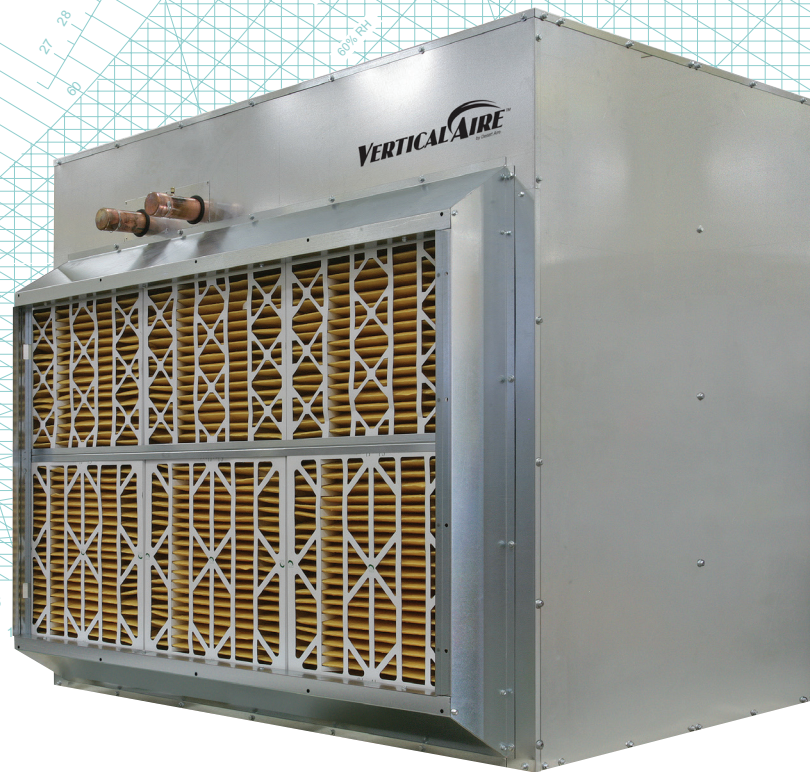


**DEDICATED OUTDOOR AIR SYSTEMS**

**DOAS and HOAS Equipment  
for 100% Outdoor Air and  
Mixed Air Applications**



Our VerticalAire™ series was developed to fill the need to install dedicated outside air systems (DOAS) and high outside air systems (HOAS) in tight indoor mechanical rooms. This series was developed to address all critical IAQ issues plus provide the design engineer many choices of condenser options and auxiliary heating options. The flexibility of the VerticalAire™ series will allow you to design a system for both new and retrofit applications and meet the demands of ASHRAE 62.1 requirements.

**OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY**

### FOR LIMITED FOOTPRINT APPLICATIONS

Desert Aire's VerticalAire™ Series dehumidifiers are the ideal complete IAQ control option for any indoor installation where space is restricted. Their reduced size and innovative vertical design allow them to be integrated into almost any HVAC project where a limited footprint is the norm.

### ISSUES OF INDOOR AIR QUALITY (IAQ)

Several HVAC trade and professional organizations, including ASHRAE, have documented the need for suitable indoor air quality. A primary requirement for maintaining proper IAQ is through the introduction of varying amounts of outdoor air. The down side of adding outdoor air is that it also admits excess moisture into the facility. If this condition is not controlled, it can create an environment for mold, mildew, viruses and other potentially hazardous organisms to flourish. The key to preventing mold formation and growth is to control the relative humidity within the space. A standard air conditioner cannot achieve this since it controls only temperature. Instead, a system must be implemented that can provide full control of both temperature and relative humidity.



Figure 1 - Basic Refrigeration Circuit

### DEHUMIDIFICATION

All VerticalAire™ units are designed around a reliable, efficient dehumidification system. There are two main reasons for using the dehumidifier as a base to build a complete ventilation system:

- Significant additional energy costs will result if the latent cooling provided by a standard air handler is used for dehumidification. In contrast, dehumidifiers are the only efficient means to regulate moisture removal.
- VerticalAire™ dehumidifiers are configured for the easy addition of optional components needed for a complete solution, options that offer effective solutions that are not otherwise available.

VerticalAire™ units are engineered and manufactured for excellent performance, dependability and serviceability. Specially designed evaporator coils provide maximum moisture removal. Components are carefully selected for reliable long-term operation.

### DEDICATED OUTDOOR AIR SYSTEMS (DOAS)

The most energy efficient method to remove moisture is through the use of a dedicated outdoor air system that lowers the dew point temperature of supply air to below 55°F. This also helps remove existing moisture from inside a facility. A DOAS design can also be optimized to remove maximum moisture at the lowest electrical consumption rate (Moisture Removal Efficiency, MRE) at both full and part-load conditions. Desert Aire manufactures DOAS units under our Aura™, TotalAire™ and VerticalAire™ product lines.

### HIGH OUTDOOR AIR SYSTEMS (HOAS)

If the application requires an air handler to accept outside air volumes of 50% to 100% of the supply air volume, conventional sensible heating and cooling units cannot be used. The system must be designed to remove the outdoor air's moisture, but also incorporate a specialized sequence of operation to provide the appropriate sensible cooling and heating. A HOAS design can also be optimized to remove maximum moisture at the lowest electrical consumption rate (Moisture Removal Efficiency, MRE) during both full and part-load conditions. Desert Aire manufactures HOAS units under our Aura™, TotalAire™ and VerticalAire™ product lines.

## DESIGN OPTIONS

Desert Aire's VerticalAire™ Series offers the widest range of performance options while maintaining its main focus: Meeting the target dewpoint temperature while attaining the lowest operational cost. In addition, the many options help to reduce the operating cost of the remainder of the building's sensible cooling and heating systems. The design engineer has the ability to configure the system with the following configuration options.

- DOAS or HOAS – System is flexible in the amount of outside air delivered
- Control Strategy – Multiple choices allows better energy efficiency
- Choice of Condensers – Air, water or geothermal (or combinations)
- Auxiliary Heating – Many options including:
  - Electric
  - Hot water or steam coils (20 to 30 ton)
  - Geothermal
- Miscellaneous Options - fan discharge direction, coated coils a better filtration are just a few of the many additional configuration options to be selected for inclusion on the VerticalAire™ Series.

## CONDENSER DESIGN OPTIONS

Each unit includes a hot gas reheat coil that is integrated into the refrigeration circuit along with a modulating control system to maintain the discharge temperature based upon the choice of control algorithm. This coil reheats the leaving air to the precise temperature required and rejects any remaining energy to a second condenser.

