Check the motor nameplate to verify the phase, hertz and voltage agrees with the available power supply. Connection should conform to local codes. A connection diagram for the motor is located inside the conduit box and on the motor nameplate. The motor starter should incorporate an overload protector.

3.11.2 Electrical Interlocking & System Component Starting/Stopping Order

As a general guide, the last piece or process equipment is started first with subsequent starts working up the line to the feeder being the last item started and the first item stopped. If used as a bin discharge, it should be started first and stopped last.

3.11.3 Gearmotor Startup

All units are lubricated before shipment. The breather is plugged for shipment. Before start-up or prolonged storage remove the plastic wick from the breather. The lubricant level should be checked with the unit mounted in its correct operating position. Lubricant should be added or removed to bring it to the correct level.

3.12 Unit Check

After installation is complete, carefully inspect all work and review installation requirements of this manual before installation crew leaves.

SECTION 4: OPERATION

4.1 Introduction

Pre-run inspections and safety checks throughout this section insure that the Rotary Airlock Feeder is in proper operating condition.

4.2 Before Operation

All operating personnel must be well trained in procedures for operating and maintaining the Rotary Airlock Feeder as illustrated in this manual. Of particular importance is detailed understanding of the safety precautions described in section 1.

4.3 Safety Check-Up

Before Starting the Rotary Airlock Feeder check for:

- Foreign material, i.e., nuts, bolts, wire, rags, paper, wood, etc., which may have been left in the Rotary Airlock Feeder, or system piping.
- Properly mounted guards.
- Electrical starting equipment, meters, disconnect switches, and other control devices, to see that they are clearly visible and readily accessible.
- Air Purge compressed air supply, if unit has air purged lantern rings.

4.4 Starting and Stopping Check List

This checklist should be followed during the initial installation and after any shut down period or maintenance procedure.

1. Check inside Rotary Airlock Feeder and remove any foreign material that may have accumulated during shipment and installation.
2. Check rotor for correct direction or rotation relative to material feeding.
3. Check tension and alignment of drive chain.
4. Make sure gearbox lubrication is sufficient. (Section 5.7)
5. Set up and check compressed air supply if unit is supplied with air purged lantern rings.
6. Make sure no tension from surrounding equipment is placed on airlock feeder housing.
7. First start should be without product. Check to see if packing glands are under spring pressure for proper sealing of packing.
8. Feed material into Rotary Feeder inlet while unit is in operation.
9. Do not continue to operate when malfunctions occur or problems arise.

Notes

SECTION 5: MAINTENANCE

5.1 Introduction

The Rotary Airlock Feeder is designed to operate with minimum maintenance. Routine inspections and regular maintenance will identify any work or broken parts before they become a problem. Worn or broken parts are damaging to the Rotary Airlock Feeder and its output.

WARNING DO NOT OPEN ROTARY AIRLOCK FEEDER OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE AIRLOCK HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED OUT.



5.2 Routine Inspection

Rotating equipment requires regular routine preventative maintenance procedures. Regular inspection of the rotor blades should be carried out particularly where abrasive materials are being processed. The wear pattern on the rotor blades will vary depending upon operating condition. If visual inspection shows noticeable wear which would allow for air or product leakage replacement of rotor, or optional wear bars may be required.

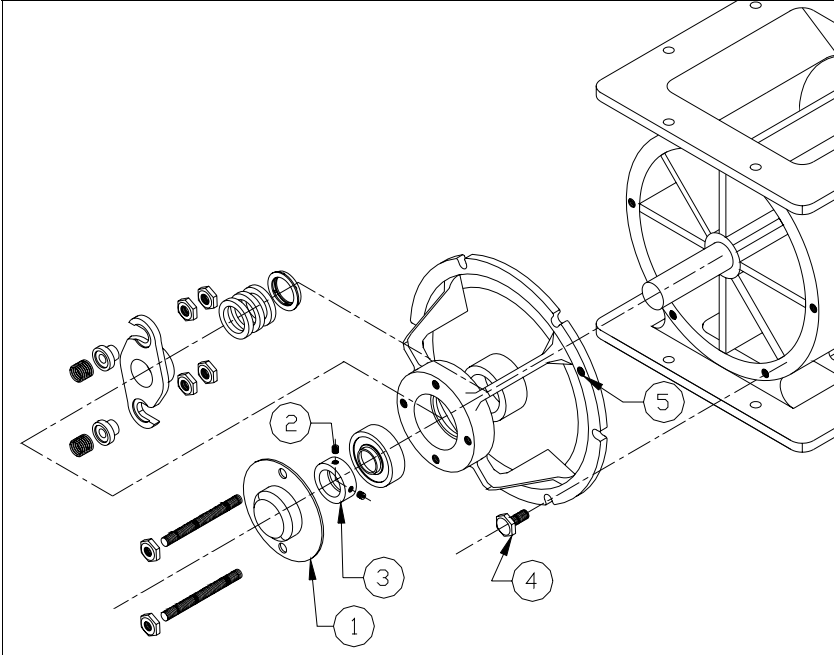
5.3 End Plate Removal

1. Turn off the Rotary Airlock Feeder and allow the rotor to come to a complete stop.
2. Lock out electrical power to the Rotary Airlock Feeder.
3. Remove bearing cap (1) in Figure H-H.
4. Loosen set screws (2) in the eccentric locking collar (3) which secures the bearing inner race to the shaft.
5. Rotate the collar (3) to the left until it is free, then slide it off the shaft.
6. Remove the 6 cap screws (4) which secure the end plate to the housing.
7. Slide the entire end plate assembly, complete with bearings, packing and packing gland off the shaft.
8. If there is difficulty removing the end plate, jack bolt holes (5) have been provided. Insert a bolt in each jack bolt hole and slowly screw the bolt into the end plate. When the bolt hits the housing the endplate should begin to detach from the housing.
9. To re-attach the end plate and follow the procedures of this section in reverse order. Whenever the locking collars are removed from the rotor it is necessary to re-gap the rotor in the housing upon reassembly as described in Section 5.4.

5.3.1 Jack Bolt Holes

Two jack bolt holes are supplied on each end plate for PAV-6, PAV-8, PAV-10 & PAV-12 with a 3/8-16 thread. PAV-14, PAV-16 & PAV1420 have a 5/8-11 thread. No jack boltholes are supplied for PAV-1824 & PAV-2830.

**FIGURE H-H
END PLATE REMOVAL**



5.4 Gapping the Rotor

When received from the factory, the Rotary Airlock Feeder has a precisely positioned rotor to create even gaps on the bore and sides of the housing. If the bearing locking collars are removed for any reason, such as removing an endplate, the rotor must be gapped before returning to operation.

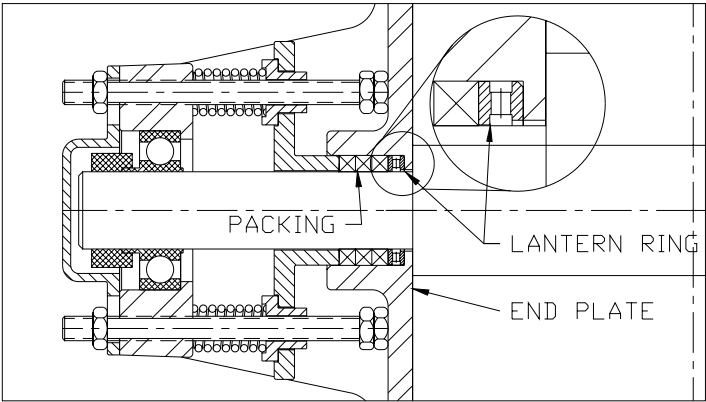
To achieve the desired clearance, use feeler gages, and insert the proper clearance gage between the rotor end, and the endplate. Lock one of the bearing collars with the spacer in place. Next space the opposite gap between the rotor and the other endplate. Adjust by lightly tapping the shaft end, and when the proper gaps are achieved lock the second bearing collar. Finally make sure the proper gap is achieved between the housing bore and the rotor blade tips. If it is not, check to make sure the bearings are seated properly in the endplates. To determine proper clearances, call Prater Industries and give the CS Representative the S/N of the airlock to obtain required clearances for the application.

5.5.1 Bearings

The bearings provided in the Rotary Airlock Feeders are lubricated and sealed at the factory and require no further lubrication for the life of the Feeder. If bearing failure occurs, Prater Industries can provide replacement bearings, such as in the spare parts kit discussed in Section 5.6.

