GeoLogix

Water Source Heat Pump Systems

Models

HBH 072 - 120

60 Hz R-410A

Due to ongoing product improvements, design, specifications, performance data and material subject to change without notice.

SUBMITTAL DATA

Unit Designation _____

Job Name _____

Architect _____

Engineer _____

Contractor _____

PERFORMANCE DATA

Cooling Capacity _____ BTUH

EER _____

Heating Capacity _____ BTUH

COP _____

Ambient Air _____ °F

Entering Water Temp (Cooling) _____ °F

Entering Air Temp (Cooling) _____ °F

Entering Water Temp (Heating) _____ °F

Entering Air Temp (Heating) _____ °F

Airflow _____ CFM

Fan Speed or Motor RPM/Turns _____

Operating Weight _____ lb.

ELECTRICAL DATA

Power Supply _____ Volts _____ Phase _____ Hz

Minimum Circuit Ampacity _____

Maximum Overcurrent Protection _____

HEAT CONTROLLER, INC.

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THE QUALITY LEADER IN CONDITIONING AIR

06/2012

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Selection Procedure

Reference Calculations

Heating

$$LWT = EWT - \frac{HE}{GPM \times 500}$$

$$LAT = EAT + \frac{HC}{CFM \times 1.08}$$

Cooling

$$LWT = EWT + \frac{HR}{GPM \times 500}$$

$$LAT\ (DB) = EAT\ (DB) - \frac{SC}{CFM \times 1.08}$$

$$LC = TC - SC$$

$$S/T = \frac{SC}{TC}$$

Legend and Glossary of Abbreviations

BTUH = BTU(British Thermal Unit) per hour
CFM = airflow, cubic feet/minute
COP = coefficient of performance = BTUH output/BTUH input
DB = dry bulb temperature (°F)
EAT = entering air temperature, Fahrenheit (dry bulb/wet bulb)
EER = energy efficiency ratio = BTUH output/Watt input
MPT = male pipe thread
ESP = external static pressure (inches w.g.)
EWT = entering water temperature
GPM = water flow in U.S. gallons/minute
HE = total heat of extraction, BTUH
HC = air heating capacity, BTUH
HR = total heat of rejection, BTUH
HWC = hot water generator (desuperheater) capacity, Mbtuh
FPT = female pipe thread
KW = total power unit input, kilowatts
LAT = leaving air temperature, °F
LC = latent cooling capacity, BTUH
LWT = leaving water temperature, °F
MBTUH = 1000 BTU per hour
S/T = sensible to total cooling ratio
SC = sensible cooling capacity, BTUH
TC = total cooling capacity, BTUH
WB = wet bulb temperature (°F)
WPD = waterside pressure drop (psi & ft. of hd.)

Conversion Table - to convert inch-pound (English) to S-I (Metric)

Air Flow	Water Flow	Ext Static Pressure	Water Pressure Drop
Airflow (L/s) = CFM x 0.472	Water Flow (L/s) = gpm x 0.0631	ESP (Pa) = ESP (in of wg) x 249	PD (kPa) = PD (ft of hd) x 2.99

Selection Procedure

Step 1 Determine the actual heating and cooling loads at the desired dry bulb and wet bulb conditions.

Step 2 Obtain the following design parameters: Entering water temperature, water flow rate in GPM, air flow in CFM, water flow pressure drop and design wet and dry bulb temperatures. Air flow CFM should be between 300 and 450 CFM per ton. Unit water pressure drop should be kept as close as possible to each other to make water balancing easier. Go to the appropriate tables and find the proper indicated water flow and water temperature.

Step 3 Select a unit based on total and sensible cooling conditions. Select a unit which is closest to the actual cooling load.

Step 4 Use data from performance tables at the design water flow and water temperature. Read the total and sensible cooling capacities (Note: interpolation is permissible, extrapolation is not).

Step 5 Read the heating capacity. If it exceeds the design criteria it is acceptable. It is quite normal for Water-Source Heat Pumps to be selected on cooling capacity only since the heating output is usually greater than the cooling capacity.

Step 6 Determine the correction factors associated with the variable factors of dry bulb and wet bulb (page 14).

Corrected Total Cooling =
tabulated total cooling x wet bulb correction.
Corrected Sensible Cooling =
tabulated sensible cooling x wet/dry bulb correction.

Step 7 Determine the correction factor associated with antifreeze in system loop. If heating EWT is 50°F or below you may have to use antifreeze. Calculate leaving water temperature per performance data selection notes (page 18). If antifreeze is required, use correction table for correcting total and sensible capacities.

Step 8 Compare the corrected capacities to the load requirements. Normally if the capacities are within 10% of the loads, the equipment is acceptable. It is better to undersize than oversize, as undersizing improves humidity control, reduces sound levels and extends the life of the equipment.

Step 9 When completed, calculate water temperature rise and assess the selection. If the units selected are not within 10% of the load calculations, then review what effect changing the GPM, water temperature and/or air flow and air temperature would have on the corrected capacities. If the desired capacity cannot be achieved, select the next larger or smaller unit and repeat the procedure. Remember, when in doubt, undersize slightly for best performance.

Example Equipment Selection For Cooling

Step 1 Load Determination:

Assume you have determined that the appropriate cooling load at the desired dry bulb 80°F and wet bulb 65°F conditions is as follows:

Total Cooling.....90,500 BTUH
Sensible Cooling.....73,300 BTUH
Entering Air Temp.....80°F Dry Bulb / 65°F Wet Bulb

Step 2 Design Conditions:

Similarly, you have also obtained the following design parameters:

Entering Water Temp (Cooling).....90°F
Entering Water Temp (Heating).....60°F
Water Flow (Based upon 12°F rise in temp.).....18 GPM
Air Flow.....2,800 CFM

Step 3, 4 & 5 HP Selection:

After making your preliminary selection (TCH096), we enter the data from tables at design water flow and water temperature and read Total Cooling, Sens. Cooling and Heat of Rej. capacities:

Total Cooling.....93,200 BTUH
Sensible Cooling.....70,390 BTUH
Heat of Rejection.....120,100 BTUH
Airflow.....3,200 CFM

Step 6, 7 & 8 Entering Air, Airflow and Antifreeze Corrections:

Next, we determine our correction factors.

Airflow 2800 ÷ 3200 = 88% Antifreeze - None

	Table	Ent Air	Air Flow	Corrected
Corrected Total Cooling = 93,200 x .977 x .976 x 1 = 88,871				
Corrected Sens Cooling = 70,390 x 1.088 x .933 x 1=71,453				
Corrected Heat of Rej. = 120,100 x .998 x .976 =116,983				

Step 9 Water Temperature Rise Calculation & Assessment:

Rise = Heat of Reject ÷ (GPM x 500)

Actual Temperature Rise 116,983 ÷ 9,000 = 13.0°F

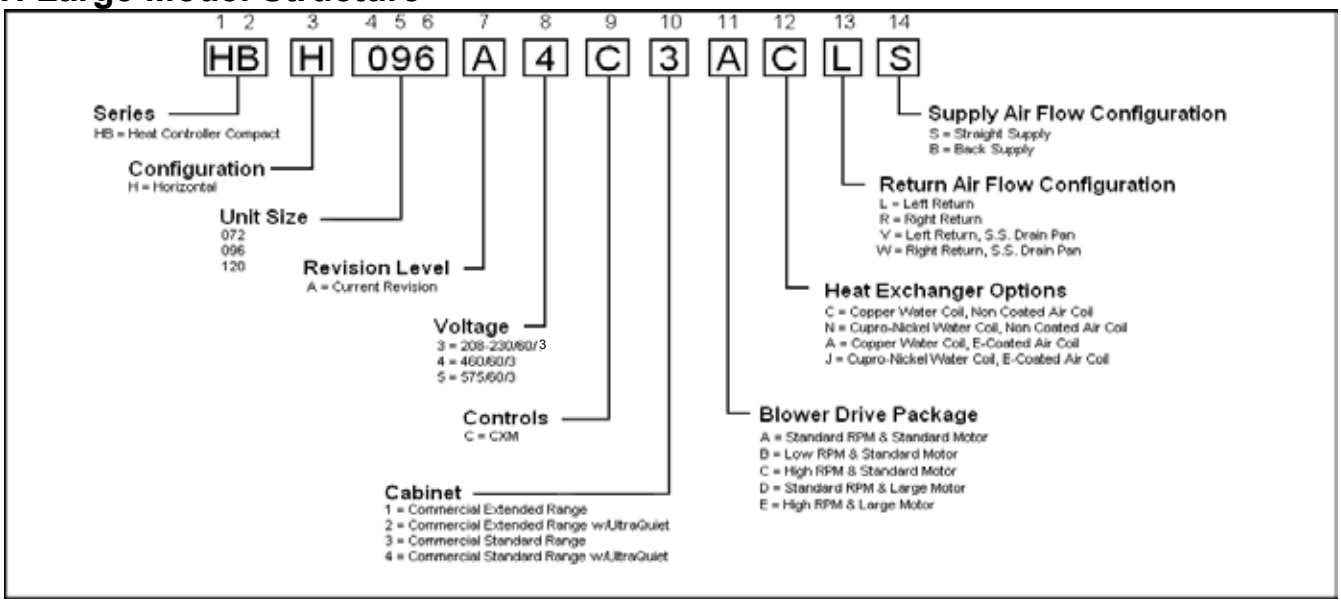
When we compare the Corrected Total Cooling and Corrected Sensible Cooling figures with our load requirements stated in Step 1, we discover that our selection is within +/- 10% of our sensible load requirement. Furthermore, we see that our Corrected Total Cooling figure is slightly undersized as recommended, when compared to the actual indicated load.

Alternate Step 7: If your EWT for heating is 40°F then system requires antifreeze. If a solution of 15% Propylene Glycol is required, then:

Corrected Total Cooling = 88,871 x .986 = 87,626
Corrected Sens Cooling = 71,453 x .986 = 70,452

Model Nomenclature

HBH Large Model Structure



Basic Unit Description:

The basic unit price includes sealed heat pump refrigerant circuit and air handler within cabinetry, filter, and a factory installed hanger kit on horizontal units.

