Turn to the experts

Product Data

Aquazone™ 50PCH 009-070

Compact Water Source Heat Pumps with Puron® Refrigerant (R-410A), 50 Hz

1.8 to 21.1 Nominal kW

AQUAZONE™

Features/Benefits

Carrier's Aquazone WSHPs are an efficient, compact solution for new construction and retrofit applications.

Single-package horizontally mounted water source heat pumps (WSHPs) with compact cabinet and standard features:

- Compact design allows for replacement of legacy WSHPs from Carrier and other manufacturers
- Cabinet constructed of heavy gauge galvanized steel to ensure long service life
- Interior panels feature an acoustical fiberglass lining for quiet operation.
- Large access panels for ease of maintenance and service
- Suitable for boiler/tower loop and geothermal loop applications with operating range of –3.9°C to 43.3°C entering water temperature
- Rotary (size 009-018) or scroll (size 024-070) compressors
- Double isolated compressor mounting for quiet operation
- Non-ozone depleting Puron refrigerant (R-410A)
- Direct drive fan assembly with Permanent Split Capacity (PSC) motor on size 009-012 or Constant Airflow Electronically Commutated Motor (ECM) or size 015-070
- Factory installed unit protection module (UPM) ensures reliable operation and simplifies troubleshooting
- Manufactured in an ISO 9001 certified facility
- All units are Communauté Européenne (CE) labeled

Operating efficiency

Aquazone WSHP units offer cooling SEERs (seasonal energy efficiency ratios) to 5.23 and heating SCOPs (seasonal coefficients of performance) to 4.91.

All efficiencies stated are in accordance with standard conditions under European Standard EN 14825:2018.

High quality construction and testing

All units are manufactured to meet extensive quality control standards. An automated control system provides continuous monitoring of each unit and performs quality control checks as equipment progresses through the production process. An automated end of line run test verifies component functionality. Units are produced in an ISO 9001 production facility.

Construction

Heavy gauge galvanized sheet metal cabinet construction enables part standardization (i.e., minimal number of parts) and modular design. Cabinet interior surfaces are lined with 12.7 mm thick, acoustic type insulation with a clear acoustic coating. Sheet metal surfaces are treated for maximum corrosion protection to provide resilience for long term vitality. Compact cabinet dimensions fit tight space limitations. All 50PC units include a stainless steel condensate pan for corrosion protection.

Compressor

Compact Aquazone units include a rotary compressor in sizes 009-018 and a scroll compressor in sizes 024-060. Compressors are mounted on an isolated system (i.e., from the cabinet) that maximizes vibration isolation and minimizes transmission to the unit structure.

Blower and motor assembly

Permanent split capacitor (PSC) motors are standard for sizes 009 and 012. All PSC motors have three speed taps for field airflow adjustment.

Constant airflow Electronically Commutated Motors (ECM) are standard for all unit sizes 015-070. Units with ECM motors include a motor controller that allows the airflow to be adjusted between nominal airflow, nominal +15% and nominal –15%.

Hanging brackets

All horizontal units come standard with hanging bracket kits for suspending the unit from field-supplied hanger rods. These kits include heavy duty steel brackets and rubber grommets for sound and vibration isolation from the building structure.

Water connections

All water connections are heavy duty bronze FPT fittings securely fastened to the unit corner post. This allows connecting to a flexible hose kit without the use of a backup wrench making for easier, faster installation.

Refrigeration/water circuit

All units have a sealed refrigerant circuit (including a rotary or scroll compressor), reversing valve (4-way valve), water-to-refrigerant coaxial (tube-in-tube) coil, enhanced aluminum fin/rifled copper tube (air-to-refrigerant heat exchanger) coil, and a thermostatic expansion valve (TXV) metering device.

All units include an insulated coaxial water coil to allow the unit to operate with low entering water temperatures without condensation developing in the unit cabinet.

The refrigerant circuit design has been optimized to ensure efficient and reliable operation, while being easy to maintain and troubleshoot.

CE Labeled

Aquazone units have CE (Communauté Européenne) labels and are factory tested under normal operating conditions at nominal water flow rates.

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Features/Benefits (cont)

Quiet operation

All 50PC units have a unique floating basepan; the compressor is mounted on a heavy steel plate which rests on a high density rubber pad on the base of the unit. In addition, compressors are mounted on rubber grommets. This double isolation is standard in all 50PC units preventing vibration and noise transmission from the compressor to the unit structure, resulting in exceptionally quiet operation.

Cabinets are fully insulated to reduce noise transmission, low speed blowers are used for quiet operation through reduced outlet air velocities, and air-to-refrigerant coils are designed for lower airflow coil face velocities. A factory installed mute package with a compressor sound blanket (sizes 024-070) or acoustical closed cell foam insulation is available for noise sensitive applications.

Indoor air coil

All units come standard with a copper coil aluminum fin evaporator coil. These evaporator coils employ lanced fin and rifled tubing for maximum heat transfer. Large face areas result in lower face velocity reducing sound while ensuring high latent heat removal for maximum dehumidification in the cooling mode.

Design flexibility

Airflow configurations for horizontal units are available in patterns including left or right return, straight through or end discharge. Horizontal units are field convertible between straight through (left or right) discharge and end discharge.

Safe, reliable operation

Standard safety features for the refrigerant circuit include a high-pressure switch and low-pressure sensor to detect refrigerant loss. Equipment safety features include water loop temperature monitoring, voltage protection, water coil freeze protection, and standard electronic condensate overflow shutdown. All safety features are tested and run at the factory to assure proper operation of all components and safety switches.

All components are carefully designed and selected for endurance, durability, and carefree day-to-day operation.

The Aquazone™ unit is shipped to provide internal and external equipment protection. Shipping supports are placed under the blower housing and compressor feet. In addition, horizontal units are both mounted on oversized pallets with lag bolts for sturdiness and maximum protection during transit.

Ease of installation

The Aquazone unit is packaged for simple low cost handling and requires minimal installation. All units are prewired and factory charged with refrigerant. Horizontal units include factory-installed hanger isolation brackets. Water connections (FPT) and condensate drains (FPT) are 19.05 mm in diameter and are anchored securely to the unit cabinet.

Simple maintenance and serviceability

The Aquazone WSHP units are constructed to provide easy maintenance. All units allow easy access to the compressor section from 2 sides with large removable panels. Additional panels allow access to the blower and control box sections.