Explosion Protection Devices

Figure J-J
Lantern Ring Orientation



5.6 Spare Parts Kit

To keep the Rotary Airlock Feeder performing optimally, a spare parts kit can be purchased from Prater Industries. This kit includes original factory replacements to components that commonly wear. Table K-K

Table K-K

Part Number from Exploded View	Description	Quantity Included
5	Packing Glands	2
4	Bearing	2
7	Nylon Spring Retainer	4
9	Music Wire Spring	4
6	Socket Set Screw	4
8	Nut, Heavy Hex Jam	8
10	Packing	10

APPENDIX G

Explosion Protection Devices

5.7 Gearmotor Lubrication and Maintenance Information

A. MOTOR

During maintenance, inspect the fan guard and remove any accumulated debris from under it and around the motor and gear. Motor bearings are greased during assembly. For re-lubrication the following suggestions are offered:

HOURS OF SERVICE PER YEAR	HP RANGE	SUGGESTED RELUBE INTERVAL
5,000	1/4 to 7 ½ 10 to 40 50 to 150	5 years 3 years 1 year
CONTINUOUS Normal Application	1/4 to 7 ½ 10 to 40 50 to 150	2 years 1 year 9 months
SEASONAL SERVICE Motor is idle for 6 months or more	ALL	1 year (beginning of season)
CONTINUOUS High ambients, dirty or moist locations, high vibrations, or where shaft is hot (pumps - fans).	1/4 to 40 50 to 190	6 months 3 months

Use high quality ball bearing grease. Use consistency of grease suitable for class of insulation stamped on nameplate as follows:

INSULATION CLASS	CONSISTENCY	TYPE	TYPICAL	FRAME TYPE
A & B	#2	Lithium Base	Shell Alvania Grease R 3	215 T & smaller
A & B	Medium	Polyurea	Shell Dolium Grease R	254T & larger
F & H	Medium	Polyurea	Shell Dolium Grease R	All

APPENDIX G

Explosion Protection Devices

Procedure:

If motor is equipped with Alemite fitting, clean tip of fitting and apply grease gun. Use 1 to 2 full strokes on motors in NEMA 215 frame and smaller. Use 2 to 3 strokes on NEMA 254 through NEMA 365 frame. Use 3 to 4 strokes on NEMA 404 frames and larger. On motors having drain plugs, remove grease drain plug and operate motor for 20 minutes before replacing drain plug.

On motors equipped with slotted head grease screw, remove screw and apply grease tube to hole. Insert 2 to 3 inch length of grease string into each hole on motors in NEMA 215 frame and smaller. Insert 3 to 5 inches length on larger motors. Having grease drain plugs, remove plug and operate motor 20 minutes before replacing drain plug.

Caution: Keep grease clean. Lubricate motors at standstill. Remove and replace drain plugs at standstill. Do not mix petroleum grease and silicone grease in motor bearings.

B. GEARS

Gear units should have the oil changed every 10,000 hours or 2 years. If synthetic lubricant is used it should be changed every 20,000 hours or 4 years. For adverse operating conditions the interval should be shorter. DO NOT MIX SYNTHETIC & MINERAL BASE OILS. Units should be checked periodically for increased noise, surface temperature, vibration, shaft movement & amperage draw. Units with inspection covers should not be operated with the inspection cover removed.

The table below offers suggestions on the viscosity & manufactures of recommended lubricants.

RECOMMENDED LUBRICANTS FOR HELICAL & BEVEL-HELICAL GEARING

Type of Lubricant	Ambient Temperature Range (°F)	kin Viscosity (cSt) at 40 °C (mm 2/s)	Viscosity SUS 175 100 °	AGMA Lubricant No.	ISO Grade	AMOCO	CHEVRON	EXXON	MOBIL	SHELL	TEXACO
Oil	15 to 125	198 to 242	900 to 1100	5EP	220EP	AMOGEAR EP220	NL GEAR Compound 220	SPARTAN EP220	Mobil Gear 630	Omala Oil 220	Meropa 220
	-10 to + 75°	90 to 765	465 to 165	3-4EP	100-150EP	AMOGEAR EP150	NL GEAR Compound 150	SPARTAN EP150	Mobil 629	Omala Oil 100	Meropa 150
	Below 10°**	15 to 680	135 to 165	-	-	-	E.P. Hydraulic Oil 22	UNIVIS J13	Mobil D.T.E. 11	-	Texamatic Fluid 9226 or Texamatic Type F
Oil-Synthetic	-40°to175°**	-	90 to 4000	-	-	-	-	-	Mobil SHC 629 or 634	-	Synstar GL75W-140
Fluid Grease	5° to 120°	-	-	-	-	-	-	-	-	-	MARKFAK 00

For bearings not lubricated in oil bath use a lithium base bearing grease, NLGI #2 or #3

‡ Ambient temperature below -20°F and above 140°F require special oil seals

‡‡ Consult with Nord Gear Corporation for these applications

Bold ambient temperature indicates factory filled

APPENDIX G

Explosion Protection Devices

SECTION 6: TROUBLESHOOTING

WARNING DO NOT OPEN ROTARY AIRLOCK FEEDER OR ATTEMPT ANY FORM OF INSPECTION UNTIL THE ROTARY AIRLOCK FEEDER HAS COME TO A COMPLETE STOP AND THE ELECTRICAL DISCONNECT HAS BEEN LOCKED OUT.



6.1 Introduction

This section is offered as a general guide to analyzing problems. If after reviewing this section you have not identified your problem, contact Prater Customer Service Department for further assistance.

6.2 Start-Up Problems

Prater Equipment is made of high quality materials and assembled by skilled workers who take pride in their work. However, even on the best equipment there can still be start-up or operational problems.

If trouble occurs, please check the following:

1. Check the power source for sufficient power as specified on the nameplate. Check the wiring connections and the motor protection devices, i.e. fuses, circuit breakers, and overload elements. Replace fuses, if blown, and reset the circuit breakers or overload elements, if tripped.
2. The motor may be burned out. If it is, it will need to be repaired or replaced.
3. The gears in the gear case may have seized up due to the lack of oil. Replace the gears or the gear case.
4. If the drive is a mechanical variable speed drive and the motor runs but the output shaft doesn't turn, turn the control to 0, which is the lowest feeder speed, and adjust it back to the desired speed.
5. Check for proper assembly of the drive chain and the sprockets. The chain may be disconnected or broken.
6. Check for jamming of the rotor. If jammed, the feeder may need to be disassembled, and cleaned. Do not attempt this until the unit has been locked out. The bearings or seals may need to be replaced.

6.3 Unusual Drive or Motor Noise

1. Check for the proper alignment of the drive components. Align the sprockets with a straight edge. Insure that the chain is not rubbing against the drive guard.
2. Check for proper adjustment of the chain. If the chain is too tight, it will overload the shaft and bearings. If the chain is jumping on the sprockets, they may be worn and need to be replaced. The chain may need to be lubricated.

Explosion Protection Devices

6.4 Unusual Feeder Noise

1. Check the motor's amp draw to determine whether material build-up on the rotor or housing is overloading the motor. If the build-up is excessive, clean the rotor and housing after locking out the unit.
 - Check for the correct direction of rotation. A rotor with relieved tips rotating in the wrong direction will cause material build-up.
 - Some materials are susceptible to build-up and may cause a squealing noise as the rotor turns. This will be normal for some types of material and should not be a cause for concern if it does not cause a motor overload or damage the rotor.
2. The rotor may be rubbing on housing. Check for external loads on the inlet and outlet flanges. The feeder is not to be used as a support for loads other than the drive assembly and line adapter. Make sure rotor is centered in the housing so that it does not rub the end plates.

6.5 High Temperature

Motors operating under rated load (amp draw) and ambient conditions, as specified on the nameplate, may feel warm when touched. If overheating is suspected, check the following:

1. Check for proper operation of the feeder bearings. See section 6.6.
2. Check for excessive material build-up in the rotor. See section 6.4, step 1.
3. Verify that the electrical overload elements are properly sized per the full load amp specification on the motor nameplate. Oversized elements will not protect the motor from overload.
4. Check for proper ventilation around the motor. Material or dust build-up on the exterior of the motor may hamper ventilation.
5. Check the oil level in the gear case. If it needs to be filled, see section 5.7.

6.6 Feeder Bearing Malfunction or Failure

1. Disassemble the bearing from the feeder.
 - Check the wear, dirt or material in the bearings. If there is damage, replace the bearings. If there is material in the bearings, check the condition of the seals. See paragraph 6.7.

6.7 Leaking Air Purge Seals

1. Check to insure that a compressed air supply has been installed to the feeder. Never operate a feeder that has air purge seals without purge air. If the feeder has been operated without the air purge operating, the seals are probably damaged and need to be replaced. See section 5.5.3
2. Check for proper operation and adjustment. The air should be set 3 - 5 PSI above the conveying system operating pressure. If the air is set too low, material will not be properly cleaned from the air purge diffusers and will damage the seals. The seals should be replaced. See section 5.5.3

Explosion Protection Devices

6.8 Leaking Packing Seals

1. The packing gland may not be tight against the packing. Be sure spring release nuts (8), See section 2.1.1 are not in contact with spring retainer (7).
2. The packing seals may be damaged or worn. Remove the seals and replace them. See section 5.5.3

6.9 Air Loss

1. Check for the correct rotor-to-housing and rotor-to-end plate clearance. Excessive clearance will result in excessive air loss.
2. Check the condition of the seals. See paragraphs 6.7 and 6.8.

6.10 Material Not Flowing

1. Check for material build-up in the rotor pockets. Clean the feeder rotor after the unit has been locked out.
2. Check for correct rotor-to-housing and rotor-to-end plate clearance. If there is too much clearance, air loss through the clearances may cause the material to bridge above the feeder decreasing the material flow.
3. Vented shear protectors are designed to minimize the changes for material bridging above the feeder by venting the displaced air from each pocket as it fills, as well as any air leakage through the clearances. A vented shear protector may need to be installed for your application.
4. If a vented shear protector is installed, check the condition of the long seal flap. If it is worn or sheared off due to incorrect installation or incorrect rotor rotation, it will need to be replaced.
5. Check for the correct feeder RPM.