- **Cabinetry** - Compact design - galvanized steel construction - FPT water connections, high and low voltage knockouts - filter and filter brackets. All horizontal units have field convertible discharge air patterns, no extra parts required.
- **Standard Controls** - CXM Controller, loss of charge switch, high pressure switch, water coil low temperature cutout, lockout safety circuit reset at thermostat or disconnect, LED fault indication, five minute anti-short cycle, random start, high and low voltage protection, condensate overflow protection, dry contact for alarm.
- **Compressor** - High efficiency scroll compressor - overload protected.
- **Refrigerant Circuit** - Dual refrigerant circuit. Thermostatic expansion valve's for refrigerant metering, copper tubing interconnecting all components - sealed & tested non-ozone depleting, R-410A refrigerant circuit with high and low-side Schrader ports.
- **Reversing Valve** - 4-way, pilot operated, solenoid activated in cooling.
- **Water to Refrigerant Coil** - Tube-in-tube, convoluted copper inner water tube.
- **Refrigerant to Air Coil** - Lanced aluminum fins on rifled copper tubes.
- **Blower Motor** - Belt drive with adjustable sheave, single blower and single blower motor.
- **Application** - Units can be applied in WLHP, GWHP or GLHP applications.
- **Field Connections** - For supply, return and condensate can be made on either side (plug opposite side). Condensate connection on end opposite compressor end.

Performance Data
AHRI/ASHRAE/ISO 13256-1

ASHRAE/AHRI/ISO 13256-1. English (I-P) Units

Model	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
HBH072	69,000	13.3	92,500	5.0	78,500	19.7	75,500	4.4	71,000	14.6	58,000	3.5
HBH096	95,000	13.7	123,000	5.0	104,500	20.0	101,000	4.4	98,000	15.2	77,000	3.6
HBH120	119,000	13.3	160,000	4.6	134,000	19.3	132,500	4.0	122,500	14.5	103,000	3.3

Note 1: All HBH072 ratings @ 2400CFM (1133 l/s) w/20GPM (1.26 l/s). Sheave setting for AHRI is 2.5 turns open.
Note 2: All HBH096 ratings @ 3200CFM (1510 l/s) w/24GPM (1.51 l/s). Sheave setting for AHRI is 3.0 turns open.
Note 3: All HBH120 ratings @ 4000CFM (1888 l/s) w/30GPM (1.89 l/s). Sheave setting for AHRI is 3.0 turns open.
Note 4: Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature.
Note 5: Heating capacities based upon 68°F DB, 59°F WB entering air temperature.
Note 6: All ratings based upon operation at lower voltage of dual voltage rated models.

Model	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
	Cooling 30°C		Heating 20°C		Cooling 15°C		Heating 10°C		Cooling 25°C		Heating 0°C	
	Capacity Watts	EER W/W	Capacity Watts	COP	Capacity Watts	EER W/W	Capacity Watts	COP	Capacity Watts	EER W/W	Capacity Watts	Heating COP
HBH072	20,223	3.9	27,110	5.0	23,007	5.8	22,128	4.4	20,809	4.3	16,999	3.5
HBH096	27,843	4.0	36,049	5.0	30,627	5.9	29,601	4.4	28,722	4.5	22,567	3.6
HBH120	34,877	3.9	46,893	4.6	39,273	5.7	38,834	4.0	35,903	4.2	30,188	3.3

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature.
Heating capacities based upon 68°F DB, 59°F WB entering air temperature.
All ratings based upon operation at lower voltage of dual voltage rated models

Performance Data
Selection Notes

For operation in the shaded area when water is used in lieu of an anti-freeze solution, the LWT (Leaving Water Temperature) must be calculated. Flow must be maintained to a level such that the LWT is maintained above 42°F [5.6°C] when the JW3 jumper is not clipped (see example below). This is due to the potential of the refrigerant temperature being as low as 32°F [0°C] with 40°F [4.4°C] LWT, which may lead to a nuisance cutout due to the activation of the Low Temperature Protection. JW3 should never be clipped for standard range equipment or systems without antifreeze.

HBH096

WATER/BRINE				Heating - EAT 70°F				
EWT °F	FLOW gpm	PD psi	PD ft.	HC	kW	HE	LAT	COP
50	12.0	1.7	4.0	96.7	7.17	72.2	95.9	4.0
	18.0	4.5	10.3	101.9	7.27	77.1	97.4	4.1
	24.0	7.9	18.2	104.7	7.32	79.8	98.2	4.2

Example:

At 50°F EWT (Entering Water Temperature) and 1.5 gpm/ton, a 8 ton unit has a HE of 72,200 Btuh.

To calculate LWT, rearrange the formula for HE as follows:

HE = TD x GPM x 500, where HE = Heat of Extraction (Btuh); TD = temperature difference (EWT - LWT) and GPM = U.S. Gallons per Minute.

TD = HE / (GPM x 500)

TD = 72,200 / (12 x 500)

TD = 12°F

LWT = EWT - TD

LWT = 50 - 12 = 38°F - Antifreeze must be used

In this example, a higher flow rate will be required for EWTs at or below 50°F without antifreeze.

Performance Data: HBH072

2400 CFM Nominal Airflow Heating & Cooling

Performance capacities shown in thousands of Btuh

WATER/BRINE				Cooling - EAT 80/67°F					Heating - EAT 70°F				
EWT °F	FLOW gpm	PD psi	PD ft.	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	20.00	6.8	15.8	Operation Not Recommended					49.5	5.0	32.5	87.1	2.9
30	10.00	1.2	2.7	82.3	56.8	3.6	94.5	23.0	54.7	5.0	37.5	89.0	3.2
	15.00	3.3	7.7	81.1	55.8	3.4	92.8	23.6	56.8	5.1	39.6	89.9	3.3
	20.00	6.2	14.3	80.2	55.1	3.4	91.7	23.8	58.0	5.1	40.7	90.3	3.4
40	10.00	1.0	2.2	82.4	57.4	3.9	95.6	21.2	63.2	5.1	45.6	92.3	3.6
	15.00	3.0	7.0	82.6	57.1	3.7	95.1	22.4	66.1	5.2	48.4	93.4	3.7
	20.00	5.6	13.0	82.4	56.8	3.6	94.6	22.9	67.7	5.2	50.0	94.1	3.8
50	10.00	0.9	2.0	80.7	57.2	4.2	95.1	19.0	72.3	5.3	54.4	95.8	4.0
	15.00	2.8	6.5	81.9	57.4	4.0	95.6	20.5	76.0	5.3	57.8	97.2	4.2
	20.00	5.3	12.2	82.3	57.4	3.9	95.6	21.1	78.0	5.4	59.7	98.0	4.3
60	10.00	0.5	1.2	77.7	56.3	4.7	93.6	16.7	81.8	5.4	63.3	99.5	4.4
	15.00	2.2	5.1	79.7	56.9	4.4	94.7	18.2	86.0	5.5	67.2	101.1	4.6
	20.00	4.4	10.1	80.6	57.2	4.3	95.1	18.9	88.3	5.5	69.4	102.0	4.7
70	10.00	0.5	1.1	73.9	54.9	5.2	91.4	14.3	91.1	5.6	72.0	103.1	4.8
	15.00	2.1	4.8	76.3	55.8	4.8	92.8	15.8	95.6	5.7	76.3	104.8	4.9
	20.00	4.2	9.6	77.5	56.2	4.69	93.5	16.5	98.0	5.7	78.5	105.7	5.0
80	10.00	0.4	0.9	69.4	53.1	5.71	88.9	12.2	99.8	5.8	80.2	106.4	5.1
	15.00	1.9	4.5	72.2	54.2	5.37	90.5	13.4	104.4	5.9	84.4	108.2	5.2
	20.00	3.9	9.1	73.5	54.7	5.20	91.2	14.1	106.7	5.9	86.5	109.1	5.3
85	10.00	0.4	0.8	67.1	52.1	6.03	87.7	11.2	103.7	5.8	83.8	107.9	5.2
	15.00	1.9	4.4	69.8	53.3	5.66	89.2	12.4	108.0	5.9	87.8	109.6	5.3
	20.00	3.9	8.9	71.2	53.8	5.49	89.9	13.0	110.1	6.0	89.7	110.4	5.4
90	10.00	0.3	0.8	64.8	51.2	6.35	86.4	10.2	107.6	5.9	87.4	109.4	5.3
	15.00	1.8	4.3	67.5	52.3	5.96	87.9	11.3	111.7	6.0	91.1	111.0	5.4
	20.00	3.8	8.8	68.9	52.9	5.78	88.6	11.9	113.5	6.0	92.8	111.7	5.5
100	10.00	0.3	0.7	60.1	49.2	7.06	84.2	8.5	Operation Not Recommended				
	15.00	1.8	4.1	62.7	50.3	6.64	85.4	9.4					
	20.00	3.7	8.5	64.1	50.9	6.44	86.1	10.0					
110	10.00	0.2	0.6	55.8	47.5	7.87	82.7	7.1					
	15.00	1.7	3.9	58.1	48.4	7.41	83.4	7.8					
	20.00	3.6	8.3	59.4	48.9	7.19	83.9	8.3					
120	10.00	0.2	0.5	52.2	46.3	8.78	82.2	5.9					
	15.00	1.6	3.7	54.1	46.9	8.27	82.3	6.5					
	20.00	3.5	8.0	55.1	47.3	8.02	82.5	6.9					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

