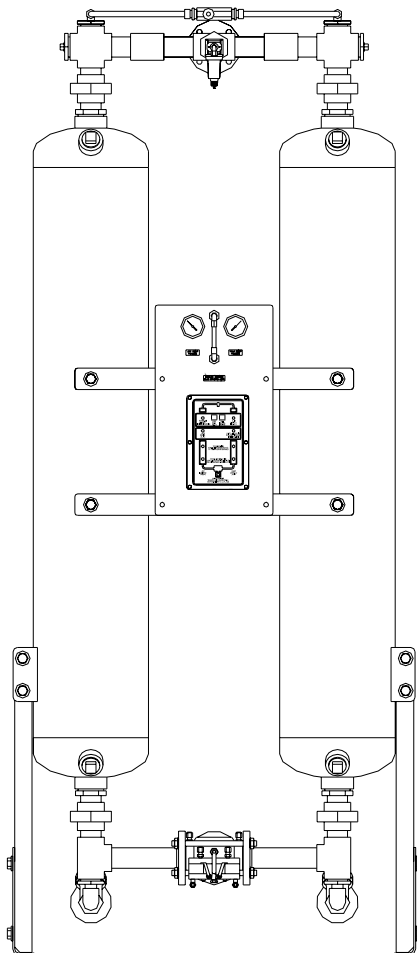


HDH Dryer Series *OWNER/OPERATOR MANUAL*

PARTS, INSTALLATION, OPERATION
AND SERVICE INSTRUCTIONS
MODEL HDH-0200



WARNING

READ ALL INFORMATION IN THIS MANUAL BEFORE BEGINNING INSTALLATION OR OPERATION OF THE DRYER. BEFORE STARTING INSTALLATION AND/OR MAINTENANCE PROCEDURES, TURN OFF THE MAIN POWER TO THE DRYER AND COMPLETELY DEPRESSURIZE THE UNIT TO PREVENT PERSONAL INJURY.

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THIS DRYER WHILE IT IS UNDER PRESSURE.

NEVER OPERATE THIS DRYER ABOVE THE RATED OPERATING CONDITIONS. OPERATION ABOVE SPECIFIED CONDITIONS WILL RESULT IN DECREASED PERFORMANCE, POSSIBLE DAMAGE TO THE UNIT AND/OR PERSONAL INJURY.

SEE BACK OF THIS MANUAL FOR ADDITIONAL SAFETY INSTRUCTIONS

1.1 HANDLING INSTRUCTIONS

WARNING

DO NOT LIFT THE DRYER BY THE INLET PIPING OR CONTROL BOX. THESE COMPONENTS ARE NOT DESIGNED TO HOLD THE WEIGHT OF THE DRYER. PERSONAL INJURY AND/OR EQUIPMENT DAMAGE MAY RESULT.

Lift the dryer by the outlet (top) piping or vessel center connector bar.

When lifting the unit make sure that the chains or cables are clear of all tubing and fragile components.

1.2 STORAGE INSTRUCTIONS

The ideal place to store the unit is indoors. The location should be free from corrosive gasses and extreme humidity. These conditions will cause damage to the unit. The unit should be covered with a tarpaulin to keep the unit clean.

If the unit is to be stored outdoors, it **MUST BE** covered completely. The cover must be adequate enough to prevent rain or snow from accumulating on the dryer. The location must be free of standing water and mud. The preferred location if outdoors, is on a paved surface.

1.3 EQUIPMENT CHECK

Inspect the dryer for any damage that may have occurred during shipment. Inspect all fittings, piping connections, fasteners, etc. for loose connections. Also check gauges for cracks or breakage.

IF DRYER HAS BEEN DAMAGED DURING SHIPMENT:

- (1) NOTIFY CARRIER IMMEDIATELY AND FILE A CLAIM.
- (2) CONSULT FACTORY BEFORE OPERATING THE DRYER.

SAFETY INSTRUCTIONS**SECTION 2**

2.1 HANDLING

DO NOT LIFT THE DRYER BY INLET (BOTTOM) PIPING OR CONTROL BOX. THESE COMPONENTS ARE NOT DESIGNED TO HOLD THE WEIGHT OF THE DRYER. PERSONAL INJURY AND/OR EQUIPMENT DAMAGE MAY RESULT.

MAKE SURE THAT ALL EQUIPMENT BEING USED TO LIFT THE DRYER IS CAPABLE OF LIFTING THE WEIGHT OF THE DRYER.

IF THE DRYER IS TO BE TRANSPORTED OVERHEAD, MAKE SURE THAT ALL PERSONNEL ARE ALERTED AND SAFETY PROCEDURES ARE FOLLOWED.

2.2 INSTALLATION

BEFORE STARTING INSTALLATION AND/OR MAINTENANCE PROCEDURES, TURN OFF POWER AND DEPRESSURIZE UNIT TO PREVENT INJURY. SERIOUS PERSONAL INJURY MAY RESULT IF THESE SAFETY RULES ARE NOT FOLLOWED.

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON DRYER WHILE IT IS UNDER PRESSURE. TURN OFF MAIN POWER TO THE DRYER AND DEPRESSURIZE THE DRYER COMPLETELY BEFORE STARTING INSTALLATION AND/OR MAINTENANCE PROCEDURES.

WHEN INSTALLING AND OPERATING THIS EQUIPMENT, COMPLY WITH THE NATIONAL ELECTRICAL CODE AND ANY APPLICABLE FEDERAL, STATE, AND LOCAL CODES.

WHEN INSTALLING THIS DRYER, MAKE SURE THAT THE NEMA RATING OF THE CONTROL BOX IS APPLICABLE TO THE INSTALLATION.

MAKE SURE THAT ALL CUSTOMER SUPPLIED WIRING AND ELECTRICAL DEVICES ARE PROPERLY SIZED TO HANDLE THE ELECTRICAL REQUIREMENTS OF THE DRYER.

ALWAYS WEAR EYE PROTECTION, GLOVES AND A RESPIRATORY PROTECTIVE DEVICE WHEN HANDLING THE DESICCANT. THE DUST FROM THE DESICCANT MAY CAUSE EYE AND SKIN IRRITATION. AVOID BREATHING THE DUST AND PROLONGED CONTACT WITH THE SKIN.

FIRST AID IN CASE OF EYE CONTACT WITH DESICCANT DUST; IMMEDIATELY FLUSH THE EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN.

2.3 OPERATION

DO NOT OPERATE DRYER IF THERE IS A LEAK IN EITHER VESSEL. IMMEDIATELY TAKE THE DRYER OUT OF SERVICE.

ANY DAMAGE TO THE VESSELS CAN MAKE THEM UNSAFE TO USE. INSPECT OUTSIDE AND INSIDE OF VESSELS REGULARLY FOR CORROSION AND ANY DAMAGE (I.E., DENTS, GOUGES OR BULGES). IF DAMAGED, TAKE OUT OF SERVICE IMMEDIATELY.

DO NOT OPERATE THIS DRYER ABOVE THE MAXIMUM RATED WORKING PRESSURE.

OPERATING CONDITIONS FOR PROPER PERFORMANCE OF THIS DRYER ARE DIFFERENT THAN MAXIMUM OPERATING CONDITIONS FOR THE VESSELS. BE SURE TO CHECK THE DRYER OPERATING CONDITIONS. SEE SECTION 3.1.

USE THIS DRYER FOR COMPRESSED AIR ONLY.

AIR FROM THIS DRYER IS NOT SUITABLE FOR BREATHABLE AIR SYSTEMS WITHOUT FURTHER TREATMENT.

DO NOT OPERATE THIS DRYER IF EITHER VESSEL HAS BEEN DAMAGED BY FIRE. TAKE OUT OF SERVICE IMMEDIATELY.

2.4 MAINTENANCE

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THE DRYER WHILE IT IS UNDER PRESSURE. TURN OFF MAIN POWER TO THE DRYER AND DEPRESSURIZE THE DRYER COMPLETELY BEFORE STARTING MAINTENANCE PROCEDURES.

DO NOT WELD OR GRIND ON EITHER VESSEL. IT WILL NOT BE SAFE TO OPERATE.

3.1 DRYER SPECIFICATIONS

WEIGHT (with desiccant installed)

HDH-0200.... 660 lbs

DIMENSIONS See SECTION 3.2

IN/OUT CONNECTION

HDH-02001-1/2" NPT

VESSELS (desiccant towers)

Construction Manufactured to the ASME CODE,
Section VIII, Division 1. Model HDH-0200
vessels stamped "UM" symbol.