Explosion Protection Devices

Return and Missing Material Information

Prater must be advised within five (5) working days of receipt of shipment on all claims regarding missing parts or shortages. Failure to inform Prater within this period will forfeit any such claims.

All parts and units must have pre-approval by Prater Customer Service Dept. before any parts or units are returned.

Customer service will issue a return material authorization (R.M.A.) Number prior to return of parts.

Any item which the customer claims to be defective must be returned prepaid, unless Prater has shipped incorrect material, then the following action will be taken:

UPS call tag will be issued.

If the material exceeds UPS weight limits Prater will direct its freight carrier to pick up the material.

Only material which has been in the customer's possession for less than one year after ship date will be authorized for return.

All returns must be received within 30 days from issue date of R.M.A. number.

Material must be returned undamaged with no signs of rust and/or marks.

Only material deemed standard by Prater would be authorized for return unless the return is necessary due to Prater error.

A 25% restocking charge will be imposed on returns, which are due to customer's error.

Merchandise credit will be issued on returns approved by customer service.

Installation

The company does not provide installation services. Installation and operating instructions, drawings and suggested electrician's wiring diagram (where required) will be furnished. The Company is not responsible for the improper installation or wiring or system problems where the Company does not supply the whole system. If a Company service technician is to inspect the installation when completed perform adjustments, direct changes and/or instruct personnel in equipment use and service, see rates below.

Service Rates:

1. \$ _____ per day portal to portal based on eight (8) hours per day, Monday through Friday.
2. If less than eight (8) hours are applicable in any one day, the rate shall be \$ _____ per hour, portal to portal, Monday through Friday.
3. An eight (8) hour work period on Saturday, Sunday or holidays shall be \$ _____ per day, portal to portal.
4. If the service technician shall be required to work more than twelve (12) hours at a time. The technician will be allowed a minimum of ten (10) hours of before required to return to a job.
5. All travel and living expenses are to be changed at the cost incurred plus 10%. All efforts will be made to keep this to a reasonable level.
7. Company car: mileage charge = \$ _____ per mile.

The rates quoted are those in affect at the date indicated on this sheet and are subject to change without notice.

The above rates cover a qualified factory-trained service technician. If an engineer or other type specialist is required, a different rate will apply.

APPENDIX H

HEPA Filters Installation & Maintenance



APPENDIX H

HEPA Filters

Features:

The RoboVent Magna Series HEPA grade air filters are designed for high-efficiency commercial and industrial applications. Magna Series efficiency ranges include: 1000 Series - 99.97% and 1100 Series - 99.99%, all based on a .30 micron particle. RoboVent Magna filters are produced in a wide range of sizes, frame types and header combinations and are ideal for converting or upgrading existing systems. As an option, RoboVent High-Capacity Magna filter models are also available for higher velocity applications and incorporate more media area for lower resistance.

Quality Assurance - the Magna 1000 Series - 99.97% and 1100 Series - 99.99% filters incorporate glass microfiber media rolls that are randomly tested and certified to meet minimum-efficiency requirements by the media manufacturer. In addition, Glasfloss randomly selects and tests filters for leaks under a rigorous quality control Program.

Media produced from glass microfibers are moisture-resistant and will not support microbial growth.

Magna 99.99% filters are tested for leaks based on near-monodispersed .30 micron size particle.

Frame is available in either 3/4" particleboard or 18 gauge galvanized metal for the 1000 Series - 99.97% and 1100 Series - 99.99%. A 26-gauge galvanized metal frame is used for the Magna 950 Series - 95%.

Aluminum separators incorporate rolled edges that help prevent media chaffing and damage in handling. The filter cartridge is bonded within the frame using a two-part sealant that isolates the filter from external shock and prevents air bypass.

Neoprene closed cell gasket is standard on each filter.

Magna 950 Series - 95%, 1000 Series - 99.97% and 1100 Series - 99.99% are available in standard and special size face dimensions.

Optional Features:

Upon request, the Magna 1000 Series - 99.97% shall be individually tested for leaks based on near-monodispersed .30 micron size particle.

An expanded metal wire lath face guard can be placed on air-entry and/or the air-exit side of the filter.

An aluminum header is available on the particleboard frame.

High-capacity and turbine style filters are available.

APPENDIX H

HEPA Filters

Construction:

The RoboVent Magna Series shall be manufactured with high-efficiency glass microfiber media that is gently pleated to form the media pack. Rolled-edge aluminum separators are inserted between each pleat to provide an extensive area for open air flow and to stabilize the media pack. A heavy-duty galvanized metal frame shall encapsulate the media pack. A self-extinguishing adhesive shall completely bond the media pack inside the filter frame to prevent air bypass. An external neoprene gasket is standard on the filter. Each Magna filter is packaged into a heavy-duty carton to help protect the filter from damage.

Applications:

The RoboVent Magna Series is designed for use where a high degree of cleanliness is required and contaminants must be removed to protect health, products or building interiors. The filters are ideal in a variety of applications including hospitals, manufacturing plants, microelectronics component assembly, negative-air machines, biological hoods and food processing.

Specifications:

The frame shall be made of 18-gauge galvanized metal. A 26-gauge galvanized steel header is available on the metal frame and an aluminum header. The media shall be constructed of a water-resistant, inorganic glass microfiber. For quality assurance, the glass microfiber media rolls are randomly tested and certified to meet minimum efficiency requirements by the media manufacturer. The media pack shall consist of a continuous sheet of the pleated glass microfiber. The pleated media pack is separated with multiple rolled-edge corrugated aluminum separators. The media cartridge shall be sealed with a fire retarding, rubber base, two-part sealant that bonds the media and separators to the interior of the frame. A 1/4" thick closed cell neoprene gasket shall be applied on the filter.

The filter shall be rated to withstand temperatures at a continuous 180o Fahrenheit. The 99.97% and 99.99% Magna filters shall be rated Class 2 under U. L. Std. 900. The filter element shall be factory-constructed by pleating a continuous sheet of glass microfiber media into uniform spaced pleats which are separated by rolled-edge corrugated aluminum. The efficiency shall be 99.97% or 99.99% based on a nearmonodispersed .30 micron size particle. This filter pack shall be encased in 18-gauge galvanized steel for the 1000 Series - 99.97% and 1100 Series - 99.99% efficiencies. The frame shall not exceed 5-7/8" or 11-1/2" in depth, and standard tolerances shall be +/- 1/16" on height and width. A closed-cell neoprene gasket shall be applied to the filter. Each filter shall be packaged into a heavy-duty carton. Filters shall be listed U.L. Class 2 under Std. 900.

APPENDIX H
HEPA Filters

BASE MODEL NUMBER	SIZE H x W x D NOMINAL	SIZE H x W x D EXACT	RATED VELOCITY FPM		INITIAL RESIST. IN. W.G.	
			Std.	H.C.	Std.	H.C.
0808A5	8 x 8 x 6	8 x 8 x 5-7/8	175		1.0"	
1212A5	12 x 12 x 6	12 x 12 x 5-7/8	175		1.0"	
1224A5	12 x 24 x 6	12 x 24 x 5-7/8	175		1.0"	
1818A5	18 x 18 x 6	18 x 18 x 5-7/8	175		1.0"	
1824A5	18 x 24 x 6	18 x 24 x 5-7/8	175		1.0"	
2424A5	24 x 24 x 6	24 x 24 x 5-7/8	175		1.0"	
2430A5	24 x 30 x 6	24 x 30 x 5-7/8	175		1.0"	
2436A5	24 x 30 x 6	24 x 36 x 5-7/8	175		1.0"	
2448A5	24 x 48 x 6	24 x 48 x 5-7/8	175		1.0"	
2460A5	24 x 60 x 6	24 x 72 x 5-7/8	175		1.0"	
2472A5	24 x 72 x 6	24 x 72 x 5-7/8	175		1.0"	
1212B5	12 x 12 x 12	12 x 12 x 11-1/2	275	500	1.0"	1.45"
23F11FB5	24 x 12 x 12	23-3/8 x 11-3/8 x 11-1/2	275	500	1.0"	1.45"
2412B5	24 x 12 x 12	24 x 12 x 11-1/2	275	500	1.0"	1.45"
2418B5	24 x 18 x 12	24 x 18 x 11-1/2	275	500	1.0"	1.45"
23F23FB5	24 x 24 x 12	23-3/8 x 23-3/8 x 11-1/2	275	500	1.0"	1.45"
2424B5	24 x 24 x 12	24 x 24 x 11-1/2	275	500	1.0"	1.45"
2430B5	24 x 30 x 12	24 x 30 x 11-1/2	275	500	1.0"	1.45"

APPENDIX H
HEPA Filters

MEDIA SQUARE FEET Std. H.C.		SIZE H x W x D EXACT	RATED VELOCITY M/H Std. H.C.		INITIAL RESIST.PASCALS Std. H.C.	
7.87		203 x 203 x 149	3202.5		248.8	
20.93		305 x 305 x 149	3202.5		248.8	
44.84		305 x 610 x 149	3202.5		248.8	
51.68		457 x 457 x 149	3202.5		248.8	
70.47		457 x 610 x 149	3202.5		248.8	
96.09		610 x 610 x 149	3202.5		248.8	
123.32		610 x 762 x 149	3202.5		248.8	
148.95		610 x 914 x 149	3202.5		248.8	
200.20		610 x 1219 x 19	3202.5		248.8	
253.05		610 x 1524 x 149	3202.5		248.8	
304.30		610 x 1829 x 149	3202.5		248.8	
42.88	50.53	305 x 305 x 292	5032.5	9150	248.8	360.6
84.97	100.81	594 x 289 x 292	5032.5	9150	248.8	360.6
91.88	110.25	610 x 305 x 292	5032.5	9150	248.8	360.6
144.38	173.25	610 x 457 x 292	5032.5	9150	248.8	360.6
188.22	223.31	594 x 594 x 292	5032.5	9150	248.8	360.6
196.88	236.25	610 x 610 x 292	5032.5	9150	248.8	360.6
252.66	298.59	610 x 762 x 292	5032.5	9150	248.8	360.6



APPENDIX I

Delta3 Maintenance



Delta3 Maintenance

Delta3 Monthly Maintenance

1. Inspect the inside of the Delta3 for damage.
2. Wipe down inside surface of Delta3 to keep it clean of debris and particulate build-up.



