DAIKIN McQUAY™

Catalog 604-3

Magnitude™ Magnetic Bearing Centrifugal Chiller

Model WME

400 to 700 tons (1400 to 2461 kW)
3/60/460
HFC-134a

Note: The unit shown is for the default configuration; your unit may be configured differently. Refer to your selection for configuration.

Contents

Manufactured in an ISO-certified facility

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Original Issue:	October 2009
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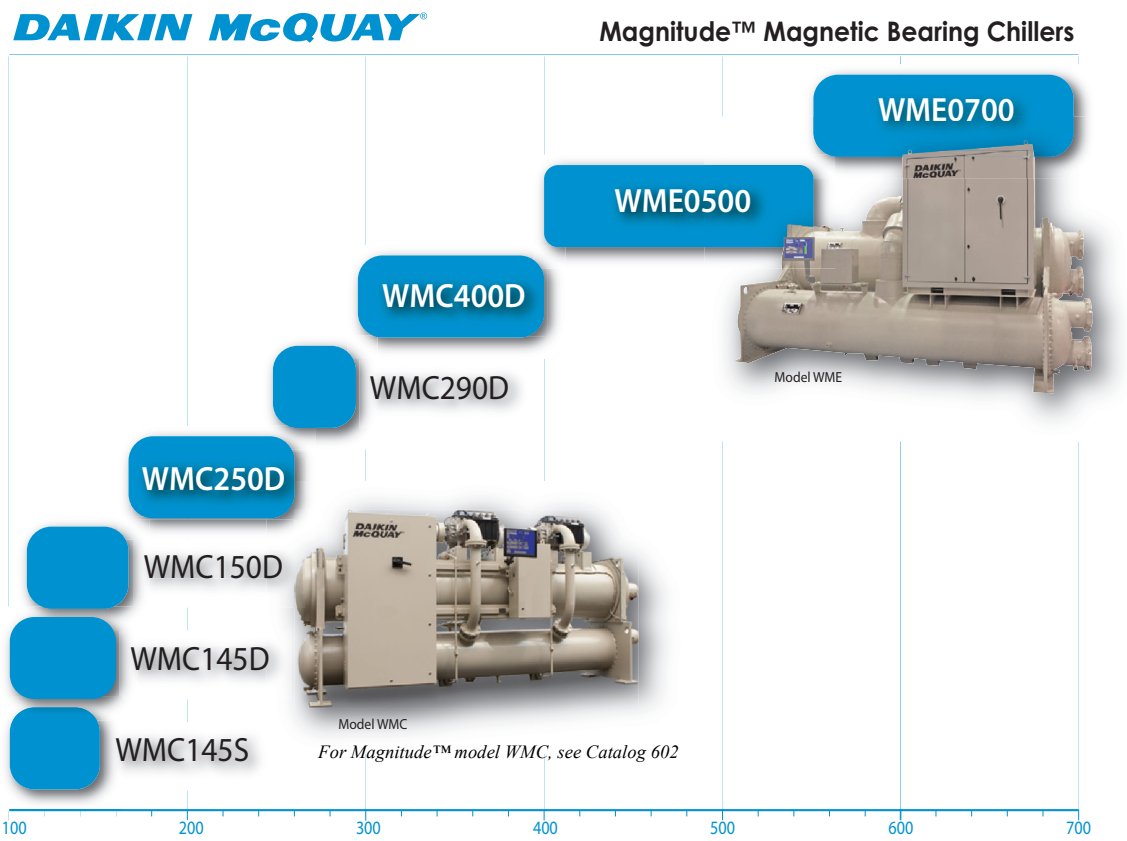


Technology That Just Makes Sense

The newest member of the Daikin McQuay Magnitude™ Chiller family (Model WME) takes Magnetic Bearing Centrifugal Chillers to a new level. Building on the outstanding success of Magnitude model WMC, the newest Magnetic Bearing centrifugal chiller capitalizes on our 50 years of experience designing and manufacturing centrifugal compressor chillers. Magnitude model WME shares important features with its predecessors:

- State-of-the-art magnetic bearing compressor
- Magnetic Bearing oil-free technology
- Unit-mounted Variable Frequency Drive
- Positive pressure design
- Hermetically sealed direct-drive motor
- User-friendly MicroTech® controls
- Open Choices™ feature for BAS of your choice
- R-134a refrigerant (Zero Ozone Depletion Potential)
- Onboard Refrigerant Containment
- AHRI certification

Benefit Summary

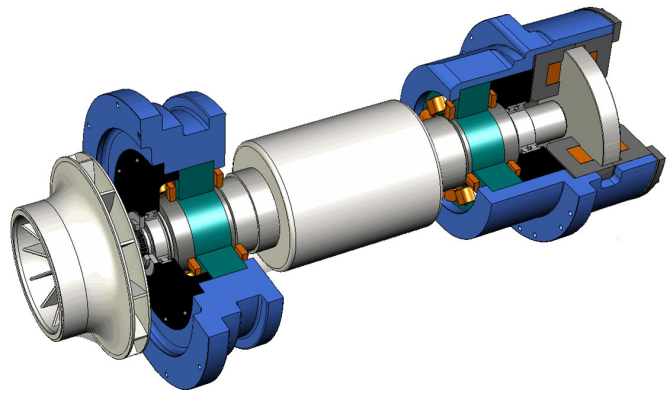
- **Lowest Energy Consumption** due to highest full and part load efficiency in its size range.
- **Sustainable Performance** assured for the operating life of the chiller. The positive pressure, oil-free design eliminates performance degradation due to non-condensables and oil contamination of the refrigerant.
- **Increased Reliability** Magnetic bearing design needs no oil management system, and has only one major moving part.
- **Enhanced Flexibility** Selectable shell and tube sizes ensures maximum heat exchanger flexibility to meet the flow and performance requirements of your application.
- **Quiet** Low sound level with virtually no structure-borne vibration eliminates the need for additional expensive sound attenuation accessories.
- **Smart Refrigerant Choice** The compressor is optimized for R-134a, a positive pressure refrigerant that has no phase-out schedule and no ozone depletion - a green solution.
- **Smart Controls** Onboard digital electronics provide smart controls, incorporating a system of sophisticated self-diagnostic monitoring and controls.
- **Industry Leading Design** Learn more about potential LEED® points and optional Seismic certification page 7.

The Compressor Technology

Cutting-edge magnetic bearing technology enables outstanding energy efficiency and reliable, long-life operation. The Magnitude chiller's exceptional efficiency is due to the direct drive magnetic bearing compressor technology. This design eliminates the friction inherent in traditional centrifugal compressors that can reduce efficiency.

A digitally-controlled magnetic bearing system replaces conventional lubricated bearings. The direct drive motor eliminates the need for a lubricated gear box and associated power losses. The frictionless compressor shaft is the compressor's only moving component, and it levitates on a magnetic cushion. Sensors at each magnetic bearing provide real-time feedback to the bearing control system.

Figure 1: Compressor Rotating Assembly



Low Operating Costs

The Magnitude chiller Integrated Part Load Value (IPLV) is extremely low when compared with any other chillers in this tonnage range - as low as 0.312. (See page 6 for IPLV definition and discussion). There is a potential for significant energy savings at part load and lower ambient temperatures compared to fixed-speed chillers.

Sustainable Performance

All oil-lubricated chillers will deposit oil on heat transfer surfaces and eventually lose some efficiency. Since the Magnitude chiller uses a positive pressure refrigerant (HFC-134a) and has no oil, the industry-leading efficiency can be maintained for the life of the chiller. Additionally, over time negative pressure chillers (such as those using HCFC-123) may draw air and moisture into the system, which can significantly increase energy consumption.

Ultra-Smart Controls

It is only fitting that this revolutionary chiller design be matched with the advanced Daikin McQuay MicroTech® control technology to give you the ultimate in chiller performance and control. Our control design includes many energy-saving features and interface enhancements not found in any other unit controller system on the market today.

The chillers utilize digital control electronics to proactively manage unit operation and provide control of external chilled water and cooling tower pumps. The compressor runs at the minimum speed necessary to maintain cooling capacity and lift (which decreases with lower condenser water temperatures), thus minimizing energy usage over the entire range of operating conditions. The innovative design of the MicroTech E controller will help keep your chiller running efficiently... day in, day out, for years to come.

Extremely Low Vibration Levels

As a result of the magnetic bearings and low inertia design, the compressor vibration levels are extremely low, minimizing vibration that could be transmitted to the structure.

The unit is shipped with rubber waffle mounting pads. Spring vibration isolators are usually not required.

Low Sound Levels

Continuing the legacy of industry-leading sound levels, the Magnitude chiller has lower sound levels than comparably sized centrifugal chillers.

Oil-Free Design Benefits

Totally Oil-Free Operation = Greater Efficiency

With no oil to coat the heat transfer surfaces, a gain in heat exchanger efficiency can be realized.

No Oil Loss = Sustainable Performance

With no possibility of oil loss at light loads or due to worn seals, the original energy saving efficiency can be maintained for the life of the chiller.

No Oil Handling Equipment = Greater Reliability

With magnetic bearings operating in a magnetic electrical field instead of oil-lubricated bearings, the oil handling equipment is removed. No need for:

- oil pumps
- oil reservoirs
- oil coolers
- oil filters
- water regulating valves
- oil relief valves
- oil system controls, starter, piping, heaters, etc...

that are needed to maintain oil quality. These devices can be a fault source in traditional chillers, and removing them significantly increases unit and system reliability.

No Oil System = Reduced Maintenance Costs

With oil removed from the system, oil samples, oil changes, oil system maintenance, oil filter changes and leaks are eliminated.

Open Choices™ BAS Flexibility

The exclusive Open Choices feature provides seamless integration and comprehensive monitoring, control, and two-way data exchange using industry standard protocols LonTalk®, BACnet™ or Modbus™. Open Choices offers simple and inexpensive flexibility to use the Building Automation System of your choice without an expensive gateway panel. Open Choice Benefits include:

- Easy to integrate into your BAS of choice
- Factory- or field-installed communications module
- Integrated control logic for factory options
- Easy-to-use local user interface
- Comprehensive data exchange

Compliance with ASHRAE Std. 90.1

According to ASHRAE, chillers usually spend 99% of their operating hours at part load conditions and most of this time at less than 60% of design capacity. Thus, the part load efficiency of chillers is all-important.

ASHRAE Standard 90.1 was developed to assist owners and designers make informed choices on a buildings design, systems and equipment selection. Magnitude chillers can significantly exceed ASHRAE 90.1 minimum efficiency requirements.

IPLV/NPLV Defined

Part load performance can be presented in terms of Integrated Part Load Value (IPLV), which is based on AHRI standard rating conditions (listed above), or Non-Standard Part Load Values (NPLV), which is based on specified or job site conditions. IPLV and NPLV are based on the following weighting equation from AHRI 550/590:

$$IPLVorNPLV = \frac{1}{\frac{0.01}{A} + \frac{0.42}{B} + \frac{0.45}{C} + \frac{0.12}{D}}$$

Using kW/ton, where:
A = kW/ton (or COP) at 100%
B = kW/ton (or COP) at 75%
C = kW/ton (or COP) at 50%
D = kW/ton (or COP) at 25%

Weighting

The percent of annual ton-hours of operation near the four rated load points are as follows:

- 1% of operating ton-hours in the bin range 93~100% load (represented by the rating at 100% load)
- 42% of operating ton-hours in the bin range 62~92% load (represented by the rating at 75% load)
- 45% of operating ton-hours in the bin range 37~61% load (represented by the rating at 50% load)
- 12% of operating ton-hours in the bin range 0~36% load (represented by the rating at 25% load)

Integrated Variable Frequency Drives

A Variable Frequency Drive (VFD) modulates compressor speed in response to load and evaporator/condenser pressure. VFD technology significantly reduces power input at part load operation and at lower than design ambient temperatures.

The VFD can dramatically reduce annual energy costs when there are long periods of part load operation and/or low compressor lift (lower condenser water temperatures). The attributes of VFD drives produce one of the industry's most efficient single-compressor chillers based on the all-important IPLV value. See IPLV/NPLV Defined inset for details on the AHRI IPLV efficiency rating.

An additional benefit of a VFD is improved power factors. The power factor will be 95% at 500 tons (AHRI conditions) with the M3 low harmonic option, and 91% for the M2 standard VFD (at 500 tons), which may help reduce power costs.

The use of a VFD on centrifugal chillers also provides an excellent method of reducing motor starting inrush-even better than “solid state” starters. Starting current can be closely controlled since both the frequency and voltage are regulated. This can be an important benefit to a building's electrical distribution system. Low inrush current at startup is also ideal for operation with backup or emergency power systems and can reduce the size of backup generators.

Onboard Refrigerant Containment System

Pumpout systems are required on many jobs to collect and contain the refrigerant charge when access to internal chiller components is required for service. Magnitude condensers are designed to hold the entire unit refrigerant charge (<90% full and at 90°F (32°C) ambient temperature). When service is required, the refrigerant charge can be pumped down into the condenser by compressor operation and use of a refrigerant transfer unit. Elimination of the cost and space requirements of an external storage tank is a significant Daikin McQuay advantage.

Unit Control Features

The Magnitude chiller control system consists of three major components: the unit control panel and the operator interface panel and the VFD power panel. The touch screen panel is on an adjustable arm so that it can be positioned comfortably for the operator. The control panel contains a USB port for downloading the unit's fault history, major parameter trends, and unit operating manual that is stored in memory.

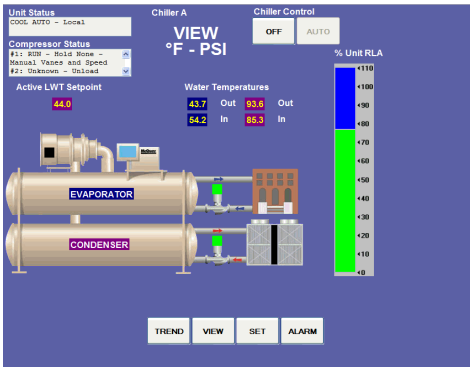
By constantly monitoring chiller status and real time data, the MicroTech E controller will automatically take proactive measures to relieve abnormal conditions or shut the unit down if a fault occurs. For example, if a problem occurs in the cooling tower and discharge pressure starts to rise, the controller will automatically hold the load point and activate an alarm signal. A further rise in pressure will initiate compressor unloading in an effort to stay online. If the pressure continues to rise, the unit will shut off as a safety feature.

User-Friendly Touch Screen Panel

Operation simplicity was one of the main considerations in the development of the MicroTech E controller. The operator interface is a 15-inch, Super VGA color touch-screen monitor, mounted on an adjustable arm. Key operating parameters and setpoints are easily accessible.

For added convenience, the unit Operating and Maintenance manual is viewable on the touch-screen panel.

Figure 2: MicroTech E Home Screen



The MicroTech E controller's memory retains a record of faults and the time/date stamp. The controller memory (no batteries required) retains the fault history for troubleshooting and monitoring unit performance.

The MicroTech E controller can record and plot water temperatures, refrigerant pressures, and motor load in order to trend performance. These values can also be downloaded through a convenient USB port in the control panel, and exported into a spreadsheet for further evaluation and record purposes.

MicroTech E Controller Increases Chiller Economy

Smart features that optimize operating efficiency have been incorporated into our MicroTech controls:

Direct control of water pumps- Digital output relays provide automatic lead-lag of the evaporator and condenser pumps, permitting pump operation only when required.

Chilled-water reset- Accomplished directly on the unit or remotely by resetting the leaving water temperature based on the return water temperature. Raising the chilled water setpoint during periods of light loads can dramatically reduce electrical consumption.

Demand limit control- Maximum motor current draw can be set on the panel, adjusted from a remote 4-20 ma signal, or set via the BAS interface using the Open Choices feature. This feature controls maximum demand charges during high usage periods.

Staging Options (Multiple Chiller Installations)- "The WME onboard chiller controls are designed to offer chiller staging and loading optimization for many common multiple chiller plant configurations. Contact the Chiller Applications department for more information on this capability."

Safe Power Interruption - In the event of a power failure, the compressor motor acts as a generator, providing power for the bearing control system during coast down. It also has a backup bearing system.

Quality Standards

AHRI Certification

We have an on-going commitment to supply chillers that perform as specified, and participate in the AHRI Certification Program. On-going performance verification of chiller capacity and power input plus AHRI certified selection output provide the owner with specified performance in accordance with the latest version of AHRI Standard 550/590.

LEED®

Building owners who wish to pursue Leadership in Energy and Environmental Design (LEED®) Green Building Certification, the performance of the WME may contribute points towards Energy and Atmosphere (EA) Credits 1 and 4.

Points earned for EA Credit 1 are awarded based on overall building efficiency. The great efficiency of the WME will contribute to the total points earned for this credit.

EA Credit 4 qualification is partially determined by tonnage and refrigerant quantity. Vessel stack and tube count selections will affect the quantity of refrigerant in the chiller. Most WME configurations will qualify for EA Credit 4. Contact your local Daikin McQuay sales representative for more information.

