

## SELECTAIRE PLUS™ SERIES DEHUMIDIFIERS

# Next Generation Latent Enhancement Systems for Large Natatoriums & Water Parks



Natatoriums



Water Parks



School Aquatic Facilities



Desert Aire's patent pending SelectAire Plus™ (SP Series) dehumidification systems offer you complete humidity control solutions for large indoor pool applications and water parks. Building on our years of design, manufacture and applications expertise of natatorium-specific equipment, Desert Aire developed the SelectAire Plus™ Series to provide industry leading performance, efficiency and value. The SelectAire Plus™ Series incorporates the original SelectAire™ System energy recovery technology and adds features for applications that require the superior cabinetry, state-of-the-art fan design and next-generation control features for enhanced setup and serviceability. Best of all, an industry exclusive wrap-around heat pipe enhances the moisture removal capacity and efficiency of SelectAire Plus™ Series dehumidifiers, getting more work out of less energy throughout the year.

### MAJOR FEATURES AND BENEFITS

- Unique dual circuit design with enhanced dehumidification section and a separate enhanced cooling and energy recovery section is an industry-leading exclusive
- Unique SelectAire Energy Recovery recovers more exhaust air energy than any other technology
- Automated control of ventilation air and exhaust air protects the occupants and the building
- Direct Expansion Technology with scroll compressors provides more dehumidification and higher energy efficiency than units with secondary glycol loops
- New optional air-cooled packaged and integrated gas heating solutions simplify installations
- Backward inclined airfoil plenum fans for both supply and exhaust are matched to the specific airflow and static pressure requested for the highest efficiency. All fans include electronically commutated (EC) motors or AC motors with variable speed drives in a fan-array configuration

**OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY**

## DEHUMIDIFICATION OPTIONS

- 2" double-wall injected foam cabinet with hinged access doors ensure sealing even against high static pressure and provides excellent serviceability
- Single piece designs for large units and sectioned system options make installation simple – indoors or out

### ENHANCED LATENT DESIGN

SelectAire Plus™ Series uses a unique dual-circuit design to maximize the dehumidification capacity. A wrap-around heat pipe on one of the circuits enhances the moisture removal capabilities of the evaporator coil. The nature of the wrap-around heat pipe also tempers the air as it leaves the coil. This provides a more neutral leaving air condition and minimizes temperature fluctuations and drafts in the poolroom.

When warm air passes over the heat pipe assembly, the refrigerant within the heat pipe vaporizes, carrying heat to the second section of heat pipe assembly placed downstream. Because some heat has been removed from the air before encountering the evaporator coil, the incoming air stream section is called the pre-cool heat pipe.

Air entering the evaporator coil is assisted to a lower temperature, therefore coming closer to saturation and resulting in greater condensate removal by the coil. The "over-cooled" air is then reheated to a desirable temperature by the reheat heat pipe section, using the heat transferred from the pre-cool heat pipe. This entire process of pre-cool and reheat is accomplished with very little additional energy use.

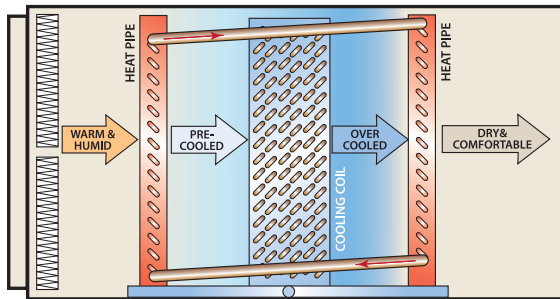


Figure 1 - SelectAire Plus™ Series unique enhanced latent design with heat pipe assembly

The improved efficiency of this section is extremely important since most pools are inactive for a majority of their operating hours. This means only half of the capacity of the dehumidifier needs to be used. In addition cold, dry winter air also reduces the moisture loads of occupied active pools during much of the year. Thus a dehumidifier that maximizes its moisture removal efficiency for the majority of operating hours will yield the lowest operating cost system. This circuit on the SelectAire Plus™ Series will be approximately 25% more efficient than a conventional natatorium dehumidifier without this technology.