A choice of secondary condenser options allows the design engineer to integrate the superior design features of the VerticalAire™ system into any building type or location. The condensing system is selected to work in series with the hot gas reheat coil to implement the control option of choice. You may choose either an air-cooled condenser, that dissipates heat to the outdoors, or a water-cooled heat exchanger, which releases heat into a facility's chilled water or cooling tower loop. The water-cooled condenser is incorporated into the dehumidifier, while the air-cooled condenser is split outdoors from the dehumidifier. Desert Aire only requires two refrigeration pipes (suction and liquid lines) to be run between the dehumidifier and remote condenser.

## AIR SEPARATED COILS

If a hot gas reheat coil is installed too close to the evaporator coil, re-hydration can occur. Water on the surface of the evaporator coil can be blown onto the hot gas reheat coil. This will convert it back into vapor which will then be returned to the space. This completely negates all dehumidification efforts and fails to meet basic IAQ design requirements. Consequently, the system will remove less moisture at a higher electrical cost. That's the reason we design our IAQ units with adequate separation between the outlet face of the evaporator coil and the inlet face of the hot gas reheat coil to prevent re-hydration.

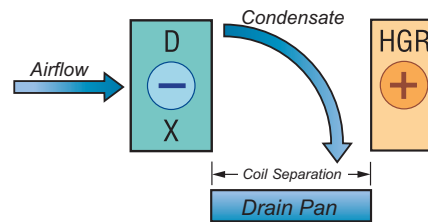


Figure 2 - Re-Hydration Prevention

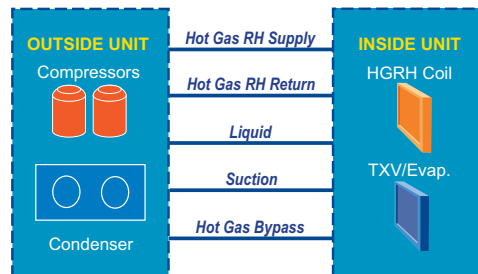


Figure 3 - Competition's Line Set Schematic

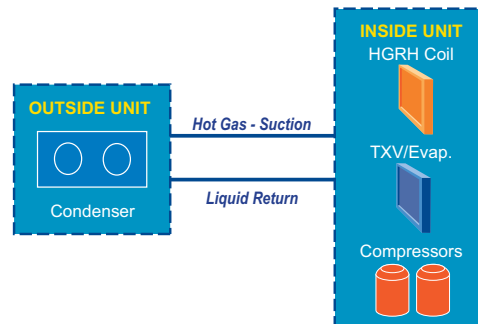


Figure 4 - VerticalAire™ Line Set Schematic

For more information visit [www.desert-aire.com](http://www.desert-aire.com)

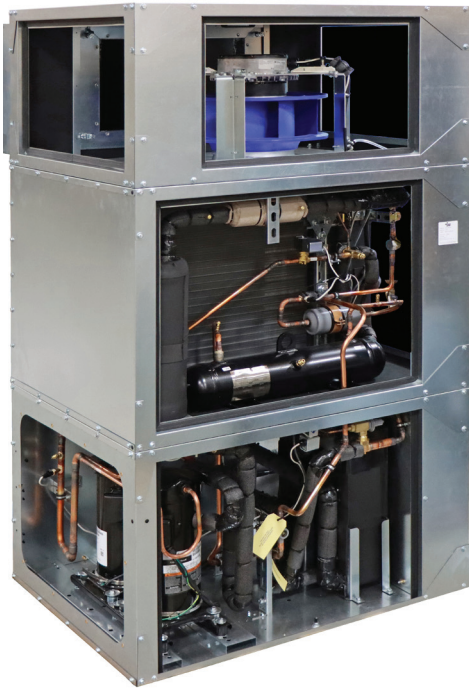


## CABINET AND UNIT CONSTRUCTION

The VerticalAire™ Series features a double walled steel construction cabinet design with galvanized outer and inner panels for the 20 to 30 ton systems. Our smaller VerticalAire™ systems are normally installed in close proximity to the room being conditioned, so these systems have their compressors in a separate section. An insulated airside section reduces propagating noise through the use of closed cell foam as the inner liner. All units use EC fan assemblies with field convertible discharge direction.

## FILTRATION

Filtration is essential to prevent dirt from accumulating on coils and contaminating indoor spaces. When 1-inch or 2-inch wide filters are used, they must be frequently replaced. Therefore, our IAQ units are equipped with a minimum of 4-inch, MERV 11, pleated filters to reduce filter maintenance. Optional higher efficiency MERV 13 filters are available as an option.



*Desert Aire factory assembles and tests all units as systems, not just components.*

## COIL COATINGS

Sea coast coil coatings are available. Desert Aire uses coated coils to provide long life in corrosive environments.

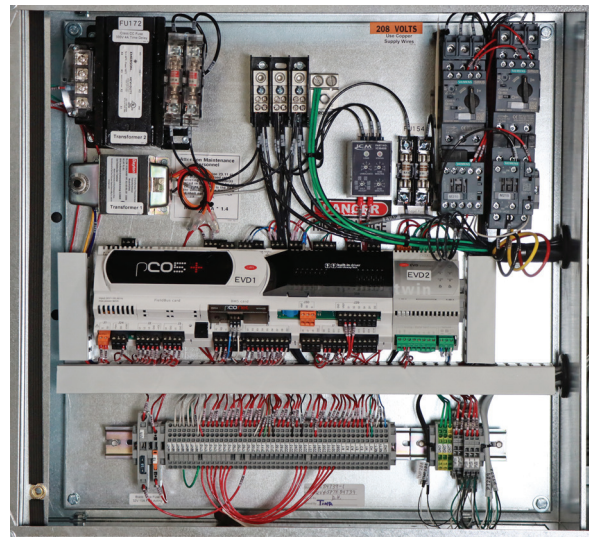
## BUILDING MANAGEMENT INTEGRATION

The unit's controller has the following BMS choices:

- LonWorks® compatible
- BACnet™ MSTP compatible
- BACnet™ Ethernet compatible
- Modbus® compatible

## COMPLETE SOLUTIONS FOR 100% OUTDOOR AIR

Solving the 100% outdoor air problem is easy with a VerticalAire™ dehumidifier and the expertise of a Desert Aire representative. Complete solutions addressing moisture, cooling and heating loads while recovering and saving energy will help ensure proper indoor air quality and comfort. Contact Desert Aire for assistance when you need complete solutions for conditioning ventilation air.