Design Pressure 150 PSIG

Design Temperature -20°F TO 300°F

PIPING

Threaded pipe fittings: ANSI B16.3

Threaded unions: ANSI B16.39

Pipe: Carbon Steel, Schedule 40

VALVES

Inlet Proprietary 3-way piloted shuttle valve

Outlet Two (2) Check valves, butterfly type

Purge Normally closed, diaphragm type

CONTROL AIR FILTER

Construction .. Zinc housing

ELECTRICAL

Nema 4 Electrical enclosure

Standard 115V 115-120V/1PH/50-60HZ

DESICCANT

Material Activated Alumina, 1/8" (2-5 MM) Bead type

Quantity Per Tower 106 lbs

OPERATING CONDITIONS

Inlet Air Pressure MIN 60 PSIG MAX 150 PSIG

Inlet Air Temperature MIN 40°F MAX 120°F

Ambient Air Temperature .. MIN 40°F MAX 120°F

RATED INLET CONDITIONS

Inlet Air Pressure 100 PSIG

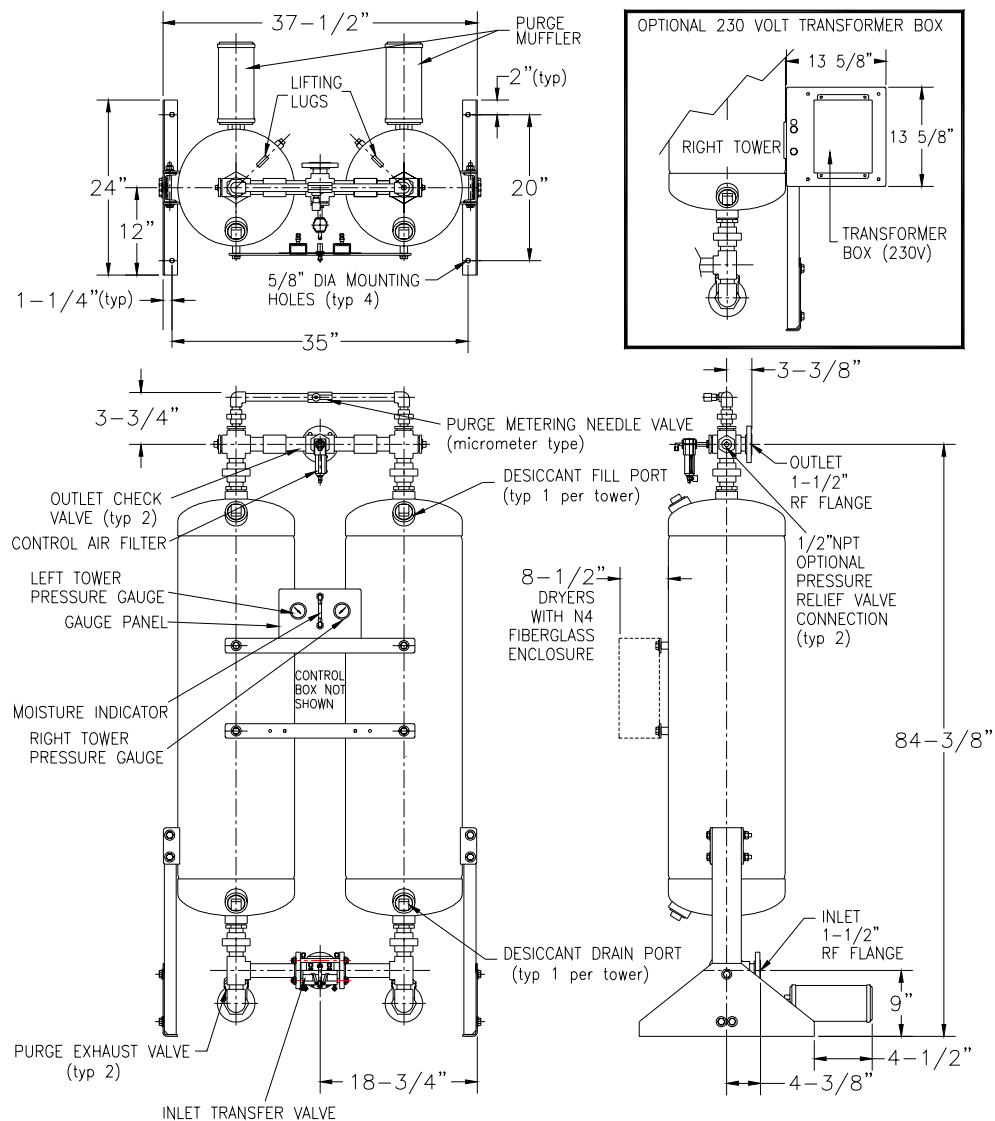
Inlet Air Temperature 100°F

Relative Humidity (saturation) 100% RH

FLOW CAPACITIES (SCFM) at various pressures (100°F)

	60 PSIG	80 PSIG	100 PSIG	110 PSIG	125 PSIG	140 PSIG	150 PSIG
HDH-0200	130	165	200	209	221	232	240

3.2 DIMENSIONS Models HDH-0200



4.1 LOCATION

WARNING

DO NOT INSTALL THIS DRYER IN AN ENVIRONMENT OF CORROSIVE CHEMICALS, EXPLOSIVE GASSES, POISONOUS GASSES, OR SATURATED STEAM HEAT.

Locate dryer in a protected, well vented area where ambient temperatures are between 40°F and 120°F. Allow sufficient clearance over and around the dryer for access to desiccant fill and drain ports and controls. **Refer to SECTION 3.2 for dryer dimensions.**

If this dryer must be installed where ambient temperatures are below 40°F, insulation and heat tracing must be properly installed on the inlet piping, purge exhaust line and the desiccant towers to prevent freezing of the equipment.

Position the dryer in the upright position on a solid, level, vibration free surface capable of supporting the dryer's weight. **Refer to SECTION 3.1 for dryer specifications.**

The dryer should not be located in extremely dirty areas where airborne contaminants can accumulate on the dryer. If this cannot be prevented, the dryer should be cleaned periodically. An accumulation of dirt on the dryer may cause the inlet transfer valve to fail.

4.2 PIPING AND ANCILLARY EQUIPMENT

CAUTION

Make sure that the inlet air piping is connected at the bottom and the outlet air piping is connected at the top of the dryer.

Make sure that the inlet and outlet piping to and from the dryer is properly supported. Excessive stress may cause damage and/or dryer malfunction.

Remove protective caps or covers from all valves before installing this dryer.

If this dryer is to be installed into an existing piping system, clean the existing inlet piping to remove all accumulated dirt, pipe scale, etc., before connecting the dryer. Make sure that the inlet and outlet shutoff valves are tightly closed before connecting to the existing piping system.

If excessive vibrations are present in the piping, install a flexible hose between the compressor and the dryer inlet.

When installing the piping and any additional components, make sure that adequate pipe supports are used. Excessive stress on the dryer and components may cause damage or premature failure. Use either overhead or stiff-leg type supports.

Make sure that the piping is correctly connected to the dryer. The inlet is the bottom connection and the outlet is the top connection. **Reference SECTION 3.2 for dryer dimensions and connection locations.**

Once the location has been determined, place the dryer into position. Lift the dryer by the lifting lugs only. **Reference SECTION 1 for handling instructions.**

When the dryer is in place, it can be fastened to the mounting surface. **Reference SECTION 3.2 for dryer dimensions.**

4.2-1 BYPASS PIPING (optional)

The installation of bypass piping is not required, but will allow the dryer and filter(s) to be taken off stream without interrupting the air system.

In Figure 4A, several recommended bypass piping layouts and additional components are shown.

Basic bypass piping should include an inlet isolation valve, a bypass valve, and an outlet isolation valve. The isolation and bypass valves must be bubble-tight.

4.2-2 FILTERS

CAUTION

A PROPERLY RATED COALESCING PREFILTER MUST BE INSTALLED BEFORE THE DRYER TO REMOVE LUBRICATING OILS, DUST AND PIPE SCALE CONTAMINATION. FAILURE TO USE A PREFILTER WILL RESULT IN DAMAGE TO THE DRYER AND VOIDS THE WARRANTY.

Make sure that the elements are installed in all filter housings prior to start up.

THE DRYER AND PREFILTER ARE NOT DESIGNED TO HANDLE LIQUID WATER. IF LIQUID WATER IS PRESENT IN THE AIR SYSTEM, A SEPARATOR WITH AN AUTOMATIC DRAIN MUST BE INSTALLED UPSTREAM TO THE PREFILTER AND DRYER TO PREVENT FLOODING.

A coalescing prefilter must be installed before the dryer to remove lubricating oils, dust and pipe scale contamination. It is recommended that a high efficiency coalescing filter with an automatic drain or electric drain valve be installed. The filter should be equipped with a pressure differential indicator to monitor the condition of the element.

A particulate afterfilter should be installed downstream of the dryer to remove any desiccant dust. The filter should be equipped with a pressure differential indicator to monitor the condition of the element.