### COOLING AND ENERGY RECOVERY

In addition to the enhanced moisture removal circuit, the SelectAire Plus™ Series features a second circuit optimized for cooling the air and recovering energy from the exhaust air. This circuit has a higher velocity over the cooling coil than the dehumidification enhanced circuit.

When there is a call for cooling only or a call for more cooling than the dehumidification-enhanced circuit is providing while operational, the cooling circuit is enabled. The operation of the circuit is further enhanced through the use of refrigeration suction pressure controls and airflow monitoring. As moisture load is reduced in the space, airflow is increased even further until the space is cooled to the setpoint. When cooling is enabled the heat absorbed when cooling the air is rejected to the pool water circuit or an auxiliary heat sink such as a condenser located outdoors.

Even the relative capacity of the individual circuits has been thoughtfully designed. Extensive field research has shown that the vast majority of poolrooms require more total dehumidification capacity than sensible cooling capacity. SelectAire Plus™ Series circuit sizes have been specifically developed to ensure that the sensible cooling load on a design day is addressed, yet efficiency is extremely high.

When heating is required the SelectAire Plus™ System shifts dampers to reroute the air through this sensible cooling coil before exhausting it. The refrigeration system also re-routes the hot gas from the compressor so that it is rejected into the supply air. In this way, a significant amount of energy is recovered from the exhaust air. Desert Aire's use of this "heat-pump" technique has no equal in the industry. Where other passive-type recovery devices including run-around glycol loops and exhaust air heat pipes have significantly reduced capacity at part-load heating conditions, the SelectAire Plus™ System has a constant capacity. This system also recovers much more heat as the energy in the exhaust air, in the form of moisture, is converted to pure air heat energy.

### INTEGRATED AND AUTOMATED VENTILATION AND EXHAUST AIR

Ventilation air is critical for occupant comfort and safety. Also, maintaining negative static pressure relative to outdoors and adjacent spaces is a critical issue for the longevity of the structure. The standard outdoor air and exhaust air in the SelectAire Plus™ System has self balancing and monitoring capability. The design of the SelectAire Plus™ System helps to automate setup by directly monitoring the outdoor airflow rate and poolroom static pressure. Up to five modes of outdoor airflow rates can be programmed and controlled: Unoccupied; Occupied; Event; Alarm; and, Purge. The static pressure in the space is automatically controlled when modes are switched.

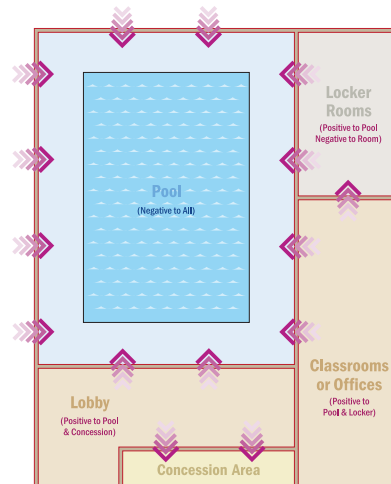


Figure 2 - Negative static pressure in the poolroom

Static pressure, outdoor airflow and exhaust flow are directly read by personnel at the user interface. This helps to ensure that setup is done properly and with minimal effort.

## FANS

The SelectAire Plus™ fans are custom designed for the application. Automated selection software evaluates available fan and motor systems for each application to optimize cost and efficiency. All fans modulate and are automatically controlled to ensure that correct flow rates are maintained through each component, regardless of filter loading or mode changes.

All fans include high-performance backwards-inclined airfoil blades. Electronically commutated (EC) external-rotor motors or direct drive NEMA Premium efficient motors with variable speed drives are used in a fan-wall configuration.

## CABINET

All exterior cabinet parts are galvanized steel. All exterior panels include a powder coat finish; a tough coating that assists the base materials in resisting corrosion. This process meets a corrosion resistance specification of 1,000 hours of salt spray minimum. Cabinet walls are 2 inches thick with superior insulating properties.

