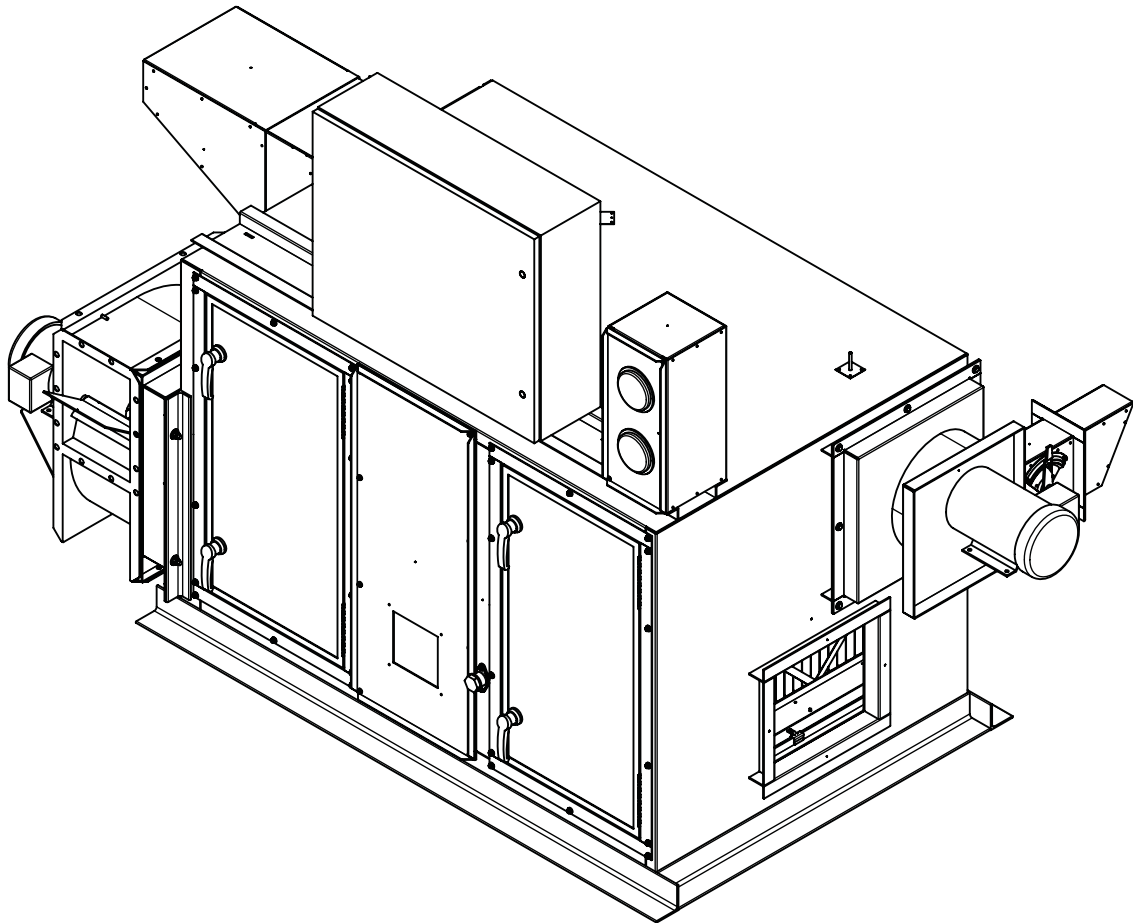


DES Series 2000

Installation, Operation and Maintenance Manual

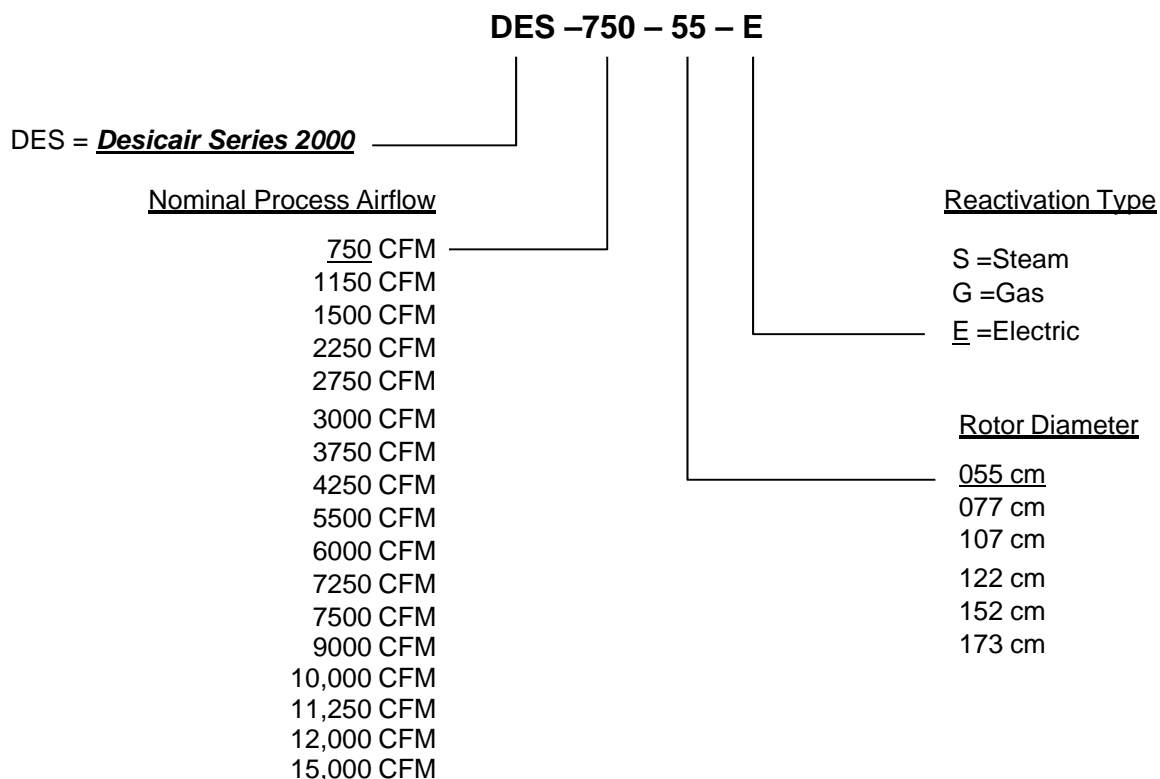


**Desiccant
Dehumidification
System**



MODEL NOMENCLATURE

DESICaIR Product Identification Number Example



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1.0 GENERAL INFORMATION

1.1 About this Manual

This manual provides installation, operation, and maintenance information for the STULZ DESICAiR® DES Series 2000 dehumidification system. The DES system has several standard options which are covered in this manual. The exact configuration of your system is reflected in the Engineering drawings provided in the Technical Data Package shipped with your system. It is also described in the Dehumidifier Identification Number (DIN) sheet and other submittal package documents for your system. You can use these documents to determine the sections of this manual that are relevant to your system.

1.2 Introduction

The DES Series 2000 dehumidification system is designed and manufactured by Stulz Air Technology Systems, Inc. (STULZ) utilizing the latest, state-of-the-art control technology. Recognized as a world leader, STULZ provides dehumidification systems manufactured with the highest quality craftsmanship and materials. The unit will provide years of trouble free service if it is installed, operated and maintained as described in this manual. Damage to the unit from improper installation, operation or maintenance is not covered by the warranty.

Study the instructions in this manual; they must be followed to avoid difficulties. Spare parts are available from STULZ to ensure continuous

operation. Using substitute parts or bypassing electrical or other components in order to continue operation is not recommended and will void the warranty.

1.2.1 Technical Data Package

This manual is part of the Technical Data Package provided with your unit. The Technical Data Package typically includes drawings, Technical Data Sheets, a Flow Diagram, a Test Report and component part manufacturer's manuals containing additional information about significant components. The Technical Data Package may also contain related STULZ manuals (for example, the *E² Series Microprocessor Controller for Desicair Dehumidification Systems IOM* manual). These documents should be stored in a safe place on or near the unit for reference.

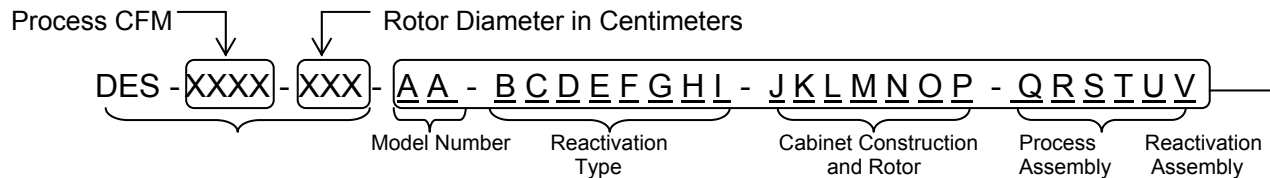
A Warranty Registration and Start-up Checklist form is also included in the Technical Data Package. This form must be completed during installation and returned to STULZ Product Support to activate your warranty.

1.2.2 Dehumidifier Identification Number

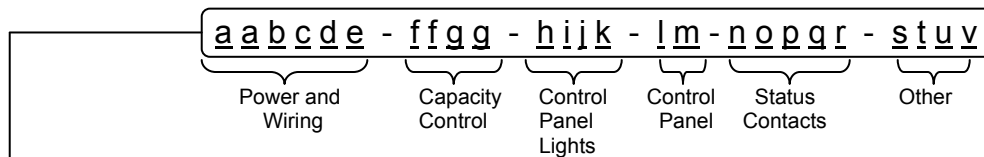
The Dehumidifier Identification Number (DIN) is a long series of numbers and letters that define the specific features provided in your unit. It is included for reference on a sheet in the unit Technical Data Package. The meaning of the numbers and letters encoded in the DIN is described in section 1.2.2.1.

1.2.2.1 Dehumidifier Identification Number (DIN) Sheet

The DIN starts with the model number. The DES model number includes the nominal process CFM followed by the desiccant rotor diameter (ex. DES-5500-106). The first 23 digits after the model number (represented by the uppercase letters A–V below) pertain to the cabinet construction, rotor, and process and reactivation accessories or options.



The last 25 numbers (represented by lowercase letters a–v) pertain to the electrical system, unit controls, the power supply, control scheme, and the control panel.



The following is a sample DIN Sheet for a DESICAiR DES Series 2000 Desiccant Dehumidifier

DESICAIR DEHUMIDIFIER SPECIFICATION REVIEW			Date: _____
DEHUMIDIFIER IDENTIFICATION NUMBER			
DES-5500-106-05-01211110-1223111-222311-061021-1117-0000-21-10001-0000			
Cabinet construction, rotor, process and reactivation assemblies:			
A - 05	Reactivation Heater:	Direct natural gas	
B - 0	Unit Configuration:	Left-hand: View Proc. In - Access on Left	
C - 1	Cabinet Construction:	Standard: Single-wall aluminum	
D - 2	Insulation (Process Inlet):	1" Armaflex	
E - 1	Paint:	Standard: Industrial Gray	
F - 1	Mounting:	Structural Rail	
G - 1	Rotor:	Standard	
H - 1	Rotor Drive Motor:	Standard	
I - 0	Gauges:	4" Diameter (Ambient > 20 F)	
J - 1	Process Inlet:	Standard: Flange	
K - 2	Process Inlet Filters:	30% pleated	
L - 2	Process Outlet:	Flange with damper for -106 & larger	
M - 3	Process Blower Size Range:	DES Flow @ 800 FPM thru rotor	
N - 1	Process Blower Orientation:	Standard: Horizontal - front	
O - 1	Process Blower Isolation:	-106 & larger = RUBBER ; -55 & -77 = NON	
P - 1	Process Blower Motor:	Standard efficiency, TEFC	
Q - 2	Reactivation Inlet:	Weather hood w/screen	
R - 2	Reactivation Inlet Filters:	30% pleated	
S - 2	Reactivation Outlet:	Weather hood w/screen	
T - 3	Reactivation Blower:	Flow @ 800 FPM thru rotor	
U - 1	Reactivation Blower Orientation:	Standard: Horizontal - rear	
V - 1	Reactivation Blower Motor:	Standard efficiency, TEFC	
Electrical system, power supply, control scheme, and control panel:			
a - 06	Power Supply:	460/3/60	
b - 1	Elect. Encl. & Wiring:	STD: NEMA-4 box, Liquid Tight conduit	
c - 0	Disconnect:	None	
d - 2	Electrical Enclosure Heater:	Yes (below 32 F ambient)	
e - 1	Control Panel (Op Station/MMI):	Standard: Mtd on elect. enclosure	
f - 11	Capacity Control:	Dew-Trac	
g - 17	Sensor/Transmitter:	Dew-Trac: Field-mtd (duct) > -40 F	
h - 0	Dirty Filter Indicator Light:	None	
i - 0	Future Feature:	Reserved	
j - 0	Future Feature:	Reserved	
k - 0	Future Feature:	Reserved	
l - 2	Overheat Reset P-button:	Externally-mtd on elect. enclosure	
m - 1	Press-to-Test Lights:	Yes	
n - 1	Process Blower Interlock Dry Contact:	Yes	
o - 0	Dirty Filter Contact:	No	
p - 0	Process Air Proving Contact:	No	
q - 0	React Air Proving Contact:	No	
r - 1	Summary Fault Contact:	Contact and lights	
s - 0	Phase Monitor/ Voltage Monitor:	No	
t - 0	Emergency STOP P-button:	No	
u - 0	Future Feature:	Reserved	
v - 0	Future Feature:	Reserved	

1.2.3 Unit Nameplate

The Unit Nameplate, located in or near the main electrical enclosure (see Figure 1 for an example), is a quick source for useful information about your system, such as the unit model number, serial number and specific STULZ job number. This data will be required if you contact STULZ for assistance, warranty information, or spare parts. The Unit Nameplate also includes the process and reactivation airflow targets, along with their corresponding rotor pressure drops.

Manufactured By		
STULZ		
Air Technology Systems, Inc.		
Frederick, Maryland, USA		
www.stulz-ats.com		
Cage Code OB716		
Tel: (301) 620-2033		
Fax: (301) 620-1396		
MO #		
Item #		
Job #		
Model #		
Serial #		
Short Circuit Current Rating:		
Amps RMS Symmetrical		
Electrical Data:		
Voltage:	Phase:	Hz:
No. Wires: (Including Ground)		
Unit Data:		
FLA:	MCA:	MFS:
Process Motor HP:	FLA:	
Reactivation Motor HP:	FLA:	
Rotor Drive Motor HP:	FLA:	
Reactivation Heater		
Gas Type:		
Max. Burner Capacity:		btu/hr
Max. Req'd. Capacity:		btu/hr
Max. Gas Pressure		in w.g.
Min. Req'd. Gas Pressure		in w.g.
Max. Output Air Temperature		
Process: 200 F	Reactivation: 200 F	
External Static Pressure		
Process:	SCFM Range: 0.0 To	in w.g.
Reactivation:	SCFM Range: 0.0 To	in w.g.
Target Rotor Pressure Gauge values		
Process:		in w.g.
Reactivation:		in w.g.
Desiccant Rotor Type:		
Silica Gel Bonded To Fluted Substrate		
Minimum Installation Clearance: 0 FT		
Suitable for Outdoor Use		
Enclosure Type:		
Date of Manufacture:		
Q.A. Acceptance:		
Caution: Disconnect Main Power Before Servicing Equipment		

Figure 1 - Sample STULZ Nameplate

1.3 Safety Summary

Read and understand all instructions, recommendations, and guidelines in this manual

regarding the installation, maintenance, and operation of this unit prior to installation and start-up. All maintenance and repairs should be conducted by personnel thoroughly trained in the operation and maintenance of this or like equipment.

The main power supply to the equipment must be shut off before beginning work on the equipment. Take extreme care to ensure that every capacitor likely to hold electrical charge has been grounded. Always remove all rings, watches, and other jewelry when working on electrical equipment. Some of the equipment used may present the hazard of Electrostatic Discharge (ESD). When working inside the equipment, always ground all parts before touching. When working on or near ESD-sensitive components, use a wrist grounding strap if possible.


Never operate the unit with any cover, screen, guard, panel, etc., removed unless the instructions specifically state to do so, and then do so with extreme caution to avoid personal injury. Never attempt to lift any component in excess of 35 pounds without additional help.


Placards and/or stickers have been placed in various locations on or in the unit. These placards/stickers are intended to call attention to personal safety and equipment damage hazards.


Certain maintenance and cleaning procedures may either recommend or specify the use of solvents, chemicals, or cleansers. Always refer to the manufacturer's Safety Data Sheet (SDS) prior to handling any of these materials.


