



MAC-060HE-02-L

High Efficiency Air-Cooled Chiller

Air-Cooled Chillers for Global
Residential and Light Commercial
Micro Climates

Rev 1.2

HVAC Guide Specifications

Air-Cooled Liquid Chiller with **Low Ambient Kit**

Nominal Size:

5 Tons

MultiAqua Model Number:

MAC-060HE-02-L

Part 1-General

1.01 System Description

MultiAqua air-cooled liquid chillers are designed using scroll compressors, low sound condenser fan and high efficiency pump.

1.02 Quality Assurance

- A. Certified in accordance with U.L. Standard 95, 4th edition (U.S.A.).
- B. Manufactured in a facility registered to ISO 9002, Manufacturing Quality Standard.
- C. ETL Certified
- D. Fully load tested at the factory.
- E. Damage resistant packaging.

1.03 Delivery, Storage and Handling

- A. Packaged and readied for shipment from the factory.
- B. Controls shall be capable of withstanding 150°F storage temperatures in the control compartment.
- C. Stored and handled per manufacturer's recommendations.

Part 2-Product

2.01 Equipment

- A. General:
 1. Unit shall be a factory assembled and tested air-cooled liquid chiller.
 2. Shall be assembled on heavy gauge steel mounting/lifting rails.
 3. Contained within the unit cabinet shall be all factory wiring, piping, controls, refrigerant charge (R407c), POE oil and special accessories required prior to start up.
 4. Brass body strainer with 20 mesh screen and blow down shall be supplied in cabinet as a field installable accessory.
- B. Unit Cabinet:
 1. Composed of heavy gauge galvanized steel casing with a baked polyester powder.
 2. Capable of withstanding 500-hour salt spray test in accordance with the ASTM (USA) standard.
- C. Condenser Fan:
 1. Four blade glass reinforced polypropylene (PPG) petals mounted on a cast aluminum hub construction and shall be dynamically balanced and corrosion resistant.
 2. Vertical discharged air.
 3. Motors and blades shall be protected by coated steel wire safety guards.
- D. Fan Motors:
 1. Condenser fan motors shall be single speed, direct drive.
 2. Totally enclosed.
 3. Permanently lubricated sleeve bearings and Class F insulation.
 4. Internal overload protection.
- E. Compressors:
 1. Unit shall contain one fully hermetic scroll compressors.
 2. Direct-drive, 3500 rpm (60Hz)
 3. Compressor motor shall be suction gas cooled.
 4. Internal motor protection.
 5. Externally protected by low and high pressure cutout devices.
 6. Individual vibration isolators.

F. Pump:

1. Integral circulating pump shall be stainless steel with high efficiency enclosed motor.
2. Unit shall have chilled liquid solution piping to the exterior of the cabinet.

G. Evaporator:

1. Evaporator shall have one independent refrigerant circuit and one liquid solution circuit.
2. Rated for a refrigerant side working pressure of 450 psig and a maximum water side working pressure of 60 psig.
3. Single pass, ANSI type 316 stainless steel, brazed plate construction.
4. Externally insulated with closed cell, elastomeric foam. (ASTM518)

H. Condenser:

1. Condenser coil shall be air-cooled with integral sub-cooler.
2. One independent refrigerant circuit.
3. Constructed of rifled copper tubing mechanically bonded to aluminum fins.
4. Cleaned and dehydrated.
5. Factory leak tested to 450 psig.

I. Refrigerant Circuits:

1. Each circuit shall contain a sight glass, liquid line filter, thermal expansion valve, refrigerant charge of R407c and POE compressor oil.

Part 3-Controls and Safeties**3.01 Controls**

- A. Chiller shall be completely factory wired and tested.
- B. Temperature control shall be based on leaving chilled liquid solution temperature.
 1. Temperature accuracy shall be + - 1°F
- C. Controls shall include the following components.
 1. 24vac transformer to serve all controllers relays and control components.
 2. Microprocessor based liquid solution temperature controller.
 3. Leaving water temperature thermistor.
 4. Pump bypass timer.
 5. Compressor recycle timer.
 6. Optional low pressure bypass timer for low ambient operation.
 7. Optional fan cycling control for low ambient operation.
 8. Chilled liquid solution flow switch.

3.02 Safeties

- A. Unit shall be equipped with thermistors and all necessary components in conjunction with the control system to provide the following protectants.
 1. Low refrigerant pressure.
 2. High refrigerant pressure.
 3. Low chilled liquid solution temperature.
 4. Low chilled liquid solution flow.
 5. Thermal overload.
 6. Short cycling.