Make sure that the filters are properly installed according to the instructions provided with them.

4.3 INSTALLING THE PRESSURE RELIEF VALVES

CAUTION

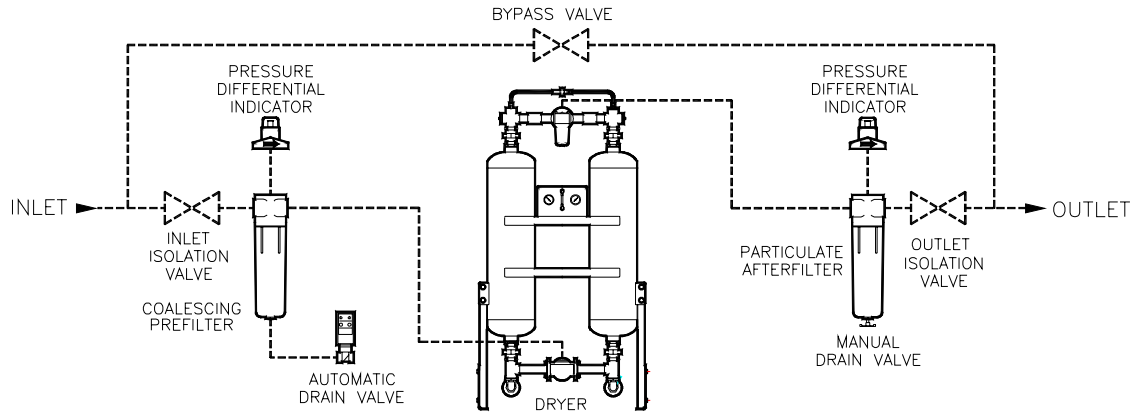
THESE ASME CODE VESSELS MUST BE PROTECTED BY PRESSURE RELIEF VALVES. Refer to OSHA 1910.169 Par. b, Sub. Par (3) and ASME Boiler and Pressure Vessel Code, Section VIII, Division 1, UG-125 through UG-136. Also check government regulations, i.e., state and local codes.

Connections are provided in the outlet piping for the installation of pressure relief valves. Reference SECTION 3.2 for location and connection size.

Install the pressure relief valves into the provided connections. If pressure relief valves were not purchased with the dryer, the following valve sets are available from your local VAN AIR representative.

DRYER MODEL	VALVE PART NO.
HDH-0200	14-1448 (2)

FIGURE 4A RECOMMENDED PIPING CONFIGURATION AND COMPONENTS



4.4 REMOTE PURGE EXHAUST PIPING

To reduce noise during purging and tower depressurization, this dryer was supplied with mufflers for installation on the purge exhaust valves. If the sound or humidity discharged from the dryer is unacceptable, the purge of this dryer can be remotely piped away.

IMPORTANT

Make sure that the piping is as short as possible and does not create back pressure on the dryer. To prevent liquid accumulation in the piping and purge valves, the piping must be at the same level or lower than the purge valves.

The purge line must be vented to atmospheric pressure. If the ambient temperature at the venting end of the piping is subject to temperatures below 40°F, freeze protection must be installed.

The purge valves have threaded pipe connections. Reference Section 3.2 for location. Use adequate pipe supports to prevent stress on valves.

The distance will determine the size of piping that is recommended. For distances of 10 feet or less, use piping of the same size as the purge valves. For distances up to 20 feet, use piping one size larger than the purge valves.

4.5 INSTALLING THE PURGE MUFFLERS

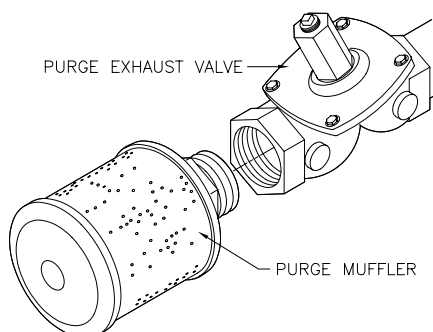
To reduce the sound level during purge and tower depressurization, this dryer was supplied with mufflers for installation on the purge exhaust valves.

Mufflers were shipped separately. They should **NOT** be installed until the dryer has been operated for several hours. From desiccant installation, some dust may be present in the desiccant towers. Operating the dryer with the mufflers installed immediately after the towers have been filled with the desiccant or during initial start up may cause the mufflers to clog.

IMPORTANT

The dryer must be operated for several hours without the mufflers after the towers have been filled with desiccant. This will prevent the mufflers from becoming clogged.

FIGURE 4B PURGE MUFFLER INSTALLATION



4.6 ELECTRICAL CONNECTIONS

WARNING

SERIOUS PERSONAL INJURY AND DAMAGE TO THE DRYER WILL OCCUR IF THE DRYER IS CONNECTED TO A POWER SOURCE OTHER THAN THE VOLTAGE LISTED ON THE DATA TAG.

WHEN INSTALLING THE ELECTRICAL CONNECTIONS FOR THIS DRYER, COMPLY WITH NATIONAL ELECTRICAL CODE AND ALL APPLICABLE FEDERAL, STATE AND LOCAL CODES

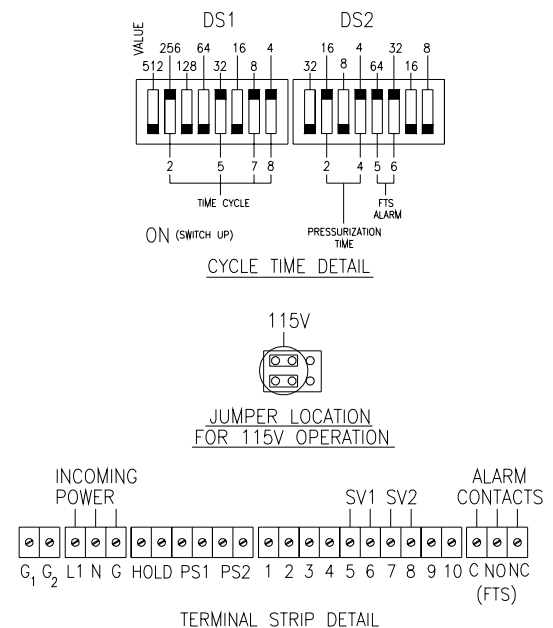
4.6-1 STANDARD CONTROL BOX (115V)

The power supply to the dryer is to be connected to the dryer control box. A 7/8" dia hole was provided in the bottom of the box for the connection of conduit or a cord grip connector.

Check the electrical rating of the dryer as listed on the dryer data tag. Make sure that the power source is correct for the dryer rating.

Remove the box cover to access the power and alarm terminals. Wire the power supply as shown in **Figure 4C (Standard Control Box)**. Connect the wiring to the dryer box. Comply with all codes applicable for this installation.

FIGURE 4C ELECTRICAL CONNECTIONS



5.1 START UP

WARNING

BEFORE STARTING THIS DRYER, FOLLOW THE INSTALLATION INSTRUCTIONS AND PROCEDURES COMPLETELY. SERIOUS PERSONAL INJURY CAN RESULT IF INSTRUCTIONS ARE NOT CAREFULLY AND COMPLETELY FOLLOWED.

DO NOT REMOVE, REPAIR, OR REPLACE ANY ITEM ON THIS DRYER WHILE IT IS UNDER PRESSURE.

Make sure the Stop button is pressed.

If the dryer is being started up for the first time or after the desiccant has been changed, the purge mufflers must be removed. The dryer should be operated until no desiccant dust is visible at the purge valves. Then the mufflers can be reinstalled. See Section 2.2 for safety precautions concerning the desiccant dust.

WARNING

WHEN OPERATING THIS DRYER WITHOUT THE MUFFLERS INSTALLED, USE HEARING PROTECTION.

If bypass piping was installed on this dryer as outlined in SECTION 4.2, close the inlet and outlet isolation valves. Open the bypass valve.

Pressurize the air system. Once the air system is pressurized, slowly open the inlet isolation valve. DO NOT open the outlet isolation valve.

To start the dryer, press the Run button which will light the Run LED. One tower will already be pressurized. The other tower will depressurize. The purge valve on the tower that is not pressurized will be open, air should be exhausting from the muffler.

The dryer is equipped with a purge metering valve. The setting should be checked before placing the dryer on stream.

5.2 ADJUSTING THE PURGE FLOW

IMPORTANT

NEVER OPERATE THE DRYER WITH THE PURGE METERING VALVE CLOSED. IF THE VALVE IS CLOSED, THE TOWERS WILL NOT REPRESSURIZE AND SWITCHING FAILURE WILL OCCUR.