IBC/OSHPD Seismic Certification

Daikin McQuay Magnitude Chillers have been tested and certified by an independent agency, experts in seismic analysis and design to meet IBC seismic and OSHPD pre-approval. Find more information about seismic requirements and HVAC systems on the Seismic Information page of www.daikinmcquay.com.

Factory Testing

All of our centrifugal chillers are factory-tested with water at specified job conditions on AHRI qualified test stands. Operating and safety controls are checked for correct settings and operation. This testing helps reduce field start-up issues and maintain critical construction schedules.

McQuay Factory Service Startup

All Magnitude chillers are commissioned by McQuay Factory Service personnel or by authorized McQuay startup technicians. This procedure helps assure that proper starting and checkout procedures are employed and that the chiller will be at optimum performance.

Chiller Identification

Figure 3: Magnitude Code String Chiller Identification

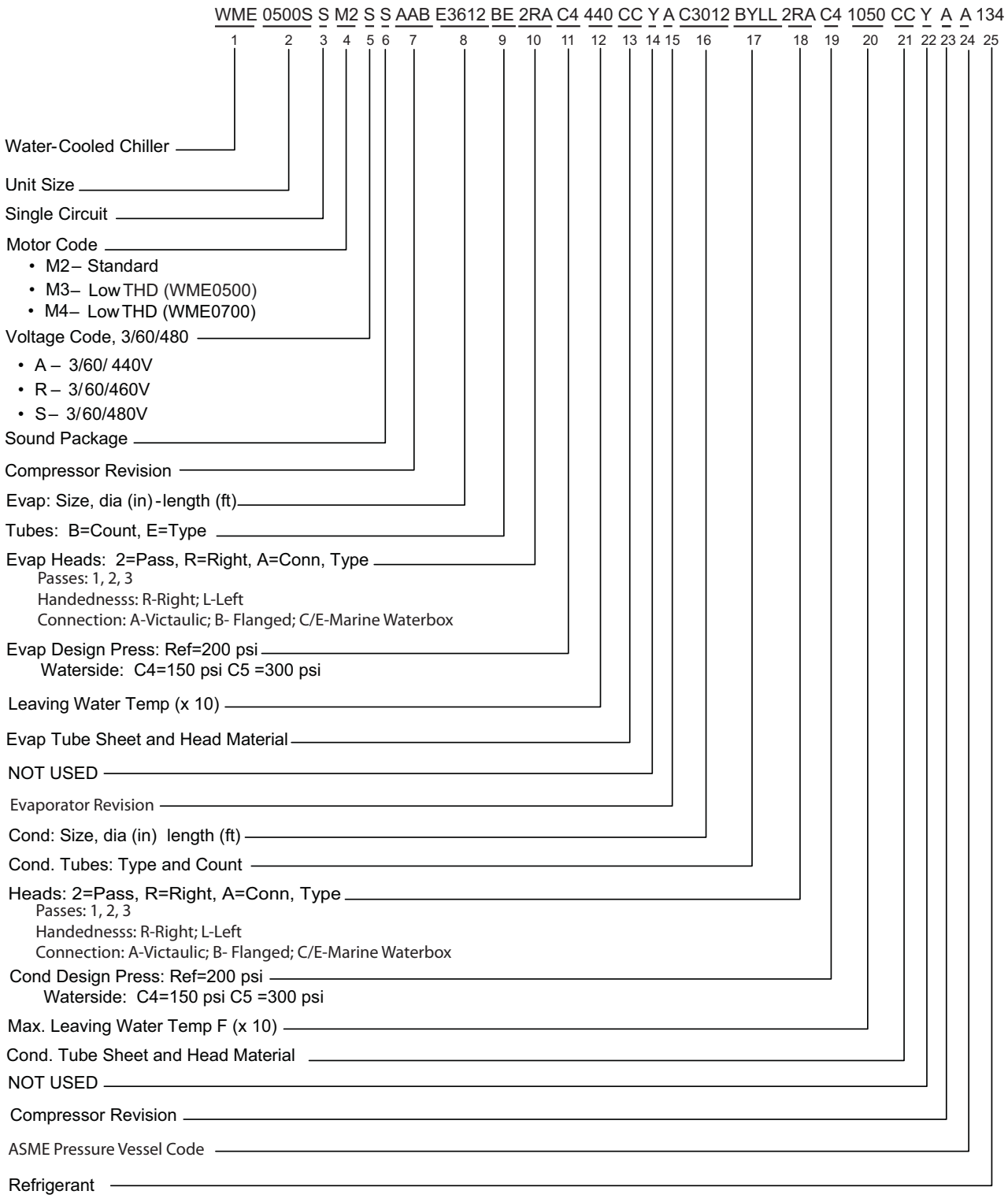


Figure 4: Magnitude Code String Chiller Identification

Electrical Notes

1. Units are available for 460 or 440 to 480 VAC at 60 Hz.
2. Wiring, fuse and wire size must be in accordance with the National Electric Code (NEC).
3. Important: Voltage unbalance not to exceed 2%.

Power Wiring

Use only copper supply wires with ampacity based on 75°C conductor rating. Connections to terminals must be made with copper lugs and copper wire.

Lug size range is: (3) 3/0 AWG - 500 kc mil.

Power Factor Correction Capacitors

Do not use power factor correction capacitors with(WME chillers. Doing so can cause harmful electrical resonance in the system. Correction capacitors are not necessary since VFDs inherently maintain high power factors

Short Circuit Current Ratings

The standard short circuit rating is 35kA for 460 V. Optional high short circuit current ratings are available for 65kA, and 100kA with a matching circuit breaker.

The optional circuit breaker must be sized to meet these ratings.

3-Phase vs. 6-phase Motors

WME 500 motors are designated as M2 or M3.

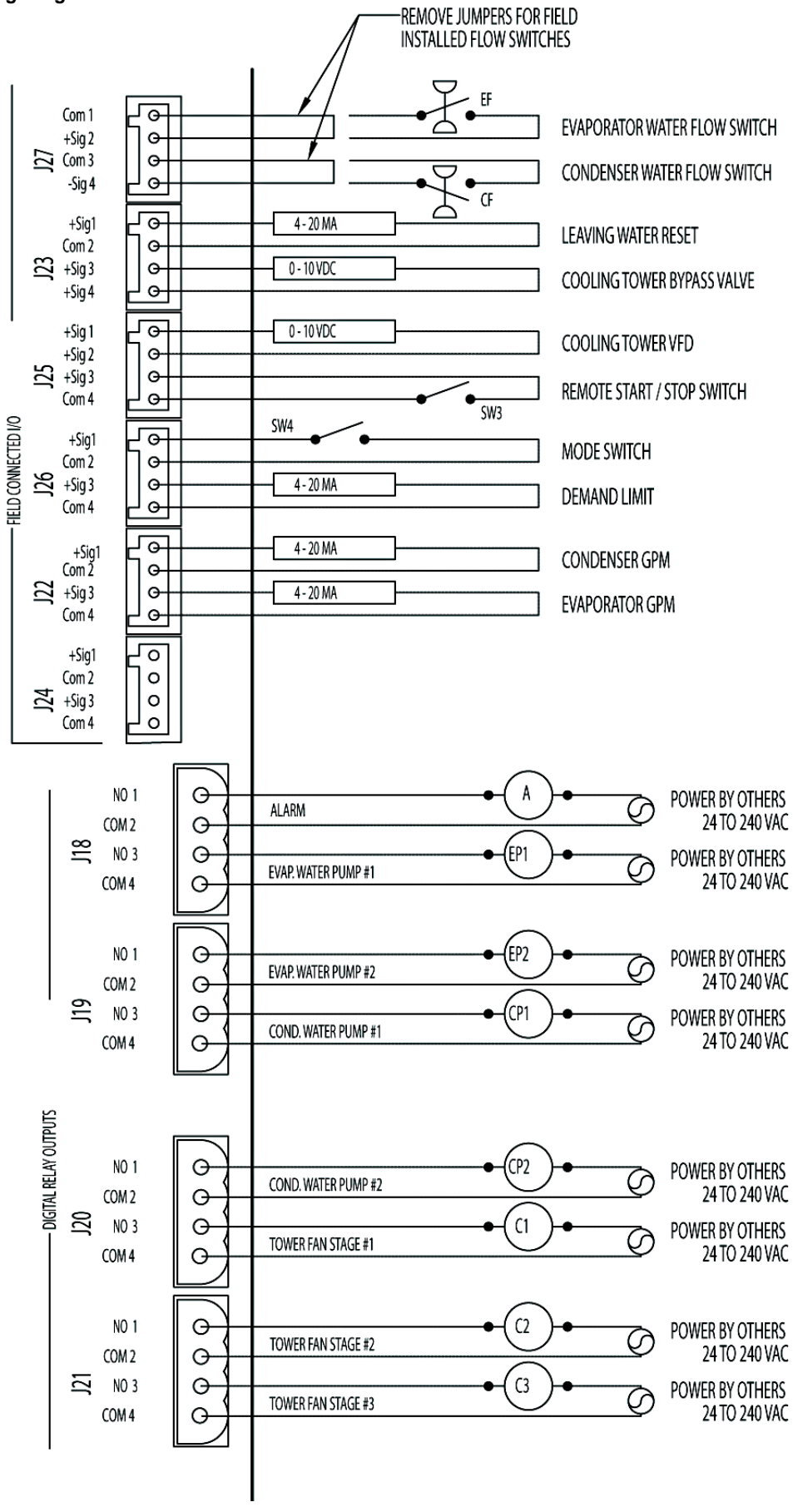
- "M2 motors are standard 3-phase and the VFD performs similar to a 6-pulse drive.
- "M3 motors are 6-phase (connected to a 3-phase power supply) and the VFD performs similar to a 12-pulse drive. They provide increased protection against harmonic distortion, but are not required on most applications.

WME 700 motors are 6-phase and designated as M4. The VFD performs similar to a 12-pulse drive.

Notes for field wiring diagram

1. All line-side wiring must be in accordance with the NEC and be made with copper wire and copper lugs only.
2. A customer furnished 24 to 240 Vac power for alarm relay coil may be connected at J18. Maximum rating of the alarm relay coil is 25 VA.
3. Remote on/off control of unit can be accomplished by connecting a set of isolated dry contacts at J25.
4. If field supplied pressure differential flow switches are used, they must be installed across the vessel and not the pump. They must provide isolated dry contacts at J27.
5. An optional customer supplied 25 VA maximum coil rated, chilled water pump relay (one or two) may be wired as shown. This option will cycle the chilled water pump in response to chiller demand.
6. The condenser water pump must cycle with the unit. A customer supplied 25 VA maximum coil rated, condenser water pump relay (one or two) must be wired as shown. Units used in a free-cooling application must have condenser water above 50°F before starting.
7. Optional customer supplied 25 VA maximum coil rated cooling tower fan relays may be wired as shown. This option will cycle the cooling tower fans as prescribed by the tower control set points.
8. External 4-20mA signals can be wired to J23 for leaving (chilled) water reset and to J26 for demand limit.

Figure 5: Field Wiring Diagram



Drawing Notes

1 All dimensions are in inches [millimeters] unless noted otherwise.

2 Final connections must allow for 0.5 inch +/- (12.7mm) manufacturing tolerances.

3 1.00-inch FPT [25.4 mm] evaporator and condenser relief valves must be piped per ANSI / ASHRAE 15. Number of relief valves is 1 per evaporator and 2 per condenser.

4 .375 inch [9 mm] suction nozzle relief valve must be piped per ANSI / ASHRAE 15.

5 MinimumClearances (See Figure 6):

- Installation layout should be designed by qualified personnel familiar with local codes.
- Allow a minimum of 3 ft. on all for sides and the top sides of chiller to allow for service access.
- Provide a minimum of 3 ft. clearance in front of chiller starter panel or according to NEC or local codes.
- Provide a minimum of 14 ft. clearance on one end of the chiller for tube removal.

6 Electric Panels- Most codes require 48 inches (1219 mm) clearance in front of control boxes and electrical panels. Check codes for your location.

7 3.25-inch [83mm] diameter lifting holes are provided. See installation manual IM 1033 (available on www.daikinmcquay.com) for lifting instructions.

8 All water connections are given in standard U.S. pipe sizes. Standard connections are suitable for welding or victaulic couplings.

9 Unit shown has standard right-hand water connections. Left-hand connections are available for either vessel. For right hand evaporator the inlet and outlet nozzles are reversed. ANSI-flanged connections are available upon request. When using ANSI-flanged connections add 0.5 inch [13 mm] to each flanged end.

10 Dimensions shown are for units (evaporator / condenser) with standard design pressures. The waterside design pressure is 150 PSI {1034 kPa}. Consult the factory for unit dimensions with higher design pressures.

11 The unit vibration isolator pads are provided for field installation and when fully loaded are 0.250 inches [6 mm] thick.

12 These values are for units with standard wall thickness copper tubing only.

13 The shipping skid adds 4.00 inches [105 mm] to the overall unit height.

14 If main power wiring is brought up through the floor, this wiring must be outside the envelope of the unit.

15 The unit is shipped with an operating charge of refrigerant.

16 Optional marine water box connections are available upon request.

Figure 6: Minimum Clearances

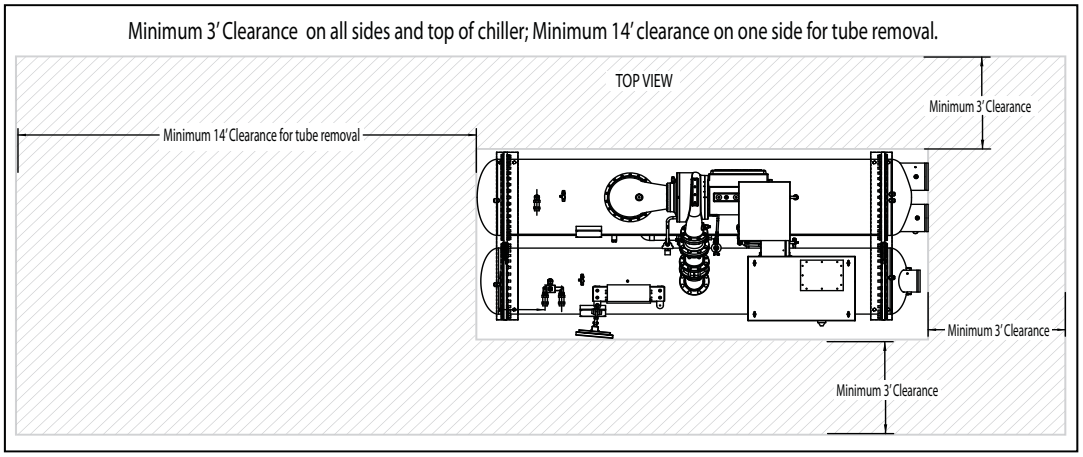
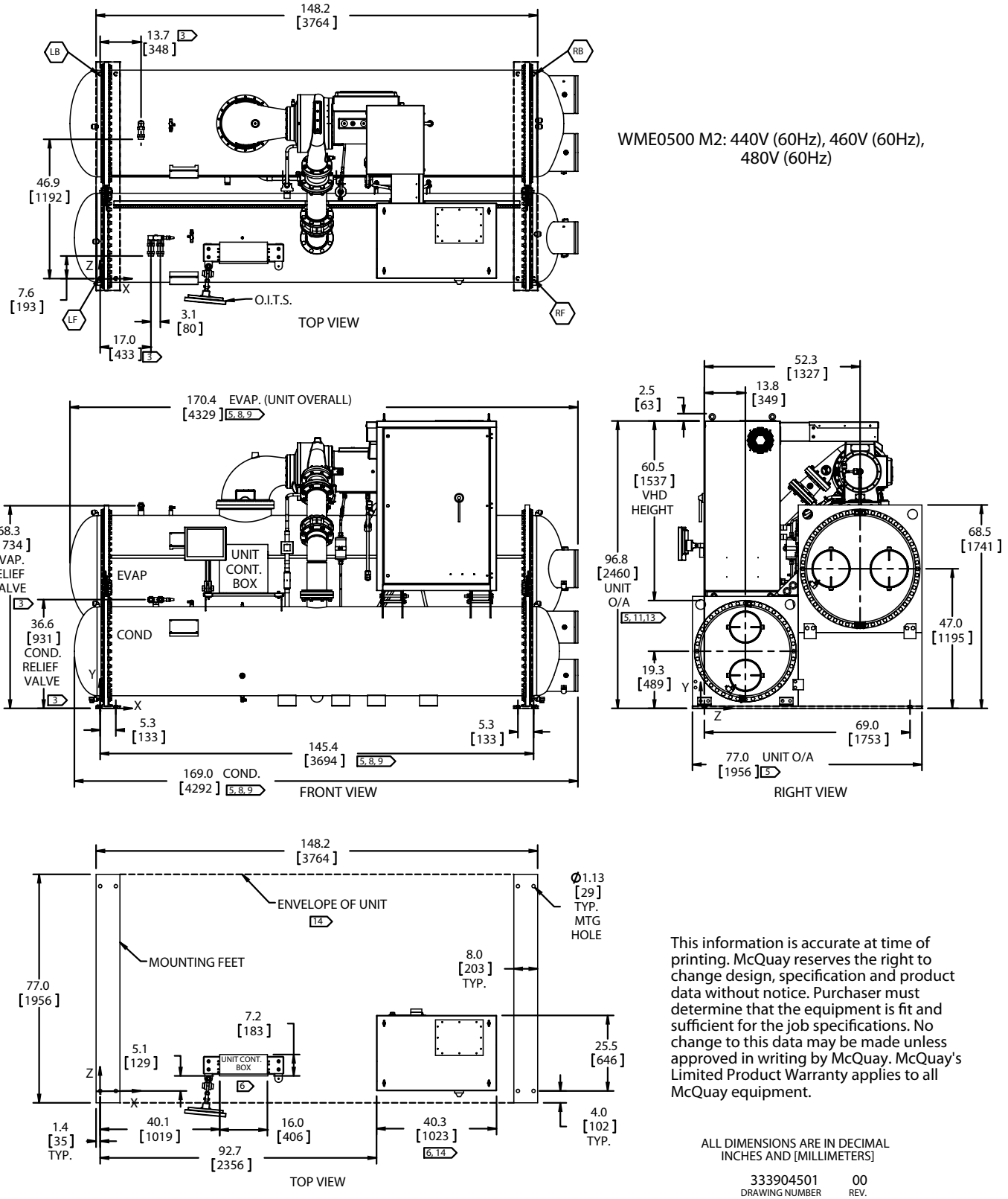