Part 4-Operating Characteristics:**4.01 Temperatures**

- A. Unit shall be capable of starting and running at outdoor temperatures from 55°F to 120°F.
- B. Optional Low Ambient Kit shall allow starting and running at outdoor temperatures to -20°F. A field supplied and installed crankcase heater must be used when operating at these temperatures.
- C. Unit shall be capable of starting up with a maximum 80°F and a sustained 70°F entering fluid solution temperature to the evaporator.
- D. Minimum 10% Glycol solution is always required.
- E. For outdoor temperatures below 32°F, reference MAC Glycol Solution Data table.

4.02 Electrical Requirements

- A. Primary electrical power supply shall enter the unit at a single location.
- B. Electrical power supply shall be rated to withstand 120°F operating ambient temperature.
- C. Units shall be available in 1 or 3-phase power at the voltages shown in the equipment electrical data.
- D. Control points shall be accessed through terminal block.

Part 5- Definitions:**5.01 Abbreviations**

- A. CFM = Cubic Feet per Minute
- B. DB = Dry Bulb Temperature
- C. EWT = Entering Water Temperature
- D. GPM = US Gallons Per Minute
- E. MBH = BTU X 1000
- F. SC = Sensible Cooling
- G. TC = Total Cooling = Sensible + Latent
- H. WB = Wet Bulb Temperature
- I. WPD = Water Pressure Drop in feet of head
- J. dB = Decibel Level
- K. m = Meter

5.02 Measurements

- A. All measurements with regard to length, width, and height shall be in inches.

MAC-060HE-02-L Product Specifications

Physical Data						
Model Number	Chiller				Weight (lbs.)	
	Height (in)	Length (in)	Width (in)	Refrigerant	Net	Shipping
MAC-060HE-02-L	57.75	35.25	40.875	R407c	575	805

Model Number	Volts/ Phase/Hertz	Compressor		Condenser Fan Motor (1 Qty)		Pump Motor	Fuse or HACR Circuit Breaker	
		(RLA)	(LRA)	(FLA)	(RPM)	(FLA)	MCA	MOP
MAC-060HE-02-L	208/230-3-50/60	25	128	2.5	1130	4.1	35	50

MAC-060HE-02-L	
Compressor	Copeland Scroll
Refrigerant	R407c
Heat Exchanger	Brazed Plate
Max. Pump Head Pressure	50 ft.
Internal WPD	8.5 Ft. of Head
Max Flow Rate	14.4 gpm
Min Flow Rate	6.5 gpm
Supply Water Temp	44°
Return Water Temp	54°
Min. Solution Content	25 Gallons
Expansion Tank Size	2 Gallons
Water Connections	1.00" S (MPT) & 1.25" R (FPT)
Pump*	1/2 HP

* Integral pump included

MultiAqua chillers are designed to operate exclusively with R407c refrigerant in a self-contained, pre-charged refrigerant system. Do not access the closed refrigerant circuit for any reason other than after-sale, after installation component replacement. Routine maintenance and service is to be performed by qualified personnel only.

MAC-060HE-02-L Product Specifications

Glycol Solution Concentration Data	
Propylene Glycol %	Min. Ambient Temp
10%	26°F
20%	18°F
30%	8°F
40%	-7°F
50%	-29°F

<u>Estimated Propylene Glycol Adjustment Factors:</u>		
Percent of Propylene Glycol	Capacity adjustment Multiply TONS by:	Pressure Drop adjustment Multiply PD by:
10%	0.995	1.02
15%	0.992	1.04
20%	0.986	1.08
25%	0.972	1.13
30%	0.96	1.21
35%	0.95	1.26
40%	0.928	1.47
50%	0.878	2.79

Important

Required Use of 10% Minimum Propylene Glycol

Multiaqua Inc. requires a minimum concentration of 10% propylene glycol in the chiller system solution. This requirement applies to all chiller product models for protection of the brazed plate heat exchanger (BPHE), **regardless of outdoor ambient operating temperature.**

The Multiaqua chiller operating at a 44 leaving water temperature (LWT) will have an internal BPHE temperature of 32 F to 38 F. Without the required MINIMUM 10% concentration of propylene glycol, the unit is susceptible to areas of freezing within the BPHE which could result in failure of the BPHE.

