Catalog 1117-1

SmartSource® Dedicated Outside Air Water Source Heat Pump – Model GOV – Vertical

Unit Sizes 800 – 2400 CFM

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1	2-3	4	5-7	8	9	10-11	12	13	14	15	16-17	18	19	20	21	22	23-24	25	26
W	GO	V	012	F	1	RF	B	B	K	S	00	2	0	0	0	S	75	D	D

Category	Code Option	Code Designation		Description
Product Category	**1**	W	=	Water Source Heat Pump
Model Type	**2-3**	GO	=	DOAS
Configuration	**4**	V	=	Vertical
Unit Size	**5-7**	008	=	800 CFM
		012	=	1200 CFM
		016	=	1600 CFM
		024	=	2400 CFM
Voltage	**8**	F	=	208-230/60/3
		K	=	460-60-3
Design Series (Vintage)	**9**	1	=	Revision / Design Series 1
Entering / Discharge Air	**10-11**	RF	=	Rear Entering Air / Upblast Front Discharge
Water Coil Type	**12**	B	=	Brazed Plate Heat Exchanger
Control Options	**13**	B	=	Standard Controller w/ BACnet
		L	=	Standard Controller + LON Module
Fan Motor Options	**14**	L	=	Single Blower (NA on 2400)
		K	=	Dual Blower (NA on 800)
Sound Package	**15**	B	=	Base Package
		S	=	Sound Package
Options	**16-17**	00	=	Pre-heat Ready
		HH	=	Left-Hand Hydronic Pre-heat Coil, Field Piped
Filters & Racks	18	2	=	Merv 8 in 2" Frame with Duct Flange
		4	=	Merv 13 in 4" Frame with Duct Flange
		0	=	No Filter with Duct Flange
Not Used	**19**	0	=	None
Not Used	**20**	0	=	None
Not Used	**21**	0	=	None
Standard or Special	**22**	S	=	Standard
		X	=	Special
Transformer	**23-24**	75	=	75VA Control Transformer
Corrosion Protection	**25**	0	=	None
		D	=	Corrosion Protection
Disconnect Switch	**26**	0	=	None
		D	=	Disconnect Switch

Water Source Heat Pump

Table 1: Water Source Heat Pump - Rated in Accordance with AHRI 920-2020

Unit Size	Airflow	GPM	Dehumidification Operation								
			Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
008	850	15.0	74.0	52.9	32.0	5.4	73.7	52.8	28.2	6.5	6.6
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			72.0	53.2	16.8	8.0	69.2	48.9	5.0	4.2	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COPDOAS[8]	Supply Air Dry Bulb		Heating Capacity[10]		COPDOAS[11]	
			73.0	23,500	5.1	74.0		50,300		5.8	5.1

Unit Size	Airflow	GPM	Dehumidification Operation								
			Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
012	1200	24.0	74.5	54.8	43.5	5.8	73.7	54.7	38.6	7.1	6.2
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			72.7	55.3	19.0	6.8	68.8	48.8	2.2	2.8	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COPDOAS[8]	Supply Air Dry Bulb		Heating Capacity[10]		COPDOAS[11]	
			75.0	35,500	4.0	74.0		71,600		5.4	4.1

Unit Size	Airflow	GPM	Dehumidification Operation								
			Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
016	1600	30.0	73.9	54.4	54.5	5.9	72.3	54.4	49.2	7.4	6.6
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			70.7	54.6	25.8	7.1	68.8	49.2	6.0	3.6	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COPDOAS[8]	Supply Air Dry Bulb		Heating Capacity[10]		COPDOAS[11]	
			72.0	41,800	3.8	74.0		98,900		4.9	3.9

Water Source Heat Pump (Continued)

Unit Size	Airflow	GPM	Dehumidification Operation								
024	2200	40.0	Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			73.7	56.0	69.5	4.9	71.7	56.1	62.0	6.4	5.6
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			70.6	56.7	31.6	6.7	69.2	49.4	1.0	1.0	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COP_{DOAS}[8]	Supply Air Dry Bulb		Heating Capacity[10]		COP_{DOAS}[11]	3.8
			72.0	58,100	3.7	74.0		131,300		5.1	

Notes:
1. Dehumidification Rating Point A (95/78 EAT, 86°F EWT)
2. Dehumidification Rating Point B (80/73 EAT, 81°F EWT)
3. Dehumidification Rating Point C (70/66 EAT, 74°F EWT)
4. Dehumidification Rating Point D (63/59 EAT, 67°F EWT)
5. ISMRE2 rating is in pounds of moisture per kW-h
6. MRC is in pounds of moisture per hour
7. MRE is in pounds of moisture per kW-h
8. Rating Point E conditions (47°F EAT, 68°F EWT)
9. Rating Point F conditions (17°F EAT, 68°F EWT)
10. Heating Capacity in Btu/h. Heating capacity shown is not maximum unit heating capacity.
11. COP & ISCOP2 ratings in W/W
12. MRE_{70} & $ISMRE2_{70}$ ratings are equal to MRE & ISMRE2 ratings
13. Supply Air Leaving Dry-bulb temperature is the same for Rating Points A, B, C & D
14. Ratings based on operation at 230 volt, 3 phase, 60hz power
15. Ratings are without energy recovery

Ground Source Closed Loop

Table 2: Water Source Heat Pump Ground Source Closed Loop - Rated in Accordance with AHRI 920-2020

Unit Size	Airflow	GPM	Dehumidification Operation								
008	850	15.0	Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			74.7	51.4	33.0	6.2	73.6	51.0	30.4	6.7	6.5
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			74.3	51.3	18.6	7.2	75.5	49.4	6.8	4.5	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COP_{DOAS}[8]	Supply Air Dry Bulb		Heating Capacity[10]		COP_{DOAS}[11]	
			75.0	24,400	3.7	74.0		50,100		4.1	3.7

Ground Source Closed Loop (Continued)

Unit Size	Airflow	GPM	Dehumidification Operation								
012	1200	24.0	Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			71.6	53.3	44.5	6.6	73.1	53.0	41.4	7.4	7.0
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			73.6	53.2	21.4	7.6	69.5	48.8	6.0	4.2	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COP_{DOAS}[8]	Supply Air Dry Bulb		Heating Capacity[10]		COP_{DOAS}[11]	
			74.0	33,800	3.0	73.0		71,200		3.8	3.1

Unit Size	Airflow	GPM	Dehumidification Operation								
016	1600	30.0	Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			73.1	53.8	56.5	6.7	72.0	53.8	50.2	7.9	7.1
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			70.2	54.1	27.8	7.8	69.5	49.4	6.6	3.7	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COP_{DOAS}[8]	Supply Air Dry Bulb		Heating Capacity[10]		COP_{DOAS}[11]	
			72.0	43,200	3.1	73.0		94,600		3.8	3.2

Unit Size	Airflow	GPM	Dehumidification Operation								
024	2200	40.0	Rating Point A[1]				Rating Point B[2]				ISMRE2[5]
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			73.1	54.8	74.0	5.8	72.1	54.6	66.6	6.9	6.4
			Rating Point C[3]				Rating Point D[4]				
			Supply Air Temperature		MRC[6]	MRE[7]	Supply Air Temperature		MRC[6]	MRE[7]	
			Dry-Bulb	Dew-Point			Dry-Bulb	Dew-Point			
			70.3	55.3	33.6	7.4	69.8	49.5	5.2	2.7	
			Heating Operation								
			Rating Point E[8]			Rating Point F[9]					ISCOP2[11]
			Supply Air Dry Bulb	Heating Capacity[10]	COP_{DOAS}[8]	Supply Air Dry Bulb		Heating Capacity[10]		COP_{DOAS}[11]	
			71.0	53,900	3.2	74		129,700		3.6	3.3

Notes:
1. Dehumidification Rating Point A (95/78 EAT, 77°F EWT)
2. Dehumidification Rating Point B (80/73 EAT, 77°F EWT)
3. Dehumidification Rating Point C (70/66 EAT, 68°F EWT)
4. Dehumidification Rating Point D (63/59 EAT, 68°F EWT)
5. ISMRE2 rating is in pounds of moisture per kW-h
6. MRC is in pounds of moisture per hour
7. MRE is in pounds of moisture per kW-h
8. Rating Point E conditions (47°F EAT, 41°F EWT)
9. Rating Point F conditions (17°F EAT, 32°F EWT)
10. Heating Capacity in Btu/h. Heating capacity shown is not maximum unit heating capacity.
11. COP & ISCOP2 ratings in W/W
12. MRE_{70} & $ISMRE2_{70}$ ratings are equal to MRE & ISMRE2 ratings
13. Supply Air Leaving Dry-bulb temperature is the same for Rating Points A, B, C & D
14. Ratings based on operation at 230 volt, 3 phase, 60hz power
15. Ratings are without energy recovery

Dedicated Outside Air Water Source Heat Pump – Model GOV

The Daikin SmartSource Dedicated Outside Air System (DOAS) Water Source Heat Pump (WSHP) has been specifically designed to condition ventilation airflow from a wide range of entering outdoor conditions to a tightly controlled, user defined supply air condition.

The SmartSource DOAS incorporates many new technologies to provide premium performance, achieving up to a 7.1 ISMRE2 rating, 49% higher than ASHRAE 90.1-2016 minimum efficiency, yet at a budget friendly price. Using a SmartSource DOAS unit to condition ventilation air for a WSHP system allows the space conditioning WSHPs to be downsized and optimized for the space loads. The SmartSource DOAS WSHP is also the perfect match to be used with a Daikin water-cooled VRV system.

1 Multi-stage Tandem Scroll Compressors
- Provide 8 steps of capacity control from 30%-100%

2 Modulating Hot Gas Reheat Valve
- Controls discharge air temperature to ±1°F

3 Electronic Expansion Valve
- Dynamic superheat control increases accuracy of discharge air temperature and provides stable operation.

4 Shaftless Blower with EC Motor
- Constant or Variable Air Volume with field programmable airflow levels.

5 SmartBoost Heating Technology™
- Aluminum micro-channel coil
- Dual-functioning coil provides reheat for dehumidification and capacity boost for heating

6 Brazed Plate Heat Exchanger
- Asymmetric design for low water pressure drop and higher efficiency

7 MicroTech® Controls
- Advanced DDC
- 4-line OLED digital display with key pad
- Accurate discharge air temperature and humidity control
- Standard BACnet communication
- Optional on-board trending

Multi-Stage Tandem Scroll Compressors

Standard WSHP models are typically designed for entering air temperatures ranging between 50-85°F and capacity is controlled to provide hot or cold air to satisfy a desired space temperature. In this application the exact temperature of the leaving air is not critical as long as warm air is provided during a demand for heating and cool air during a demand for cooling. Therefore, single or two-stage control is sufficient in water source heat pumps used for space conditioning. When a water source heat pump is used to supply conditioned ventilation air it is important to have the ability to accurately control to a desired supply air temperature and humidity level. Because the entering airflow is 100% outside air the water source heat pump must be designed for a much wider range of entering conditions. It must have the ability to maintain the desired supply air conditions on a hot and humid summer day, the coldest night in winter and every condition in between. To achieve this range of operation and level of control Daikin has employed multi-stage uneven tandem scroll compressors. Each tandem consists of two 2-stage compressors with offset capacity, resulting in eight steps of capacity control. In the dehumidification mode compressor capacity is controlled to ensure the supply air is below the desired maximum humidity level. If the entering air is already below the desired humidity level then compressor capacity is controlled to achieve the desired leaving air temperature.

Figure 1: Multi-Stage Tandem Scroll Compressors

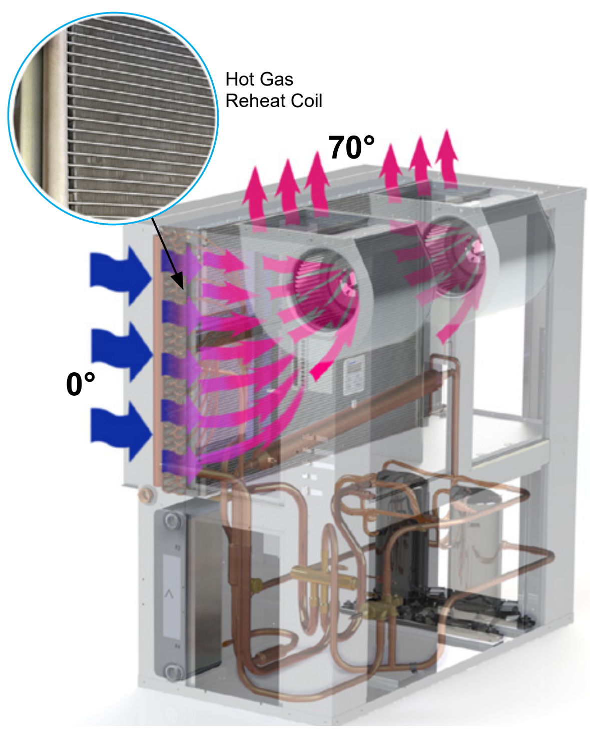
Modulating Hot Gas Reheat

The typical Dedicated Outside Air System application is to provide “neutral air” between 70-75°F and below 50% relative humidity. In the dehumidification mode the entering air must be cooled to 55°F or colder to remove moisture from the air, and then reheated to the desired supply temperature. In this mode the Daikin SmartSource DOAS water source heat pump uses a fully modulating hot gas reheat valve to achieve ±1°F supply air temperature accuracy. The modulating hot gas reheat can also be used in the cooling mode to provide precise control of supply air temperature with a minimal use of hot gas reheat.

Figure 2: Modulating Hot Gas Reheat Valve

SmartBoost Heating Technology™

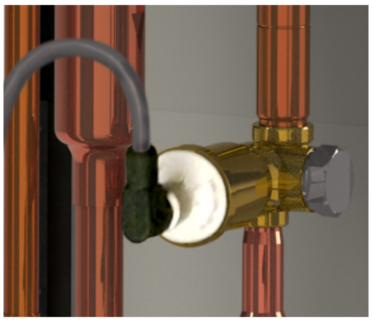
Hot gas reheat coils are commonly used exclusively for reheat during a dehumidification mode but are inactive in the basic cooling or heating modes. Daikin’s patent pending SmartBoost Heat Technology uses the hot gas reheat coil in the heating mode to boost capacity and efficiency. Using the hot gas reheat coil in addition to the unit’s primary direct expansion coil is what allows the SmartSource DOAS to heat entering air as low as 0°F without the use of pre-heat, and achieve heating efficiencies as high as 5.1 ISCOP2 per AHRI 920-2020.



Electronic Expansion Valve

The SmartSource DOAS water source heat pump uses an electronic expansion valve to provide accurate control of superheat and deliver very stable system operation. The MicroTech controls monitor compressor suction temperature and compressor suction pressure to control suction superheat to within ±1°F of set point. The target superheat is dynamically adjusted in conjunction with compressor staging to accurately meet the user defined discharge air temperature.

Figure 3: Electronic Expansion Valve



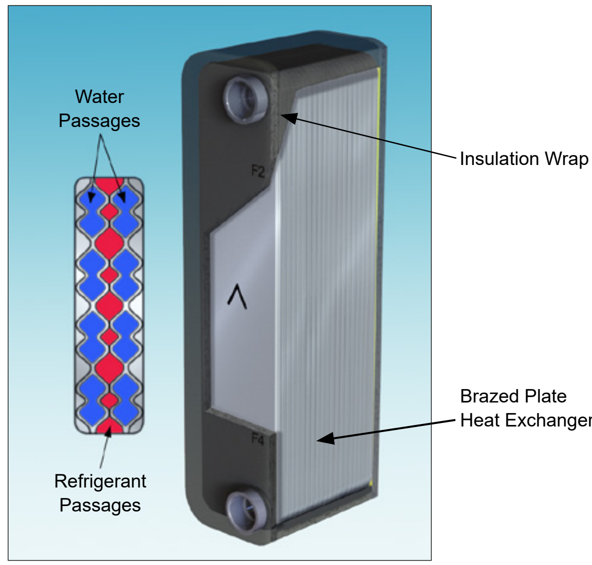
Shaftless Fan System with ECM

The SmartSource DOAS water source heat pump uses the latest new fan technology, a forward-curved blower with integral electronically commutated motor (ECM). With this fan system the motor acts as the hub for the blower wheel. With unrestricted airflow entering both sides of the blower, less power is required to deliver the desired airflow performance. With this motor technology the SmartSource DOAS can be applied for constant volume or variable volume applications. Design airflow can be selected from 70% to 200% of nominal airflow, and external static pressure of 2.0" or higher can be achieved at nominal unit airflow.

Figure 4: Shaftless EC Motor System

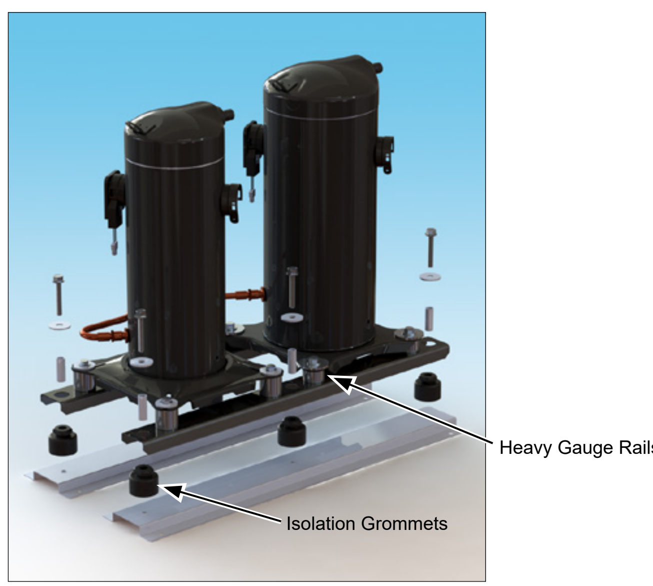
Brazed Plate Heat Exchanger

The SmartSource DOAS water source heat pump uses a Brazed Plate Heat Exchanger (BPHE) with an asymmetric plate design to efficiently transfer energy between the refrigerant and fluid loop. With this asymmetric design the water passages are significantly larger than the refrigerant passages, resulting in a lower water pressure drop and reduced susceptibility to fouling. Field water connections are made directly to the brazed plate heat exchanger, eliminating possible water leaks at internal piping joints.



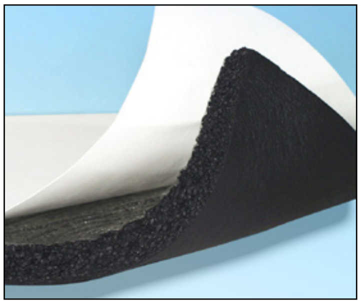
Designed-in Sound Reduction

Each compressor tandem is mounted to heavy gauge support rails. The support rails are then isolated from the unit cabinet using rubber isolation grommets.



Cabinet Insulation

Closed-cell non-fibrous insulation is standard on the SmartSource DOAS water source heat pump. The insulation meets NFPA 90A/90B requirements and has a flame spread of less than 25 and a smoke developed classification of less than 50 per ASTM E-84. All air-side insulation shall confirm to mold growth limits in accordance with UL-181 fungi resistance per ASTM G21 or ASTM C 1338, and bacterial resistance per ASTM G22.



Closed Cell Foam Insulation

Discharge and Entering Air Fold Out Duct Collars

The standard unit discharge and entering air duct collars are perforated and easily fold out for duct connection. This design helps to prevent damage during shipping and handling.