Figure 7: WME0500 - E3612/C3012 - 2-pass - M2 standard motor (60Hz - 440/460/480V) (See page 12 for drawing notes)



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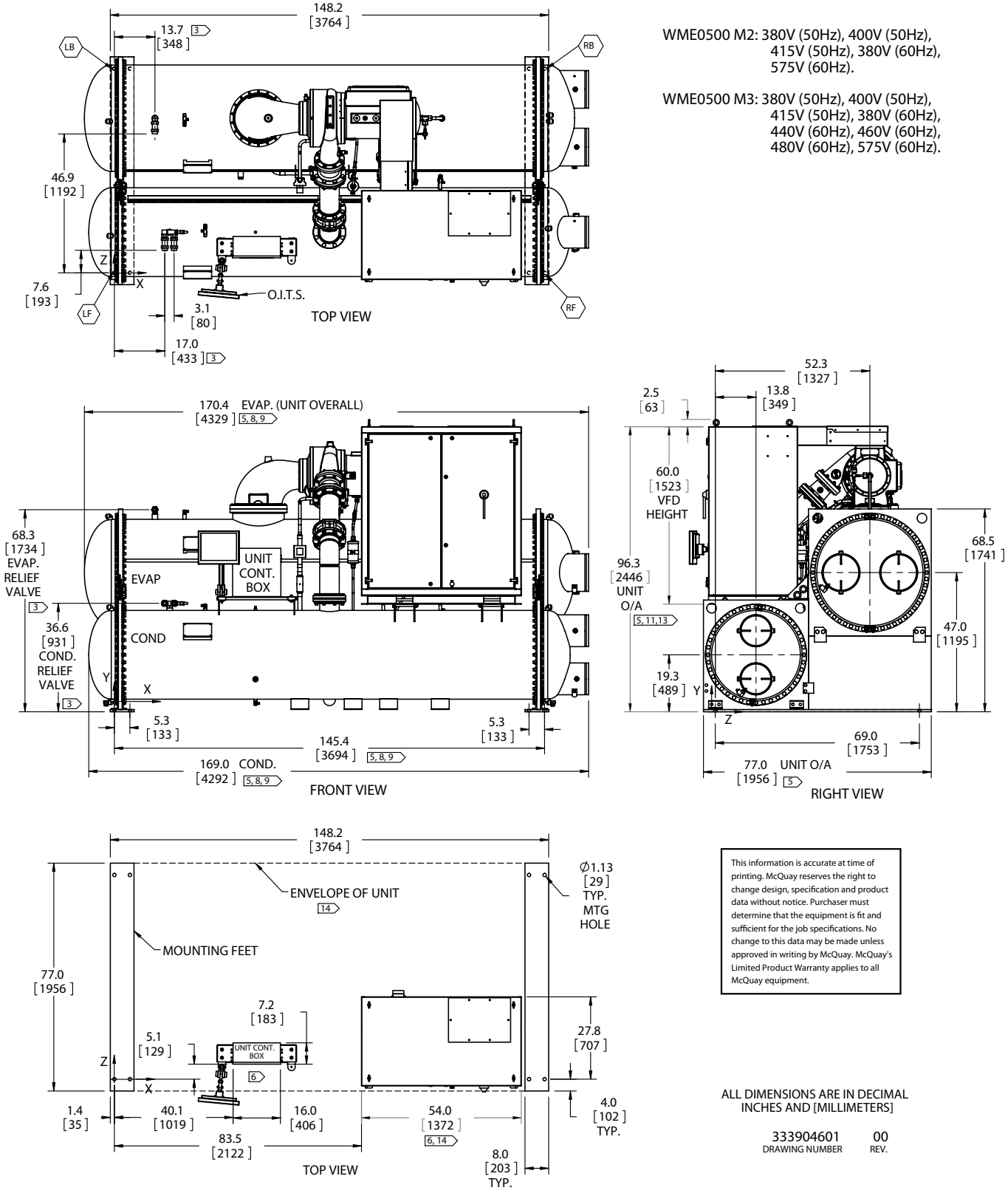
ALL DIMENSIONS ARE IN DECIMAL INCHES AND [MILLIMETERS]

333904501 DRAWING NUMBER 00 REV.

Dimension Drawings

Figure 8: WME0500 - E3612/C3012 - 2-pass - M2 Standard Motor (50Hz 380/400/415V - 60Hz 380/575V)
WME0500 - E3612/C3012 - 2-pass - M3 Low THD Motor (50Hz 380/400/415V - 60Hz 380/440/460/480/575V)
(See page 12 for drawing notes)



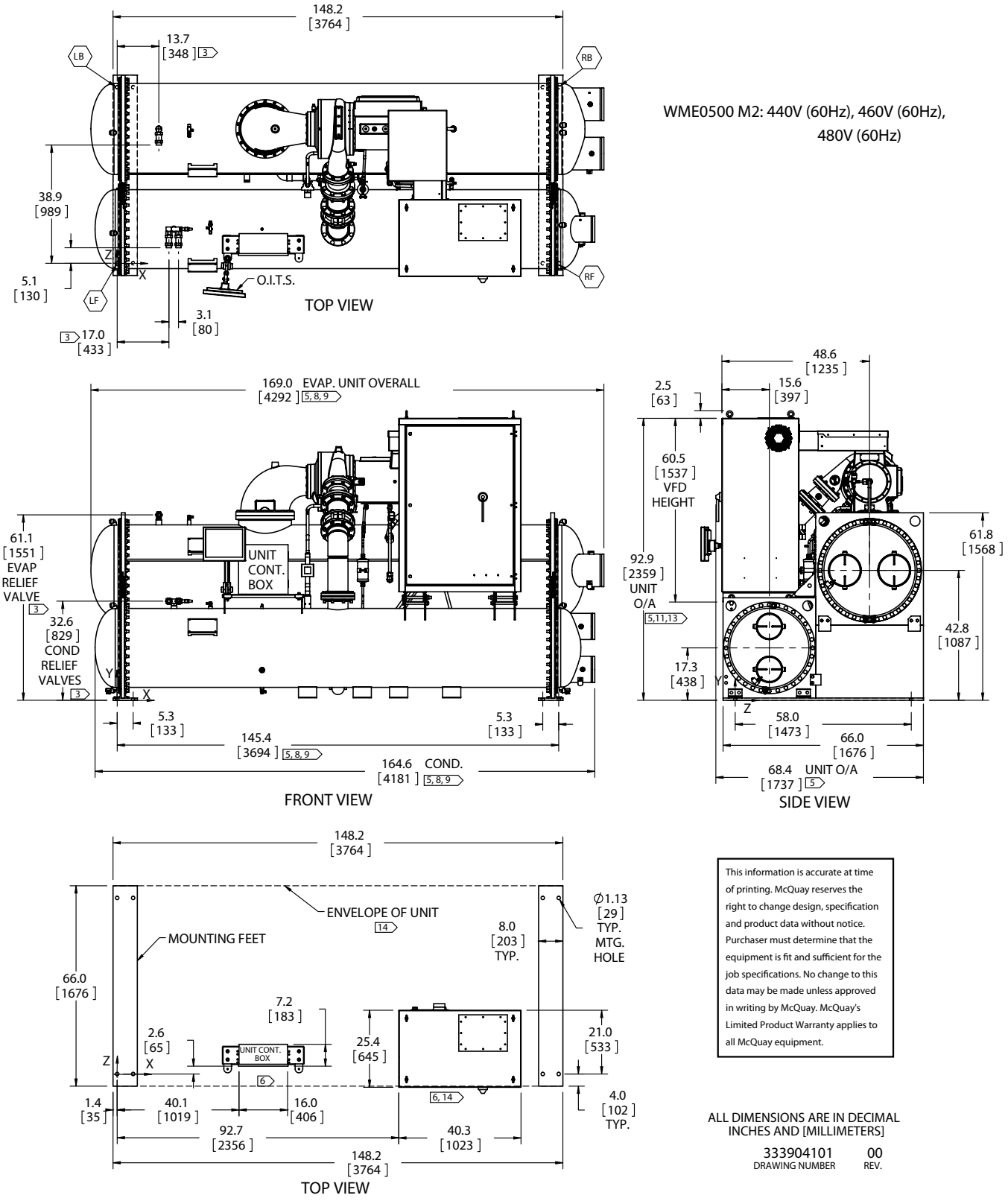
WME0500 M2: 380V (50Hz), 400V (50Hz), 415V (50Hz), 380V (60Hz), 575V (60Hz).

WME0500 M3: 380V (50Hz), 400V (50Hz), 415V (50Hz), 380V (60Hz), 440V (60Hz), 460V (60Hz), 480V (60Hz), 575V (60Hz).

ALL DIMENSIONS ARE IN DECIMAL INCHES AND [MILLIMETERS]

333904601 DRAWING NUMBER
00 REV.

Figure 9: WME0500 - E3012/C2612 -2-pass, M2 standard motor (60 Hz 440/460/480V) (See page 12 for drawing notes)

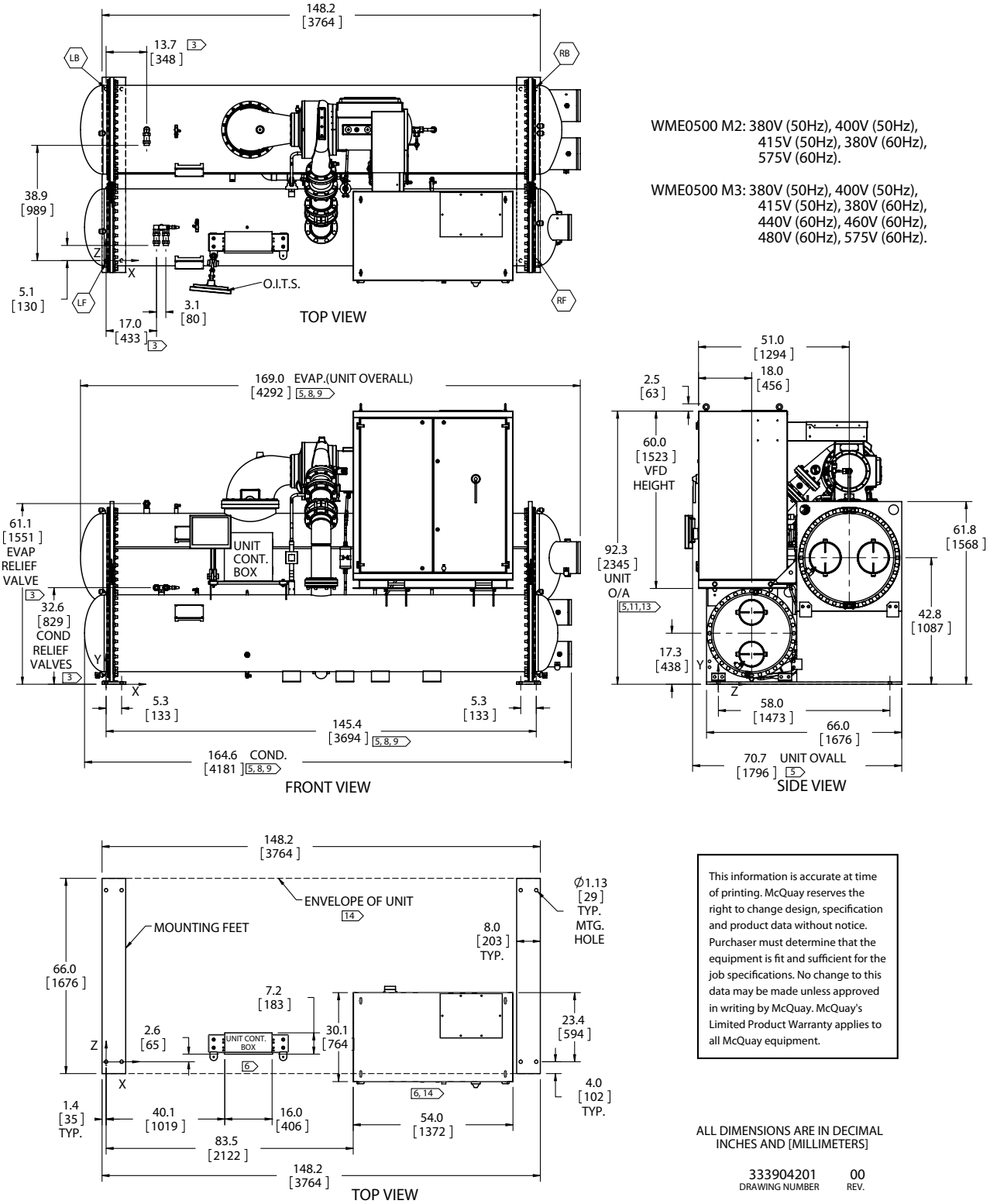


ALL DIMENSIONS ARE IN DECIMAL INCHES AND [MILLIMETERS]

333904101 DRAWING NUMBER 00 REV.

Dimension Drawings

Figure 10: WME0500 - E3012/C2612 - 2-pass M2 Standard motor (50Hz 380/400/415V) (60Hz 380/575V)
WME0500 - E3012/C2612 - 2-pass M3 Low THD motor (50Hz 380/400/415) (60Hz 380/440/460/480/575V)
(See page 12 for drawing notes)



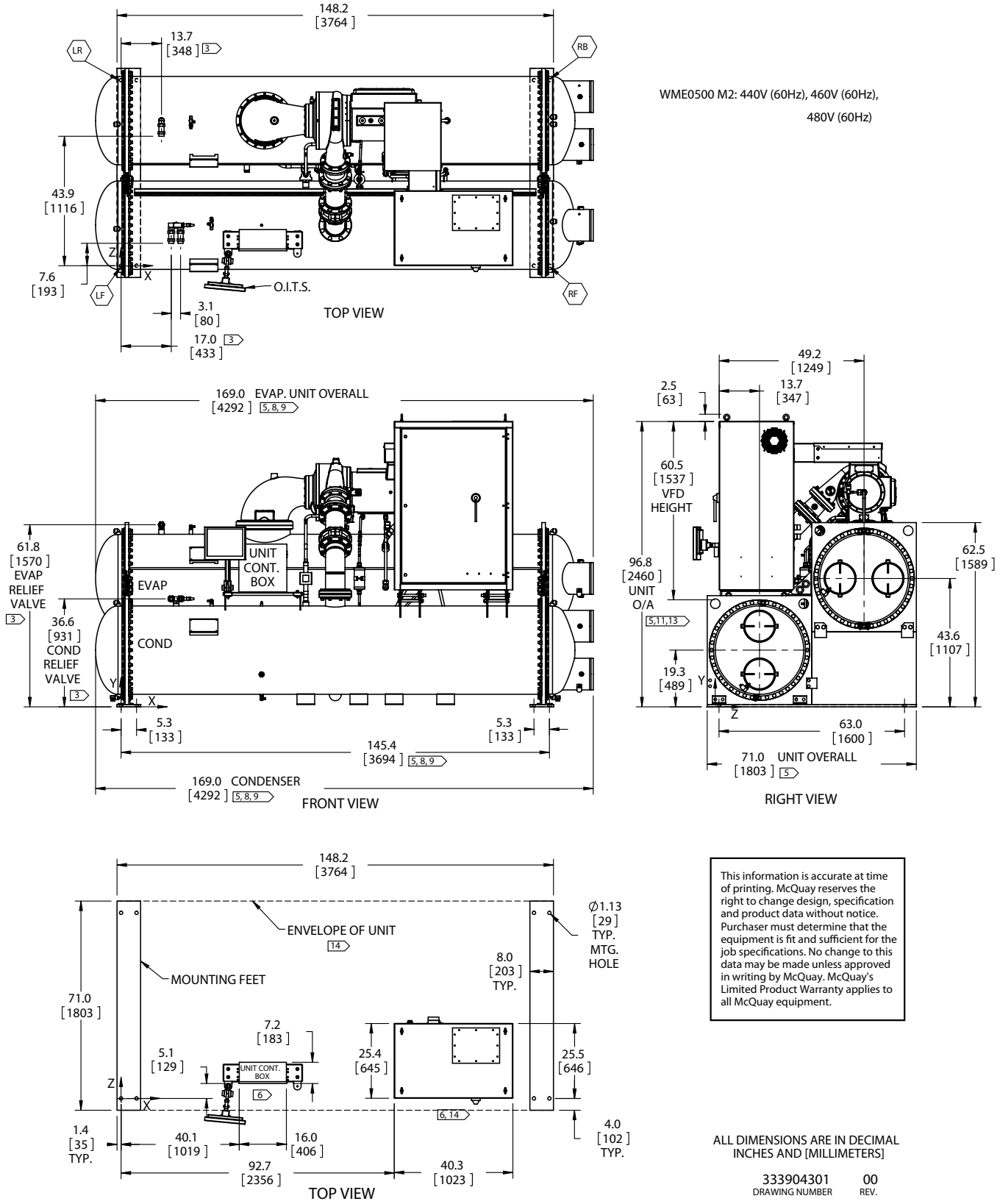
WME0500 M2: 380V (50Hz), 400V (50Hz), 415V (50Hz), 380V (60Hz), 575V (60Hz).