With any deviation from full flow through the BPHE, the BPHE would also be susceptible to areas of freezing within the BPHE. This could be caused by, but not limited to, contaminants being caught in the wye strainer, flow switch or pump failure. Each chiller is supplied from the factory with a Wye strainer that is to be installed on the inlet (suction) side of the pump on the MAC- 036HE, 048HE, 060HE, and MAC120HE chillers.

Failure to follow this requirement will void the chiller warranty. Failure to comply may result in BPHE failure due to freezing followed by compressor failure, all of which are not covered by Multiaqua's warranty.

MAC-060HE-02-L Cooling Performance Data

		Entering Air Temperature				Entering Air Temperature			
		70°F				80°F			
<u>LWT (°F)</u>	<u>PD (ft.-head)</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>
35	8.51	55392	4.62	13.17	3.86	51547	4.30	11.34	3.32
40	8.51	58826	4.90	14.02	4.11	54978	4.58	12.18	3.57
42	8.51	60845	5.07	14.29	4.19	57401	4.78	12.68	3.71
44	8.51	62837	5.24	14.53	4.26	59493	4.96	12.99	3.81
45	8.51	64402	5.37	14.88	4.36	60670	5.06	13.16	3.86
48	8.51	67681	5.64	15.43	4.52	64209	5.35	13.85	4.06
50	8.51	69640	5.80	15.60	4.57	66706	5.56	14.28	4.19
55	8.51	72163	6.01	16.02	4.69	69437	5.79	14.81	4.34
60	8.51	76628	6.39	16.75	4.91	74213	6.18	15.69	4.60

		Entering Air Temperature				Entering Air Temperature			
		95°F				100°F			
<u>LWT (°F)</u>	<u>PD (ft.-head)</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>
35	8.51	47237	3.94	9.44	2.77	45165	3.76	8.65	2.53
40	8.51	49926	4.16	9.95	2.91	47723	3.98	9.10	2.67
42	8.51	52130	4.34	10.35	3.03	49837	4.15	9.48	2.78
44	8.51	54277	4.52	10.71	3.14	52099	4.34	9.88	2.90
45	8.51	55166	4.60	10.77	3.16	53300	4.44	10.07	2.95
48	8.51	58343	4.86	11.32	3.32	56095	4.67	10.48	3.07
50	8.51	60475	5.04	11.62	3.40	58153	4.85	10.76	3.15
55	8.51	62671	5.22	11.92	3.49	59629	4.97	10.82	3.17
60	8.51	66865	5.57	12.58	3.69	63562	5.30	11.40	3.34

MAC-060HE-02-L Cooling Performance Data

		Entering Air Temperature				Entering Air Temperature			
		105°F				110°F			
<u>LWT (°F)</u>	<u>PD (ft.-head)</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>
35	8.51	43641	3.64	8.08	2.37	41959	3.50	7.48	2.19
40	8.51	46021	3.84	8.48	2.48	44182	3.68	7.83	2.29
42	8.51	47944	4.00	8.78	2.57	45493	3.79	7.93	2.32
44	8.51	50451	4.20	9.28	2.72	47978	4.00	8.41	2.46
45	8.51	51616	4.30	9.45	2.77	49361	4.11	8.66	2.54
48	8.51	53385	4.45	9.51	2.79	51022	4.25	8.71	2.55
50	8.51	55314	4.61	9.76	2.86	53115	4.43	9.01	2.64
55	8.51	57594	4.80	10.10	2.96	55608	4.63	9.43	2.76
60	8.51	60792	5.07	10.45	3.06	58394	4.87	9.65	2.83

		Entering Air Temperature				Entering Air Temperature			
		115°F				120°F			
<u>LWT (°F)</u>	<u>PD (ft.-head)</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>	<u>BTU's</u>	<u>TONS</u>	<u>EER</u>	<u>COP</u>
35	8.51	39874	3.32	6.78	1.99	35842	2.99	5.53	1.62
40	8.51	42820	3.57	7.36	2.16	38615	3.22	6.04	1.77
42	8.51	44104	3.68	7.46	2.19	40477	3.37	6.32	1.85
44	8.51	45468	3.79	7.57	2.22	41674	3.47	6.41	1.88
45	8.51	47133	3.93	7.90	2.32	43725	3.64	6.85	2.01
48	8.51	49234	4.10	8.12	2.38	45372	3.78	6.94	2.03
50	8.51	51090	4.26	8.35	2.45	46751	3.90	7.04	2.06
55	8.51	53291	4.44	8.68	2.54				
60	8.51	55943	4.66	8.88	2.60				