Discharge Collars

Entering Air Duct Collars

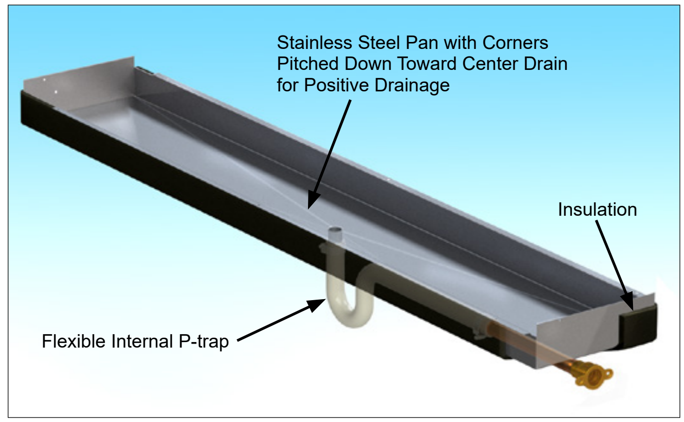
Air-to-Refrigerant Coils

The primary air-to-refrigerant heat exchanger has copper tubes and aluminum fins. The fins are lanced and mechanically bonded to the tubes using finned edges on the inside which expand during assembly to enhance heat transfer capabilities. The copper tube/aluminum fin coil design is optimal for providing efficient performance in both heating and cooling. The hot gas reheat coil is an all aluminum micro-channel coil. Micro-channel coils provide optimal performance when used as a condenser in the hot gas reheat or heating modes. The coils can be coated with an optional inorganic, silicon-based nano-ceramic coating. This coating has a 3,000 hour salt spray rating per ASTM B-117.

Stainless Steel Drain Pan

The condensate drain pan is constructed of corrosion-resistant stainless steel. It is a cross break design and conforms to the requirements of ASHRAE 62.1 for drain pan design. The entire bottom of the drain pan is covered with 1/8" insulated foam that helps reduce sweating. The drain pan includes an electronic condensate overflow protection sensor, more reliable than a mechanical float switch used with many competitor pans. The condensate drain is internally trapped.

Figure 5: Stainless Steel Drain Pan



Factory Options

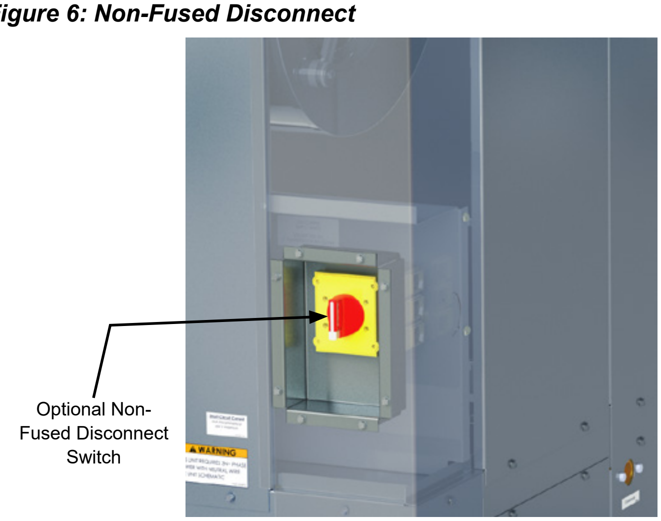
Sound Package

Sound attenuating compressor blankets are available.

Non-Fused Disconnect

DOAS units are available with an optional non-fused disconnect, located on the controls side corner post. The disconnect switch is used to break power to the unit for ease of field service and is provided with a lockout/ tag out feature.

Figure 6: Non-Fused Disconnect



Filters & Filter Racks

Units come standard with a 2" thick factory-installed MERV 8 filter, mounted in a 4-sided low-leak filter rack. An optional 4" deep filter rack that accepts a MERV 13 filter is available. The filter rack has perforations that easily fold out to form a entering air duct collar. These low leak racks include gaskets between the filter rack and cabinet that prevent ambient air from being drawn into the unit. The 4-sided filter rack includes a removable access panel to facilitate filter change-out.

The unit may also be selected with a duct flange without a filter rack for applications using external filters and/or connection to a field supplied energy recovery ventilator.

Figure 7: Optional 2-inch, Low Leak Filter Rack

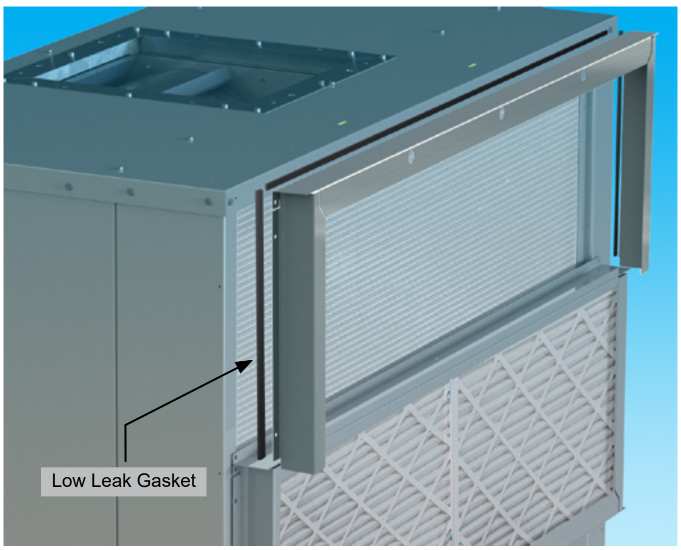
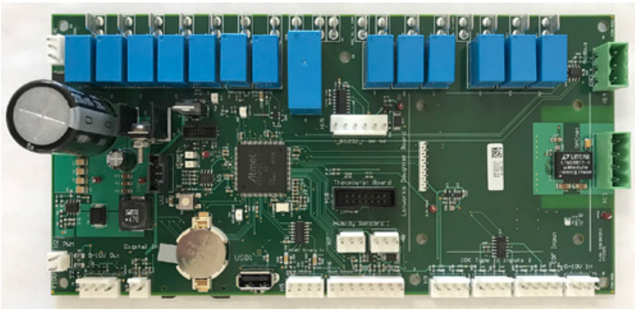


Figure 8: Optional 4-inch, Low Leak Filter Rack

Hydronic Pre-Heat Coil

For applications where the minimum design entering air temperature will be below the minimum allowable entering air temperature of the selected unit, a 4-row hot water heating coil can be factory installed. The coil is field piped to a hot water supply loop that is sufficiently protected against freezing with a glycol mixture. To temper the desired supply air temperature the MicroTech controller modulates a field provided control valve when the unit has reached maximum heating capacity.

MicroTech® Unit Controller



The MicroTech Controller is a microprocessor-based controller designed by Daikin to provide sophisticated control of the SmartSource DOAS water source heat pump. The controller monitors the safety devices to protect the unit from unsafe operating conditions, controls the expansion valve, reversing valve, hot gas reheat valve, compressor staging and fan operation for efficient unit operation. This controller also protects against freezing of the water to refrigerant and air to refrigerant heat exchanger as well as condensate overflow.

Safety controls included as standard:

- High pressure switch located in the refrigerant discharge line
- Loss of charge pressure switch
- Air coil freeze protection is provided by monitoring the air temperature leaving the coil as well as the refrigerant suction temperature
- Three-phase line voltage monitoring
- Water freeze protection is provided by monitoring suction gas temperature
- High duct pressure limit (VAV applications only)
- Compressor oil level protection will be provided through periodic boost mode events
- Condensate overflow protection sensor is factory mounted in the drain pan of the unit

The controller is accessible within the electrical control box through the upper-front access panel.

For additional information on the MicroTech controller, see OM 1308.

Local User Interface

The Local User Interface (LUI) touch pad with digital LED display is located on the front panels of the unit. The LUI features a 4 x 20 OLED digital display, 6 keys, and 2 individual LED indicators. In addition to the operating mode states and fan functions, the touch pad will digitally display:

- The supply air temperature & dew point set points
- The current supply air temperature and dew point
- The current airflow volume
- Any fault code for quick diagnostics at the unit

Controls Integration

The Daikin in SmartSource DOAS MicroTech controller comes with standard BACnet MS/TP communication capability that is designed to communicate over a BACnet MS/TP communications network to a building automation system (BAS). The unit controller is programmed and tested with all the logic required to monitor and control the unit. The controller makes operational data and commands available on a communications network using BACnet objects and properties:

The network cable is a shielded twisted-pair cable

- Network communications run up to 76.8 Kbps
- Software settings on the controller enable the MS/TP MAC address to be set in the range 0-127
- Two green LEDs on the controller indicate communication activity on the controller network

Modes of Operation

Dehumidification Mode

In the Dehumidification Mode the unit will control to both a humidity and temperature control set point. Compressor staging will be controlled so that the air temperature leaving the primary DX coil will be below the leaving coil dew-point set point. The hot gas reheat capacity will be modulated to achieve the discharge air temperature set point to an accuracy of ±1°F. See "Psychrometric Chart – Modes of Operation" on page 15.

Cooling Mode

Precision Cooling

In the Precision Cooling Mode compressor staging will be controlled to ensure the air temperature leaving the primary coil is below the discharge air set point. The modulating hot gas reheat will then be used to achieve the discharge air temperature set point to an accuracy of ±1°F. See "Psychrometric Chart – Modes of Operation" on page 15.

Economy Cooling

In the Economy Cooling Mode compressor staging will be controlled to achieve the discharge air temperature set point. The accuracy of control will be dependent on airflow volume and entering air conditions.

Heating Mode

In the Heating Mode compressor staging will be controlled to achieve the discharge air temperature set point. The Microtech controls also dynamically modulate the EEV and hot gas reheat valve to achieve an accuracy of +/-1°F under steady state conditions.

Fan Only Mode

In the Fan Only Mode the compressors will be disabled.

Mode Selection

When set for automatic control the MicroTech controller will select the appropriate mode based on the temperature and humidity of the entering air versus the user defined supply air temperature and humidity set points per the table below.

Humidity	Temperature	Mode
OADP > DPSP	OAT > 55°F	Dehumidification[1]
OADP < DPSP	OAT > CLSP	Cooling[1]
OADP < DPSP[1]	OAT < HTSP	Heating
OADP < DPSP	HTSP < OAT < CLSP	Fan Only

[1] When OAT is 55°F or lower the OADP is ignored, dehumidification and cooling modes are disabled and the heating mode is given priority.

- OADP = Outside Air Dew Point

- DPSP = Dew Point Set Point (Default = 55°F, Min = 45°F, Max = 60°F)

- OAT = Outside Air Temperature

- CLSP = Outside Air Temperature Cooling Mode Set Point (Default = 75°F, Min = 70°F, Max = 80°F)

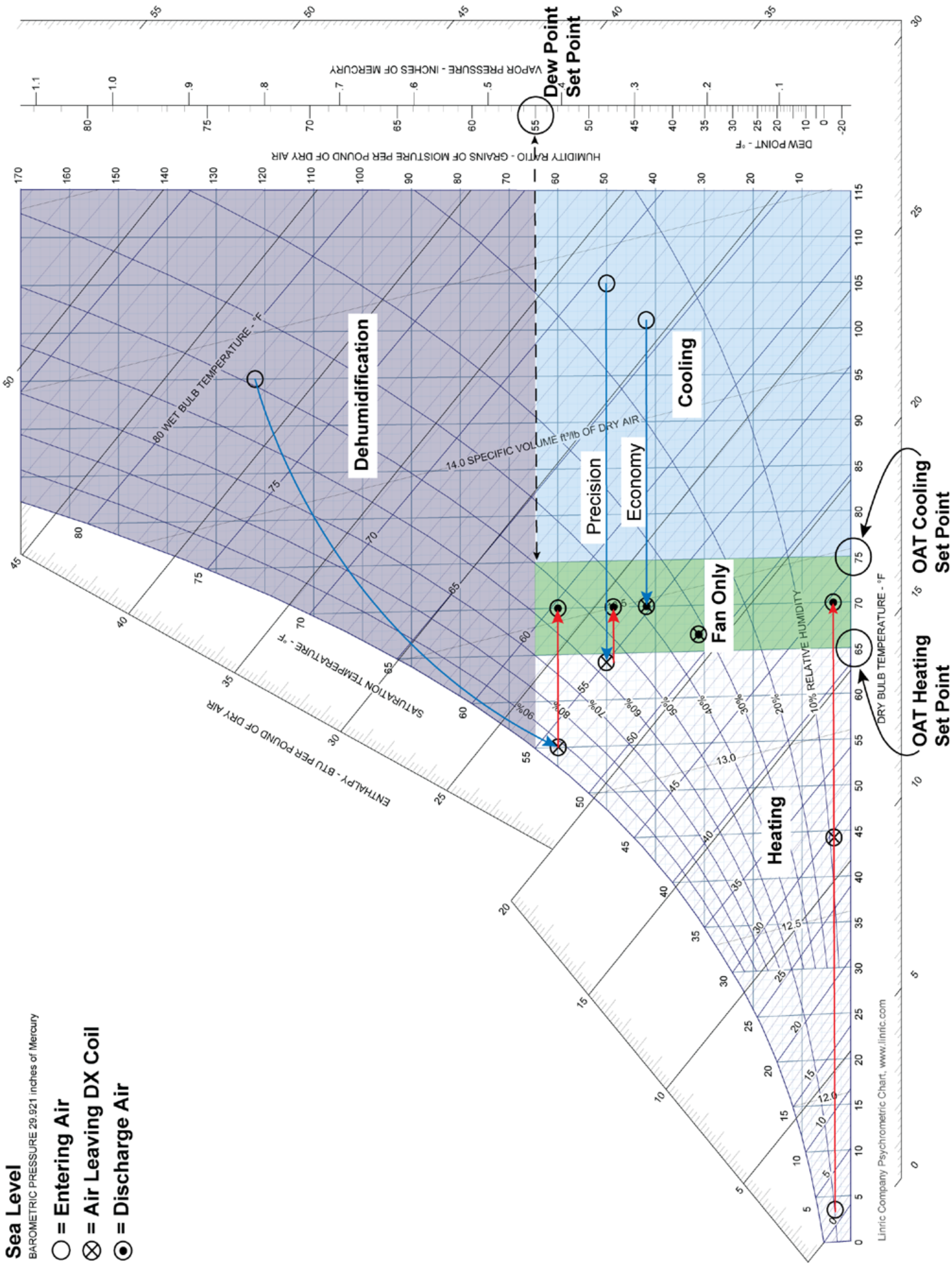
- HTSP = Outside Air Temperature Heating Mode Set Point (Default = 65°F, Min = 55°F, Max = 70°F)

- ○ *Min CLSP-HTSP delta = 5°F, Max CLSP-HTSP delta = 25°F*

Supply Air Temperature Reset

In the dehumidification, cooling or heating modes the effective supply air temperature control point can be reset in response to outdoor air temperature, space temperature or external input. Reset can be independently enabled for dehumidification, cooling or heating modes. The reset function for each mode can be programmed with different minimum/maximum discharge air setpoints and reset range setpoints. With this function the temperature of the ventilation airflow can be lowered to partially offset the sensible cooling load on the space conditioning units.

Psychrometric Chart – Modes of Operation



Fan Operation

Constant Airflow Volume

The MicroTech controller will adjust the fan speed to maintain the user defined supply air volume. The minimum and maximum airflow volume set points are shown in Table 3.

Variable Airflow Volume

In a Variable Airflow Volume (VAV) application the MicroTech controller will vary the unit airflow between user defined maximum and minimum set points based on one of the five methods listed below. The maximum and minimum airflow values must be within the range shown in Table 3.

Table 3: Unit Airflow Range

	Size 008	Size 012	Size 016	Size 024
Maximum Airflow	1600	2000	2400	4000
Minimum Airflow	600	850	1150	1800

Duct Static Pressure

The MicroTech controller will attempt to maintain a fixed supply duct static pressure by modulating unit airflow. This mode can be used with a distributed demand control ventilation system where the supply of ventilation airflow to individual zones or space conditioning units is controlled by a damper responding to space Indoor Air Quality (IAQ) or unit operation.

Building Static Pressure

The MicroTech controller will attempt to maintain a fixed building static pressure by modulating unit airflow. This mode of operation can be used when the space served by the SmartSource DOAS unit may have exhaust devices that operate intermittently.

CO_2 Sensor Reset

The MicroTech controller will modulate unit airflow in response to a space-mounted CO_2 sensor. This option should only be used when the SmartSource DOAS unit is providing ventilation airflow to a single occupied space.

Note: *Duct Static, Building Static or CO_2 control requires the installation of optional sensors.*

0-10vdc External Analog Input

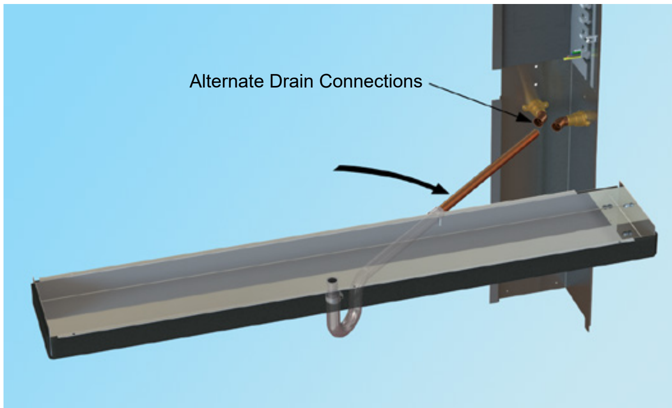
The MicroTech controller will modulate unit airflow in response to a 0-10vdc analog input signal from a field supplied device. The unit airflow will vary linearly between the VAV minimum set point at 0 vdc signal to the VAV maximum set point at a 10 vdc signal.

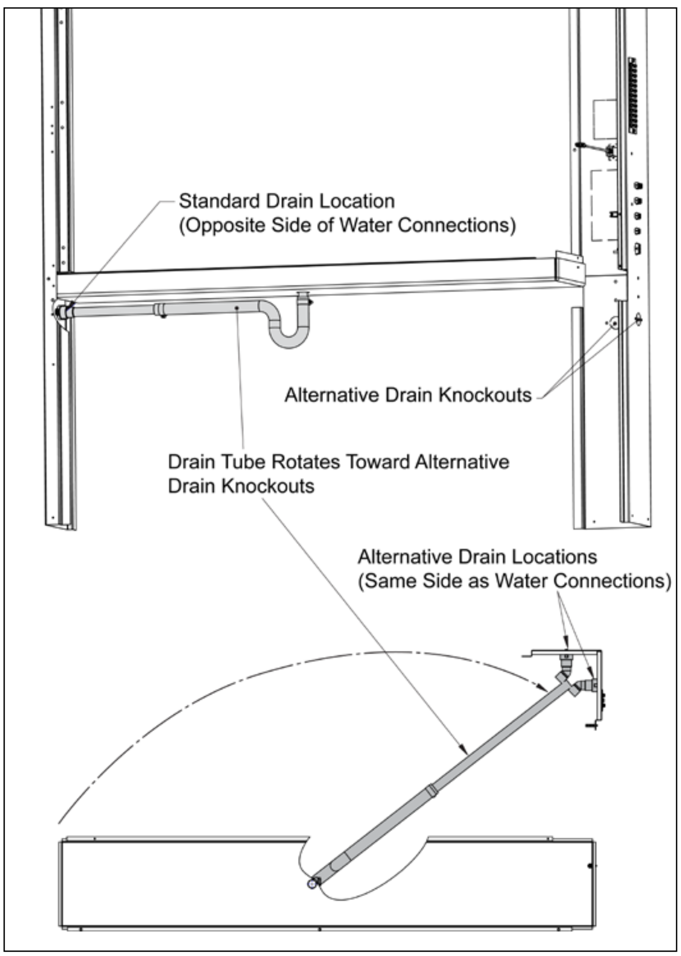
Network Input

The MicroTech controller will modulate unit airflow in response to a network command.

Alternate Side Condensate Drain

The standard condensate drain connection is located on the opposite side of the unit from the water coil connections. This accessory kit allows for the drain connection to be located on the same side of the unit as the water loop connections.