WME0500 M3: 380V (50Hz), 400V (50Hz), 415V (50Hz), 380V (60Hz), 440V (60Hz), 460V (60Hz), 480V (60Hz), 575V (60Hz).

ALL DIMENSIONS ARE IN DECIMAL INCHES AND [MILLIMETERS]

333904201 DRAWING NUMBER 00 REV.

Figure 11: WME0500 - E30C30 - 2 pass, M2 Standard motor (60Hz 440/460/480V)

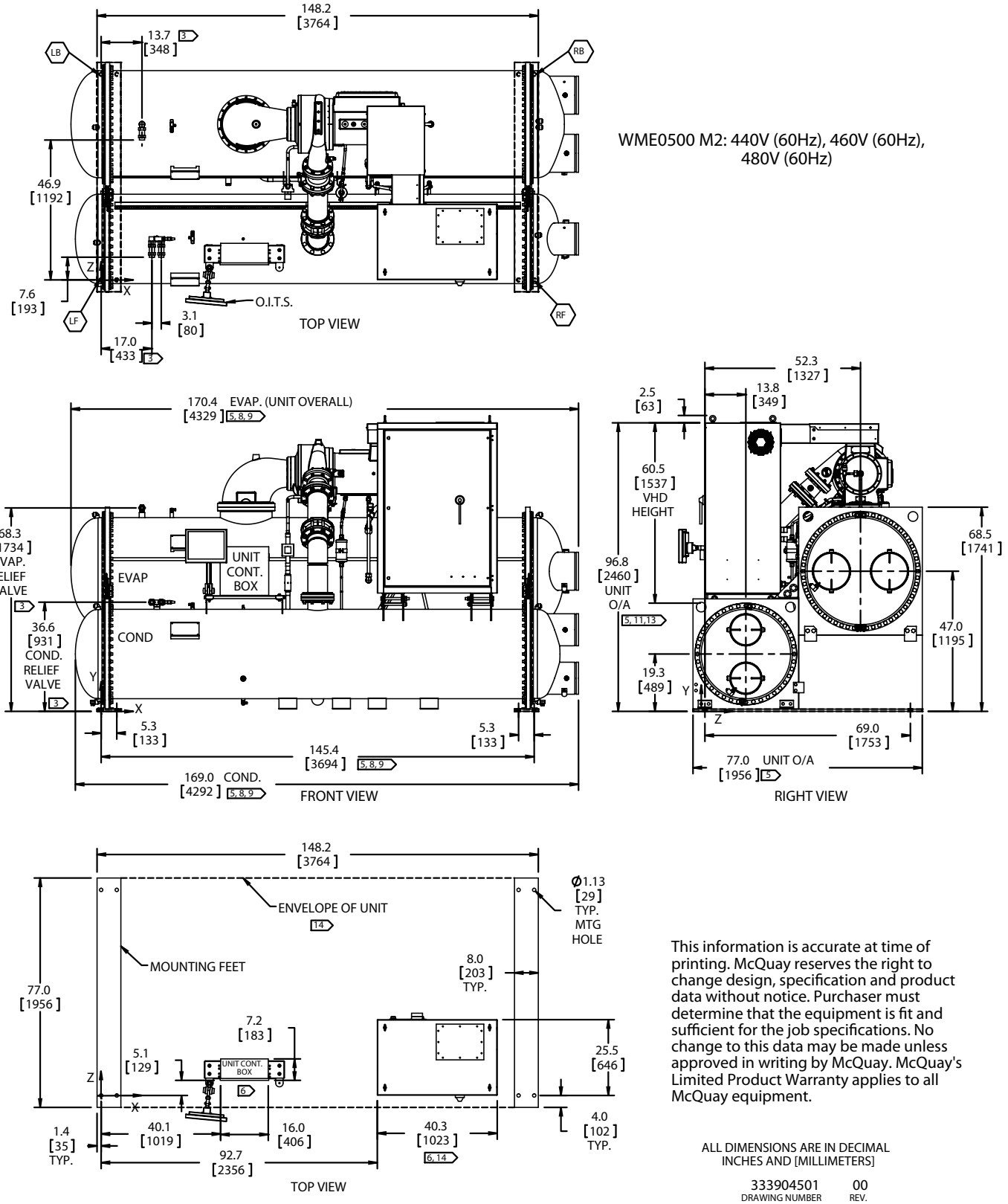


ALL DIMENSIONS ARE IN DECIMAL
INCHES AND [MILLIMETERS]

333904301 DRAWING NUMBER
00 REV.

Dimension Drawings

Figure 12: WME0500 E3612 C3012, M2 Standard motor (60Hz 440/460/480V)



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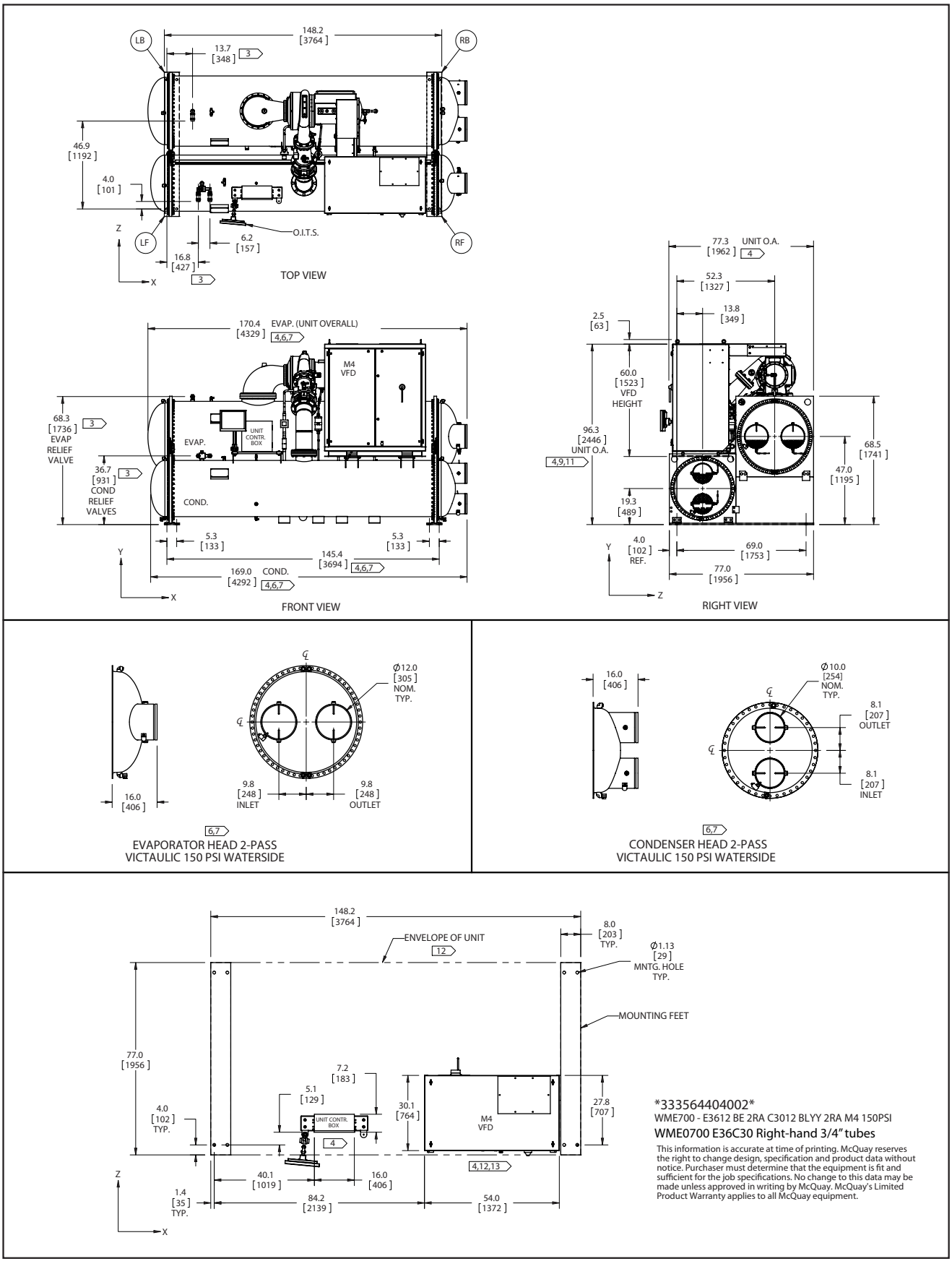
333904501 DRAWING NUMBER 00 REV.

Figure 13: Model WME0700 - E3612/C3012 - 2-pass, M4 motor, 3/4" tubes



Dimension Drawings

Figure 14: Model WME0700 - E3612/C3012 - 2-pass, M4 motor, 1” tubes

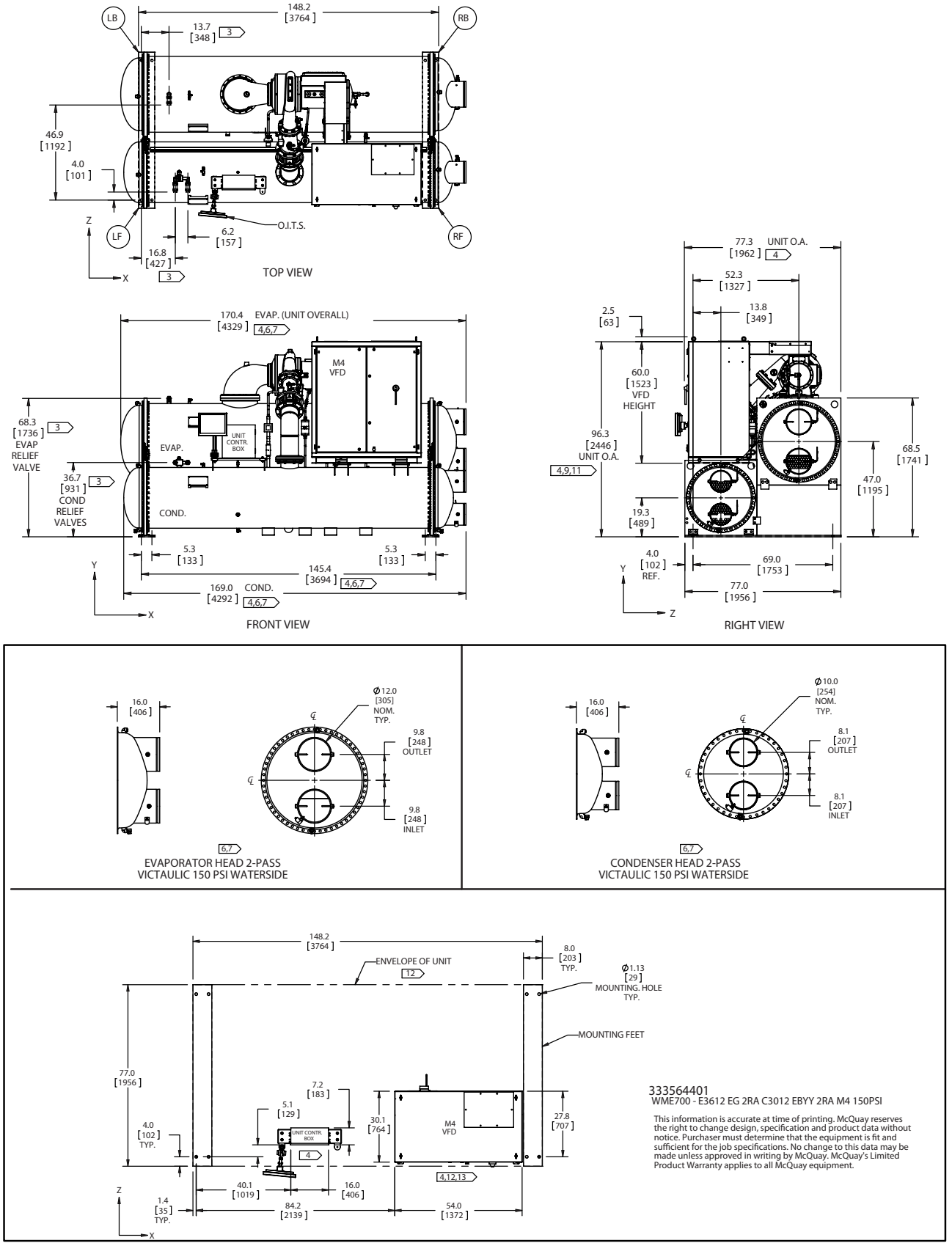
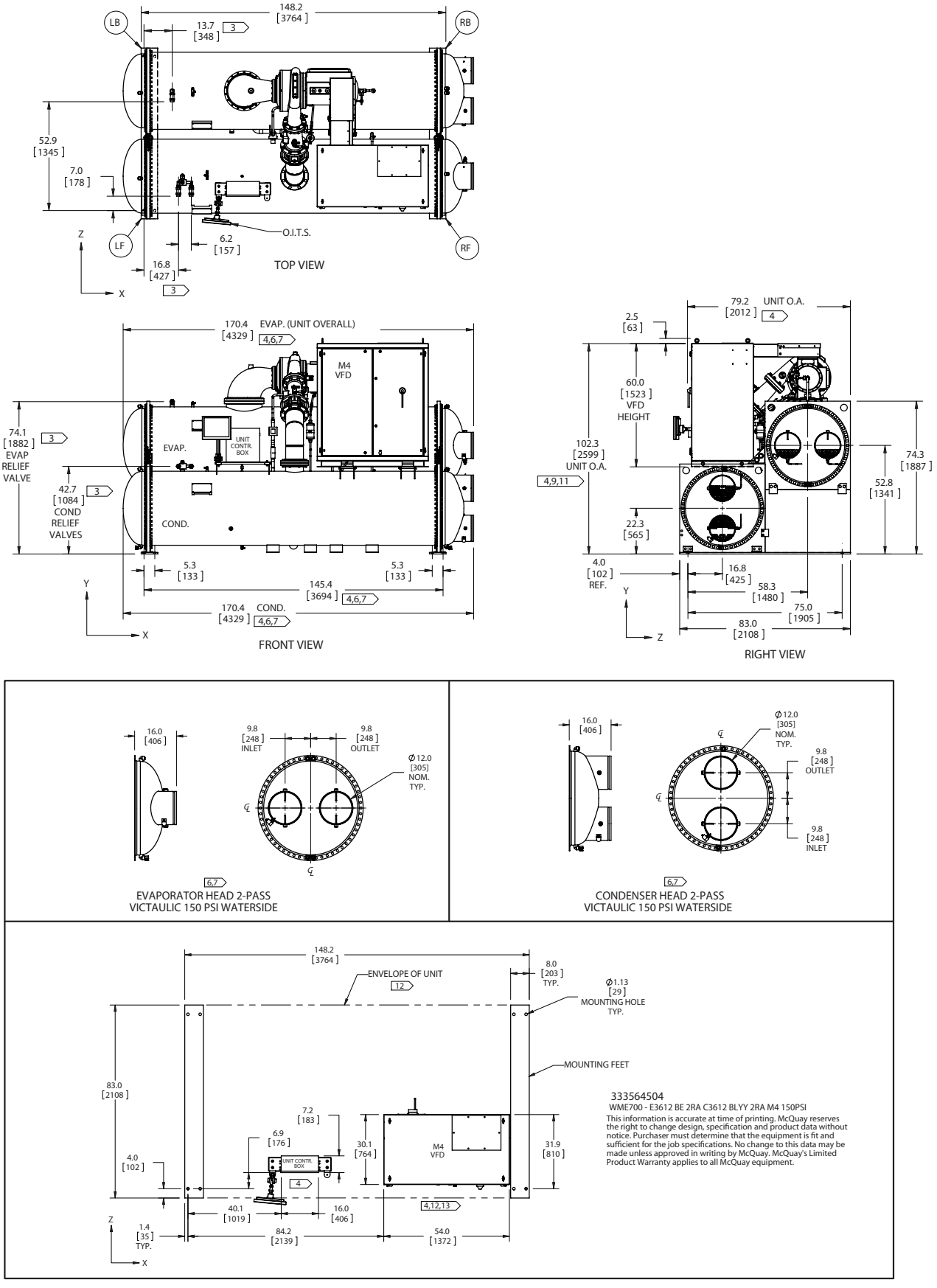
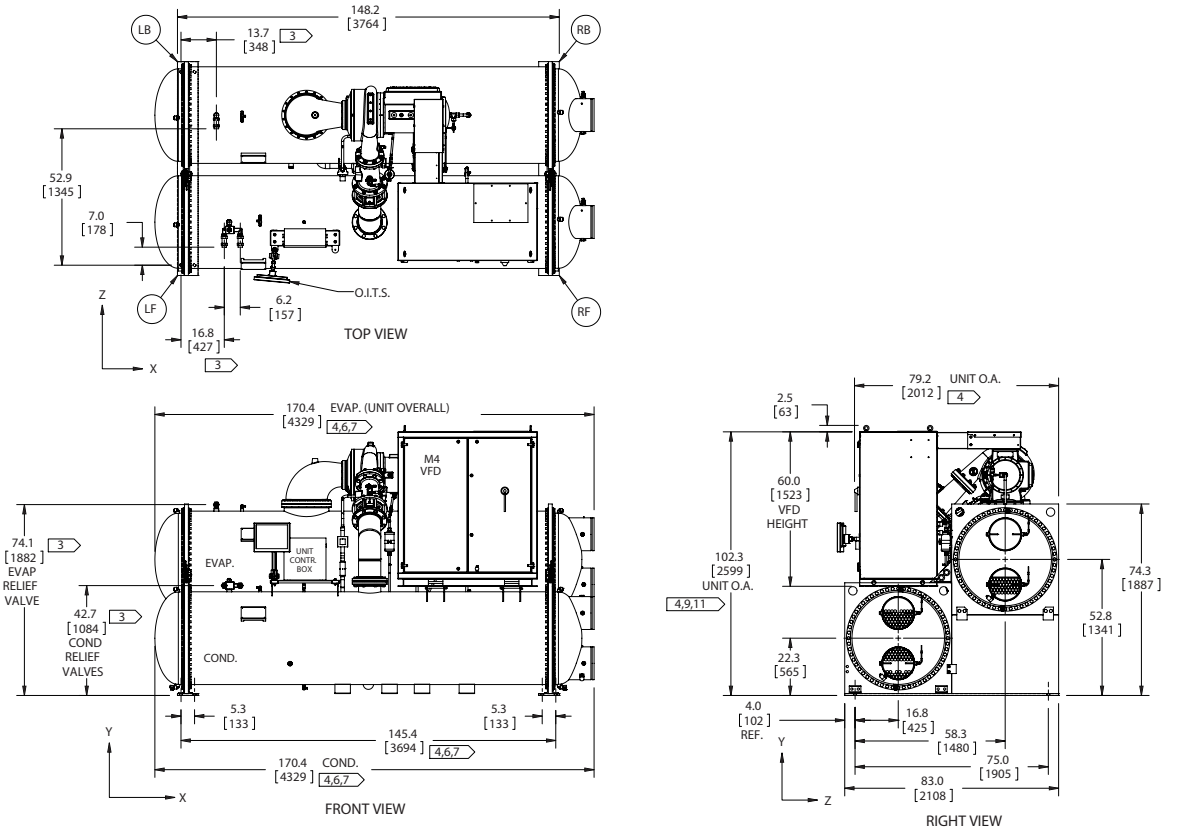