		Entering Air Temperature			
		95°F			
<u>Percent of Load %</u>		<u>100%</u>	<u>75%</u>	<u>50%</u>	<u>25%</u>
<u>LWT (°F)</u>		44°F	44°F	44°F	44°F
<u>Capacity Point Btu/h</u>		54277	58612	60446	60370
<u>EER</u>		10.71	13.99	17.53	19.83
<u>IPLV</u>		16.25			

MAC-060HE-02-L Altitude Adjustment Factors

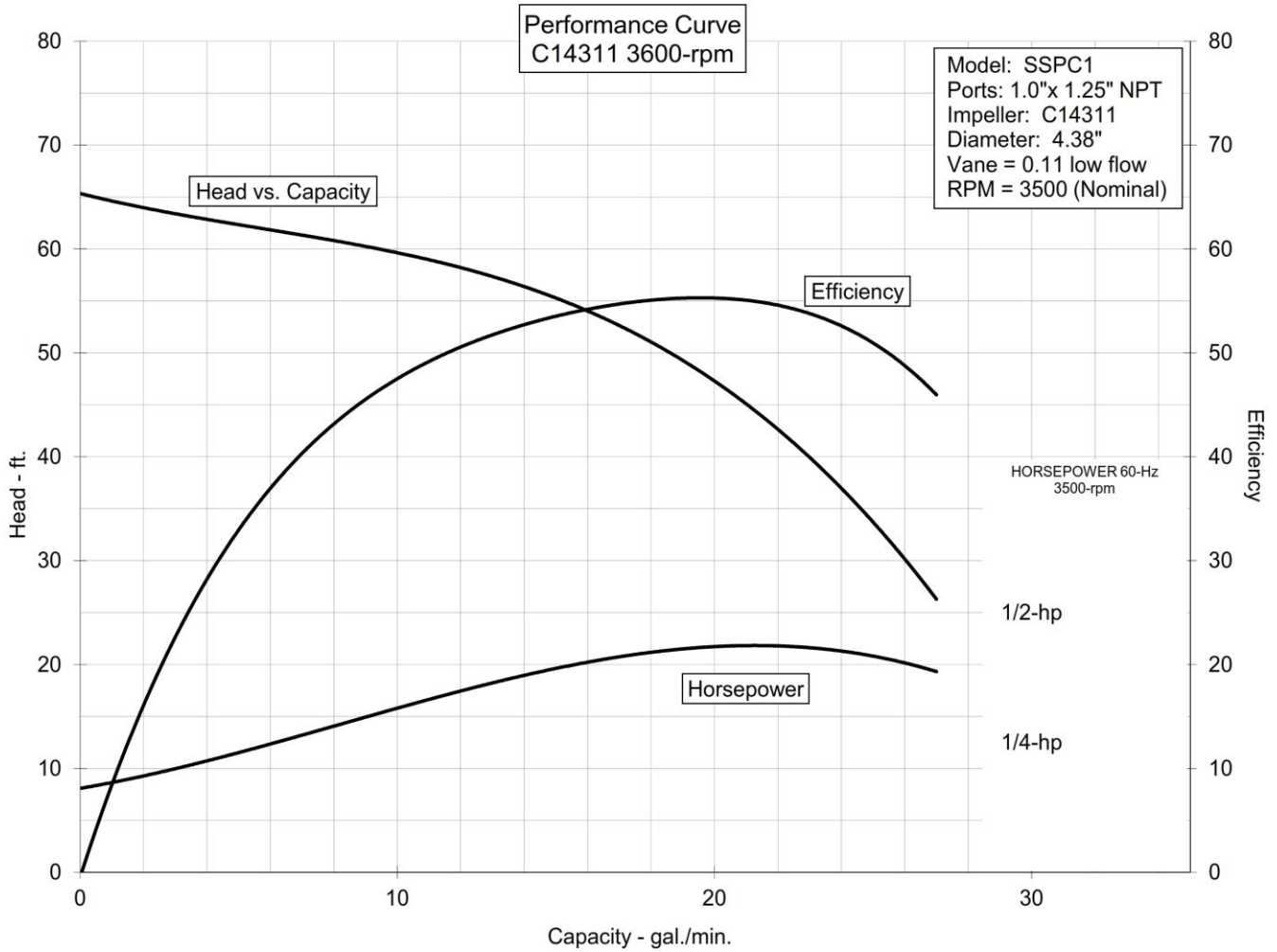
Altitude	Tons
1000 ft.	.995
2000 ft.	.990
3000 ft.	.986
4000 ft.	.983
5000 ft.	.980
6000 ft.	.978