The blower housing assembly can be serviced without disconnecting ductwork from the dedicated blower access panel. Blower units come with permanently lubricated bearings for worry-free performance. Blower inlet rings allow blower wheel removal without having to remove the housing or ductwork connections.

Electrical disconnection of the blower motor and control box is easily accomplished via quick disconnects on each component.

Easy removal of the control box from the unit provides access to all refrigeration components.

The refrigeration circuit is easily tested and serviced through high and low pressure ports integral to the refrigeration circuit.

Maximum control flexibility

All Aquazone water source heat pumps feature a factory installed and configured unit protection module (UPM), which regulates unit operation, monitors the unit safeties, and simplifies unit troubleshooting.

Unit control is accomplished using the included heat pump thermostat style inputs (C,O,Y1,R,G) for use with a field-provided thermostat. The thermostat signals are sent to the UPM, which controls the unit compressors and reversing valve, and monitors the refrigerant circuit safeties to ensure proper operation.

The UPM also includes an LED fault indicator and test mode to simplify unit troubleshooting. Additional features and functions of the UPM include:

Anti-short cycle timer

The anti-short cycle timer provides a minimum off time to prevent the unit from short cycling. The 5-minute timer energizes when the compressor is deenergized, resulting in a 5-minute delay before the unit can be restarted.

Random start relay

Random start delay provides a random delay in energizing each different WSHP unit. This option minimizes peak electrical demand during start-up from different operating modes or after building power outages. Each controller has a unique random start delay ranging from 270 to 300 seconds after power is applied to the board.

High and low pressure refrigerant protection

High and low pressure refrigerant protection safeguards against unreliable unit operation and prevents refrigerant from leaking.

Condensate overflow sensor

The condensate overflow sensor is an electronic sensor mounted to the drain pan. When condensate pan liquid reaches an unacceptable level, the unit is automatically deactivated and placed in a lockout condition. The sensor recognizes 30 continuous seconds of overflow as a fault condition.

High and low voltage protection

High and low voltage protection provides safety protection from excessive or low voltage conditions.

Automatic intelligent reset

Automatic intelligent reset will automatically restart unit 5 minutes after shutdown if the fault has cleared. Should a fault occur 3 times sequentially, lockout will occur.

Features/Benefits (cont)

Water coil freeze protection (selectable for water or antifreeze)

Water coil freeze protection provides a field selectable switch for water and water/glycol solution systems which initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Air coil freeze protection (check filter operation)

Air coil freeze protection provides a field selectable switch for assessing excessive filter pressure drop. The switch initiates a fault when temperatures exceed the selected limit for 30 continuous seconds.

Alarm relay setting

Alarm relay setting is a selectable 24-v or pilot duty dry contact for activating a remote alarm.

Low pressure bypass timer

The low pressure switch is bypassed for 120 seconds after a call for compressor operation to prevent nuisance low pressure lockouts during cold start-up in the heating mode.

Service Test mode with diagnostic LED (light-emitting diode)

Service Test mode allows service personnel to check the operation of the WSHP and control system efficiently. Upon entering Test mode, time delays speed up, and the Status LED flashes a code to indicate the last fault experienced. This mode provides easy fault diagnosis; based on the fault code that the status LED flashes, Carrier troubleshooting tables provide easy reference to typical problems.

Puron® refrigerant (R-410A)

Puron refrigerant (R-410A) is a non-chlorine based environmentally balanced, non-ozone depleting refrigerant. Puron refrigerant characteristics, compared to R-22, have:

- Binary and near azeotropic mixture of 50% R-32 and 50% R-125.
- Higher efficiencies (50 to 60% higher operating pressures).
- Virtually no glide. Unlike other alternative refrigerants, the two components in Puron refrigerant have virtually the same leak rates. Therefore, refrigerant can be added if necessary without recovering the charge.

Model number nomenclature

50PCH 024 B C C 7 F C A 1

Puron® Single-Stage Water Source Heat Pump
50PCH – Horizontal Configuration

Nominal Capacity - kW (Tons)

009 – 1.8 kW (3/4 Ton)
012 – 3.5 kW (1 Ton)
015 – 4.4 kW (1 1/4 Ton)
018 – 5.3 kW (1 1/2 Ton)
024 – 7.0 kW (2 Ton)
030 – 8.8 kW (2 1/2 Ton)
036 – 10.6 kW (3 Ton)
042 – 12.3 kW (3 1/2 Ton)
048 – 14.1 kW (4 Ton)
060 – 17.6 kW (5 Ton)
070 – 21.1 kW (6 Ton)

Airflow Configuration
50PCH

	Return	Discharge	Blower Motor
B	Right	Back	PSC
E	Left	Right	PSC
C	Right	Left	CA ECM
D	Right	Back	CA ECM
S	Left	Back	PSC
F	Left	Right	CA ECM
G	Left	Back	CA ECM
Z	Right	Left	PSC

LEGEND
CA — Constant Airflow
ECM — Electronically Commutated Motor
PSC — Permanent Split Capacitor

Refrigerant Circuit Options
C – Copper (Standard)

Control
C – Standard Complete C Microprocessor Control

Voltage
7 – 220/240-1-50 (sizes 009-036)
9 – 380/540-3-50 (sizes 030-070)

Revision Code
F – CE Rated Units (50Hz)

Valve Options
C – None

Operating Range/Sound Option
A – Extended Range (-3.9 to 43.3 C)
D – Extended Range with Closed Cell Foam (CCF)
F – Extended Range with CCF, Mute Package
J – Extended Range with Mute Package

Factory Installed Options
1 – 1 in. Filter with 2 Sided Filter Rack
8 – 2 in. MERV 8 Filter with 4 Sided Filter Rack
9 – 2 in. MERV 13 Filter with 4 Sided Filter Rack

Capacity ratings

50PC UNIT SIZE	PSC MOTOR (BASE) WATER LOOP HEAT PUMP							
	COOLING 30°C				HEATING 20°C			
	Cooling Cap (kW)	Cooling Power (kW)	SEER	SEERon	Heating Cap (kW)	Heating Power (kW)	SCOP	SCOPon
009	1.51	0.70	2.16	–	3.0	0.58	4.51	4.49
012	2.64	1.01	3.72	–	3.72	0.86	3.79	3.78