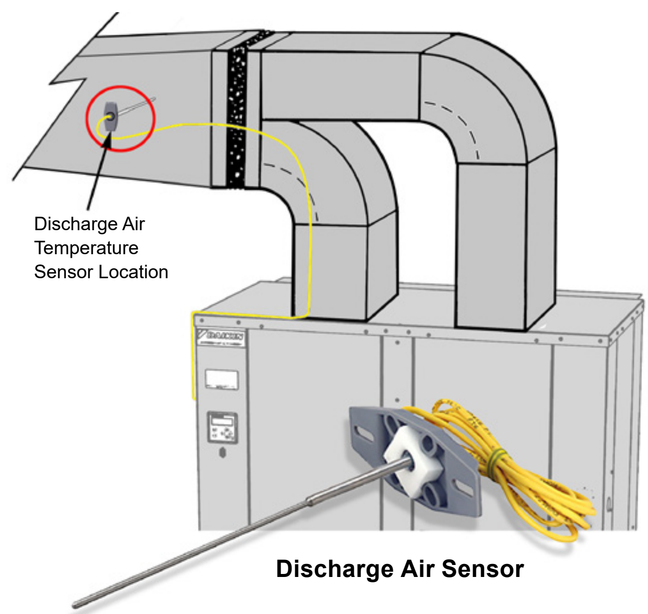
Sensors

Entering Air Temperature / Humidity Sensor (Standard – Field-Installed)

The Entering Air Temperature / Humidity Sensor is used to determine the mode of operation. This sensor must be field installed between the OA intake and unit entering air connection. If an ERV is used this sensor should be installed downstream of the ERV discharge.

Discharge Air Temperature Sensor (Standard – Field-Installed)

The Discharge Air Temperature (DAT) sensor is typically installed 2 to 3 feet down stream of the fan housing. Because the airflow is more uniform at this location in the airstream, a more accurate reading of the discharge air temperature is possible.



Space CO_2 Sensor (Optional – Field-Installed)

The CO_2 Sensor is used to control variable airflow volume based on maintaining acceptable indoor air quality in the occupied space.

Duct Static Pressure Sensor (Optional – Field-Installed)

The Duct Static Pressure Sensor is used to control variable airflow volume based on maintaining a duct static pressure set point. Variable airflow building exhaust control must not be used in combination with this feature. This sensor is field mounted on the supply ductwork and wired back to a molex plug connection on the unit.

Building Static Pressure Sensor (Optional – Field-Installed)

The Building Static Pressure Sensor is used to control variable airflow volume based on maintaining a positive building static pressure set point. This sensor is field mounted remotely and wired back to a molex plug connection on the unit.

High Duct Limit Switch (Optional - Field Installed)

The High Duct Limit Switch must be installed in all variable air volume applications. It has an adjustable range of 2.35 to 6.4 in H2O.

Space Temperature Sensor (Optional – Field-Installed)

The Space Temperature Sensor (Part # 910152149) is used as a method to reset the discharge air temperature control point to a lower value when the occupied space exceeds a space temperature set point. This sensor includes a unit status LED and unoccupied override button.

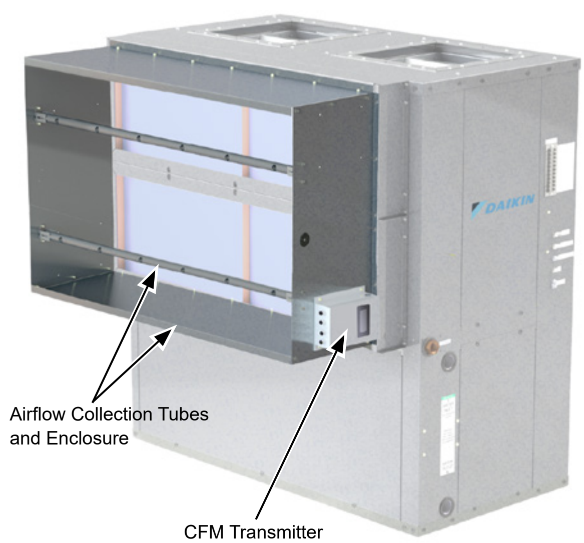
Notes: *Three conductors are required for the basic sensor 910152149. For complete specification and wiring information refer to ED 19107_WSHP-Tstats_Specs.*

Dirty Filter Switch (Optional - Field Installed)

The Dirty Filter Switch is an adjustable differential pressure switch that generates a dirty filter warning. This switch may only be used in constant volume applications.

Outdoor Airflow Sensor (Optional - Field Installed)

The OA CFM sensor kit is used to measure the total unit airflow volume. This measurement can be used to comply with the LEED Indoor Environmental Quality EQ1.2 requirement.



Supply and Return Water Hoses

Available as fire rated construction in 2 or 3 foot (610 mm or 914 mm) lengths. Fire rated hoses have a synthetic polymer core with an outer rated covering of stainless steel. Fittings are steel. Assembly is "fire rated" and tested according to UL 94 with a VO rating and ASTM 84. Each hose has MPT connections. Hoses have a swivel connection at one end and are available in 1¼" (32 mm) to match the FPT fittings on the unit.

All hose kits include a supply-side Y-strainer with 20 mesh stainless steel strainer and ball valve on both hoses. The ball valves have integral PT ports. Hose kits may also include an auto flow control valve selected to match the unit flow rate.

Hose Specifications

Inner Tube:

Fire retardant TRP (Thermosplastic Rubber) tested to UL-94 with VO rating.

Outer Braid:

Stainless steel wire (ANSI 302/304)

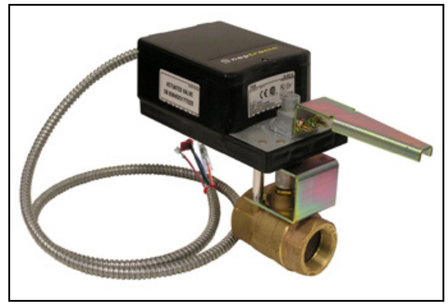
Temperature Range:

-40°F to 212°F

Motorized Valve

Used in variable pumping type applications, the valve is typically piped to the return water line. The 2-way motorized water valve kit includes the valve body, actuator and wire harness. The 24vac valve actuator must be wired to the terminal block located on the front left corner panel of the unit. The valve will only energize during dehumidification, cooling or heating modes. The 1-1/4" valve is rated for 300 psig (2068 kPa).

Figure 9: 2-Way Motorized Valve



Pre-Heat Modulating Water Valves

Used to control flow through the hydronic pre-heat coil and is typically piped on the leaving water side of the coil. Valves are available for 2-way variable flow or 3-way mixing control. The accessory valve kit includes the valve, modulating actuator and wiring harness. Power and signal wiring connects to the external terminal strip on the left end of the unit. Valves have 1" NPT connections and are rated for 600 psi.

Figure 10: Optional 1", 2-Way, Normally Closed (N.C.) Motorized Valve With 2-10vdc Actuator

Figure 11: Optional 1", 3-Way, Motorized Valve With 2-10vdc Actuator

SmartSource DOAS Application Considerations

Dedicated Outside Air System Application

Dedicated outside air systems (DOAS) make it easier to ensure proper ventilation airflow is delivered to the occupied space, can be simple to control and maintain, will provide improved indoor air quality, may result in system energy savings and can be implemented with little to no additional cost to the project. The primary function of a DOAS unit is to decouple the sensible and latent load of the ventilation air from the occupied space cooling and heating loads. This pre-conditioned air can be delivered directly to the space through a dedicated distribution system, or through the local space conditioning units and associated ductwork. Decoupling the ventilation load from the space load allows for downsizing of the local units and can result in little to no increase in overall system cost. A decentralized DOAS system, using multiple smaller DOAS units, can provide additional first cost reductions and operational savings. Decentralized systems use smaller ductwork and shorter runs between the unit and the served space, requiring lower total fan energy compared to central DOAS systems. With decentralized systems the risk of a complete system failure is eliminated, and using multiple smaller units can be easier for retrofit projects with little space for ductwork.

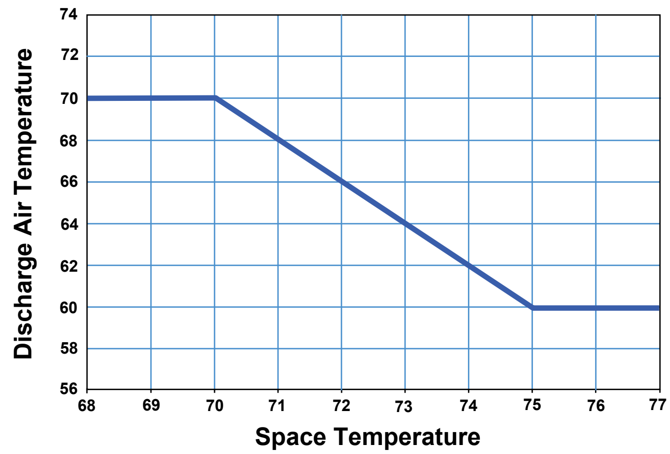
DOAS Unit Selection

The DOAS unit should be selected to completely handle the sensible and latent load of the ventilation airflow at the peak latent load and peak heating design conditions. Proper selection and operation of the DOAS unit can also reduce the capacity requirements of the space conditioning units. Ventilation air delivered with a low enough dew point temperature can offset or eliminate space latent loads. If the ventilation air is delivered at a temperature below the space cooling set point it can also help offset space sensible loads. The SmartSource DOAS unit can dynamically reset the discharge air temperature set point based on space temperature, outdoor air temperature, external 0-10vdc or network input. This feature is required by ASHRAE 90.1-2016, section 6.5.2.6 if following the prescriptive path, limiting the reheat set point to 60°F or below when most of the zones being served require cooling. Even if some zones require heating, providing cooler ventilation air can result in overall system energy savings, especially in a WSHP system where the DOAS unit will be rejecting waste heat into the water loop.

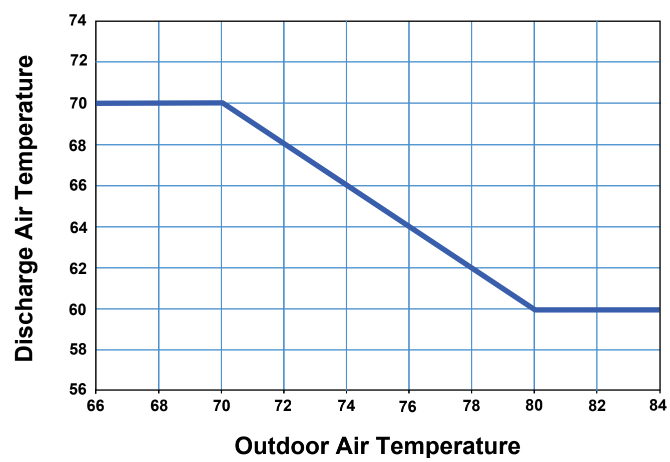
Discharge Air Reset Methods

The discharge air temperature control point can be dynamically reset based on space conditions, outside air temperature or via an external analog or network input. A reset value will be applied to the discharge air set point in dehumidification, cooling or heating modes. A maximum reset value will determine the minimum allowable discharge air temperature.

- **Space Temperature:** A space temperature sensor is used to compare the temperature in a single zone to minimum and maximum reset set points. If the space temperature is below the occupied set point the DOAS unit will deliver air at the nominal set point for the current mode of operation. As the space temperature increases above the minimum reset set point the temperature of the DOAS discharge air will be reduced.



- **Outside Air Temperature:** The outside air temperature sensor is used to compare the outdoor temperature to minimum and maximum reset set points. If the outside air temperature is below the minimum reset set point the DOAS unit will deliver air at the nominal set point for the current mode of operation. As the outside air temperature increases above the minimum reset set point the temperature of the DOAS discharge air will be reduced.



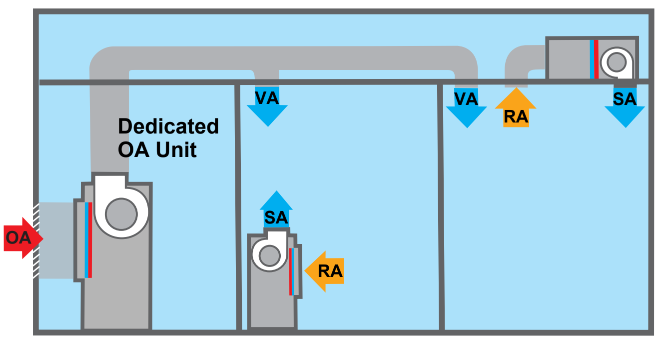
- 0-10vdc Input: Based on the external signal voltage the reset value will increase from zero at 0 vdc to the maximum reset value at 10vdc.
- Network Input: Through the network interface the BAS can write to the reset value.

Methods of Air Distribution

Ventilation airflow from the SmartSource DOAS unit can be delivered to the occupied zone by one of five different methods. Each method has unique advantages or disadvantages as discussed below.

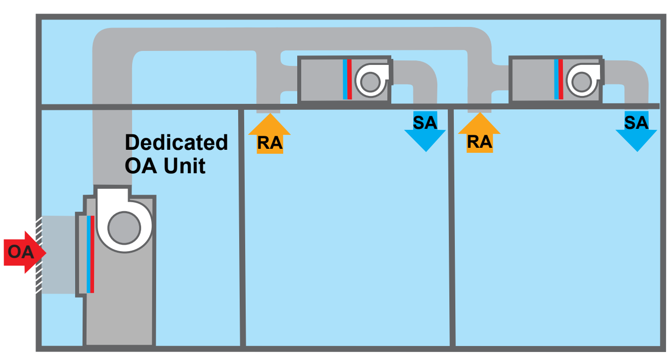
- **Delivered directly to the occupied space through dedicated distribution** (Figure 12). While this method requires additional ductwork and air distribution devices it ensures that the required ventilation airflow is always delivered effectively to the occupied space. Since ventilation airflow will be provided regardless of local unit operation, it may be possible to cycle the local unit fan based on cooling or heating demand, resulting in additional energy savings. This is the preferred method of distribution and works well with DCV control.

Figure 12: OA Delivered Directly to Each Space



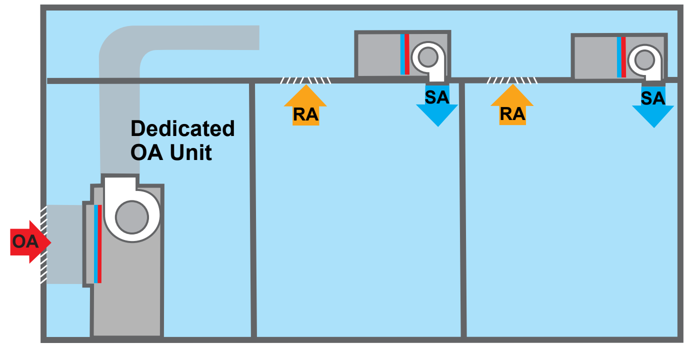
- **Delivered to the intake of the local units** (Figure 13). This method uses the local unit air distribution to deliver ventilation airflow to the space, providing some first cost savings. Since the ventilation airflow is delivered directly to the local unit return air intake, the local unit fan must remain on during all occupied periods to deliver ventilation air to the space.

Figure 13: OA Delivered to the Intake of Each Local Unit



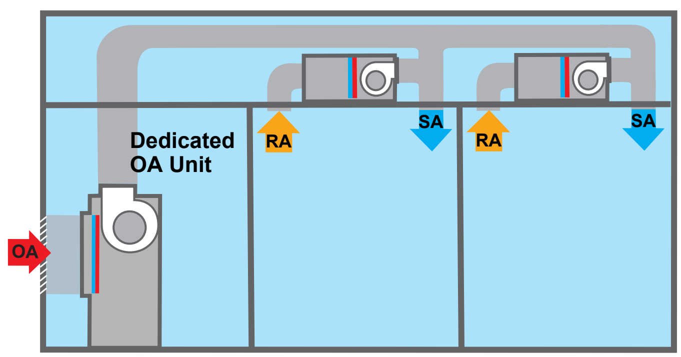
- **Delivered to the return plenum for the space unit** (Figure 14). This method mixes ventilation air with return air in the plenum. Because the ventilation air distribution is not directly connected to the space airflow distribution it is difficult to ensure the required ventilation airflow reaches the occupied zone. ASHRAE 62.1 provides guidance on using this distribution method and should be referenced for additional information. Local codes should also be reviewed.

Figure 14: OA Delivered to the Plenum Near Each Local Unit



- **Delivered to the supply ductwork from the space unit (Figure 15).** This method mixes ventilation air with the local unit supply airflow. Balancing can be difficult due to the positive pressure of the supply ductwork.

Figure 15: OA Delivered to the Supply Side of Each Local Unit



For any of the methods where ventilation air is delivered through the local unit distribution, the temperature of the ventilation air will affect the distributed air temperature and may need to be considered when sizing the local unit. The local unit fan must run continuously during all occupied hours with these distribution methods. If the local unit fan utilizes multi-speed or variable-speed supply fan logic, additional measures may need to be taken to ensure adequate ventilation airflow to the occupied zone. Pressure-independent volume dampers is one possible solution to ensure desired ventilation airflow rate.

Demand Control Ventilation

The DOAS unit will be selected to deliver design ventilation air volume to each zone that it will serve (Figure 16). It is very likely that most or all zones will be below design occupancy for most of the occupied hours. Employing DCV logic can result in significant energy savings in most climates. The SmartSource DOAS unit is capable of performance DCV operation by one of the following sequences:

- **Variable Air Volume based on discharge duct static.** In this configuration the supply ductwork to each zone will have a motorized volume damper. This damper can be operated by a modulating actuator controlled by a space CO_2 sensor, or a two-position damper controlled by an occupancy sensor. When all zone dampers are fully open the unit will operate at the maximum design airflow. The SmartSource DOAS controls will reduce airflow in order to maintain a constant duct static pressure as dampers modulate closed in response to lower occupancy. The static pressure set point should be adjusted so that at minimum airflow all the terminals receive the minimum static pressure required plus any downstream resistance. The sum of all zone minimum airflows must be equal to or higher than the DOAS unit minimum airflow.

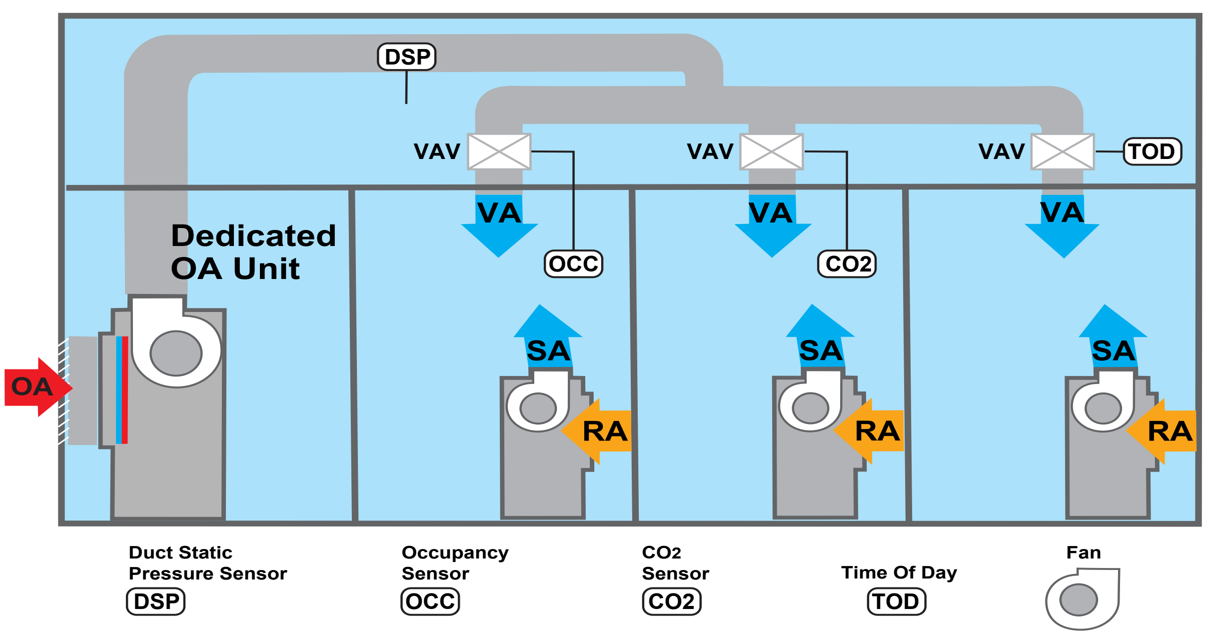
In placing a duct static pressure sensor, locate a pressure tap near the end of the main duct trunk. Locate the static pressure sensor tap in the ductwork in an area free from turbulence effects and at least ten duct diameters downstream and several duct diameters upstream from any major interference, including branch takeoffs.