1.4 Warnings & Cautions


The following is a condensed list of Warnings and Cautions that are noted throughout this manual. All personnel who operate, maintain or service this equipment should read and understand these Warnings and Cautions. Warnings indicate a potential threat to personnel and Cautions indicate a potential threat of equipment damage.


 **WARNING** Voltages used with this unit can be deadly. Be careful not to contact high AC voltage connections when installing or operating this equipment. Use the services of a qualified electrician and/or technician to make the electrical power connections and perform maintenance.


 **WARNING** Disconnect main power to the unit before performing any maintenance or service. Turning the mode selector switch to the Off position does not disconnect power to controls or the unit itself.


 **WARNING** Whenever the nature of the operation permits, keep one hand away from the equipment to reduce the hazard of current flowing through vital organs of the body.


 **WARNING** Never work on electrical equipment unless there is someone nearby who is both familiar with the operation and hazards of the equipment and competent to administer first aid. When operators aid the technician, the technician must warn them about dangerous areas.


 **WARNING** Do not be misled by the term "low voltage" which may appear in this manual or on drawings or documents in the Technical Data Package. Electrical voltages as low as 50 volts can cause death under certain conditions.

 **WARNING** Multiple power sources may be used in the unit. Ensure power is disconnected from all sources before servicing powered components.


 **WARNING** Do not touch hot system components. The design reactivation temperature range is 250–300 °F. The components of the reactivation system may be extremely hot during operation. Be absolutely certain that the unit and/or reactivation components are cool before attempting to work on or near them.


 **WARNING** The connection and service of steam components presents an extreme hazard of both heat and pressure. Use the services of a qualified technician only.


 **WARNING** The connection and service of gas components presents an extreme explosive hazard. Use the services of a qualified technician only.


 **WARNING** Blower motors may start unexpectedly when the unit is running due to an automatic resetting of the internal overload device.

 **WARNING** Do not allow anyone under the equipment while it's suspended from a lifting device.

 **WARNING** Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury to personnel and damage to the equipment.

 **CAUTION** Air intake and discharge openings must be free of obstructions. Ensure that filters are clean and that panels are on and properly secured into position.

 **CAUTION** Do not operate the unit without filters. It is better to operate the unit with dirty filters than with no filters. Operating the unit with no filters may void the warranty.

 **CAUTION** Do not interchange natural and propane gas on a gas-fired unit. Only use the type of gas specified on the Unit Nameplate.

1.5 Theory of Operation

The DES series is designed to dehumidify a space to a level below that attainable with a refrigeration-based dehumidification system. Moisture is removed from the air by being passed through a desiccant wheel (called the "rotor") that is impregnated with a dry desiccant. Process air (the air being dehumidified) is filtered, dehumidified and supplied to a conditioned space at a lower relative humidity and a slightly higher dry bulb temperature than its inlet condition.

Simultaneously, a second airstream (reactivation air) is filtered and heated by a reactivation heater system, then passed through a separate segment of the rotor. This heated reactivation air removes the previously adsorbed moisture from the desiccant rotor and exhausts it to an area other than that being conditioned. During operation, the desiccant rotor rotates through the process and reactivation airstreams of the dehumidifier at a constant speed. The two airstreams are separated by face and peripheral seals and by internal fluting in the desiccant rotor. Process and reactivation airstreams are counter-flow to maximize the efficiency of the adsorption process and to help prevent the rotor's flutes from fouling.

The reactivation heater is sized to raise the temperature of the reactivation air entering the desiccant rotor approximately 180 °F above ambient

(depending upon moisture adsorbed from the process air and reactivation airflows). The energy from the heated reactivation air is used to desorb the moisture. Reactivation discharge air temperature will vary and can be as high as 150 °F and moist. Controls are included in the unit to vary reactivation heat based upon the amount of moisture adsorbed from the process airstream.

The main dehumidifier components include the reactivation heater system (electric, steam or gas-

fired), desiccant rotor, rotor seals, rotor drive gearmotor, blowers/motors, air filters, electrical controls, electrical contacts and indicator lights.

NOTE: The reactivation air temperatures mentioned in the preceding discussion may vary between DES systems. See the Technical Data Sheet for your unit for target temperatures.

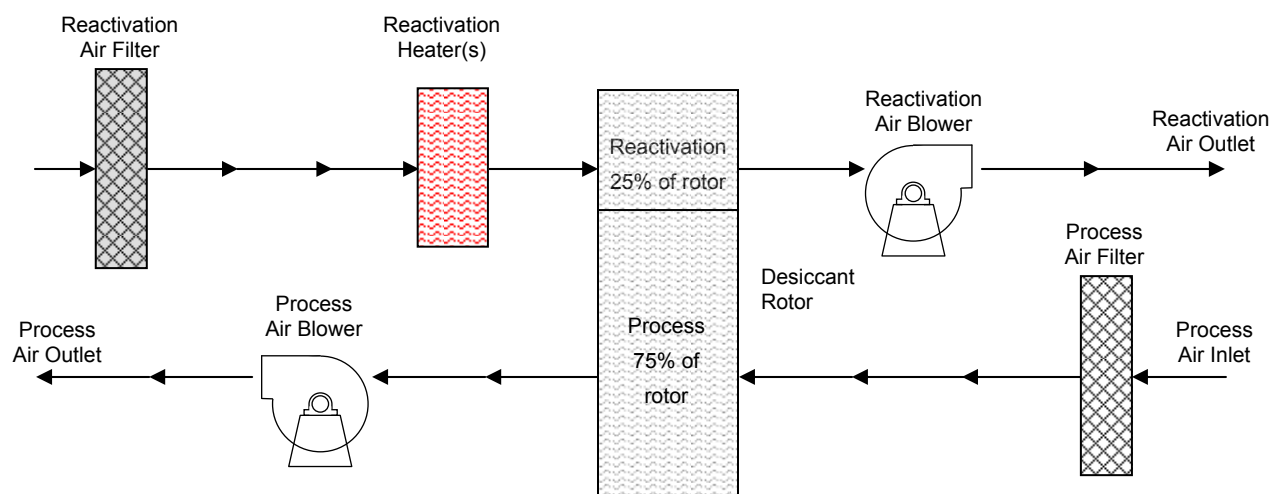


Figure 2 - General Theory of Operation

1.6 Construction

Your STULZ desiccant dehumidifier has passed rigorous Quality Control checks, including a complete functional test. Every effort has been made to ensure the dehumidification system will perform satisfactorily for many years.

1.6.1 Design Features

- Rugged all-aluminum cabinet
- Continuous or automatic operation
- Inert, stable silica gel desiccant
- Non-toxic, non-corrosive desiccant
- Capable of withstanding 100% RH without adverse effect
- Counterflow process and reactivation air patterns
- Overheat safety protection
- Electric, gas or steam reactivation heat
- Easy access to internal components
- Low operating cost, energy efficient dehumidification

- Optional process and reactivation inlet air filters

For a comprehensive list of the features included, refer to the DIN Sheet provided with this unit (see Section 1.2.2). The DIN sheet is a listing of all the features (standard and optional) that are included in your unit. For details about the features, refer to the Technical Data Package provided with your unit.

1.6.2 Cabinet

This unit is self-contained in an aluminum cabinet and will be rated for either indoor or outdoor use (see the Unit Nameplate). The exterior of the cabinet is finished with a durable paint to protect it against corrosion. Hinged doors or removable access panels are provided for easy access to all major components for maintenance and/or service. The operator controls are conveniently located at the front of the cabinet (see the Installation drawing provided with your unit). The cabinet houses the desiccant rotor assembly and drive system, process and reactivation air blowers, a reactivation heater system and electrical controls.

1.6.3 Inlets and Outlets

Depending on whether the unit is designed for indoor or outdoor use, the process and reactivation inlets and outlets may be equipped with hoods to prevent rain and snow from entering. A screen may be provided to prevent birds and other small animals from nesting in the inlets and outlets.

1.7 Reactivation Types

Reactivation heat is controlled during operation to maintain the reactivation discharge (leaving) air temperature, generally between 120 to 150 °F. The temperature of the reactivation air entering the rotor is about 180 °F above ambient (depending upon the moisture load of the reactivation air and/or the flow of the reactivation air).

NOTE: The reactivation air temperatures mentioned above may vary between DES systems. See the Technical Data Sheet for your unit for target temperatures.

There are three basic reactivation options for DES Series 2000 units: Electric, steam and gas-fired. Refer to the Electrical drawing provided with your unit for detail on the heater circuit. The general theory of each reactivation type is described in this section.

1.7.1 Electric Reactivation

Electric heat is controlled by an SCR (silicon controlled rectifier) controlled heater. The SCR receives a signal from the system controller, and modulates the percentage of energy output.

Depending upon the capacity required there may be more than one heater bank. Refer to the Electrical drawing for details.

1.7.2 Steam Reactivation

Steam coil(s) may be mounted in the reactivation airstream for steam reactivation heat. If equipped with steam reactivation, the unit will require steam specialties (customer supplied) that include: Piping, traps, strainers and valves. Steam is to be provided at a constant pressure (saturated, not superheated steam). See the Unit Nameplate for steam pressure and condensate removal requirements.

The amount of steam energy consumed to reactivate the desiccant rotor corresponds to the moisture load being adsorbed by the process side of the rotor. Steam reactivation heat is controlled by

varying the reactivation airflow through the steam coil(s). Increasing airflow through the steam coil(s) increases heat output, providing more drying capability when needed. A temperature sensor installed in the reactivation airstream transmits the reactivation air temperature to the system controller, which in turn sends a proportional control signal for adjusting the airflow to maintain the required reactivation temperature.

As a benefit, energy costs are reduced by limiting the steam usage to only the amount that's required to reactivate the rotor.

NOTE: There's a reactivation air isolation damper that prevents air passing through the steam coils when reactivation is off. When reactivation is active, the damper opens; when off, the damper closes.

1.7.2.1 Blower Speed Control

Steam reactivation blower speed is controlled by a VFD responding to a proportional control signal from the system controller. If the moisture load is high, the VFD's output proportionally increases the blower's speed to provide additional heat. The system controller signals the VFD to reduce blower speed proportionally as the moisture load in the rotor is reduced. This results in additional energy savings as the VFD reduces the blower motor's power consumption.

1.7.3 Direct Gas-fired Reactivation

The gas supplied for a direct-fired unit may be natural or propane. In a direct-fired unit, the burner is mounted in the reactivation airstream. The ignition sequence is controlled by a Burner Control Relay Module (see Figure 6 on page 12). Piping details can be found on the Gas Flow drawing provided with your unit.

The system controller modulates a gas valve to regulate the amount of gas reaching the burner, thereby maintaining the reactivation discharge air temperature.

2.0 INSTALLATION

2.1 Receipt of the Unit

Upon receiving the DES Series 2000 unit, immediately inspect the equipment for damage which may have occurred during shipment. If any is found, report it to the carrier immediately. Any obvious damage incurred during shipping must be noted on the freight carrier's delivery forms before signing for the equipment. Freight claims must be done through the freight carrier. Generally, all equipment ships F.O.B. Factory. STULZ can assist in the claim filing process with the freight company.

Carefully remove the shipping materials. Open or remove the access panels, remove any loose parts and check the equipment against the packing list to see if the shipment is complete. Report all discrepancies to the appropriate authority.

2.2 Rigging

The dehumidifier is designed to be operated in a level position. Move the unit with a suitable device such as a forklift or attach an overhead lifting sling to the unit, supporting it from the skid rails (if provided) or beneath the mounting base. See the unit Installation drawing for the location of lifting points.

If an overhead lifting device is used, use one with the appropriate capacity to ensure that it can safely handle the weight of the unit. Weight tables are provided on the Installation drawing. If using an overhead lifting device, utilize spreader bars that exceed the cabinet width (see Figure 3), so as to avoid crushing the sides of the unit and/or damaging components mounted to the sides.



WARNING Do not allow the unit to swing while suspended from a lifting device. Failure to observe this warning may result in injury or damage to the equipment.

2.3 System Location and Clearance

Allow unrestricted access to the dehumidifier to perform routine inspection and maintenance. The recommended minimum clearance at the front of the unit is the full width of the unit and necessary equipment (forklift, lifting device, etc.).

To judge the clearance requirements, consider that of the components housed inside the dehumidifier cabinet, the desiccant rotor is

typically the largest component requiring removal, although blower assemblies, while somewhat smaller, also require sufficient clearance for removal.

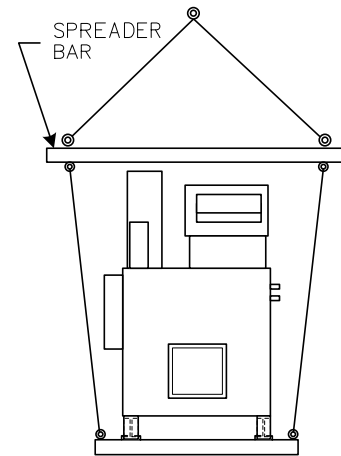


Figure 3 - End View with Spreader Bar



WARNING Reactivation discharge air can be very warm and humid. Keep items that may be damaged by excessive heat and humidity away from the reactivation air outlet.

The following general requirements should also be considered:

1. The main power disconnect should be located as near as possible to the installed location of the equipment.
2. Provision should be made to ensure that power is not accidentally disconnected during normal operation and that the disconnect switch is not used to turn off the unit for normal shut-down.
3. If possible, avoid locations where the air intakes will be laden with dust, dirt, soot, smoke, or other debris.
4. Do not operate the unit in or near flammable or corrosive environments or allow flammable or corrosive air into the unit.

2.4 Placing the Unit

Before placing the equipment in the target location, make sure the mounting surface can support its weight and that the mounting surface is level. Position the unit, and then secure the unit to the mounting surface. Mounting holes may be drilled into the base of the unit for anchoring.

2.5 Connecting Ductwork

All ducting must be air-tight or the dehumidification system will not perform to its maximum capability. Even small leaks can have a dramatic effect on system performance. Ducting should be sized for the appropriate airflow and pressure drop. The clearance required for the duct connections depends on whether the unit is to be ducted for process air, reactivation air, or both.

The reactivation air temperature at the outlet will be warm (approximately 150 °F) and humid during normal operation. (Reactivation air may approach 180 °F during a fault condition.)

When installing a unit in the conditioned space, the reactivation inlet and outlet must be ducted to and from another area to prevent warm, moist air from returning to the conditioned space. If ductwork is connected to the reactivation outlet, it should be insulated and sloped down and away from the unit. This will prevent condensed moisture from accumulating at the reactivation outlet.

When installing a unit outside the conditioned space, the process inlet and outlet must be ducted to and from the conditioned space to prevent humid air from entering the process airstream. Refer to the Installation drawing for the duct connection sizes and locations.

NOTE: Flow regulation dampers are required but may not be provided with this unit. In such cases, it is the responsibility of the contractor or the owner to install flow regulation dampers. Adjust the regulating dampers after all ductwork is installed. Refer to Section 4.3, "Monitoring Unit Performance," for more information concerning setting the correct airflows. If the airflows are not set correctly, unit performance may be affected.

Ensure inlets and outlets are free of obstructions and filters are clean.

2.6 Utility Connections

2.6.1 Power Hookup



WARNING High voltage is used in this unit. Use a qualified electrician to make electrical power connections.

1. Refer to the Electrical drawing for the main power connections.

2. Connect power to the unit disconnect switch per the Electrical drawing. The wire gauge must be selected according to the distance and the circuit ampacity. See the Unit Nameplate for Minimum Circuit Ampacity (MCA) and Maximum Fuse Size (MFS).
3. Branch circuit protection is required by National Electric Codes.

2.6.2 Gas Connections

Have your local gas company connect the gas supply line if applicable (natural or propane, as specified on the Unit Nameplate), making sure it is adequately sized for the required BTU/hr (as indicated on the Unit Nameplate). The required design inlet gas pressure is 10" to 14" w.c., or as defined on the Unit Nameplate. Do not exceed the maximum gas pressure shown. Refer to the gas flow drawing for more details about the gas connections.



CAUTION Do not interchange natural and propane gas on a gas-fired unit. Only use the type of gas specified on the Unit Nameplate.

2.6.3 Steam Connections

Connect steam supply and condensate lines if applicable; connection locations and sizes are shown on the Installation drawing. Supply and condensate lines should be sized for the condensate load on the Unit Nameplate. Each steam coil should be individually equipped with a steam trap and other steam specialties such as vacuum breakers, strainers, etc., as required.

2.7 Installing a Control Sensor

A terminal block is provided for the connection of a control sensor, such as a humidistat, T/H sensor, or dewpoint sensor. Interconnecting field wiring must be installed in accordance with NFPA 70 of the National Electrical Code (N.E.C.). Refer to the Electrical drawing for the electrical connections.