APPENDIX J

OSHA's Hexavalent Chromium Standards

OSHA's Hexavalent Chromium Standards

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Introduction

This document is intended to supplement OSHA's Small Entity Compliance Guide for the Hexavalent Chromium Standards published in 2006 (see Additional Information section for web link to this document) and to give readers an overview of the provisions and requirements of the Hexavalent Chromium standards for general industry (29 CFR 1910.1026), shipyards (29 CFR 1915.1026), and construction (29 CFR 1926.1126).

Hexavalent chromium (Cr(VI)) is a toxic form of the element chromium. Hexavalent chromium is rarely found in nature and is generally man-made. Cr(VI) is widely used in pigments, metal finishing (electroplating), wood preservatives and fungicides, and in chemical synthesis as an ingredient and catalyst. Table 1 on the next page lists some selected Cr(VI) compounds with their synonyms and common uses.

Hexavalent chromium may also be present in fumes generated during the production or welding of chrome alloys. Chromium metal is often alloyed with other metals or plated on metal and plastic substrates to improve corrosion resistance and provide protective coatings. The steel industry is a major consumer of chromium metal in the production of stainless steel.

This booklet is intended to provide information about the Hexavalent Chromium standards for general industry (29 CFR 1910.1026), shipyards (29 CFR 1915.1026), and construction (29 CFR 1926.1126). The *Occupational Safety and Health Act* requires employers to comply with safety and health standards promulgated by OSHA or by a state with an OSHA-approved state plan. However, this booklet is not itself a standard or regulation, and it creates no new legal obligations.

OSHA's Hexavalent Chromium Standards



Since 2000, there has been a decline in the use of chromates in pigments for paints and coatings; printing inks; ceramic, glass and construction materials; roofing and plastics. Employers are substituting less toxic inorganic and organic pigments where possible (SRI Consulting, 2008).

Table 1. Selected Cr(VI) Compounds and Their Uses

<i>Chemical Name</i>	<i>Synonyms</i>	<i>Uses</i>
Chromium Trioxide	Chromic acid, chromia, chromic (VI) acid, chromic trioxide, chromium oxide, chromium (VI) oxide	Most common uses: chromium plating, aluminum anodizing, and chemical intermediate for chromated copper arsenate wood preservatives. Other uses: ceramic glazes, colored glass, metal cleaning, inks, and paints (inorganic pigments).
Lead Chromate	C.I. pigment Yellow 34, crocoite, lead chromium oxide, plumbous chromate	Decorating china, pigment in industrial paints, rubber and plastics, pigment in oil paints and watercolors, and printing fabrics.
Sodium Dichromate	Disodium salt, chromium sodium oxide, dichromic acid, disodium dichromate, sodium bichromate, sodium dichromate	Inks, oxidizing agent in the manufacture of dyes and many other synthetic organic chemicals, electric batteries, manufacture of chromic acid, other chromates and chrome pigments, corrosion inhibiting paints, component of wood preservatives, and colorant for glass.
Zinc Chromate	Zinc salt, chromium zinc oxide, zinc chromium oxide, zinc tetraoxychromate	Priming paints for metals, varnishes and pigments in aerospace paints.

Adapted from: Meridian Research, 1994.

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Worker Exposure and Health Consequences

Workplace exposure to Cr(VI) may cause the following health effects:

- lung cancer in workers who breathe airborne Cr(VI);
- irritation or damage to the nose, throat and lungs (respiratory tract) if Cr(VI) is inhaled; and
- irritation or damage to the eyes and skin if Cr(VI) contacts these organs.

Workers can inhale airborne Cr(VI) as a dust, fume or mist while, among other things, producing chromate pigments, dyes and powders (such as chromic acid and chromium catalysts); working near chrome electroplating; performing hot work and welding on stainless steel, high chrome alloys and chrome-coated metal; and applying and removing chromate-containing paints and other surface coatings. Skin exposure can occur while handling solutions, coatings and cements containing Cr(VI).

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OSHA has separate standards for Cr(VI) exposures in general industry, shipyards and construction. Most of the requirements are the same for all sectors, with the exception of provisions for regulated areas, hygiene areas and practices, and housekeeping. Where there are differences, they will be explained in this booklet. The standards generally apply to occupational exposures to Cr(VI) in all forms and compounds in general industry, shipyards and construction, with specific exceptions outlined in the box below. States that administer their own OSHA-approved occupational safety and health plans may have different requirements. See the Additional Information section for a list of State plans and their contact information.

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Exceptions

The Cr(VI) standards do not apply in three situations:

- exposures that occur in the application of pesticides;
- exposures to Portland cement; and
- where the employer has objective data demonstrating that a material containing Cr(VI) or a specific process, operation, or activity involving Cr(VI) cannot release dusts, fumes or mists of Cr(VI) in concentrations at or above 0.5 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) of air as an 8-hour time-weighted average (TWA) under any expected conditions of use.

Exposure Limits

The final Cr(VI) rule establishes an 8-hour TWA permissible exposure limit (PEL) of $5 \mu\text{g}/\text{m}^3$ measured as Cr(VI). This means that over the course of any 8-hour work shift, the average exposure to Cr(VI) cannot exceed $5 \mu\text{g}/\text{m}^3$.

The Action Level is set at $2.5 \mu\text{g}/\text{m}^3$ of Cr(VI) calculated as an 8-hour TWA.

Exposures above the Action Level trigger specific requirements, and exposures above the PEL trigger additional requirements. The substantive provisions of the Cr(VI) standard are described below.

Exposure Monitoring and Determinations

Each employer who has a workplace or work operation covered by the Cr(VI) standards must determine the 8-hour TWA exposure for each worker exposed to Cr(VI). To comply with this provision, employers can choose between two options for performing exposure determinations:

- a scheduled monitoring option; or
- a performance-oriented option.

When monitoring for Cr(VI), employers must use a method of monitoring and analysis that provides values within plus or minus

25 percent of the true value at least 95 percent of the time for airborne concentrations at or above the Action Level. Examples of methods that meet these criteria are OSHA method ID215 (version 2) and NIOSH methods 7600, 7604, 7605 and 7703.

Scheduled Monitoring Option

The Initial Monitoring

Employers who select the scheduled monitoring option must conduct initial exposure monitoring to determine exposure to Cr(VI) for each worker. This involves taking a sufficient number of personal breathing zone air samples to accurately characterize full shift exposure on each shift, for each job classification, in each work area. Monitoring results must indicate the worker's time-weighted average exposure to airborne Cr(VI) over a typical 8-hour workday.

In some cases the employer will need to monitor all exposed workers, while in other cases it will be sufficient to monitor "representative" personnel. Representative exposure sampling is permitted when a number of workers perform essentially the same job under the same conditions. For example, an employer may choose one welder to sample as a representative of several welders who work in a welding shop for determining exposure as long as all of the welders represented by the monitoring perform the same job under the same conditions. Representative personal sampling for workers engaged in similar work involving similar Cr(VI) exposures is achieved by monitoring the worker(s) reasonably expected to have the highest Cr(VI) exposures. For example, this may involve monitoring the Cr(VI) exposure of the worker closest to an exposure source. This exposure result may then be used to represent the exposure of other workers in the group. The employer must take at least one sample characteristic of the entire work shift or consecutive representative samples taken over the length of the shift.

Periodic Monitoring

Periodic monitoring is required if the initial monitoring shows that the worker's exposure is at or above the Action Level (See

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Table 2, below, for monitoring frequency.)

Table 2. Monitoring Frequency

<i>Exposure Scenario</i>	<i>Required Monitoring Activity</i>
Below the Action Level (< 2.5 µg/m³)	No periodic monitoring required for workers represented by the initial monitoring.
At or above the Action Level but at or below the PEL (2.5 µg/m³ to 5 µg/m³)	Monitor every six months.
Above the PEL (> 5 µg/m³)	Monitor every three months.

If initial monitoring shows exposures above the PEL, but subsequent periodic measurements indicate that exposures have fallen to levels at or below the PEL, but still above the Action Level, the employer may reduce the frequency of periodic monitoring to every six months. In addition, an employer may discontinue periodic monitoring for workers represented by monitoring results indicating that exposures have fallen below the Action Level if those results are confirmed by a second measurement taken at least seven days later.