*Figure 5 - VerticalAire™ Electrical Panel Detail*

## OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY

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**LEAVING AIR TEMPERATURE CONTROL OPTIONS**

**Supply Air Control Strategy**

DX-DOAS and DX-HOAS units can use three unique methods to control supply air temperature. The first and simplest strategy is referred to as Supply Air Temperature Control. This method maintains a constant supply air temperature (SAT) regardless of the season and space requirements.

However, two other strategies can achieve greater energy efficiency – Zone Reset of Supply Air Temperature Control as well as Outdoor Air Reset of Supply Air Temperature Control. Both of these methods allow the design engineer to integrate the loads of the DX-DOAS and the main air handler. Because supply air temperature can be varied by the DX-DOAS, the main air handler can be downsized to save compressor and fan energy since the latent load is minimized or eliminated for this sensible cooling system.

**Supply Air Temperature Control**

In this basic mode, the unit always maintains the supply air setpoint value, regardless of the outdoor or inside room temperature. This fundamental control allows the outdoor air to be conditioned to a neutral temperature (e.g. 72°F) in all seasons. The main air handler for the space controls the actual space temperature. This strategy uses a duct-mounted discharge temperature sensor to provide a feedback signal to the PID controller and maintain a precise SAT regardless of the conditions of the entering air. The SAT on the system is maintained at  $\pm 0.2^\circ\text{F}$  DB when the compressor is running.

This method enables the DX-DOAS system to deliver neutral air while the main air handler must be sized for the zone's full load.

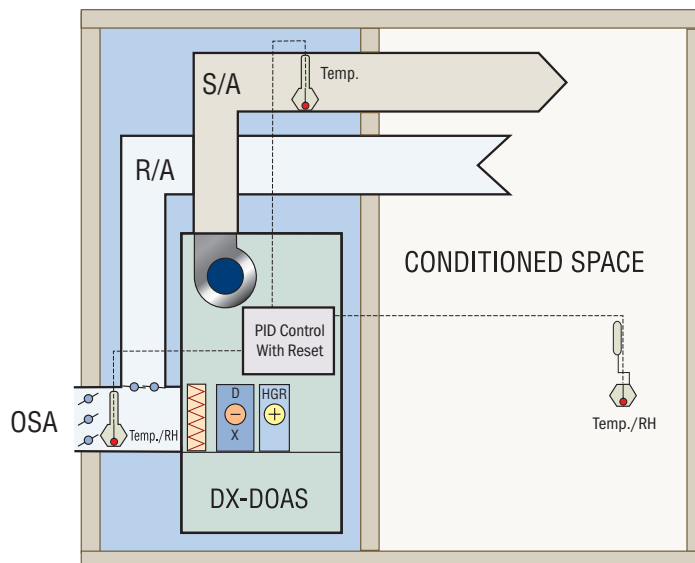


Figure 1 - Zone Reset Control Configuration

## Zone Reset of Supply Air Temperature Control

This strategy combines a wall-mounted zone sensor with a duct-mounted sensor to provide supplemental sensible heating or cooling to the conditioned space (see Figure 1). The zone sensor completes a feedback loop to the controller such that the supply air temperature setpoint is adjusted to maintain a targeted zone temperature due to changing conditions in the zone. When the system's compressors are energized, the controller will vary the amount of hot gas being rejected to the reheat coil. In the auxiliary heating mode it varies the auxiliary heating output. The controller varies the supply air temperature within a fixed range (e.g., 60° to 95° F) to maintain a room's setpoint (conditional upon system's capacity).

In this strategy, the DX-DOAS unit becomes the first stage cooling or heating system with the main air handler being the second stage. This is best applied if rooms have similar load characteristics. While a DX-DOAS primarily focuses on dehumidifying and reheating the air, the unit provides a secondary benefit in the cooling mode. Should the space temperature rise above the setpoint, the system can switch to the cooling mode and reject the resulting heat to the condenser. Because the DX-DOAS assumes a large portion of the cooling load, the size of the main air handler can be reduced proportionally to provide second stage cooling.

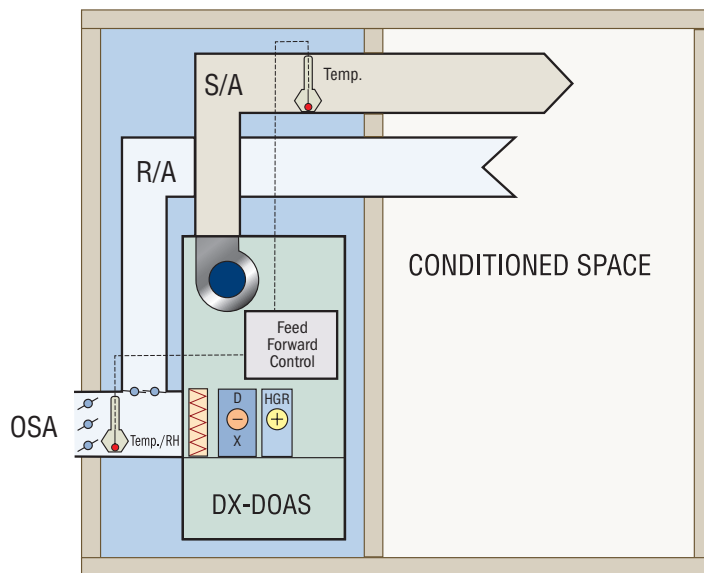


Figure 2 - Outdoor Air Reset Control Configuration


## Outdoor Air Reset

This strategy uses feed-forward logic in that the controller resets SAT based on the outdoor air temperature. (See Figure 2.) As outdoor air becomes warmer and more humid, the DX-DOAS will identify that the space needs cooling and thus lower the SAT of the system. If the outdoor air turns cooler, it will reset the SAT to a warmer temperature. Four temperature ranges are established. All reset setpoints are adjustable between 60° and 95° F, but cannot overlap.

## OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY

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## HEAT PUMP AUXILIARY HEATING OPTION

### Q-PUMP™ PROVIDES HIGHEST COP

#### Q-PUMP™ - 100% OUTDOOR AIR SYSTEM

Desert Aire's Q-Pump™ system (protected by patent #6,666,040 and an additional patent applied) uses a four-element refrigeration system to overcome the typical problems of a two-element reverse cycle system, including:

1. Reduced efficiency and performance.
2. High cost of oversized refrigeration valves.
3. Potential for liquid slugging and need for accumulators.
4. Refrigerant suddenly flashing into vapor, violently expanding and damaging pipes.

Desert Aire's Q-Pump™ dehumidifier uses a unique method of heating 100% outdoor winter air without the need for a separate auxiliary heat source such as a gas furnace. The system utilizes an Electronic Expansion Valve (EXV) to insure the best performance and operation at low outside air temperatures while reducing the set-up time. At typical airflows for DOAS, our basic system is effective down to 0°F winter design temperature.

The key difference between Desert Aire's Q-Pump™ option and prior solutions is the use of two independent water condensers. One acts as the true condenser for the balance of the total heat of rejection (THR) of the system and the other is the evaporator in the reverse cycle heating mode.

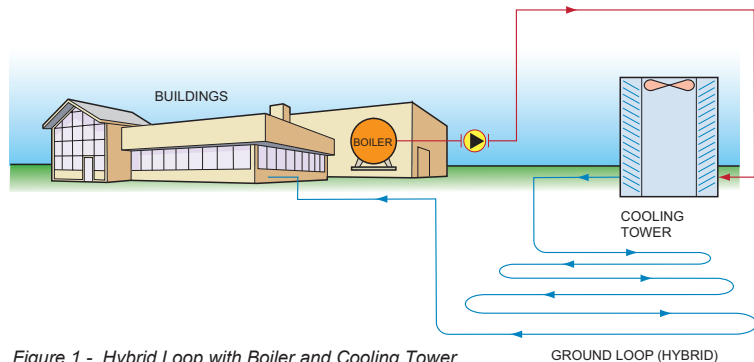


Figure 1 - Hybrid Loop with Boiler and Cooling Tower

The Q-Pump™ is easily incorporated into Desert Aire's VerticalAire™ systems by adding one water exchanger. The hot gas reheat coil typically rejects 75% of the THR. The remaining energy is rejected to the water condenser which raises the ground source water loop by 2.5° to 3°F. This added energy to the water loop increases the system's efficiency. In the summer mode the water evaporator is inactive and removed from the refrigeration loop by a solenoid valve. In the winter, the air evaporator coil is inactive and the water evaporator will pull energy from the slightly heated ground water loop. The evaporator reduces the water temperature by 5° to 6°F. Figures 7 and 8 provide a detailed schematic of our Q-Pump™ system and also show how it functions in the summer and winter modes.

A second unique feature to Desert Aire's Q-Pump™ is its sophisticated control logic that automatically adjusts the systems condensing temperature to allow the system to have enough heat on cold winter days to meet the desired leaving air temperatures. Without enthalpy wheels, conventional heat pumps turn off at entering temperatures below 40°F and must utilize auxiliary heating devices to heat the air. During this operating period, these devices have COP's less than 1.0. Desert Aire's Q-Pump™ uses the following sequence to eliminate this problem:

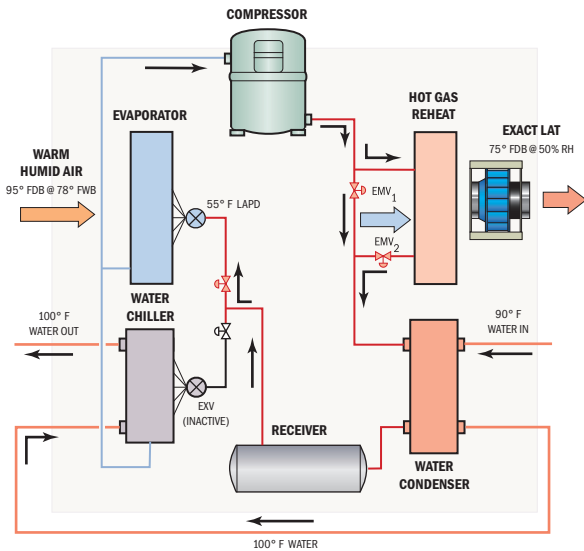


Figure 2 - Q-Pump Schematic with LAT Control: Cooling Mode

- First stage is to adjust the Electronic Modulating Valves (EMV<sub>1</sub> and EMV<sub>2</sub>) valves to regulate the amount of hot gas to the hot gas reheat coil. This controls the air temperature while keeping power consumption low. COP for this mode will generally fall between 3.5 and 4.0.
- Second stage is to adjust the EMV<sub>2</sub> to regulate the systems condensing temperature. Raising the condensing temperature increases the heating capacity of the system, but this increases the electrical energy consumed so at the coldest entering air temperature (e.g. 0°F), the COP would be reduced slightly to approximately 3.0.

## CONCLUSION

If feasible, the installation of a heat pump into an HVAC application provides many advantages. First and foremost, this type of system provides such an efficient exchange of energy that a facility can expect an average of 50% savings in heating and cooling bills with respect to the 100% outside air dehumidifier.

While the concept of a heat pump is simple, the application requires precise, flawless engineering. Because Desert Aire's VerticalAire™ dehumidifiers are specifically designed for energy recovery, a Q-Pump™ can be easily incorporated into the system. Desert Aire's Q-Pump™ provides these unique benefits:

- Lowest operating cost by utilizing dedicated evaporators for the dehumidification and heat extraction
- Control of heating set-points at the lowest entering air conditions
- Automatic adjustment of system set-up using electronic expansion valve

Contact your local Desert Aire representative if you would like more information or assistance about incorporating a VerticalAire™ dehumidifier and heat pump into your HVAC system.

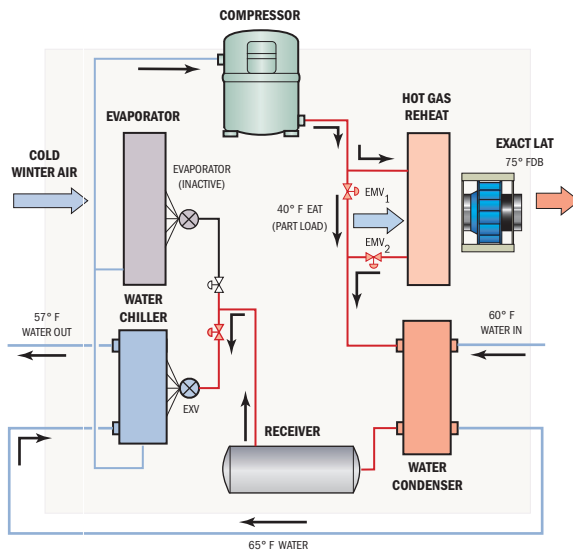


Figure 3 - Q-Pump Schematic with LAT Control: Heating Mode

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## AUXILIARY ELECTRIC HEAT

### OPTIONAL AUXILIARY ELECTRIC HEATING OPTIONS

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

These heating elements are utilized when the outside air temperature for a DOAS unit or mixed air temperature for a HOAS unit drops below the low economizer set point. The heaters are not allowed to operate when the unit is in the cooling or dehumidification mode.