Performance Data: HBH096

3200 CFM Nominal Airflow Heating & Cooling

Performance capacities shown in thousands of Btuh

WATER/BRINE				Cooling - EAT 80/67°F					Heating - EAT 70°F				
EWT °F	FLOW gpm	PD psi	PD ft.	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	24.0	10.2	23.5	Operation Not Recommended					67.1	6.60	44.6	87.4	3.0
30	12.0	2.1	4.9	109.6	77.9	4.9	126.2	22.4	73.6	6.73	50.7	89.3	3.2
	18.0	5.3	12.1	109.3	77.9	4.7	125.3	23.3	76.9	6.79	53.7	90.2	3.3
	24.0	9.3	21.4	108.9	77.8	4.6	124.6	23.7	78.7	6.83	55.4	90.7	3.4
40	12.0	1.9	4.4	108.7	77.3	5.3	126.7	20.7	84.8	6.95	61.1	92.5	3.6
	18.0	4.8	11.0	109.5	77.8	5.0	126.5	21.9	89.0	7.03	65.1	93.7	3.7
	24.0	8.4	19.3	109.6	77.9	4.9	126.2	22.5	91.4	7.07	67.3	94.4	3.8
50	12.0	1.7	4.0	106.7	76.2	5.7	126.2	18.7	96.7	7.17	72.2	95.9	4.0
	18.0	4.5	10.3	108.2	77.0	5.4	126.6	20.1	101.9	7.27	77.1	97.4	4.1
	24.0	7.9	18.2	108.8	77.3	5.2	126.7	20.8	104.7	7.32	79.8	98.2	4.2
60	12.0	1.5	3.4	103.6	74.8	6.3	124.9	16.5	108.8	7.40	83.6	99.4	4.3
	18.0	3.8	8.8	105.8	75.8	5.9	125.9	18.0	114.9	7.51	89.3	101.2	4.5
	24.0	6.8	15.8	106.8	76.3	5.7	126.2	18.8	118.2	7.58	92.4	102.1	4.6
70	12.0	1.3	3.1	99.6	73.1	6.9	123.1	14.5	121.0	7.63	95.0	102.9	4.6
	18.0	3.6	8.4	102.4	74.3	6.5	124.4	15.9	127.7	7.76	101.2	104.9	4.8
	24.0	6.6	15.2	103.7	74.9	6.2	125.0	16.6	131.3	7.83	104.6	105.9	4.9
80	12.0	1.2	2.8	94.9	71.1	7.6	120.9	12.5	132.8	7.86	106.0	106.3	5.0
	18.0	3.4	7.9	98.2	72.5	7.1	122.4	13.8	139.8	8.01	112.5	108.4	5.1
	24.0	6.3	14.5	99.7	73.1	6.9	123.2	14.5	143.5	8.09	115.9	109.4	5.2
85	12.0	1.1	2.7	92.3	70.0	8.0	119.6	11.6	138.3	7.98	111.1	107.9	5.1
	18.0	3.4	7.7	95.7	71.4	7.5	121.3	12.8	145.3	8.13	117.5	109.9	5.2
	24.0	6.2	14.2	97.3	72.1	7.2	122.0	13.5	148.8	8.21	120.8	111.0	5.3
90	12.0	1.1	2.5	89.6	68.9	8.4	118.4	10.6	143.9	8.10	116.2	109.5	5.2
	18.0	3.3	7.6	93.2	70.4	7.9	120.1	11.8	150.8	8.25	122.6	111.5	5.4
	24.0	6.1	14.0	94.9	71.1	7.6	120.9	12.5	154.2	8.34	125.7	112.5	5.4
100	12.0	1.0	2.3	83.9	66.6	9.3	115.7	9.0	Operation Not Recommended				
	18.0	3.1	7.2	87.7	68.1	8.7	117.5	10.0					
	24.0	5.9	13.6	89.6	68.9	8.4	118.3	10.6					
110	12.0	0.9	2.0	77.8	64.0	10.4	113.1	7.5					
	18.0	3.0	6.8	81.7	65.7	9.7	114.8	8.4					
	24.0	5.7	13.1	83.7	66.5	9.4	115.6	8.9					
120	12.0	0.8	1.8	71.5	61.2	11.5	110.6	6.2					
	18.0	2.8	6.5	75.4	63.0	10.8	112.2	7.0					
	24.0	5.5	12.6	77.4	63.8	10.4	113.0	7.4					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

Performance Data: HBH120

4000 CFM Nominal Airflow Heating & Cooling

Performance capacities shown in thousands of Btuh

WATER/BRINE				Cooling - EAT 80/67°F					Heating - EAT 70°F				
EWT °F	FLOW gpm	PD psi	PD ft.	TC	SC	kW	HR	EER	HC	kW	HE	LAT	COP
20	30.00	16.0	36.9	Operation Not Recommended					91.8	9.0	61.1	89.2	3.0
30	15.00	4.0	9.2	141.5	98.1	6.6	163.9	21.6	99.2	9.2	67.8	90.9	3.2
	22.50	8.6	19.9	140.4	98.2	6.3	162.0	22.2	103.3	9.3	71.6	91.9	3.3
	30.00	14.5	33.4	139.2	98.0	6.2	160.5	22.4	105.6	9.4	73.7	92.4	3.3
40	15.00	3.5	8.0	140.6	97.2	7.0	164.4	20.1	112.5	9.5	80.1	94.0	3.5
	22.50	7.7	17.8	141.5	98.0	6.7	164.2	21.3	117.8	9.6	84.9	95.2	3.6
	30.00	13.0	30.0	141.5	98.2	6.5	163.7	21.7	120.8	9.7	87.6	95.9	3.6
50	15.00	3.2	7.4	137.4	95.6	7.5	163.0	18.3	126.8	9.9	93.2	97.3	3.8
	22.50	7.2	16.6	139.9	96.8	7.1	164.1	19.7	133.3	10.0	99.2	98.8	3.9
	30.00	12.2	28.3	140.8	97.3	6.9	164.4	20.3	136.9	10.1	102.5	99.6	4.0
60	15.00	2.4	5.5	132.6	93.5	8.1	160.3	16.3	141.7	10.2	106.9	100.7	4.1
	22.50	5.8	13.4	136.2	95.0	7.7	162.4	17.7	149.3	10.4	114.0	102.5	4.2
	30.00	10.2	23.6	137.7	95.8	7.5	163.2	18.5	153.6	10.5	117.9	103.5	4.3
70	15.00	2.2	5.1	126.6	90.9	8.9	156.9	14.3	156.8	10.5	120.9	104.2	4.4
	22.50	5.5	12.7	130.9	92.8	8.3	159.4	15.7	165.6	10.7	129.0	106.2	4.5
	30.00	9.8	22.6	133.0	93.6	8.1	160.6	16.4	170.4	10.8	133.4	107.3	4.6
80	15.00	2.1	4.7	119.9	88.0	9.7	153.1	12.3	172.0	10.9	135.0	107.7	4.6
	22.50	5.2	12.0	124.6	90.0	9.1	155.7	13.7	181.6	11.1	143.8	110.0	4.8
	30.00	9.4	21.7	126.9	91.0	8.8	157.1	14.4	186.9	11.2	148.6	111.2	4.9
85	15.00	2.0	4.6	116.4	86.5	10.2	151.2	11.5	179.5	11.0	141.9	109.5	4.8
	22.50	5.1	11.9	121.1	88.5	9.6	153.8	12.7	189.4	11.3	151.0	111.7	4.9
	30.00	9.3	21.5	123.5	89.6	9.3	155.1	13.4	194.8	11.4	155.8	113.0	5.0
90	15.00	2.0	4.5	113.0	85.0	10.7	149.3	10.6	187.0	11.2	148.7	111.2	4.9
	22.50	5.1	11.7	117.7	87.0	10.0	151.8	11.8	197.2	11.5	158.1	113.5	5.0
	30.00	9.2	21.2	120.1	88.1	9.7	153.2	12.4	202.7	11.6	163.1	114.8	5.1
100	15.00	1.9	4.3	106.0	81.8	11.7	146.0	9.0	Operation Not Recommended				
	22.50	4.9	11.4	110.6	83.9	11.0	148.1	10.0					
	30.00	9.0	20.8	112.9	84.9	10.7	149.3	10.6					
110	15.00	1.8	4.1	99.6	78.9	12.9	143.6	7.7					
	22.50	4.8	11.1	103.7	80.8	12.1	145.0	8.6					
	30.00	8.8	20.4	105.9	81.8	11.8	145.9	9.0					
120	15.00	1.7	3.9	94.2	76.5	14.2	142.6	6.6					
	22.50	4.7	10.8	97.5	78.0	13.4	143.1	7.3					
	30.00	8.6	19.9	99.4	78.8	13.0	143.5	7.7					

Interpolation is permissible; extrapolation is not.
All entering air conditions are 80°F DB and 67°F WB in cooling, and 70°F DB in heating.
AHRI/ISO certified conditions are 80.6°F DB and 66.2°F WB in cooling and 68°F DB in heating.
Table does not reflect fan or pump power corrections for AHRI/ISO conditions.
All performance is based upon the lower voltage of dual voltage rated units.
Performance stated is at the rated power supply; performance may vary as the power supply varies from the rated.
Operation below 40°F EWT is based upon a 15% methanol antifreeze solution.
Operation below 60°F EWT requires optional insulated water/refrigerant circuit.
See performance correction tables for operating conditions other than those listed above.
See Performance Data Selection Notes for operation in the shaded areas.