Additional Monitoring

Additional monitoring is necessary when a workplace change may result in new or additional exposures to Cr(VI) or the employer has any reason to believe that new or additional exposures have occurred. These changes may include alterations in the production process, raw materials, equipment, personnel, work practices, or control methods used in the workplace.

Examples of Situations Requiring Additional Monitoring

Example 1: If an employer has conducted monitoring for an electroplating operation while using fume suppressants, and the use of fume suppressants is discontinued, then additional monitoring

would be necessary to determine worker exposures under the modified conditions.

Example 2: A welder may move from an open, outdoor location to an enclosed or confined space. Even though the task performed and materials used may remain constant, the changed environment could reasonably be expected to result in higher exposures to Cr(VI).

Performance-Oriented Option

The performance-oriented option allows the employer to determine the 8-hour TWA exposure for each worker on the basis of any combination of air monitoring data, historical monitoring data, or objective data sufficient to accurately determine current worker exposure to Cr(VI). This option is intended to allow employers flexibility in assessing the Cr(VI) exposures of their personnel. Where the employer elects to use this option, the exposure determination must be performed prior to the time that the work operation commences and must provide the same degree of assurance that worker exposures have been correctly characterized as is provided for under the scheduled monitoring option. Like under the scheduled monitoring option, the employer is expected to reevaluate worker exposures when there is any change in the production process, raw materials, equipment, personnel, work practices, or control methods that may result in new or additional exposures to Cr(VI). However, the employer using the performance-oriented option does not have to follow any particular fixed schedule for performing reevaluations.

Objective Data

The Objective data means information that demonstrates the expected worker exposure to Cr(VI) associated with a particular product or material or a specific process, operation, or activity. Information that can serve as objective data includes, but is not

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limited to, air monitoring data from an industry-wide survey; data collected by a trade association from its members; or calculations based on the composition or chemical and physical properties of a material. The data must reflect workplace conditions closely resembling the processes, types of material, control methods, work practices and environmental conditions in the employer's current operations.

Regulated Areas

The Cr(VI) standard for general industry includes requirements for regulated areas wherever a worker's exposure to airborne concentrations of Cr(VI) is or is reasonably expected to be above the PEL. However, OSHA has not included this requirement in the construction and shipyard standards due to the expected practical difficulties of establishing regulated areas for operations in these sectors.

Employers are required to distinguish the regulated area from the rest of the workplace in a manner that adequately establishes and alerts workers to the boundaries of the regulated area. The standard does not specify how employers are to indicate the regulated areas. Warning signs, gates, ropes, barricades, lines, textured flooring, or other methods may be appropriate. Whatever methods are chosen must effectively warn workers not to enter the area unless they are authorized. Authorized personnel are those persons required by their job duties to be present in the area and may include maintenance/repair personnel, managers and quality control engineers. Also, designated worker representatives may enter the regulated area to observe exposure monitoring. All persons who enter the regulated area must use proper protective equipment, including respirators when appropriate.

Control Measures

To protect workers from Cr(VI) hazards, whenever exposures exceed the PEL employers must use engineering and work practice controls to reduce and maintain Cr(VI) exposures to or

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below the PEL. These are the most effective controls. Whenever feasible engineering and work practice controls are not sufficient to reduce exposures to or below the PEL, the employer must use such controls to reduce exposures to the lowest levels achievable and supplement them by the use of respiratory protection.

Engineering controls include substitution (using a less toxic material or process that results in lower exposures), isolation (such as enclosing the source of exposure), and ventilation (such as using a local exhaust system that captures airborne Cr(VI) near its source).

Work practice controls involve adjustments in the way a task is performed. Workers must know the proper way to perform a task in order to minimize their exposure and to maximize the effectiveness of the control. For example, a welder should be properly trained to correctly position himself and the local exhaust ventilation to minimize exposure to the welding fume. In many cases, work practice controls complement engineering controls in providing worker protection.

Employers are not permitted to rotate workers to different jobs as a means of achieving compliance with the PEL.

Exceptions to the general requirement for primary use of feasible engineering and work practice controls to reduce worker exposures to within permissible limits:

- In the aerospace industry, when workers are painting aircraft or large aircraft parts (e.g., the interior or exterior of whole aircraft, aircraft wings or tail sections, or comparably sized aircraft parts), the employer must use feasible engineering and work practice controls to reduce worker Cr(VI) exposures to levels at or below 25 $\mu\text{g}/\text{m}^3$. The employer must supplement its engineering and work practice controls with respiratory protection to achieve the PEL.
- If the employer can demonstrate that a particular process or task does not result in worker exposures to Cr(VI) exceeding the PEL for 30 or more days during any 12 consecutive months, the employer is allowed to use any combination of

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controls, including respirators alone, to achieve the PEL. Historical data, objective data, or exposure monitoring data may be used for this purpose.

Respiratory Protection

Employers are required to provide workers with respirators when feasible engineering and work practice controls are unable to reduce worker exposure to Cr(VI) to levels at or below the PEL. Respirators are required during:

- Work operations such as maintenance and repair activities for which engineering and work practice controls are not feasible;
- Emergencies (i.e., any occurrence that results or is likely to result in an uncontrolled release of Cr(VI) that is not an incidental release that can be controlled by workers in the immediate area or by maintenance personnel);
- Where workers are exposed above the PEL for fewer than 30 days per year and the employer has opted not to implement engineering/work practice controls to achieve the PEL;
- Periods necessary to install or implement feasible engineering and work practice controls; or
- Operations where all feasible engineering and work practice controls have been implemented but are not sufficient to reduce exposures to or below the PEL.

Where respirator use is required, the employer must establish a respiratory protection program in accordance with OSHA's Respiratory Protection standard (29 CFR 1910.134). The respiratory protection program addresses procedures for properly selecting, using and maintaining respirators in the workplace. OSHA has prepared the document, a *Small Entity Compliance Guide for the Revised Respiratory Protection Standard* (see the Additional Information section at page 22).

Requirements for Protective Work Clothing and Equipment

Employers are required to provide and ensure the proper use of

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appropriate protective clothing and equipment whenever a hazard evaluation of the workplace has identified that skin or eye contact with Cr(VI) presents or is likely to present a hazard to workers. Where such a hazard is identified, the employer must select the clothing and equipment needed to protect workers from Cr(VI) hazards. Some examples of protective clothing and equipment that may be necessary include, but are not limited to, gloves, aprons, coveralls, foot coverings and goggles. Normal street clothing and uniforms or other accessories that do not protect workers from Cr(VI) hazards are not considered protective clothing or equipment under the standard. Employers must provide and maintain the clothing and equipment at no cost to the worker.

The following precautions must be taken to protect workers and others who handle protective clothing and equipment:

- The employer must ensure that workers remove protective clothing and equipment that has become contaminated with Cr(VI) either at the end of their work shift or when they complete their tasks involving Cr(VI) exposure, whichever comes first.
- The employer must not allow any worker to remove contaminated protective clothing or equipment from the workplace, except for those workers whose job it is to launder, clean, maintain, or dispose of the clothing or equipment.
- When contaminated protective clothing or equipment is removed for laundering, cleaning, maintenance or disposal, the employer must ensure that it is stored and transported in sealed, impermeable bags or other closed, impermeable containers.
- Bags or containers of contaminated protective clothing or equipment that are removed from change rooms for laundering, cleaning, maintenance or disposal must be labeled in accordance with OSHA's Hazard Communication standard at 29 CFR 1910.1200.
- The employer must clean, launder, repair and replace protective clothing and equipment as necessary to ensure that the effectiveness of the clothing and equipment is maintained.
- The employer must inform any person who launders or cleans protective clothing or equipment contaminated with Cr(VI) of the potentially harmful effects of Cr(VI) exposure, and that the

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clothing and equipment should be laundered or cleaned in a manner that minimizes skin or eye contact with Cr(VI) and prevents exposure to Cr(VI) in excess of the PEL. Removal of Cr(VI) from protective clothing and equipment by blowing, shaking, or any other means that disperses Cr(VI) into the air or onto a worker's body is prohibited.

Hygiene Areas and Practices

The Cr(VI) standards include requirements for change rooms, washing facilities, and eating and drinking areas to minimize exposure to Cr(VI). They are:

Change rooms are only required when workers must change out of their street clothes to use protective clothing and equipment. The change rooms must conform to 29 CFR 1910.141 (for general industry and shipyards) and 29 CFR 1926.51 (for construction), prevent Cr(VI) contamination of street clothes, and be equipped with separate storage facilities for protective clothing and equipment and for street clothes. This provision is intended to limit exposures after the work shift ends and avoid the contamination of workers' cars and homes.

Washing facilities must be provided and must be readily accessible and capable of removing Cr(VI) from the skin. Washing facilities must comply with OSHA's sanitation requirements at 29 CFR 1910.141 (for general industry), 29 CFR 1926.51 (for construction), and 29 CFR 1915.97 (for shipyards). The employer must ensure that affected workers use these facilities when necessary. This includes making sure that workers who have skin contact with Cr(VI) wash their hands and faces at the end of the work shift and prior to eating, drinking, smoking, chewing tobacco or gum, applying cosmetics, or using the toilet.