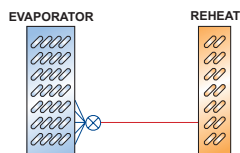
The cabinet has double-bypass seals on all doors for superior weather resistance and tight sealing against high static pressures. Service doors are located at all regular maintenance and inspection points. Major mechanical components are located out of the airstream for accessibility. This also ensures that any high humidity or corrosive indoor air does not affect operation or longevity.

Indoor units contain a mechanical section for major components that is outside of the airstream. Lights and service outlet for this area are standard and can be powered by a 120 VAC 15A circuit supplied by the field.

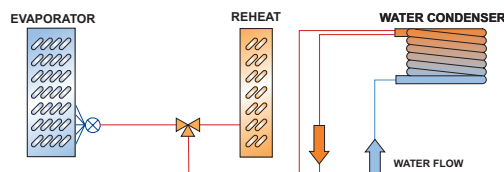
## OPERATION

Desert Aire's indoor pool dehumidifier systems are flexible in their design options. This modular concept allows each system to be customized for specific dehumidification applications. Each module type is described below.

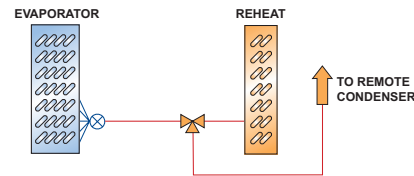
**REHEAT ONLY ...** This is the basic option which removes moisture from the air at the evaporator coil and reheats it before returning to the space as dehumidified air.



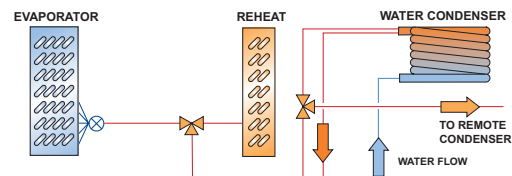
**REHEAT & WATER...** In addition to the reheat coil, a water-condensing coil is added to the refrigeration circuit. Either condenser can become the primary heat sink allowing the circuit's latent and sensible heat to be directed to a water source or returned to the air.



**REHEAT & AIR REMOTE CONDENSER READY...** This option offers a reheat coil and an air cooled remote condenser connection.



**REHEAT & WATER & AIR COOLED REMOTE CONDENSER READY...** This is the combination of all heat sink options. The combination is used when only a partial water heatsink is available but full capacity dehumidification is required continuously, regardless of season. This is typical for large natatoriums and water parks.



## CONTROLS & MODES OF OPERATION

Each circuit is controlled by the integral microprocessor based controller. This control system includes an easy-to read user interface. A Remote Display Terminal (RDT) may be ordered separately for remote mounting. The use of basic control and staging sequences provides great flexibility in optimizing dehumidification and energy recovery capacity. The system features control of all dehumidification functions including auxiliary heating, occupancy schedules and ventilation air. The control system also provides diagnostic readouts and alarms. Optional communication cards are offered that allow the system controller to be connected to a building automation system. Communication is offered for BACnet™ MS/TP, BACnet™ Ethernet™, LonWorks® and Modbus®.

The system automatically controls the selection of the compressor set that should be operational. This depends on the internal loads such as humidity and temperature. With completely separate exhaust and ventilation air streams, the SelectAire Plus™ Series and its integrated dampers will provide the correct solution to the ever changing demands of natatorium internal space conditions.

In the dehumidification mode the system will capture the high energy content of the exhaust air and return this energy back to the air or pool water at an industry-leading coefficient of performance (COP) approaching 5. This helps to minimize the amount of new energy required to make up the ventilation load's heating requirement.