50PC UNIT SIZE	CA ECM MOTOR (BASE) WATER LOOP HEAT PUMP							
	COOLING 30°C				HEATING 20°C			
	Cooling Cap (kW)	Cooling Power (kW)	SEER	SEERon	Heating Cap (kW)	Heating Power (kW)	SCOP	SCOPon
015	3.57	1.12	3.21	–	4.21	0.85	4.35	4.34
018	4.46	1.0	4.76	4.89	4.86	1.01	4.91	4.19
024	6.15	1.57	5.14	5.22	7.19	1.28	4.48	4.91
030	7.03	1.57	4.73	4.79	8.47	1.66	4.48	4.48
036	9.01	1.87	5.23	5.29	9.31	1.89	4.31	4.31
042	10.13	2.21	4.82	4.87	10.77	2.20	4.28	4.28
048	11.70	2.56	4.95	5.00	14.86	2.97	4.37	4.37
060	15.55	3.44	4.51	–	18.60	3.93	4.15	4.14
070	15.78	3.50	4.52	–	19.12	3.70	4.53	4.52

LEGEND

SCOP — Seasonal Coefficient of Performance
SEER — Seasonal Energy Efficiency Ratio
SCOPon/SEERon — Active Mode Ratings

NOTE: Ratings in accordance with EN 14825:2018

Physical data

PHYSICAL DATA — 50PCH,PCV009-070 UNITS CE RATED

50PCH UNIT	009	012	015	018	024	030
COMPRESSOR (1 each)	Rotary	Rotary	Rotary	Rotary	Scroll	Scroll
Maximum Water Working Pressure (kPa)	2758	2758	2758	2758	2758	2758
PSC FAN MOTOR AND BLOWER						
Fan Motor Type	PSC	PSC	ECM	ECM	ECM	ECM
Fan Motor (W)	75	75	249	249	249	249
Blower Wheel Size (Dia x W) (mm)	114.3 x 114.3	139.7 x 114.3	228.6 x 177.8	228.6 x 177.8	228.6 x 177.8	228.6 x 177.8
WATER CONNECTION SIZE						
FPT (in.)	3/4	3/4	3/4	3/4	3/4	3/4
Coaxial Coil Volume (L)	0.23	0.29	0.36	0.55	0.90	0.90
HORIZONTAL CABINET						
Refrigeration Charge (kg)	0.45	0.54	0.54	0.62	0.99	0.99
Air Coil Dimensions (cm) (H x W)	25.4 x 35.6	25.4 x 35.6	30.5 x 41.9	40.6 x 41.9	40.6 x 52.1	40.6 x 52.1
Standard Filter - 2.5 cm Throwaway (cm) (L x H)	25.4 x 40.6	25.4 x 40.6	40.6 x 50.8	40.6 x 50.8	40.6 x 63.5	40.6 x 63.5
Weight - Operating (kg)	45	48	62	79	82	86
Weight - Shipping (kg)	60	61	72	94	96	102

50PCH UNIT	036	042	048	060	070
COMPRESSOR (1 each)	Scroll	Scroll	Scroll	Scroll	Scroll
Maximum Water Working Pressure (kPa)	2758	2758	2758	2758	2758
PSC FAN MOTOR AND BLOWER					
Fan Motor Type/Speeds	ECM	ECM	ECM	ECM	ECM
Fan Motor (W)	373	373	559	559	559
Blower Wheel Size (Dia x W) (mm)	228.6 x 177.8	254 x 203.2	254 x 203.2	279.4 x 228.6	279.4 x 228.6
WATER CONNECTION SIZE					
FPT (in.)	3/4	3/4	1	1	1
Coaxial Coil Volume (L)	1.31	1.31	1.86	2.32	2.32
HORIZONTAL CABINET					
Refrigeration Charge (kg)	1.13	1.22	1.45	1.76	1.73
Air Coil Dimensions (cm) (H x W)	45.7 x 69.9	45.7 x 69.9	50.8 x 81.3	50.8 x 81.3	50.8 x 106.7
Standard Filter - 2.5 cm Throwaway (cm) (L x H)	45.7 x 76.2	45.7 x 76.2	50.8 x 87.6	50.8 x 87.6	50.8 x 61.0 (2)
Weight - Operating (kg)	103	105	125	131	143
Weight - Shipping (kg)	123	120	136	144	166

LEGEND

ECM — Electronically Commutated Motor
FPT — Female Pipe Thread
PSC — Permanent Split Capacitor

Factory-installed options

Closed cell foam (CCF) insulation

Closed cell foam insulation is available as a factory installed option on all 50PC units. 12.7mm CCF insulation is installed on all side panels and the unit top panel to help reduce radiated sound from the compressor and supply fan.

Mute package

The Mute package includes a factory installed foam sound blanket on the compressor to reduce compressor radiated sound. The Mute package is only available on units with a scroll compressor (size 024-070).

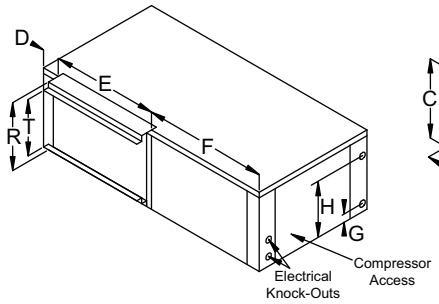
Multiple filter options

Multiple filter options are available for the 50PC. The standard filter is a 1 in. throwaway filter. All units are available with an upgrade to a 2 in. MERV 8 filter for improved indoor air quality. Units with an ECM motor are also available with a 2 in. MERV 13 filter for applications requiring high grade filtration.

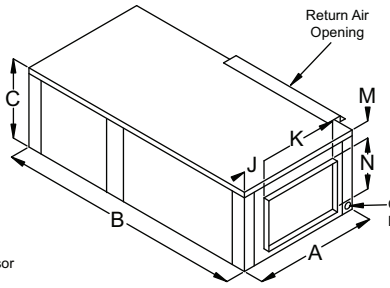
The standard filter rack is a 1 in. rack with top and bottom rails to allow easy removal of the filter from either side of the filter rack. Units ordered with a factory installed 2 in. filter option include a 4-sided filter rack for improved sealing around the filter media. 4-sided filter racks include bottom and top rails with tool-less side clips for easy filter changing.