Eating and drinking areas and surfaces must conform with 29 CFR 1910.141 (for general industry), 29 CFR 1926.51 (for construction), and 29 CFR 1915.97 (for shipyards) and be maintained as free as practicable of Cr(VI) whenever employers allow workers to consume food or beverages at a worksite where Cr(VI) is present. Employers are also required to ensure that workers do not enter eating and drinking areas wearing protective clothing or equip-

ment, unless the protective clothing or equipment is properly cleaned beforehand. Employers may use any method for removing surface Cr(VI) from clothing and equipment that does not disperse the dust into the air or onto the worker's body. For example, if a worker is wearing coveralls for protection against Cr(VI), thorough HEPA vacuuming of the coveralls could be performed prior to entry into a lunchroom. **Do NOT blow dust off protective clothing and equipment.**

The employer must ensure that workers do not eat, drink, smoke, chew tobacco or gum, or apply cosmetics – or carry or store products associated with these activities – in regulated areas or in areas where skin or eye contact with Cr(VI) occurs.

Housekeeping

The Cr(VI) standard for general industry includes housekeeping measures. OSHA did not include these requirements in the construction and shipyard standards due to the expected practical difficulties of complying with such requirements in those sectors. Proper housekeeping requirements are important because they target sources of exposure to Cr(VI) that engineering controls are generally not designed to address (such as skin exposures). Employers must ensure that all surfaces are maintained as free as practicable of accumulations of Cr(VI). Spills and releases of Cr(VI)-containing material must be cleaned up promptly. The requirement to maintain surfaces “as free as practicable” is performance-oriented. The standard does not specify what an allowable surface loading of Cr(VI) contamination in work areas would be. Instead, the requirement for “as free as practicable” is met when the employer is vigilant in efforts to ensure that surfaces are kept free of accumulation of Cr(VI) dust. OSHA will consider the employer's housekeeping schedule, the possibility of exposure from the surfaces in question, and the characteristics of the workplace. (OSHA, Jan. 13, 2003, Letter of Interpretation.)

Cleaning Methods

Surfaces contaminated with Cr(VI) must be cleaned by HEPA-filtered vacuuming or other methods that minimize exposure to

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Cr(VI), including wet methods such as wet sweeping or wet scrubbing. Dry methods (e.g., dry shoveling, dry sweeping and dry brushing) are only allowed in cases where HEPA-filtered vacuuming or other methods that minimize the likelihood of exposure to Cr(VI) have been tried and found not to be effective. The use of compressed air for cleaning surfaces is only allowed when used in conjunction with a ventilation system designed to capture the dust cloud or when no alternative method is feasible. Employers should use caution whenever compressed air is used as a cleaning method, since the air will spread the contamination further unless the dust is appropriately collected. Compressed air should never be directed at workers and should not be used to clean protective clothing or equipment.

Employers must ensure that waste, scrap, debris and any other materials contaminated with Cr(VI) are collected and disposed of in sealed, impermeable bags or other closed, impermeable containers. Additionally, bags or containers of waste, scrap, debris and any other materials contaminated with Cr(VI) must be labeled in accordance with the requirements of the Hazard Communication standard, 29 CFR 1910.1200.

Medical Surveillance

The purpose of medical surveillance is to determine if an individual can be exposed to Cr(VI) at his or her workplace without experiencing adverse health effects; to identify Cr(VI)-related adverse health effects when they do occur so that appropriate intervention measures can be taken; and to determine a worker's fitness to use personal protective equipment such as respirators.

All medical examinations and procedures required by the standards must be performed by or under the supervision of a physician or other licensed healthcare professional (PLHCP). When medical surveillance is required it must be provided at no cost to workers and at a reasonable time and place. If participation requires travel away from the worksite, the employer must bear the cost. Workers must be paid for time spent taking medical examinations, including travel time.

***Employers must provide medical surveillance
to workers who are:***

- Exposed or may be exposed to Cr(VI) at concentrations at or above the Action Level (as an 8-hour TWA) for 30 or more days per year;
- Experiencing signs and symptoms of adverse health effects associated with Cr(VI) exposures (e.g., blistering lesions, redness or itchiness of exposed skin, shortness of breath or wheezing that worsens at work, nosebleeds, a whistling sound while inhaling or exhaling); or
- Exposed in an emergency situation (i.e., any occurrence that results or is likely to result in an uncontrolled release of Cr(VI) that is not an incidental release that can be controlled by workers in the immediate area or by maintenance personnel).

Frequency of Medical Examination

Medical examinations must be given:

- Within 30 days after initial assignment to a job involving Cr(VI) exposure, unless the worker has received an examination that meets the requirements of the standard within the last 12 months;
- Annually;
- Within 30 days after a PLHCP's written medical opinion recommends an additional examination;
- Whenever a worker shows signs or symptoms of the adverse health effects associated with Cr(VI) exposure;
- Within 30 days after exposure during an emergency which results in an uncontrolled release of Cr(VI); or
- At the termination of employment, unless the last examination provided was less than six months prior to the date of termination.

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Contents of the Medical Exams

- A medical and work history which focuses on: the worker's past, present and anticipated future exposure to Cr(VI); any history of respiratory system dysfunction; any history of asthma, dermatitis, skin ulceration or nasal septum perforation; and smoking status and history.
- A physical examination of the skin and respiratory tract.
- Any additional tests that the examining PLHCP considers appropriate for that worker.

Note: The standards do not specify tests or procedures that must be provided to all workers. Rather, the information obtained from the medical and work history along with the physical examination of the skin and respiratory tract (the main targets of Cr(VI) toxicity) allow the PLHCPs to use their medical judgment to determine what tests, if any, are warranted.

Information Provided to the PLHCP

The employer must ensure that the PLHCP has a copy of the Cr(VI) standard, and must provide the PLHCP with:

- A description of the affected worker's former, current and anticipated duties as they relate to Cr(VI) exposure;
- Information on the worker's former, current and anticipated Cr(VI) exposure levels;
- A description of any personal protective equipment used or to be used by the worker, including when and for how long the worker has used that equipment; and
- Information from records of employment-related medical examinations previously provided to the affected worker, currently within the control of the employer.

The Written Medical Opinion

The employer must obtain a written medical opinion from the PLHCP for each medical examination performed. The written medical opinion must be obtained within 30 days of the exam-

ination, and must contain:

- The PLHCP's opinion as to whether the worker has any detected medical condition(s) that would place the worker at increased risk of material impairment to health from further exposure to Cr(VI);
- Any recommended limitations on the worker's exposure to Cr(VI) or on the use of personal protective equipment such as respirators; and
- A statement that the PLHCP has explained to the worker the results of the medical examination, including any medical conditions related to Cr(VI) exposure that require further evaluation or treatment, and any special provisions for the use of protective clothing or equipment.

The PLHCP must not reveal to the employer any specific findings or diagnoses that are not related to workplace Cr(VI) exposure. The employer is required to provide a copy of the written medical opinion to the examined worker within two weeks after receiving it.

Worker Training and Communication

It is critically important that workers recognize the hazards associated with exposure to Cr(VI) and understand the measures they can take to protect themselves. OSHA's Hazard Communication standard (29 CFR 1910.1200) establishes requirements for employers to provide workers with information on hazardous chemicals such as Cr(VI) through comprehensive chemical hazard communication programs that include material safety data sheets (MSDSs), labels and worker training. Employers must follow the requirements of the Hazard Communication standard with regard to workers exposed to Cr(VI). These requirements include, but are not limited to, informing workers of any operations in their work area where Cr(VI) is present and training workers on the hazards of Cr(VI) and measures they can take to protect themselves from these hazards (e.g., appropriate work practices, emergency procedures and protective equipment to be used).

In addition, the Cr(VI) standards require the employer to provide information and training sufficient to ensure that workers can demonstrate knowledge of:

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- The requirements of the Cr(VI) standard; and
- The medical surveillance program required by the standard, including recognition of the signs and symptoms of adverse health effects that may result from Cr(VI) exposure.

The employer must also make a copy of the Cr(VI) standard available without cost to affected workers.

Recordkeeping

Accurate records can demonstrate employer compliance with the standard and can assist in diagnosing and identifying workplace-related illnesses. Therefore, employers are required to maintain records of worker Cr(VI) exposures (including air monitoring data, historical monitoring data and objective data) and medical surveillance records.

Air Monitoring Data

Employers must keep an accurate record of all air monitoring performed to comply with the standard. The record must indicate:

- The date of the measurement for each sample taken;
- The operation involving exposure to Cr(VI) that was monitored;
- Sampling and analytical methods used and evidence of their accuracy;
- The number, duration and results of samples taken;
- The type of personal protective equipment used (e.g., type of respirators worn); and
- The name, social security number and job classification of all workers represented by the monitoring, specifying which workers were actually monitored.

Historical Monitoring Data

When an employer relies on historical monitoring data to determine worker exposures to Cr(VI), an accurate record of the historical monitoring data must be maintained. The record must show:

- That the data was collected using methods that meet the accuracy requirements of the standard;
- That the processes and work practices, characteristics of the Cr(VI)-containing material, and environmental conditions at the time the data was obtained are essentially the same as those of the job for which current exposure is being determined; and
- Any other relevant data regarding operations, materials, processes, or worker exposures.