HBH Performance Data
Correction Tables

Air Flow Correction Table

Percentage of Rated Airflow	Cooling				Heating		
	Total Capacity	Sensible Capacity	Power	Heat of Rejection	Heating Capacity	Power	Heat of Extraction
75%	0.957	0.869	0.951	0.955	0.970	1.054	0.964
81%	0.966	0.901	0.963	0.966	0.978	1.035	0.975
88%	0.976	0.933	0.974	0.976	0.986	1.017	0.987
94%	0.988	0.966	0.987	0.988	0.993	1.009	0.993
100%	1.000	1.000	1.000	1.000	1.000	1.000	1.000
106%	1.006	1.029	1.014	1.008	1.006	0.999	1.005
113%	1.012	1.058	1.027	1.015	1.012	0.997	1.010
119%	1.017	1.080	1.051	1.024	1.017	0.996	1.014
125%	1.022	1.103	1.074	1.033	1.022	0.996	1.019

HBH072-120 Entering Air Correction Table Cooling

Entering Air WB°F	Total Capacity	Sensible Cooling Capacity Multiplier - Entering DB °F									Power	Heat of Rejection
		60	65	70	75	80	80.6	85	90	95		
50	0.7335	0.8825	*	*	*	*	*	*	*	*	0.9782	0.7834
55	0.8063	0.6757	0.8842	1.1119	*	*	*	*	*	*	0.9836	0.8424
60	0.8830		0.6734	0.8817	1.0918	*	*	*	*	*	0.9900	0.9301
65	0.9774			0.6682	0.8764	1.0885	1.1136	1.2949	*	*	0.9973	0.9981
66.2	0.9851			0.6177	0.8243	1.0357	1.0612	1.2452	*	*	0.9987	0.9879
67	1.0000			0.5842	0.7897	1.0000	1.0262	1.2119	*	*	1.0000	1.0000
70	1.0426				0.6609	0.8688	0.8941	1.0811	1.2916	*	1.0043	1.0420
75	1.1386					0.6517	0.6517	0.8594	1.0695	1.2838	1.0118	1.1128

* = Sensible capacity equals total capacity
AHRI/ISO/ASHRAE 13256-1 uses entering air conditions of Cooling - 80.6°F DB/66.2°F WB, 1 and Heating - 68°F DB/59°F WB entering air temperature

Entering Air Correction Table

Entering Air DB°F	Heating Capacity	Power	Heat of Extraction
50	1.044	0.834	1.099
55	1.034	0.872	1.076
60	1.024	0.910	1.053
65	1.012	0.955	1.027
68	1.005	0.982	1.011
70	1.000	1.000	1.000
75	0.989	1.047	0.974
80	0.974	1.101	0.942

Antifreeze Correction Table

Antifreeze Type	Antifreeze %	Cooling EWT 90°F			Heating EWT 30°F		WPD Corr. Fct. EWT 30°F
		Total Cap	Sens Cap	Power	Htg Cap	Power	
Water	0	1.000	1.000	1.000			
Propylene Glycol	5	0.995	0.995	1.003	0.989	0.997	1.070
	15	0.986	0.986	1.009	0.968	0.990	1.210
	25	0.978	0.978	1.014	0.947	0.983	1.360
Methanol	5	0.995	0.995	1.002	0.989	0.997	1.070
	15	0.990	0.990	1.007	0.968	0.990	1.160
	25	0.982	0.982	1.012	0.949	0.984	1.220
Ethanol	5	0.998	0.998	1.002	0.981	0.994	1.140
	15	0.994	0.994	1.005	0.944	0.983	1.300
	25	0.986	0.986	1.009	0.917	0.974	1.360
Ethylene Glycol	5	0.998	0.998	1.002	0.993	0.998	1.040
	15	0.994	0.994	1.004	0.980	0.994	1.120
	25	0.988	0.988	1.008	0.966	0.990	1.200

Blower Performance Data
HBH072 - Standard Unit

All Data is Wet Coil

SCFM	ESP	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
1800	BHP			0.28	0.32	0.35	0.39	0.42	0.45	0.48	0.52	0.56	0.60	0.64	0.69	0.72	0.76
	Sheave/Mtr			B	B	B	A	A	A	A	A	A	C	C	C	C	C
	RPM			599	645	690	735	775	815	850	885	910	940	965	995	1015	1040
	Turns Open			3	2	1	4	3.5	2.5	2	1.5	1	5	4.5	4	3.5	3
1900	BHP			0.31	0.36	0.40	0.44	0.49	0.53	2.50	0.62	0.65	0.69	0.73	0.76	0.80	0.84
	Sheave/Mtr			B	B	A	A	A	A	A	A	C	C	C	C	C	C
	RPM			604	655	695	740	780	820	855	890	920	950	980	1005	1030	1055
	Turns Open			3	2	5	4	3	2.5	2	1.5	5.5	4.5	4	3.5	3	3
2000	BHP		0.31	0.34	0.39	0.45	0.50	0.54	0.59	0.63	0.67	0.72	0.75	0.79	0.82	0.86	0.90
	Sheave/Mtr		B	B	B	A	A	A	A	A	A	C	C	C	C	C	C
	RPM		568	615	660	705	750	785	825	860	895	930	960	990	1015	1040	1065
	Turns Open		4.5	2.5	1.5	4.5	3.5	3	2.5	1.5	1	5	4.5	4	3.5	3	2.5
2100	BHP	0.33	0.38	0.42	0.46	0.50	0.54	0.59	0.65	0.70	0.74	0.78	0.81	0.85	0.89	0.94	0.98
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	C	C	C	C	C	C
	RPM	531	583	630	670	715	755	795	835	875	905	940	970	1000	1025	1055	1080
	Turns Open	4.5	3.5	2	5	4.5	3.5	2.5	2	1.5	1	5	4	4	3	2.5	2.5
2200	BHP	0.37	0.40	0.45	0.49	0.55	0.60	0.65	0.70	0.75	0.79	0.83	0.87	0.92	0.96	1.00	1.04
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	C	C	C	C	C	E	E
	RPM	552	599	645	685	730	770	810	850	885	915	950	980	1010	1040	1065	1090
	Turns Open	4	3	2	5	4	3	2.5	2	1.5	5.5	4.5	4	3.5	3	2.5	2
2300	BHP	0.42	0.47	0.51	0.56	0.60	0.65	0.70	0.75	0.80	0.84	0.89	0.94	1.00	1.05	1.10	1.16
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	C	C	C	E	E	E	E
	RPM	573	620	660	705	745	785	820	860	895	925	960	990	1020	1050	1075	1105
	Turns Open	3.5	2.5	1.5	4.5	4	3	2.5	1.5	1	5	4.5	4	3.5	3	2.5	2
2400	BHP	0.48	0.52	0.57	0.61	0.66	0.72	0.78	0.83	0.87	0.92	0.97	1.02	1.07	1.13	1.19	1.25
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	C	C	E	E	E	E	E
	RPM	604	645	690	730	765	805	845	880	910	945	975	1010	1035	1065	1095	1125
	Turns Open	3	2	5	4	3.5	2.5	2	1.5	1	5	4	3.5	3	2.5	2	1.5
2500	BHP	0.52	0.57	0.61	0.66	0.72	0.78	0.83	0.89	0.94	1.00	1.03	1.08	1.14	1.20	1.25	1.31
	Sheave/Mtr	B	B	A	A	A	A	A	A	C	E	E	E	E	E	E	E
	RPM	620	660	700	740	780	815	850	885	920	950	985	1015	1045	1075	1100	1130
	Turns Open	2.5	1.5	4.5	4	3	2.5	2	1.5	5.5	4.5	4	3.5	3	2.5	2	1.5
2600	BHP	0.56	0.61	0.66	0.70	0.76	0.82	0.88	0.93	0.98	1.04	1.08	1.14	1.20	1.26	1.32	1.37
	Sheave/Mtr	B	A	A	A	A	A	A	A	C	E	E	E	E	E	E	E
	RPM	635	675	715	750	790	825	860	895	925	960	990	1020	1050	1080	1110	1135
	Turns Open	2.5	5	4.5	3.5	3	2	1.5	1	5	4.5	4	3.5	3	2.5	1.5	1.5
2700	BHP	0.61	0.66	0.71	0.76	0.82	0.87	0.93	0.98	1.04	1.10	1.15	1.21	1.27	1.33	1.39	1.45
	Sheave/Mtr	B	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E
	RPM	655	695	730	770	805	840	875	905	940	970	1000	1030	1060	1090	1120	1145
	Turns Open	2	4.5	4	3.5	2.5	2	1.5	1	5	4.5	3.5	3	2.5	2	1.5	1
2800	BHP	0.66	0.72	0.77	0.83	0.88	0.93	0.99	1.05	1.11	1.16	1.22	1.30	1.37	1.44	1.51	1.57
	Sheave/Mtr	B	A	A	A	A	A	A	D	E	E	E	E	E	E	E	E
	RPM	670	710	750	785	815	850	885	915	950	980	1010	1040	1070	1100	1130	1155
	Turns Open	1.5	4.5	3.5	3	2.5	1.5	1.5	1	4.5	4	3.5	3	2.5	2	1.5	1
2900	BHP	0.71	0.77	0.82	0.87	0.93	0.98	1.04	1.10	1.16	1.22	1.30	1.36	1.43	1.50	1.57	1.63
	Sheave/Mtr	A	A	A	A	A	A	D	E	E	E	E	E	E	E	E	E
	RPM	685	725	765	795	830	860	895	925	955	985	1020	1045	1075	1105	1135	1160
	Turns Open	5	4	3.5	3	2	1.5	1	5	4.5	4	3.5	3	2.5	1.5	1	1
3000	BHP	0.79	0.84	0.90	0.95	1.01	1.07	1.13	1.19	1.25	1.31	1.38	1.46	1.52	1.59	1.66	
	Sheave/Mtr	A	A	A	A	A	D	D	E	E	E	E	E	E	E	E	
	RPM	710	745	780	815	850	885	915	945	975	1005	1035	1065	1090	1120	1150	
	Turns Open	4.5	4	3	2.5	2	1	1	5	4	3.5	3	2.5	2	1.5	1	

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance Data
HBH096 - Standard Unit