Variable Air Volume based on Space CO_2 level. This control method should only be used if the SmartSource DOAS unit is providing ventilation airflow to a single zone. A space mounted CO_2 sensor is used to measure the level of indoor air quality. When the CO_2 level is satisfactory the SmartSource DOAS unit will operate at a minimum airflow level. As the CO_2 level rises above the desired set point the unit airflow will be increased, up to a maximum airflow level.

Other Methods of Variable Air Volume Control

- **Variable Air Volume based on External 0-10vdc input.** The SmartSource DOAS unit airflow will vary between a minimum value at a 0 vdc signal to a maximum value at a 10vdc input.
- **Variable Air Volume based on Network Command.** The SmartSource DOAS unit airflow will vary between a minimum value and a maximum value based on the network command input.
- **Variable Air Volume based on Building Pressure**. In applications where one or more zones contains a variable speed or intermittently used exhaust fan, for example a lab hood in a school classroom, the building pressure control logic can be used to provide additional make-up air when the exhaust airflow is increased. For this application the minimum DOAS airflow should be selected to meet the design ventilation rate, but unit capacity should be selected to meet the required discharge air temperature and dew-point level at maximum airflow.

Figure 16: Demand Control Ventilation (DCV) – Variable Air Volume Based on Discharge Duct Static



Care should be taken when selecting a location for the building pressure sensor in order to get a valid pressure reading. Locations near doors, operable windows or high air movement should be avoided. The outdoor pick-up location should be located where it will not be affected by wind speed or direction.

For any variable airflow control method, other than building pressure control, a variable exhaust control method must be employed to avoid negative building static pressure. Variable airflow exhaust fans controlled by building pressure should never be used in conjunction with DOAS unit building pressure airflow control.

Pre-Heat

With the SmartBoost Heating Technology included on all SmartSource DOAS units pre-heat will only be required at extremely low outdoor air temperatures. The optional factory hot water coil or a field supplied electric duct heater may be used for pre-heat when required. Pre-heat logic uses a 0-10vdc output signal to modulate a pre-heat water valve or vary the capacity of an SCR controlled electric heater, raising the DOAS entering air temperature. This occurs when the unit reaches maximum capacity (Stage 8) and is unable to achieve the desired discharge air temperature. If a hot water coil is used it should be fed from a separate hot water loop, not from the WSHP loop, and the fluid should contain a sufficient level of glycol to prevent the coil from freezing.

Using SmartSource DOAS with an Energy Recovery Ventilator

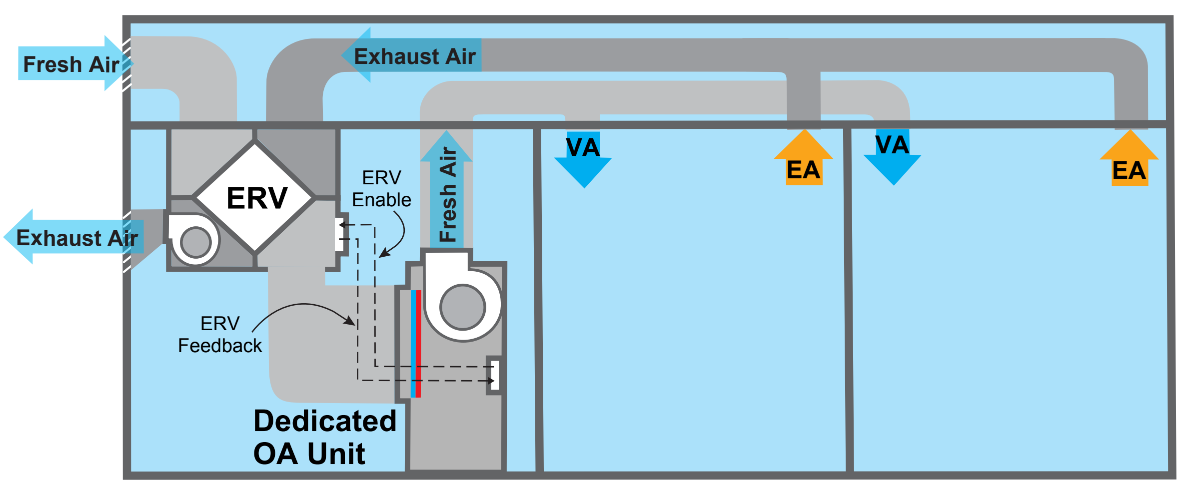
Energy Recovery Ventilators (ERV) can provide significant energy savings by using exhaust air energy to pre-condition ventilation airflow. When a separate ERV is used in conjunction with a SmartSource DOAS unit, the dehumidification, cooling and heating capacity requirements of the DOAS are significantly reduced. As a result, the DOAS unit can be selected for a higher airflow rate and still achieve the desired discharge air conditions. See Figure 17.

ERVs are most efficient when exhaust airflow rate is close to or balanced with supply airflow rate. Building systems with multiple exhausts paths could result in an ERV exhaust airflow significantly lower than the required ventilation airflow. In this case a bypass duct within or around the ERV can be used to reduce the supply airflow passing through the energy recovery media.

The SmartSource DOAS Microtech Controls will provide a 24 volt enable signal to the ERV controller whenever the DOAS unit supply fan is enabled. The ERV supply fan must run when this signal is enabled. An ERV Status feedback input is available. When this input is enabled the DOAS unit will respond by shutting down and initiating an alarm on the BAS network (default) or by only initiating a network alarm (configurable option).

When using an ERV in conjunction with a SmartSource DOAS unit the ERV may be configured with or without a supply side fan. If the ERV is provided without a supply side fan the ERV static pressure loss, in addition to the intake louver, damper and ductwork, must be accounted for in the DOAS fan selection. This will limit the available discharge static capability. If the ERV is provided with a supply side fan the selection and control of this fan is critical to proper system operation. The fan should be sized to handle the design airflow at a static pressure equal to the loss of the ERV and all upstream devices.

Figure 17: DOAS with an ERV Ventilator



The static pressure in the ductwork connecting the ERV to the DOAS unit should be at zero or slightly negative. The ERV fan motor should be a constant RPM type as variable RPM motors may impact the stability of the DOAS EC motor control logic. Contact Daikin Applications Engineering support when considering applying an ERV in series with a SmartSource DOAS unit.

General Applications Notes

This section contains basic application and installation guidelines to consider as part of the detailed analysis of any project. For proper operation, rig units following instructions in IM 1301. Explicitly follow factory check, test, and start procedures for satisfactory start-up and operation (see IM 1301).

Unit Location

Locate the equipment room away from sound sensitive areas. Whenever possible, isolate the equipment room from these areas by locating restrooms, utility rooms, stairwells, hallways, elevators, etc. around its perimeter. This allows not only isolation from radiated sound but provides the capability to route ductwork over less sensitive areas.

Acoustically seal the equipment room with a high quality, flexible material to prevent air and noise from escaping. Even a small leak compromises the acoustic performance of the installation. Design the equipment room door to seal tightly on a perimeter gasket.

Equipment room wall construction should be concrete block or offset, double stud. The decision depends on the critical nature of the application. If offset, use double stud construction. Line the cavity with glass fiber insulation and use a double layer of wallboard on each side of the wall.

The floor must be structurally strong enough to support the unit with minimum deflection (see "Physical Data" on page 35 for unit weights). Provide proper structural support to minimize sound and vibration transmission. Consider a concrete floor. Extra design consideration is required when installing on a wooden structure. Install unit level from front-to-back and side-to side.

Locate unit fresh air intakes away from building flue stacks, exhaust ventilators and areas containing automotive or other exhaust to prevent the possible introduction of contaminated air to the system. Intakes should have bird/insect screens and be located as close to the DOAS unit as possible to minimize duct static losses. The intake duct should include a motorized damper as close to the intake as possible.

Allow enough space around the unit for service and maintenance clearance. Refer to "Figure 18: Service Clearances" on page 27.

Locate equipment room access doors in a manner that can assist in service access if needed (e.g., coil removal). Contact your local Daikin sales representative if reduced service/maintenance clearances are required.

Where code considerations such as the NEC require extended clearances, they take precedence over minimum service/ maintenance clearances.

Acoustical Considerations

Good acoustical design is critical for any installation and should start at the earliest stages in the design process. Common sound paths that must be addressed are:

- Radiated sound through the casing of the unit
- Structure-borne vibration from the unit to the building
- Airborne sound through the supply air duct
- Airborne sound through the return air duct

Basic Guidelines for Good Acoustical Performance Include:

1. Always provide proper structural support under the unit. The unit should be set on a vibration isolation pad or vibration isolators.
2. Provide adequate mass in the floor structure, especially when located over an occupied space where good acoustics are essential.
3. Seal all supply and return air duct penetrations once the duct is installed.
4. Minimize system static pressure losses to reduce fan sound generation.
5. Select the appropriate unit/fan for the application.
6. Design duct systems to minimize turbulence.
7. Account for low frequency duct breakout noise in system design. Route the first 20' of rectangular duct over non-sensitive areas and avoid large duct aspect ratios. Consider round or oval duct to reduce breakout.

Ductwork

Fan noise travels through the ductwork to occupied spaces; it likely is the most challenging to control. Careful duct design and routing practice is required. Avoid any abrupt change in duct size and sharp turns in the fan discharge. Avoid turns opposed to wheel rotation since they generate air turbulence and result in unwanted sound. The ASHRAE Applications Handbook discusses sound attenuation relevant to self-contained system applications. Advances in acoustical science allow for designing sound levels in each space if equipment sound power data is available. Contact your local Daikin sales representative for sound power data for your specific application.

Supply Duct

Extend a lined section of supply air duct at least 15 feet from the equipment room. Using round duct significantly reduces low frequency sound near the equipment room. If rectangular duct is used, keep the aspect ratio of the duct as small as possible. The large flat surfaces associated with large aspect ratios transmit sound to the space and increase the potential for duct generated noise such as oil canning. The maximum recommended supply air duct velocity is 2000 feet per minute.

Duct Protection

An adjustable duct high limit switch is standard equipment on all SmartSource DOAS systems with VAV controls. This is of importance when using fast-acting, normally closed boxes. The switch is field adjustable; set it to meet the specific rating of the system ductwork.

Vibration Isolation

Make duct connections to the unit with a flexible connection. Though flexible piping and electrical connections are not required, pay attention to these areas to avoid vibration transmission from outside sources to the unit.

Piping

The water source heat pump unit is typically connected to the supply / return piping using a “reverse return” piping system which includes a flow control device so that flow requirements are met for each zone. A short, high pressure “flexible hose” is used to connect the unit to the building’s hard piping and acts as a sound attenuator for both the unit operating noise and hydronic pumping noise. One end of the hose has a swivel fitting to facilitate removal of the unit for replacement or service. Include supply and return shutoff valves in the design to allow removal of a unit without the need to shut down the entire heat pump system. The return valve may be used for balancing and will typically have a “memory stop” so that it can be reopened to the proper position for the flow required. Fixed flow devices are commercially available and can be installed to eliminate the need for memory stop shut off valves. Include Pressure / Temperature ports to allow the service technician to measure water flow and unit operation.

Daikin has available optional hose kit combinations to better facilitate system flow balancing. These flexible hoses reduce vibration between the unit and the rigid piping system.

A minimum 20-mesh strainer installed in the supply piping is required.

⚠ WARNING

Polyolester Oil, commonly known as POE oil is a synthetic oil used in many refrigeration systems, and may be present in this Daikin product. POE oil, if ever in contact with PVC/CPVC will coat the inside wall of PVC/CPVC pipe causing environmental stress fractures. Although there is no PVC/CPVC piping in this product, please keep this in mind when selecting piping materials for your application, as system failure and property damage could result. For these reasons Daikin Applied does not recommend the use of PVC/CPVC water piping.

Smoke and Fire Protection

Due to the wide variation in building design and ambient operating conditions to which our units are applied, we do not represent or warrant that our products are fit and sufficient for smoke, fume, and fire control purposes. The owner and a fully qualified building designer are responsible for meeting all local and NFPA building code requirements with respect to smoke, fume, and fire control. This unit's control terminal strip includes an Emergency Shutdown input where field provided smoke detectors can be connect to initiate a unit shutdown. Any other smoke detector, its installation, and the wiring to the unit controller are all field supplied.

Water System Quality

The cleaning, flushing and chemical treatment of a water source heat pump system is fundamental to efficient operation and the life expectancy of the system.

Potential system problems produced using water fall into three general categories:

1. **Scale formation** – Mineral deposits which result from the crystallization and precipitation of dissolved salts in the water. The deposits form an insulating barrier, reducing the heat transfer rate and impeding the circulation of fluids due to increased pressure drop.
2. **Corrosion** – Decomposition of the metal caused by absorption of gases from the air. Corrosion may occur in any metal component of the system.
3. **Organic growths** – Slime and algae which form under certain environmental conditions and can reduce the heat transfer rate by forming an insulating coating or can promote corrosion by pitting.

The system water should be evaluated for degrees of impurity, with testing available from independent testing labs, health departments or state agencies.

In Table 4 is a list of water characteristics, the potential impurities and their results and the recommended treatment.

Avoiding Potential Problems

As shown in Table 4, all water contains some degree of impurities which may affect the performance of a heat pump system. Water flow rates should:

A. Be high enough that the temperature rise through the heat exchanger does not exceed 10°F when operating in the cooling mode.
B. Not exceed 4 GPM per nominal ton. Flow rates that have velocities of 10 feet per second or more may cause pipe erosion and heat exchanger failure.

Table 4: Water Impurities, Recommended Water System Application

	Plate Material: ANSI 316 Stainless Steel	Brazing Material: Copper
Alkalinity (HCO_3^-)	no limit	70-300 ppm
Sulphate[1] (SO_4^{2-})	no limit	< 70 ppm
HCO_3^- / SO_4^{2-}	no limit	> 1.0
Electrical conductivity	no limit	10-500 µS/cm
ph	> 6.0	7.5-9.0
Ammonium (NH_4^+)	no limit	< 2 ppm
Chlorides (Cl^-)	< 300 ppm	< 300 ppm
Free chlorine (Cl_2)	< 1 ppm	< 1 ppm
Hydrogen sulfide (H_2S)	no limit	< 0.05 ppm
Free (aggressive) carbon dioxide (CO_2)	no limit	< 5 ppm
Total hardness	< 300 ppm[5]	< 300 ppm[5]
Nitrate[1] (NO_3^-)	no limit	< 100 ppm
Iron[3] (Fe)	no limit	< 0.2 ppm
Aluminium (Al)	no limit	< 0.2 ppm
Manganese[3] (Mn)	no limit	< 0.1 ppm
Ironoxide	< 0.2 ppm	< 0.2 ppm
Total Dissolved Solids	< 1000 ppm[6]	

Notes: [1] Sulfates and nitrates works as inhibitors for pitting corrosion caused by chlorides in pH neutral environments
[2] In general low pH (below 6) increase corrosion risk and high pH (above 7.5) decrease the corrosion risk
[3] Fe3+ and Mn4+ are strong oxidants and may increase the risk for localized corrosion on stainless steels
[4] in combination with brazing material copper
[5] Hardness or SiO2 above 150ppm will increase the risk of scaling
[6] Lower TDS limit may be required

Varying combinations of pH, TDS, Calcium, Alkalinity and water temperature can affect the likelihood of scaling. To determine if the system is at risk for scaling use the Langelier Saturation Index

Zone Sensor Placement

If a zone temperature sensor is used for discharge air reset capability the placement of the sensor is critical for proper and economical operation of the DOAS system. It is generally recommended that the space sensor be located on an inside wall (3 to 5 feet from an outside wall) in a space having a floor area of at least 400 square feet. Do not locate the sensor below the outlet of a supply diffuser, in the direct rays of the sun, on a wall adjacent to an unheated or abnormally warm room (boiler or incinerator room), or near any heat producing equipment.

Filtration

Routinely replace filters to minimize filter loading. As filters get dirty, the filter pressure drop increases, affecting system airflow and energy requirements. The effect of filter loading is the most critical when using high efficiency filters.

When making a fan selection, include a pressure drop component in the system total static pressure to account for dirty filters. Use a value midway between clean and dirty filter ratings. If a minimum airflow is critical, make the fan selection using the higher, dirty filter pressure drop value. For VAV systems, consider setting the fan control device so part of its modulation range can be used to maintain airflow as filters become dirty. Following these recommendations should limit airflow fluctuation as the filters load.

Unit Wiring

All units require three phase, 60 Hz, 208/230 or 460 volt power supply. All units include branch circuits and short circuit protection and are available with a power block or non-fused disconnect switch. All wiring must be installed in accordance with the National Electric Code (NEC) and local codes.

Pre-Heat Coil Freeze Protection

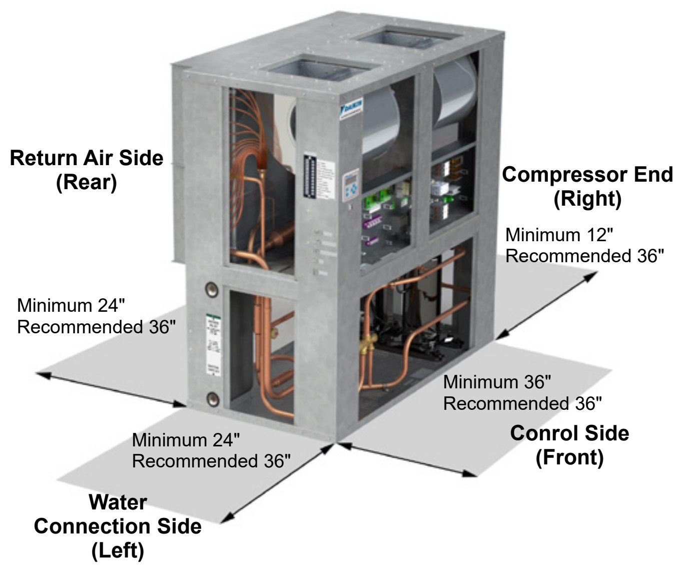
When applying the optional pre-heat hot water coil, freeze protection measures must be provided as this coil is upstream of the refrigerant coils used for heating. Glycol is strongly recommended as a positive means of freeze protection for water coils. No control sequence can prevent coil freezing in the event of a power failure or equipment malfunction.

Standard Unit Typical Installation

The SmartSource DOAS WSHP should be installed in a mechanical room or large closet with sufficient room for service access. The preferred location would be close to an exterior wall to minimize the length of ductwork containing untreated outdoor air.

The contractor should make sure that access has been provided including clearance for filter brackets, duct collars and fittings at water and electrical connections. It is recommended that the unit be installed in an equipment room close to an exterior wall to minimize duct static pressure. The entering air must be ducted to the unit and can be supplied directly from an outdoor air intake or from a separate energy recovery ventilator. It is recommended that the unit be located on vibration isolators to reduce any vibration (see Figure 20 on page 29).

Figure 18: Service Clearances

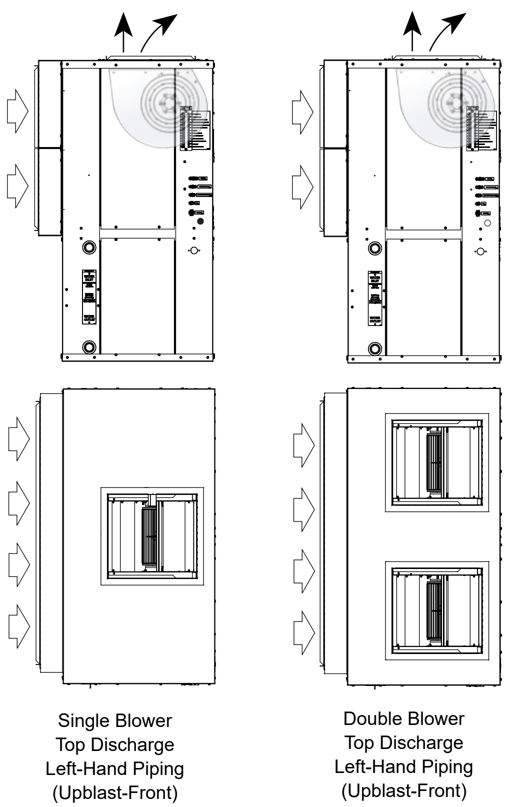


Note: *Local codes that require greater clearances prevail over manufacture recommendations.*

Fan Deck Arrangements

Two fan discharge arrangements and a left-hand piping arrangement is available. With the control box location side defined as the “front” of the unit, the water piping connections are on the left-hand (side). Supply and return water connections are made directly to the brazed plate heat exchanger. The condensate connection is a brass FPT fitting. The standard location is on the right side of the cabinet. The connection location can be relocated to the left front corner by use of an accessory kit. The entering air is located on the rear side of the unit. The fan discharge is front. The EC fan motor controller modules are located on the side of the fan housing facing the left end of the unit.