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 an exact leaving air 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 VerticalAire™ 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 NEC, UL and CSA

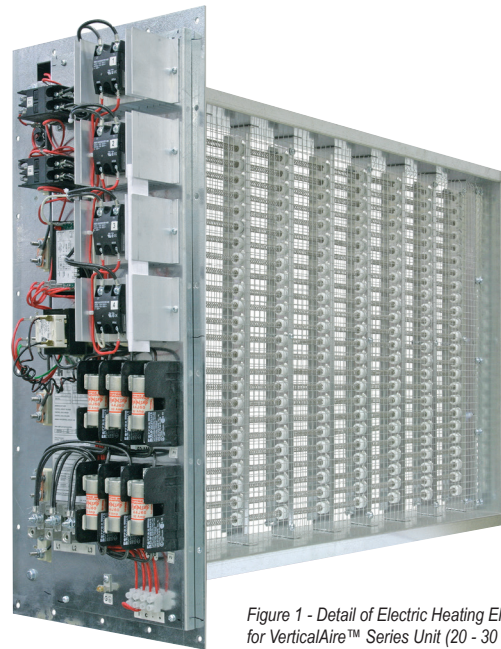


Figure 1 - Detail of Electric Heating Element for VerticalAire™ Series Unit (20 - 30 tons)

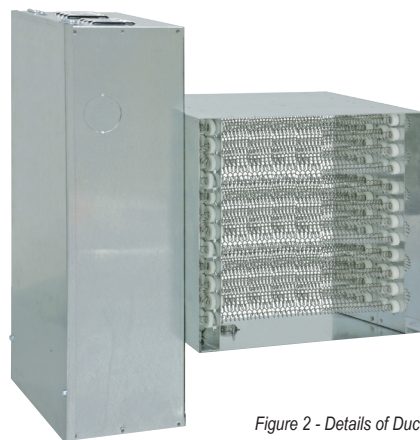


Figure 2 - Details of Duct Heater (3 - 15 tons)

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**DEMAND CONTROL OPTIONS SAVE ENERGY**

**High Outdoor Air Systems (HOAS)**

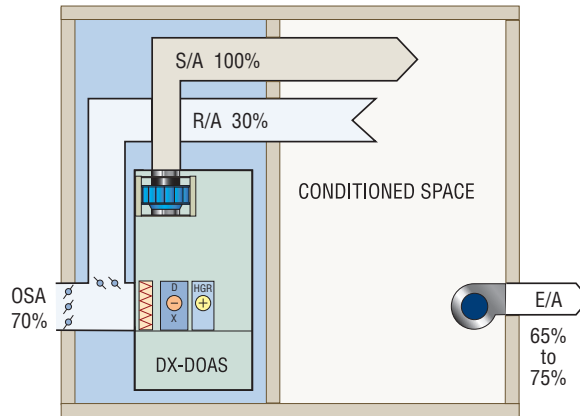


Figure 1 - High Outdoor Air System schematic with 70% outside air

There are many applications that require a single air handler to function as both the outside air source in addition to its function of providing the appropriate sensible cooling and heating. This occurs in many renovation projects that are attempting to bring a building up to the current recommended ASHRAE 62.1 ventilation code but do not have room for a dedicated outside air system and a conventional unitary device. This requires outside air volumes as a percentage of supply air volume greater than 50%. The HOAS system during occupied times provides the desired volume of code ventilation with the remainder of the supply air requirements being

made up with recirculated air from the zone. The system must be designed to remove the outdoor air's moisture, but also incorporate a specialized sequence of operation to provide heating and cooling to the space. Most conventional unitary equipment cannot handle outside air volumes above 30% and specialty equipment such as the VerticalAire™ Series are required. In addition, the building must have an exhaust air system that is balanced with the volume of outside air to provide the desired pressurization in the space.

**Night Setback Strategy**

During the unoccupied mode, the basic night setback strategy is to close the outdoor air damper and turn off the blower to save energy. However, in some humid environments, there is still a high infiltration rate of moist outdoor air into buildings during unoccupied times creating excessive humidity levels.

In these instances, it is desirable to add a recirculation damper to the system and turn on the blower and compressors to remove the unwanted moisture during unoccupied times. This capability is available on Desert Aire's VerticalAire™ series by adding the following components to the system:

- Supply EC fan (standard feature)
- Night setback additional components:
  - Outside air damper and actuator
  - Recirculation air damper and actuator
  - Field installed zone temperature and relative humidity sensor package

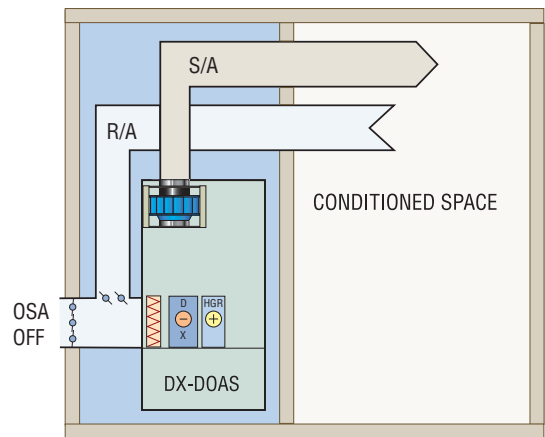


Figure 2 - Diagram of a VerticalAire™ Series unit in night setback mode

The Zone Reset of Supply Air Temperature Control package must be ordered to receive the zone sensors.

## CO<sub>2</sub> Control Strategy

As engineers continue to meet ASHRAE 62 ventilation code air flow rates, they also are trying to minimize energy costs where ASHRAE 90.1, LEED programs, GSA P100, or other codes and standards are required. Using additional sophistication in the controls can be an excellent way to minimize energy cost while maintaining proper indoor air quality and building pressurization.