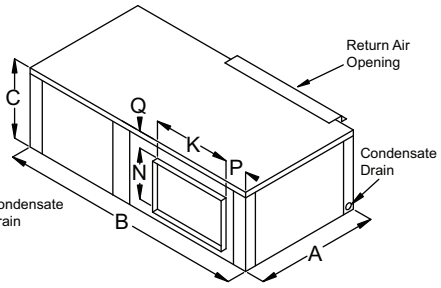
Dimensions

50PCH UNIT



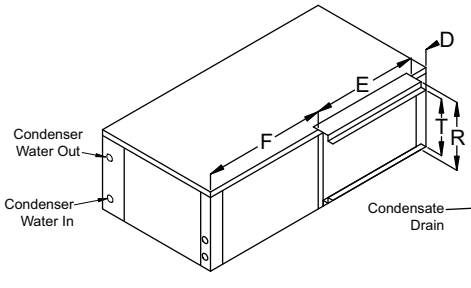
Left Hand End Blow



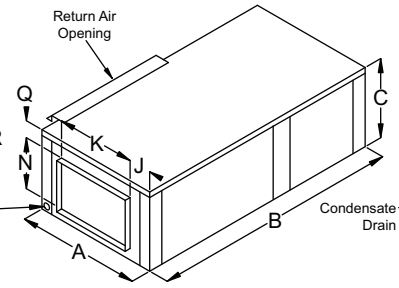


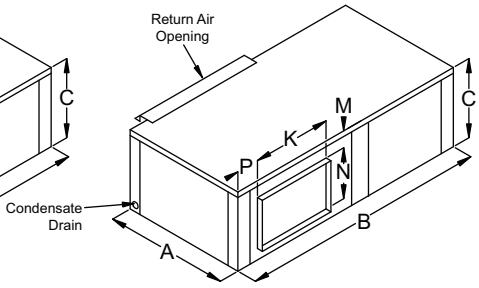
Left Hand Return Straight Through

NOTE: Models 048 and 060 Left Hand Return units have condenser water connections on the front right and electrical knockouts on the front left.



Right Hand Return End Blow



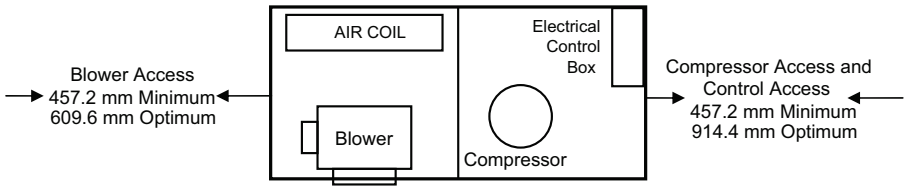


Right Hand Return Straight Through

LEGEND

R/A — Return Air

Service Clearances



50PCH009-070 UNITS

50PCH UNIT SIZE	A WIDTH	B DEPTH	C HEIGHT	D CAB END TO FILTER RACK	E R/A DUCT WIDTH	F CAB FRONT TO FILTER RACK	G WATER INLET	H WATER OUTLET	J SIDE TO DISC. WIDTH	K DISC. WIDTH	M TOP TO DISC.	N DISC. HEIGHT	P END TO DISC.	Q TOP TO DISC.	R FILTER RACK HEIGHT	T R/A DUCT FLANGE HEIGHT	CONDENSER WATER CONNECTIONS FPT (in.)	RECOMMENEDED REPLACEMENT NOMINAL FILTER SIZE
009	482.5	838.2	292.1	38.1	410.2	389.9	60.5	241.3	136.5	160.0	151.6	104.1	123.8	35.8	287.0	218.4	3/4	254x406.4x25.4
012	482.5	838.2	292.1	38.1	410.2	389.9	60.5	241.3	133.3	163.3	160.3	104.1	120.6	28.9	287.0	218.4	3/4	254x406.4x25.4
015	558.8	1092.2	431.8	38.1	511.8	542.3	72.6	381.0	207.0	163.3	242.6	104.1	194.3	86.3	426.7	381.0	3/4	406.4x508x25.4
018	558.8	1092.2	431.8	38.1	511.8	542.3	72.6	358.9	137.7	231.9	155.2	245.1	124.9	31.2	426.7	381.0	3/4	406.4x508x25.4
024	558.8	1092.2	457.2	38.1	635.0	419.1	72.6	358.9	137.7	231.9	155.2	245.1	124.9	31.2	426.7	381.0	3/4	406.4x635x25.4
030	558.8	1092.2	457.2	38.1	635.0	419.1	62.7	381.0	137.7	231.9	155.2	245.1	124.9	31.2	426.7	381.0	3/4	406.4x635x25.4
036	558.8	1384.3	482.6	38.1	765.8	580.4	72.6	409.7	164.3	231.9	190.5	261.1	151.6	30.7	477.5	431.8	3/4	457.2x762x25.4
042	558.8	1384.3	482.6	38.1	765.8	580.4	72.6	409.7	133.9	265.4	164.1	287.0	121.1	30.9	477.5	431.8	3/4	457.2x762x25.4
048	635.0	1384.3	533.4	38.1	878.8	467.4	72.6	470.4	184.1	265.4	189.5	288.5	171.5	54.8	528.3	482.6	1	508x876.3x25.4
060	635.0	1384.3	533.4	38.1	878.8	467.4	72.6	470.4	160.5	298.7	172.9	317.5	147.8	42.6	528.3	482.6	1	508x876.3x25.4
070	635.0	1651.0	533.4	38.1	1221.7	391.1	72.6	470.4	160.5	298.7	172.9	317.5	147.8	42.6	528.3	482.6	1	508x609.6x25.4 (2)

NOTES:

1. All dimensions are metric (mm) unless stated otherwise.
2. All condensate drain connections are 3/4 in. FPT.
3. Specifications subject to change without notice.
4. The 25.4 mm filter rack extends 31.24 mm beyond the side of the unit. The 50.8 mm filter rack extends 73.4 mm beyond the side of the unit. The 50.8 mm filter rack is 4-sided with a filter access door on one end and can accept either a 25.4 mm or 50.8 mm filter.

Dimensions (cont)

50PCH009-070 CORNER WEIGHTS (kg)

UNIT SIZE	TOTAL (kg)	LEFT HAND EVAPORATOR				RIGHT HAND EVAPORATOR			
		LEFT FRONT*	RIGHT FRONT*	LEFT BACK	RIGHT BACK	LEFT FRONT*	RIGHT FRONT*	LEFT BACK	RIGHT BACK
009	47	13	10	12	11	10	13	11	12
012	48	13	11	12	12	11	13	12	12
015	58	16	13	15	13	13	16	13	15
018	80	26	16	22	17	16	26	17	22
024	82	26	17	22	17	17	26	17	22
030	88	28	18	23	19	18	28	19	23
036	108	32	22	30	24	22	32	24	30
042	105	32	21	29	23	21	32	23	29
048	122	39	27	28	27	27	39	27	28
060	131	40	29	31	30	29	40	30	31
070	143	44	32	35	32	32	44	32	35

* Front is control box end.