All Data is Wet Coil

SCFM	ESP	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
2400	BHP	0.45	0.50	0.54	0.59	0.63	0.69	0.74	0.80	0.85	0.90	0.94	0.99	1.04	1.10	1.16	1.22
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	A	A	A	C	C
	RPM	578	625	665	705	745	785	820	860	895	925	960	990	1020	1050	1080	1110
	Turns Open	5	4	3	2.5	1.5	5.5	5	4	3.5	3	2.5	2	1.5	1	4	3.5
2500	BHP	0.50	0.55	0.59	0.64	0.69	0.75	0.81	0.88	0.92	0.97	1.01	1.06	1.12	1.17	1.23	1.29
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	A	C	C	C
	RPM	599	645	685	725	765	800	835	875	905	940	970	1005	1035	1060	1090	1120
	Turns Open	4.5	3.5	2.5	2	6	5	4.5	4	3.5	3	2.5	2	1	4.5	3.5	3
2600	BHP	0.55	0.60	0.65	0.69	0.75	0.80	0.86	0.92	0.97	1.02	1.08	1.13	1.19	1.25	1.30	1.36
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	A	C	C	C
	RPM	625	665	705	740	780	815	850	885	920	950	985	1015	1045	1075	1100	1130
	Turns Open	4	3	2.5	1.5	5.5	5	4.5	3.5	3	2.5	2	1.5	1	4	3.5	3
2700	BHP	0.60	0.65	0.70	0.75	0.80	0.86	0.91	0.97	1.02	1.08	1.14	1.20	1.26	1.32	1.38	1.44
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	645	685	725	760	795	830	865	900	930	960	995	1025	1055	1085	1115	1140
	Turns Open	3.5	2.5	2	6	5.5	4.5	4	3.5	3	2.5	2	1.5	4.5	4	3.5	3
2800	BHP	0.65	0.71	0.76	0.82	0.87	0.93	0.98	1.04	1.10	1.16	1.21	1.28	1.36	1.43	1.50	1.56
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	665	705	745	780	810	845	880	910	945	975	1005	1035	1065	1095	1125	1150
	Turns Open	3	2.5	1.5	5.5	5	4.5	4	3	2.5	2	1.5	1	4	3.5	3	2.5
2900	BHP	0.71	0.76	0.82	0.87	0.92	0.98	1.03	1.09	1.16	1.22	1.29	1.36	1.43	1.50	1.57	1.63
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	685	720	760	795	825	860	890	920	955	985	1015	1045	1075	1105	1135	1160
	Turns Open	2.5	2	6	5.5	5	4	3.5	3	2.5	2	1.5	1	4	3.5	3	2.5
3000	BHP	0.78	0.84	0.89	0.95	1.00	1.06	1.12	1.18	1.24	1.30	1.37	1.43	1.50	1.58	1.64	1.71
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	700	740	775	810	845	880	910	940	970	1000	1030	1055	1085	1115	1140	1170
	Turns Open	2.5	1.5	5.5	5	4.5	4	3.5	2.5	2	1.5	1	4.5	3.5	3.5	3	2.5
3100	BHP	0.85	0.91	0.96	1.02	1.08	1.14	1.22	1.29	1.36	1.44	1.50	1.57	1.63	1.70	1.76	1.82
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C
	RPM	720	755	790	825	860	890	925	955	985	1015	1040	1070	1095	1125	1150	1175
	Turns Open	2	1	5.5	4.5	4	3.5	3	2.5	2	1.5	1	4	3.5	3	2.5	2
3200	BHP	0.93	1.00	1.07	1.14	1.20	1.26	1.32	1.38	1.44	1.51	1.57	1.64	1.70	1.78	1.85	1.92
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C	C
	RPM	740	775	810	845	875	905	935	965	995	1025	1050	1080	1105	1135	1160	1185
	Turns Open	1.5	5.5	5	4.5	4	3.5	3	2	1.5	1	4.5	4	3.5	3	2.5	2

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Table Continued on Next Page

Blower Performance Data
HBH096 - Standard Unit

Table Continued from Previous Page

All Data is Wet Coil

SCFM	ESP	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
3300	BHP	1.01	1.08	1.14	1.21	1.28	1.33	1.39	1.45	1.51	1.58	1.64	1.72	1.78	1.84	1.93	2.00
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	A	C	C	C	C	C	E
	RPM	755	790	820	855	890	915	945	975	1005	1035	1060	1090	1115	1140	1170	1195
	Turns Open	1	5.5	5	4	3.5	3	2.5	2	1.5	1	4	3.5	3	3	2.5	2
3400	BHP	1.08	1.15	1.22	1.29	1.35	1.41	1.47	1.53	1.59	1.68	1.75	1.83	1.90	1.96	2.02	2.08
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	A	C	C	C	C	E	E
	RPM	765	800	835	870	900	930	960	990	1015	1045	1070	1100	1125	1150	1175	1200
	Turns Open	6	5	4.5	4	3.5	3	2.5	2	1.5	1	4	3.5	3	2.5	2	2
3500	BHP	1.16	1.23	1.29	1.36	1.42	1.48	1.54	1.60	1.66	1.73	1.79	1.85	1.92	2.01	2.09	2.17
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	C	C	C	C	E	E	E
	RPM	780	815	845	880	910	940	970	1000	1025	1055	1080	1105	1130	1160	1185	1210
	Turns Open	5.5	5	4.5	3.5	3	2.5	2	1.5	1	4.5	4	3.5	3	2.5	2	1.5
3600	BHP	1.24	1.30	1.37	1.44	1.51	1.58	1.65	1.72	1.78	1.86	1.92	1.98	2.06	2.13	2.21	2.29
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	C	C	C	E	E	E	E
	RPM	795	825	860	890	920	950	980	1010	1035	1065	1090	1115	1145	1165	1190	1215
	Turns Open	5.5	4.5	4	3.5	3	2.5	2	1.5	1	4	3.5	3	2.5	2.5	2	1.5
3700	BHP	1.34	1.40	1.46	1.53	1.61	1.68	1.75	1.82	1.90	1.97	2.06	2.13	2.21	2.28	2.36	2.44
	Sheave/Mtr	A	A	A	A	A	A	A	A	C	C	E	E	E	E	E	E
	RPM	820	850	880	910	940	970	1000	1025	1055	1080	1110	1135	1160	1180	1205	1230
	Turns Open	5	4.5	3.5	3	2.5	2	1.5	1	4.5	4	3.5	3	2.5	2	1.5	1.5
3800	BHP	1.43	1.49	1.56	1.63	1.70	1.78	1.86	1.94	2.02	2.12	2.20	2.28	2.34	2.42	2.50	2.58
	Sheave/Mtr	A	A	A	A	A	A	A	A	E	E	E	E	E	E	E	E
	RPM	840	870	900	930	960	990	1020	1045	1070	1100	1125	1150	1170	1195	1220	1245
	Turns Open	4.5	4	3.5	3	2.5	2	1.5	1	4	3.5	3	2.5	2.5	2	1.5	1
3900	BHP	1.58	1.64	1.71	1.78	1.85	1.93	2.01	2.09	2.19	2.27	2.35	2.41	2.49	2.57	2.65	
	Sheave/Mtr	A	A	A	A	A	A	D	D	E	E	E	E	E	E	E	
	RPM	865	890	920	950	980	1010	1035	1060	1090	1115	1140	1160	1185	1210	1235	
	Turns Open	4	4	3	2.5	2	1.5	1	1	4	3.5	3	2.5	2	1.5	1.5	
4000	BHP	1.68	1.75	1.83	1.92	2.00	2.08	2.16	2.26	2.34	2.42	2.50	2.56	2.64	2.72	2.80	
	Sheave/Mtr	A	A	A	A	D	D	D	E	E	E	E	E	E	E	E	
	RPM	885	910	940	970	1000	1025	1050	1080	1105	1130	1155	1175	1200	1225	1250	
	Turns Open	4	3.5	2.5	2.5	2	1	1	4	3.5	3	2.5	2	2	1.5	1	

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Blower Performance Data
HBH120 - Standard Unit

All Data is Wet Coil

SCFM	ESP	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
3000	BHP	0.75	0.81	0.86	0.91	0.97	1.03	1.09	1.15	1.21	1.27	1.34	1.41	1.47	1.54	1.61	1.67
	Sheave/Mtr	B	B	B	B	B	B	A	A	A	A	A	A	A	A	A	A
	RPM	680	720	755	790	825	860	895	925	955	985	1015	1045	1070	1100	1130	1155
	Turns Open	5	4	3.5	3	2.5	1.5	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1
3100	BHP	0.82	0.88	0.94	0.99	1.04	1.10	1.17	1.26	1.33	1.40	1.46	1.53	1.59	1.66	1.72	1.80
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	A	A	A	A	C
	RPM	700	735	775	805	840	875	905	940	970	1000	1025	1055	1080	1110	1135	1165
	Turns Open	4.5	4	3	2.5	2	6	5.5	4.5	4.5	3.5	3	3	2.5	2	1.5	4
3200	BHP	0.90	0.96	1.03	1.10	1.17	1.23	1.29	1.35	1.41	1.47	1.55	1.61	1.68	1.74	1.81	1.89
	Sheave/Mtr	B	B	B	B	B	A	A	A	A	A	A	A	A	A	A	C
	RPM	720	755	790	825	860	890	920	950	980	1010	1040	1065	1095	1120	1145	1175
	Turns Open	4	3.5	3	2	1.5	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	3.5
3300	BHP	0.98	1.04	1.11	1.18	1.25	1.31	1.37	1.43	1.49	1.55	1.62	1.68	1.75	1.81	1.88	1.95
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	A	A	A	C
	RPM	740	770	805	840	875	905	935	965	995	1020	1050	1075	1105	1130	1155	1180
	Turns Open	4	3	2.5	2	6	5.5	5	4	4	3	2.5	2.5	2	1.5	1	3.5
3400	BHP	1.06	1.13	1.19	1.26	1.33	1.38	1.44	1.50	1.56	1.65	1.72	1.80	1.87	1.94	2.00	2.06
	Sheave/Mtr	B	B	B	B	A	A	A	A	A	A	A	A	A	A	C	C
	RPM	755	790	820	855	890	915	945	975	1005	1035	1060	1090	1115	1140	1165	1190
	Turns Open	3.5	3	2.5	1.5	6	5	4.5	4	3.5	3	2.5	2	1.5	1	4	3
3500	BHP	1.14	1.21	1.27	1.34	1.40	1.46	1.52	1.58	1.65	1.71	1.77	1.84	1.90	1.98	2.06	2.14
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	A	A	A	C	C
	RPM	770	805	835	870	900	930	960	990	1020	1045	1070	1100	1125	1150	1175	1200
	Turns Open	3	2.5	2	6	5.5	5	4.5	3.5	3.5	3	2.5	2	1.5	1	3.5	3
3600	BHP	1.23	1.29	1.36	1.42	1.50	1.57	1.64	1.71	1.77	1.84	1.90	1.96	2.05	2.13	2.21	2.27
	Sheave/Mtr	B	B	B	A	A	A	A	A	A	A	A	A	A	C	C	C
	RPM	790	820	855	885	915	945	975	1005	1030	1060	1085	1110	1140	1165	1190	1210
	Turns Open	3	2.5	1.5	6	5.5	4.5	4	3.5	3	2.5	2	1.5	1.5	4	3.5	3
3700	BHP	1.32	1.38	1.44	1.51	1.58	1.65	1.73	1.81	1.88	1.96	2.03	2.10	2.18	2.26	2.34	2.42
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	A	A	A	C	C	C
	RPM	810	840	870	900	930	960	990	1020	1045	1075	1100	1125	1150	1175	1200	1225
	Turns Open	2.5	2	6	5.5	5	4.5	4	3	3	2.5	2	1.5	1	3.5	3	2.5
3800	BHP	1.41	1.47	1.54	1.61	1.68	1.75	1.82	1.91	1.99	2.07	2.17	2.25	2.31	2.39	2.47	2.55
	Sheave/Mtr	B	B	A	A	A	A	A	A	A	A	A	A	A	C	C	C
	RPM	830	860	890	920	950	980	1005	1035	1060	1085	1115	1140	1160	1185	1210	1235
	Turns Open	2	1.5	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	1	3.5	3	2.5
3900	BHP	1.54	1.60	1.67	1.74	1.82	1.89	1.96	2.04	2.14	2.22	2.30	2.38	2.46	2.52	2.60	2.68
	Sheave/Mtr	B	A	A	A	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	850	875	905	935	965	995	1020	1045	1075	1100	1125	1150	1175	1195	1220	1245
	Turns Open	2	6	5.5	5	4.5	3.5	3	2.5	2.5	2	1.5	1	3.5	3	2.5	2
4000	BHP	1.63	1.71	1.78	1.86	1.94	2.03	2.11	2.19	2.27	2.37	2.45	2.51	2.59	2.67	2.75	2.85
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	A	A	A	C	C	C	C
	RPM	865	895	920	950	980	1010	1035	1060	1085	1115	1140	1160	1185	1210	1235	1260
	Turns Open	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	1	3.5	3	2.5	2
4100	BHP	1.73	1.81	1.90	1.97	2.05	2.12	2.20	2.27	2.34	2.42	2.52	2.62	2.70	2.80	2.90	
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	A	A	C	C	C	C	
	RPM	885	915	945	970	1000	1025	1055	1080	1105	1130	1155	1180	1200	1225	1250	
	Turns Open	6	5.5	4.5	4	4	3	2.5	2	2	1.5	1	3.5	3	2.5	2	
4200	BHP	1.87	1.94	2.02	2.08	2.16	2.24	2.32	2.40	2.48	2.58	2.68	2.76	2.86	2.96		
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	A	C	C	C	C		
	RPM	905	935	965	990	1020	1045	1070	1095	1120	1145	1170	1190	1215	1240		
	Turns Open	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	3.5	3.5	3	2.5		