DO NOT ADJUST THE PURGE METERING VALVE ABOVE OR BELOW THE RECOMMENDED SETTING FOR THE OPERATING CONDITIONS OF THIS INSTALLATION. IMPROPER SETTING MAY CAUSE POOR DRYER PERFORMANCE AND/OR EXCESSIVE USE OF PROCESS AIR.

The purge flow can be adjusted for the operating conditions. Standard dryers are equipped with a micrometer type needle valve. The valve can be adjusted to the desired setting.

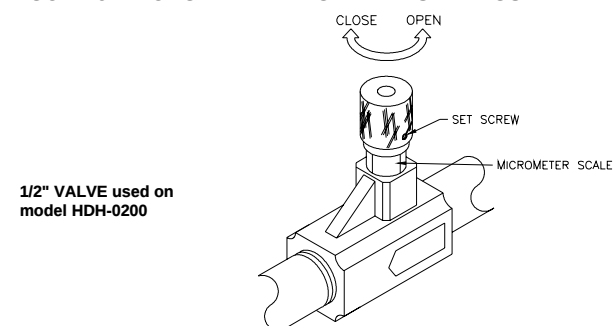
This dryer was shipped with the purge flow set for the rated inlet flow at 100 PSIG. Reference Section 3.1 for rated flow. This setting should be correct for most installations. Before placing the dryer on stream, check the purge metering valve setting.

Figure 5B shows the purge flow required for each model. This flow is required to properly regenerate the desiccant beds.

If the dryer is being operated at a pressure other than inlet rated conditions, the purge metering valve must be adjusted to maintain the required purge flow rate listed in Figure 5B.

Determine the dryer minimum operating pressure. Using the chart in Figure 5A, find the valve setting for that pressure. The valve is equipped with a set screw which must be loosened before the valve is adjusted. Adjust the needle valve to the desired setting. Tighten the set screw to prevent tampering.

FIGURE 5A PURGE METERING VALVE SETTINGS



			FACTORY SETTING		
MODEL	60 PSIG	80 PSIG	100 PSIG	120 PSIG	150 PSIG
HDH-0200	3.5 turns	3.3 turns	3.2 turns	3.1 turns	3.0 turns

FIGURE 5B REQUIRED PURGE FLOW

DRYER MODEL	PURGE FLOW
HDH-0200	36.0 SCFM

5.3 CONDITIONING THE DESICCANT BED

To condition the desiccant bed, the dryer is operated without any outlet flow, while the towers regenerate with purge air.

To start the dryer, press the Run button which will light the Run LED.

Dryers should be set on the 10 minute time cycle. Observe the dryer for several cycles. Make sure that it is operating properly.

At initial start up or after extended shutdowns (over one month), the dryer may take 24 to 48 hours of continuous operation for the bed to be conditioned. Moisture that has accumulated on the desiccant bed should be removed before the dryer is placed on stream.

Once the moisture indicator on the dryer turns blue, the desiccant bed is ready. Place the dryer on stream by opening the outlet isolation valve. Make sure that the by-pass valve is closed.

6.1 PRINCIPLE OF OPERATION

HDH Series Heatless Regenerative Air Dryers utilize the pressure swing principle of operation. The desiccant bed in one tower dries the air stream while the desiccant bed in the other tower is regenerated.

A purge of dry air is used for tower regeneration. It is taken from the outlet of the dryer.

The dryer is equipped with a purge metering valve to allow the correct amount of dry air to flow into the regenerating tower. The heat created during adsorption of moisture in the drying tower is retained in the desiccant bed and increases the moisture removal capacity of the purge air.

The timing cycle of the dryer is controlled by two 3-way pilot valves.

A patented shuttle valve system is used to repressurize, changeover, and depressurize the towers. The inlet transfer valve is controlled by the pilot valves. The movement of the shuttle in the inlet transfer valve mechanically actuates the external pneumatic limit switches, which open the purge valves and depressurize the tower. The shuttle cannot shift until the tower pressures are nearly equal. The dryer cannot depressurize until the shuttle has fully seated and the one of the limit switches is engaged.

To achieve maximum performance from this dryer, it should be operated continuously. Operating this dryer for single shift periods may result in varied outlet dew point performance.

The dryer operation consists of four stages; REPRESSURIZATION, CHANGEOVER/DEPRESSURIZATION, DRYING and REGENERATION.

6.1-1 REPRESSURIZATION STAGE

Repressurization occurs in the regenerating tower. Repressurization must occur before tower changeover. This reduces shock to the desiccant and the possibility of downstream pressure spikes.

The purge valve is closed and the purge air, which was vented to atmosphere earlier in the cycle, is now used to repressurize the regenerated tower.

The pilot valves SV1 & SV2 de-energize causing the purge valve on the regenerating tower to close. The purge air, which was vented to atmosphere earlier in the cycle, is now used to repressurize the regenerated tower.

6.1-2 CHANGEOVER/DEPRESSURIZATION STAGE

Tower changeover occurs after the previous regenerating tower is pressurized. The controller signals the inlet transfer valve to switch. The tower that was on line and drying the process air will begin to depressurize.

Pressure in the regenerating tower will approach full line pressure. The pilot valves SV1 or SV2 will energize. Pilot air will be supplied to one side of the inlet transfer valve. The inlet transfer valve shuttle will move to the side that has pilot pressure.

When the inlet transfer valve changes position, the position indicator will move and actuate the other pneumatic limit switch. This will open the purge valve on the tower that was drying the process air, causing the tower to depressurize.

6.1-3 DRYING AND REGENERATION STAGE

During the drying stage, one tower is pressurized with process air. This tower is in the drying stage. The process air passes through the desiccant bed, which adsorbs moisture from the air. The regeneration stage of one tower occurs at the same time as the drying stage in the opposite tower. During the regeneration stage, a percentage of dry air is directed through the desiccant bed of the offstream tower. The purge air is vented through the purge valve to the atmosphere.

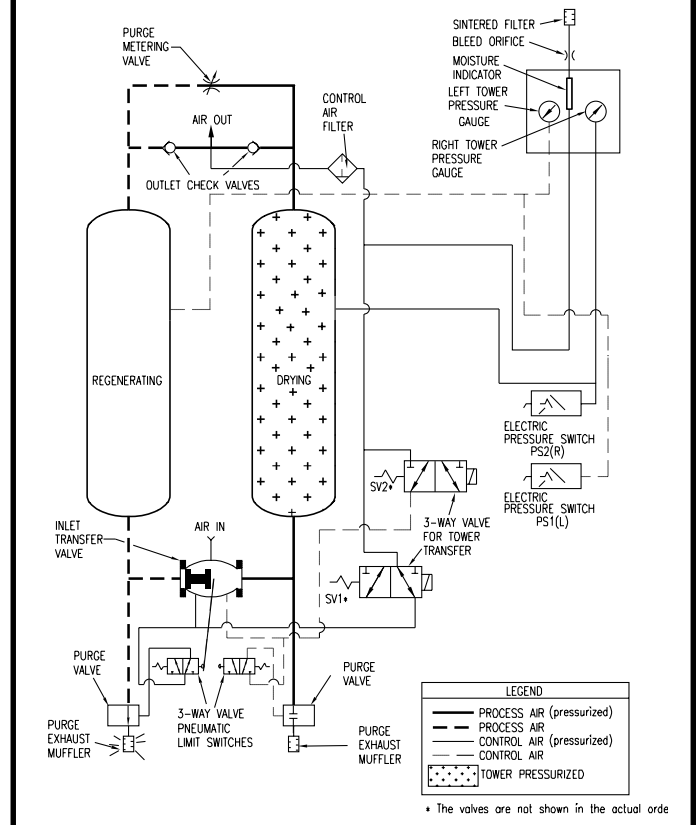
The pilot valves SV1 or SV2 are either energized or de-energized depending on which tower is on stream (drying). If SV2 is energized, the LEFT tower is drying and if SV1 is energized, the RIGHT tower is drying.

6.2 MOISTURE INDICATOR

The moisture indicator is in the center of the panel. The moisture indicator is a clear plastic tube filled with moisture sensing crystals. A sample of outlet air is directed through the indicator.

The crystals will change colors from **PINK (indicating wet air)** to **BLUE (indicating dry air)** as the dew point of the air changes from +20°F to -40°F.

FIGURE 6A PNEUMATIC SCHEMATIC for DRYERS WITH STANDARD CONTROL



7.1 STANDARD CONTROL

The STANDARD CONTROL is a compact NEMA 4X control box. It has the following features:

- Dryer Status LEDs
 - POWER ON LED
 - RUN LED
 - HOLD LED
 - SWITCHING FAILURE LED
 - L/R TOWER DRYING LED
 - L/R TOWER REGENERATING LED
 - DRYER PURGING LED

The Dryer Status LEDs are located on the front panel of the control box.