Figure 19: DOAS Unit Arrangements



Notes: *1. The control box location is considered the “front” of the unit. The piping and electrical connections are always made on the “left-hand” side of the unit.*

Vibration Isolators

For minimum sound and vibration transmission, it is recommended that the unit be mounted on vibration isolators.

Holes are provided in the bottom panel to facilitate connection of isolators (see Figure 20 for hole locations).

Field supplied isolators may be rubber or spring type. Table 5 provides point load weights to assist in selecting the appropriate isolators.

The holes in the bottom of the unit allow for a 3⁄8" (10 mm) bolt to be secured to the isolator.

Figure 20: Unit Point Load Weights and Vibration Isolators Hole Locations

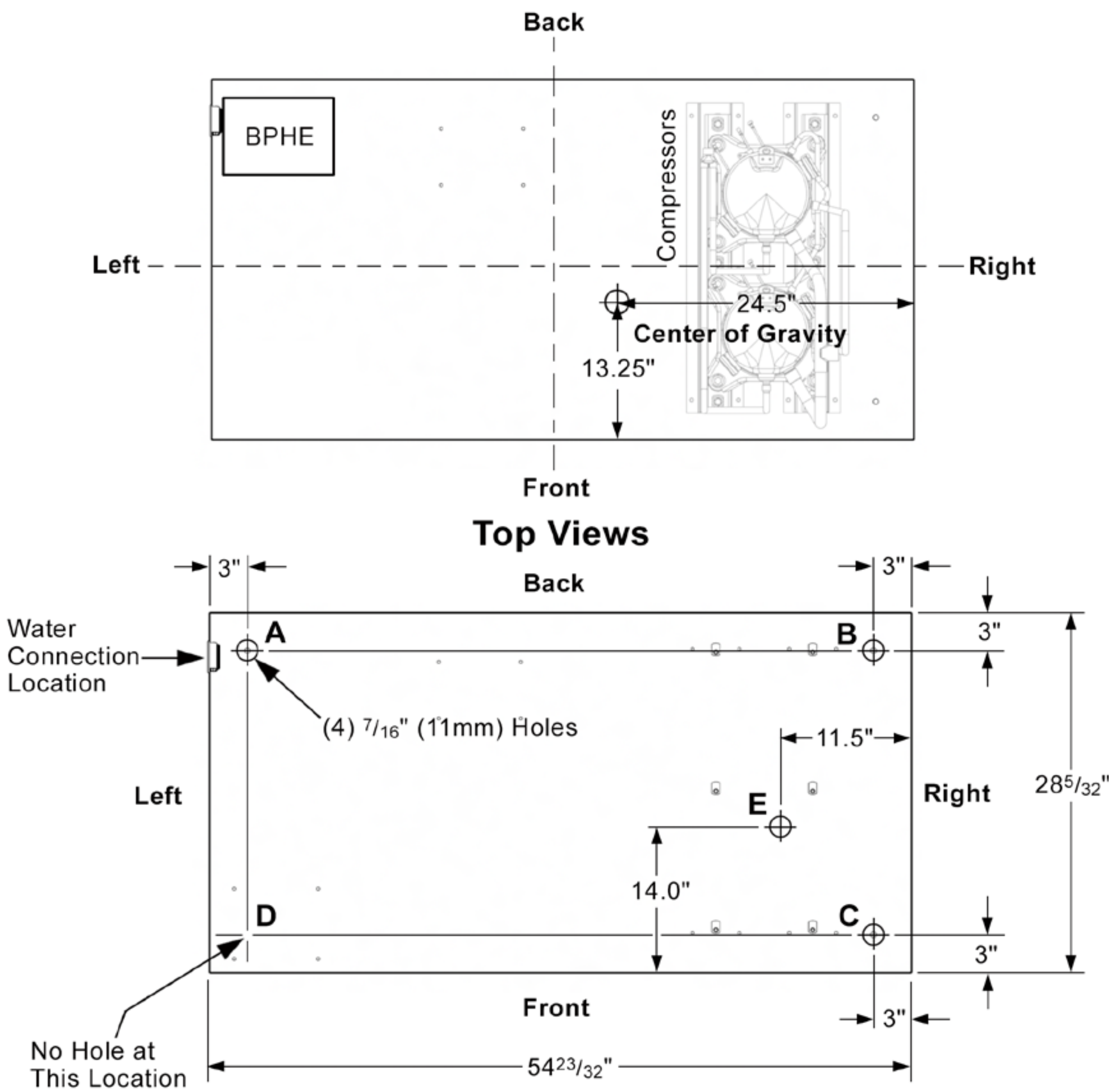


Table 5: Unit Point Load Weights

Unit Size	No. Fans	A	B	C	D	E
Size 008	1	61	61	82	124	89
Size 012	1	68	68	91	138	98
	2	72	72	96	146	104
Size 016	1	75	75	101	153	109
	2	79	79	106	161	115
Size 024	2	80	80	108	164	117

Ductwork and Attenuation

All ductwork should conform to industry standards of good practice as described in ASHRAE Systems Guide.

The discharge duct system will normally consist of a flexible connector, a transition piece to the final duct size, a short run of duct, an elbow without vanes and a trunk duct tee'd into branch ducts with discharge diffusers. Transition duct must not have angles totalling more than 30 degrees or severe loss of air performance can result.

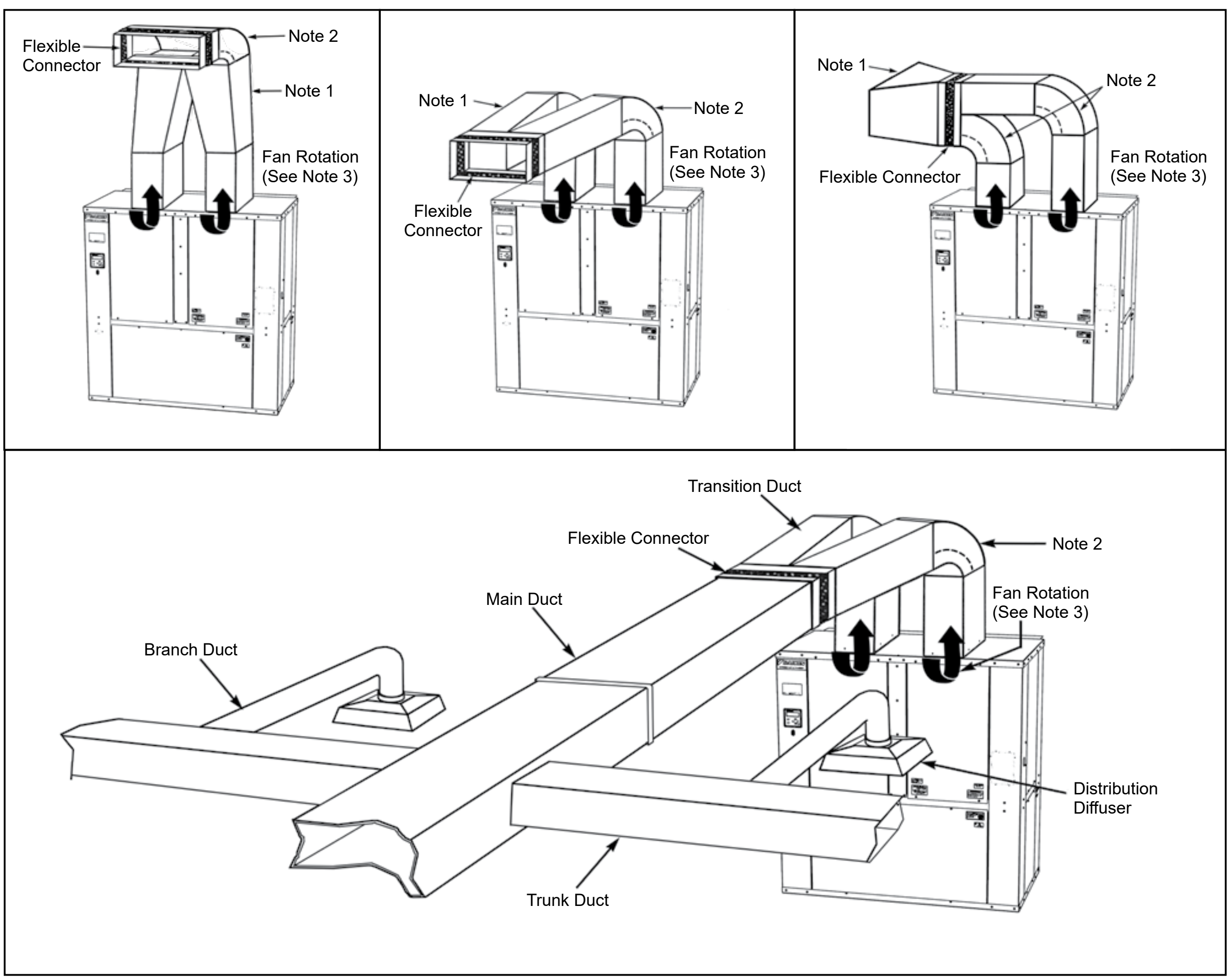
Some units have multiple fan outlets. The preferred method for minimum static pressure loss would be individual ducts at each outlet connected to a larger main duct downstream (Figure 21).

For minimum noise transmission, the metal duct material should be internally lined with acoustic fibrous insulation. The ductwork should be laid out so that there is no line of sight between the conditioner discharge and the distribution diffusers.

Do not insert sheet metal screws directly into the unit cabinet for connection of supply or entering air ductwork, especially entering air ductwork which can hit the drain pan or the air coil.

Notes:
1. Transitions to supply duct have maximum slope of 1" to 7".
2. Square elbows with double thickness vanes may be substituted.
3. Do not install ducts so that the air flow is counter to fan rotation.
4. Transitions and units shall be adequately supported so no weight is on the flexible connection.

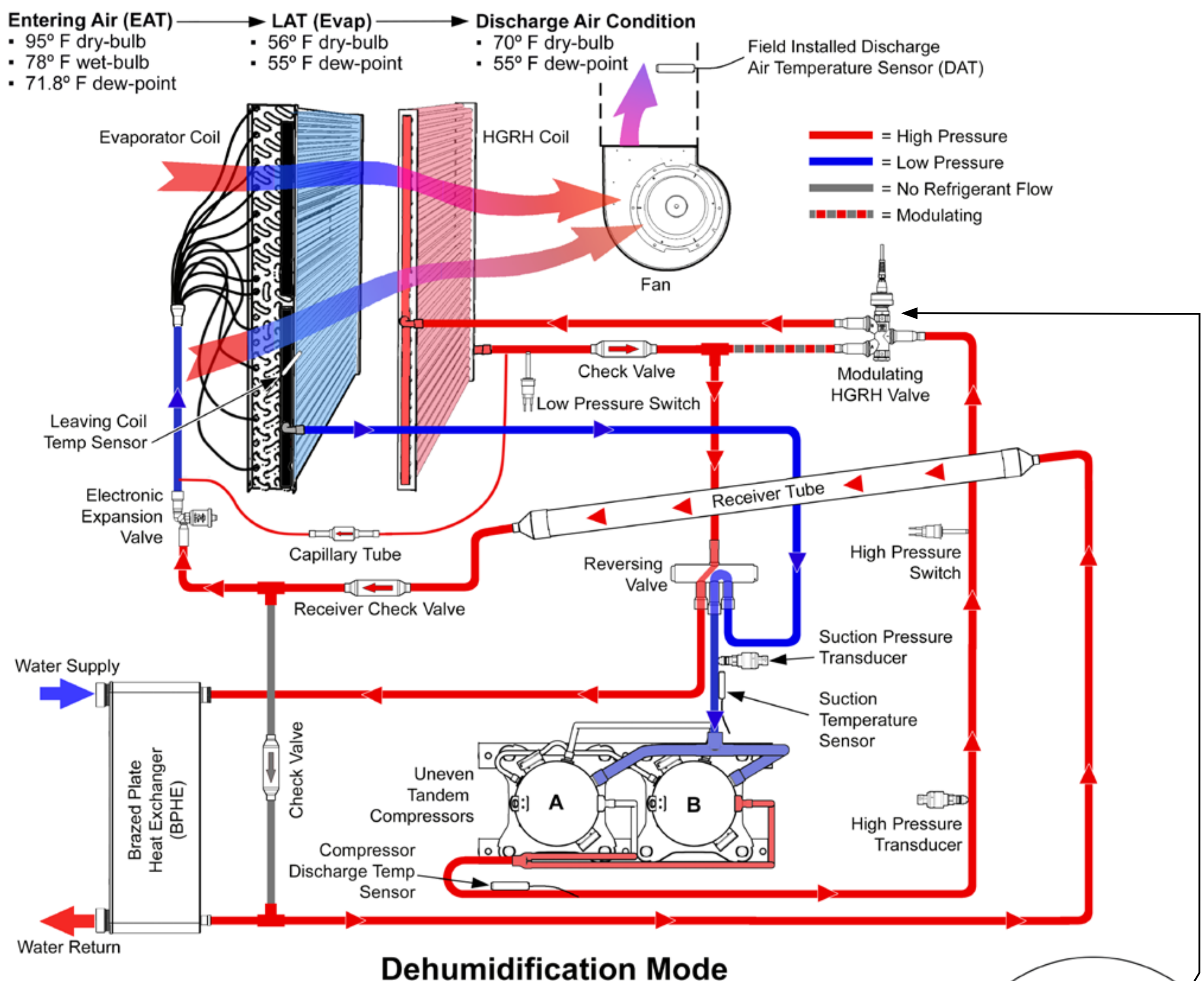
Figure 21: Suggested Supply Ducting per ASHRAE and SMACNA Publications, Dual Blower Unit Shown



Dehumidification or Precision Cooling Mode

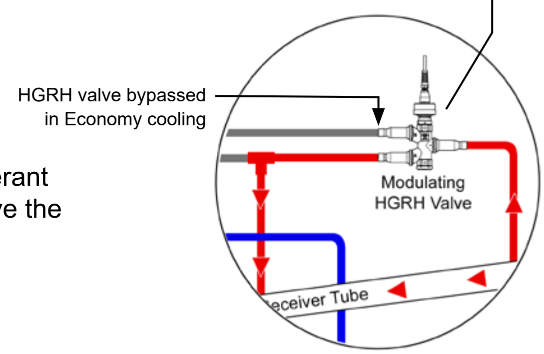
When the unit enters the DEHUMIDIFICATION or PRECISION COOLING modes the reversing valve will be de-energized and the hot gas reheat (HGRH) valve will modulate to vary the amount of high-pressure compressor discharge gas flowing through the hot gas reheat coil. Energy is rejected through the HGRH coil, warming the air, and the HGRH valve will be modulated to achieve the desired supply air temperature. After flowing through or bypassing the HGRH coil, the refrigerant will pass through the reversing valve to the brazed plate heat exchanger (BPHE) where excess heat is rejected into the water loop. At this point the refrigerant is a high-pressure liquid and flows through a receiver tube to the electronic expansion valve (EEV). The refrigerant drops to a low pressure as it passes through the EEV, which is modulated to achieve a desired suction superheat condition. As the low-pressure refrigerant passes through the primary DX coil energy is absorbed from the air, cooling and dehumidifying the airflow, before flowing back through the reversing valve to the compressors. Compressor capacity is staged to achieve the desired dew point temperature leaving the primary DX coil.

Figure 22: Dehumidification or Precision Cooling Mode – Refrigeration Cycle



Economy Cooling

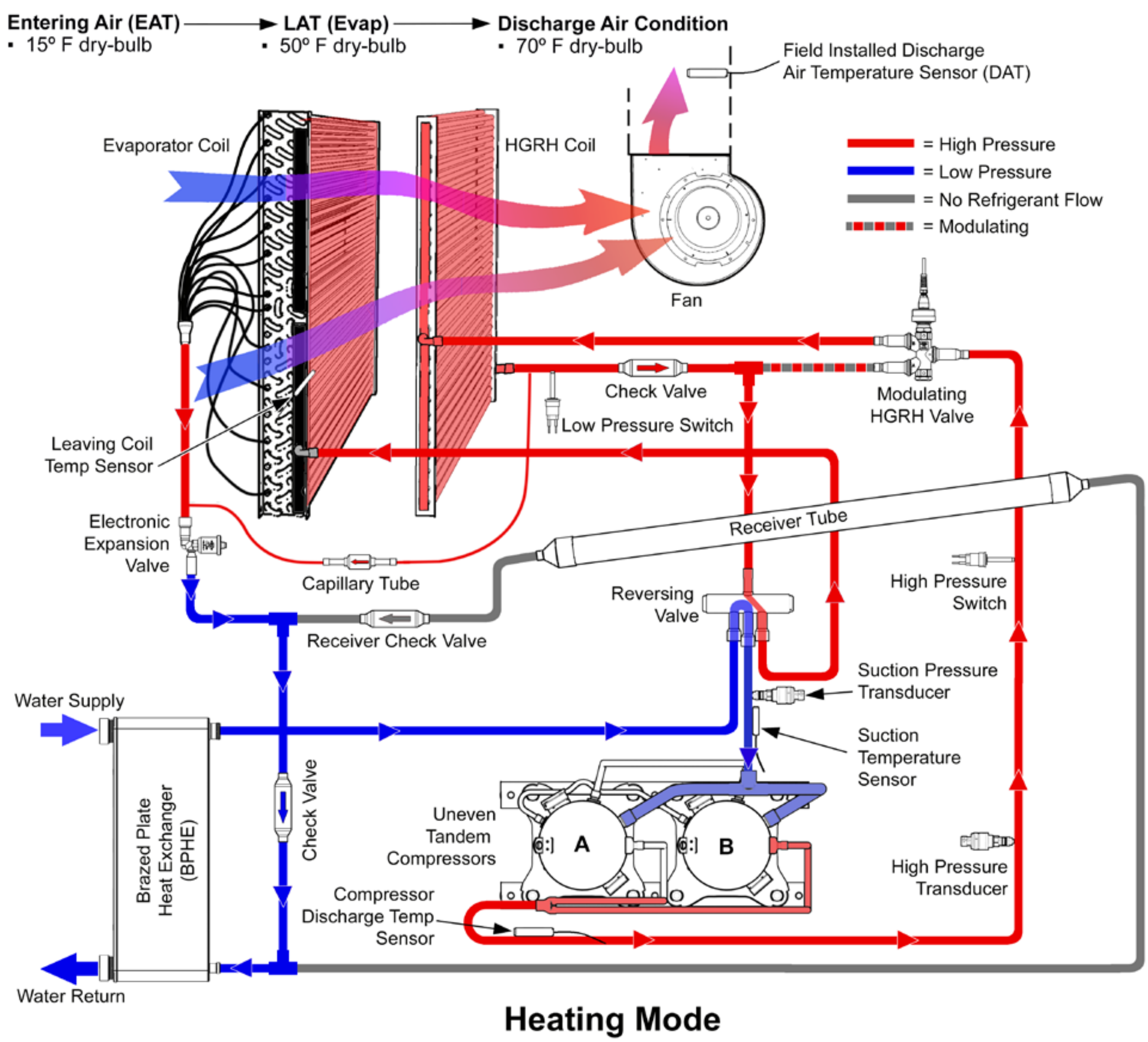
When the unit is in ECONOMY COOLING operation 100% of the refrigerant will bypass the HGRH coil and the compressors will be staged to achieve the desired supply air temperature.