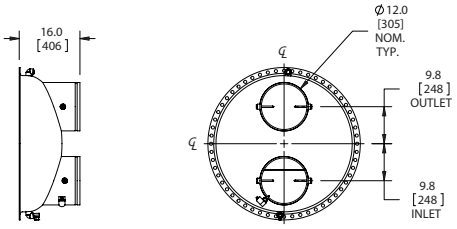
Figure 15: Model WME0700 - E3612/C3612 - 2-pass, M4 motor, 3/4" tubes

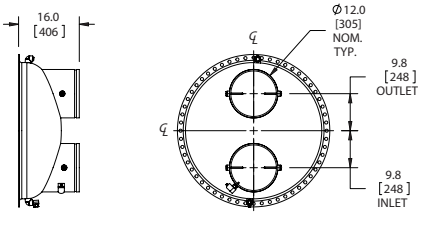


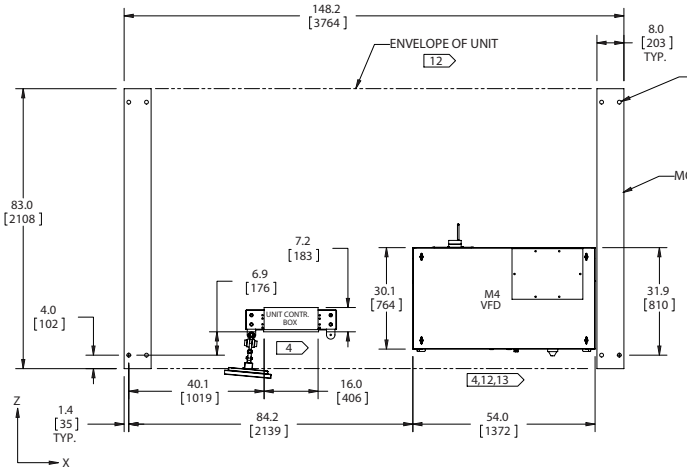
Dimension Drawings

Figure 16: Model WME0700 - E3612/C3612 - 2-pass, M4 motor, 1" tubes









333564501

WME700 - E3612 EG 2RA C3612 EBYY 2RA M4 150PSI

This information is accurate at time of printing. McQuay reserves the right to change design, specification and product data without notice. Purchaser must determine that the equipment is fit and sufficient for the job specifications. No change to this data may be made unless approved in writing by McQuay. McQuay's Limited Product Warranty applies to all McQuay equipment.

Standard Head Connection Dimensions

Figure 17: Standard Dished Head Connection Dimensions (Victaulic and Flanged)

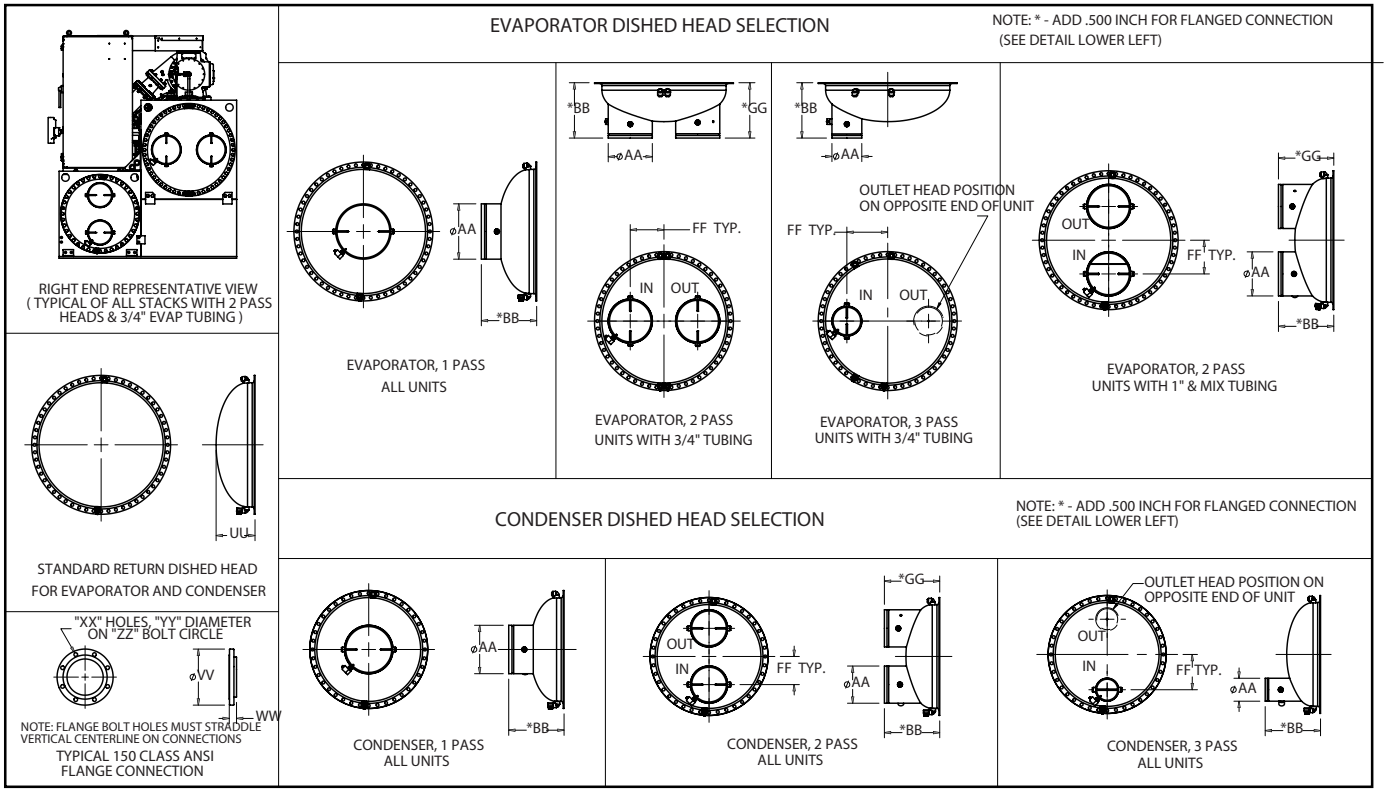


Table 1: Standard Dished Head Connection Dimensions - Victaulic Connections

Diameter	1 PASS		2 PASS				3 PASS			Return Head
Evap	AA	BB	AA	BB	FF	GG	AA	BB	FF	UU
E30	14.00	16.00	10.75	16.00	8.13	16.00	6.63	16.00	10.19	9.78
E36	16.00	16.00	12.75	16.00	9.75	16.00	8.63	16.00	11.81	11.26
Cond	AA	BB	AA	BB	FF	GG	AA	BB	FF	UU
C26	10.75	13.00	8.63	13.00	7.07	13.00	6.63	13.00	8.07	8.38
C30	14.00	16.00	10.75	16.00	8.13	16.00	6.63	16.00	10.19	9.78
C36	16.00	16.00	12.75	16.00	9.75	16.00	8.63	16.00	11.81	11.26

Table 2: Standard Dished Head Connection Dimensions - Flanged Connections

Diameter	1 PASS		2 PASS				3 PASS			Return Head
Evap	AA	BB	AA	BB	FF	GG	AA	BB	FF	UU
E30	14.00	16.50	10.75	16.50	8.13	16.50	6.63	16.50	10.19	9.78
E36	16.00	16.50	12.75	16.50	9.75	16.50	8.63	16.50	11.81	11.26
Cond	AA	BB	AA	BB	FF	GG	AA	BB	FF	UU
C26	10.75	13.50	8.63	13.50	7.07	13.50	6.63	13.50	8.07	8.38
C30	14.00	16.50	10.75	16.50	8.13	16.50	6.63	16.50	10.19	9.78
C36	16.00	16.50	12.75	16.50	9.75	16.50	8.63	16.50	11.81	11.26

Table 3: 150 Class ANSI Flange Connection Dimensions (Detail from Figure 17)

Nozzle Dia.	VV	WW	XX	YY	ZZ
6.63	11.00	1.56	8.00	0.88	9.50
8.63	13.50	1.75	8.00	0.88	11.75
10.75	16.00	1.94	12.00	1.00	14.25
12.75	19.00	2.19	12.00	1.00	17.00
14.00	21.00	2.25	12.00	1.12	18.75
16.00	23.50	2.50	16.00	1.12	21.25

Drawing & Dimension Notes:

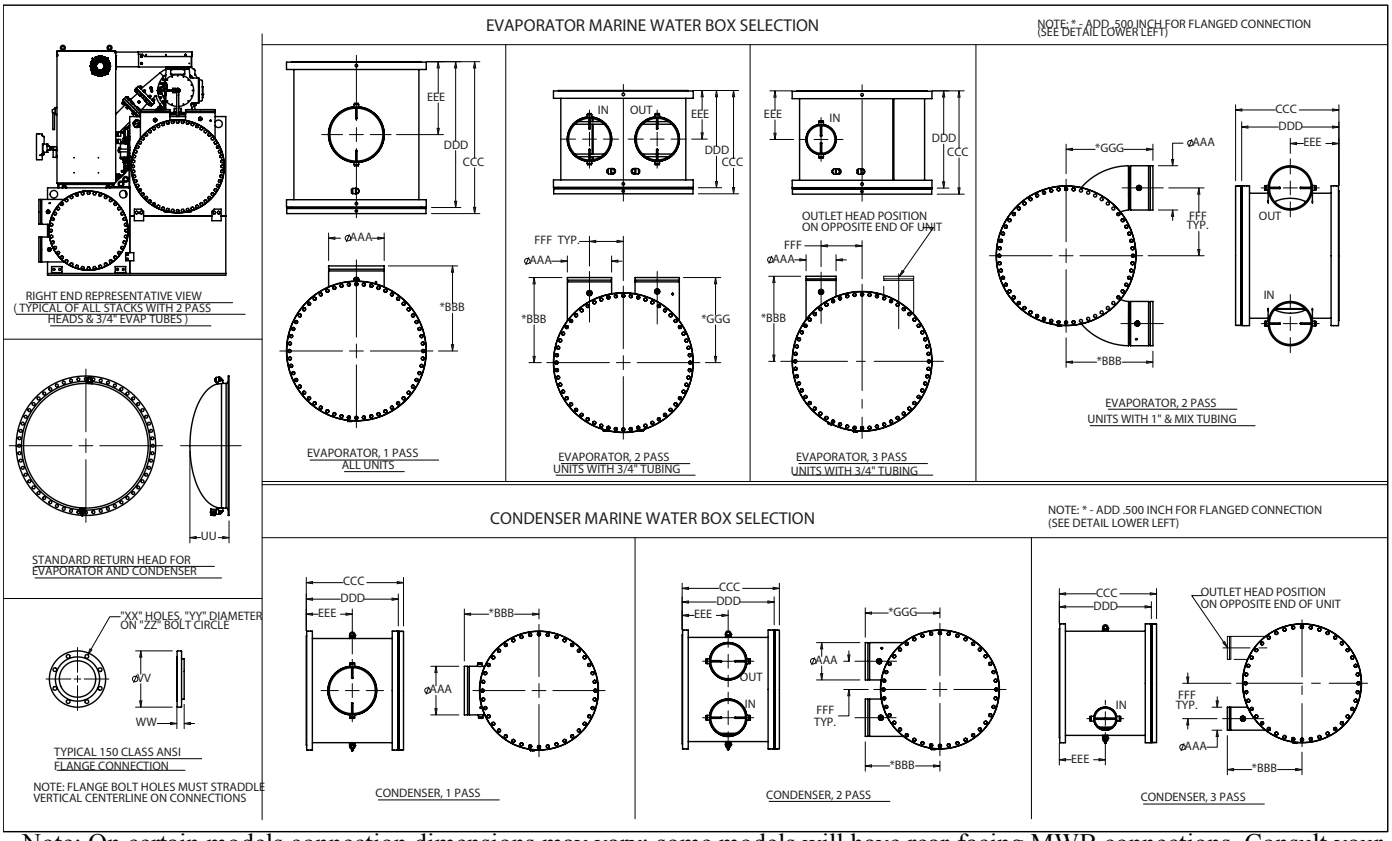
1. Dimensions in inches.
2. Flanges are ANSI raised face. Mating flanges by others.
3. Some condensers with flanges can have staggered connections due to flange interference. Consult factory.
4. Flanges add 0.5 inches to the distance from the vertical centerline to the flange face compared to Victaulic.

Dimension Drawings

Marine Water Box Dimensions

Marine water boxes with removable end covers are an available option on all evaporator and condenser sizes.

Figure 18: Marine Water Box Dimensions with Victaulic or Flanged Connections



Note: On certain models connection dimensions may vary; some models will have rear-facing MWB connections. Consult your Item Drawings for unit-specific configuration and dimensions.