Locate the sensor according to the application. To control the conditions in a space, a wall-mounted sensor may be used in the space or a duct-mounted sensor may be located in the return air inlet duct if the air is re-circulated. To control the air supplying a process, a duct-mounted sensor may be located in the supply air duct near the process. Duct-mounted sensors cannot be used for D-Stat control but can be used if the unit is configured for control schemes where the process blower runs continuously, such as D-Stat II, H-Trac or Dew Trac control.

Wall-mounted control devices should typically be mounted 4–5 feet up from the floor in the conditioned space (see Figure 4). The sensor should not be mounted in an open doorway or an area where it will be exposed to direct sunlight.

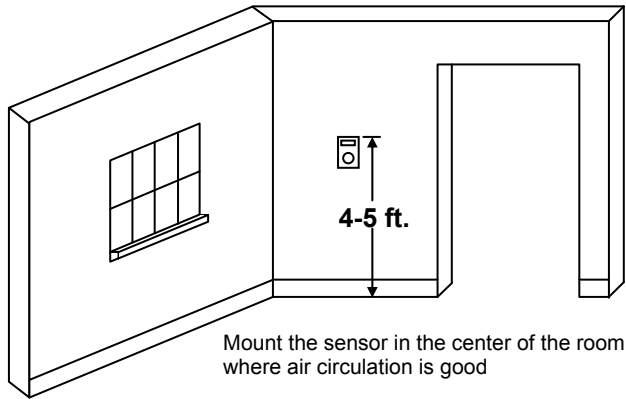


Figure 4 - Locating Wall-Mounted Sensor/Transmitter

A cold surface temperature sensor (used for C-TROL II capacity control) should be installed on or near the coldest surface in the conditioned space, such as a cold water pipe (see Figure 5). Place the sensor against the side of the pipe. Use refrigeration pipe insulating tape to wrap the sensor to the pipe, covering the entire sensor with the insulating tape as shown in Figure 5. A cable-tie may be used to secure the cable to the pipe. Attach the tie at least 6" away from the end of the sensor.

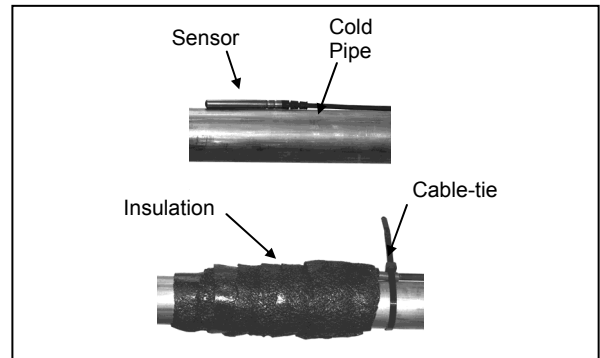


Figure 5 - Cold Surface Sensor

! CAUTION Do not use clamps or cable-ties on the sensing element itself as damage may occur.

3.0 OPERATION

The following information provides an overview of operating procedures and sequences for the DES unit. Before operating the unit, go through the checklist below to make sure all electrical and utility connections are correct and that the unit is ready for operation.

NOTE: Warranty Registration and Start-Up Checklist forms are provided in the data package supplied with your unit. It must be completed during installation and sent to STULZ, Attn: Product Support. It will assist if service or troubleshooting support is needed. See section 10.0 for contact information.

3.1 Installation Checks

Using the Warranty Registration and Start-Up Checklist forms, record the steps taken during installation. Recommended tools for performing the pre-operation checkout include a voltage meter with temperature probe, a flashlight, a Phillips and flat-head screwdriver, and a digital amp meter.

1. Verify the main power is correct per the Unit Nameplate. Only use power that's rated for this unit per the Unit Nameplate. Incorrect power may damage the unit and cause damage to property or injury or death to personnel.
2. Check the wiring to any remote sensors, humidistats, start/stop devices, etc. Refer to the Electrical drawing for specific wiring connections.
3. Check all electrical connections for tightness.
4. For gas fired units, ensure all burner fuel valves and/or gas cocks on the unit are closed.
5. For gas and steam reactivation, turn on the source supply (gas or steam) and verify the pressure is correct per the Unit Nameplate. For gas units, make sure all lines are purged of air.
6. Be sure there are no loose parts or spare parts (such as extra filters, etc.) located inside the unit or electric box.
7. Be sure all access panels or doors are closed tight. Small air leaks can significantly reduce unit performance.

3.2 Start-Up

1. Apply main power to the unit and turn the mode selector switch to Local.
2. Ensure the rotation of all motors (process, reactivation, and rotor drive motor) are as indicated by the arrow labels on or near the motors.
3. Set airflows to the required rotor pressure drop versus the airflow required for this application. Airflow is indicated by rotor pressure drop values as viewed on the differential pressure gauges mounted on the front of the unit.

NOTE: During basic unit operation, process air enters one side of the unit cool and humid and leaves the other side of the unit warm and dry. Reactivation air enters one side of the unit cool and leaves the other side very warm and moist.

Refer to the Unit Nameplate for the target process and reactivation rotor pressure gauge values (in. w.c.). Using dampers, set the process and reactivation airflows to establish the rotor pressure drops at the values indicated. Set the airflows while the unit is still cold. Refer to Section 4.3, "Monitoring Unit Performance," for a detailed description on setting and monitoring airflows.

4. Verify that amp draws of each component are within $\pm 10\%$ of the ratings shown on the Unit Nameplate.
5. Ensure the operation of the heater controls. For electric reactivation, refer to Section 1.7.1. For steam reactivation, refer to Section 1.7.2. For gas-fired units, see Section 3.3 for initial start-up instructions.
6. Verify the operation of all switches and safeties. The green "Unit On" and red "Summary Fault" lights are equipped with press-to-test capability. This feature can be used to test operation of the lamp element when main power is on. If a press-to-test light does not illuminate when pressed, it may be burned out or the electrical connections may be faulty.
7. Depending on the control methodology, set the humidity or dew-point to the desired setting with the system controller.
8. Insert a temperature probe into the temperature test ports to verify the reactivation temperature entering the rotor

(varies up to 180 °F above ambient). Also verify the reactivation temperature leaving the rotor (120–150 °F at full output).

NOTE: The reactivation air temperatures mentioned above may vary between DES systems. See the Technical Data Sheet for your unit for target temperatures.

9. After the rotor is reactivated (reactivation temperatures are stable) verify the grain depression across the system (in the process airstream) is correct per the Technical Data Sheet provided with your unit.

3.3 Initial Start-Up for Gas Fired Units

3.3.1 Gas Train Ignition Sequence

There are several important parts to an industrial gas unit. On the gas train itself is a pilot solenoid valve, two main gas solenoid valves, a main gas regulator and pilot gas regulator, a gas control valve with actuator and several hand valves. The burner assembly consists of a spark ignitor, a flame rod (to detect a flame), and the burner. Inside the electric box is a burner control relay module (see Figure 6).

Refer to the source manufacturers wiring diagram provided for the burner control relay module. Applying power on terminals L1 and L2 of the burner control relay module provides power to the electronic network.

The burner control relay module initiates the ignition sequence with a pre-purge cycle. Following the pre-purge cycle, the pilot solenoid opens and the ignition transformer is energized. Refer to the burner control relay module source manufacturer's information for the ignition sequence (provided separately).

3.3.2 Flame Safety Interlocks

The unit is equipped with a High/Low Gas Pressure Switch (S20). If the gas supply pressure is not within the limits of the switch, the Check Air/Gas indicator light illuminates and the burner control relay module will not allow the burner to light or operate.

Failure to establish a pilot flame during a limited ignition trial cycle causes the pilot valve to de-energize and stop electric ignition. The burner control relay module remains locked out until a manual reset occurs.

Note: The safety lockout requires a manual reset. See Figure 6 for the location of the reset button.

If the flame rod senses a flame, it signals the burner control relay module, which opens the main gas solenoid valves (V21 and V22). The system controller determines how much heat is required to achieve setpoint and modulates the gas valve actuator (AT20) accordingly.

Flame failure during operation de-energizes the fuel valves and the gas control circuit automatically goes into a new purge and then an ignition trial cycle one more time.


Power interruption to the burner control relay module de-energizes relays and valves. The main gas and pilot solenoid valves close immediately. The modulating gas control valve actuator is spring-return, closing when the unit loses power.

Once power is restored, the timer motor completes its cycle plus another safe-start check, complete purge and new ignition trial.

3.3.3 Gas Burner System Start-Up

For initial system start-up:

NOTE: The gas burner is set up and adjusted when the unit is tested prior to leaving the factory.

 **CAUTION** Do not interchange natural and propane gas on a gas-fired unit. Only use the type of gas specified on the Unit Nameplate.

1. Ensure that the gas supply line is purged of all air up to the main gas connection on the unit. Several ignition trials/resets may be required to purge the gas line up to the burner.
2. Inspect the flame to ensure the burner produces an even, blue flame along its entire length at minimum and maximum output.
3. If the burner won't ignite after several trials or the flame isn't evenly distributed, see Section 3.3.4 for burner setup/adjustment instructions.

3.3.4 Gas Burner Set-Up/ Adjustment

If the gas burner won't ignite or the flame is uneven or yellow, the burner may need to be adjusted. This may be because the gas supply quality or pressure varies as compared to the STULZ gas supply used for testing.

Before making adjustments, review Section 3.3.1 for a full understanding of the ignition sequence.



WARNING: The connection and service of gas components presents an explosion hazard. Initial burner start-up and adjustments should only be performed by qualified technicians who are trained to work with combustion systems.

1. Prior to supplying main gas to the dehumidifier, gas pressure must be checked to ensure it doesn't exceed the maximum inlet pressure shown on the Unit Nameplate.
2. Check that all dampers are properly positioned and locked into the operating position.
3. Start the unit with all hand operated gas valves closed. Check for proper motor rotation and impeller direction. Ensure the gas burner differential pressure gauge reads between 0.7" w.c. and 1.3" w.c.
4. Turn the unit off before proceeding to step 5.



CAUTION Do not bypass any control panel timers which typically control sequential operation.

5. To light and adjust the gas pilot: Open the Main Gas Supply Shut-off Valve and open the Pilot Gas Shut-off Valve (see Figure 8). Start the unit and ensure the pilot indicator light illuminates (see Figure 6). Observe the pilot flame through the burner viewing window.
6. If ignition doesn't occur the first time, it may be necessary to reset the burner control relay module. Several ignition trials/resets may be required to purge the gas line up to the pilot.

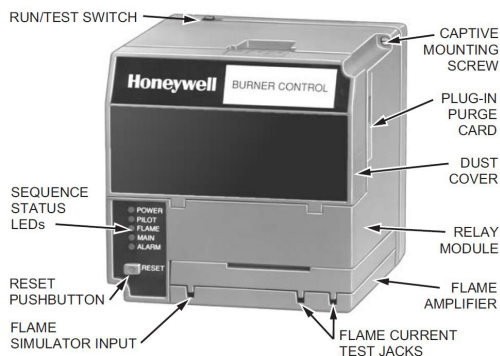


Figure 6 - Burner Control Relay Module

7. Refine the pilot setting for a hard blue flame by adjusting the gas flow through the Pilot Gas Adjustment Needle Valve and/or Pilot Gas Regulator.
8. Prepare to light the main burner flame. Using the system controller, manually adjust the Gas Modulating Control Valve to the minimum position by varying the analog output signal. Refer to the system controller IOM for information on adjusting the output signal.
9. With the Gas Modulating Control Valve set to minimum, light the main burner by gradually opening the Main Burner Gas Shut-off valve. Adjust the Main Gas Regulator to provide the desired outlet pressure. A good minimum fire should provide a uniform blue flame across the entire burner, which is contained within the zipper flame channel (see Figure 7).
10. Close the Main Gas Balancing Valve. Using the system controller, manually adjust the output signal to the Gas Modulating Control Valve to the maximum output position. Open the Main Gas Balancing Valve gradually and adjust it to limit the gas flow so the reactivation air temperature doesn't exceed the design temperature. Adjust the Main Gas Regulator and the Upper and Lower Profile plates as required to obtain an even blue flame.
11. After the reactivation heater temperature approaches equilibrium, manually adjust the Main Gas Balancing Valve to limit the minimum burner output to achieve a reactivation air temperature rise of approximately 180 °F above the reactivation inlet air temperature.
12. Any thin spots or gaps indicate uneven air velocity over the burner and must be corrected by re-adjusting the burner profile plates to provide an even air flow across the top and bottom of the burner. Re-adjust the Upper and Lower Profile plates together with the reactivation outlet damper to achieve the correct burner and reactivation differential pressures (in. w.c.) as indicated on the Unit Nameplate. Burner and reactivation static pressures are displayed on the unit's differential pressure gauges.
13. Shut off the unit then start it again. The burner should light quickly after the pre-purge time delay.

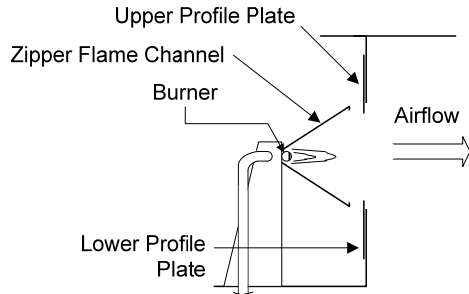


Figure 7 - Burner Assembly

14. Tighten the set screw on the Main Gas Balancing Valve to lock its position. Cycle the unit on and off several times and verify the burner ignites each time. Return control of the Modulating Gas Control Valve to automatic operation.

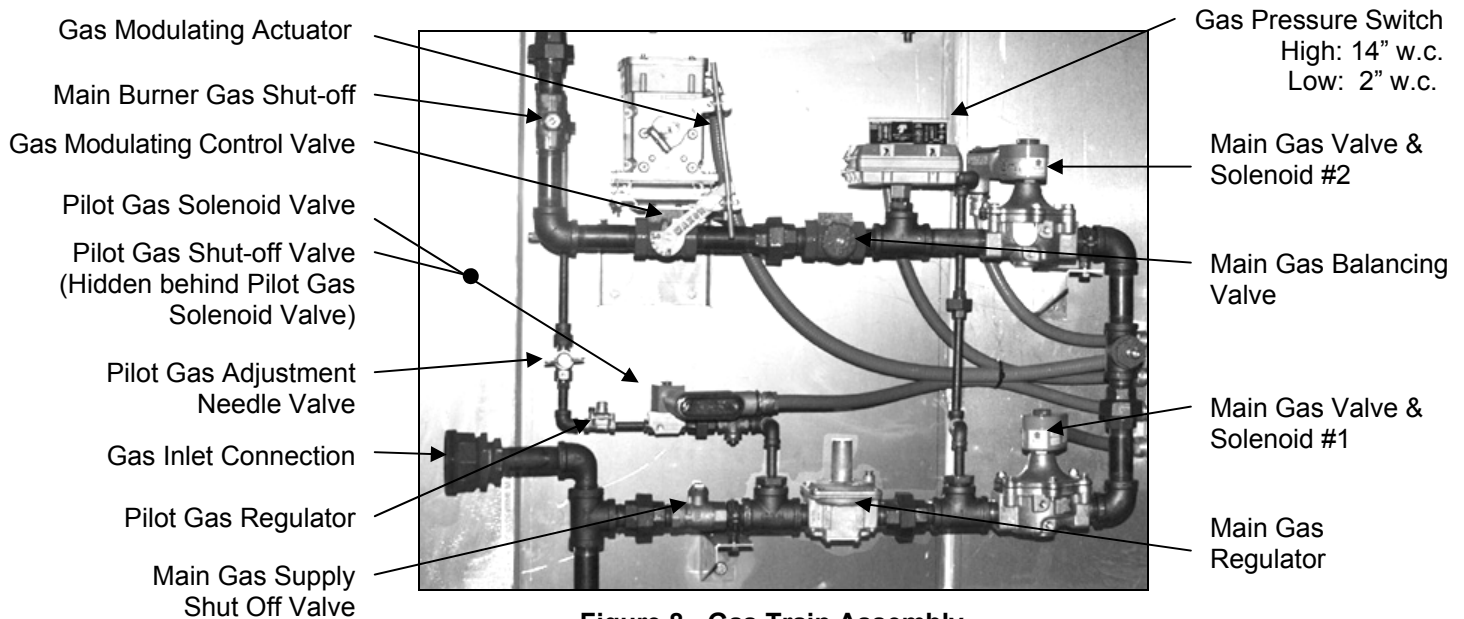


Figure 8 - Gas Train Assembly

3.4 Control Device

This unit is equipped with a microprocessor controller mounted inside the electric box. Generally, this device is used to modulate the on-board reactivation heater controller to maintain the reactivation discharge air temperature setpoint of 120 to 150 °F at the reactivation air outlet. The controller is shipped from the factory pre-programmed. The source manufacturer's operating manual for the controller is provided under separate cover. Refer to the source manufacturer's instructions for detailed information on operating the controller and adjusting control parameters.