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

Table Continued on Next Page

Blower Performance Data
HBH120 - Standard Unit

Table Continued from Previous Page

All Data is Wet Coil

SCFM	ESP	0.00	0.10	0.20	0.30	0.40	0.50	0.60	0.70	0.80	0.90	1.00	1.10	1.20	1.30	1.40	1.50
4300	BHP	2.00	2.07	2.16	2.23	2.31	2.41	2.49	2.57	2.66	2.74	2.84	2.94	3.02	3.15		
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	C	C	C	E	E		
	RPM	930	955	985	1010	1035	1065	1090	1115	1140	1160	1185	1210	1230	1255		
	Turns Open	5	4.5	4	3.5	3	2.5	2	1.5	1.5	4	3.5	3	2.5	2		
4400	BHP	2.14	2.22	2.32	2.40	2.48	2.56	2.65	2.74	2.82	2.92	3.00	3.10	3.18			
	Sheave/Mtr	A	A	A	A	A	A	A	A	A	C	E	E	E			
	RPM	950	975	1005	1030	1055	1080	1110	1135	1155	1180	1200	1225	1245			
	Turns Open	4.5	4	3.5	3	3	2.5	2	1.5	1	4	3	3	2.5			
4500	BHP	2.30	2.38	2.46	2.54	2.62	2.72	2.80	2.88	3.00	3.08	3.16	3.26				
	Sheave/Mtr	A	A	A	A	A	A	A	A	D	E	E	E				
	RPM	970	995	1020	1045	1070	1100	1125	1145	1170	1195	1215	1240				
	Turns Open	4.5	4	3.5	3	2.5	2	1.5	1.5	1	3.5	3	2.5				
4600	BHP	2.39	2.45	2.54	2.63	2.72	2.83	2.92	3.00	3.10	3.18	3.28	3.38				
	Sheave/Mtr	A	A	A	A	A	A	A	D	D	E	E	E				
	RPM	980	1000	1025	1050	1075	1105	1130	1150	1175	1195	1220	1245				
	Turns Open	4	3.5	3.5	3	2.5	2	1.5	1	1	3.5	3	2.5				
4700	BHP	2.46	2.52	2.62	2.72	2.82	2.92	3.02	3.12	3.22	3.32	3.40	3.50				
	Sheave/Mtr	A	A	A	A	A	A	D	D	E	E	E	E				
	RPM	985	1005	1030	1055	1080	1105	1130	1155	1180	1205	1225	1250				
	Turns Open	4	3.5	3	2.5	2	1.5	1.5	1	4	3.5	2.5	2.5				
4800	BHP	2.57	2.64	2.74	2.84	2.94	3.04	3.14	3.24	3.32	3.42	3.52	3.60				
	Sheave/Mtr	A	A	A	A	A	D	D	D	E	E	E	E				
	RPM	990	1010	1035	1060	1085	1110	1135	1160	1180	1205	1230	1250				
	Turns Open	4	3.5	3	2.5	2	1.5	1	1	3.5	3	2.5	2				
4900	BHP	2.68	2.78	2.88	3.00	3.06	3.16	3.26	3.36	3.44	3.54	3.64	3.75				
	Sheave/Mtr	A	A	A	D	D	D	D	E	E	E	E	E				
	RPM	995	1020	1045	1070	1090	1115	1140	1165	1185	1210	1235	1255				
	Turns Open	3.5	3	3	2.5	1.5	1.5	1	4	3.5	3	2.5	2				
5000	BHP	2.82	2.92	3.00	3.10	3.20	3.28	3.38	3.48	3.56	3.66	3.74					
	Sheave/Mtr	A	A	D	D	D	D	D	E	E	E	E					
	RPM	1005	1030	1050	1075	1100	1120	1145	1170	1190	1215	1235					
	Turns Open	3.5	3	2.5	2	1.5	1	1	3.5	3	2.5	2					

A = Standard Static/Standard Motor, B = Low Static/Standard Motor, C = High Static/Standard Motor, D = Standard Static/Large Motor, E = High Static/Large Motor
Unit factory shipped with standard static sheave and drive at 2.5 turns open. Other speed require field selection.
For applications requiring higher static pressures, contact your local representative. Performance data does not include drive losses and is based on sea level conditions.
Do not operate in black regions. All airflow is rated at lowest Voltage if unit is dual Voltage rated, i.e. 208V for 208-230V units.

HBH Physical Data

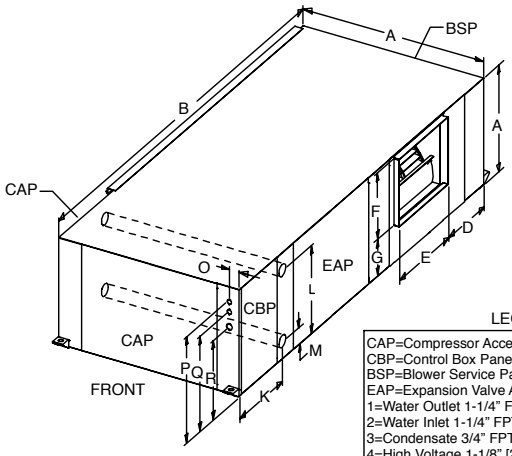
Model	072	096	120
Compressor Quantity	Scroll		
Number of Circuits (Compressors)	2		
Factory Charge R-410a (oz) [kg] per circuit	60 [1.70]	76 [2.15]	80 [2.27]
Blower Motor			
Blower Motor Quantity	1		
Standard Motor (hp) [kw]	1 [0.75]	2 [1.49]	3 [2.24]
Large Motor (hp)[KW]	(2)[1.49]	3[2.24]	5[3.73]
Blower			
No. of Blowers	1		
Blower Wheel Size D x W (in0 [cm]	12 x 12 [30.48 x 30.48]		
Water Connection Size			
FPT (in) [mm]	1-1/4" [31.8]		1-1/2" [38.1]
Coax Volume			
Volume (Gallons) [liters]	1.62 [6.13]	1.81 [6.85]	2.40 [9.08]
Condensate Connection Size			
FPT (in) [mm]	3/4" [19.1]		
Air Coil Data			
Air Coil Dimensions H x W (in) [cm]	20 x 54 [50.8 x 137.16]	20 x 64 [50.8 x 162.56]	
Air Coil Total Face Area (ft2) [m2]	7.5 [0.70]	8.9 [0.83]	
Air Coil Tube Size (in) [cm]	3/8" [0.953]		
Air Coil Fin Spacing (fpi) [fins per cm]	14 [5.5]		
Air Coil Number of Rows	3		
Miscellaneous Data			
Filter Standard - 1" [25.4mm] Throwaway (qty) (in) [cm]	(QTY.4) 16 x20 [40.64 x 50.80]		
Weight - Operating (lbs) [kg]	586 [265.8]	644 [292.1]	698 [316.6]
Weight - Packaged (lbs) [kg]	626 [283.9]	684 [310.3]	738 [334.8]

All units have grommet compressor mountings, and 1/2” & 1-3/4” electrical knockouts.