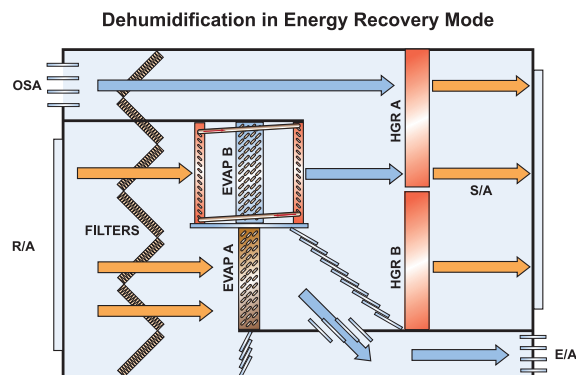


Figure 3 - Dehumidification in Energy Recovery Mode

Many conventional dehumidifiers exhaust the air after the evaporator coil for construction convenience. The SelectAire Plus™ System strategically configures its airflow arrangement to “Select” where the exhaust air is coming from. In the cooling mode the higher enthalpy return air is exhausted before the evaporator coil thus maintaining all of the cooling performed by the evaporator and delivering this cool air to the space. In the heating mode the energy of the high enthalpy containing return air is recovered by the evaporator coil and the cool air is exhausted after the coil. Refer to Desert Aire's Technical Bulletin 6 – SelectAire Heat Recovery System, for more details.

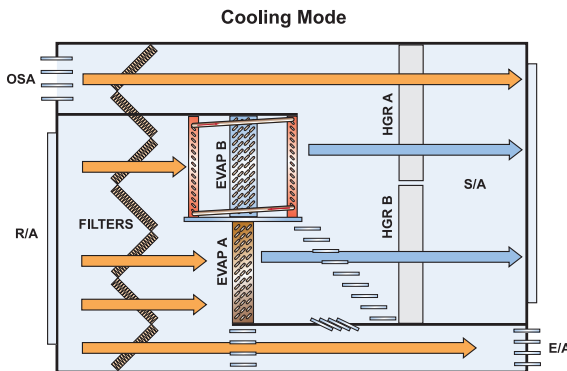


Figure 4 - Dehumidification in Cooling Mode

## STANDARD SP SERIES REFRIGERATION DESIGN FEATURES

- Dual, independent refrigeration circuits operate independently or simultaneously
- Heavy-duty scroll compressors located in a separate vestibule
- Maximum of 38" coil height maximizes moisture removal
- Sloped, stainless steel drain pan for each circuit
- Minimum of 8" separation between evaporator and condenser coils prevents re-evaporation
- One circuit is designed for maximized latent removal using a wrap-around heat pipe
- One circuit is designed for sensible cooling and energy recovery R-410A refrigerant

## CABINET AND CONSTRUCTION

- Base rails and supports constructed of 12-gauge steel channels
- Doors and access panels constructed of 2" injected foam panels made of 20ga. galvannnealed steel finished with powder paint coating. Rated for 1000-hour salt spray

## BLOWER

- Backward-inclined airfoil plenum fans
- Electronically commutated (EC) or direct drive motors
- All fans arranged in a fan-wall array

## OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY

N120 W18485 Friestadt Road, Germantown, WI 53022 sales@desert-aire.com

**Ph: (262) 946-7400 - [www.desert-aire.com](http://www.desert-aire.com)**

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## FILTERS

- Return Air: 4" MERV 8, pleated filters
- Outdoor Air: 4" MERV 8, pleated filters

## ELECTRICAL SERVICE

- Hinged electrical panel with separate sections for high and low voltage components
- Single point power connection for all units

## CONTROLS

- Duct or wall mount temperature and humidity sensors
- Integrated Display with an optional remote display terminal
- BAS communication options
- Built in time clock for standalone operation
- Alarm Retention

## COIL COATING

- Coil ElectroFin® E-Coat to resist chemicals and corrosion

## AUXILIARY HEAT OPTIONS

- Hot water coil supplied downstream from hot gas reheat coil
- Steam coil supplied downstream from hot gas reheat coil
- Electric SCR heat supplied downstream from hot gas reheat coil
- Gas heater supplied downstream of blowers
- Control outputs for field supplied auxiliary heating devices

## INSTALLATION LOCATION

- Indoor
- Outdoor
- Rooftop

## CONDENSER (Choose per circuit)

(All circuits reject the full THR - Total Heat of Rejection)

- Packaged air-cooled condenser (outdoor units only)
- Split air-cooled remote condenser
- Water condenser for water loops or fluid cooler

## POOL WATER HEAT

- Coaxial heat exchanger for recovery of heat to pool water

## WARRANTY

- 2-year parts warranty
- ElectroFin® Coated coils include 5-year parts warranty





## AUXILIARY ELECTRIC HEAT

### OPTIONAL AUXILIARY ELECTRIC HEATING OPTIONS

Desert Aire provides auxiliary electric heating options for the SelectAire Plus™ Series that are sized to meet the winter heating requirements of the outside air.