3.5 Energy Savings Feature

The E² controller Energy Savings Feature may be used to shut down reactivation when dehumidification is not required. Should the controller's reactivation control

output remain below a user-selectable setpoint for an adjustable time period, reactivation is disabled. Reactivation is re-enabled once the control output rises above the Energy Savings differential value. This feature may be enabled in the E² controller Configuration menu.

3.6 Control Panel

The unit control panel consists of a set of push-to-test indicator lights, an Overheat Reset pushbutton, and an operating mode selection rotary switch, as shown in Figure 9.

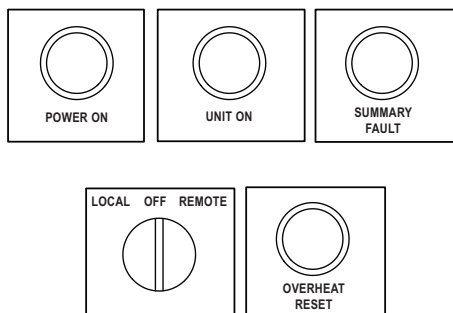


Figure 9 - Control Panel

3.6.1 Mode Selector Switch

The standard mode selector switch on a Series 2000 unit is a three-position switch that sets the operating mode to Local, Remote, or Off. Note that some systems are configured with a simple two-position On/Off switch.

Mode	Status of Unit
LOCAL	Unit runs continuously; green "Unit On" indicator light is illuminated.
OFF	Unit is off, power is still live if the main disconnect is ON; white "Power On" indicator light is illuminated.
REMOTE	Unit operates in response to a Remote Start/Stop signal; green "Unit On" light illuminates when the unit is running.

NOTE: If your unit is equipped with an optional remote start/stop control, the remote start/stop switch must be closed, or a jumper must be installed across the terminals, to enable automatic operation. Refer to the electrical diagram for specific wiring connections.

NOTE: The reactivation blower and the rotor will continue to run for five minutes after the unit cycles off to remove residual heat from the unit (gas and electric units only).


3.6.2 Overheat Reset Pushbutton

This push button is used on units with electric or gas reactivation heat to reset the unit when a Reactivation Overheat fault occurs.

NOTE: Determine the cause of the overheat condition prior to resetting the unit. For example, check the condition of the filters and the system airflow, as indicated by rotor pressure drops (see 4.3, "Monitoring Unit Performance").

3.6.3 Control Panel Lights

The unit is equipped with visual indicator lights to notify the operator of the current status of the unit. The green Unit On and the optional red status indicator lights are equipped with "press-to-test" capability. This should be used to test operation of the lamp element. If a light does not illuminate when pressed, it may be burned out or the electrical connections may be faulty. Certain status indicator lights may operate in sequence with optional customer interface indicators. For specific information regarding troubleshooting fault lights, refer to Section 8.0, "Troubleshooting" and the Electrical drawing provided with the unit.

The light  icon next to the light name in the following text contains the light's color: **W** for white, **G** for green and **R** for red.

Power On

This illuminates white indicating that main power is supplied to the unit.

Unit On

This illuminates green when main power is supplied to the unit and the unit is running.

Summary Fault

This illuminates red when the controller logs a critical alarm that is tied to the Summary Fault. The controller display will indicate the actual alarm. Refer to the *E² Series Microprocessor Controller for Desicair Dehumidification Systems IOM* for a list of the alarms tied to the Summary Fault.

3.6.4 System Controller

RJ11 telephone connector (J10) for interface display/keypad connection



The controller I/O module is located in the main electric box. The controller is furnished with factory configured software designed to maintain space or process discharge air conditions (temperature and/or humidity).

3.6.5 Display/Keypad



A display/keypad is provided for interaction with the system controller. It may be located in the main electric enclosure, in a separate "window" box mounted on the unit or shipped loose for field installation.

Press the alarm (bell icon) key on the keypad to call up alarm screen messages. After the alarm condition is corrected, press the alarm key again to reset the controller and resume normal operation.

4.0 UNIT FEATURES

4.1 Control Sensor Terminals

This unit is equipped with terminal positions for the connection of a control device or sensor, such as a humidistat, temperature/RH sensor or dewpoint sensor, required for operating the selected control scheme (see section 6.1, "Capacity Control"). As an option, the control sensor may be provided by STULZ, either pre-installed in the ductwork or shipped loose for installation by the customer. Refer to the Electrical drawing for details on wiring control sensor(s) to the unit.

4.2 Overheat Reset Push Button

4.3 Monitoring Unit Performance

There are two differential pressure gauges which indicate the pressure drops across the rotor (see Figure 10). Rotor pressure drop (static pressure) correlates directly to airflow. In order to maintain optimum performance, process and reactivation airflows are set using the rotor pressure drops. Refer to the Unit Nameplate to determine the appropriate values for the rotor pressure drops (inches w.c.).



Figure 10 - Differential Pressure Gauge

The Unit Nameplate indicates the pressure drops across the rotor as set by the factory. After all ductwork is installed during initial installation, the airflows may need to be adjusted to re-establish rotor pressure drops to the values indicated on the Unit Nameplate.

Set the airflows by adjusting the process and reactivation air dampers while the unit is still cold. The air dampers (provided optionally) are generally located in the process and reactivation air outlets.

Afterward, if the gauges show readings that are significantly lower than the initial factory settings, there may be an obstruction in the duct or the filters may need to be changed. Operating the unit with dirty filters will reduce unit performance and may damage the desiccant rotor.

NOTE: Filter gauges are optionally available for DES systems. See section 5.1 for information.

4.3.1 Gas Burner Pressure Drop Indication

If gas is used for reactivation, a separate differential pressure gauge is supplied to monitor the pressure drop across the burner. For optimal performance the burner gauge reading should be between 0.7" to 1.3" w.c. The burner pressure drop is pre-set at the factory and should not require adjustment.

4.4 Test Ports

Test ports are conveniently located at strategic points before and after the desiccant rotor in the process and reactivation airstreams. These test ports are equipped with 1" NPT threaded stubs which are capped off during normal operation. The test ports allow for measurement probes to be inserted for monitoring the temperature or humidity conditions within the unit while it's operating.

4.5 Reactivation Air Proving

A reactivation air proving switch is provided as a safety feature. The switch closes when there is sufficient reactivation airflow. The switch opens upon loss of reactivation airflow, causing the reactivation inlet damper to close on steam reactivated units.

For gas and electric units, the reactivation heater is interlocked by the reactivation air proving switch to shut down the heater if reactivation airflow is inadequate. An alarm is signaled if reactivation airflow is inadequate. When the airflow problem is corrected and the alarm is reset, the reactivation heater automatically resumes normal operation.

5.0 OPTIONAL FEATURES

This unit may be equipped with one or more of the following optional features. For a detailed list of the options purchased with this unit, refer to the DIN number on the Dehumidifier Identification Number (DIN) sheet provided with the unit. (See section 1.2.2 for instructions on interpreting the DIN number.)

5.1 Filter Gauges

The unit may be provided with optional, differential pressure gauges for selected filters. These differential pressure gauges may be used to monitor the condition of the filters.

The differential pressure values below indicate the change-out value for the filters:

Aluminum Filters	1.0" w.c.
30% Pleated Filters.....	1.0" w.c.
30% Pleated w/ Aluminum Pre-Filter.....	1.0" w.c.

When a filter gauge shows the maximum value listed above, the filter(s) should be serviced (cleaned or replaced).

5.2 Customer Interface Terminals

This unit may be equipped with optional customer interface terminal positions located on terminal blocks in the electrical enclosure(s). The terminals are used for remote monitoring and control purposes. Certain status contacts may operate together with assigned status indicator lights. Refer to the unit DIN sheet to determine which status contacts and indicator lights are provided with this unit.

NOTE: Refer to the Electrical drawing for specific ratings of the contacts and for wiring details.

SUMMARY FAULT CONTACT

This contact closes to notify the operator of such problems as a heater fault, rotor rotation fault or a fault with the process and/or reactivation blower motors.

ROTOR ROTATION FAULT CONTACT

This contact closes if the rotor has not made a complete revolution within a specified period of time.

PROCESS BLOWER INTERLOCK CONTACT

This contact closes when the process blower is operating. It can be used to indicate unit operating status or to start and stop auxiliary equipment such as a circulating fan or condensing unit.

REACTIVATION AIR PROVING CONTACT

This contact closes when the unit is turned on and the reactivation air proving switch has detected sufficient airflow. The contact will open upon loss of reactivation airflow.

PROCESS AIR PROVING CONTACT

This contact closes when the unit is turned on and the process air proving switch has detected sufficient airflow. The contact will open upon loss of process airflow.

DIRTY FILTER CONTACT

This contact closes when the differential pressure across the process or reactivation air filter has reached a predetermined value, indicating that the filter should be cleaned and/or changed. The differential pressure gauges may be used to determine which filters should be changed (see Section 4.3, "Monitoring Unit Performance").

REMOTE START/STOP CONTACT

Terminal positions may be provided to connect a remotely operated start/stop control device. It may be used to start and stop the unit when the mode selector switch is in the Remote position. The Remote Start/Stop Contact terminals are to be wired to operate as normally closed. When the circuit is closed, the unit operates; when the circuit is open, the unit stops (after the purge cycle). The contact must be correctly sized to match the voltage and current requirements of the circuit. Refer to the Electrical drawing to determine the correct rating for the contact and for wiring details.

NOTE: The unit will not start in Remote mode if the application conditions are below setpoint.

24 VOLT REMOTE OPERATION

As an option, terminal positions may be provided to allow remote operation of the unit using a customer supplied control signal. For this option, the customer may supply a 24VDC signal to remotely start and stop the unit independent of the system controls (unit must be placed in Remote mode).

NOTE: The unit will not start in Remote mode if the application conditions are below setpoint.

EMERGENCY STOP

The customer may connect a remotely located, Emergency Stop switch. In an emergency, the switch may be opened to disconnect control power from the dehumidifier to stop operation.

NOTE: The emergency stop disconnects control power from the unit contactors, causing them to open. Main power remains present in the unit after the emergency stop is used.

FIRE/SMOKE DETECTION

The customer may connect a fire/smoke detector for the system controller to monitor. Upon receiving a fire/smoke alarm signal, the controller will shut down the unit and activate the summary alarm (indicator light and contact).

SENSOR RETRANSMIT TERMINALS

As a special option, terminal positions may be provided for analog output signals that indicate specific operating parameters of the system. The system controller translates signal inputs as measured by the sensors. The controller retransmits the values as output signals to terminal block(s) located inside the electric box. Refer to the Electrical drawing for the analog output signal(s) provided, their applicable range and for wiring details.

5.3 Electrical Enclosure Heater

This unit may be equipped with an electrical enclosure heater to prevent damage to or malfunction of the controls. When the temperature in the control panel drops below a pre-determined level, the heater energizes and when it rises above a pre-determined level, the heater de-energizes. For wiring details, refer to the Electrical drawing supplied with the unit.

5.4 Electrical Disconnect

This unit may be equipped with a fused or non-fused electrical disconnect. One is recommended and may be required by local or national electrical codes. Rotary disconnects are located on the control box. Knife-style disconnects have a separate box located adjacent to the electrical enclosure. The disconnect switch allows power to be removed during maintenance or service functions. The handle of the switch is equipped with a lockout feature to prevent unauthorized switch actuation during periods of service or maintenance. If a disconnect switch is not provided, the unit will have power when the electrical connections to the main power terminal block are made. Use caution when servicing the unit. For wiring details, refer to the Electrical drawing provided with the unit.



WARNING Even with the optional Disconnect switch in the Off position, incoming power may still be live between the switch and the main power source. Power must be disconnected from the main source before servicing.

5.5 Emergency Stop

This unit may be equipped with an optional emergency stop push button mounted on the control panel. In an emergency, the button may be pressed to disconnect control power from the unit to cease operation. To restore control power, twist the switch button to release it and it will return to the normal position.

NOTE: The emergency stop switch disconnects control power from the unit contactors causing them to open. Main power is still present in the unit when the emergency stop switch is pressed.

5.6 Voltage Sensor/Phase Monitor

This unit may be equipped with either a voltage sensor or a phase monitor device. A voltage sensor (used on single phase units) causes the control power to be interrupted in the event of low line voltage. A phase monitor (used on three-phase units) causes the control power to be interrupted in the event of an incorrect phase sequence, loss of a single phase, low voltage, or voltage unbalance. This protects the unit's motors. An automatic reset occurs when the fault condition is corrected. An LED on the device illuminates to indicate that operating conditions are normal.

5.7 Filtration

This unit may be equipped with 30% efficient pleated filters on the process and reactivation air inlets. Optional, cleanable aluminum roughing pre-filters may also be included. Optional differential pressure gauges and/or status contacts may be assigned to these filters to notify the user when they must be cleaned or replaced.

NOTE: Do not operate the unit without filters. It is better to operate the unit with dirty filters than no filters. Operating the unit without filters may void the warranty.

5.8 Dampers

This unit may be equipped with optional, manually adjustable air dampers for the process airstream and reactivation airstream. The dampers are actuated by means of a slide/lock control handle located on the side of the duct transition. The dampers are used to adjust the process and reactivation airflows to meet design conditions for optimal unit performance after installation of the ductwork is complete. Refer to Section 4.3, "Monitoring Unit Performance."

5.9 Process Air Proving (Optional)

Operation of the dehumidifier's reactivation circuit is enabled only when there is process airflow. The process air proving switch closes when the unit is turned on and the air proving switch has detected sufficient airflow. The switch opens upon loss of

process airflow, disabling the reactivation circuit. An alarm is signaled if process airflow is inadequate. When the airflow problem is corrected and the alarm is reset, the reactivation heater automatically resumes normal operation.

5.10 Spare Rotor Belt

This unit may be equipped with a spare rotor drive belt mounted to the rotor ring adjacent to the peripheral seal. This simplifies the belt removal and new belt installation steps that are discussed in the Repair Procedures section. To change belts, follow steps 1–4 in section 9.2.1, "Removing the Old Belt." Cut the old belt to remove it or attach it to the rotor ring like the spare belt. Remove the clamp securing the spare belt and slide the belt over the rotor and onto the rotor drive-belt pulley. Restore tension by positioning the tensioner pulley on the belt.

6.0 SYSTEM CONTROL

6.1 Capacity Control

There are four basic control methods available for Series 2000 units: D-Stat, H-Trac, Dew-Trac and C-Trol II. The way the unit operates depends on the features purchased for the unit. Refer to your order sheet or DIN Sheet for the control method used by your unit.

6.1.1 D-Stat

What it Does:

This control method cycles the dehumidifier on and off to maintain the relative humidity setting.

Requires:

A wall-mounted humidistat (optionally provided by STULZ) or a customer supplied humidity control device with a dry contact.

How it Works:

With the mode selector switch set to Local, the dehumidifier runs continuously. With the mode selector switch set to Remote, the dehumidifier responds to a control signal from a humidistat (provided as an option) or a customer supplied humidity control device which cycles the dehumidifier on and off to maintain the relative humidity setting.

6.1.2 D-Stat II

How it Works:

This control method functions similarly to D-Stat, except the process blower runs continuously. The reactivation heater and blower cycle on and off in response to a humidistat (provided as an option) or a customer-supplied humidity control device with a dry contact.

NOTE: D-Stat and D-Stat II will not work without a humidistat or a customer supplied dry contact control signal.

6.1.3 H-Trac

What it Does:

This control method regulates the reactivation heater to provide constant process discharge or space relative humidity.

Requires:

A factory or space-mounted RH sensor/transmitter and adjustable setpoint microprocessor controller.

How it Works:

The controller determines the amount of reactivation energy required to maintain the relative humidity setpoint and develops an appropriate control output. The dehumidifier runs continuously and the controller continually adjusts reactivation heat in response to load changes. In Remote mode the dehumidifier responds to a customer-supplied start/stop signal.

6.1.4 Dew-Trac

What it Does:

This control method regulates the reactivation heater to provide constant process discharge or space dewpoint temperature.

Requires:

A factory or space-mounted dewpoint transmitter and adjustable setpoint microprocessor controller.

How it Works:

The controller determines the amount of reactivation energy required to maintain the dewpoint setpoint and develops an appropriate control output. The dehumidifier runs continuously and the controller continually adjusts reactivation heat in response to load changes. In Remote mode the dehumidifier responds to a customer-supplied start/stop signal.

6.1.5 C-Trol II

What it Does:

This control method regulates reactivation heat, to prevent condensation from forming on cold surfaces, by maintaining the ambient dewpoint temperature below the temperature of the cold surface.