The Ventilation Rate procedure of ASHRAE 62 is a prescriptive procedure that indicates the outdoor air intake flow rate based on the level and type of occupancy as well as the floor area. The Ventilation Rate procedure allows for a dynamic reset of the outdoor air intake flow as operating conditions change. Although the floor area in any building is fixed, the level and type of occupancy may change from day to day or even throughout a single day.

One of the most effective methods of dynamically changing the flow rate based on occupancy is the utilization of CO<sub>2</sub> sensors. Although expected concentrations of CO<sub>2</sub> are not considered a direct contaminant, it is an excellent measurable “tracer gas” that indicates the number of occupants present and their activity level. CO<sub>2</sub> sensors are also relatively inexpensive and durable devices.

This non-wheeled system has been designed to save energy by introducing outside air at a rate that addresses the occupancy level of the zone based on the CO<sub>2</sub> level in the zone which is measured and calculated by the building management system. The addition of two CO<sub>2</sub> sensors and variable frequency drives work together to maintain constant total system air flow by recirculating zone air and introducing varying outdoor air flow rates. The BMS provides a signal that represents 0 to 100% OSA damper opening. The minimum outside air setting value for occupied times is determined by the test and balance commissioning contractor and is provided to the controls contractor for entry into the BMS.

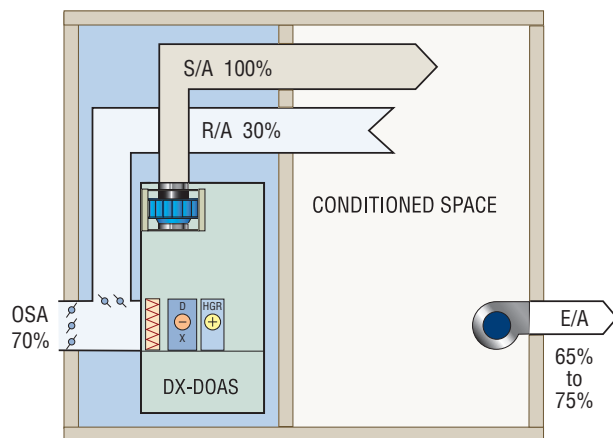


Figure 3 - DOAS CO<sub>2</sub> Control

When a change in CO<sub>2</sub> is sensed due to occupants entering or exiting the breathing zone, the outdoor air dampers account for this change in occupancy. The outdoor air flow rate will vary between the minimum flow rate programmed and 100% outdoor air as needed, always optimizing the indoor air quality and energy use. The return air is used to maintain the supply air flow rate while the outdoor air flow rate varies. The constant supply air flow rate ensures that the duct system operates as intended. It also ensures that diffusers are able to deliver ventilation air at the correct velocity so that it reaches the breathing zone at all times as required by ASHRAE 62.1.

Several components are added to maintain a constant supply air volume. The exhaust air fan (supplied by others) is controlled by the BMS in order to maintain building pressurization. The DOAS includes the following components:

- Supply EC fan (standard feature)
- Night setback components:
  - Outside air damper and actuator
  - Recirculation air damper and actuator
  - Field installed CO<sub>2</sub> sensor package

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## AUXILIARY HOT WATER HEAT

### OPTIONAL HOT WATER HEATING OPTIONS

Desert Aire provides auxiliary heating options for its VerticalAire™ Series product line that are sized to meet the winter heating requirements of the outside air.

These heating elements are utilized when the outside air temperature for a DOAS unit or mixed air temperature for a HOAS unit drops below the low economizer set point. The heaters are not allowed to operate when the unit is in the cooling or dehumidification mode. 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
- MBH capacity desired
- Entering air temperature (EAT), winter design for your area
- Leaving air temperature (LAT), typically neutral to a maximum of 100°F
- GPM flow rate desired
- If there are fluid pressure drop restrictions to be aware of
- Type and concentration of glycol used

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°F with an auto reset switch. If engaged the unit controls would respond by closing the outdoor air damper, open the return air damper (if applicable), 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.

Optional coil coating for sea coast construction is available.

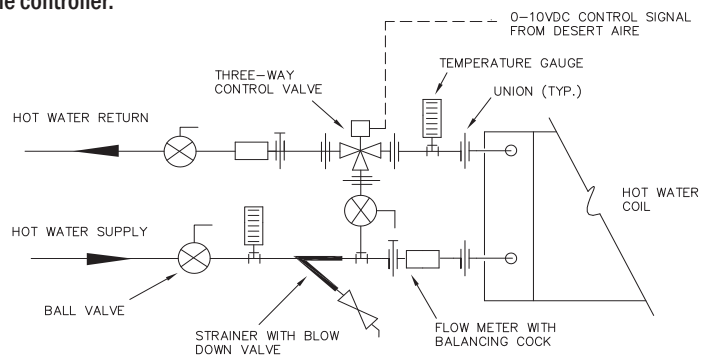


Figure 1 - Hot Water Piping Detail

### OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY

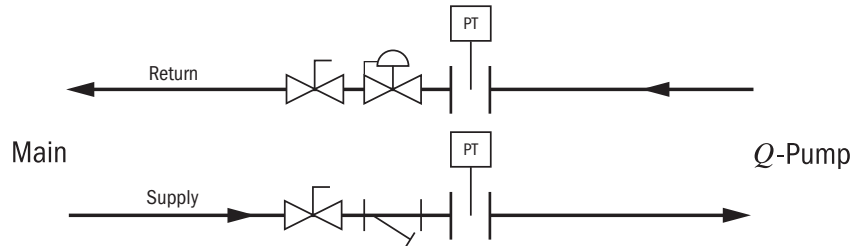
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## BASIC FLOW CONTROL PACKAGE



### Package Components

- Y-Ball Strainer (20 Mesh)
- Automatic balancing control valve
- Blowdown valve
- PT plugs on inlet /outlet

Maintaining proper, constant flow through water-source heat pump equipment optimizes efficiency and capacity. In today's larger, dynamic loops that include many valves, branches, and variable speed pumps, maintaining this constant flow can be challenging. A simple ball valve or circuit setter may not be sufficient to regulate the flow in these situations. The result may be lower efficiency, nuisance alarm trips, or even possible long-term equipment damage.