Table 4: Marine Waterbox Dimensions - Victaulic Connections

Diameter	1 PASS					2 PASS							3 PASS						Return Head
Evap	AAA	BBB	CCC	DDD	EEE	AAA	BBB	CCC	DDD	EEE	FFF	GGG	AAA	BBB	CCC	DDD	EEE	FFF	UU
E30	14.00	21.00	27.75	26.50	13.25	10.75	21.00	27.75	26.50	13.25	8.13	21.00	6.63	21.00	27.75	26.50	13.25	10.19	9.78
E36	16.00	24.00	43.50	42.00	21.00	12.75	24.00	29.50	28.00	14.00	9.75	24.00	8.63	24.00	29.50	28.00	14.00	11.81	11.26
Cond	AAA	BBB	CCC	DDD	EEE	AAA	BBB	CCC	DDD	EEE	FFF	GGG	AAA	BBB	CCC	DDD	EEE	FFF	UU
C26	10.75	19.00	21.25	20.00	10.00	8.63	19.00	21.25	20.00	10.00	7.07	19.00	6.63	19.00	21.25	20.00	10.00	8.07	8.38
C30	14.00	21.00	27.75	26.50	13.25	10.75	21.00	27.75	26.50	13.25	8.13	21.00	6.63	21.00	27.75	26.50	13.25	10.19	9.78
C36	16.00	24.00	43.50	42.00	21.00	12.75	24.00	29.50	28.00	14.00	9.75	24.00	8.63	24.00	29.50	28.00	14.00	11.81	11.26

Table 5: Marine Waterbox Dimensions - Flanged Connections

Diameter	1 PASS					2 PASS							3 PASS						Return Head
Evap	AAA	BBB	CCC	DDD	EEE	AAA	BBB	CCC	DDD	EEE	FFF	GGG	AAA	BBB	CCC	DDD	EEE	FFF	UU
E30	14.00	21.50	27.75	26.50	13.25	10.75	21.50	27.75	26.50	13.25	8.13	21.50	6.63	21.50	27.75	26.50	13.25	10.19	9.78
E36	16.00	24.50	43.50	42.00	21.00	12.75	24.50	29.50	28.00	14.00	9.75	24.50	8.63	24.50	29.50	28.00	14.00	11.81	11.26
Cond	AAA	BBB	CCC	DDD	EEE	AAA	BBB	CCC	DDD	EEE	FFF	GGG	AAA	BBB	CCC	DDD	EEE	FFF	UU
C26	10.75	19.50	21.25	20.00	10.00	8.63	19.50	21.25	20.00	10.00	7.07	19.50	6.63	19.50	21.25	20.00	10.00	8.07	8.38
C30	14.00	21.50	27.75	26.50	13.25	10.75	21.50	27.75	26.50	13.25	8.13	21.50	6.63	21.50	27.75	26.50	13.25	10.19	9.78
C36	16.00	24.50	43.50	42.00	21.00	12.75	24.50	29.50	28.00	14.00	9.75	24.50	8.63	24.50	29.50	28.00	14.00	11.81	11.26

Table 6: 150 Class ANSI Flange Connection Dimensions (Detail from Figure 18)

Nozzle Dia.	VV	WW	XX	YY	ZZ
6.63	11.00	1.56	8.00	0.88	9.50
8.63	13.50	1.75	8.00	0.88	11.75
10.75	16.00	1.94	12.00	1.00	14.25
12.75	19.00	2.19	12.00	1.00	17.00
14.00	21.00	2.25	12.00	1.12	18.75
16.00	23.50	2.50	16.00	1.12	21.25

Drawing & Dimension Notes:

1. Dimensions in inches.
2. Flanges are ANSI raised face. Mating flanges by others.
3. Some condensers with flanges can have staggered connections due to flange interference. Consult factory.
4. Flanges add 0.5 inches to the distance from the vertical centerline to the flange face compared to Victaulic.

Optional External Harmonic Filter Dimensions

Figure 19: Model AUHF 300, 350, 400, Free Standing, 460Volt, Harmonic Filter

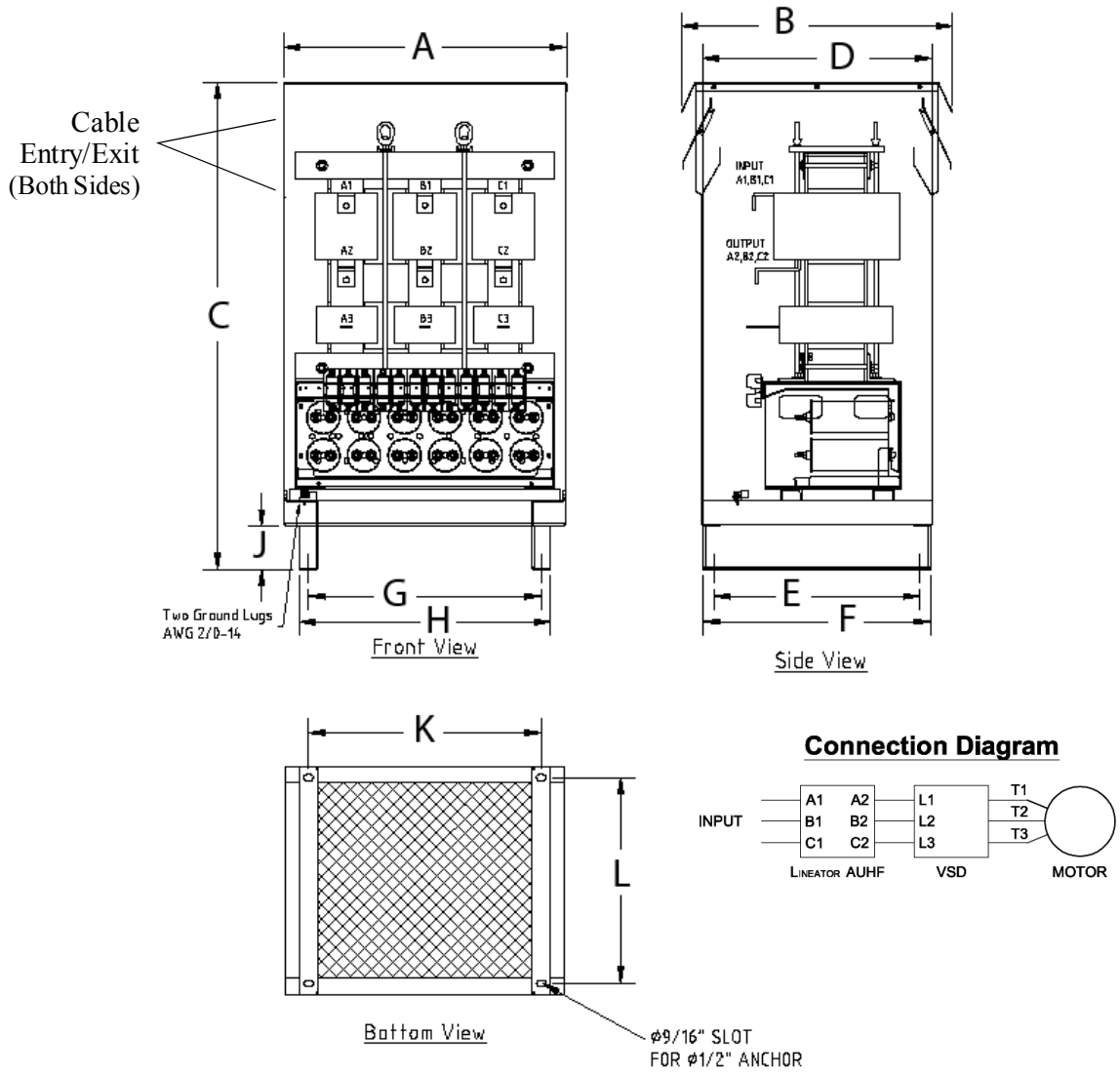


Table 7: Model AUHF Dimensions from Figure 19

MODEL		A	B	C	D	E	F	G	H	J	K	L	WEIGHT
AUHF 300-460V	in. (mm)	26.2 (664)	25.0 (636)	45.0 (1143)	21.2 (538)	19.0 (483)	21.0 (533)	21.5 (546)	23.3 (591)	4.0 (102)	21.5 (546)	19.0 (483)	585 lbs 266 kg
AUHF 350-460V	in. (mm)	32.0 (813)	29.5 (749)	51.5 (1308)	25.6 (651)	23.5 (597)	25.5 (648)	23.5 (597)	25.2 (641)	6.4 (164)	23.5 (597)	23.5 (597)	800 lbs 363 kg
AUHF 400-460V	in. (mm)	32.0 (813)	29.5 (749)	51.5 (1308)	25.6 (651)	23.5 (597)	25.5 (648)	23.5 (597)	25.2 (641)	6.4 (164)	23.5 (597)	23.5 (597)	946 lbs 429 kg

Notes:

1 Requires front access only.

2 Allow 6-inches at rear for ventilation.

Dimension Drawings

Figure 20: Model ATL 300, 350, 400, Free Standing, 600Volt, Auto Transformer Harmonic Filter

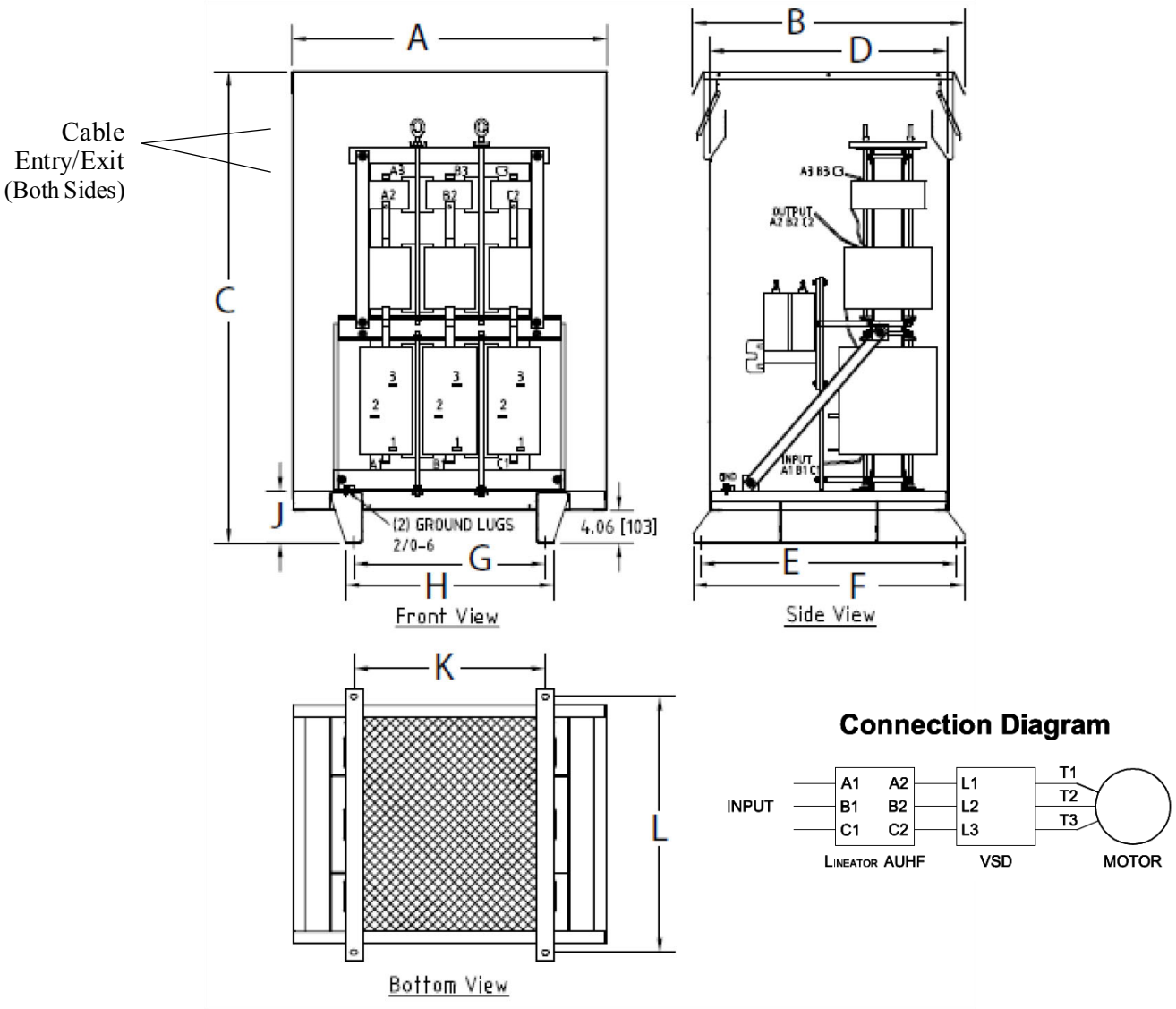


Table 8: Model ATL Dimensions & Weights, 60Hz; 380V, 440V, 600V, from Figure 20

MODEL		A	B	C	D	E	F	G	H	J	K	L	WEIGHT
ATL 300	in.	39.5	34.1	59.0	29.8	32.0	34.0	24.0	26.1	6.6	24.0	32.0	1690 lbs
	(mm)	(1004)	(867)	(1499)	(756)	(813)	(864)	(610)	(663)	(167)	(610)	(813)	(767 kg)
ATL 350V	in.	44.0	38.0	66.0	33.7	36.0	38.0	26..0	28.1	6.6	26.0	36.0	1890 lbs
	(mm)	(1119)	(965)	(1676)	(855)	(914)	(965)	(660)	(714)	(167)	(660)	(914)	(857 kg)
ATL 400V	in.	44.0	38.0	66.0	33.7	36.0	38.0	26..0	28.1	6.6	26.0	36.0	2210 lbs
	(mm)	(1119)	(965)	(1676)	(855)	(914)	(965)	(660)	(714)	(167)	(660)	(914)	(1002 kg)

Table 9: Model ATL Dimensions & Weights, 50Hz, 380/400Vfrom Figure 20

MODEL		A	B	C	D	E	F	G	H	J	K	L	WEIGHT
ATL 300	in.	44.0	38.0	66.0	33.7	36.0	38.0	26..0	28.1	6.6	26.0	36.0	1900 lbs
	(mm)	(1119)	(965)	(1676)	(855)	(914)	(965)	(660)	(714)	(167)	(660)	(914)	(862 kg)
ATL 350	in.	44.0	38.0	66.0	33.7	36.0	38.0	26.0	28.1	6.6	26.0	36.0	2318 lbs
	(mm)	(1119)	(965)	(1676)	(855)	(914)	(965)	(660)	(714)	(167)	(660)	(914)	(1052 kg)
ATL 400	in.	44.0	38.0	66.0	33.7	36.0	38.0	26..0	28.1	6.6	26.0	36.0	2475 lbs
	(mm)	(1119)	(965)	(1676)	(855)	(914)	(965)	(660)	(714)	(167)	(660)	(914)	(1122 kg)

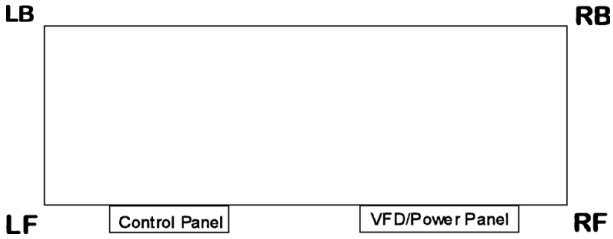
Notes:

1 Requires front access only.

2 Allow 6-inches at rear for ventilation.

Lifting and Mounting Weights

Figure 21: Corner Identification



NOTES:

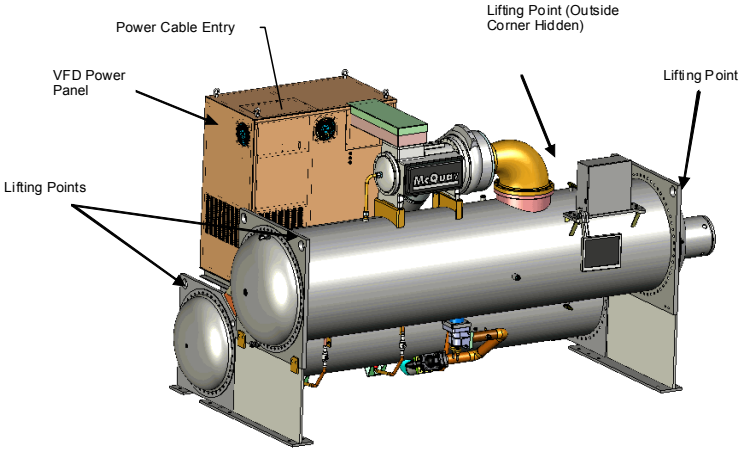
1. The block shown above is the mounting footprint, not the entire unit footprint.
2. Lifting holes in the top of the tube sheets are 3.25-inch (83 mm) diameter.
3. Mounting holes in the feet are 1.125-inch diameter.
4. Lifting and mounting weights are based on standard configuration; actual weight may vary. Consult Certified Drawing