These heating elements are utilized when the air temperature in the zone drops below the customer set point.

Desert Aire sizes the heating elements to precisely match the load requirement of the system. The heaters are automatically controlled by the units microprocessor to maintain zone temperature. An SCR controller is used for the electric heat option to vary the heat output.

#### Design Specifications

The following list highlights the noteworthy features of the SelectAire Plus™ Series electric heaters:

- System Single Point Power to Dehumidifier
- NiCr 60 Corrosion-Resistant Element
- Welded Construction Using 20 MSG Galvanized Steel
- Automatic Reset High Temperature Limit Safety Switch
- Manual Reset High Maximum Temperature Limit Safety Switch
- Air Flow Pressure Switch
- Fusing as Required for Each 48 Amp Circuit
- Fused Circuits per N.E.C., UL, and CSA
- SCR modulation

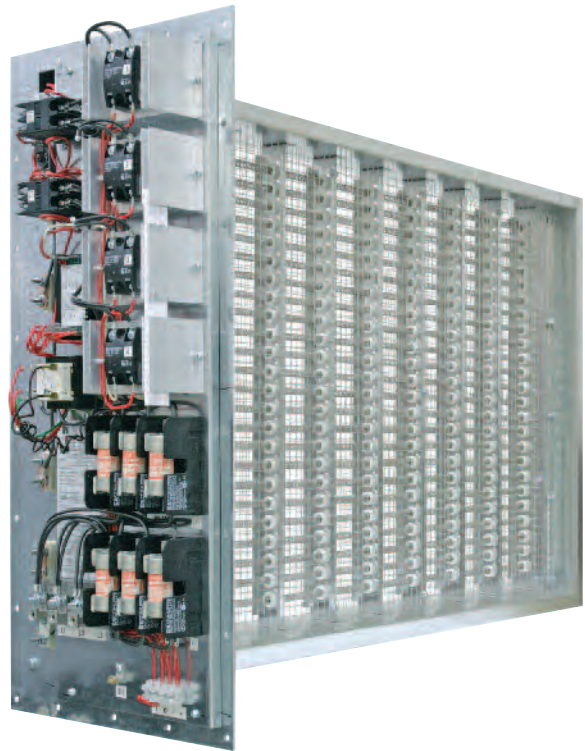



Figure 1 - Detail of Electric Heating Element for SelectAire Plus™ Series Unit

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## AUXILIARY HOT WATER HEAT

### OPTIONAL HOT WATER HEATING OPTIONS

Desert Aire provides auxiliary heating options for its SelectAire Plus™ Series product line that are sized to meet the winter heating requirements of the space.

These heating elements are utilized when the air temperature in the zone drops below the customer set point. Desert Aire sizes the heating elements to precisely match the load requirement of the system. The heaters are automatically controlled by the unit's microprocessor to maintain an exact leaving air temperature. A customer supplied hot water control valve is modulated from the controller with a 0 to 10 VDC direct acting signal. Please refer to figure 1 for a typical installation.

#### HWC Design Inputs

The coil is selected for each customer's particular application based on the following criteria:

- Entering water temperature (EWT), typically between 140° F and 180° F
- Leaving water temperature (LWT), typically 20 degrees less than the EWT
- Customer specified capacity required (MBH)
- Entering air temperature (EAT), (the mix temperature of outdoor air at winter design with return air)
- Specify fluid pressure drop maximum
- Type and concentration of glycol used, if applicable

For freeze protection Desert Aire uses a capillary type temperature sensor which is attached across the downstream face of the coil. Freezestat is set at 38 deg F with an auto reset switch. If engaged the unit controls would respond by closing the outdoor air damper, wait 5 minutes and if not reset, de-energize the fan, open the hot water coil valve 100%, and log the alarm on the controller.

To size the control valve, please provide a qualified vendor the water temperature, flow rate (gpm) and the requirement for a 0 to 10VDC signal and they will select the appropriate valve to purchase.