MAC-060HE-02-L Chiller Pump Curve

Pump Model Number
C14311BBTVF / C14311-3600
 (208/230-3-50/60)
 0.5 Horsepower



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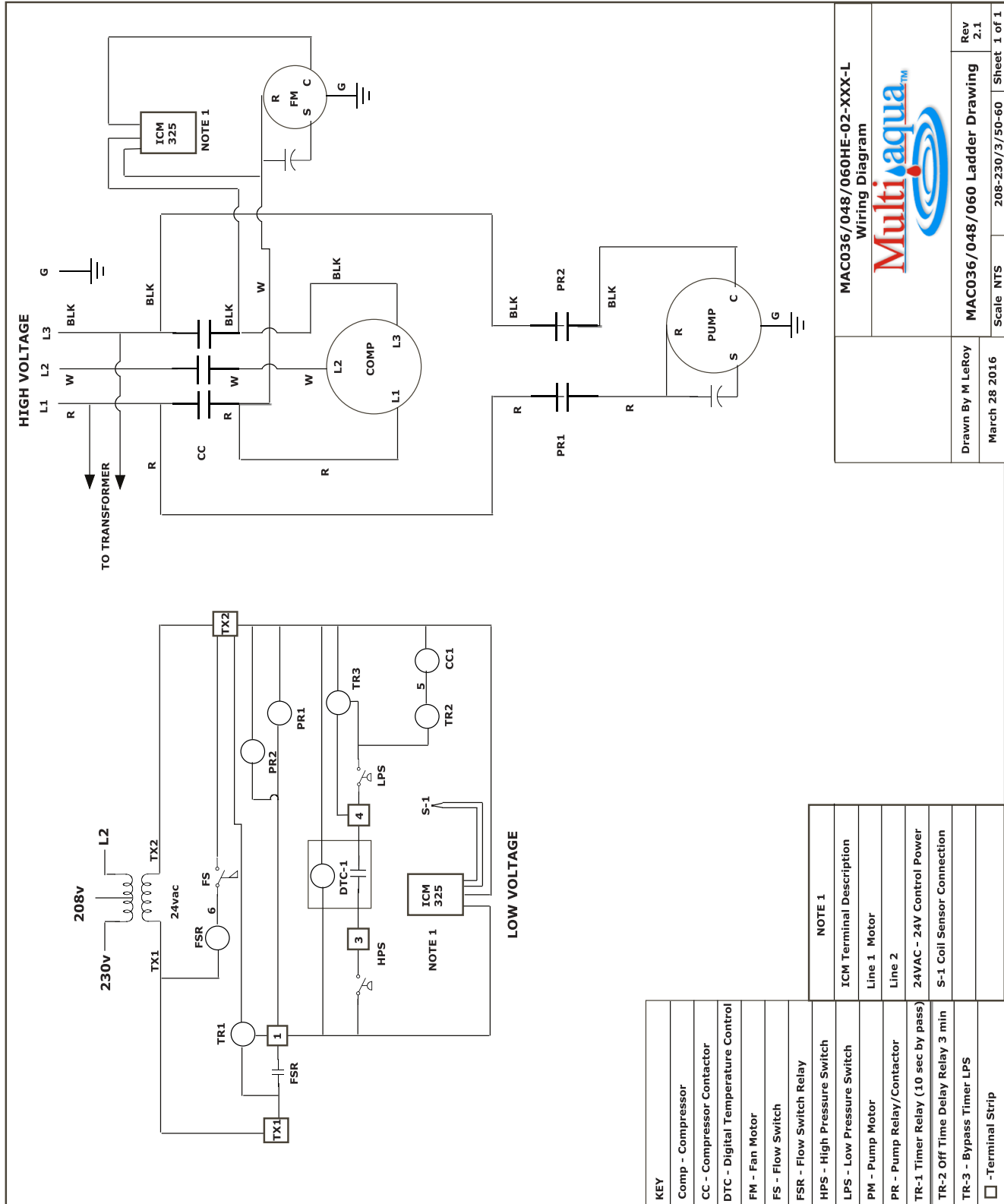
14032 Avalon Blvd. Los Angeles CA 90061
 Phone (310) 630-8089 ~ Fax (310) 630-8095