Figure 7A shows the location of each. **Note: There is a Red LED located on the inside of the control box. This LED flashes on and off indicating the timer is active.**

Start the dryer per SECTION 5.1. When the Left tower is pressurized and on line drying the process air, the corresponding LEFT TOWER DRYING LED is illuminated. When the right tower is pressurized and on line drying the process air, the corresponding RIGHT TOWER DRYING LED is illuminated. The DRYER PURGING LED is illuminated when the corresponding purge exhaust valve is open. During repressurization this LED will not be illuminated. Repressurization occurs for approximately 20 seconds just before tower changeover. The operation timing sequence of the dryer is shown in Figure 7C TIMING CHART FOR STANDARD CONTROL.

SWITCHING FAILURE:

When there is a switching failure, the LED will be lit. This will energize the contacts shown in Figure 4C. The contacts can be wired for remote annunciation. To reset the Switching Failure Alarm press the Run button on the control box front panel.

HOLD FEATURE:

For Low load or Static pressure conditions, the hold contacts shown on Figure 4C can be wired to an auxiliary set of normally closed contacts on the compressor starter. This will stop the cycling of the dryer and repressurize both towers of the dryer, until there is demand on the compressor. The Hold LED will light, if the dryer is wired as described and the compressor is not running.

FIGURE 7A CONTROL BOX FRONT PANEL

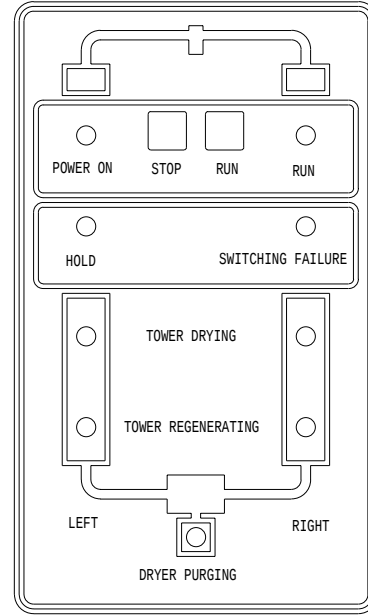
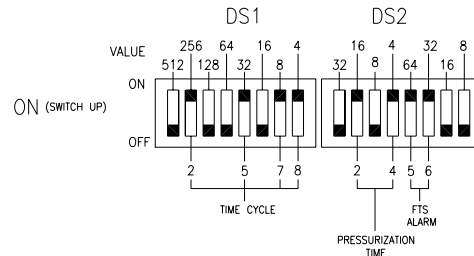


FIGURE 7B CYCLE TIME DETAIL



The setting for the alarm time is **96 sec.** For the alarm time setting, the switches indicated for **DS2 (5 & 6)** as shown in the **CYCLE TIME DETAIL** have been factory set by pushing the switches up. The values for these switches are **(64 & 32) sec.**, so when added together equal **96 sec.** **WE DO NOT RECOMMEND CHANGING THIS SETTING.**

NOTE: THE ALARM TIME SETTING NEEDS TO BE LESS THEN THE HALF CYCLE TIME SETTING OR THIS WILL NEGATE THE ALARM FUNCTION.

7.2 SETTING THE CYCLE TIME

Reference Figure 7B:

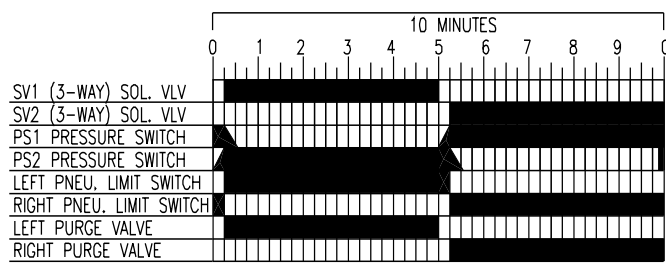
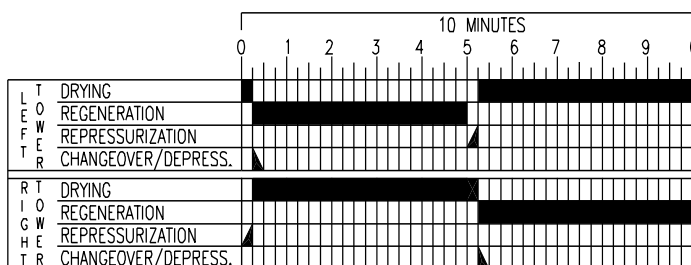
The setting for the time cycle is a **5 min/half cycle.** For the half cycle time setting, the switches indicated for **DS1 (2, 5, 7, & 8)** as shown in the **CYCLE TIME DETAIL** have been factory set by pushing the switches up. The values for these switches are **(256, 32, 8, & 4) sec.**, so when added together equal **300 sec or 5 min.** **WE DO NOT RECOMMEND** a time cycle setting below **2 min/half cycle.** For this half cycle time setting, the switches that need to be pushed up are **DS1 (4, 5, 6, & 7)** there values are **(64, 32, 16, & 8) sec.** so when added together equal **120 sec or 2 min.**

The setting for the pressurization time is **20 sec.** For the pressurization time setting, the switches indicated for **DS2 (2 & 4)** as shown in the **CYCLE TIME DETAIL** have been factory set by pushing the switches up. The values for these switches are **(16 & 4) sec.**, so when added together equal **20sec.** **WE DO NOT RECOMMEND CHANGING THIS SETTING.**

IMPORTANT

Operating this dryer on the 4 minute cycle will more than double the wear on the dryer components. To reduce wear on the dryer, operate the dryer on the 10 minute cycle if the -40°F dew point is acceptable.

FIGURE 7C TIMING CHART FOR STANDARD CONTROL



8.1 SHUTDOWN PROCEDURES

Close the inlet and outlet isolation valves (if installed). Open the bypass valve (if installed). Let the dryer depressurize completely.

Turn the dryer off by pressing the Stop button.

If maintenance is to be performed on the dryer, make sure the dryer is completely depressurized. Tower pressure gauges must read 0 PSIG before removing any item on the dryer.

9.1 DAILY INSPECTION

The following procedures should be performed daily:

- Check the dryer operating conditions, inlet temperature, ambient temperature, inlet pressure and inlet flow.
- Monitor the dryer for one complete cycle. Make sure it is operating properly.
- Check the purge mufflers. Purge air should be exhausting from one of the valves. If oil is present, the dryer and air system may be contaminated with lubricants.
- Inspect all upstream equipment, aftercoolers, separators, drains and filters.
- Check the pressure differential indicator on all prefilters and afterfilters. If the differential pressure is unacceptable, replace the elements.
- Check the prefilter(s) for proper draining. If the prefilter is not equipped with an automatic drain, it must be drained manually.
- Make sure that all bypass valves are tightly closed.
- Visually check the dryer and piping for damage.
- Visually check the dryer moisture indicator (blue dry or pink wet)

9.2 SCHEDULED MAINTENANCE

12 MONTHS

- Replace purge muffler elements
- Replace the control air filter element

24-60 MONTHS

- The desiccant in the towers should be replaced every two to five years. The life of the desiccant will vary depending on the inlet air conditions. Systems with excessive contaminants and/or inadequate filtration will decrease the life span of the desiccant drastically. Once the desiccant is contaminated with lubricants, it must be replaced.

9.3 DESICCANT REPLACEMENT

WARNING

DO NOT ATTEMPT TO REMOVE PLUGS OR HATCH COVERS UNTIL ALL AIR PRESSURE IS OUT OF THE VESSEL. CHECK ALL TOWER PRESSURE GAUGES, MAKING SURE THAT THEY ARE AT 0 PSIG AND INCOMING PRESSURE HAS BEEN TURNED OFF.

ALWAYS WEAR EYE PROTECTION AND GLOVES WHEN HANDLING THE DESICCANT. DUST FROM THE DESICCANT MAY CAUSE EYE AND SKIN IRRITATION. AVOID BREATHING THE DUST AND PROLONGED CONTACT WITH THE SKIN.

FIRST AID IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. CONSULT A PHYSICIAN.

Take dryer off stream following the **SHUTDOWN PROCEDURES IN SECTION 8.**

Remove the plugs from the desiccant drain and fill ports; drain old desiccant from each tower.

Remove any oil, dirt, or scale from the towers and inlet piping. Do NOT weld, grind or sandblast the vessels as this voids the ASME Certification. The vessels may be steam cleaned internally and externally to remove dirt and oil.

CAUTION

Make sure that the towers are clean to prevent contamination of new desiccant.

Replace plugs securely on desiccant drain ports. Apply pipe thread sealant as necessary.

Make sure that the drain ports or hatch covers are installed before attempting to fill the towers. Load desiccant through the desiccant filler ports or hatches. **REFER TO SECTION 3.1 FOR PROPER DESICCANT AMOUNTS.**

Reinstall the fill port plugs. Use pipe sealant.