Desert Aire offers HW valve/actuators as an option. Please consult with your Desert Aire sales representative if you wish for Desert Aire to supply this component.

Optional ElectroFin coil coating for pool environments is available.

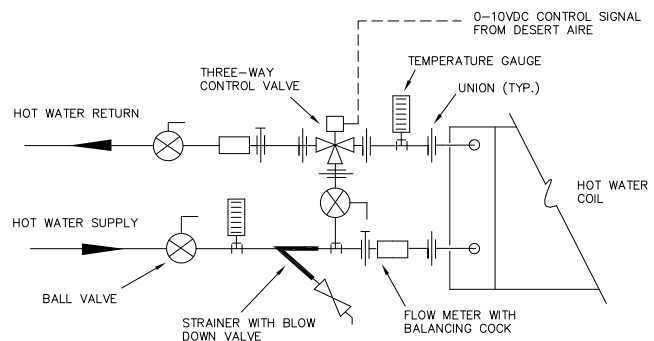


Figure 1 - Hot Water Piping Detail

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## COIL COATING

Desert Aire recommends the use of coil coating in applications that are in harsh environments such as indoor pools and for seacoast installations because of its superior performance in preventing corrosion and fin deterioration. Our coating is a water-based, low VOC coating process engineered specifically for HVAC/R heat transfer coils.

## CORROSION RESISTANCE

In the coating process, the entire coil assembly is protected. This includes the coil fins, end plates, copper tubing and copper return bends. The coating covers the entire coil assembly. The result is a finish which provides excellent resistance to pool chemical, coastal marine (salt-air), industrial and urban environments. When properly maintained, you can expect the coated coils to provide protection for years. Desert Aire provides a 5-year coil parts warranty as evidence of its superior protection.

## RESISTANCE To UV DEGRADATION

When coils are to be subjected to ultraviolet exposure such as the remote condenser, they receive a spray-applied, UV-resistant urethane mastic topcoat. As a result, UV degradation of the coating polymer molecules is eliminated, and the film integrity is maintained. The UV topcoat is included on all ROC Series condensers that are ordered with coil coating option.

## PROVEN EFFECTIVE

The process is the most automatic, controllable, and efficient method for applying a corrosion inhibiting coating to a metallic work piece. The process dictates that all metal surfaces are coated in an even, uniform finish. All coil surfaces reach an average dry film thickness of 1 mil (0.001"). It meets the 5B rating crosshatch adhesion per ASTM B3359-93. Corrosion durability is confirmed through testing to no less than 15,000 hours salt spray resistance per ASTM B117-90 using scribed aluminum test coupons.

## COMPARISON TO FIN STOCK COATINGS

Not all coil coatings are the same. Many dehumidifier companies use a fin stock coating that is applied to the aluminum stock before the coil is manufactured. This means the edges of the fin; the copper tubes and the steel header remain uncoated.

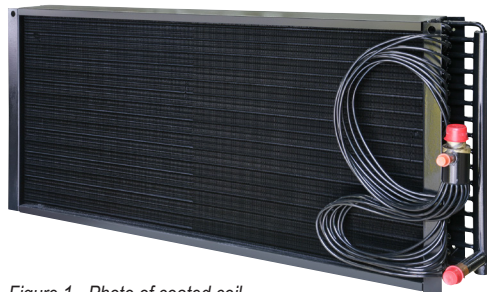


Figure 1 - Photo of coated coil

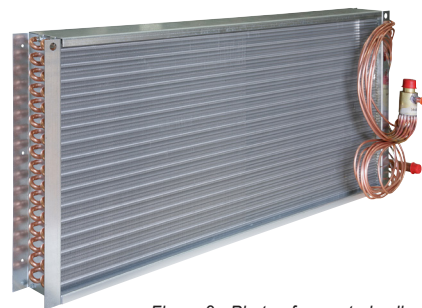


Figure 2 - Photo of uncoated coil

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## AUXILIARY GAS HEATING OPTION

### OPTIONAL GAS HEATING MODULE

Desert Aire provides auxiliary heating options for its SelectAire Plus™ Series product line that are available in several capacities to meet the winter specified heating requirements of the space.