Requires:

A cold surface temperature sensor (or temperature sensor at coldest point in room), an ambient dewpoint temperature transmitter, and an E² microprocessor controller.

How it Works:

The controller determines the amount of reactivation energy required to maintain dewpoint temperature. The controller compares the cold surface temperature to the ambient dewpoint temperature and develops a control output. The dehumidifier runs continuously (see "Energy Savings Feature," section 3.5) and the controller continuously adjusts reactivation heat in response to load changes. The dehumidifier maintains the space dewpoint at 5 °F (adjustable) less than the cold surface temperature.

In Remote mode the process blower runs continuously and the dehumidifier responds to a customer-supplied start/stop signal.

6.1.6 Proportional Reactivation Controls (H-Trac or Dew-Trac)

If the system is configured for H-Trac or Dew-Trac reactivation control, the unit proportionally controls humidity. When the Humidity PI loop output exceeds 0%, the reactivation heater and reactivation blower turn on. The controller calculates PI loop outputs for

humidity, reactivation discharge air temperature and reactivation heater temperature (see Figure 11).

As each of these PI loop outputs modulate, the controller selects the lower PI loop output and uses that output to control the reactivation heater. Note: This methodology prevents overheating of the desiccant, which would result in diminished drying performance. Once the Humidity PI loop output drops to 0% for the "Reactivation Idle" time, the Energy Savings Feature shuts off reactivation but the process blower continues to operate, ensuring accurate humidity measurement and control, even when dehumidification isn't required.

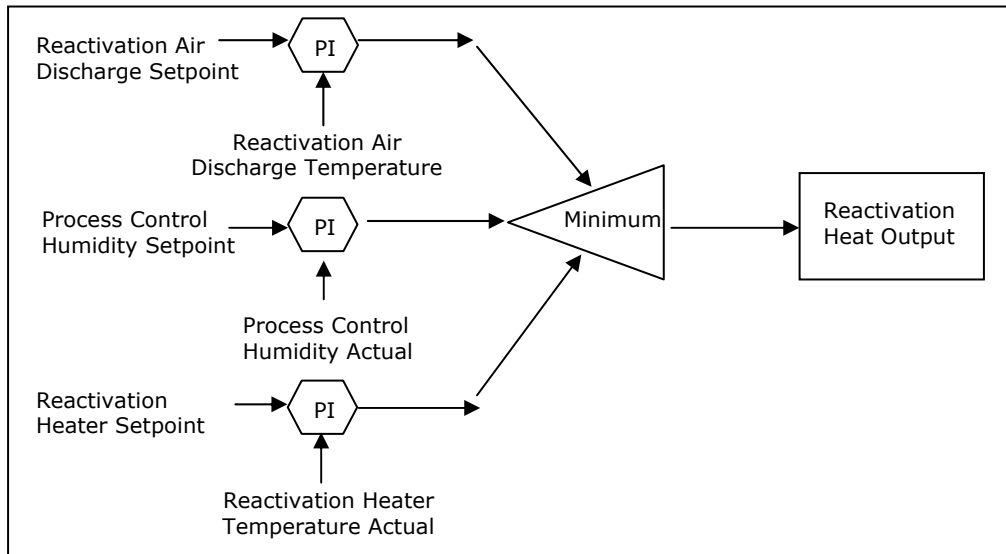


Figure 11 - Proportional (Trac) Control Diagram

7.0 PREVENTIVE MAINTENANCE

Minimal periodic Preventive Maintenance Checks and Services (PMCS) are recommended to ensure optimal performance of the DESICAiR Series 2000 dehumidification unit. Routine maintenance can correct deficiencies before they cause serious damage to the equipment and it helps ensure the unit is ready for operation at all times.

A schedule for preventive maintenance inspection and service should be established immediately after installing the unit. A system should be established to record any problems, defects, and deficiencies noted by operators and discovered during maintenance inspections, together with the corrective actions taken. Use copies of the Periodic General Maintenance Checklist in Appendix A to record maintenance inspections. For assistance, contact STULZ Product Support.

The following lists the preventive maintenance checks and services that should be performed and the recommended intervals. When operating under extreme or unusual conditions, such as a very dusty or sandy environment, it may be necessary to reduce the maintenance intervals indicated. The schedule below assumes that your system operates continuously.



WARNING Disconnect main power before performing any service or maintenance function. Turning the mode selector switch to the Off position does not disconnect power.

7.1 Monthly

- Check all electrical connections to ensure they are tight and not shorted to ground.
- Ensure the control panel lights are functional and not burned out. (Use the buttons' press-to-test feature.)
- Remove, clean, and/or replace the filters to ensure proper airflow through the unit. If your environment is exceptionally dusty or sandy, this may be required on a more frequent basis.
- Inspect the flame on gas units. It should be clean and blue as described in steps 2 and 3 in Section 3.3.3, "Gas Burner System Start-Up."
- Check the rotor seals for wear and ensure the seals are touching the rotor face and rotor flange.
- For steam units, inspect the area around the coil(s) for leaks.

- Check the rotor drive belt for signs of abnormal wear.
- Check the blower belts (if applicable) for signs of abnormal wear.
- Lubricate motor bearings if necessary.
- Ensure the pillow block bearing shaft set screws are tight.
- Ensure the shaft key, pulley and bearing lockdowns are tight.

7.2 Yearly

Thoroughly clean the unit inside and out, making sure to remove any dust from fan blades and dirt from steam coils (if applicable).

7.3 Rotor Drive Maintenance

A drive belt and speed-reducing gearmotor are used to rotate the desiccant rotor. The rotating speed is relatively slow and is measured in RPH (revolutions per hour), not RPM (revolutions per minute).

7.3.1 Rotor Drive Motor

The gear motor bearings are pre-lubricated and do not require re-lubrication. Periodically inspect around the gear motor for accumulated dirt and remove by vacuuming.



CAUTION Dirt accumulation can cause motor heating and can be a fire hazard.

Also, measure gearmotor current during unit operation and compare it against the Full Load Amps (FLA) value on the Unit Nameplate. Check for unusual noises or vibration, overheating, worn or loose couplings and loose mounting bolts.

7.3.2 Rotor Drive Belt

A drive belt rides on a series of cleats that are pop riveted to the rotor's circumference. Periodically check the drive belt and cleats for cracks, crazing and abnormal wear. Also, ensure there is good mating between the drive belt and all cleats. Too much tension in the drive belt can reduce belt life so ensure there is some slack by adjusting, as necessary, the tensioner located near the gearmotor.

7.4 Blower Motor Maintenance

7.4.1 General Inspection

Inspect the blower motors at regular intervals (approximately every 550 hours of operation or

every 3 months). Keep the motors clean and make sure the ventilation openings are clear. The steps listed below should be performed at each inspection.



WARNING Voltages used in this unit can be deadly. Use the services of a qualified electrician and/or technician to make the electrical power connections and perform maintenance.

1. Ensure the motor is clean. Check to make sure the interior and exterior of the motor are free of dirt, oil, grease, water, etc., because these things can accumulate and block motor ventilation. If the motor is not properly ventilated, overheating can occur and cause early motor failure.
2. Use a "Megger" periodically to verify the integrity of the winding insulation and record the readings. If there is a significant drop in insulation resistance, immediately investigate.
3. Ensure all electrical connections are tight.

7.4.2 Lubrication and Bearings

The lubricating ability of bearing grease depends primarily on the type of grease, the size of the

bearing, the speed at which the bearing operates and the severity of the operating conditions. This lubricating ability can be lost over time.

1. A high grade ball or roller bearing grease should be used. Consult the motor manufacturer's nameplate, if provided, for the recommended grease to use. If none is listed, the recommended greases for standard service conditions are Shell Dolium R, Texaco Polystar, Amoco Rykon Premium #2 or Chevron SRI#2.
2. Lubrication should be performed at the recommended intervals shown in the table below. These recommended intervals are based on average use. See the motor nameplate for the frame size and rated speed.

NOTE: Some motors are provided permanently lubricated and will not require service for the lifetime of the equipment.

For motors that require periodic service, the following recommended lubrication interval and procedure should be followed.

Table 1 - Lubrication Intervals

NEMA/(IEC) Frame Size	Rated Speed - RPM	
	3600	1800
Up to 210 incl. (132)	5500 Hrs.	12000 Hrs.
Over 210 to 280 incl. (180)	3600 Hrs.	9500 Hrs.
Over 280	2200 Hrs.	7400 Hrs.

Table 2 - Service Conditions

Severity of Service	Ambient Temperature Maximum	Atmospheric Contamination	Type of Bearing
Standard	40°C	Clean, Little Corrosion	Deep Groove Ball Bearing
Severe	50°C	Moderate dirt, Corrosion	Ball Thrust, Roller
Extreme	>50°C* or Class H Insulation	Severe dirt, Abrasive dust, Corrosion	All Bearings
Low Temperature	<-30°C**		

*Special high temperature grease is recommended (Dow Corning DC44 or Darmex 707).

**Special low temperature grease is recommended (Aeroshell 7).

Table 3 - Lubrication Interval Multiplier

Severity of Service	Multiplier
Standard	1.0
Severe	0.5
Extreme	0.1

Table 4 - Bearing Sizes and Types

Frame Size NEMA (IEC)	Bearing Description (These are the "Large" bearings (shaft End) in each frame size)					
	Bearing	OD mm	Width mm	Weight of Grease to add oz (grams)	Volume of grease to be added	
					in ³	teaspoon
Up to 210 incl. (132)	6307	80	21	0.30 (8.4)	0.6	2.0
Over 210 to 280 incl. (180)	6311	120	29	0.61 (17.4)	1.2	3.9
Over 280	6313	140	33	0.81 (23.1)	1.5	5.2

Sample Lubrication Determination

Assume NEMA 286T (IEC 180), 1750 RPM motor driving an exhaust fan in an ambient temperature of 43°C and an atmosphere that is moderately corrosive.

1. Table 1 lists 9500 hours for standard conditions.
2. Table 2 classifies severity of service as Severe.
3. Table 3 lists a multiplier of 0.5 for severe conditions.
4. Table 4 shows 1.2 in³ or 3.9 teaspoons of grease to be added.

7.4.3 Lubrication Procedure

Be sure that the grease you are adding is compatible with the grease already in the motor. Consult the factory or the motor manufacturer if you are using a grease other than the recommended type.

! CAUTION To avoid damage to motor bearings, keep grease free of dirt. If you have an extremely dirty environment, contact the factory or the motor manufacturer for additional information.

1. Clean the grease fitting.
2. If the motor has a grease outlet plug, remove it.

3. If the motor is stopped, slowly add the recommended amount of grease. If the motor is to be greased while running, add a slightly greater quantity of grease.
4. Add grease slowly until new grease appears at shaft hole in the endplate or grease outlet plug.
5. Re-install grease outlet plug if removed.

NOTE: Some grease is pressed out of the bearings during installation to ensure there are no air pockets in the lines or bearings.

8.0 TROUBLESHOOTING

The *DES/CAiR* dehumidifier is designed for continuous and dependable operation. An overheat fault circuit and air proving switch is built into the reactivation air path to detect high reactivation air temperature or loss of airflow. Refer to the Electrical and Installation drawings provided with your unit for the location of the system components and their relationship to each other. If the problem can't be resolved using the guidelines below, contact STULZ Product Support for assistance (see Section 10.0).

The following guidelines are included to help you troubleshoot dehumidifier operational or performance problems.

NOTE: The thermal overheat safety could trip if main power is disconnected from the unit while it is running. Before disconnecting main power, turn the dehumidifier mode selector switch to the Off position and wait five minutes until the reactivation time delay shuts off the reactivation blower (the time delay is not applicable on steam units).

Problem: Unit Does Not Run

If the dehumidifier is controlled by a remote device such as a humidistat or remote start/stop switch, check this device before you check the dehumidifier itself.

In Remote mode:

1. Check the remote mounted sensors and the system controller.
2. If this check-out does not solve the problem, set the mode selector switch to Local. If the unit operates, the problem is related to the remote controller or the wiring between the controller and the dehumidifier.

In Local mode:

1. Check power supply for correct voltage and phase.
2. Check wiring connections. Refer to the electrical diagram included with your unit.
3. Check fuses and replace if necessary.
4. Check the motor thermal overloads or circuit controllers.

Problem: "Summary Fault" Lamp is Illuminated

A Summary Fault can indicate a number of fault conditions, including a motor fault, high reactivation temperature condition, rotor rotation fault or air proving fault. To correct the fault condition, check that the airflows are sufficient (refer to section 4.3, "Monitoring Unit Performance"). Check that all filters are clean, check for obstructions in unit or ductwork and check the rotor drive belt.

Check the other status indicator lights and status contacts, if the unit is so equipped, for troubleshooting a specific fault. Refer to the other troubleshooting guidelines (i.e., High Reactivation Temperature Light On), for corrective action for fault condition(s) that are observed.

Problem: Process Blower Does Not Turn, Yet "Unit On" Lamp is Illuminated

1. Check the motor thermal overload and circuit controller (CT3) for the process blower.

- a. Reset if necessary.
- b. Identify and correct the cause of the overload condition.

In this case, amp draw of the motor exceeded the design condition. With main power off, ensure the blower turns freely. Also, ensure all wire connections are tight and no shorts are present.

- c. Ensure the overload current setting on CT3 matches the motor data plate FLA for the rated voltage. Adjust CT3 if necessary.

Problem: Reactivation Blower Does Not Turn, Yet "Unit On" Lamp is Illuminated

1. Check controller to ensure output signal.
2. Check the VFD to ensure output signal (steam reactivated units only).
3. Check the motor thermal overload and circuit controller (CT2) for the reactivation blower.
 - a. Reset if necessary.
 - b. Identify and correct cause of overload condition.

In this case, amp draw of the motor exceeded the design condition. With main power off, ensure the blower turns freely. Also, ensure all wire connections are tight and no shorts are present.

- c. Ensure the overload current setting on CT2 matches the motor data plate FLA for the rated voltage. Adjust CT2 if necessary.

NOTE: With D-Stat II and C-Trol II capacity control, the reactivation blower and rotor do not run if humidity conditions are satisfied.

Problem: Desiccant Rotor Does Not Turn

1. Check the motor thermal overload and/or Circuit Controller (CT1) for the rotor drive motor.
 - a. Reset if necessary.
 - b. In this case, amp draw of the motor exceeded the design condition. Identify and correct the cause of the overload condition.
2. With main power off, ensure the belt and tensioner are properly positioned. Realign the belt or reset the tensioner if necessary. Check the seals for improper adjustment or wear. If the seals aren't properly adjusted or if the surface is worn through, increased drag will occur. This may cause increased power draw or too much torque for the motor.
3. Ensure the overload current setting on (CT1) matches the motor data plate FLA for the rated voltage. Adjust (CT1) if necessary.
4. Check the power wiring to the rotor drive motor.
 - a. Ensure all wiring terminations are tight and no shorts are present.
5. Check the reactivation blower VFD (steam reactivated units only) to ensure there is an output signal to the blower.

Problem: Dehumidifier Performance is Reduced

This condition could indicate a problem with the dehumidifier or a change in moisture loads within the space being conditioned. See the Technical Data Sheets provided with your unit and refer to the performance curves in Appendix B to verify the performance conditions are as stated.

It is important that the power supply voltage and phase be correct and that the airflow rate be adjusted to the correct values.

1. To check the dehumidifier performance, take dry bulb and wet bulb temperature measurements upstream and downstream of the dehumidifier rotor in the process airstream. Convert the readings to dry bulb temperature and grains per pound (see Appendix B). Compare the results to those indicated by the published performance curve. If the results are comparable, the problem is not with the unit. In this case, analysis of the entire system of duct work and space, including any changes in moisture loads (occupancy etc.), is required.
2. Ensure the fans are rotating in the correct direction. If they are reversed, turn the unit off, allow for the cool down cycle, and then disconnect main power. Check the motor wiring against the diagrams shown on the motor nameplate to ensure it matches the phase and voltage shown on the dehumidifier Unit Nameplate (see Figure 1). If the unit is three-phase, simply switch any two power supply leads at the power distribution block. If the unit is single phase, reconnect the wires according to the motor nameplate diagram.
3. Check the process and reactivation airflows. See Section 4.3, "Monitoring Unit Performance."

The desiccant itself is designed for a ten year life span with little degradation over time (<10% over 10 years). However, improperly filtered air or oil-contaminated air can affect the capacity of the desiccant. If this occurs, performance may be restored by washing the rotor as described in Section 9.4, "Washing the Rotor."

If the result of following the above troubleshooting steps doesn't solve the problem, contact STULZ Product Support.