Follow **START UP PROCEDURES IN SECTION 5.1** to start up and place dryer in operation.

9.4 CONTROL AIR FILTER REPLACEMENT

Close the dryer inlet and outlet isolation valves (and open bypass valve if provided). Turn off the power and completely depressurize the dryer.

WARNING

DO NOT REMOVE THE FILTER BOWL FROM HEAD UNTIL HOUSING IS COMPLETELY DEPRESSURIZED.

After all pressure is out of the dryer, grasp the filter bowl firmly, while pushing the bowl upward turn it clockwise to remove it from the filter head.

Remove the used element from the head. Discard used element properly.

Remove new element from the shipping package. Place the new element into the filter head.

While pushing the bowl upward into the head turn the bowl counterclockwise to lock it in place.

Following the start up procedures for the dryer, place the dryer on stream.

9.5 TROUBLESHOOTING

The following check list should be used as a guideline for troubleshooting problems. Each of the topics will reference other sections in this manual for further information.

IS THE POWER ON?

Check the main power source. Make sure the Run button is pressed and the Run LED is lit.

IS THE SYSTEM PRESSURIZED?

The dryer is designed to operate at 60 to 150 psig. Check the upstream equipment and any isolation or bypass valves.

IS THE DRYER CYCLING?

• IS THE FAILURE TO SWITCH ALARM ACTIVATED?

If the dryer is not cycling the FAILURE TO SWITCH ALARM should be activated. The dryer should be checked to determine the cause of switching failure.

• IS THERE CONTROL AIR PRESSURE, 60 PSIG MINIMUM.

Make sure that the dryer inlet pressure is above 60 PSIG. Check the control air filter element and replace it with a new element. Reference Section 9.4 for element replacement instructions.

• ARE THE PILOT VALVES FAULTY? (SV1 & SV2)

Reference Section 9.5-3 for procedures to check the operation of the 3-way valves.

Replace any faulty 3-way valves.

• IS THE INLET VALVE FAULTY? Reference Section 9.5-5 for procedures to check the operation of the inlet transfer valve.

Rebuild or replace the inlet valve as necessary. Reference Section 10.4 for repair kit details.

• IS A PURGE EXHAUST VALVE FAULTY? Reference Section 9.5-7 for procedures to check the operation of the purge exhaust valves.

Rebuild or replace the faulty purge exhaust valve. Reference Section 10.3 for valve breakdowns and repair kit details.

• IS AN OUTLET CHECK VALVE FAULTY? Reference Section 9.5-8 for procedures to check the operation of the outlet check valves.

If a valve is faulty, replace it.

• IS THE PURGE METERING VALVE SET PROPERLY? Reference Section 5.2 for purge metering valve settings and procedures.

If the purge metering valve requires adjustment, follow the procedures in Section 5.2.

ARE THE TOWERS DEPRESSURIZING?

• ARE THE PNEUMATIC LIMIT SWITCHES FAULTY?

Reference Section 9.5-6 for procedures to check the operation of the pneumatic limit switches.

If either of the pneumatic limit switches are faulty, replace them both.

IS THE VISIBLE MOISTURE INDICATOR BLUE? Reference Section 6.2 for an explanation of operation for the moisture indicator.

• IS THE BLEED ORIFICE FITTING OR SINTERED MUFFLER ON THE MOISTURE INDICATOR CLOGGED?

Inspect the bleed orifice fitting and the sintered filter on the back of the moisture indicator. They can be cleaned or replaced.

IS THE DEW POINT ACCEPTABLE?

• ARE THE INLET CONDITIONS WITHIN THE SPECIFICATIONS? Reference Section 3.1 for the inlet conditions of the dryer.

Correct the inlet conditions if necessary. Excessive inlet flow will greatly reduce the performance of the dryer.

• IS THE PURGE METERING VALVE SET PROPERLY? Reference Section 5.2 for purge metering valve settings and procedures.

IS THE DEW POINT ACCEPTABLE? (cont'd)

If the purge metering valve requires adjustment, follow the procedures in Section 5.2.

• WAS THE DESICCANT INSTALLED?

Make sure that the desiccant was installed. Reference Section 9.3 for desiccant replacement procedures.

• IS THE DESICCANT CONTAMINATED WITH LUBRICANTS?

Check the condition of the desiccant bed. If the bed is contaminated with lubricants, replace the desiccant following the procedures in Section 9.3.

• IS THE DESICCANT CONTAMINATED WITH MOISTURE?

If the dryer was operated under excessive inlet conditions, the desiccant bed may be saturated with liquid moisture. Check upstream equipment such as aftercoolers. Check the actual inlet conditions, correct them and condition the bed following the procedures in Section 5.3.

• ARE THE BYPASS VALVES OPEN OR LEAKING?

Check the valves (if installed). Repair or replace if faulty.

9.5-3 CHECKING THE 3-WAY PILOT VALVES (SV1 & SV2) TOWER CHANGEOVER

All 3-way pilot valves have manual override buttons on the top of the valve. To test SV1 and SV2 do the following:

Make sure the Stop button is pressed and the dryer is pressurized. Both towers should be at full line pressure. Pushing the manual override of SV1 should cause the left tower to depressurize. Allow the left tower to come back up to full line pressure. Pushing the manual override of SV2 should cause the right tower to depressurize. If this does not happen, replace that solenoid valve.

9.5-5 CHECKING THE INLET TRANSFER VALVE

The inlet transfer valve will not switch positions unless the pressure in both desiccant towers is nearly equal. At tower changeover, the regenerating tower should approach full line pressure before the inlet valve will switch. Make sure that there are no leaks in the piping or fittings. Make sure that the purge exhaust valves are closing and that the purge metering valve is properly set.

The exhaust ports on top of the pilot valves (SV1 & SV2) should not have air exhausting through them continuously. If air is exhausting continuously through either of the exhaust ports, the inlet transfer valve is faulty and should be rebuilt or replaced.

To test the inlet transfer valve for proper operation, turn off the power, isolate and depressurize the dryer.

Remove the two pilot lines to the inlet valve. The pilot lines are connected to the outside flanges of the valve. Using an air nozzle and clean air, pressurize one of the ports. Observe the position indicator. It should move in the direction of the port that is being pressurized. No air should be exhausting from the other port.

Pressurize the other port. The valve should move to the other side. If the valve does not move or air is being exhausted out of the port that is not pressurized, the inlet transfer valve must be rebuilt or replaced. Reference Section 10.4 for parts listing.

9.5-6 CHECKING THE PNEUMATIC LIMIT SWITCHES

Mounted on the inlet transfer valve is a set of 3-way pneumatic limit switches. These switches control the pilot air to open and close the purge exhaust valves.

When a pneumatic limit switch is activated by the inlet transfer valve position indicator, pilot air is supplied to the purge exhaust valve on that side of the dryer.

To check the pneumatic limit switches, allow the dryer to cycle. Check the pilot line to the purge exhaust valve on the side of the activated limit switch. If no air is present, the limit switch must be replaced. The limit switches are sold in sets only.

9.5-7 CHECKING THE PURGE EXHAUST VALVES

The purge exhaust valves are normally closed. They can be checked by removing the pilot air lines to them. The valves should be closed.

Using an air nozzle and clean air, pressurize the purge exhaust valves. The valves should open when pressurized. If valve does not open and close, it should be rebuilt or replaced. See Section 10.3 for valve breakdown and parts listing.