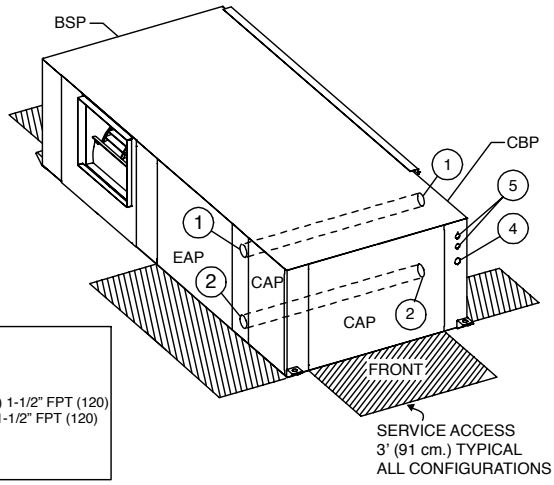
Unit Maximum Water Working Pressure	Max Pressure PSIG [kPa]
Base Unit	500 [3445]

HBH072-120 Dimensional Data

LEFT RETURN STRAIGHT DISCHARGE



RIGHT RETURN STRAIGHT DISCHARGE

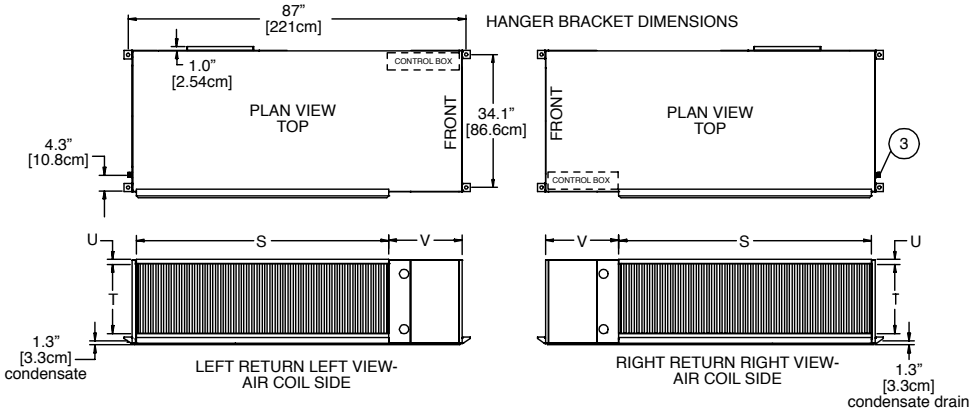


LEGEND

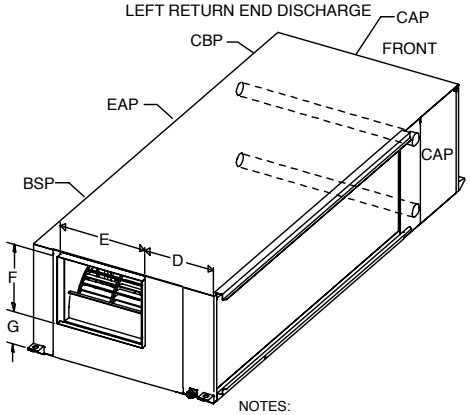
CAP=Compressor Access Panel
CBP=Control Box Panel
BSP=Blower Service Panel
EAP=Expansion Valve Access panel
1=Water Outlet 1-1/4" FPT (072-096) 1-1/2" FPT (120)
2=Water Inlet 1-1/4" FPT (072-096) 1-1/2" FPT (120)
3=Condensate 3/4" FPT
4=High Voltage 1-1/8" [2.9cm] KO
5=Low Voltage 7/8" [2.2cm] KO

NOTES FOR LEGEND:

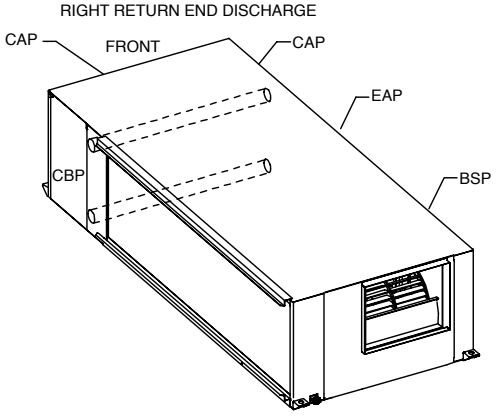
1. Access is required for all removable panels and installer should take care to comply with all building codes and allow adequate clearance for future field service.
2. Water inlet and water outlet connections are available on either side (left or right) of the unit. Qty (2x) MPT Plugs are shipped loose in a plastic bag tied to the water leg in front of the unit. Installer must plug water inlet/outlet side not being connected to.
3. Condensate drain is available on end opposite compressor.
4. Electrical access is available on either side (left or right) of the front.
5. Electric box is on right side. It can be field converted to left side. Conversion should only be attempted by qualified service technician.



LEFT RETURN END DISCHARGE



RIGHT RETURN END DISCHARGE



NOTES:
- All dimensions in inches (cm)
- Units require 3' (9.1 cm) clearance for water connections, CAP, CSP, EAP and BSP service access.
- Overall cabinet width dimensions does not include filter rail and duct flange.

DIMENSIONAL DATA TABLE ON NEXT PAGE

HBH072-120 Dimensional Data

Model		Overall Cabinet			Discharge Connections Duct Flange				Water Connections			Electrical Knockouts				Return Air Connections Using Return Air Opening			
		A Depth	B Width	C Height	D	E Supply Depth	F Supply Width	G Supply Height	K	L Water Outlet	M Water Inlet	O	P	Q	R	S Return Depth	T Return Height	U	V
072-120	in.	36.3	84.9	21.6	14.0	17.0	13.5	7.8	15.0	8.3	4.0	2.0	18.8	16.8	13.8	65.0	18.0	1.0	18.9
	cm.	92.2	215.6	54.9	35.6	43.2	34.3	19.8	38.1	21.1	10.2	5.1	47.8	42.7	35.1	165.1	45.7	2.5	48.0

HBH072-120 Corner Weights

	HBH072	HBH096	HBH120
Weight - Operating (lbs) [kg]	586 [265.8]	644 [292.1]	698 [316.6]
Weight - Packaged (lbs) [kg]	626 [283.9]	684 [310.3]	738 [334.8]
Weight - Corner - Control box/Compressor side (lbs) [kg]	235 [106.6]	254 [115.2]	271 [122.9]
Weight - Corner - Compressor side (lbs) [kg]	101 [45.8]	120 [54.4]	137 [62.1]
Weight - Corner - Blower side side (lbs) [kg]	180 [81.6]	190 [86.2]	200 [90.7]
Weight - Corner - Air Coil side (lbs) [kg]	70 [31.8]	80 [36.3]	90 [40.8]