Heating Mode

When the unit enters the HEATING mode the reversing valve will be energized and the hot gas reheat (HGRH) valve will modulate to vary the amount of direct 100% of the high-pressure compressor discharge gas to flow through the hot gas reheat coil. The refrigerant will then flow through the reversing valve to the primary DX coil. With Daikin's patent-pending SmartBoost Heating Technology energy is rejected through both the HGRH and primary DX coils, heating the airflow. After flowing through both coils the refrigerant is a high-pressure liquid and flows to the electronic expansion valve (EEV). The refrigerant drops to a low pressure as it passes through the EEV, which is modulated to achieve a desired suction superheat condition. As the low-pressure refrigerant passes through the brazed plate heat exchanger (BPHE) heat is absorbed from the water loop transitioning the refrigerant to a gas. From the BPHE the low-pressure gas flows throughout the reversing valve back to the compressors. Compressor capacity is staged to achieve a desired supply air temperature.

Figure 23: Heating Mode – Refrigeration Cycle



Systems

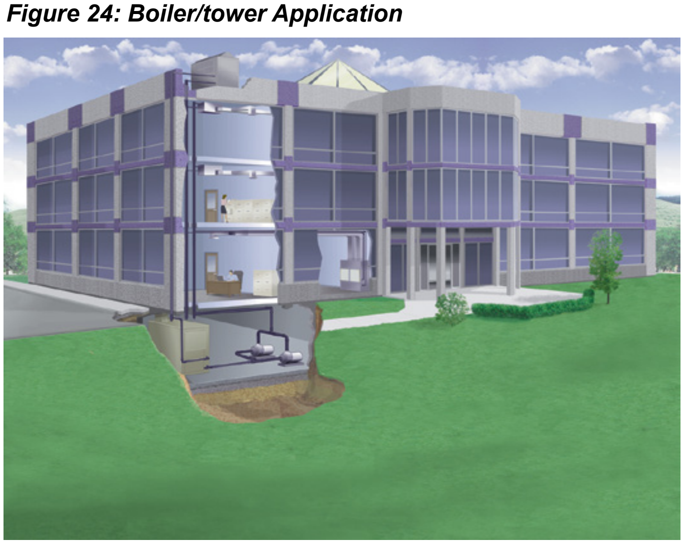
Water source heat pump systems are one of the most efficient, environmentally friendly systems available for heating and cooling buildings. High-efficiency, self contained units (sizes 7,000 btuh to 290,000 btuh) can be placed in virtually any location within a building. Each unit responds only to the heating or cooling load of the individual zone it serves. This permits an excellent comfort level for occupants, better control of energy use for building owners and lower seasonal operating costs. The Air-Conditioning, Heating and Refrigeration Institute (AHRI) and the International Standards Organization (ISO) publish standards so that water source heat pumps are rated for specific applications. The ARI/ISO loop options shown in this catalog are typical water source heat pump loop choices available in today's market. These systems offer benefits ranging from low cost installation to the highest energy efficiency available in the market today.

Boiler / Tower Applications

A "Boiler/Tower" application uses a simple two-pipe water circulating system that adds heat, removes heat or transfers rejected heat to other units throughout the building. The water temperature for heating is generally maintained between 65ºF – 70ºF and is usually provided by a natural gas or electric boiler located in a mechanical room. The condensing water temperature, during cooling months, is maintained between 85ºF and 95ºF and requires the use of a cooling tower to dissipate waste heat. Cooling towers can be located on the roof, or inside or adjacent to the building. This application can be the lowest cost of the loop options available.

Note: ASHRAE 90.1 standards require that circulating pumps over 10 HP will require use of "variable frequency drive" equipment and pipe insulation to be used whenever water temperatures are below 60 degrees and above 105 degrees. See ASHRAE 90.1 Standards for details.

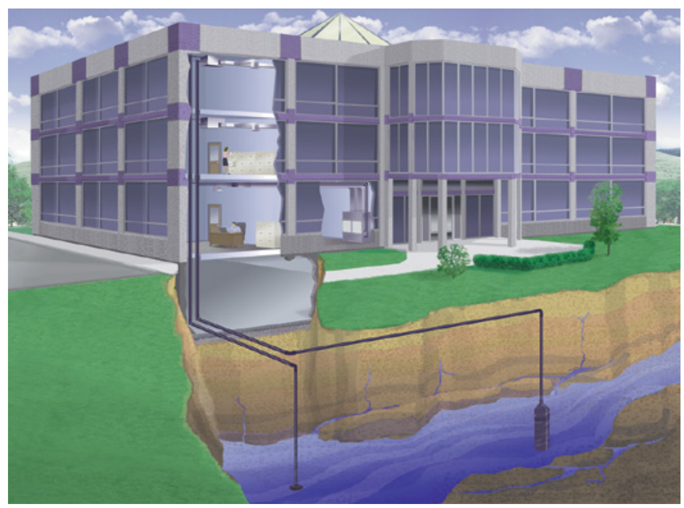
Figure 24: Boiler/tower Application



Open Loop Well Water Applications

"Open Loop" well water systems use ground water to remove or add heat to the interior water loop. The key benefit of an open loop system is the constant water temperature, usually 50ºF to 60ºF, which provides efficient operation at a low first cost. Most commercial designers incorporate a heat exchanger to isolate the building loop from the well water. Using heat exchangers can reduce maintenance issues while still allowing the transfer of heat from unit to unit as with the "Boiler/Tower System". A successful design provides an ample amount of groundwater (approximately 2 GPM per ton) and adequate provisions for discharging water back to the aquifer or surface. Open Loop applications are commonly used in coastal areas where soil characteristics allow reinjection wells to return the water back to the aquifer. Note that some states have requirements on the depths of return water reinjection wells, and such wells must be approved by the United States Environmental Protection Agency. Also, bad water quality can increase problems with heat exchanger scaling. Suspended solids can erode the heat exchanger. Strainers can be used to contain suspended solids.

Figure 25: Open Loop Well Application



Closed Loop Geothermal Applications

"Vertical Closed Loop" applications are installed by drilling vertical bore holes into the earth and inserting a plastic polyethylene supply/return pipe into the holes. The vertical wells are connected in parallel reverse return fashion to allow the water from the building to circulate evenly throughout the bore field. The circulating fluid dissipates heat to the ground in a similar manner as a "tower" and adds heat back to the loop like a boiler. If properly designed, the loop field can maintain the loop temperatures necessary to condition the building without the use of a boiler or a tower. Loop temperatures usually range from 37ºF to 95ºF in Northern climates. Southern applications can see temperatures ranging from 40ºF to 100ºF. The number of bore holes and their depth should be determined by using commercial software that is specifically designed for vertical geothermal applications. Typical bore depths of a vertical loop range from 150 to 400 feet and generally require about 250 feet of surface area per ton of cooling.

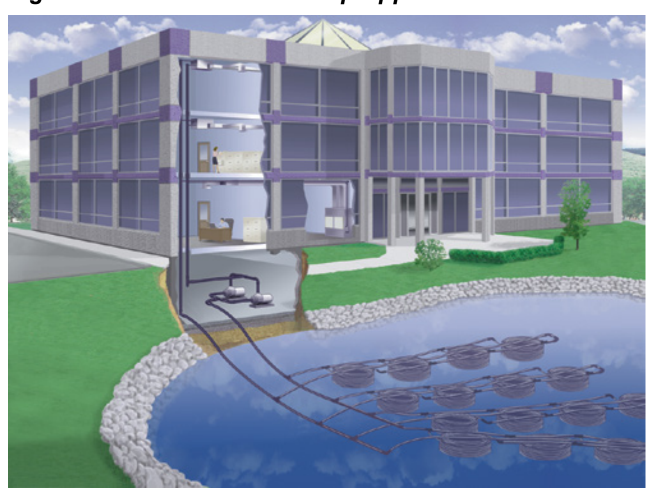
Figure 26: Vertical Loop Application

A closed loop "Horizontal" geothermal application is similar to a vertical loop application with the exception that the loops are installed in trenches approximately 5 feet below the ground surface. The piping may be installed using a "four-pipe" or "six-pipe" design and could require 1,500 to 2,000 square feet of surface area per ton of cooling. Loop temperatures for a commercial application can range from 35ºF to 95ºF in Northern climates. Southern climates can see temperatures ranging from 40ºF to 100ºF. Horizontal loops are generally not applied in urban areas because land use and costs can be prohibitive. New advances in installation procedures have improved the assembly time of horizontal loops while keeping the first cost lower than a vertical loop.

Figure 27: Horizontal Loop Application

A "Surface Water" or "Lake" closed loop system is a geothermal loop that is directly installed in a lake or body of water that is near the building. In many cases, the body of water is constructed on the building site to meet drainage or aesthetic requirements. Surface loops use bundled polyethylene coils that are connected in the same manner as a vertical or horizontal loop using a parallel reverse return design. The size and the depth of the lake is critical. Commercial design services should be used to certify that a given body of water is sufficient to withstand the building loads. Loop temperatures usually range from 35ºF to 90ºF and prove to be the best cooling performer and lowest cost loop option of the three geothermal loops. Some applications may not be good candidates due to public access or debris problems from flooding.

Figure 28: Surface Water Loop Application



Physical Data

Table 6: DOAS Unit Size 800-2400

Unit Size	800	1200		1600		2400
Fan Wheel - D x W (In.)	10 x 10					
Fan Motor Horsepower	3/4					
Fan Quantity	1	1	2	1	2	2
Coil Face Area (Sq. Ft.)	10.0					
Coil Rows	3	3		3		4
Refrigerant Charge (Oz.)	220	280				370
Filter, (Qty.) Size (In.)	(4) @ 16 x 25 x 2 or 16 x 25 x 4					
BPHE Water Volume (gal)	0.48	1.13				1.29
Water Connections, Female NPT (In.)	1.25					
Condensate Connection, Female NPT (In.)	.75					
Weight, Operating (Lbs.)	454	504	534	559	589	599
Weight, Shipping (Lbs.)	564	614	644	669	699	709
Units with Optional Pre-Heat Water Coil						
Pre-Heat Water Coil Volume (gal)	0.48	1.13				1.29
Weight, Operating (Lbs.) with Pre-heat Coil	507	557	587	612	642	652
Weight, Shipping (Lbs.) with Pre-heat Coil	617	667	697	722	752	762

Electrical Data

Table 7: DOAS Unit Size 800-2400

Unit Size	Voltage/Hz/ Phase	Fan Quantity	Compressor Motor #1		Compressor Motor #2		Total Fan FLA	Total Unit FLA	Minimum Voltage	Maximum Voltage	Unit MCA	Max. Fuse / HACR Size
			RLA	LRA	RLA	LRA						
800	208-230/60/3	1	14.0	83.1	11.6	73.0	6.6	32.2	187	253	35.7	45
	460/60/3		6.4	41.0	5.7	38.0	5.2	17.3	414	506	18.9	25
1200	208-230/60/3	1	16.2	110.0	14.0	83.1	6.6	36.8	187	253	40.9	50
	460/60/3		7.6	52.0	6.4	41.0	5.2	19.2	414	506	21.1	25
1200	208-230/60/3	2	16.2	110.0	14.0	83.1	13.2	43.4	187	253	47.5	60
	460/60/3		7.6	52.0	6.4	41.0	10.4	24.4	414	506	26.3	30
1600	208-230/60/3	1	17.6	136.0	16.5	110.0	6.6	40.7	187	253	45.1	60
	460/60/3		8.5	66.1	7.2	52.0	5.2	20.9	414	506	23.0	30
1600	208-230/60/3	2	17.6	136.0	16.5	110.0	13.2	47.3	187	253	51.7	60
	460/60/3		8.5	66.1	7.2	52.0	10.4	26.1	414	506	28.2	35
2400	208-230/60/3	2	26.9	164.0	25.3	184.0	13.2	65.4	187	253	72.1	90
	460/60/3		12.0	84.0	9.6	84.0	10.4	32.0	414	506	35.0	45

Note: All 460/60/3 units require 4-wire power which includes a neutral wire. EC motors on 460/60/3 volt units require a 265 volt power supply. Both a hot AND a neutral wire are required to obtain proper fan motor voltage. Therefore, 4-wires with a wye type wiring arrangement is required.

Operating Temperature Limits

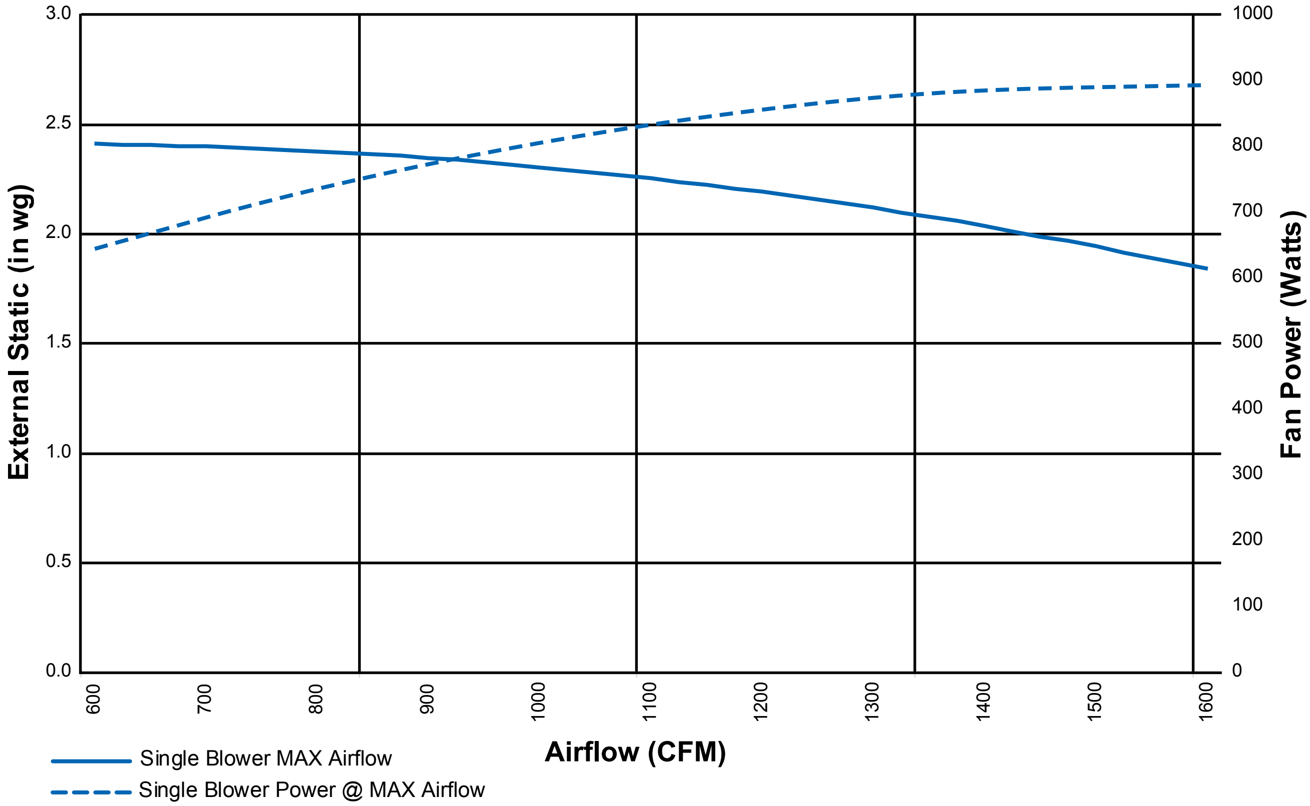
Table 8: DOAS Operating Temperature Limits

Operating Mode	Entering Air °F				Entering Water °F		Ambient Temperature °F	
	Minimum		Maximum		Minimum	Maximum	Minimum	Maximum
	DB	WB	DB	WB				
Cooling	56	51	115	82	30	110	50	100
Heating	0	n/a	70	n/a	30	90	50	85

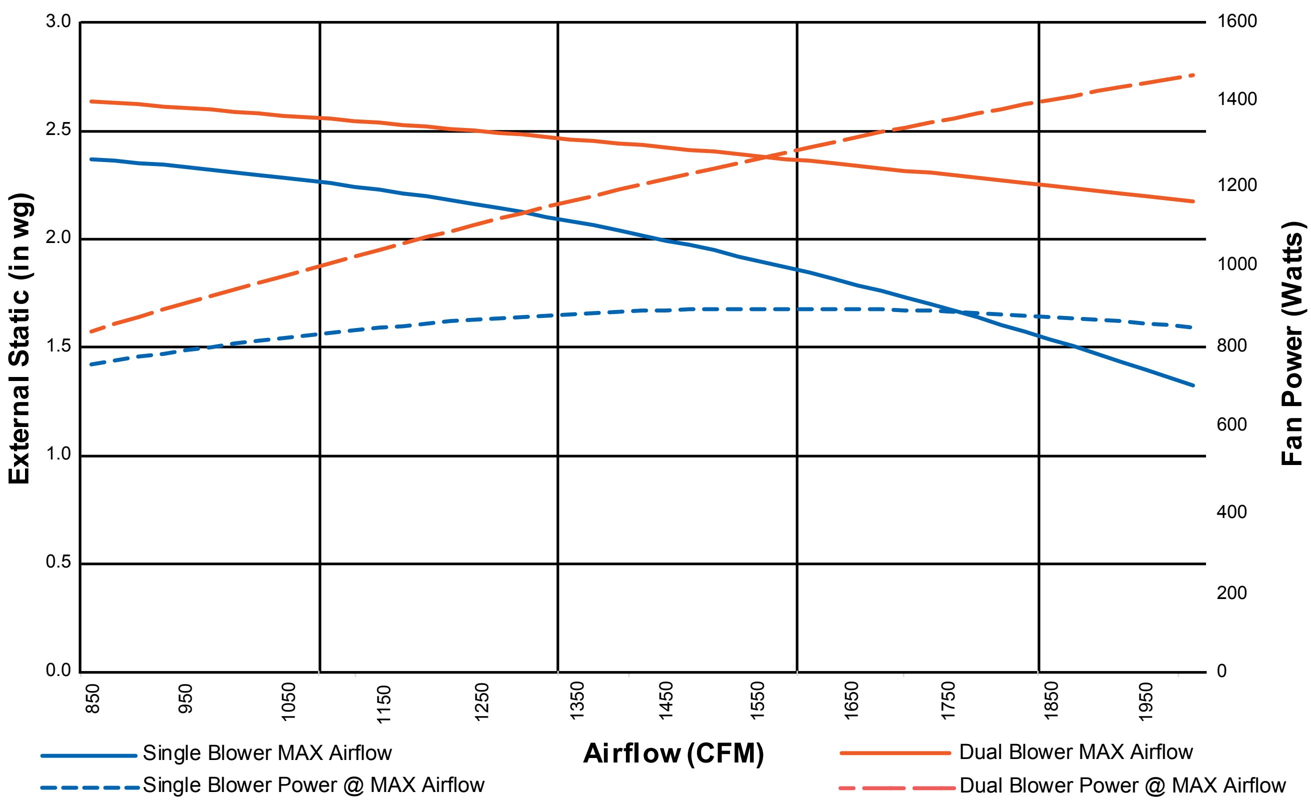
Fluid Flow Rate (GPM)	800	1200	1600	2400
Minimum	7.5	12.0	15.0	20.0
Maximum	20.0	32.0	40.0	53.3

Note: Maximum and minimum values may not be combined. If one value is at maximum or minimum, the other two conditions may not exceed the normal condition for standard units. Extended range units may combine any two maximum conditions, but not more than two, with all other conditions being normal conditions.