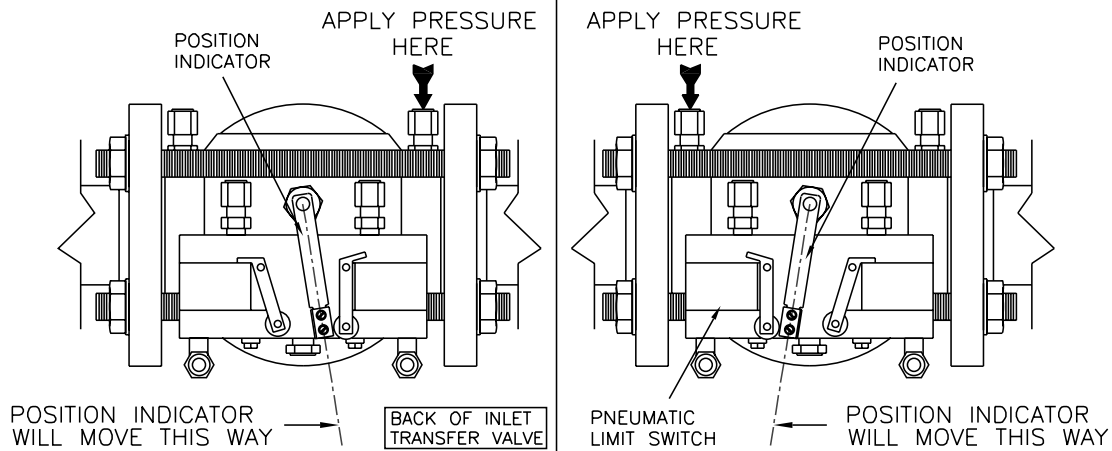
9.5-8 CHECKING THE OUTLET CHECK VALVES

This dryer uses two check valves for outlet air control. If either of the outlet valves fails, one of the following will occur:

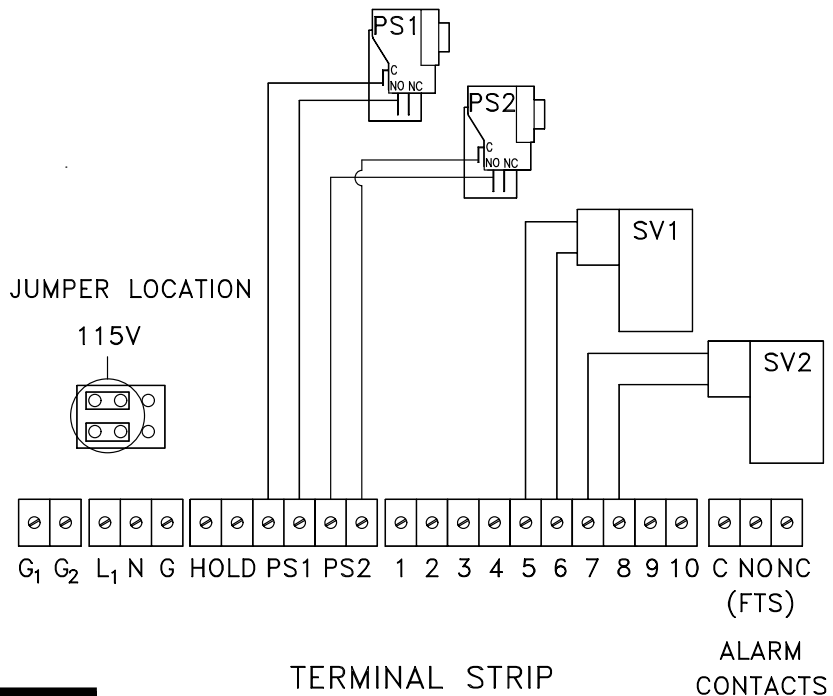
- A large amount of air will purge from one tower
- The outlet air flow will be blocked

If either happens, the faulty check valve must be replaced.

INLET TRANSFER VALVE DETAIL



WIRING DIAGRAM

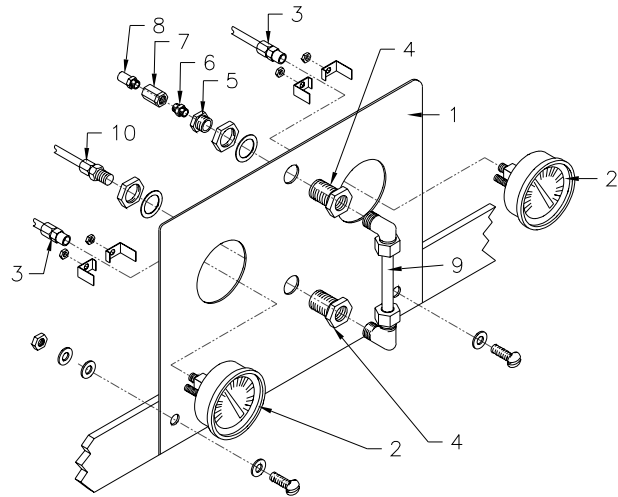


CAUTION

THE DRYER CONTROL CIRCUIT IS DUAL VOLTAGE RATED. NEVER SET THE BOARD TO A VOLTAGE OTHER THAN THE VOLTAGE RATING OF THE DRYER LISTED ON THE DRYER DATA TAG. SETTING THE BOARD INCORRECTLY WILL CAUSE DAMAGE TO THE INLET AND PURGE VALVES AND POSSIBLE PERSONAL INJURY OR FIRE.

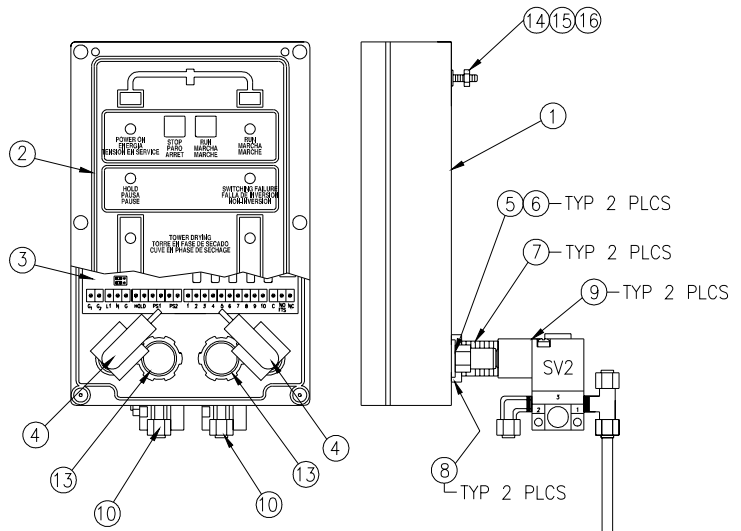
10.1 STANDARD CONTROL AND CYCLE SAVER GAUGE PANEL REPLACEMENT PARTS

ITEM	QTY	DESCRIPTION	STANDARD CONTROL PART NO.
1	1	Panel	C26-6487
2	2	2" Pressure Gauge, 0-200 PSIG	C29-0278
3	2	1/8" NPT x 1/4" Female Straight Tube Fitting	C26-0233
4	2	1/4" NPT Anchor Tube Fitting	C26-1497
5	1	1/4" NPT x 10-32 Reducer Bushing	C26-0296
6	1	10-32 Short Coupling	C26-0657
7	1	10-32 Choke Fitting	C26-0490
8	1	10-32 Sintered Filter	C26-0623
9	1	Visible Moisture Indicator Assembly	C46-2300
10	1	1/4" NPT x 1/4" Male Straight Tube Fitting	C26-0231



10.2 STANDARD CONTROL SYSTEM REPLACEMENT PARTS

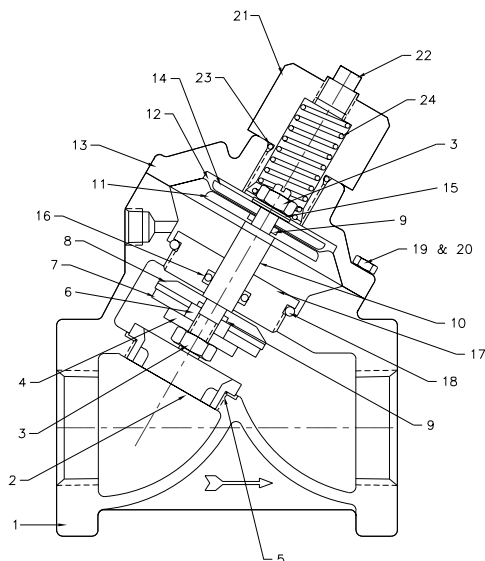
ITEM	QTY	DESCRIPTION	115V PART NO.
1	1	Enclosure	C27-1139
2	1	Panel Membrane and Ribbon Connector	C26-6356
3	1	Circuit Board	C26-6469
4	2	Pressure Switch	C26-5284
5	2	Female Connector Fitting	C26-6492
6	2	Threaded Seal Fitting	C26-3042
7	2	1/2" NPT x 2" LG. Close Nipple, Galvanized	C12-0515
8	2	Seal Fitting	C26-0883
9	2	1/8" Solenoid Valve	C14-2082
10	3	Male Elbow Tube Fitting	C26-0234
11	1	Male Tee Tube Fitting	C26-0504
12	1/4 ft.	Nylon Tubing 1/4" Outside Diameter	C26-0223
13	2	1/2" Connector Locknut	C26-6491
14	1	8-32 Washer Stat-O-Seal	C28-1371
15	1	8-32UNF x 1" LG Rd. Mach Grounding Screw	C28-1372
16	1	8-32UNF Hex Nut	C28-1373