Table 10: Lifting and Mounting Weights and Centes of Gravity

WME Model	Vessel Models	Motor Code	Lifting (Shipping) Weight, lbs (kg)					Center of Gravity in. (mm)		
			LB	LF	RB	RF	Total	X	Y	Z
500	E3012/C2612	M2	2682 (1217)	3380 (1533)	3263 (1480)	4113 (1866)	13438 (6095)	79.8 (2028)	35.1 (891)	25.7 (652)
500	E3012/C2612	M3	2652 (1203)	3667 (1663)	3472 (1575)	4801 (2178)	14592 (6619)	82.5 (2094)	36.6 (929)	24.3 (618)
500	E3012/C3012	M2	2953 (1339)	3769 (1710)	3546 (1609)	4527 (2053)	14795 (6711)	79.4 (2016)	34.7 (881)	27.7 (703)
500	E3012/C3012	M3	2948 (1337)	4031 (1829)	3789 (1719)	5182 (2350)	15950 (7235)	81.8 (2078)	36.4 (924)	26.6 (676)
500	E3612/C3012	M2	3537 (1604)	4314 (1957)	4149 (1882)	5060 (2295)	17060 (7738)	80.7 (2050)	38.1 (969)	29.9 (760)
500	E3612/C3012	M3	3519 (1596)	4591 (2082)	4385 (1989)	5721 (2595)	18216 (8263)	80.7 (2050)	38.1 (969)	29.9 (760)
700	E3612/C3012	M4	3635 (1649)	4598 (2086)	4543 (2061)	5746 (2606)	18522 (8401)	80.8 (2052)	39.4 (1000)	30.5 (774)
700	E3612/C3612	M4	4102 (1861)	5370 (2436)	4995 (2266)	6539 (2966)	21006 (9528)	79.9 (2028)	40.2 (1022)	32.5 (825)
WME Model	Vessel Models	Motor Code	Mounting (Operating) Weight, lbs (kg)					Center of Gravity in. (mm)		
			LB	LF	RB	RF	Total	X	Y	Z
500	E3012/C2612	M2	3263 (1480)	3896 (1767)	3902 (1770)	4660 (2114)	15721 (7131)	79.2 (2012)	34.8 (883)	26.4 (671)
500	E3012/C2612	M3	3228 (1464)	4189 (1900)	4117 (1867)	5343 (2424)	16877 (7655)	81.5 (2071)	36.1 (916)	25.2 (641)
500	E3012/C3012	M2	3612 (1638)	4446 (2017)	4272 (1938)	5257 (2385)	17587 (7977)	78.8 (2001)	34.2 (868)	28.2 (717)
500	E3012/C3012	M3	3604 (1635)	4712 (2137)	4518 (2049)	5908 (2680)	18742 (8501)	80.9 (2055)	35.6 (905)	27.3 (693)
500	E3612/C3012	M2	4437 (2013)	5077 (2303)	5132 (2328)	5872 (2663)	20518 (9307)	78.0 (1981)	36.7 (933)	32.2 (817)
500	E3612/C3012	M3	4412 (2001)	5359 (2431)	5374 (2438)	6527 (2961)	21672 (9830)	79.9 (2028)	37.9 (962)	31.2 (791)
700	E3612/C3012	M4	4529 (2054)	5366 (2434)	5532 (2509)	6553 (2972)	21980 (9970)	80.0 (2031)	38.9 (989)	31.6 (802)
700	E3612/C3612	M4	5150 (2336)	6461 (2931)	6130 (2781)	7691 (3489)	25432 (11536)	79.0 (2007)	39.7 (1008)	33.3 (845)

Physical Data & Weights

Figure 22: Lifting Points - See Installation Manual IM 1033 for handling information.



Note: This drawing is for general reference only.
Refer to dimension drawings for location of components.

Physical Data - Evaporator

Refrigerant-side maximum working pressure is 200psig. Water-side is 150 psi (1034 kPa) with 300 psi (2068 kPa) available as an option. Approximate total square footage of insulation surface required for individual packaged chillers is tabulated by evaporator code and can be found below. The suction elbow and compressor also require insulation. Factory-installed insulation on cold surfaces, ¾ or 1 ½ inch thick is an available option.

Table 11: Evaporator Physical Data

WME Model	Evaporator Model	Tube Length	Evaporator Water Volume, gal (L)	Insulation Area sq. ft. (m^2)	Number of Relief Valves
0500	E3012	12 ft.	147 (555)	115 (11)	1
0500	E3612	12 ft.	191 (723)	129 (12)	1
0700	E3612	12 ft.	214 (809)	129 (12)	1

Note: Refrigerant charge will depend on a number of variables. Actual charge will be shown on the unit nameplate.
Note: Water capacity is based on standard tube configuration and standard dished heads, and may change depending on your configuration. Consult Certified Drawing.

Physical Data - Condenser

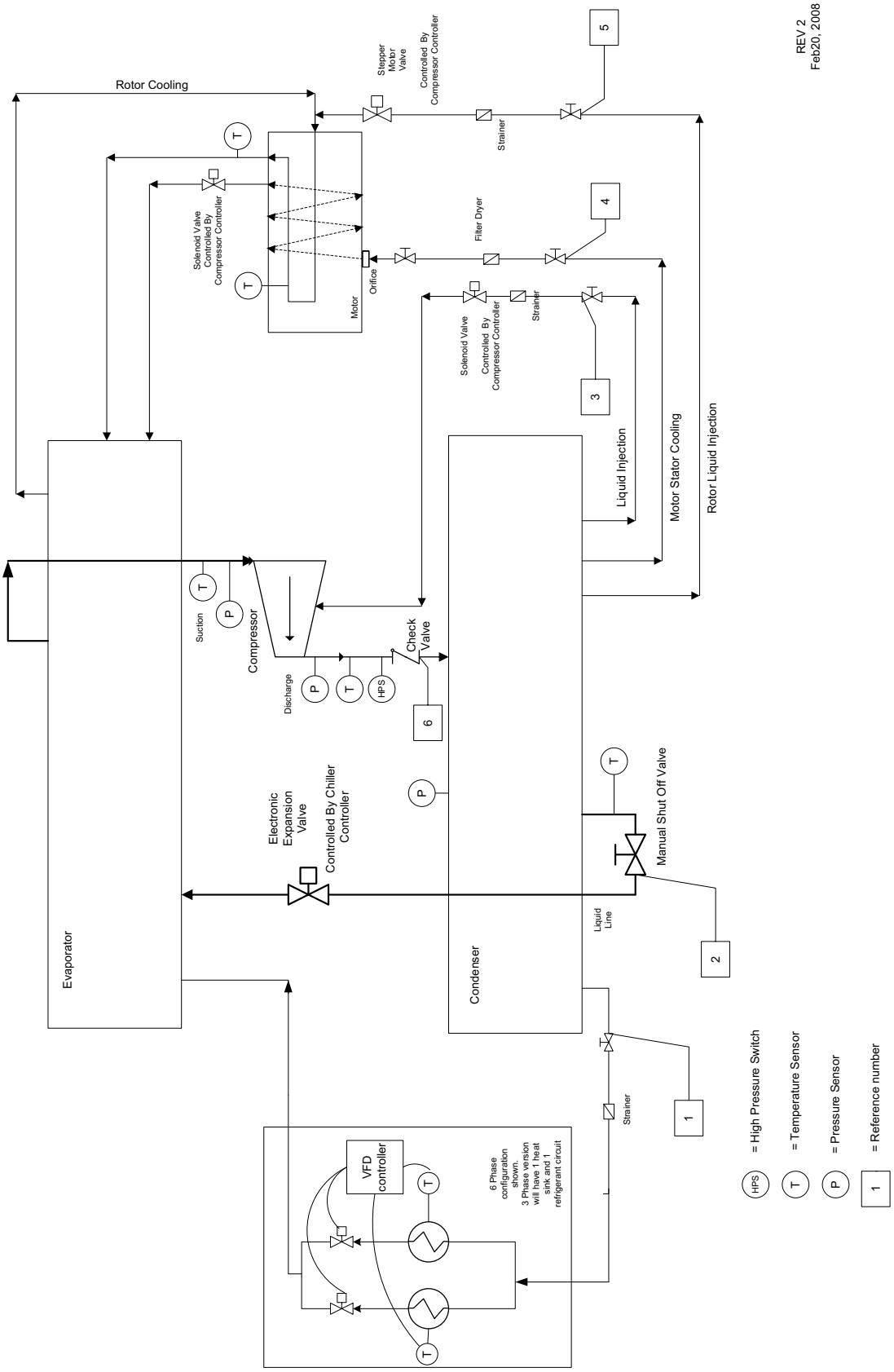
With positive pressure systems, the pressure variance with temperature is always predictable and the vessel design and pressure relief protection are based upon pure refrigerant characteristics. R-134a requires ASME vessel design, inspection and testing and uses spring-loaded pressure relief valves. When an over-pressure condition occurs, spring-loaded relief valves purge only that quantity of refrigerant required to reduce system pressure to the valve's set pressure, and then close.Refrigerant-side design pressure is 200 psi; Water-side design is 150 psi with 300 psi available as an option. .

Table 12: Condenser Physical Data

WMC Model	Condenser Model	Tube Length	Maximum Pumpdown Capacity lb. (kg)	Water Volume gal. (L)	Number of Relief Valves
0500	C2612	12 ft.	1656 (751)	111 (419)	2
0500	C3012	12 ft.	2148 (975)	144 (545)	2
0700	C3012	12 ft.	2060 (934)	214 (808)	2
0700	C3612	12 ft.	2814 (1276)	337 (1276)	2

Note: Condenser pumpdown capacity based on 90% full at 90°F.
Note: Water capacity based on standard configuration and standard heads, and may change depending on your configuration. Consult Certified Drawing.
Note: See Relief Valves section of IM 1033 (available on www.daikinmcquay.com) for additional information.

Figure 23: Refrigeration Diagram



Application Considerations

Location Requirements

Daikin McQuay Magnitude units are designed only for indoor, weather-protected, non-freezing area consistent with the NEMA 1 rating on the chiller, controls, and electrical panels. Equipment room temperature for operating and standby conditions is 40°F to 122°F (4.4°C to 50°C).

Optimum Water Temperatures and Flow

A key to improving energy efficiency for any chiller is minimizing the compressor pressure lift. Reducing the lift reduces the compressor work and its energy consumption per unit of output. The chiller typically consumes more energy than any other component in the chiller system. Therefore, the optimum plant design must take into account all of the interactions between chiller, pumps, and tower.

Higher Leaving Chilled Water Temperatures

Warmer leaving chilled water temperatures will raise the compressor's suction pressure and decrease the lift, improving efficiency. Using 45°F (7°C) leaving water instead of 42°F (5.5°C) will significantly reduce chiller energy consumption.

Evaporator Temperature Drop

The industry standard has been a 10°F (5.5°C) temperature drop in the evaporator. Increasing the drop to 12°F or 14°F (6.6°C or 7.7°C)will improve the evaporator heat transfer, raise the suction pressure, and improve chiller efficiency. Chilled water pump energy will also be reduced.

Reduced Evaporator Fluid Flow

Several popular chiller plant control practices including Variable Primary Flow systems advocate reducing the evaporator fluid flow rate as the chiller capacity is reduced. This practice can significantly reduce the evaporator pumping power while having little effect on chiller energy consumption. The Magnitude chiller can operate effectively in variable evaporator flow systems as long as the minimum and maximum tube velocities are taken into consideration when selecting the chiller. See section Variable Fluid Flow Rates and Tube Velocities, page 32.

If it is decided to vary the evaporator water flow rate the rate of change should not exceed 50% per minute and should not exceed the minimum or maximum velocity limits.

Condenser Entering Water Temperature

As a general rule, a 1°F (0.5°C) drop in condenser entering water temperature will reduce chiller energy consumption by two percent. Cooler water lowers the condensing pressure and reduces compressor work. One or two degrees can make a noticeable difference. The incremental cost of a larger tower can be small and provide a good return on investment.

Condenser Water Temperature Rise

The industry standard of 3 gpm/ton or about a 9.5°F (5.3°C) delta-T seems to work well for most applications.

Reduced Condenser Fluid Flow

Several popular chiller plant control practices also advocate reducing the condenser fluid flow rate as the chiller load is reduced. This practice can significantly reduce the condenser pumping power, but it may also have the unintended consequence of significantly increasing compressor power since the leaving condenser water temperature is directly related to compressor lift and power. The higher compressor power will typically be larger than the condenser pumping power reduction and will result in a net increase in chiller plant energy consumption. Therefore, before this strategy is applied for energy saving purposes it should be extensively modeled or used in an adaptive chiller plant control system which will take into account all of the interdependent variables affecting chiller plant energy. If it is decided to use variable condenser fluid flow, the Magnitude chiller can operate effectively as long as the minimum and maximum tube velocities are taken into consideration when selecting the chiller.

Chilled Water Temperature

The maximum temperature of water entering the chiller on standby must not exceed 105°F (46.1°C). Maximum temperature entering on start-up must not exceed 90°F (32°C). Minimum chilled water leaving temperature without antifreeze is approximately 38°F (3.3°C).

Piping

Piping must be adequately supported to remove weight and strain on the chiller's fittings and connections. Be sure piping is adequately insulated for job conditions. Install a cleanable 20-mesh water strainer upstream of the evaporator and condenser. Install enough shutoff valves to permit draining water from the evaporator or condenser without draining the complete system.

Note: This product is equipped with a copper-brazed 304 series stainless steel evaporator plate or a shell and tube evaporator with carbon steel shell and copper tubes. The water or other fluid used in these evaporators must be clean and non-corrosive to the materials used in the evaporator. Non-compatible fluids can void the equipment warranty. If the compatibility of the fluid with the evaporator is in question, a professional water quality consultant should administer the proper testing and evaluate compatibility.

Condenser Water Temperature

When the ambient wet bulb temperature is lower than design, the entering condenser water temperature of Magnitude WME chillers can be lowered to improve chiller performance.

Chillers can start with entering condenser water temperatures as low as 40°F (4.4°C). For short periods of time during startup, the entering condenser water temperature can even be lower than the leaving chilled water temperature.

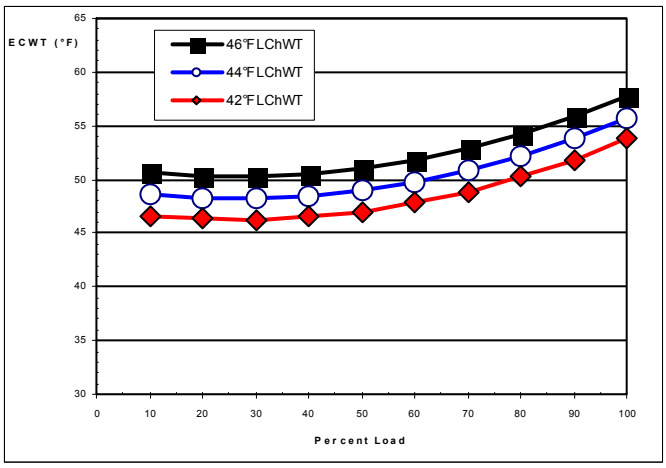
Magnitude WME chillers are equipped with electronic expansion valves (EXV) and will run with entering condenser water temperatures as low as shown in Figure 24 or as calculated from the following equation on which the curves are based:

Min. ECWT = $5.25+(LWT)-0.75*DT_{FL}*(PLD/100)+14*(PLD/100)^2$

Where:

ECWT = Entering condenser water temperature
LWT = Leaving chilled water temperature
DTFL = Chilled Water Delta-T at full load
PLD = The percent chiller load point to be checked

Figure 24: WME Minimum Entering Condenser Water Temperature (EXV) (10°F Range at Full Load)



For example; at 44°F LWT, 10°F Delta-T at full load, and 50% full load operation, the entering condenser water temperature could be as low as 49°F. This provides excellent operation with water-side economizer systems.

Depending on local climatic conditions, using the lowest possible entering condenser water temperature may be more costly in total system power consumed than the expected savings in chiller power would suggest, due to the excessive fan power required.

In this scenario, cooling tower fans would continue to operate at 100% capacity at low wet bulb temperatures. The trade-off between better chiller efficiency and fan power should be analyzed for best overall system efficiency. The Energy Analyzer program (available from your Daikin McQuay Sales Representative) can optimize the chiller/tower operation for specific buildings in specific locales.

Even with tower fan control, some form of water flow control, such as tower bypass, is recommended.

Figure 25 and Figure 26 illustrate two temperature-actuated tower bypass arrangements. The “Cold Weather” scheme, Figure 26, provides better startup under cold ambient air temperature conditions. The bypass valve and piping are indoors and thus warmer, allowing for warmer water to be immediately available to the condenser. The check valve may be required to prevent air at the pump inlet.

Figure 25: Tower Bypass: Mild Weather Operation

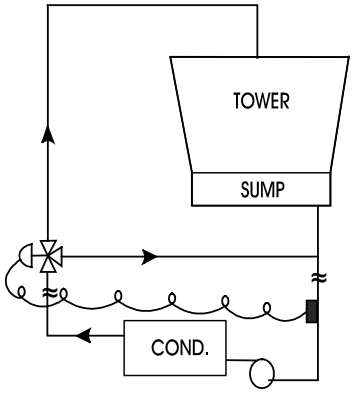
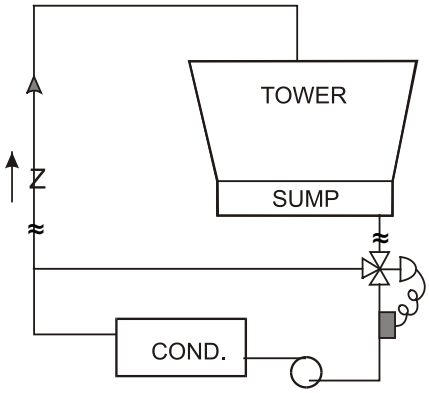


Figure 26: Tower Bypass: Cold Weather Operation (Bypass Indoors)



Condenser water temperature control

The standard MicroTech controller is capable of three stages of tower fan control plus an analog control of either a three-way tower-bypass valve or variable speed tower-fan motor. Stages are controlled from condenser-water temperature. The three-way valve can be controlled to a different water temperature or track the current tower stage. This allows optimum chilled water plant performance based upon specific job requirements.