These heating elements are utilized when the air temperature in the space drops below the customer set point. Desert Aire sizes the heating elements to precisely match the load requirement of the system. The heaters are automatically controlled by the unit's microprocessor to maintain an exact leaving air temperature. Desert Aire controls the heater output with a 0-10VDC control signal from the dehumidifier's operating controller.

Desert Aire combines different burner sizes to precisely match the load of the system. This may be in a single heater module or in multiple modules. A modulating gas valve is automatically controlled by the unit's microprocessor to maintain an exact leaving air temperature. If multiple burner sets are utilized, then a venier sequence is used where the base burner is modulated and the others are staged. The system's overall turn down ratio is a function of the number of heating modules and is summarized in the table below:

Input Capacity (MBH)	Output Capacity (MBH)	Gas Module Qty.	Effective Turndown Ratio	Gas Connection
800	640	2	10 to 1	One 2" NPT
1,000	800	2	10 to 1	One 2" NPT
1,200	960	2	10 to 1	One 2" NPT
1,600	1,280	4	20 to 1	Two 2" NPT
2,000	1,600	4	20 to 1	Two 2" NPT
2,400	1,920	4	20 to 1	Two 2" NPT



Figure 1 - Detail of Gas Heat Compartment on SelectAire Plus™ Series Unit





Figure 2 - Detail of Gas Heat Burner Assembly

The gas module shall provide a minimum combustion efficiency of 80%, and listed for operation downstream of refrigeration or cooling system, and provide means for removal of condensate that occurs in the heat exchanger during cooling operation. They are listed for outdoor installation without the need for additional power ventilation.

Heat exchanger shall be tubular in design and constructed of Type 304L stainless steel and employ (integral formed dimple restrictors, formed turbulators) and provide for an unobstructed drainage path for condensate and provide a positive pitch to promote drainage.

Additionally the gas module shall employ:

- Patented inshot gas burners, with integral carryovers, capable of operation at 5:1 turndown with modulating controls
- A combustion blower to provide for positive venting of flue gases
- Pressure switch to prove air supply for combustion
- Direct spark ignition of gas burners with remote flame sensor to prove carryover across all burners
- An automatic reset type high limit switch to limit maximum outlet air temperature to less than 250° F
- Manual reset flame rollout switch
- Listed Combination Gas Valve incorporating redundant safety shut-off valve, manual shut-off , and gas regulator which regulates gas pressure to burner supply manifold.
- Direct Spark ignition control design certified by a Recognized National Testing Laboratory and incorporating a LED diagnostic light and alarm capable contact

The completed heater assembly shall be factory fire tested prior to shipment.


AUXILIARY GAS HEAT

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## Exhaust Air Integration - Duct Mount

Desert Aire's SelectAire Plus™ natatorium dehumidifier can vary the volume of outside air and exhaust air based on the level of contaminants within the pool room. The key to this integration is the use of a Volatile Organic Compounds (VOC) sensing element that can detect when interior levels of chemicals are present such as chloramines. This provides a similar methodology as the use of CO<sub>2</sub> sensors in general ventilation applications for the pool environment. Now there is the ability to optimize the volume of exhaust air required with the energy cost of doing so and insure a suitable pool environment for the occupants.

The VOC duct sensor samples duct air using an aspiration tube. Moving air from the duct enters the tube, is forced into the enclosure and exits through the other half of the tube. As long as there is air movement in the duct, air is continuously exchanged.

### Sensor Specifications

Power: 15 to 35 VDC @ 50 mA  
Power Sensing Element: VOCs: Micro-machined Metal Oxide Quick Response Sensor through Aspiration Tube

Analog Outputs: 0 to 10VDC, (>10KΩ impedance)  
VOC Contaminants: 0 to 2,000 PPM CO<sub>2</sub> Equivalent  
VOC Detection Range: 0 to 100%  
Response Time: Less Than 60 Seconds  
Start-Up Time: 15 minutes  
Operating Environment: 32 to 122°F (0 to 50°C)  
0 to 95%RH non-condensing

Dimension: 4.91"H x 3.21"W x 1.20"D  
(124.6 x 81.5 x 30.5 mm)