Desert Aire has selected Hays Fluid Controls as its partner for its flow regulation control package vendor because of the importance of maintaining precise flow through our *Q*-Pump. These flow control packages dynamically regulate water flow during changing conditions to allow the heat pumps to achieve the highest energy efficiency in both heating and cooling while eliminating the nuisance alarms so typical of unregulated loop piping systems.

The Hays Mesurflo™ flow regulation valve provides a constant flow rate over a wide range of pressure differentials (2 to 80 psid). As the pressure drop increases, the rubber diaphragm will flex into the contoured orifice plate to decrease the flow path. Both the rubber diaphragm and the contoured orifice plate are rigidly controlled to provide a constant flow rate. The "flexing" action of the rubber diaphragm against the fixed orifice plate makes the Mesurflo™ difficult to clog and resistant to cavitation damage.

The Hays Mesurflo™ is a constant flow rate device. Since it is a variable orifice that changes to govern the flow, it cannot be described with the  $C_v$  or a pressure drop at a given flow for piping systems design purposes. The designer may assume a constant flow rate over the differential pressure.

The control packages simplify the selection and installation of the piping system. Each component in the package has been predefined to work with the corresponding Desert Aire system. All of the recommended accessories for typical loops are included in the package. The packages for models QV04 to 15 further reduces installation time by including a flexible hose with NPT unit connections. The control package and equipping the unit with optional NPT connections allows for quick, leak-free connections, vibration isolation, and fewer issues with misalignment.

## Standard Features of Package

- Operating range 32°F to 225°F
- ± 10% flow accuracy
- Valve body suitable for 400 psig
- Pipe Type
  - 15 ton and less – 24 inch Flexible Hose Kits provided by Desert Aire
  - 20 ton and larger – Hard pipe provided by others
- Extended Pressure / Temperature Ports
- Material Specifications
  - Ball – chrome plated brass
  - P/T ports – brass
  - O-rings – EPDM
  - Orifice – Polyphenylsulfone

## Package Specifications

Tons	DA Part #	GPM	Connection Size		Valve Body	Connection Type
			Main (In. FNPT)	Q-Pump (In. MNPT)		
04/05	DFQ05FN	19	1"	1"	Brass	Flex Hose
08	DFQ08FN	26	1-1/4"	1-1/4"	Gray Iron	Flex Hose
10	DFQ10FN	34	1-1/4"	1-1/4"	Gray Iron	Flex Hose
15	DFQ15FN	49	1-1/2"	1-1/2"	Gray Iron	Flex Hose

Tons	DA Part #	GPM	Connection Size		Valve Body	Connection Type
			Main (In. FNPT)	Q-Pump (In. MNPT)		
20	DFQ20PN	69	2-1/2"	2-1/2"	Ductile Iron	Hard Pipe
25	DFQ25PN	84	2-1/2"	2-1/2"	Ductile Iron	Hard Pipe
30	DFQ30PN	102	2-1/2"	2-1/2"	Ductile Iron	Hard Pipe

Q-Pump is a U. S. Registered trademark of Desert Aire Corp. and Mesurflo is a Registered trademark of Hays Fluid Controls. The automatic balancing valves are protected by U. S. Patent 6,311,712


PACKAGE SPECIFICATIONS

## OPTIMIZING SOLUTIONS THROUGH SUPERIOR DEHUMIDIFICATION TECHNOLOGY

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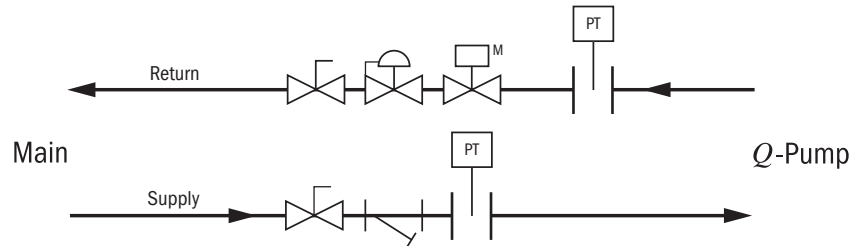
**Ph: (262) 946-7400 - www.desert-aire.com**



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## 2-WAY FLOW CONTROL PACKAGE

# 2-WAY FLOW CONTROL PACKAGE OPTION



### Package Components

- Y-Ball Strainer (20 Mesh)
- Automatic balancing control valve
- Blowdown valve
- Automatic 2-way control valve w/actuator
  - Transformer and signal from Q-Pump
- PT plugs on inlet / outlet

Maintaining proper, constant flow through water-source heat pump equipment optimizes efficiency and capacity. In today's larger, dynamic loops that include many valves, branches, and variable speed pumps, maintaining this constant flow can be challenging. A simple ball valve or circuit setter may not be sufficient to regulate the flow in these situations. The result may be lower efficiency, nuisance alarm trips, or even possible long-term equipment damage.

Desert Aire has selected Hays Fluid Controls as its partner for its flow regulation control package vendor because of the importance of maintaining precise flow through our Q-Pump. These flow control packages dynamically regulate water flow during changing conditions to allow the heat pumps to achieve the highest energy efficiency in both heating and cooling while eliminating the nuisance alarms so typical of unregulated loop piping systems.

The Hays Mesurflo™ flow regulation valve provides a constant flow rate over a wide range of pressure differentials (2 to 80 psid). As the pressure drop increases, the rubber diaphragm will flex into the contoured orifice plate to decrease the flow path. Both the rubber diaphragm and the contoured orifice plate are rigidly controlled to provide a constant flow rate. The "flexing" action of the rubber diaphragm against the fixed orifice plate makes the Mesurflo™ difficult to clog and resistant to cavitation damage.

The Hays Mesurflo™ is a constant flow rate device. Since it is a variable orifice that changes to govern the flow, it cannot be described with the Cv or a pressure drop at a given flow for piping systems design purposes. The designer may assume a constant flow rate over the differential pressure.

The two way flow package includes an integral actuator to terminate the flow to the Q-Pump™ when the DOAS system is commanded to the unoccupied mode for those water loops with variable speed drives on the water pumps.

The control packages simplify the selection and installation of the piping system. Each component in the package has been predefined to work with the corresponding Desert Aire system. All of the recommended accessories for typical loops are included in the package. The packages for models QV 04 to 15 further reduces installation time by including a flexible hose with NPT unit connections. The control package and equipping the unit with optional NPT connections allows for quick, leak-free connections, vibration isolation, and fewer issues with misalignment.