Problem: Reactivation Temperature Fault (Electric or Gas Reactivation Only)

Indicates a high temperature condition in either the reactivation heater section (above 350/425 °F) or the reactivation discharge air temperature is above 175 °F. Allow at least 10 seconds for the blowers to cool the unit then press the red Overheat Reset button. This fault will automatically reset without pressing the Overheat Reset button if power is removed from the unit.

To prevent this problem from recurring, verify that reactivation air volume is sufficient. Ensure the reactivation inlet, reactivation outlet and the ductwork are not obstructed or damaged. Ensure the filters are clean and unclogged, the rotor flutes are not dirty (clogged) and the reactivation discharge air damper is in the proper position. Referring to Section 4.3, "Monitoring Unit Performance" and the Unit Nameplate, ensure there is proper pressure drop across the desiccant rotor by adjusting the reactivation discharge damper if necessary.

For gas-fired units, ensure there are no mechanical failures in the gas train and the main gas balancing valve (see Figure 8) is locked down and has not been tampered with. Contact the factory for instructions on adjusting or repairing gas train components.

A High Reactivation Temperature fault can also occur if either sensor (thermocouple) connected to an overheat safety switch (S21-1 or S21-2) is malfunctioning.

Problem: Burner Faults Continuously (Gas Fired Reactivation Only)

1. Check the manual valves in the gas line.
2. Purge all air out of the gas line supplying the dehumidifier.
3. Reset the burner control relay module (KR20), located in the main electrical enclosure.

Problem: Check Air/Gas Fault (Gas Fired Reactivation Only)

This indicates either an improper burner pressure drop setting or a high/low gas pressure condition. Ensure the burner pressure drop is approximately 1.0" by adjusting the burner profile plates both above and below the gas burner, if necessary. Refer to Figure 7 on page 13. The profile plates should be adjusted so that an even airflow distribution is maintained across both the upper and lower sections of the burner. Ensure that the inlet gas pressure is between 2" and 14" WC. If gas inlet pressure is within the limits, both switch contacts will be closed (this can be checked through the small view windows on the gas pressure switch (S20) located on the gas train. Ensure that the burner air proving switch (S14) is adjusted correctly¹ (the switch is located behind the burner pressure differential gauge). This switch may need to be adjusted depending on altitude.

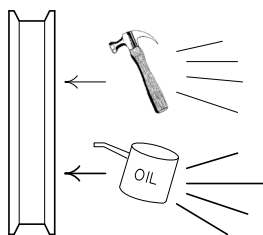
¹ Air switches are typically set to trip at 2/3's of the measured pressure drop (example: if the pressure drop setting is 1.5", then the switch should be set to open at 1.0").

9.0 REPAIR PROCEDURES

Under normal operating conditions and with the proper preventive maintenance, the unit should provide excellent service for many years. If necessary, the unit may be returned to the manufacturer or a suitably qualified depot for major overhaul and refurbishment. All work must be performed by qualified technicians and should include replacement of rotor, seals, motors, starters, contactors, bearings and other accessories as necessary.

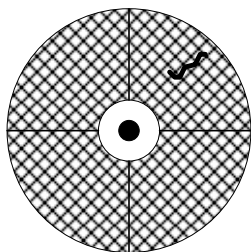
9.1 Rotor Handling Guidelines

When performing maintenance on the rotor, please observe the following guidelines:



DO NOT STRIKE ROTOR

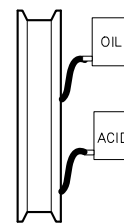
- Do not strike the surface of the rotor or allow any objects to strike the surface which may cause damage to the shell and the fluted desiccant media.



DO NOT SCRATCH ROTOR

- Do not allow the surface of the rotor to become scratched. Use caution around the rotor when working with any tools that could cause scratches to the surface.

NOTE: If damage occurs to the face of the rotor, refer to Section 9.5, "Repairing the Rotor" or contact STULZ Product Support for repair assistance.



AVOID CONTACT WITH PAINT,
OIL, ACIDS, ETC.

- Do not allow the rotor to come into contact with paint, oil, acids, etc.
- Do not allow dirt, dust, or debris to settle into the rotor element. Follow rotor washing instructions if the rotor has been subjected to long periods of storage in extreme conditions.
- Do not subject the rotor to vibration.

9.2 Replacing the Rotor Drive Belt

The following instructions for removing and replacing the drive belt for the rotor are in sequential order. Do not skip or rearrange the steps listed below when replacing the belt. Refer to Figure 12 for details about the rotor assembly parts.

Before replacing the belt, read the instructions below. Make sure the tools listed below are available and that power has been disconnected. Check the new belt to ensure it is free from cracks, rips, tears or other defects.

The following tools are required to remove the belt:

- Rubber mallet
- One large Phillips screwdriver
- One large flat-head screwdriver
- A utility (razor) knife
- Small swivel mirror
- Flashlight
- One tube of silicone sealant and a caulking gun
- Wrenches (box end and socket) 5/16", 3/8" & 7/16" (avoid open-end wrenches because they can slip off the head of the screw causing damage to the rotor)
- Socket wrench extension (minimum 2" long)
- One 4" x 4" block of wood, approx. 8" long
- One 2" x 4" piece of wood, 36" – 48" long
- A standard business card
- Wax paper sheet, approximately 1 ft. square

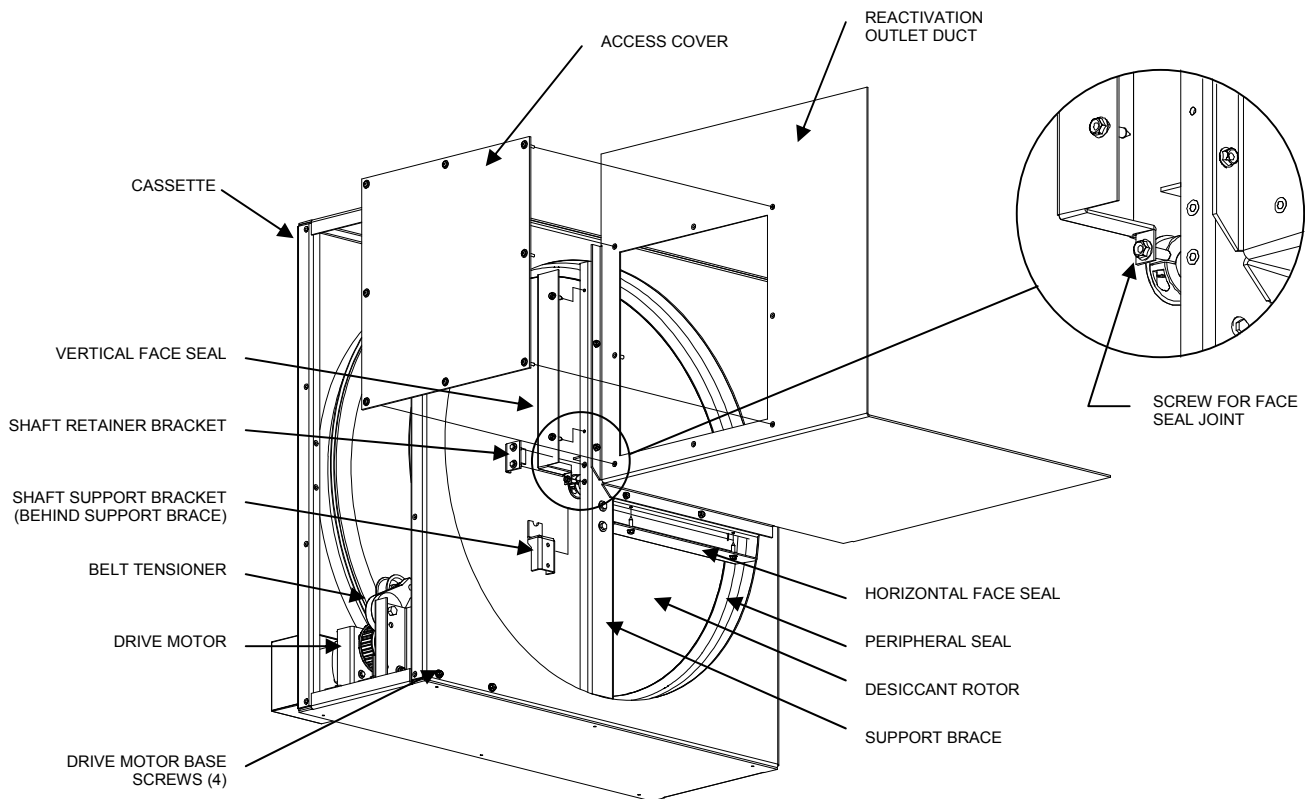


Figure 12 - Rotor Assembly Parts

9.2.1 Removing the Old Belt

1. Allow the reactivation blower and rotor to run for five or more minutes to remove residual heat from the unit, and then disconnect all power to the unit. Turning the mode selector switch to Off does not disconnect power to the unit. Do not attempt to change the belt if the rotor or reactivation portion of the unit is warm.
2. Open the cabinet access doors on both sides of the rotor. Refer to the Installation drawing for the location of the correct access doors.
3. Remove the desiccant rotor access panel from the cabinet (held in place with Phillips head screws). Set the panel and screws aside.
4. Remove the access cover from the reactivation outlet duct (held in place with Phillips head screws).
5. Remove the belt from the tensioner (near the drive motor). Pull the arm of the tensioner towards you to release the tension then, slip the belt off the drive wheel of the motor. The belt should now hang free on the rotor.
6. Remove the four hex screws (two on each side of the cassette) holding the rotor drive motor base. Disconnect the wires from the motor. Remove the motor and tensioner assembly from the cabinet and set it aside.
7. Remove the hex screws holding the shaft retainer brackets (both sides of rotor). Set the brackets and screws aside.
8. Remove the hex screws that secure the horizontal and vertical face seals in place between the reactivation outlet duct and the surface of the rotor, then use a 7/16" socket wrench with a 2" socket extension to remove the screw for the face seal joint. This screw is difficult to see as it's situated between the rotor surface and the vertical support brace. It can only be accessed after removing the shaft retainer bracket. It will help to use a flashlight with a small swivel mirror to locate the screw head.

9. After all the face seal screws are removed, locate the point where the vertical and horizontal face seals meet the peripheral seal (see Figure 13). This union has been joined together with silicone sealant. Using a razor utility knife, carefully break the silicone sealant bond only. Avoid cutting through the peripheral seal or the rotor surface.

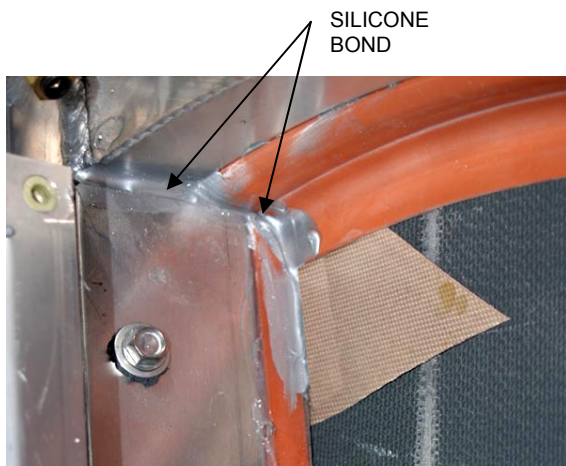


Figure 13 - Face/Peripheral Seal Union

You should now be able to slide the face seals past the surface of the rotor and remove them.

10. Refer to Figure 14. From the end of the cassette (where the motor was located), place a 4 x 4 block of wood on the floor of the cabinet. Place it under the same side of the rotor from which you removed the face seals. Position it underneath the angled, edge support flange that runs around the perimeter of the rotor.
11. Next, wedge a 2 x 4 between the 4 x 4 and the edge of the angled support flange to raise the rotor. Make sure the 2 x 4 does not lift the rotor at the center, away from the angled support flange, or the rotor will be damaged. Apply leverage to slightly raise the rotor. Only raise the rotor enough to take the weight off the rotor shaft support bracket on the side of the rotor from which you removed the face seals (no more than 1/8"). Raising it too high may damage the rotor surface and mounting hardware on the opposite side.
12. Secure the 2 x 4 by wedging it between the rotor's angled support flange and the 4 x 4.
13. Remove the rotor shaft support bracket on the side of the rotor from which you removed the face seals.

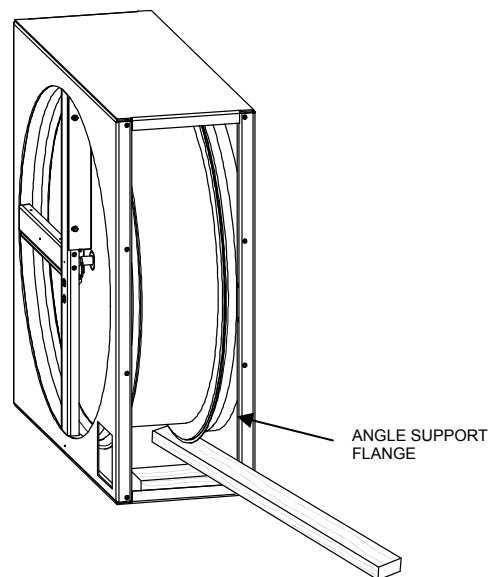


Figure 14 - Raising the Rotor

14. Next, carefully remove the old belt using your fingers and/or a non-metallic rounded object (like a pencil). Work the belt out through the peripheral seal and towards the reactivation outlet duct. Take care not to damage the surface of the rotor or the peripheral seal.
15. Once the entire belt is free of the rotor, slip it out through the gap underneath the rotor shaft. Discard the old belt.

9.2.2 Installing the New Belt

1. Work the new belt through the gap underneath the rotor shaft.
2. Next, work the belt between peripheral seal and the rotor face until the belt is resting on top of the rotor. Take care not to damage the surface of the rotor or the peripheral seal. Make sure there are no twists in the belt.
3. Replace the rotor shaft support bracket and securely tighten the mounting screws, then remove the 2 x 4 and 4 x 4 pieces of wood so the weight of the rotor is back on the rotor shaft support bracket.
4. If necessary, use your fingers and/or a non-metallic rounded object to unfold the peripheral seals, restoring them to their original position around the rotor so they provide a double barrier against mixing airstreams (see Figure 15).

5. Reinstall the horizontal and vertical face seals reversing the procedure you followed to remove them. Ensure the screw for the face seal joint is installed. Secure the mounting screws by hand; do not completely tighten them at this time.
6. The face seal brackets have slotted mounting holes. Using hand pressure, push the face seals toward the rotor to seat them lightly against the rotor surface. Using a standard business card, check the clearance by sliding it back and forth between the face seals and the rotor. There should only be a slight drag. If not, use a rubber mallet and a flat-head screwdriver to move the seal closer to the rotor. Place the tip of the screwdriver at the apex of the face seal bracket and gently tap the end of the screwdriver with the rubber mallet. If the seal is too tight against the rotor surface, excessive friction and wear will occur to the rotor and the seal.
7. After the face seals are properly seated, tighten the screws on both the horizontal and vertical face seals to secure them.
8. Reseal the union between the face seals and the peripheral seal with silicone. Also, reseal the seam where the horizontal and vertical face seals meet. Do not get silicone on the rotor. (Slip a piece of wax paper between the rotor and the area to be sealed—shown in Figure 13—to prevent silicone from sticking to the rotor surface.)
9. After applying the silicone, allow it to set up to 6–8 hours then remove the wax paper used in step 8.
10. Replace the reactivation duct cover using the original fasteners and reseal the edges with silicone.
11. Replace the shaft retainer brackets (both sides of rotor).
12. Reinstall the rotor drive motor assembly to the floor of the cabinet and reconnect the wires.
13. Place the new drive belt on the motor drive pulley, making sure the belt is lined up on the rotor drive cleats and the pulley.
14. Make sure all tools, silicone and equipment are removed from the unit, then replace the rotor access panel and close the cabinet doors.

15. When the unit is turned back on and in its normal operating mode, observe the rotor through the viewing window to ensure it turns freely and without interruption.

9.3 Replacing Seals

9.3.1 Removing Old Face Seals

1. Follow steps 1 to 10 for “Removing the Old Belt”. (Skip steps 5 and 6.)
2. Visually inspect the seals for cracks or worn areas. (Inlet side and outlet side of rotor.)
3. If seals are worn or cracked, they should be replaced.

NOTE: If the face seals are replaced on one side of the rotor, the seals on the opposite side should be replaced at the same time even if they don't appear worn or cracked.

9.3.2 Installing New Face Seals

1. Carefully slide the new rotor seals between the rotor surface and the support braces taking care not to scratch the rotor surface.
2. Follow steps 5 to 11 in section 9.2.2, “Installing the New Belt.”