Objective Data

When an employer relies on objective data to comply with the Cr(VI) standard, an accurate record of the objective data must be maintained. The record must indicate:

- The Cr(VI)-containing material in question;
- The source of the objective data;
- The testing protocol and results of testing, or analysis of the material for the release of Cr(VI);
- A description of the process, operation, or activity and how the data support the determination; and
- Any other relevant data regarding the processes, operations, activities, materials, or worker exposures.

Medical Surveillance

The employer must maintain an accurate record for each worker provided medical surveillance under the standard. The record must include the following information about the worker:

- Name and social security number;
- A copy of the PLHCP's written opinions; and
- A copy of the information that the employer was required to provide to the PLHCP (i.e., a description of the worker's duties as they relate to occupational Cr(VI) exposure; the worker's Cr(VI) exposure levels; a description of the personal protective equipment used by the worker; and information from previous employment-related medical examinations).

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Exposure and medical records must be maintained and made available to workers and their representatives in accordance with 29 CFR 1910.1020, Access to Employee Exposure and Medical Records. In general, exposure records must be kept for at least 30 years, and medical records must be kept for the duration of employment plus 30 years. It is necessary to keep these records for extended periods because cancer often cannot be detected until 20 or more years after exposure, and exposure and medical records can assist in diagnosing and identifying the cause of disease.

Effective Dates

All provisions of the standard are currently in effect, except that employers have until May 31, 2010 to implement required engineering controls.

Additional Information

Small Entity Compliance Guide for the Hexavalent Chromium Standards:

www.osha.gov/Publications/OSHA_small_entity_comp.pdf

Small Entity Compliance Guide for the Revised Respiratory Protection Standard:

www.osha.gov/Publications/3384small-entity-for-respiratory-protection-standard-rev.pdf

OSHA Fact Sheet: Health Effects of Hexavalent Chromium:

www.osha.gov/OshDoc/data_General_Facts/hexavalent_chromium.pdf

Hexavalent Chromium General Industry standard:

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=13096

Hexavalent Chromium Shipyard standard:

www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=13116



Hexavalent Chromium Construction standard:
www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=13117

For a list of State plans and contact information:
www.osha.gov/dcsp/osp/index.html.

References

Meridian Research, Inc. 1994. Final Report: Selected Chapters of an Economic Impact Analysis for a Revised OSHA Standard for Chromium VI: Introduction, Industry Profiles, Exposure Profiles, Technological Feasibility (for 6 industries) and Environmental Impacts. Prepared for: Office of Regulatory Analysis, OSHA, Prepared by: Meridian Research, Inc., Prepared under Contract Number: J-9-F-4-0012, Task Order No. 1, Base Year, December 18, 1994, pages I-2 through I-7, Document ID Number OSHA-H054A-2006-0064-0720 (formerly Exhibit Number 26).

OSHA. 2003. Clarification of “as free as practicable” and lead contamination under 29 CFR 1926.62. OSHA’s Letter of Interpretation response to Mr. Frank White of Organization Resources Counselors, Inc. January 13, 2003.

OSHA. 2006. Occupational Exposure to Hexavalent Chromium. Final Rule. 71 FR 10099-10385. 2/28/2006.

OSHA Instruction. 2008. Inspection Procedures for the Chromium (VI) Standards. Directive Number: CPL 02-02-074. Effective Date: January 24, 2008.

SRI Consulting. 2008. Chemical Economics Handbook. Inorganic Color Pigments. CEH Marketing Research Report. January 2008, pages 575.3002A through 575.3002J.

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OSHA Assistance

OSHA can provide extensive help through a variety of programs, including technical assistance about effective safety and health programs, state plans, workplace consultations, and training and education.

Safety and Health Management System Guidelines

Effective management of worker safety and health protection is a decisive factor in reducing the extent and severity of work-related injuries and illnesses and their related costs. In fact, an effective safety and health management system forms the basis of good worker protection, can save time and money, increase productivity and reduce employee injuries, illnesses and related workers' compensation costs.

To assist employers and workers in developing effective safety and health management systems, OSHA published recommended Safety and Health Program Management Guidelines (54 *Federal Register* (16): 3904-3916, January 26, 1989). These voluntary guidelines can be applied to all places of employment covered by OSHA.

The guidelines identify four general elements critical to the development of a successful safety and health management system:

- Management leadership and worker involvement,
- Worksite analysis,
- Hazard prevention and control, and
- Safety and health training.

The guidelines recommend specific actions, under each of these general elements, to achieve an effective safety and health management system. The *Federal Register* notice is available online at www.osha.gov.

State Programs

The Occupational Safety and Health Act of 1970 (OSH Act) encourages states to develop and operate their own job safety and health plans. Twenty-four states, Puerto Rico and the Virgin

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Islands currently operate approved state plans: 22 cover both private and public (state and local government) employment; Connecticut, New Jersey, New York and the Virgin Islands cover the public sector only. States and territories with their own OSHA-approved occupational safety and health plans must adopt standards identical to, or at least as effective as, the Federal OSHA standards.

Consultation Services

Consultation assistance is available on request to employers who want help in establishing and maintaining a safe and healthful workplace. Largely funded by OSHA, the service is provided at no cost to the employer. Primarily developed for smaller employers with more hazardous operations, the consultation service is delivered by state governments employing professional safety and health consultants. Comprehensive assistance includes an appraisal of all mechanical systems, work practices and occupational safety and health hazards of the workplace and all aspects of the employer's present job safety and health program. In addition, the service offers assistance to employers in developing and implementing an effective safety and health program. No penalties are proposed or citations issued for hazards identified by the consultant. OSHA provides consultation assistance to the employer with the assurance that his or her name and firm and any information about the workplace will not be routinely reported to OSHA enforcement staff. For more information concerning consultation assistance, see OSHA's website at www.osha.gov.

Strategic Partnership Program

OSHA's Strategic Partnership Program helps encourage, assist and recognize the efforts of partners to eliminate serious workplace hazards and achieve a high level of worker safety and health. Most strategic partnerships seek to have a broad impact by building cooperative relationships with groups of employers and workers. These partnerships are voluntary relationships between OSHA, employers, worker representatives, and others (e.g., trade unions, trade and professional associations, universities, and other government agencies).

OSHA's Hexavalent Chromium Standards



For more information on this and other agency programs, contact your nearest OSHA office, or visit OSHA's website at www.osha.gov.

OSHA Training and Education

OSHA area offices offer a variety of information services, such as technical advice, publications, audiovisual aids and speakers for special engagements. OSHA's Training Institute in Arlington Heights, IL, provides basic and advanced courses in safety and health for Federal and state compliance officers, state consultants, Federal agency personnel, and private sector employers, workers and their representatives.

The OSHA Training Institute also has established OSHA Training Institute Education Centers to address the increased demand for its courses from the private sector and from other federal agencies. These centers are colleges, universities and nonprofit organizations that have been selected after a competition for participation in the program.

OSHA also provides funds to nonprofit organizations, through grants, to conduct workplace training and education in subjects where OSHA believes there is a lack of workplace training. Grants are awarded annually.

For more information on grants, training and education, contact the OSHA Training Institute, Directorate of Training and Education, 2020 South Arlington Heights Road, Arlington Heights, IL 60005, (847) 297-4810, or see Training on OSHA's website at www.osha.gov. For further information on any OSHA program, contact your nearest OSHA regional office listed at the end of this publication.

Information Available Electronically

OSHA has a variety of materials and tools available on its website at www.osha.gov. These include electronic tools, such as *Safety and Health Topics*, *eTools*, *Expert Advisors*; regulations, directives and publications; videos and other information for employers and workers. OSHA's software programs and eTools walk you through challenging safety and health issues and common problems to find the best solutions for your workplace.

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OSHA Publications

OSHA has an extensive publications program. For a listing of free items, visit OSHA's website at www.osha.gov or contact the OSHA Publications Office, U.S. Department of Labor, 200 Constitution Avenue, NW, N-3101, Washington, DC 20210; telephone (202) 693-1888 or fax to (202) 693-2498.

Contacting OSHA

To report an emergency, file a complaint, or seek OSHA advice, assistance, or products, call (800) 321-OSHA or contact your nearest OSHA Regional or Area office listed at the end of this publication. The teletypewriter (TTY) number is (877) 889-5627.

Written correspondence can be mailed to the nearest OSHA Regional or Area Office listed at the end of this publication or to OSHA's national office at: U.S. Department of Labor, Occupational Safety and Health Administration, 200 Constitution Avenue, N.W., Washington, DC 20210.

By visiting OSHA's website at www.osha.gov, you can also:

- File a complaint online,
- Submit general inquiries about workplace safety and health electronically, and
- Find more information about OSHA and occupational safety and health.