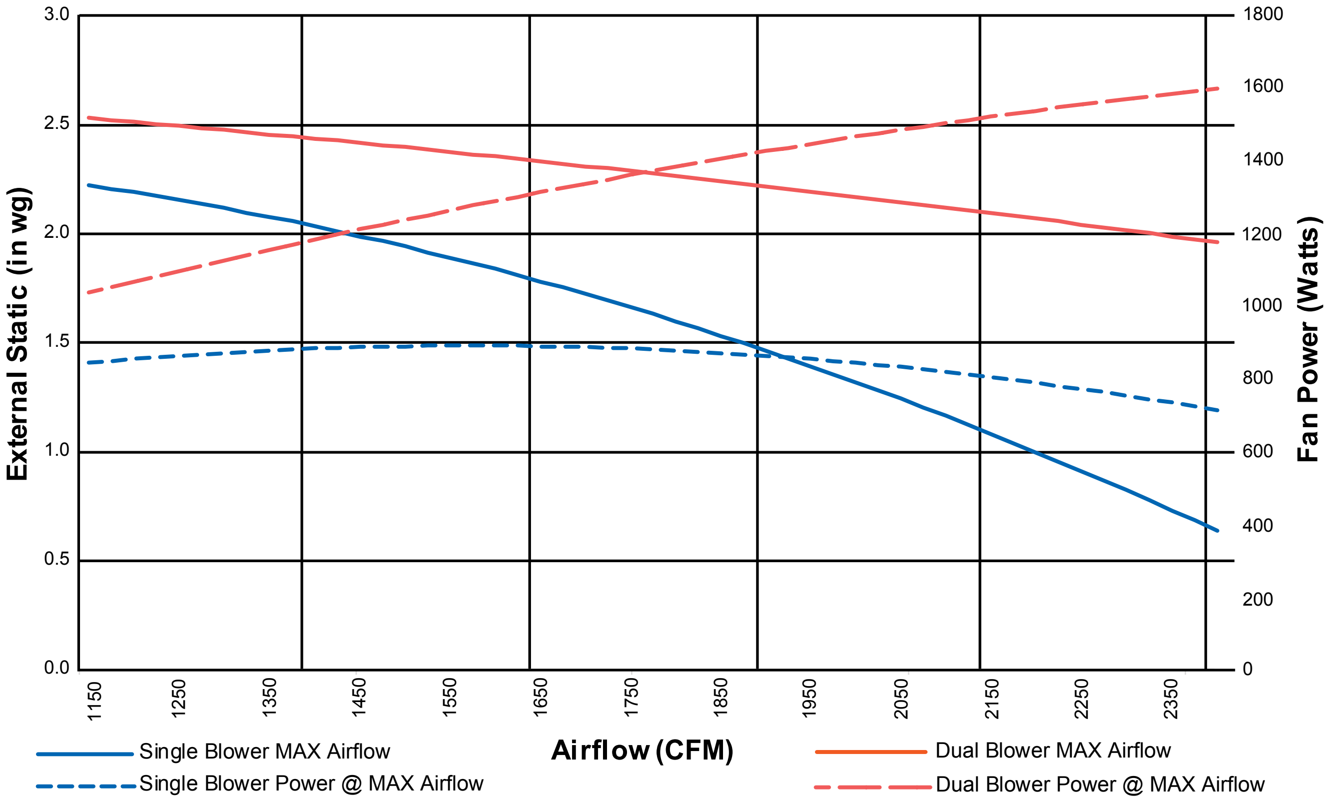
WGOV Size 008 Performance Curve



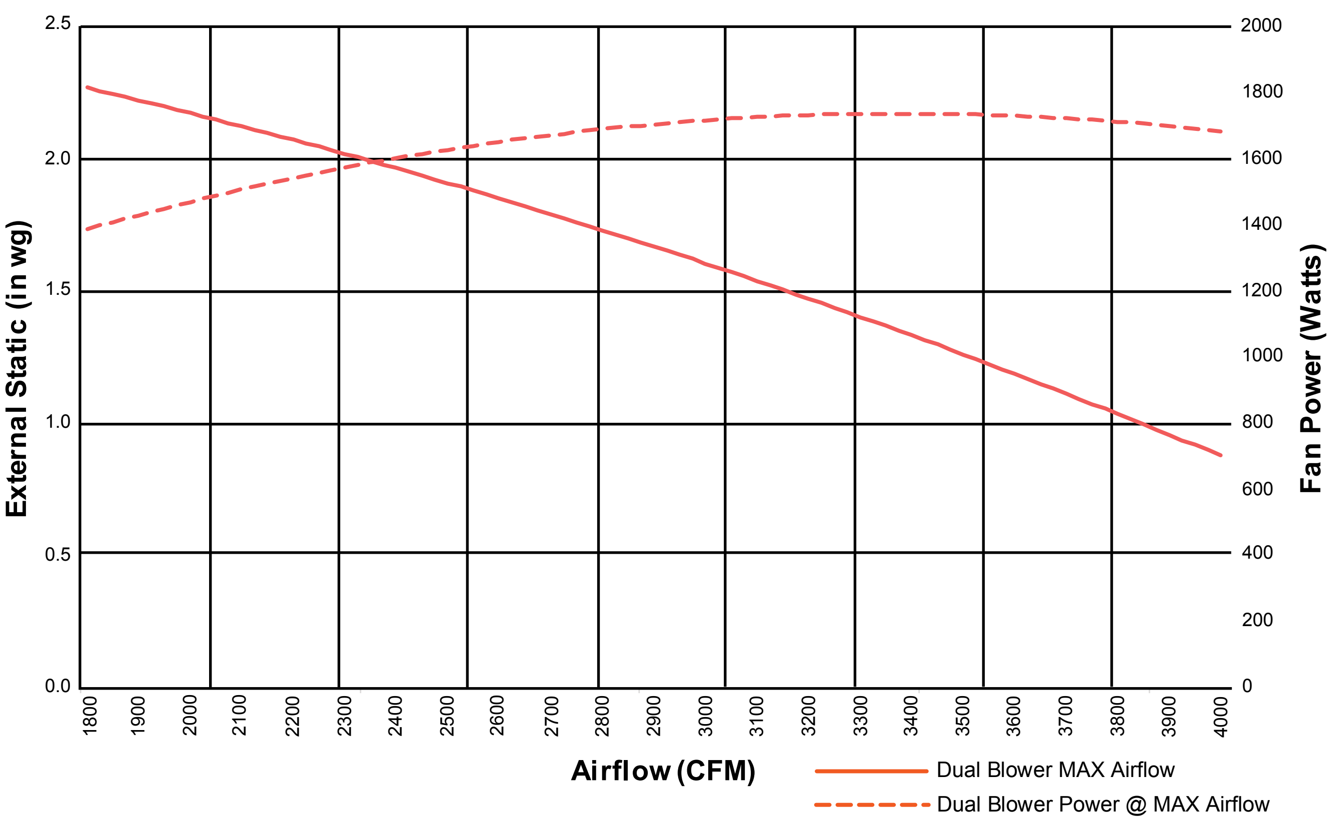
WGOV Size 012 Performance Curve



WGOV Size 016 Performance Curve



WGOV Size 024 Performance Curve



WGOV – Single Blower Sizes 800 – 1600

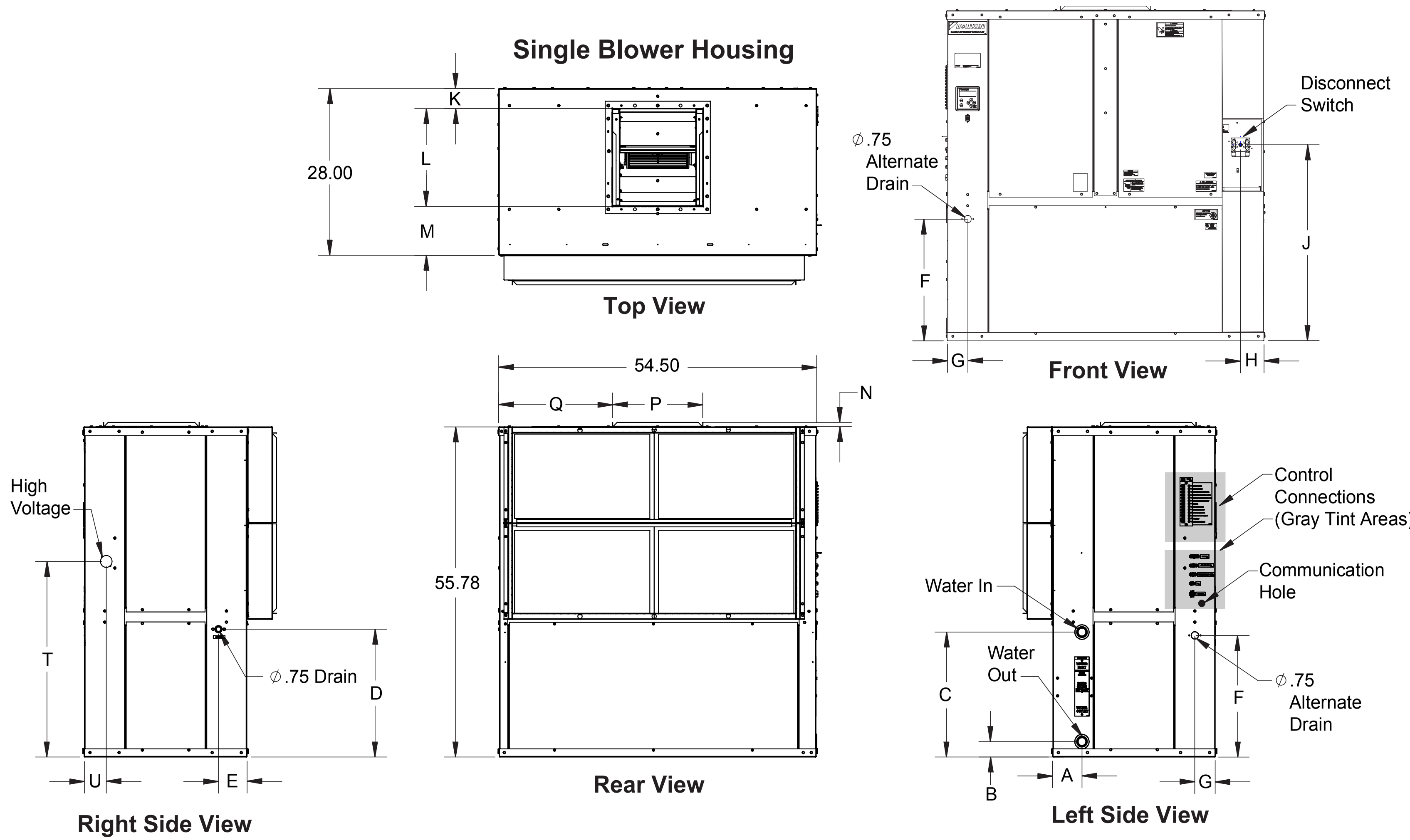


Table 9: Single Blower - Letter Dimensions

Unit Size	Water Connections			3/4" dia. Condensate Drain (Standard)		3/4" dia. Condensate Drain (Alternate Option)		Disconnect Switch		*Discharge Opening (Duct Flange)						Line Voltage Electrical Knockout	
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	T	U
800 1200 1600	5.1	2.6	21.1	21.6	4.9	20.5	3.5	4.1	33.1	3.4	16.5	8.3	.75	15.6	19.6	33.1	3.8

Note: * Discharge opening dimensions are to the outside edge of flanges bent out at 90 degrees at the perforations. Dimensions are approximate and dependent on degree of bend.

WGOV – Double Blower Sizes 1200 – 2400

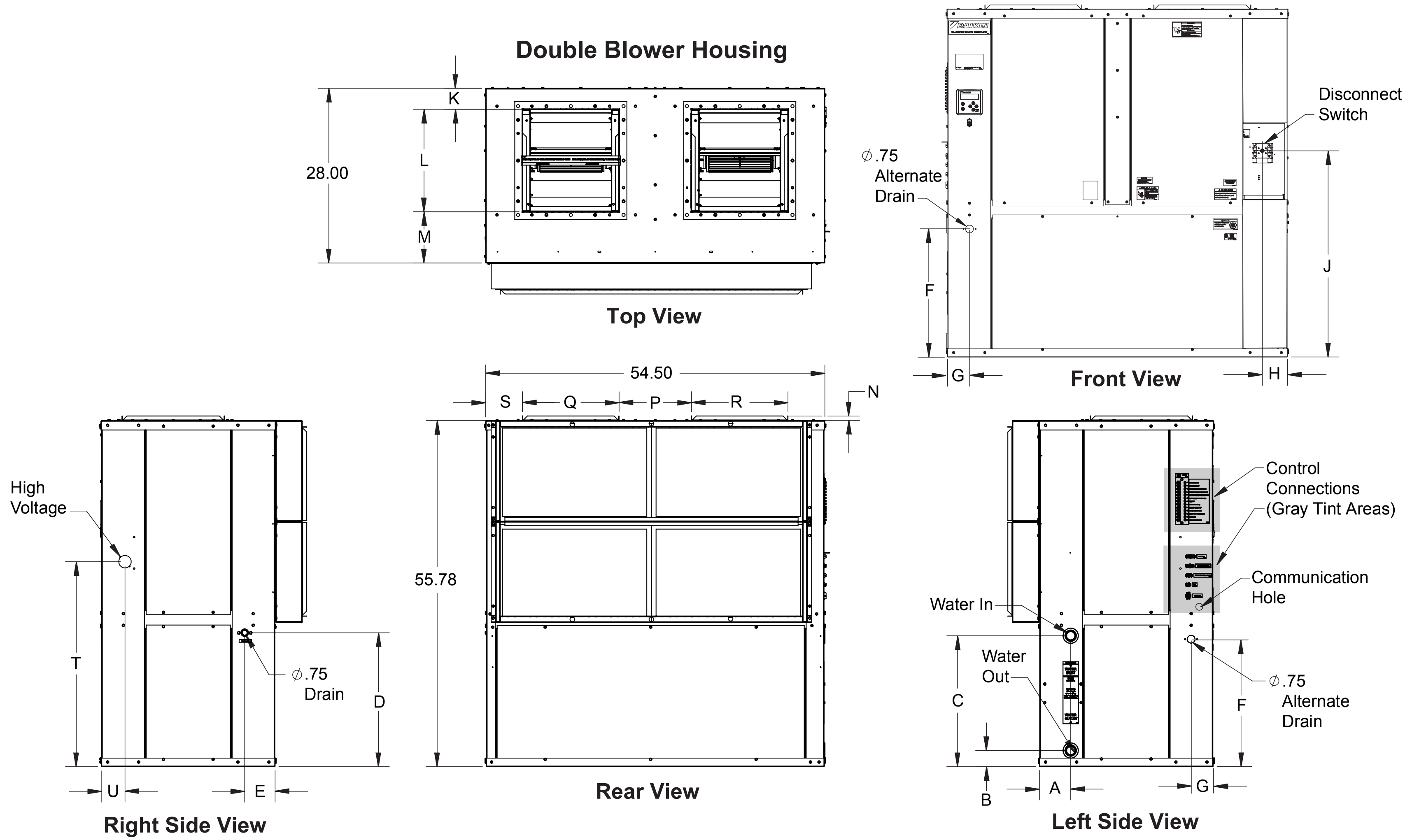


Table 10: Double Blower - Letter Dimensions

Unit Size	Water Connections			3/4" dia. Condensate Drain (Standard)		3/4" dia. Condensate Drain (Alternate Option)		Disconnect Switch		*Discharge Opening (Duct Flange)								Line Voltage Electrical Knockout	
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	U
1200 1600 2400	5.1	2.6	21.1	21.6	4.9	20.5	3.5	4.1	33.1	3.4	16.5	8.3	.75	11.7	15.6	15.6	5.9	33.1	3.8

Note: * Discharge opening dimensions are to the outside edge of flanges bent out at 90 degrees at the perforations. Dimensions are approximate and dependent on degree of bend.

WGOV – Filter Rack Dimensions

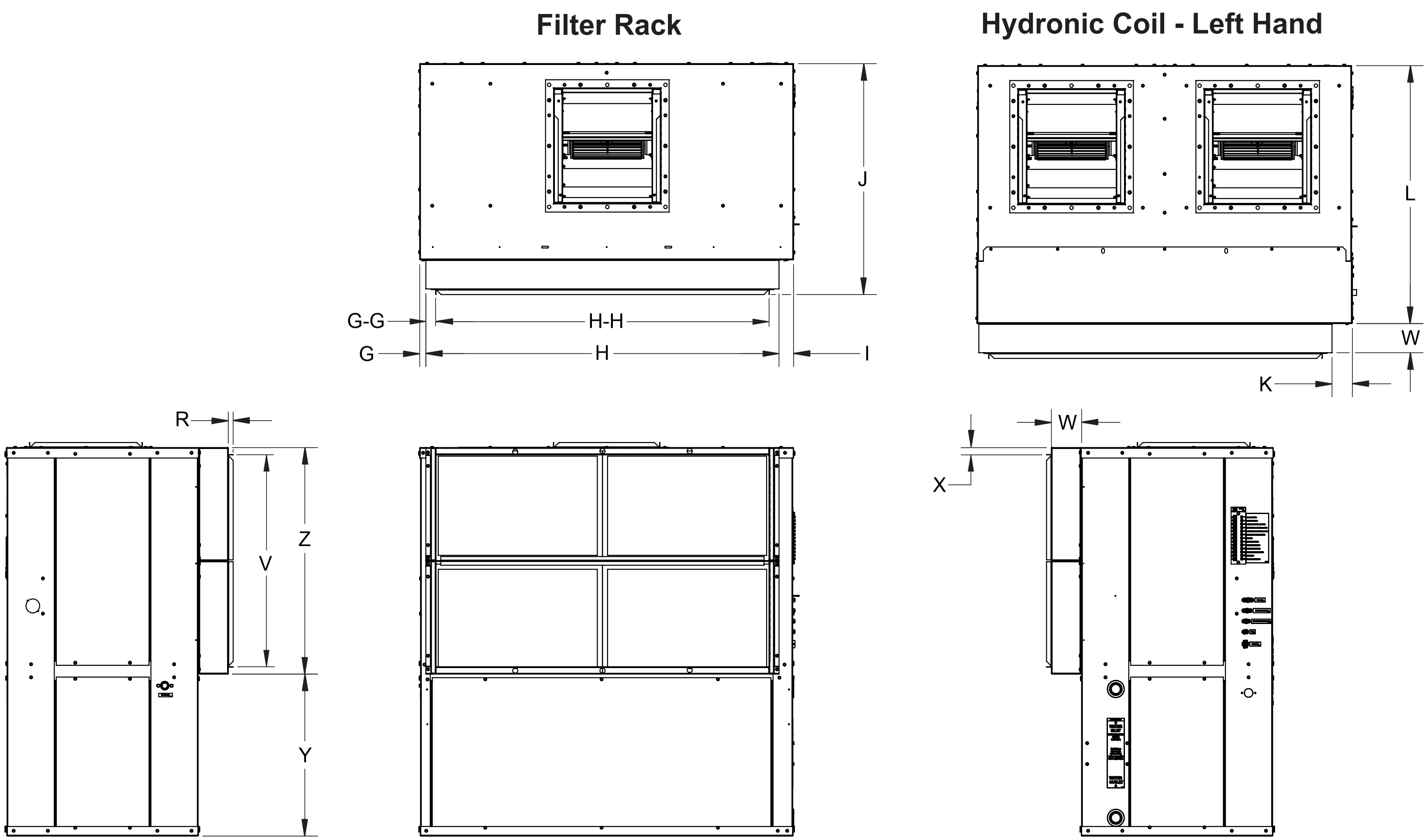


Table 11: Filter Rack and Hydronic Unit - Letter Dimensions

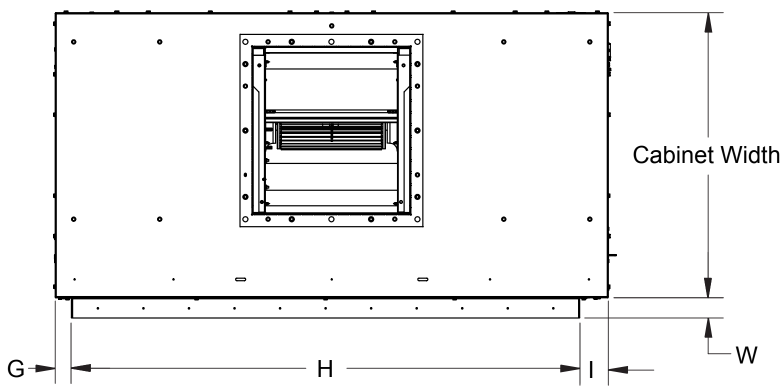
Unit Size	G	H	I	J	K	L*	R	V	W*	X	Y	Z	GG	HH
800	.93	51.6	2.1	30.4	3.0	37.1	0.75	30.5	2.3	1.0	23.3	32.5	1.4	48.8
1200														
1600														
2400														

***Notes:** Filter rack flange dimensions are to the outside edge of the flange when bent out to 90 degrees at perforations. Dimensions are approximate and dependent on degree of bend.