9.3.3 Replacing Peripheral Seals

1. Follow steps 1 to 10 in section 9.2.1, “Removing the Old Belt.” Perform the steps on both sides of the rotor, first removing the face seals from each side.
2. Locate the point where the ends of the peripheral seal meet. Using a razor knife, break the silicone bond.
3. Working from one end of the peripheral seal, carefully slide it out of the gap between the rotor and the mounting edge, removing it from the unit.
4. Repeat steps 2 and 3 to remove the peripheral seal on the opposite side of the rotor.
5. Install the new peripheral seals in the same manner in which the old ones were removed (both sides of rotor).

NOTE: The flaps of the seal spreads outwards towards the center of the rotor and towards the outer edge against the angled support flange (see Figure 15). Ensure the flaps are not folded over.

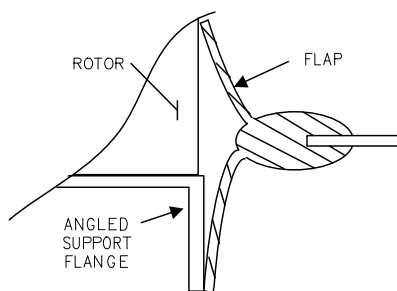


Figure 15 - Peripheral Seal, Edge View

6. Reattach the ends of the seals together with silicone. Do not get silicone on the rotor. (Slip a piece of wax paper between the rotor and the area to be sealed.)

9.4 Washing the Rotor

Over time, dirt may accumulate on the surface of the rotor, blocking the openings of the flutes. The rotor may require periodic cleaning to maintain peak performance. Accumulated dirt can be removed from the surface of the rotor using a vacuum cleaner. Heavier accumulations may be removed by washing the rotor with clean water. If the desiccant wheel is continuously exposed to air containing oil laden vapors, it may be necessary to wash the rotor with a solution of water mixed with a light, non-alkaline detergent.

The following procedure describes the steps required to wash the rotor. At least two people are required to efficiently and safely clean the rotor. Required materials include:

- Plastic sheeting to protect internal electrical components
- Dry vacuum
- Wet vacuum
- Wood block
- Hand-held spraying device (found at most hardware stores)
- Water/solution supply

9.4.1 Preparation

Operate the unit with the reactivation blower on, the reactivation heater off, and the process blower off for two hours, or until the entering and reactivation discharge air temperature is the same. Pre-cooling of the airstream is not necessary.

9.4.2 Unit Shut Down

1. Disconnect the power (turning the mode selector switch to Off does not disconnect the power).
2. Remove the rotor service panels to allow access to the unit and the cassette.
3. Loosen the drive belt tensioner and allow the belt to drop free from the drive system.
4. Carefully cover the drive motor with plastic to prevent the water/solution from coming in contact with the drive motor.

9.4.3 Cleaning

1. Note the initial starting point. Using an industrial duty dry vacuum cleaner with a clean soft bristle brush applicator, draw air through the rotor flutes into the vacuum. Vacuum the entire surface of the rotor. While one person is operating the vacuum, the other person slowly rotates the rotor by pulling on the drive belt.
2. Dry vacuum for at least one full revolution of the rotor. Repeat this process for the other side of the rotor (if possible).
3. After dry vacuuming, stabilize the rotor by placing a wood block under the rotor near the drive motor to prevent rotation during washing.

NOTE: Do not blow air through the flutes as any particulate blown free would scatter through the work site.

4. Open the drain holes in the floor of the cabinet to allow the cleaning solution to flow out.

NOTE: Ensure that a means of collecting the cleaning solution for proper disposal is provided.

5. With the water/solution in the spraying device, flush the rotor through the lower half section (see Figure 16).

NOTE: If using a detergent solution, thoroughly rinse the rotor with clean water after flushing with the solution.

6. Remove the wood block and rotate the wet part of the rotor 1/4 turn away from the

- reactivation section of the cassette. Replace the wood block under the rotor.
7. Continue washing/rinsing the next section of the rotor. At the same time, wet vac the rotor at the upper section of the cassette. Then dry vac the same portion of the rotor. After dry vacuuming, remove the wood block and rotate the rotor in the same direction 1/4 turn. Begin washing/rinsing and vacuuming as before.
 8. Continue this operation until the entire rotor has been washed, rinsed, and vacuumed.
 9. When finished, use the wet/dry vac to remove any water from around the hub, spokes, and flange areas. Spin/rotate the rotor to check for balance. An unbalanced rotor may indicate the need for more wet/dry vacuuming. Repeat the drying operations as necessary.
 10. Drain, wet vac, and dry mop the bottom of the cabinet on both the upstream and downstream side of the rotor/cassette.
 11. Remove the wood block, the plastic sheeting, and make sure the rotor turns freely and there is no moisture around the base of the drive motor.
 12. Align and reinstall the rotor drive belt and tensioner. Replace all service panels (making sure all tools/supplies are removed from unit first). Reconnect power.
 13. Operate the unit with the reactivation blower on, the reactivation heater off and the process blower off for 60 minutes. Then resume normal unit operation.
 14. After 6 hours, check the performance of the unit. If the process air discharge is excessively humid (greater than 10% of original performance), turn the process blower off and run the reactivation heater and blower for another 2 hours to reactivate the desiccant. If conditions still do not return to normal, consult the factory.

9.5 Repairing the Rotor

Minor repairs, such as rotor cracks, can be performed by service technicians when required. Materials needed include:

- Masking tape
- Small piece of stiff cardboard with flat edge
- Tube of 100% Silicone
- Caulking gun

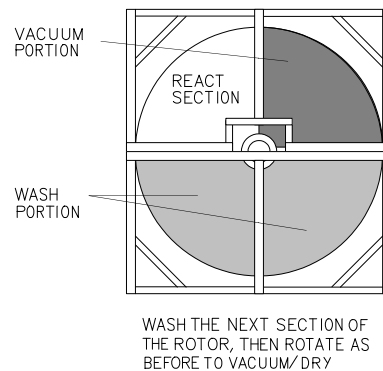
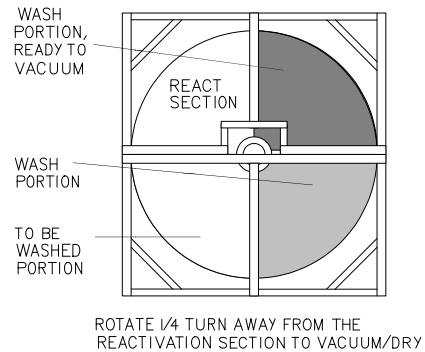
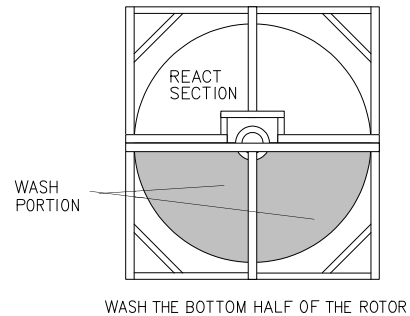


Figure 16 - Rotor Washing

NOTE: These instructions are for small cracks in the rotor surface. For large cracks or for information on replacing the rotor, contact STULZ Product Support.

1. Turn the unit off and disconnect main power. Remove the service panels to the unit.
2. Remove the belt from the rotor drive pulley so you can turn the rotor freely. Position the rotor so you have unobstructed access to the cracked portion of the rotor.
3. Apply masking tape to the face of the rotor on the right and left sides of the crack. Allow for about two corrugations on each side of the crack.
4. Apply 100% silicone to the crack, keeping the angled cut of the silicone tube parallel and very close to the surface of the rotor to ensure good penetration. Allow the silicon seal to extend $\frac{1}{2}$ " beyond the crack. For best results, apply the silicone in an upward motion to push the silicone into the crack.
5. After applying the silicone, take the piece of cardboard, and at a 45 degree angle, drag the cardboard over the bead to press the silicone into the crack and make the surface of the silicone smooth and flush with the face of the rotor. This will further enhance the penetration of the silicone and will ensure that the silicone does not protrude above the surface of the rotor.
6. Immediately after pressing the silicone into the crack with the cardboard, remove the masking tape. This must be done before the silicone starts to cure or skin over.

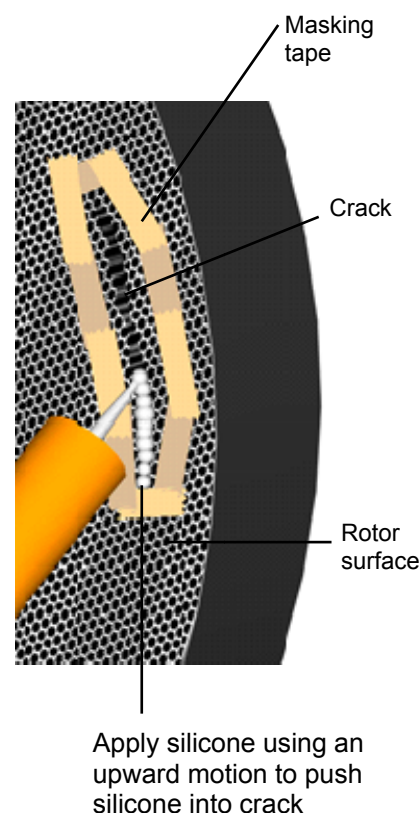


Figure 17 - Rotor Scratch Repair

7. Allow the silicone 24 hours to fully cure prior to running the unit. Should any questions or problems arise, contact STULZ Product Support.

10.0 STULZ PRODUCT SUPPORT

STULZ provides its customers with Product Support which not only provides technical support and parts but the following additional services, as requested:

- Performance Evaluations
- Start-up Assistance
- Training

10.1 Technical Support

The STULZ Technical Support Department is dedicated to the prompt reply and solution to any problem encountered with a unit. Should a problem develop that cannot be resolved using this manual, you may contact STULZ Technical Support at (888) 529-1266 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. If a problem occurs after business hours, provide your name and telephone number. One of our service technicians will return your call.

When calling to obtain support, it is important to have the following information readily available, (information is found on the Unit Nameplate):

- Unit Serial Number (12345678)
- Unit Model Number (DES-XXXX-XX-X)
- STULZ Sales Order Number (123456-12)
- Description of Problem

10.2 Obtaining Warranty Parts

Warranty inquiries should be made through the Technical Support Department at (888) 529-1266 Monday through Friday from 8:00 a.m. to 5:00 p.m. EST. A service technician at STULZ will assist in troubleshooting the system over the telephone with a field service technician to determine the defect of the part. If it is determined that the part may be defective, a replacement part will be sent via UPS ground. If the customer requests warranty part(s) be sent by any method other than UPS ground, the customer is responsible for the shipping charges. If you do not have established credit with STULZ, you must give a freight carrier account number.

A written (or faxed) purchase order is required on warranty parts and must be received prior to 12:00 p.m. for same day shipment. The purchase order must contain the following items:

- Purchase Order Number
- Date of Order
- STULZ Stated Part Price

- Customer Billing Address
- Shipping Address
- Customer's Telephone and Fax Numbers
- Contact Name
- Unit Model No., Serial No. and STULZ Item No.

The customer is responsible for the shipping cost incurred for returning the defective part(s) back to STULZ. Return of defective part(s) must be within 30 days, at which time an evaluation of the part(s) is conducted and if the part is found to have a manufacturing defect a credit will be issued.

When returning defective part(s), complete the Return Material Authorization Tag and the address label provided with the replacement part.

10.3 Obtaining Spare/Replacement Parts

It is recommended to have selected spare parts on hand to help ensure minimal system down time. Spare and replacement part requests should be made through Product Support by fax (301) 620-2606, telephone (888) 529-1266 or E-mail (parts@stulz-ats.com). Quotes are given for specified listed parts for a specific unit.

STULZ accepts Visa and MasterCard. STULZ may extend credit to its customers; a credit application must be prepared and approved (this process could take one week).

A 25% minimum restocking charge will be applied on returned stocked parts that were sold as spare/replacement parts. If the returned part is not a stocked item, a 50% restocking charge may be applied. Additionally a Return Material Authorization Number is required when returning parts. To receive credit for returned repair/replacement parts, the parts must be returned to STULZ within 30 days of the purchase date. Spare part sales over 30 days old will be considered final and the parts will remain the sole property of the ordering party.

Appendix A

Forms



Stulz Air Technology Systems Inc.
1572 Tilco Drive
Frederick, Maryland USA 21704

DESICAiR PRODUCT DIVISION

Telephone: (301) 620-2033
Facsimile: (301) 620-1396

Appendix A- Forms**Checklist for Completed Installation**

- | | |
|--|--|
| <input type="checkbox"/> 1 Proper clearances for service access have been maintained around equipment. | <input type="checkbox"/> 10 Customer supplied main power branch circuit protection device/ fuses have proper ratings for equipment installed. |
| <input type="checkbox"/> 2 Equipment is level and mounting fasteners (if applicable) are tight. | <input type="checkbox"/> 11 All control wiring completed according to applicable codes to wall mounted control panel, temperature/RH sensor transmitter, etc. (as applicable). |
| <input type="checkbox"/> 3 Foreign materials removed from inside and around equipment installed (shipping materials, blower lockdown bolts construction materials, tools, etc.). | <input type="checkbox"/> 12 Control Sensors (+/-) polarity wired correctly. |
| <input type="checkbox"/> 4 Blowers rotate freely without unusual noise. | <input type="checkbox"/> 13 All control wiring completed to terminal positions for customer control and monitoring lines. |
| <input type="checkbox"/> 5 Filter(s) installed (if required). | <input type="checkbox"/> 14 All wiring connections are tight. |
| <input type="checkbox"/> 6 Duct work installed and sealed against leaks | <input type="checkbox"/> 15 Steam piping, control valves, etc. installed (if required). |
| <input type="checkbox"/> 7 Air dampers installed in ductwork (if required). | <input type="checkbox"/> 16 All field installed piping leak tested. |
| <input type="checkbox"/> 8 Incoming line voltage matches equipment nominal nameplate rating \pm tolerances. | <input type="checkbox"/> 17 Gas inlet supply pressure matches nominal nameplate rating (if required). |
| <input type="checkbox"/> 9 Main power wiring connections to the equipment, including earth ground, have been properly installed according to applicable codes. | |

Name _____ Date _____

Company _____



Stulz Air Technology Systems Inc.
1572 Tilco Drive
Frederick, Maryland USA 21704

DESICAiR PRODUCT DIVISION

Telephone: (301) 620-2033
Facsimile: (301) 620-1396

Periodic General Maintenance Checks and Services Checklist

Date: _____ Prepared By: _____
Model Number: _____ Serial Number: _____
Item Number: _____

Monthly

Filters

- ☐ Cleanliness
- ☐ No Obstructions

Rotor

- ☐ Check Condition of Rotor Face
- ☐ Check Condition of Seals

Reactivation Heater

- ☐ Inspect Flame (Gas Units)
- ☐ Inspect For Leaks (Steam Units)

Miscellaneous

- ☐ Check and Tighten Loose Fasteners
- ☐ Check Condition of Belts
- ☐ Check Pressure Drop Readings on Gauges
- ☐ Check Steam Lines for Air (bleed as required)
- ☐ Status Indicator Lights "Press to Test" Feature Operates Properly (Should Illuminate When Pressed)

Quarter-Annually

- | | |
|---|---|
| <input type="checkbox"/> Tighten Electrical Connections | <input type="checkbox"/> Check Motors, Lubricate Per Maintenance Schedule |
| <input type="checkbox"/> Check Contacts on Contactors for Pitting | <input type="checkbox"/> Check Gas/Steam Pressure Per Unit Name Plate |
| <input type="checkbox"/> Clean Unit as Necessary | <input type="checkbox"/> Clean Strainers as Necessary (Steam Units) |
| <input type="checkbox"/> Check Motor Amps Per Unit Name Plate | <input type="checkbox"/> Clean Coils as Necessary |

Annually

- ☐ Conduct a Complete Check of All Services Listed Above and Clean Unit's Interior
- ☐ Inspect Wiring For Fraying, Discoloration
- ☐ Inspect Piping System for Leaks and Corrosion (If Applicable)

Notes: _____

Signature: _____

*** If factory assistance is required for any reason, provide the model number, serial number and SATS item number found on the unit nameplate. This will speed the process and insure accuracy of information. ***

Appendix B

Unit Performance Curves

Note: Unit Performance Curves are provided for reference only. Data is based on reactivation entering air conditions at 95°F/130 GPP. Refer to the Technical Data Sheet provided with the unit for specific unit performance data.