## Standard Features of Package

- Operating range 32°F to 225°F
- ± 10% flow accuracy
- Valve body suitable for 400 psig
- Pipe Type
  - 15 ton and less – 24 inch flexible hose kits provided by Desert Aire
  - 20 ton and larger – Hard pipe provided by others
- Extended Pressure / Temperature Ports
- Material Specifications
  - Ball – chrome plated brass
  - P/T ports – brass
  - O-rings – EPDM
  - Orifice – Polyphenylsulfone
- Actuator
  - 24VAC
  - 2 position
  - Manual operating lever / position indicator
  - Location - NEMA 2. IEC IP31

## Package Specifications

Tons	DA Part #	GPM	Connection Size		Valve Body	Connection Type
			Main (In. FNPT)	Q-Pump (In. MNPT)		
04/05	DFQ05FD	19	1"	1"	Brass	Flex Hose
08	DFQ08FD	26	1-1/4"	1-1/4"	Gray Iron	Flex Hose
10	DFQ10FD	34	1-1/4"	1-1/4"	Gray Iron	Flex Hose
15	DFQ15FD	49	1-1/2"	1-1/2"	Gray Iron	Flex Hose

Tons	DA Part #	GPM	Connection Size		Valve Body	Connection Type
			Main (In. FNPT)	Q-Pump (In. MNPT)		
20	DFQ20PD	69	2-1/2"	2-1/2"	Ductile Iron	Hard Pipe
25	DFQ25PD	84	2-1/2"	2-1/2"	Ductile Iron	Hard Pipe
30	DFQ30PD	102	2-1/2"	2-1/2"	Ductile Iron	Hard Pipe

Q-Pump is a U. S. Registered trademark of Desert Aire Corp. and Mesurflo is a Registered trademark of Hays Fluid Controls. The automatic balancing valves are protected by U. S. Patent 6,311,712

PACKAGE SPECIFICATIONS

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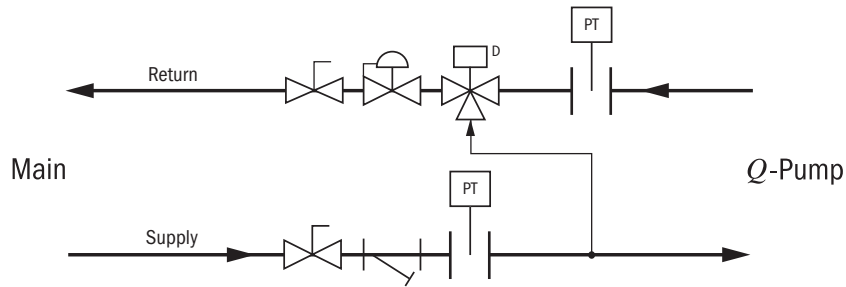


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## 3-WAY FLOW CONTROL PACKAGE

# 3-WAY FLOW CONTROL PACKAGE OPTION



### Package Components

- Y-Ball Strainer (20 Mesh)
- Automatic balancing control valve
- Blowdown valve
- Automatic 3-way control valve w/ actuator
  - Transformer and signal from Q-Pump
- PT plugs on inlet / outlet

Maintaining proper, constant flow through water-source heat pump equipment optimizes efficiency and capacity. In today's larger, dynamic loops that include many valves, branches, and variable speed pumps, maintaining this constant flow can be challenging. A simple ball valve or circuit setter may not be sufficient to regulate the flow in these situations. The result may be lower efficiency, nuisance alarm trips, or even possible long-term equipment damage.

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The Hays Mesurflo™ flow regulation valve provides a constant flow rate over a wide range of pressure differentials (2 to 80 psid). As the pressure drop increases, the rubber diaphragm will flex into the contoured orifice plate to decrease the flow path. Both the rubber diaphragm and the contoured orifice plate are rigidly controlled to provide a constant flow rate. The "flexing" action of the rubber diaphragm against the fixed orifice plate makes the Mesurflo™ difficult to clog and resistant to cavitation damage.

The Hays Mesurflo™ is a constant flow rate device. Since it is a variable orifice that changes to govern the flow, it cannot be described with the  $C_v$  or a pressure drop at a given flow for piping systems design purposes. The designer may assume a constant flow rate over the differential pressure.

The three way flow package includes an integral actuator to terminate the flow to the Q-Pump™ when the DOAS system is commanded to the unoccupied mode for those water loops with variable speed drives on the water pumps.

The control packages simplify the selection and installation of the piping system. Each component in the package has been predefined to work with the corresponding Desert Aire system. All of the recommended accessories for typical loops are included in the package. The packages for models QV04 to 15 further reduces installation time by including a flexible hose with NPT unit connections. The control package and equipping the unit with optional NPT connections allows for quick, leak-free connections, vibration isolation, and fewer issues with misalignment.

## Standard Features of Package

- Operating range 32°F to 225°F
- ± 10% flow accuracy
- Valve body suitable for 400 psig
- Pipe Type
  - 15 ton and less – 24 inch Flexible Hose Kits for connection to the unit and 12 inch flexible bypass hose provided by Desert Aire
  - 20 ton and larger – Hard pipe provided by others
- Extended Pressure / Temperature Ports
- Material Specifications
  - Ball – chrome plated brass
  - P/T ports – brass
  - O-rings – EPDM
  - Orifice – Polyphenylsulfone
- Actuator
  - 24VAC
  - 2 position
  - Manual operating lever / position indicator
  - Location - NEMA 2. IEC IP31

## Package Specifications

Tons	DA Part #	GPM	Connection Size		Valve Body	Connection Type
			Main (In. FNPT)	Q-Pump (In. MNPT)		
04/05	DFQ05FT	19	1"	1"	Brass	Flex Hose
08	DFQ08FT	26	1-1/4"	1-1/4"	Gray Iron	Flex Hose
10	DFQ10FT	34	1-1/4"	1-1/4"	Gray Iron	Flex Hose
15	DFQ15FT	49	1-1/2"	1-1/2"	Gray Iron	Flex Hose

Tons	DA Part #	GPM	Connection Size		Valve Body	Connection Type
			Main (In. FLGT)	Q-Pump (In. FLGT)		
20	DFQ20PT	69	2-1/2"	2-1/2"	Carbon Steel	Flanged
25	DFQ25PT	84	2-1/2"	2-1/2"	Carbon Steel	Flanged
30	DFQ30PT	102	2-1/2"	2-1/2"	Carbon Steel	Flanged

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