C14311-3500
 2/24/2012

MAC-060HE-02-L Sound Data

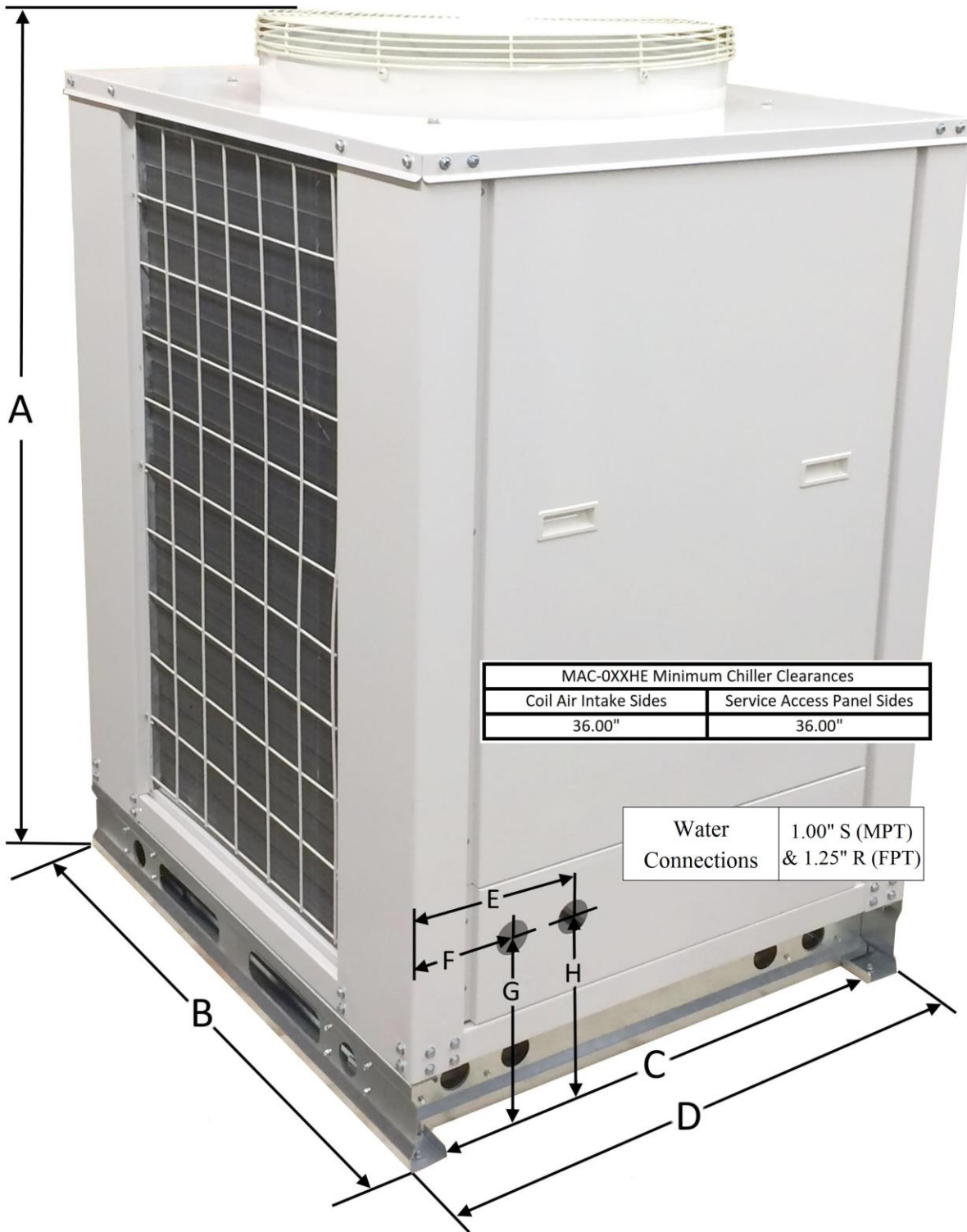
MODEL #	MAC-060HE-02-L
Fan Speed	dB @ 3 m
H	69

MAC-060HE-02-L Wiring Diagram



These specifications are subject to change without notice.
Check www.multiaqua.com for the latest information.

MAC-060HE-02-L Dimensional Drawing



MODEL	A	B	C	D	E	F	G	H
MAC-060HE	57.75"	40.875"	30.75"	35.25"	10.25"	6.25"	11.5"	11.5"

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306 Hagood Street
Easley, SC 29640
Ph: 864-850-8990
Fax: 864-850-8995
www.multiaqua.com

For Technical Assistance:
1-855-THNK-WTR (1-855-846-5987)

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