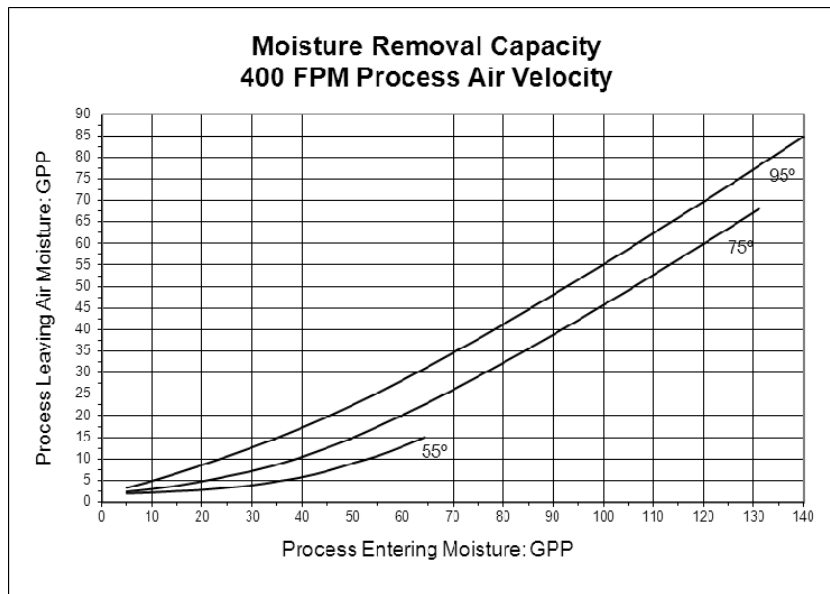
Performance for 400FPM Rotor Face Velocity

Grains Per Pound (GPP)

1. Enter the Performance Chart from the X-axis at the entering process air moisture in grains per pound (GPP).
2. Move vertically in a straight line to intersect the curve closest to the entering air temperature. Interpolate as required.
3. Move horizontally to the left and intersect the Y-axis. This point represents the leaving process air moisture from the dehumidifier in GPP

The charts on this page apply to the following models:

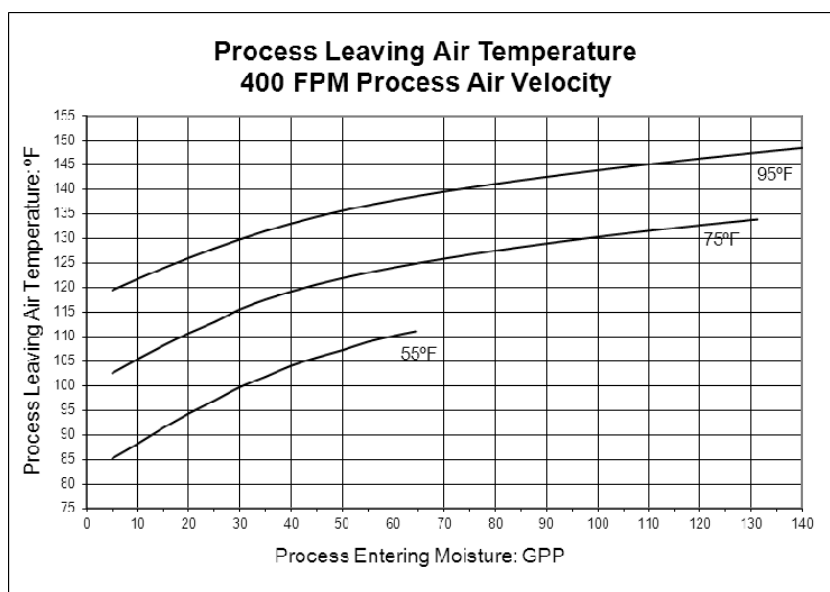
- DES-750-55
- DES-1500-77
- DES-2750-106
- DES-3250-122
- DES-6000-152



Leaving Temperature

1. Enter the Performance Chart from the X-axis at the entering process air moisture in grains per pound (GPP).
2. Move vertically in a straight line to intersect the curve closest to the entering air temperature. Interpolate as required.
3. Move horizontally to the left and intersect the Y-axis. This point represents the leaving process air moisture from the dehumidifier in °F.

NOTE: Process air outlet temperatures as shown are maximum values at standard full rated heater output. The actual process outlet air temperature will be lower when the heater output is below full rated output. This condition will occur during heater modulation cycles due to partial loading of the dehumidifier.



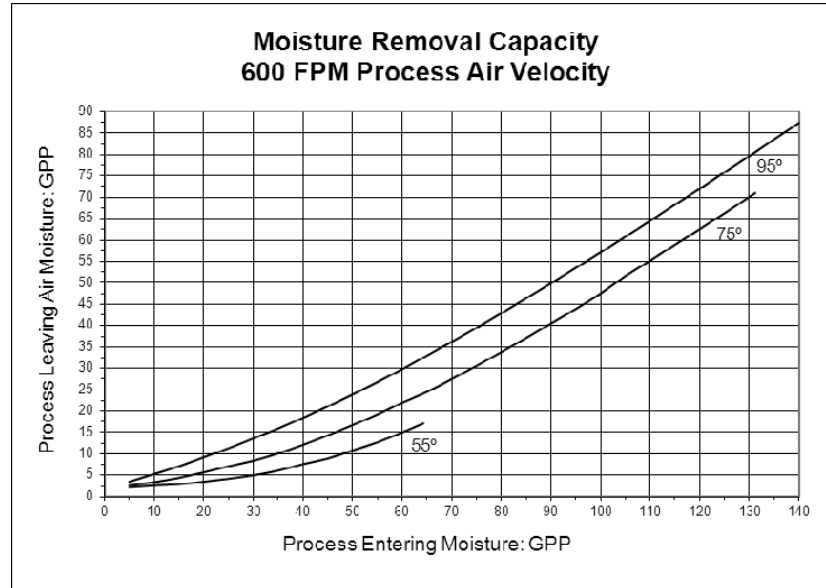
Performance for 600 FPM Rotor Face Velocity

Grains Per Pound (GPP)

1. Enter the Performance Chart from the X-axis at the entering process air moisture in grains per pound (GPP).
2. Move vertically in a straight line to intersect the curve closest to the entering air temperature. Interpolate as required.
3. Move horizontally to the left and intersect the Y-axis. This point represents the leaving process air moisture from the dehumidifier in GPP.

The charts on this page apply to the following models:

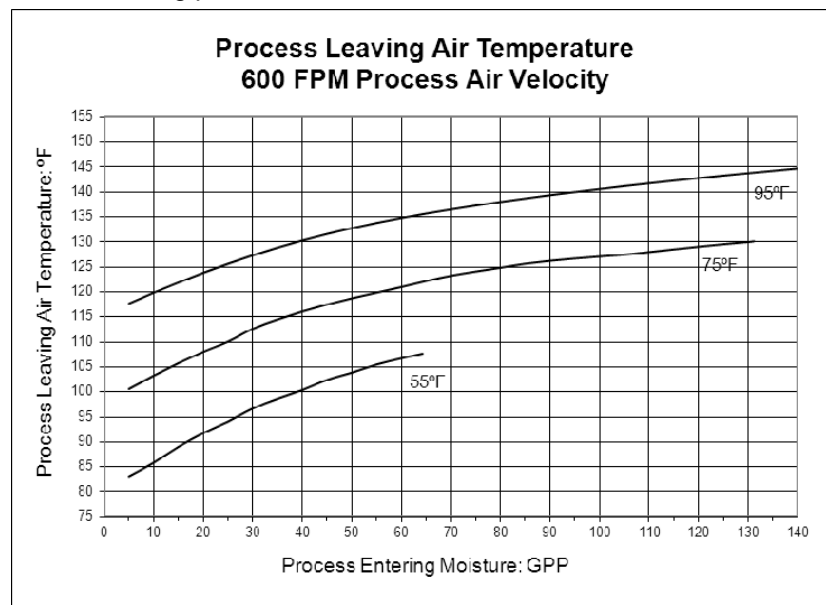
- DES-1150-55
- DES-2250-77
- DES-4250-106
- DES-5500-122
- DES-9000-152



Leaving Temperature

1. Enter the Performance Chart from the X-axis at the entering process air moisture in grains per pound (GPP).
2. Move vertically in a straight line to intersect the curve closest to the entering air temperature. Interpolate as required.
3. Move horizontally to the left and intersect the Y-axis. This point represents the leaving process air moisture from the dehumidifier in °F.

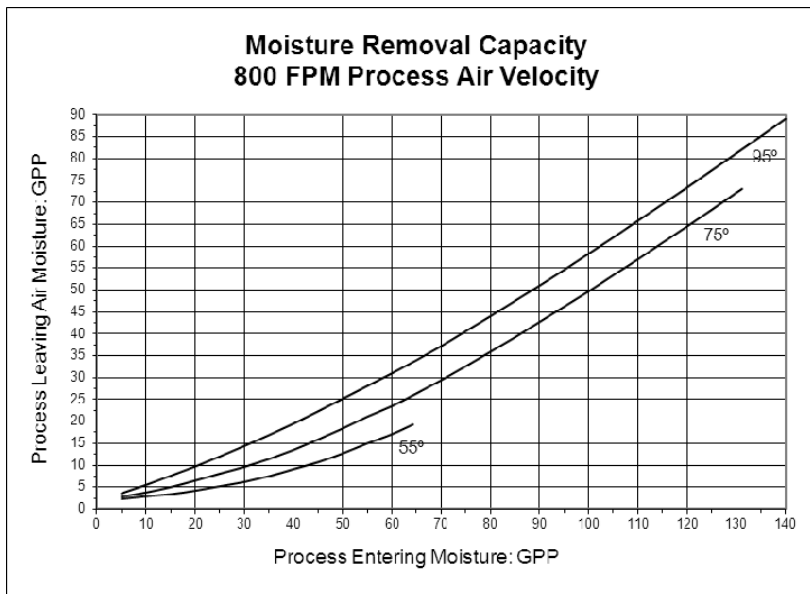
NOTE: Process air outlet temperatures as shown are maximum values at standard full rated heater output. The actual process outlet air temperature will be lower when the heater output is below full rated output. This condition will occur during heater modulation cycles due to partial loading of the dehumidifier.



Performance for 800 FPM Rotor Face Velocity

Grains Per Pound (GPP)

1. Enter the Performance Chart from the X-axis at the entering process air moisture in grains per pound (GPP).
2. Move vertically in a straight line to intersect the curve closest to the entering air temperature. Interpolate as required.
3. Move horizontally to the left and intersect the Y-axis. This point represents the leaving process air moisture from the dehumidifier in GPP

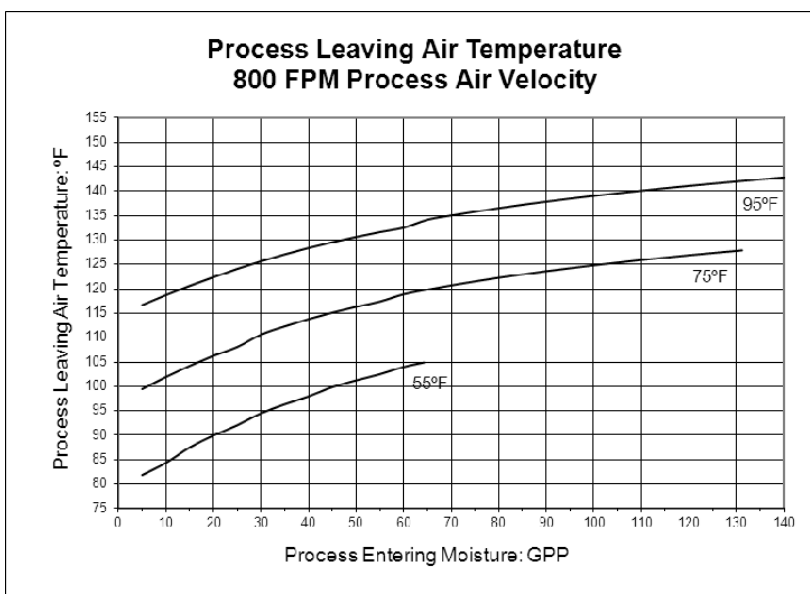


The charts on this page apply to the following models:

- DES-1500-55
- DES-3000-77
- DES-5500-106
- DES-7250-122
- DES-12000-152

Leaving Temperature

1. Enter the Performance Chart from the X-axis at the entering process air moisture in grains per pound (GPP).
2. Move vertically in a straight line to intersect the curve closest to the entering air temperature. Interpolate as required.
3. Move horizontally to the left and intersect the Y-axis. This point represents the leaving process air moisture from the dehumidifier in °F.



NOTE: Process air outlet temperatures as shown are maximum values at standard full rated heater output. The actual process outlet air temperature will be lower when the heater output is below full rated output. This condition will occur during heater modulation cycles due to partial loading of the dehumidifier.

Appendix C

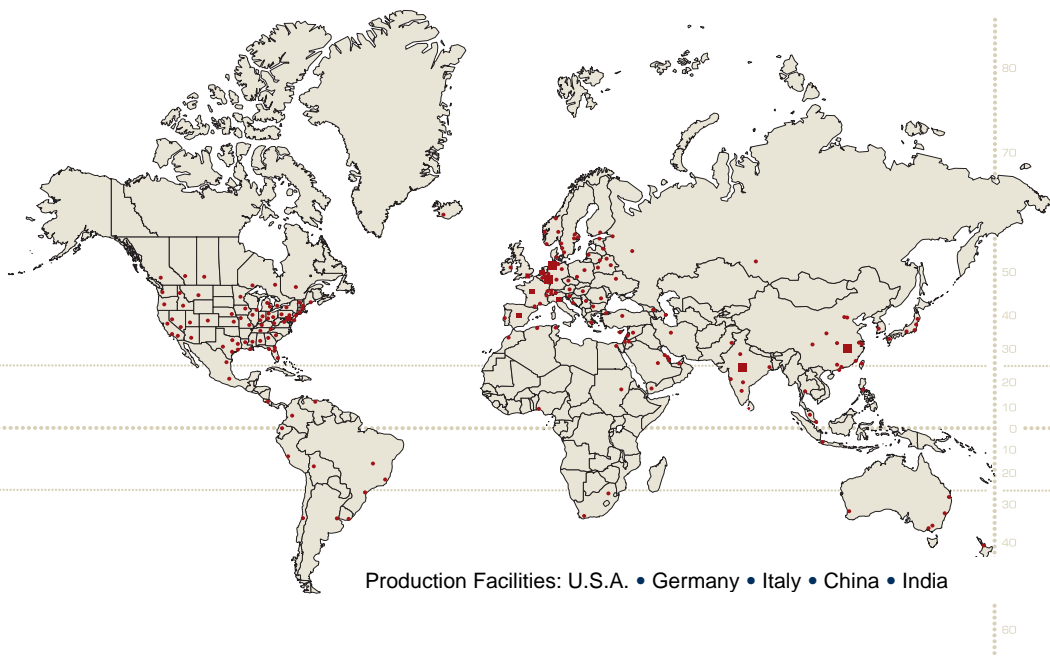
Glossary

APPENDIX C - GLOSSARY

Terms and Abbreviations

Absorb	Penetration of Vapor Molecules Into the Molecular Structure of Another Substance	In. w.c.	Inches of Water Column
Adsorb	Attraction of Vapor Molecules to the Surface of Another Substance	In. w.g.	Inches of Water Gauge
BTU/Hr	British Thermal Units Per Hour	KVA	Kilo-VoltAmp (One thousand Volt Amps)
C-TROL	Modulates Reactivation Heat To Prevent Condensation on Cold Surfaces	KW	Kilo-Watts (One thousand Watts)
CFM	Cubic Feet Per Minute	LRA	Locked Rotor Amps
D-STAT™	Cycles Dehumidifier On & Off To Maintain Relative Humidity	MFS	Maximum Fuse Size
Desorb	Removal of Absorbed or Adsorbed Vapor Molecules	MCA	Minimum Circuit Ampacity
Dew Point	Temperature At Which Humid Air Becomes 100% Saturated	NEC	National Electric Code
DEW-TRAC™	Modulates Reactivation Heat To Maintain Dew Point Temperature	PH	Phase
Dry Bulb	Temperature of Air As Measured By a Thermometer.	PSI	Pounds per Square Inch
°F	Degrees Fahrenheit	PSIG	Pounds Per Square Inch Gauge
FLA	Full Load Amperage	RH	Relative Humidity
FOB	Freight On Board	SDS	Safety Data Sheet
GPP	Grains Per Pound	STULZ	Stulz Air Technology Systems, Inc
H-TRAC™	Modulates Reactivation Heat To Maintain Relative Humidity	VAC	Voltage, Alternating Current
HP	Horse Power	Wet Bulb	Temperature of air as sensed by thermometer with a water saturated wick over the bulb.
Hz	Hertz (Frequency)		

[illegible]



Our mission is to be the premier provider of energy efficient temperature and humidity control solutions for mission critical applications.



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ISO-9001 Quality Management System - Requirements

July, 2016
OD20015G
Specifications subject to change without notice