Performance data

ANTIFREEZE CORRECTION TABLE

ANTIFREEZE TYPE	ANTIFREEZE%	COOLING			HEATING		WPD CORRECTION FACTOR
		EWT 32.2°C			EWT –1.1°C		
		Total Capacity	Sensible Capacity	kW	Heating Capacity	kW	EWT –1.1°C
Water	0	1.000	1.000	1.000	1.000	1.000	1.000
Propylene Glycol	5	0.997	0.997	1.004	0.989	0.997	1.060
	10	0.994	0.994	1.006	0.986	0.995	1.125
	15	0.990	0.990	1.009	0.978	0.988	1.190
	25	0.983	0.983	1.016	0.960	0.979	1.300
	30	0.979	0.979	1.020	0.950	0.974	1.736
	35	0.975	0.974	1.024	0.940	0.969	1.834
Methanol	5	0.997	0.997	1.003	0.990	0.997	1.060
	10	0.996	0.996	1.005	0.979	0.993	1.100
	15	0.994	0.994	1.008	0.970	0.990	1.140
	20	0.992	0.992	1.011	0.961	0.987	1.248
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.160
	10	0.996	0.996	1.004	0.960	0.988	1.230
	15	0.992	0.992	1.006	0.944	0.983	1.280
	25	0.986	0.986	1.009	0.917	0.974	1.400
Ethylene Glycol	5	0.997	0.997	1.003	0.993	0.998	1.060
	10	0.995	0.995	1.004	0.986	0.996	1.120
	15	0.992	0.992	1.005	0.980	0.993	1.190
	25	0.988	0.988	1.009	0.970	0.990	1.330
	30	0.985	0.985	1.012	0.965	0.987	1.400

LEGEND

EWT — Entering Water Temperature
WPD — Water Pressure Differential

Performance data (cont)

50PCH,PCV009-070 BLOWER PERFORMANCE — STANDARD PSC UNIT

50PCH,PCV UNIT SIZE	FAN SPEED	RATED AIRFLOW	AIR FLOW (l/s) vs. PRESSURE DROP (Pa)											
			25	50	75	100	125	150	175	200	225	250	275	300
009	Low	141	118	114	113	110	—	—	—	—	—	—	—	—
	Med		149	149	142	130	114	—	—	—	—	—	—	—
	High		165	157	149	142	134	126	—	—	—	—	—	—
012	Low	144	118	114	113	110	—	—	—	—	—	—	—	—
	Med		149	149	142	130	114	—	—	—	—	—	—	—
	High		165	157	149	142	134	126	—	—	—	—	—	—

50PCH,PCV015-070 BLOWER PERFORMANCE — ECM UNIT

MODEL/ MOTOR	FAN SPEED	AIR FLOW (l/s) vs. PRESSURE DROP (Pa)											
		25	50	75	100	125	150	175	200	225	250	275	300
50PC015 CA ECM	–	142	142	142	142	142	142	142	142	142	142	—	—
	Norm	167	167	167	167	167	167	167	167	167	167	—	—
	+	192	192	192	192	192	192	192	192	192	192	—	—
50PC018 CA ECM	–	200	200	200	200	200	200	200	200	200	200	—	—
	Norm	236	236	236	236	236	236	236	236	236	—	—	—
	+	—	271	271	271	271	271	271	271	—	—	—	—
50PC024 CA ECM	–	233	233	233	233	233	233	233	233	233	233	—	—
	Norm	275	275	275	275	275	275	275	275	275	275	—	—
	+	316	316	316	316	316	316	316	316	316	316	—	—
50PC030 CA ECM	–	284	284	284	284	284	284	284	284	284	284	—	—
	Norm	334	334	334	334	334	334	334	334	334	334	—	—
	+	384	384	384	384	384	384	384	384	384	384	—	—
50PC036 CA ECM	–	334	334	334	334	334	334	334	334	334	334	—	—
	Norm	393	393	393	393	393	393	393	393	393	393	—	—
	+	452	452	452	452	452	452	452	452	452	452	—	—
50PC042 CA ECM	–	445	445	445	445	445	445	445	445	445	445	445	—
	Norm	—	524	524	524	524	524	524	524	524	524	524	—
	+	—	603	603	603	603	603	603	603	603	—	—	—
50PC048 CA ECM	–	467	467	467	467	467	467	467	467	467	467	467	—
	Norm	550	550	550	550	550	550	550	550	550	550	550	—
	+	632	632	632	632	632	632	632	632	632	632	632	—
50PC060 CA ECM	–	568	568	568	568	568	568	568	568	568	568	568	568
	Norm	668	668	668	668	668	668	668	668	668	668	668	668
	+	768	768	768	768	768	768	768	768	768	768	768	768
50PC070 CA ECM	–	634	634	634	634	634	634	634	634	634	634	634	634
	Norm	746	746	746	746	746	746	746	746	746	746	746	746
	+	858	858	858	858	858	858	858	858	858	858	858	858

LEGEND

CA — Constant Airflow
ECM — Electronically Commutated Motor

Electrical data

50PCH,PCV009-070 UNIT WITH PSC MOTOR ELECTRICAL DATA

UNIT SIZE	RATED VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			FAN MOTOR FLA	FAN MOTOR HP	TOTAL UNIT FLA	MIN CIRCUIT AMP	MAX FUSE/ HACR
			QTY	RLA	LRA					
009	220/240	198/264	1	2.77	18.8	0.85	0.10	3.62	4.3	15
012	220/240	198/264	1	4.35	21.0	0.85	0.10	5.20	6.3	15

LEGEND

FLA — Full Load Amps
HACR — Heating, Air-Conditioning and Refrigeration
HP — Horsepower
LRA — Locked Rotor Amps
RLA — Rated Load Amps