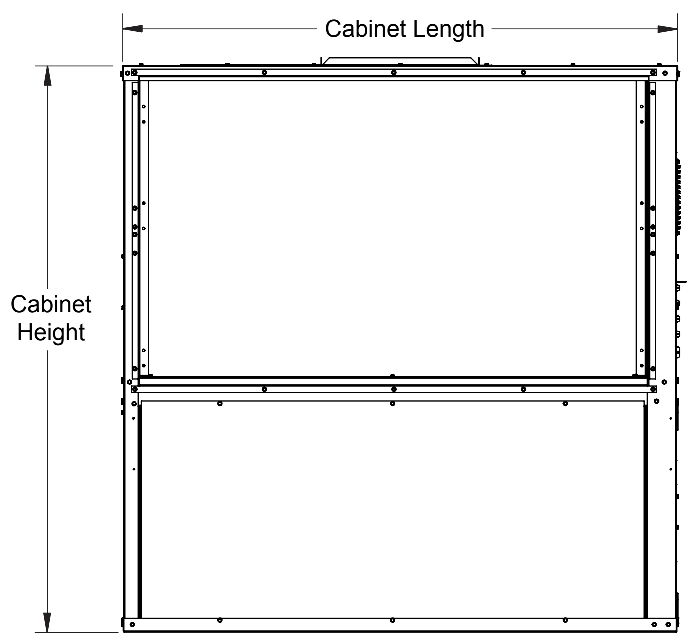
* Dimension "W" in table are units with a 2" deep filter rack. Add 2" to this dimension for a 4" deep filter rack.

WGOV – No Filter Rack, Duct Flange Only Dimensions

No Rack, Duct Flange Only



Overall Cabinet Dimensions
54.50L x 55.78H x 28W



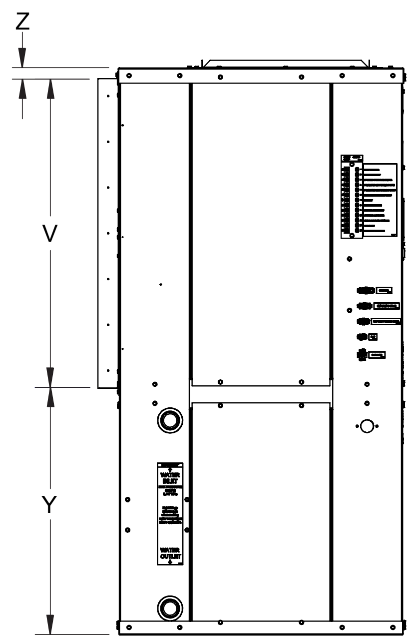
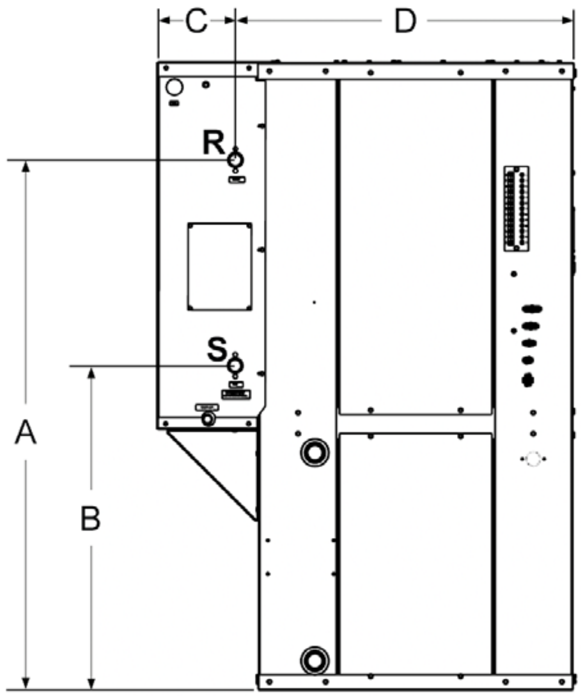


Table 12: No Filter Rack, Duct Flange Only - Letter Dimensions

<table>
<tr><th>Unit Size</th><th>G</th><th>H</th><th>I</th><th>V</th><th>W</th><th>Y</th><th>Z</th></tr>
<tr><td>800</td><td rowspan="4">1.6</td><td rowspan="4">50.3</td><td rowspan="4">2.8</td><td rowspan="4">30.4</td><td rowspan="4">2.0</td><td rowspan="4">24.3</td><td rowspan="4">1.1</td></tr>
<tr><td>1200</td></tr>
<tr><td>1600</td></tr>
<tr><td>2400</td></tr>
</table>

WGOV – Hydronic Pre-Heat Coil Connections – Sizes 800 – 2400



S = Supply **R** = Return

Table 13: Hydronic Pre-Heat Coil Connections - Letter Dimensions

Unit Size	Supply & Return Connections				Connections Size (FPT)
	Return	Supply	C	D	
	A	B			
800	47.1	28.9	7.0	30.1	1.0
1200					
1600					
2400					

SmartSource DOAS Guide Specs

General

Units shall be supplied completely factory assembled, piped, internally wired, fully charged with R-410A, vertical unit and capable of operating over an entering water temperature range from 30° to 110°F. Units shall be AHRI rated in accordance with Standard 920 and must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-60335-2-40 for the US and CAN/CSA-C22.2 NO. 236 for Canada. Each unit shall be ETL and ETLC Listed. Each unit shall be fully run tested at the factory. The installing contractor shall be responsible for furnishing and installing Water Source Heat Pumps as indicated on the plans and per installation instructions.

All units shall include:

- Insulated water-to-refrigerant heat exchanger
- Insulated refrigerant piping, designed to prevent sweating
- Refrigerant suction line low temperature safety device (freeze protection)

Casing and Cabinet

Unit cabinet shall be fabricated from heavy gauge G-60 galvanized sheet metal with a heavy gauge steel base pan. The base pan shall have holes to accept field installation of rubber or spring isolators. Interior surfaces shall be lined with 3/8-inch, closed cellular foam insulation in the airside section. Units with exposed fiberglass insulation in the air stream shall not be acceptable. Standard cabinet insulation must meet NFPA 90A/90B requirements and have a flame spread of less than 25 and a smoke developed classification of less than 50 per ASTM E-84. All air-side insulation shall confirm to mold growth limits in accordance with UL-181, fungi resistance per ASTM G21 or ASTM C 1338, and bacterial resistance per ASTM G22.

Cabinets shall have openings and knockouts for entrance of line voltage wiring. Supply and return water hoses shall connect directly to the heat exchanger. Units with water piping internal to the cabinet shall not be acceptable. Connections shall be 1.25" FPT and shall be flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench.

Drain Pan

Unit shall utilize a corrosion resistant stainless steel, insulated drain pan. Drain pan connection shall be ¾" FPT flush threaded fitting and have an internal, factory provided p-trap. The drain pan shall be designed to ensure no pooling of condensate water per ASHRAE 62.1. The unit will be supplied with solid-state electronic condensate overflow protection as standard. Mechanical float switches will not be accepted.

Refrigerant Circuit

Units shall have a R-410A sealed refrigerant circuit, which includes tandem, multi-stage scroll compressors, electronic expansion valve, water-to-refrigerant brazed plate heat exchanger, reversing valve, an aluminum lanced-fin and rifled copper tube refrigerant-to-air heat exchanger, aluminum micro-channel dual functioning condenser coil, fully modulating hot gas reheat valve and safety controls. The airside coils shall be rated at a minimum of 600 psig working pressure. The brazed plate heat exchanger shall be made of stainless steel and be rated at 500 psig working pressure on the waterside and 600 psig working pressure on the refrigerant side. Compressors shall provide a minimum of 8 stages of capacity control with a minimum capacity step of 33% or lower. Compressors shall have thermal overload protection. The compressors will be mounted on a heavy gauge compressor mounting rail. The rails shall be isolated from the cabinet base pan using rubber isolation grommets to minimize vibration transfer. Safety controls shall include a minimum of 3 safety devices; high refrigerant pressure switch, low refrigerant pressure switch and a low refrigerant suction temperature sensor. The low refrigerant suction temperature sensor shall provide freeze protection for the water coil and the air coil. Refrigerant gauge access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent the compressor from operating via a micro-controller alarm lockout. The alarm lockout shall be able to be reset at the local user interface, an optional space sensor, through a building management system, or by cycling the unit disconnect switch.

- Evaporator and HGRH coils shall be coated with an optional inorganic, silicon-based nano-ceramic coating that must pass a ASTM B-117 3,000 hour salt spray test to provide protection against corrosion due to acids, solvents, and salt found in the environment
- For additional sound attenuation, compressor blankets constructed from high performance sound material with superior sound absorption and deadening properties shall be provided. The sound rated material has a density of 1.5 lb./ft^2 and is made from a loaded vinyl reinforced barrier and is embedded with polyester fiber

Fan and Motor Assembly

Unit shall have a high efficiency blower housing with impeller driven by Axial Flux BLAC motor. Motor shall be electronically commutated type capable of constant or variable airflow control. Airflow level shall be programmable through the local user interface. Belt driven fan systems shall not be allowed.

Electrical

A control box shall be located within the unit and shall contain controls for compressors, electronic expansion valve, reversing valve, modulating hot gas reheat valve and fan motor operation. A transformer and a terminal block shall be included for low voltage field wiring connections. Unit shall be name-plated to accept time delay fuses or HACR circuit breaker for branch over-current protection of the power source.

Filter Rack and Filters

Units shall have factory-installed low leakage 2-inch, 4-sided combination filter rack with removable access door and ¾" duct collar for connection of entering air ductwork. Unit shall have factory provided 2-inch thick MERV 8 filters.

As an option to the standard filter rack the following may be provided:

- Factory-installed 4-inch thick MERV 13 filter
  - Units shall have factory-installed low leakage 4-inch, 4-sided combination filter rack with removable access door and ¾" duct collar for connection of entering air ductwork. Unit shall have factory provided 4-inch thick MERV 13 filters.
- Duct flange (no filters)
  - Units shall have factory-installed 2" duct collar for connection of entering air ductwork. Filters shall be field provided in entering air ductwork upstream of the unit.

Hydronic Pre-Heat Coil

An optional factory-installed hydronic pre-heat coil shall consist of an aluminum fin and copper tube water-to-air coil located between the unit filter rack and evaporator. A 2-10vdc, normal closed modulating control valve shall be field installed in the connected piping. Pre-heat shall only be utilized in the heating mode when the unit has reached maximum capacity and the discharge air set point cannot be achieved.

Non-Fused Disconnect Switch

This factory-installed option shall include the addition of a 3-pole switch mounted on the unit. The switch shall have a lockout/tag out feature. The switch shall be rated to handle all the voltages available for the unit.

Solid-State Control System

MicroTech control system - Unit shall be furnished with a factory installed and wired, microprocessor based DDC control system, by the manufacturer, which is pre-programmed, factory pre-tested prior to shipment and capable of complete, standalone unit control or incorporation into a building-wide network using standard BACnet communication capability. The unit control system shall include all required temperature sensors, EEV and MHGRH output boards, main microprocessor modules, Local User Interface key pad with digital multi-line OLED display, wiring and 24 volt power. Entering and discharge air sensors shall be shipped with the unit for field mounting in adjoining ductwork. The unit control logic shall provide automated airflow, dehumidification, heating and cooling operation to meet user defined set points.

The control system shall provide the following for stand-alone operation:

1. Automated selection of dehumidification, cooling or heating operation to meet user defined supply air temperature and humidity set points.
   - **a.** Dehumidification mode shall utilize compressor staging to cool and dehumidify the airflow to ensure the supply air dew-point temperature is below the user defined set point, then utilize hot gas reheat to achieve the user defined supply air dry-bulb temperature to an accuracy of +/- 1°F

2. User shall be able to select between Precision or Economy Cooling operation
   - **a.** Precision Cooling mode shall utilize compressor staging to cool the airflow to a point below the user defined supply air temperature setpoint, and then utilize minimal hot gas reheat to achieve the user defined supply air dry-bulb temperature to an accuracy of +/- 1°F
   - **b.** Economy Cooling shall utilize compressor staging to achieve the user defined supply air dry-bulb temperature without the use of reheat.

3. Heating mode shall utilize compressor staging, dynamic superheat control and the modulating reheat valve to achieve the user defined supply air dry-bulb temperature within +/-1°F under steady state conditions.

4. Constant or Variable air volume fan control. Variable air volume control can be based on:
    a. Maintaining a user defined duct static pressure set point (accessory sensor required)
    b. Maintaining a user defined building static pressure set point (accessory sensor required)
    c. Maintaining a user defined space CO_2 level (accessory sensor required)
    d. In response to an external 0-10vdc input
    e. Network input
5. Anti-short cycle time delay for compressor operation.
6. Random start up on power up mode.
    - Three-phase line voltage monitoring to protect against phase loss/reversal and unbalance
7. Single grounded connection to the "Emergency Shutdown" terminal will place the unit in the remote shutdown mode.
8. Ground signal to the "Occupancy" terminal will put the unit in night setback mode.
9. Unoccupied override function is available with the MicroTech control system using the optional space temperature sensor.
10. Brownout protection to suspend unit operation if the supply voltage drops below 80% of normal. This is low voltage protection.
11. Condensate overflow protection to suspend cooling operation or dehumidification, in an event of a full drain pan.
12. Unit protection during high or low refrigerant pressure conditions.
13. Low suction temperature sensor located in the compressor suction line to protect against coil freeze-up.
14. Method of defeating compressor, time delays for fast service diagnostics.
15. Intelligent alarm reset - clears re-settable faults the first two times they occur within a 7-day period and triggers lock-out on third fault that must be reset manually.
16. Freeze fault protection is based on the suction line temperature sensor and is used to help protect the unit from excessively low water and air coil temperature.
17. 24V output to cycle a motorized water valve when water flow is required
18. The low-pressure switch condition may exist for 30 seconds at compressor start up to avoid nuisance low pressure trips.
19. Display of all alarms on Local User Interface
20. BACnet Client-Server/Token Passing (MS/TP) allowing the unit to inter-operate with systems that use the BACnet (MS/TP) protocol with a conformance level of 3 meeting the requirements of ANSI/ ASHRAE 135-2008 standard for BACnet systems.
21. Unit controls shall allow for monitoring and adjustment via Daikin ServiceTools using a PC with Windows® 7 or newer operating systems. When using this PC and software, the unit shall be capable of reacting to commands for changes in control sequence and set points.

External Signal Connections

The unit shall have the following optional control outputs:

1. Remote Fault Indication (24vac output when an alarm is active)
2. Energy Recovery Ventilator Enable (24v output energized when unit fan is operating)
3. 2-Position Outside Air Damper (24vac output is energized when unit fan is operating)
4. Pump/Motorized Valve
    a. Normally Open contact provides a 24vac output when compressor operation is enabled
    b. Normally Closed contact provides a 24vac output when compressor operation is disabled
5. Modulating 0-10vdc Pre-Heat Output. Can be used to modulate the accessory hot water pre-heat valve or a field supplied electric duct heater

The unit shall have the following optional control inputs:

1. Dirty Filter Switch. A remote dry contact closure initiates a dirty filter alert status
2. Energy Recovery Feedback. A remote dry contact closure initiates ERV Alarm status and disables unit operation
3. Occupancy. A remote dry contact closure indicates an unoccupied state.
4. Emergency Shutdown. A remote dry contact closure will disable unit operation
5. Hydronic (Pre-Heat Coil) Freezestat. A 24vac input will indicate normal conditions and 0 vac a loop freeze condition that will disable unit operation
6. Duct High Limit Switch. A 24vac input will indicate normal conditions and a 0 vac input excess duct static pressure that will disable unit operation

Optional Sensors:

- Wall mounted room temperature sensor with timed-override button. This sensor allows for discharge air temperature reset functionality and for space temperature monitoring. The override button will enable unit operation for a 1 hour period when pressed during an unoccupied period.
- Wall mounted room humidity sensor. This sensor allows for space humidity monitoring only.
- Duct mounted static pressure sensor. This sensor is required to provide variable airflow volume based on constant supply duct static pressure.
- Building static pressure sensor. This sensor is required to provide variable airflow volume based on constant building static pressure.
- Wall Sensor space CO_2 sensor. This sensor is required to provide variable airflow volume based on maintaining an acceptable space CO_2 level.
- High Duct Static Switch. This switch is required on all variable airflow applications and acts as a safety to avoid over pressurization of the supply ductwork.
- Pipe mounted entering and leaving water temperature sensors. The optional entering water temperature (EWT) sensor can be used for an additional measure of freeze protection by locking out the heating function based on low EWT. The optional leaving water temperature (LWT) sensor is available to provide LWT as information only.
- Outdoor Airflow Sensor. This sensor can be used to validate the ventilation airflow rate.
- Dirty Filter Switch. This sensor is used to generate a dirty filter condition warning when the pressure drop across the filter exceeds the switch set point.

Hose and Valve Kits

Supply and Return Hose Kits

Two fire-rated flexible hoses with ASTM ratings of Flame Spread 25, Fuel Contribution 25 and Smoke Density 50 for connection to unit and field piping. Hoses shall be covered with stainless steel braiding to prevent damage. All hose kits shall include two ball valves and a high flow 20 mesh Y-strainer with blowdown. An automatic flow control valve may also be included. The automatic flow control valve shall be factory set to a rated flow and shall automatically control the flow to within 10% of the rated value over a 40 to 1 differential pressure, operating range (2 to 80 PSID). Operational temperature shall be rated from fluid freezing, to 225°F. The valve body shall be constructed from hot forged brass UNS C37700 per ASTM B-283 latest revision. For details on hose kits refer to catalog 1196.

Motorized Valve Kits

- Optional 1-1/4", 2-way, Normally Closed (N.C.) motorized valve with 24vac actuator.
- Optional 1.0", 2-way, Normally Closed (N.C.) motorized valve with 2-10vdc actuator for use with Hydronic pre-heat option.
- Optional 1.0", 3-way, motorized valve with 2-10vdc actuator for use with Hydronic pre-heat option.

Warranty

Standard Warranty

- The standard unit warranty covers all parts for a period of 1 year after start-up, or 18 months after shipment; whichever occurs first.

Optional Warranty

- An optional 1 or 4-year extended compressor warranty covers the compressor from the date at which the unit ships from the factory.
- An optional 1 or 4-year extended refrigeration circuit warranty covers the entire refrigeration circuit and related components.
- An optional 1 or 4-year extended complete unit warranty covers the entire unit and related components.

Daikin Applied Training and Development

Now that you have made an investment in modern, efficient Daikin equipment, its care should be a high priority. For training information on all Daikin HVAC products, please visit us at www.DaikinApplied.com and click on Training, or call 540-248-9646 and ask for the Training Department.

Warranty

All Daikin equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin Applied representative for warranty details. Refer to Form 933-430285Y. To find your local Daikin Applied representative, go to www.DaikinApplied.com.

Aftermarket Services

To find your local parts office, visit www.DaikinApplied.com or call 800-37PARTS (800-377-2787). To find your local service office, visit www.DaikinApplied.com or call 800-432-1342.

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Products manufactured in an ISO Certified Facility.