OSHA's Hexavalent Chromium Standards



OSHA Regional Offices

Region I

(CT*, ME, MA, NH, RI, VT*)
JFK Federal Building, Room E340
Boston, MA 02203
(617) 565-9860

Region II

(NJ*, NY*, PR*, VI*)
201 Varick Street, Room 670
New York, NY 10014
(212) 337-2378

Region III

(DE, DC, MD*, PA, VA*, WV)
The Curtis Center
170 S. Independence Mall West
Suite 740 West
Philadelphia, PA 19106-3309
(215) 861-4900

Region IV

(AL, FL, GA, KY*, MS, NC*, SC*, TN*)
61 Forsyth Street, SW, Room 6T50
Atlanta, GA 30303
(404) 562-2300

Region V

(IL*, IN*, MI*, MN*, OH, WI)
230 South Dearborn Street
Room 3244
Chicago, IL 60604
(312) 353-2220

Region VI

(AR, LA, NM*, OK, TX)
525 Griffin Street, Room 602
Dallas, TX 75202
(972) 850-4145

Region VII

(IA*, KS, MO, NE)
Two Pershing Square
2300 Main Street, Suite 1010
Kansas City, MO 64108-2416
(816) 283-8745

Region VIII

(CO, MT, NO, SO, UT*, WY*)
1999 Broadway, Suite 1690
PO Box 46550
Denver, CO 80202-5716
(720) 264-6550

Region IX

(AZ*, CA*, HI*, NV*, and American Samoa, Guam and the Northern Mariana Islands)
90 7th Street, Suite 18-100
San Francisco, CA 94103
(415) 625-2547

Region X

(AK*, ID, OR*, WA*)
1111 Third Avenue, Suite 715
Seattle, WA 98101-3212
(206) 553-5930

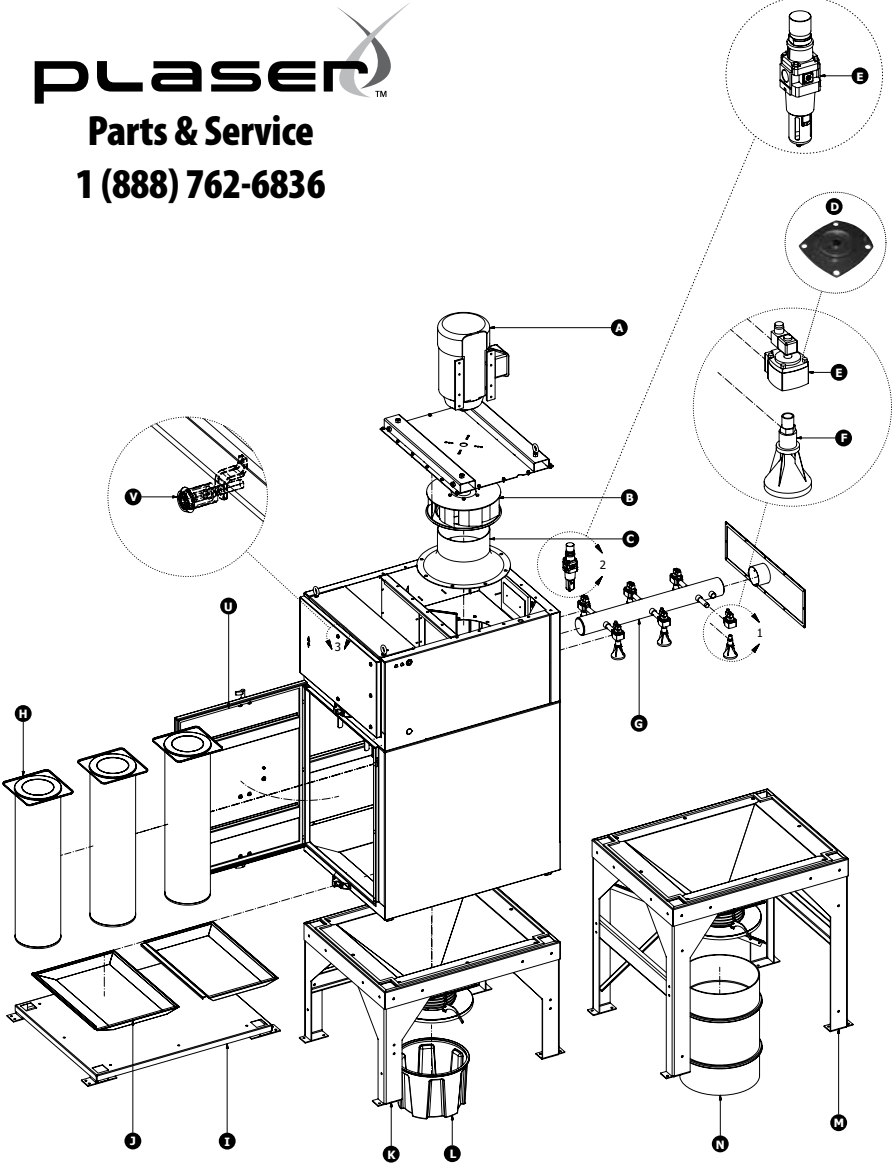
* These states and territories operate their own OSHA-approved job safety and health programs and cover state and local government employees as well as private sector employees. The Connecticut, Illinois, New Jersey, New York and Virgin Islands plans cover public employees only. States with approved programs must have standards that are identical to, or at least as effective as, the Federal OSHA standards.

Note: To get contact information for OSHA Area Offices, OSHA-approved State Plans and OSHA Consultation Projects, please visit us online at www.osha.gov or call us at 1-800-321-OSHA.

APPENDIX K

Parts List

APPENDIX K
Parts List



APPENDIX K

Parts List (continued)

Model No.	A Motor	B Blower Wheel	C Venturi	D Diaphragm Repair Kit	E Solenoid Valve Assembly	F Pulse Cone Assembly	G Air Tank
PLASER 3 SERIES							
PL-3000-2	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-2
PL-4000-3	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-6
PL-5000-4	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-8
PL-8000-6	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-6
PL-10000-8	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-8
PL-13000-10	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-10
PL-16000-12	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-6
PL-21000-16	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-8
PL-26000-20	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-10
PL-32000-24	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-8
PL-39000-30	*	**	**	RKDV-10-TU	DV-10-TU	CC-200-COM	DTS-TANK-10

Model No.	H Cartridge Filters	I Bottom Plate	J Dust Tray	K Hopper and Short Drum	L Drum 20 Gal.	M Hopper and Long Legs	N Drum 55 Gal.
PLASER 3 SERIES							
PL-3000-2	CF-14D52-ENX-SQFL	DTS-2-BP	DTS-2-DT	HSD-DTS-2	DR-20	-	DTS-55-DR
PL-4000-3	CF-14D52-ENX-SQFL	DTS-3-BP	DTS-3-DT	HSD-DTS-3	DR-20	HLL-DTS-3	DTS-55-DR
PL-5000-4	CF-14D52-ENX-SQFL	DTS-4-BP	DTS-4-DT	HSD-DTS-4	DR-20	HLL-DTS-4	DTS-55-DR
PL-8000-6	CF-14D52-ENX-SQFL	DTS-6-BP	DTS-6-DT	HSD-DTS-6	DR-20	HLL-DTS-6	DTS-55-DR
PL-10000-8	CF-14D52-ENX-SQFL	DTS-8-BP	DTS-8-DT	HSD-DTS-8	DR-20	HLL-DTS-8	DTS-55-DR
PL-13000-10	CF-14D52-ENX-SQFL	DTS-10-BP	DTS-10-DT	HSD-DTS-10	DR-20	HLL-DTS-10	DTS-55-DR
PL-16000-12	CF-14D52-ENX-SQFL	DTS-6-BP	DTS-6-DT	HSD-DTS-6	DR-20	HLL-DTS-6	DTS-55-DR
PL-21000-16	CF-14D52-ENX-SQFL	DTS-8-BP	DTS-8-DT	HSD-DTS-8	DR-20	HLL-DTS-8	DTS-55-DR
PL-26000-20	CF-14D52-ENX-SQFL	DTS-10-BP	DTS-10-DT	HSD-DTS-10	DR-20	HLL-DTS-10	DTS-55-DR
PL-32000-24	CF-14D52-ENX-SQFL	DTS-8-BP	DTS-8-DT	HSD-DTS-8	DR-20	HLL-DTS-8	DTS-55-DR
PL-39000-30	CF-14D52-ENX-SQFL	DTS-10-BP	DTS-10-DT	HSD-DTS-10	DR-20	HLL-DTS-10	DTS-55-DR

Model No.	T Pressure Regulator and Filter	U Replacement Filter Door Gasket	V Quarter Turn Door Latch
PLASER 3 SERIES			
PL-3000-2	FR-1	CDG-50-10	DL-8
PL-4000-3	FR-1	CDG-50-10	DL-8
PL-5000-4	FR-1	CDG-50-10	DL-8
PL-8000-6	FR-1	CDG-50-10	DL-8
PL-10000-8	FR-1	CDG-50-10	DL-8
PL-13000-10	FR-1	CDG-50-10	DL-8
PL-16000-12	FR-1	CDG-50-10	DL-8
PL-21000-16	FR-1	CDG-50-10	DL-8
PL-26000-20	FR-1	CDG-50-10	DL-8
PL-32000-24	FR-1	CDG-50-10	DL-8
PL-39000-30	FR-1	CDG-50-10	DL-8

- * Refer to Rating Tag on unit - specify Motor HP
** Specify unit Serial Number, Blower Wheel, Venturi size on record

Other Items

Filter Pole for Maintenance	CFX-DTS-4
Long Sleeves 36in (Filter Bags for heavy loading applications)	HL-SL-14-36
Long Sleeves 52in (Filter Bags for heavy loading applications)	HL-SL-14-52
Fire Trace Fire Suppression Tubing (per foot).....	FDT-14
Fire Trace Tubing Quick Connect Splice Fitting	ELEC-083
Replacement FM200 Fire Suppression Tank (12lb.)	FS-FM200-12#



Manufactured by:

RoboVent

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