50PCH,PCV009-070 UNIT WITH ECM MOTOR ELECTRICAL DATA

MODEL	RATED VOLTAGE	VOLTAGE MIN/MAX	COMPRESSOR			FAN MOTOR		TOTAL UNIT FLA	MIN. CIRCUIT AMPS	MAX FUSE/ HACR
			QTY	RLA	LRA	FLA	HP			
50PC015	220-240/1/50	198/264	1	5.48	24.50	2.80	0.33	8.28	9.7	15
50PC018	220-240/1/50	198/264	1	5.90	24.00	2.80	0.33	8.70	10.2	15
50PC024	220-240/1/50	198/264	1	9.00	52.00	2.80	0.33	11.80	14.1	20
	380-420/3/50	342/462	1	3.50	27.00	2.80	0.33	6.30	7.2	15
50PC030	220-240/1/50	198/264	1	10.90	60.00	2.80	0.33	13.70	16.4	25
	380-420/3/50	342/462	1	5.10	28.00	2.80	0.33	7.90	9.2	15
50PC036	220-240/1/50	198/264	1	13.50	67.00	4.30	0.50	17.80	21.2	30
	380-420/3/50	342/462	1	5.40	38.00	4.30	0.50	9.70	11.1	15
50PC042	380-420/3/50	342/462	1	5.60	36.00	4.30	0.50	9.90	11.3	15
50PC048	380-420/3/50	342/462	1	6.10	43.00	6.80	0.75	12.90	14.6	20
50PC060	380-420/3/50	342/462	1	7.80	51.50	6.80	0.75	14.60	16.6	20
50PC070	380-420/3/50	342/462	1	8.50	67.10	6.80	0.75	15.30	17.4	25

LEGEND

FLA — Full Load Amps
HACR — Heating, Air-Conditioning and Refrigeration
HP — Horsepower
LRA — Locked Rotor Amps
RLA — Rated Load Amps

Application data

Aquazone™ water source heat pumps are available in a flexible, efficient array of models, which can be used in all types of water loop, ground water, and ground loop type systems. Aquazone products provide optimal energy efficient solutions and adapt to the most challenging design requirements.

Water loop system

Water loop (or boiler/tower) system applications typically include a number of units plumbed to a common piping system. For optimal performance, this system should be designed between 0.142 and 0.189 L/s per ton of cooling capacity. The system is comprised of highly efficient packaged reverse cycle heat pump units interconnected by a water loop. The water circuit serves as both a sink and source for heat absorption and rejection and is designed for entering water temperatures between 10 and 26.6°C. Within this temperature range units can heat or cool as required from the same water source. Transferring heat from warm to cold spaces in the building, whenever they coexist, conserves energy rather than creating new heat.

Refer to the **Carrier Water Source Heat Pump System Design Guide** for assistance designing water loop systems. The guide includes a practical approach for the most current design recommendations including:

- Product application including horizontal, vertical, console, rooftop and water-to-water applications.
- Ventilation methods and system design including energy recovery.
- Acoustical considerations for different product types.
- Addressing indoor air quality (IAQ) issues such as condensate removal, humidity control.
- Air distribution design including diffuser selection/layout and ductwork design.
- Hydronic system design including pipe sizing/layout and boiler/tower sizing.
- Control configurations such as stand alone, DDC, DCV (demand controlled ventilation), and VVT® (variable volume and temperature) controls.
- Water Source Heat Pump Efficiency/Operational Cost Comparison chart.
- System variations such as a system without a boiler, variable pumping, and VAV for interior use.

Condensate drainage

Venting

Properly vent condensate lines to prevent fan pressure from causing water to hang up in the piping. Condensate lines should be pitched to assure full drainage of condensate under all load conditions. Use chemical treatment to remove algae in the condensate pans and drains in geographical areas that are conducive to algae growth.

Trapping

Condensate trapping is a necessity on every water source heat pump unit. A trap is provided to prevent the backflow of moisture from the condensate pan and into the fan intake or downstream into the mechanical system. The water seal or the length of the trap depends on the positive or negative pressure on the drain pan. As a rule of thumb, size the water seal 25.4 mm for every 25.4 mm of negative pressure on the unit. The water seal is the distance from the bottom of the unit condensate piping connection to the bottom of the condensate drain line run-out piping. Therefore, the trap size should be double the water seal dimension.

Horizontal units

Horizontal units should be sloped toward the drain at a 20.83 mm per meter pitch. If it is not possible to meet the pitch requirement, a condensate pump should be designed and installed at the unit to pump condensate to a building drain. Horizontal units are not internally trapped; therefore an external trap is necessary. Each unit must be installed with its own individual trap and means to flush or blow out the condensate drain. It is not acceptable to use a common trap or vent for multiple units. The condensate piping system should not be designed with a pipe size smaller than the drain connection pipe size.

Water conditioning

In some applications, maintaining proper water quality may require higher corrosion protection for the water-to-refrigerant heat exchanger. Water quality varies from location to location and is unique for each job. Water characteristics such as pH value, alkalinity, hardness, and specific conductance are important when considering any WSHP application. Water typically includes impurities and hardness that must be removed. The required treatment will depend on the water quality as well as type of system. Water problems fall into three main categories:

1. Scale formation caused by hard water reduces the heat transfer rate and increases the water pressure drop through the heat exchanger. As water is heated, minerals and salts are precipitated from a solution and deposited on the inside surface of the pipe or tube.
2. Corrosion is caused by absorption of gases from the air coupled with water on exposed metal. Corrosion is also common in salt-water areas.
3. Organic growths such as algae can reduce the heat transfer rate by forming an insulating coating on the inside tube surface. Algae can also promote corrosion by pitting.

NOTE: In most commercial water loop applications, Aquazone WSHP units use copper water-to-refrigerant heat exchanger.