10.3 1" PURGE VALVE

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	1	Body 1" NPT	13	1	Cap (cast iron)
2	2	Seat (cast brass)	14	1	Upper Diaphragm Plate
3	2	Hex Lock Nut (1/4-28)	15	1	Lockwasher Set (1/4")
4	2	Disc Plate	16	1	O-Ring (AFLAS)
5	2	O-Ring (viton)	17	1	O-Ring Retainer (brass)
6	2	Disc Spacer (brass)	18	1	O-Ring (viton)
7	4	Disc (hycar)	19	1	Hex HD. Cap Screw (1/4-20 x 7/8)
8	1	Disc Holder (brass)	20	1	Hex Nut (1/4-20)
9	1	O-Ring (viton)	21	1	Retainer Nut
10	1	Shaft	22	2	SQ.HD. Pipe Plug (1/4" NPT)
11	1	Lower Diaphragm Plate	23	1	O-Ring (viton)
12	1	Diaphragm (Buna N/nylon)	24	1	Spring

REPAIR KITS		PART NO.
DIAPHRAGM & SEAL KIT		C26-5687
Consists of Item Numbers: 3(2), 5, 7, 9(2), 18 &		
INTERNAL REPAIR KIT		C26-5686
Consists of Item Numbers: 4, 6, 8, 10, 11, 14, 15 & 17 and "DIAPHRAGM AND SEAL KIT "		
SPRING KIT		C26-5688
Consists of Item Number: 24		
SEAT REMOVAL TOOL		C26-5873
O-RING RETAINER REMOVAL TOOL		C26-5874



10.4 REPLACEMENT PARTS

		HL-200	
ITEM	DESCRIPTION	PART NO.	QTY
1	Inlet Transfer Valve	C14-2014	1
a	Seat & Seal Kit for Inlet Transfer Valve	C26-6272	1
b	Position Indicator Kit for Inlet Transfer Valve	C26-6273	1
c	Shuttle Assembly Kit for Inlet Transfer Valve	C26-6274	1
2	Check Valve	C14-1788	2
3	Purge Valve	C14-1841	2
a	Diaphragm & Seal Kit for Purge Valve	C26-5687	2
b	Internal Repair Kit for Purge Valve	C26-5686	2
c	Spring Kit for Purge Valve	C26-5688	2
4	Diffuser basket	C46-0224	4
5	Stud	C28-0409	4
6	Sintered Filter	C26-1014	1
7	Leg Base	C46-2347	2
8	Leg	C46-2345	2
9	Purge Exhaust Muffler	C26-3262	2
a	Element, purge exhaust muffler	C26-5774	2
10	Control Air Filter	C26-6830	1
a	Element, control air filter	C26-6831	1
11	Purge Metering Valve	C14-0474	1
12	Pneumatic Limit Switch (set)	C14-2047	1
13	Manifold Block w/Pneumatic Limit Switches	C14-2048	1
14	Desiccant		-
	Activated Alumina, 1/8" dia, 25# pail	C33-0237	9
	Activated Alumina, 1/8" dia., 50# bag	n/a	n/a
	Activated Alumina, 1/8" dia., 375# drum	n/a	n/a
15	Touch-Up Paint, 9oz. spray can	C45-0173	1
16	OPTIONAL SAFETY RELIEF VALVE	C14-1448	2

10.5 HOW TO ORDER PARTS

To order parts for your dryer contact your local VAN AIR representative or the representative where you purchased the dryer from. If you cannot find a local representative or have problems ordering the parts, contact the factory.

When contacting your local VAN AIR representative or the factory, the following information is necessary:

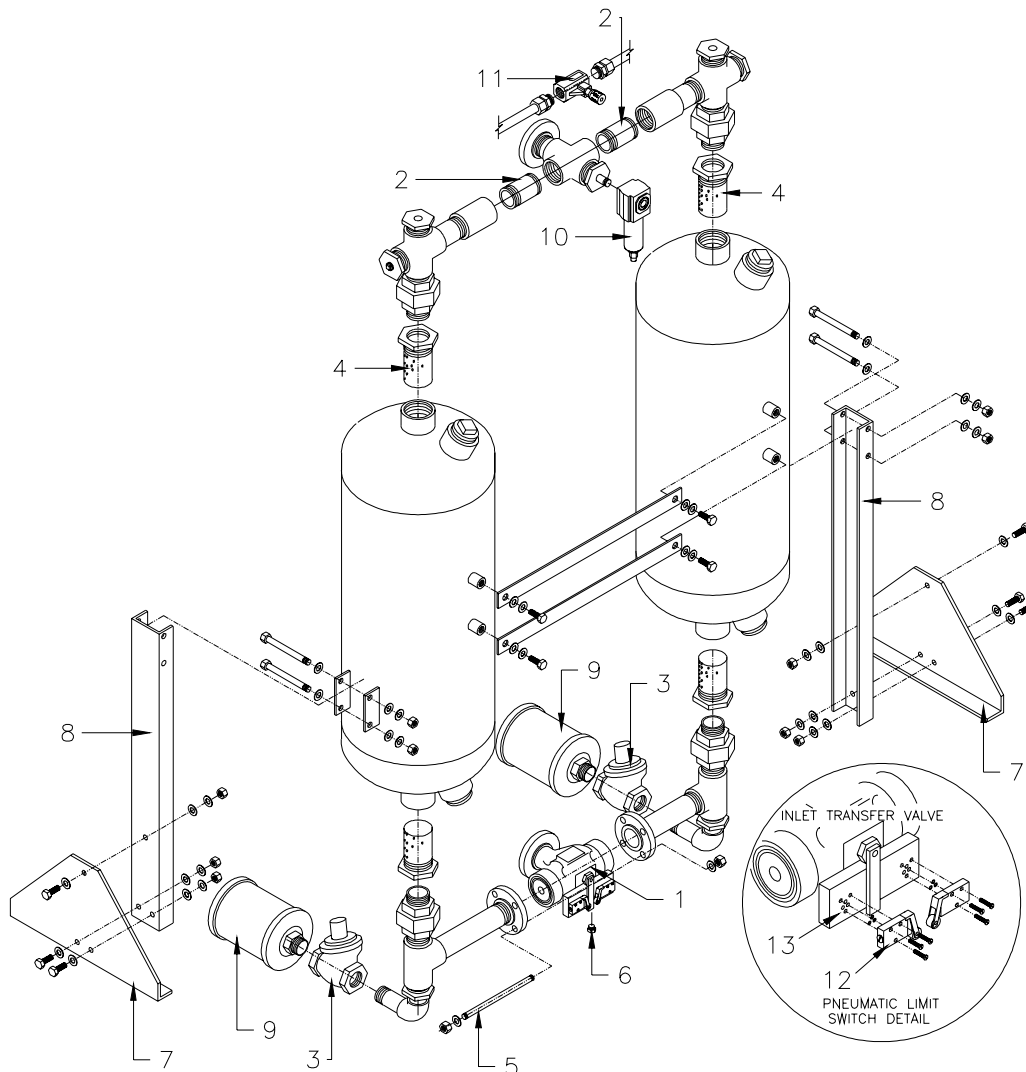
Dryer model

Dryer serial number

Dryer part number

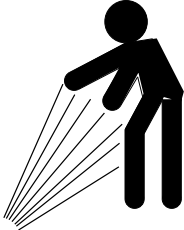
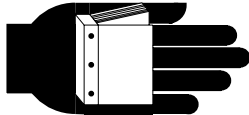
This information can be found on the dryer data tag. The data tag is located inside the door of the control box. If your dryer is equipped with the "REGENERATOR" control system, the tag is located on the valve mounting plate.

The Service Department can be reached by calling 814-774-4925 or faxing 814-774-3482. Hours are 8:00 AM EST to 5:00 PM EST, Monday through Friday.



SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious.

⚠ DANGER  DISCHARGE AIR USED FOR BREATHING WILL CAUSE SEVERE INJURY OR DEATH. CONSULT FILTRATION SPECIALIST FOR ADDITIONAL FILTRATIONS AND TREATMENT EQUIPMENT TO MEET HEALTH AND SAFETY REGULATIONS.	⚠ DANGER  AIR AND OIL UNDER PRESSURE WILL CAUSE SEVERE PERSONAL INJURY OR DEATH. SHUT DOWN COMPRESSOR AND RELIEVE SYSTEM OF ALL PRESSURE BEFORE REMOVING VALVES, CAPS, PLUGS, FITTINGS, BOLTS AND FILTER.	⚠ WARNING  ELECTRICAL SHOCK FROM IMPROPER GROUNDING CAN CAUSE INJURY OR DEATH. GROUND UNIT AND RELATED EQUIPMENT ACCORDING TO NATIONAL ELECTRICAL CODE AND LOCAL REGULATIONS.	⚠ WARNING  READ THE OPERATOR'S MANUAL BEFORE STARTING THIS UNIT. FAILURE TO ADHERE TO INSTRUCTIONS CAN RESULT IN SEVERE PERSONAL INJURY OR DEATH. REPLACEMENT MANUALS CAN BE PURCHASED BY CONTACTING THE MANUFACTURER.
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