Enclosure Rating: NEMA 4  
Enclosure Material: Polycarbonate, UL94 V-0  
VOC Duct Sensor  
Certifications: RoHS  
Warranty Period: Two years from manufacture date



Figure 1 - Duct Mounted VOC Sensor

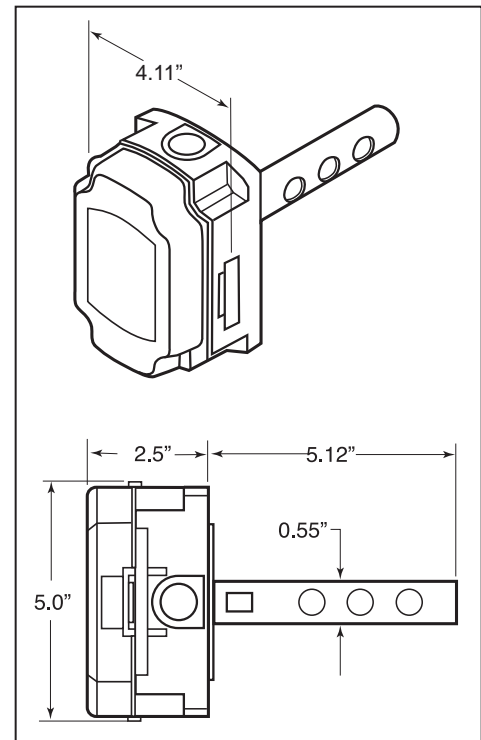


Figure 2 - Duct Sensor Dimensions

CHLORAMINE SENSOR

### Exhaust Air Integration - Wall Mount

Desert Aire's SelectAire Plus™ natatorium dehumidifier can vary the volume of outside air and exhaust air based on the level of contaminants within the pool room. The key to this integration is the use of a Volatile Organic Compounds (VOC) sensing element that can detect when interior levels of chemicals are present such as chloramines. This provides a similar methodology as the use of CO<sub>2</sub> sensors in general ventilation applications for the pool environment. Now there is the ability to optimize the volume of exhaust air required with the energy cost of doing so and insure a suitable pool environment for the occupants.

### Sensor Specifications

Power: 15 to 35 VDC @ 50 mA

Power Sensing Element: VOCs: Micro-machined Metal Oxide

Analog Outputs: 0 to 10VDC, (>10KΩ impedance)

VOC Contaminants: 0 to 2,000 PPM CO<sub>2</sub> Equivalent

VOC Detection Range: 0 to 100%

Response Time: Less Than 2 Minutes

Start-Up Time: 15 minutes

Operating Environment: 32 to 122°F (0 to 50°C)  
0 to 95%RH non-condensing

Dimension: 4.50"H x 2.86"W x 1.06"D  
(114.3 x 72.7 x 26.9 mm)

Enclosure Material: ABS Plastic, UL94 V-0

Certifications: RoHS

Warranty Period: Two years from manufacture date



Figure 1 - Wall Mounted VOC Sensor

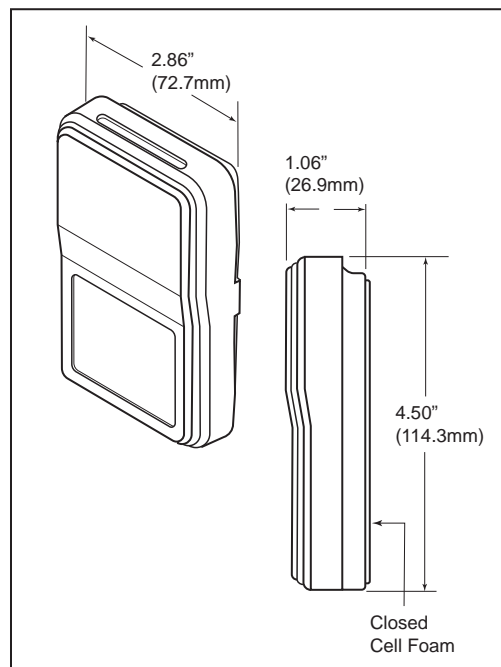


Figure 2 - Wall Sensor Dimensions

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