Application data (cont)

WATER QUALITY GUIDELINES

CONDITION	HX MATERIAL*	CLOSED RECIRCULATING†	OPEN LOOP AND RECIRCULATING WELL**
Scaling Potential — Primary Measurement			
Above the given limits, scaling is likely to occur. Scaling indexes should be calculated using the limits below.			
pH/Calcium Hardness Method	All	N/A	**pH < 7.5 and Ca Hardness, <100 ppm**
Index Limits for Probable Scaling Situations (Operation outside these limits is not recommended.)			
Scaling indexes should be calculated at 65.55°C (150°F) for direct use and at 32.22°C (90°F) for indirect HX use. A monitoring plan should be implemented.			
Ryznar Stability Index	All	N/A	**6.0 to 7.5** If >7.5 minimize steel pipe use.
Langelier Saturation Index	All	N/A	**–0.5 to +0.5** If <=0.5 minimize steel pipe use. Based upon 65.56°C direct well, 29.45°C indirect well HX.
Iron Fouling			
Iron Fe_2^+ (Ferrous) (Bacterial Iron Potential)	All	N/A	**<0.2 ppm (Ferrous)** If Fe_2^+ (ferrous) >0.2 ppm with pH 6 to 8, O_2<5 ppm, check for iron bacteria.
Iron Fouling	All	N/A	**<0.5 ppm of Oxygen** Above this level deposition will occur.
Corrosion Prevention††			
pH	All	6 - 8.5 Monitor/treat as needed.	**6 to 8.5** Minimize steel pipe below 7 and no open tanks with pH <8.
Hydrogen Sulfide (H_2S)	All	N/A	**<0.5 ppm** At H_2S>0.2 ppm, avoid use of copper and cupronickel piping or HXs. Rotten egg smell appears at 0.5 ppm level. Copper alloy (bronze or brass) cast components are acceptable to <0.5 ppm.
Ammonia Ion as Hydroxide, Chloride, Nitrate and Sulfate Compounds	All	N/A	**<0.5 ppm**
Maximum Chloride Levels			Maximum allowable at maximum water temperature.
			10°C (50°F) / 24°C (75°F) / 38°C (100°F)
	Copper	N/A	<20 ppm / NR / NR
	Cupronickel	N/A	<150 ppm / NR / NR
	304 SS	N/A	<400 ppm / <250 ppm / <150 ppm
	316 SS	N/A	<1000 ppm / <550 ppm / <375 ppm
	Titanium	N/A	>1000 ppm / >550 ppm / >375 ppm
Erosion and Clogging			
Particulate Size and Erosion	All	<10 ppm of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size.	<10 ppm (<1 ppm "sandfree" for reinjection) of particles and a maximum velocity of 6 fps. Filtered for maximum 800 micron size. Any particulate that is not removed can potentially clog components.
Brackish	All	N/A	Use cupronickel heat exchanger when concentrations of calcium or sodium chloride are greater than 125 ppm are present. (Seawater is approximately 25,000 ppm.)

LEGEND

HX — Heat Exchanger
N/A — Design Limits Not Applicable Considering Recirculating Potable Water
NR — Application Not Recommended
SS — Stainless Steel

*Heat exchanger materials considered are copper, cupronickel, 304 SS (stainless steel), 316 SS, titanium.

†Closed recirculating system is identified by a closed pressurized piping system.

**Recirculating open wells should observe the open recirculating design considerations.

††If the concentration of these corrosives exceeds the maximum allowable level, then the potential for serious corrosion problems exists.

Sulfides in the water quickly oxidize when exposed to air, requiring that no agitation occur as the sample is taken. Unless tested immediately at the site, the sample will require stabilization with a few drops of one Molar zinc acetate solution, allowing accurate sulfide determination up to 24 hours after sampling. A low pH and high alkalinity cause system problems, even when both values are within ranges shown. The term pH refers to the acidity, basicity, or neutrality of the water supply. Below 7.0, the water is considered to be acidic. Above 7.0, water is considered to be basic. Neutral water registers a pH of 7.0.

To convert ppm to grains per gallon, divide by 17. Hardness in mg/l is equivalent to ppm.

UNIT CONTROL CAPABILITIES

CAPABILITY	UPM Control
High and Low Refrigerant Pressure Switches	X
Fluid Temperature (Freeze) Protection	X
Condensate Overflow Protection Sensor	X
Air Temperature (Freeze) Protection	X
Anti-short Cycle Timer	X
Random Start Relay	X
Low Pressure Bypass Timer	X
Surge Protection	X
Intelligent Reset	X
Lockout Reset	X
Malfunction (Alarm) Output	X
Test Service Mode with LED Fault Indication	X
Transformer	50 va

Packaged Water Source Heat Pumps

HVAC Guide Specifications (Water Loop)

Size Range: **1.8 to 21.1 kW**
Carrier Unit: **50PCH Series 50 Hz**

Part 1 — General

1.01 SYSTEM DESCRIPTION

A. Install water source heat pumps, as indicated on the plans with capacities and characteristics as listed in the schedule and the specifications that follow. Units shall be horizontal configurations. All equipment shall be rated in accordance with Standard EN 14825:2018. All equipment shall carry the CE community mark.

B. Units shall be supplied completely factory built and capable of operation with an entering water temperature range from –3.9 to 43.3°C. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charging of system, detailed heating and cooling mode tests, and quality cross checking all operational and test conditions to pass/fail criteria.

C. Units shall be individually packaged on wooden skid with protective corner posts and plastic stretch wrapping for maximum protection.

1.02 QUALITY ASSURANCE

A. All equipment listed in this section must be rated in accordance with European Standard EN 14825:2018 performance standard, latest edition. The applicable units shall have a AHRI/ISO label. Standard cabinet panel insulation shall meet NFPA (National Fire Protection Association, U.S.A Standard) 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 (American Society for Testing and Materials) and ASTM G21, and shall meet zero level bacteria growth per ASTM G22.

B. All units shall be factory tested in all operating modes and safety switch operation shall be verified.

C. Serial numbers will be recorded by factory and furnished to contractor for ease of unit warranty status.

Part 2 — Product

2.01 EQUIPMENT

A. General: Units shall be prewired and precharged in factory.

B. Basic Construction:

1. Units shall have the air flow arrangement as shown on the plans. If units with these arrangements are not used, the contractor supplying the water source heat pumps is responsible for any extra costs incurred by other trades and must submit detailed mechanical drawings showing ductwork requirements and changes or relocation of any other mechanical or electrical system. If other arrangements make servicing difficult, the contractor must provide access panels and clear routes to ease service. The architect must approve all changes 10 days prior to bid.
2. All units shall have stainless steel drain pans to comply with this project's IAQ (indoor air quality) requirements. Painted steel or plastic is not acceptable.
3. The cabinet shall be fabricated from heavy gauge galvanized steel for superior corrosion protection. All interior surfaces shall be lined with 12 mm (1/2-in.) thick, multi-density, coated, fiberglass insulation. Insulation must be non-combustible, non-hydroscopic and anti-fungal. Insulation must meet NFPA 90A and 90B for fire protection as well as Fire Hazard classification 25/50 (per ASTM E84 and UL 723 and CAN/ULC S102-M88), ASTM C1071, erosion requirements of UL181 and be certified to meet GREENGUARD indoor air quality standards for low emitting products. One blower access panel and two compressor compartment access panels shall be removable with supply and return air ductwork in place.
4. Unit shall have a floating compressor or pan consisting of a 12 mm (1/2-in.) thick high density elastomeric pad between the compressor base plate and the unit base pan to prevent transmission of vibration to the structure.
5. Units shall have a 2.54 cm filter rack and 2.54 cm thick throwaway type fiberglass filter as standard. The filter rack shall incorporate a 2.54 cm duct flange. The units shall have an insulated divider panel between the air-handling section and the compressor section to minimize the transmission of compressor noise, and to permit service testing without air bypass.
6. Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. Supply and return water connections shall be brass female pipe thread fittings and mounted flush to cabinet exterior. Connections that require a backup wrench or that extrude past the unit corner post are not acceptable. Condensate connection will be stainless steel female pipe thread fittings. Plastic is not acceptable.
7. Hanging brackets shall be provided as standard for horizontal units.
8. Units shall have a short circuit current rating (SCCR) of no less than 5kA.