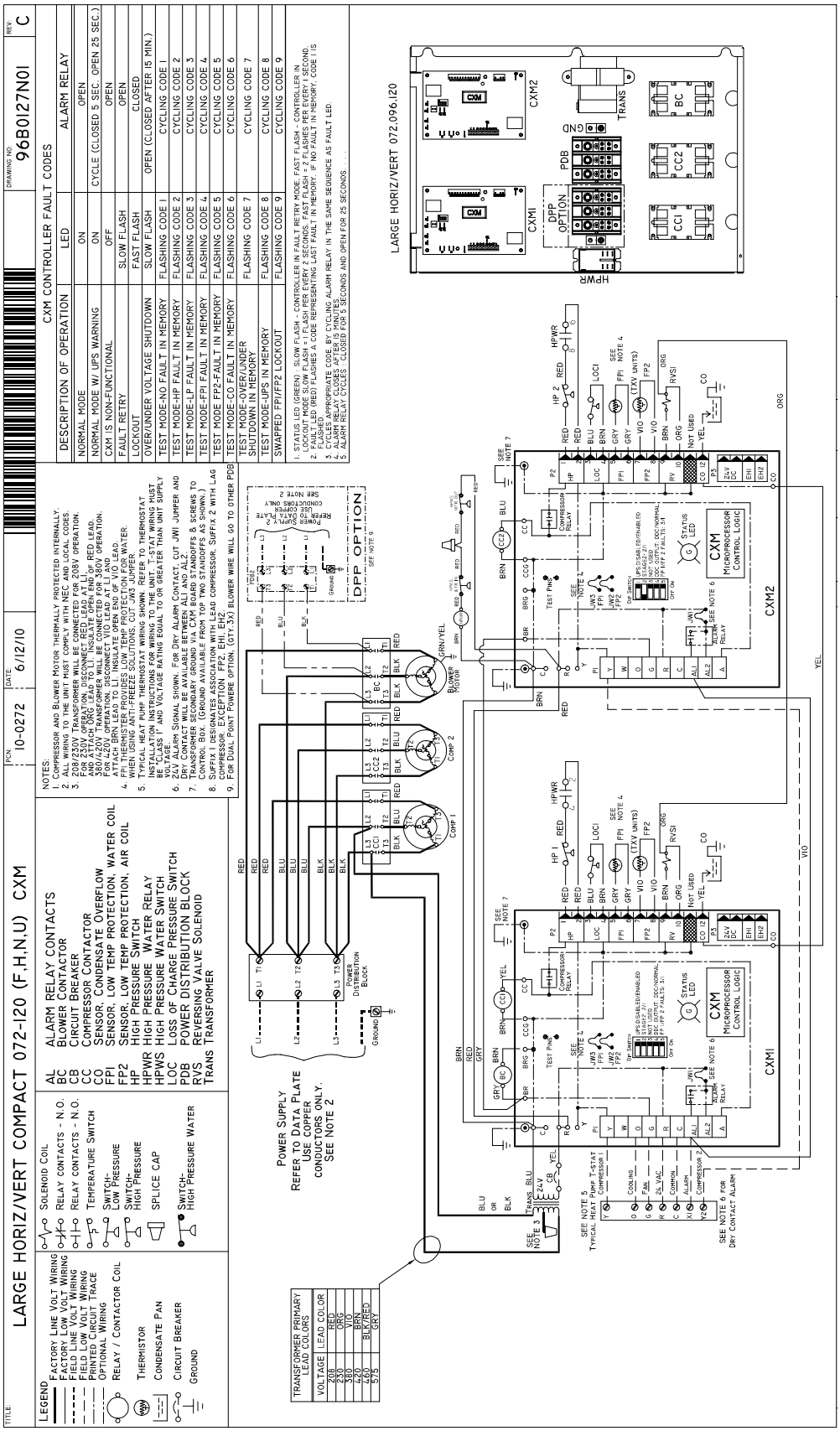
HBH Electrical Data

Standard

HB Model	Voltage Code	Rated Voltage	Voltage Min Max	Blower Option	Compressor			Fan Motor FLA	Total Unit FLA	Min Circuit Amp	Max Fuse/ HACR
					QTY	RLA	LRA				
072	H	208-3-60	197/254	A, B, C	2	10.4	73.0	4.0	24.8	27.4	35
	H	208-3-60	197/254	D, E	2	10.4	73.0	6.2	27.0	29.6	35
	F	460-3-60	414/506	A, B, C	2	5.8	38.0	2.0	13.6	15.1	20
	F	460-3-60	414/506	D, E	2	5.8	38.0	3.1	14.7	16.1	20
	N	575-3-60	518/633	A, B, C	2	3.8	36.5	1.4	9.0	9.9	15
	N	575-3-60	518/633	D, E	2	3.8	36.5	2.3	9.9	10.8	15
096	H	208-3-60	197/254	A, B, C	2	13.7	83.1	6.2	33.6	37.0	50
	H	208-3-60	197/254	D, E	2	13.7	83.1	9.2	36.6	40.0	50
	F	460-3-60	414/506	A, B, C	2	6.2	41.0	3.1	15.5	17.0	20
	F	460-3-60	414/506	D, E	2	6.2	41.0	4.3	16.7	18.3	20
	N	575-3-60	518/633	A, B, C	2	4.8	33.0	2.3	11.9	13.1	15
	N	575-3-60	518/633	D, E	2	4.8	33.0	3.4	13.0	14.2	15
120	H	208-3-60	197/254	A, B, C	2	15.6	110.0	9.2	40.4	44.3	50
	H	208-3-60	197/254	D, E	2	15.6	110.0	14.1	45.3	49.2	60
	F	460-3-60	414/506	A, B, C	2	7.8	52.0	4.3	19.9	21.9	25
	F	460-3-60	414/506	D, E	2	7.8	52.0	7.0	22.6	24.6	30
	N	575-3-60	518/633	A, B, C	2	5.8	38.9	3.4	15.0	16.5	20
	N	575-3-60	518/633	D, E	2	5.8	38.9	5.2	16.8	18.3	20

HACR circuit breaker in USA only
All fuses Class RK-5

Typical Wiring Diagram
Three Phase HBH072-120
With CXM Controller



HBH Series 60Hz
Engineering Specifications Page 1

NOTICE!

This product specification document is furnished as a means to copy and paste Heat Controller product information into a project specification. It is not intended to be a complete list of product requirements. This document is an excerpt from the product submittal and must not be used without consulting the complete product submittal. For complete product installation and application requirements, please consult the complete product submittal. Heat Controller is not responsible for misuse of this document or a failure to adequately review specific requirements in the product submittal.

HBH Series 60Hz
Engineering Specifications Page 2

General:
Furnish and install the HBH Series as indicated on the plans. Equipment shall be completely assembled, piped and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified in accordance with Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

All units shall be fully quality tested by factory run testing under normal operating conditions as described herein. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria. Detailed report card will ship with each unit displaying status for critical tests and components. **Note: If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for ease of unit warranty status. Units tested without water flow are not acceptable.**

Basic Construction:
Horizontal units shall have one of the following air flow arrangements: Left Return/Back Discharge, Left Return/Straight Discharge, Right Return/Back Discharge, Right Return/Straight Discharge as shown on the plans. **Units can be field converted without requiring new panels or belts. Units that cannot be field converted shall not be acceptable.**

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades. All units must have a minimum of two access panels for serviceability of compressor compartment. **Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable.**

Compressor section interior surfaces shall be lined with 1/2 inch (12.7mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Air handling section interior surfaces shall be lined with 1/2 in (12.7mm) thick, 1-3/4 lb/ft3 (28 kg/m3) foil backed fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. **Units without foil faced insulation in the air handling section will not be accepted.**

Horizontal heat pumps shall be fabricated from heavy gauge galvanized steel, with powder coat paint finish on front access panel. Color to be pewter. Both sides of the panel shall be painted for added protection.

Standard insulation must meet NFPA Fire Hazard Classification requirements 25/50 per ASTM E84, UL 723, CAN/ULC S102-M88 and NFPA 90A requirements; air erosion and mold growth limits of UL-181; stringent fungal resistance test per ASTM-C1071 and ASTM G21; and shall meet zero level bacteria growth per ASTM G22. **Unit insulation must meet these stringent requirements or unit(s) will not be accepted.**

Horizontal units to have discharge air duct collar and 1” (25.4mm) filter rails with 1” (25.4mm) filters factory installed and factory installed mounting brackets. **If units with these factory installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.**

All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable. Units shall have a factory installed 1 inch (25.4mm) wide filter rails with filter removal from either side. Units shall have a 1 inch (25.4mm) thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.

Cabinets shall have separate knockouts on front and sides for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings, connections on both sides (installer to choose side and plug opposite) and shall be securely mounted flush to the cabinet side allowing for connection of a flexible hose without the use of a back-up wrench. **Water connections that protrude through the cabinet or require the use of a backup wrench shall not be allowed.** Water connections on only one side will not be accepted. All water connections and electrical knockouts must 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.** Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

HBH Series 60Hz
Engineering Specifications Page 3

Fan and Motor Assembly:
All units shall have belt-driven single centrifugal fan. Fan motor shall be permanently lubricated with thermal overload protection. Units supplied without permanently lubricated motors must provide external oilers for easy service. The fan and motor assembly must be capable of overcoming the external static pressures as shown on the schedule. Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place. **Ratings based on a dry coil and/or no filter, or on an ESP less than 0.25" (6.35 mm w.g.) shall NOT be acceptable.**

Option: Various blower drive packages for selectable static pressure/airflow.

Refrigerant Circuit:
All units shall contain R-410A sealed refrigerant circuit including a high efficiency scroll compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, an enhanced corrugated aluminum lanced fin and rifled copper tube refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure switch (loss of charge), water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. **Units that cannot be reset at the thermostat shall not be acceptable.**

Hermetic compressors shall be internally sprung. The scroll compressors shall have a dual level vibration isolation system. The compressor(s) will be mounted on specially engineered sound-tested EPDM vibration isolation grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment isolated from air stream to minimize sound transmission.

Refrigerant to air heat exchangers shall utilize enhanced corrugated lanced aluminum fins and rifled copper tube construction rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced type with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

Option: The unit shall be supplied with cupro-nickel coaxial water to refrigerant heat exchanger.

Option: The unit shall be supplied with extended range Insulation option, which adds closed cell insulation to internal water lines, and provides insulation on suction side refrigeration tubing including refrigerant to water heat exchanger.

Option: The refrigerant to air heat exchanger shall be "electro-coated" with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all galvanized end plates and copper tubing, and a minimum of 2000 hours of salt spray on all aluminum fins. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

Drain Pan:
The drain pan shall be constructed of galvanized steel and have a powder coat paint application to further inhibit corrosion. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. Drain pan hose assembly can be connected to either side, drain outlet to be 1"FPT fitting. Choice of drain connection to only one side will not be accepted. The unit as standard will be supplied with solid-state electronic condensate overflow protection. Mechanical float switches will NOT be accepted.

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Option: The unit shall be supplied with stainless steel drain pan.

Electrical:
A control box shall be located within the unit compressor compartment and shall contain a 75VA transformer with load side circuit breaker protection, 24 volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor. Two compressor units shall have a solid-state time delay relay and random start to prevent both compressors from starting simultaneously.

Solid State Control System (CXM):
Units shall have a solid-state control system. **Units utilizing electro-mechanical control shall not be acceptable.** The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

a. Anti-short cycle time delay on compressor operation.
b. Random start on power up mode.
c. Low voltage protection.
d. High voltage protection.
e. Unit shutdown on high or low refrigerant pressures.
f. Unit shutdown on low water temperature.
g. Condensate overflow electronic protection.
h. Option to reset unit at thermostat or disconnect.
i. Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
j. Ability to defeat time delays for servicing.
k. Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
l. The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
m. 24V output to cycle a motorized water valve or other device with compressor contactor.
n. Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
o. Water coil low temperature sensing (selectable for water or anti-freeze).
p. Air coil low temperature sensing.

NOTE: Units not providing the 8 safety protections of anti-short cycle, low voltage, high voltage, high refrigerant pressure, low pressure (loss of charge), air coil low temperature cut-out, water coil low temperature cut-out, and condensate overflow protections will not be accepted.

Remote Service Sentinel (CXM):
Solid state control system shall communicate with thermostat to display (at the thermostat) the unit status, fault status, and specific fault condition, as well as retrieve previously stored fault that caused unit shutdown. The Remote Service Sentinel allows building maintenance personnel or service personnel to diagnose unit from the wall thermostat. The control board shall provide a signal to the thermostat fault light, indicating a lockout. Upon cycling the G (fan) input 3 times within a 60 second time period, the fault light shall display the specific code as indicated by a sequence of flashes. A detailed flashing code shall be provided at the thermostat LED to display unit status and specific fault status such as over/under voltage fault, high pressure fault, low pressure fault, low water temperature fault, condensate overflow fault, etc. Units that do not provide this remote service sentinel shall not be acceptable.

FIELD INSTALLED OPTIONS
Hose Kits:
All units 120000 BTUH (35 kW) and below shall be connected with hoses. The hoses shall be 2 feet (61cm) long, braided stainless steel; fire rated hoses complete with adapters. Only fire rated hoses will be accepted.

Valves:
The following valves are available and will be shipped loose:
a. Ball valve; bronze material, standard port full flow design, FPT connections.
b. Ball valve with memory stop and PT port.
c. “Y” strainer with blowdown valve; bronze material, FPT connections.
d. Motorized water valve; slow acting, 24v, FPT connections.

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Hose Kit Assemblies:
The following assemblies ship with the valves already assembled to the hose described:

a. Supply and return hoses having ball valve with PT port.
b. Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.
c. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
d. Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

Design, material, performance data and components
subject to change without notice.

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06/2012