C. Fan and Motor Assembly:

1. The fan shall be direct-drive centrifugal forward curved type with a dynamically balanced wheel. The housing and wheel shall be designed for quiet low velocity operation. The blower housing shall feature a removable inlet ring to facilitate removal and servicing of the fan motor. The fan motor shall be permanently lubricated, PSC (permanent split capacitor) type with thermal overload protection and three speed taps.

2. Units rated 4.4 to 21.1 kW shall have an optional electronically commutated motor (ECM) to comply with necessary CE requirements. Unit shall include ECM controller with three airflow settings.
3. Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing.
4. Units supplied without permanently lubricated motors must provide external oilers for easy service.
5. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule.
6. The airflow/static pressure rating of the unit shall be based on a wet coil and a clean filter in place.

D. Refrigerant Components:

1. Units shall use R-410A refrigerant. All units shall have a factory sealed and fully charged refrigerant circuit.
2. Hermetic Compressor:

   Rotary or scroll compressors shall be specifically designed for R-410A refrigerant and shall be internally sprung (if reciprocating), externally isolated and with thermal overload protection.
3. Refrigerant metering thermostatic expansion valves.
4. The finned tube heat exchanger shall be constructed of lanced aluminum fins not exceeding 6.3 fins per cm bonded to rifled copper tubes in a staggered pattern and will have a 4140 kPa (600 psig) working pressure. The heat exchanger shall have aluminum end sheets.
5. Reversing Valve:

   Reversing valves shall be four-way solenoid activated refrigerant valves that shall fail to the heating operation should the solenoid fail to function. Reversing valves that fail to the cooling operation shall not be allowed.
6. Coaxial (tube in tube) refrigerant to water heat exchanger. Refrigerant to water heat exchangers shall be of copper inner water tube and steel outer refrigerant tube design rated to withstand 4140 kPa (600 psig) working refrigerant pressure and 2758 kPa (400 psig) working water pressure. Heat exchanger shall be insulated with closed cell foam insulation to help prevent condensation generation with low entering water temperatures.
7. Safety controls include both a high pressure and low pressure switch. Temperature sensors shall not replace these safety switches. See the unit controls section.
8. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service.
9. Activation of any safety device shall prevent compressor operation via a lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. Units which may be reset at the disconnect switch only shall not be acceptable.

E. Controls and Safeties:

1. Electrical:

   Controls and safety devices will be factory wired and mounted within the unit. Controls shall include fan relay, compressor contactor, 24-v transformer, reversing valve coil, solid-state lockout controller and unit protection module (UPM). The standard transformer shall be rated for a minimum 50 va. All units shall be nameplated for use with time-delay fuses or HACR (Heating, Air Conditioning and Refrigeration) circuit breakers. Unit controls shall be 24-v and provide heating or cooling as required by the remote thermostat/sensor.
2. Piping:
   a. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a backup wrench.
   b. All water connections and electrical knockouts must be in the compressor compartment corner post to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature.
3. Unit Controls:
   a. Solid-State Safety Circuit:

      All units shall have a unit protection module (UPM) safety control circuit with the following features:
      1) Anti-short cycle time delay (5-minute delay on break).
      2) Random start time delay on initial power.
      3) Brown out/surge/power interruption protection.
      4) 120-second low pressure switch bypass timer.
      5) High refrigerant pressure shutdown.
      6) Low refrigerant pressure shutdown.
      7) Low water temperature shutdown (adjustable for closed loop systems).
      8) Air coil freeze protection shutdown.
      9) High condensate level shutdown.

b. The UPM shall automatically reset after a safety shutdown. Restart the unit if the cause of the shutdown no longer exists (except for low temperature and high condensate level shutdowns). Should a fault re-occur within 60 minutes after reset, then a "hard" lockout will occur. A light-emitting diode (LED) shall annunciate the following alarms: brown out, high refrigerant pressure, low refrigerant pressure, low water temperature and a high level of condensate in the drain pan. The LED will display each fault condition as soon as the fault occurs. If a hard lockout occurs, then the fault LED will display the type of fault until the unit is reset.

c. The UPM shall feature the following field configurable adjustments:
   1) Lock out reset on thermostat interruption or power reset.
   2) Two or four restart attempts before a hard lockout.
   3) Test mode (reduces all time delays to 5 seconds for diagnostic work).
   4) Antifreeze setting for low water temperature sensor.

d. Safety devices include:
   1) Low pressure cutout set a 280 kPa (40 psig) for loss of charge protection (freezestat and/or high discharge gas temperature sensor is not acceptable).
   2) High pressure cutout control set at 4125 kPa (600 psig).
   3) Low supply water temperature sensor that detects drops in refrigerant temperature that could result in water coax heat exchanger freezing.
   4) Low air coil temperature sensor that detects drops in refrigerant temperature that could result in air heat exchanger freezing.
   5) High level condensate sensor that shuts off the compressor if the condensate drain pan fills with water.
   6) On board voltage detection that disables the compressor control circuit if there are extreme variations in supply voltage.

F. Special Features:
   1. Closed cell foam insulation shall be installed on all side panels and the top panel to provide acoustic attention.
   2. Unit shall include a 2 in. MERV 8 or MERV 13 pleated filter with four sided filter rack. Filter rack shall allow tool-less filter removal on both sides of the rack.
   3. Sound attenuation (mute) package shall consist of high technology compressor blanket on sizes 024 and above.

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