Pumps

The condenser water pump(s) must be cycled off when the last chiller of the system cycles off. This will keep cold condenser water from migrating refrigerant to the condenser. Cold liquid refrigerant in the condenser can make start up difficult. In addition, turning off the condenser water pump(s) when the chillers are not operating will conserve energy.

Include thermometers and pressure gauges at the chiller inlet and outlet connections and install air vents at the high points of piping. Where noise and vibration are critical and the unit is mounted on spring isolators, flexible piping and conduit connections are necessary.

Variable Fluid Flow Rates and Tube Velocities

Many chiller system control and energy optimization strategies require significant changes in evaporator and condenser water flow rates. The Magnitude chiller line is particularly well suited to take full advantage of these energy saving opportunities provided that the maximum and minimum fluid flow rates are taken into consideration for a specific application. The sales engineer has the flexibility to use different combinations of shell size, number of tubes, and pass arrangements to select the optimum chiller for each specific application.

Both excessively high and excessively low fluid flow rates should be avoided. Excessively high fluid flow rates and correspondingly high tube velocities will result in high fluid pressure drops, high pumping power, and potentially tube corrosion and/or tube corrosion damage. Excessively low fluid flow rates and correspondingly low velocities should also be avoided as they will result in poor heat transfer, high compressor power, sedimentation and tube fouling. Excessively high and low tube velocities can be particularly problematic and damaging in open loop systems.

Rates of Fluid Flow Change

If it is decided to vary the evaporator water flow rate the rate of change should not exceed 50% per minute and should not exceed the minimum or maximum velocity limits as determined by the McQuay chiller software program.

Vibration Mounting

Daikin McQuay Magnitude chillers are almost vibration-free. Consequently, floor mounted spring isolators are not usually required. Rubber mounting pads are shipped with each unit. It is wise to continue to use piping flexible connectors to reduce sound transmitted into the pipe and to allow for expansion and contraction.

System Water Volume

All chilled water systems need adequate time to recognize a load change, respond to that load change and stabilize, without undesirable short cycling of the compressors or loss of control. In air conditioning systems, the potential for short cycling usually exists when the building load falls below the minimum chiller plant capacity or on close-coupled systems with very small water volumes.

Some of the things the designer should consider when looking at water volume are the minimum cooling load, the minimum chiller plant capacity during the low load period and the desired cycle time for the compressors.

Assuming that there are no sudden load changes and that the chiller plant has reasonable turndown, a rule of thumb of "gallons of water volume equal to two to three times the chilled water gpm flow rate" is often used.

A properly designed storage tank should be added if the system components do not provide sufficient water volume.

System Analysis

Although we recommend analyzing the entire system, it is generally effective to place the chiller in the most efficient mode because it is a large energy consumer.

The Daikin McQuay Energy Analyzer program is an excellent tool to investigate the entire system efficiency, quickly and accurately. It is especially good at comparing different system types and operating parameters. Contact your local Daikin McQuay sales office for assistance on your particular application.

Retrofit Knockdown

It is estimated that fifty percent of retrofit applications require partial or complete disassembly of the chiller. Magnitude chillers are relatively easy to disassemble due to the small compressor size, simplified refrigerant piping and the absence of a lubrication system with its attendant components and piping. Three knockdown arrangements are available as options. For detailed knockdown dimensions and installation, see IM Knockdown, available at www.daikinmcquay.com. Contact your local McQuay Factory Service for price quotation and installation scheduling.

TYPE I provides a moderate amount of disassembly. The compressor, suction and discharge piping, and compressor VFD power panel are removed and put on a skid. The touchscreen and mounting arm will ship in a separate container. All associated wiring and piping will remain attached if possible. The remaining loose parts will be packaged in a separate crate.

TYPE II provides a total knockdown of the unit. The compressor and VFD power panel are removed and put on a skid. The touchscreen and mounting arm will ship in a separate container. The condenser, evaporator, and tube sheet supports will remain connected only by the attachment bolts for easy disassembly at the job site. All wiring and piping that interconnects the components will be removed. The remaining loose parts will be packaged in a separate crate.

Type III units are shipped fully assembled, factory charged, run-tested, insulated and painted; ready for disassembly at the job site. Included are the vessel bolt-on connection brackets, discharge line bolt-on flanges at the condenser. Touch-up paint and stick-on wire ties will be included. Site disassembly and reassembly must be supervised by McQuay startup personnel.

Unit Options

Export packaging

Can be either open or closed crate and with optional shipping bag. A wooden skid and a shrink-wrapped bag covering the entire unit and protecting it from possible dirt and grime accumulation during transit are standard.

Pumpout Unit, with or without storage vessel

Available in a variety of sizes, single-phase or three-phase, with and without tanks. Contact your Daikin McQuay sales office for details.

Extended warranties

Extended 1, 2, 3, or 4 year warranties for parts only or for parts and labor are available for the compressor/motor only, the entire unit, or the entire unit including refrigerant.

Spring vibration Isolators

Spring isolators for use in special situations requiring extremely low vibration and sound levels.

Witness performance test

The specified full and/or part load tests, as ordered, are performed in the presence of the customer under the supervision of a factory engineer and include compilation of the test data onto an easy-to-read spreadsheet. Tests are run to AHRI tolerances of capacity and power. Travel and local expenses are not included.

Certified performance test

The specified full and/or part load run tests, as ordered, are performed under the supervision of a factorry engineer; data is compiled, certified and transmitted to the customer. Tests are run to AHRI tolerances of capacity and power

Refrigerant charge

Holding charge of Nitrogen or R-134a. Shipping with a full charge of R-134a is standard.

Knockdown shipment

Several options for a knockdown shipment to facilitate unit placement. See page 32 for details.

Vessel Options

Marine water boxes

Provides tube access for inspection, cleaning, and removal without dismantling water piping.

Flanges (Victaulic connections are standard)

ANSI raised face flanges on either the evaporator or condenser. Mating flanges are by others.

Water side vessel construction of 300 psi (150 psi is standard)

For high pressure water systems, typically high-rise building construction.

Epoxy coating

Evaporator and condenser tube sheets,heads and marine boxes can be epoxy coated for corrossion protection.

Single insulation - evaporator shell / heads / suction piping

0.75-inch insulation on cold surfaces. Insulation, either optional factory-installed or field-installed is required on all installations.

Double insulation - evaporator shell / heads / suction piping

1.5-inch insulation on cold surfaces (0.75-inch on suction piping) for low fluid temperatures and/or high humidity .

Tube size, wall thickness and material

A wide range of tube options are available to accommodate most flow rates and fluids. Standard wall thickness is 0.025 in., optional 0.028 in. or 0.035 in.

Controls Options

BAS interface module

Factory-installed on the unit controller for the applicable protocol being used (Can also be retrofit):

- BACnet MS/TP
- BACnet IP
- BACnet Ethernet
- LonWorks
- Modbus RTU

Electrical Options

High short circuit current rating

35kA, 65 kA and 100kA (at 460V) panel rating available with a matching circuit breaker.

Low Harmonic VFD Option

The Low THD option (M3) model VFD has been tested to meet SEMI F47-0706 standard for voltage sag immunity. This is a standard from the semi-conductor industry that specifies various scenarios regarding voltage sag intensity (percent of voltage remaining during sag) and duration (in cycles or seconds). The chiller will remain on-line during a voltage sag that meets the criteria in this testing protocol.

EMI filter

Factory-installed option. Radio interference filter.

Ground fault protection

Protects equipment from arcing ground fault damage from line-to-ground fault currents less than those required for conductor protection.

Input power meter

Allows display of phase amps and volts on the operator interface screen.

Special Order Options

The following special order options are available; requiring factory pricing, additional engineering and possible dimension changes or extended delivery:

Special Order Options:

1 Non-standard location of nozzle connections on heads (compact water boxes) or marine water boxes

2 Special corrosion inhibiting coatings on any "wetted surface" including tubesheets, heads (compact water boxes), marine water boxes, or nozzles

3 Clad tube sheets

4 Sacrificial anodes in heads (compact water boxes) or marine water boxes

5 Eddy current testing and report used to verify baseline tube condition

6 Special NEMA enclosures

7 Davits or hinges for marine water box covers or heads (compact water boxes)

8 Accelerometer and vibration monitoring pickup mounting)

9 Spacer rings on heads to accommodate automatic tube brush cleaning systems (installed by others)

Accessories

Harmonic Filter, WME 500

Free-standing, wide spectrum, passive harmonic filter is available as a kit for field mounting and wiring. Although the harmonic characteristics of the standard VFD drive of the WME500 are acceptable in the vast majority of applications, this filter is a cost effective option for those applications that require reduced harmonics. Under most application conditions, it is guaranteed to meet the IEEE Standard 519 for Isc/IL harmonic levels even if the point of common coupling is at the filter input terminals. Model AUHF for 460 volt service and Model ATL, which includes an autotransformer, for 600 volts.

Refrigerant monitor

For remote mounting including accessories such as 4-20ma signal, strobe light, audible horn, air pick-up filter.

SECTION 15XXX: MAGNETIC BEARING CENTRIFUGAL CHILLERS

PART 1 - GENERAL

1.1 SUMMARY

A Section includes design, performance criteria, refrigerants, controls, and installation requirements for water-cooled centrifugal chillers.

1.2 REFERENCES

A Comply with the following codes and standards:

- AHRI 550/590
- AHRI 575
- NEC
- ANSI/ASHRAE 15
- OSHA as adopted by the State
- ETL
- ASME Section VIII

1.3 SUBMITTALS

A Submittals shall include the following:

1 Dimensioned plan and elevation view, including required clearances, and location of all field piping and electrical connections.

2 Summaries of all auxiliary utility requirements such as: electricity, water, air, etc. Summary shall indicate quality and quantity of each required utility.

3 Diagram of control system indicating points for field interface and field connection. Diagram shall fully depict field and factory wiring.

4 Manufacturer's certified performance data at full load plus IPLV or NPLV.

5 Installation and Operating Manuals.

1.4 QUALITY ASSURANCE

A Regulatory Requirements: Comply with the codes and standards in Section 1.2.

B Chiller manufacturer plant shall be ISO Certified.

C The chiller shall be tested to job conditions on an AHRI qualified test stand at the manufacturer's plant.

1.5 DELIVERY AND HANDLING

A Chillers shall be delivered to the job site completely assembled and charged with refrigerant R-134a and be shipped on skids with a weather resistant cover.
-- OR --

A (Type I Knockdown, WME only) The compressor, suction and discharge piping, VFD power panel and touchscreen shall be removed and shipped separately. All wiring and piping shall remain attached where possible. The remaining loose parts shall be packaged in a separate crate. The unit is to be run-tested at the factory and shipped with a helium holding charge, evaporator insulated and a kit for compressor insulation. Contractor shall leak test, evacuate and charge with refrigerant after reassembly.
--OR--

A (Type II Knockdown, WME only) The compressor, VFD power panel, wiring and interconnecting piping shall be removed and shipped separately. The unit shall be run-tested at the factory. The compressor and vessels shall ship with a helium holding charge, the evaporator insulated and a kit for compressor insulation included. Contractor shall leak test, evacuate and charge with refrigerant after reassembly.
--OR--

A (Type III Knockdown, WME only) The units shall be shipped fully assembled, factory charged, run-tested, insulated and painted; ready for disassembly at the job site. The unit shall have vessel bolt-on connection brackets, discharge line bolt-on flanges at the condenser, touch-up paint and stick-on wire ties. Site disassembly and reassembly must be factory supervised. Contractor shall leak test, evacuate and charge with refrigerant after reassembly.
--OR--

A (Type IV Knockdown WMC only) The compressor and VFD power panel shall be removed at the factory and shipped on skids. The stripped vessel stack shall be shipped as a single piece. Discharge piping, liquid line and the compressor cooling lines shall be removed and crated. All associated wiring and piping possible will remain on the vessel stack. The unit shall be shipped with a holding charge of helium. Contractor shall leak test, evacuate and charge with refrigerant after reassembly
-- OR --

A (Type V Knockdown, WMC only) The unit shall be delivered to the job site completely assembled and charged with refrigerant (pumped down into condenser) and ready for field knockdown, as determined by the installing contractor. Contractor shall leak test, evacuate and charge with refrigerant after reassembly

B Comply with the manufacturer's instructions for rigging and transporting units. Leave protective covers in place until installation.

1.6 WARRANTY

A The chiller manufacturer's warranty shall cover parts and labor costs for the repair or replacement of defects in material or workmanship for a period of one year from equipment startup or 18 months from shipment, whichever occurs first.
-- OR --

A The chiller manufacturer's warranty shall cover parts and labor costs for the repair or replacement of defects in material or workmanship, and include refrigerant for the

entire unit, for a period of one year from equipment startup or 18 months from shipment, whichever occurs first. OR,

B The chiller manufacturer's warranty shall cover parts and labor costs for the repair or replacement of defects in material or workmanship, and include refrigerant for the entire unit, for a period of one year from equipment startup or 18 months from shipment, whichever occurs first, and also include an additional extended warranty for (one OR two OR three OR four) years on (the entire unit) OR (on entire unit including refrigerant coverage) OR (compressor and drive train only).

1.7 MAINTENANCE

A Maintenance of the chillers in accordance with manufacturer's recommendations as published in the installation and maintenance manuals, shall be the responsibility of the owner.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A Basis of Design - Daikin McQuay Magnitude Model WMC/WME, including the standard product features and all special features required per the plans and specifications.

B Equal Products - Equipment manufactured by [ENTER MANUFACTURER NAME HERE] may be acceptable as an equal. Naming these products as equal does not imply that their standard construction or configuration is acceptable or meets the specifications. Equipment proposed "as equal", must meet the specifications including all architectural, mechanical, electrical, and structural details, all scheduled performance and the job design, plans and specifications.

2.2 UNIT DESCRIPTION

A Provide and install as shown on the plans a factory assembled, charged, and run-tested water-cooled packaged centrifugal chiller. Chillers shall have no more than two oil-free, magnetic bearing, semi-hermetic centrifugal compressors (no exceptions). Each compressor shall have an integrated variable-frequency drive operating in concert with inlet guide vanes for optimized full and part load efficiency. On two-compressor units, the evaporator and condenser refrigerant sides and the expansion valve shall be common and the chiller shall be capable of running on one compressor with the other compressor or any of its auxiliaries inoperable or removed.

Each chiller shall be factory run-tested on an AHRI qualified test stand with water at job conditions (excluding glycol applications). Operating controls shall be adjusted and checked. The refrigerant charge shall be adjusted for optimum operation and recorded on the unit nameplate. Units operating with 50-Hz power shall be tested with a 50-Hz power supply. Any deviation in performance or operation shall be remedied prior to shipment and the init retested if necessary to confirm repairs or adjustments.

2.3 DESIGN REQUIREMENTS

A General: Provide a complete water-cooled, semi-hermetic oil-free centrifugal compressor water chiller as specified herein. The unit shall be provided according to standards indicated in Section 1.2. In general, unit shall consist of one or two magnetic bearing, completely oil-free centrifugal compressors, refrigerant, condenser and evaporator, and control systems including integrated variable frequency drive, operating controls and equipment protection controls. Chillers shall be charged with refrigerant HFC-134a. If manufacturer offers a chiller using any HCFC refrigerant, manufacturer shall provide, in writing, documentation signed by an officer of the company assuring refrigerant availability and price schedule for a 20-year period.

B The entire chiller system, including all pressure vessels, shall remain above atmospheric pressure during all operating conditions and during shut down to ensure that non-condensables and moisture do not contaminate the refrigerant and chiller system.
If any portion of the chiller system is below atmospheric pressure during either operation or shut down, the manufacturer shall include, at no charge:

1 A 20-year purge maintenance agreement that provides parts, labor, and all preventative maintenance required by the manufacturer's operating and maintenance instructions.

2 A complete purge system capable of removing non-condensables and moisture during operation and shut-down.

3 The manufacturer shall also include at no charge for a period of 20 years an annual oil and refrigerant analysis report to identify chiller contamination due to vacuum leaks. If the analysis identifies water, acid, or other contaminant levels higher than specified by the manufacturer, the oil and/or refrigerant must be replaced or returned to the manufacturer's original specification at no cost to the owner.

4 The manufacturer shall include a factory-installed and wired system that will enable service personnel to readily elevate the vessel pressure during shutdown to facilitate leak testing.

C Performance: Refer to chiller performance rating.

D Acoustics: Sound pressure for the unit shall not exceed the following specified levels. Provide the necessary acoustic treatment to chiller as required. Sound data shall be measured in dB according to AHRI Standard 575 and shall

include overall dBA. Data shall be the highest levels recorded at all load points.

Octave Band								Overall dBA
63	125	250	500	1000	2000	4000	8000	

2.4 CHILLER COMPONENTS

A Compressors:

1 The unit shall utilize magnetic bearing, oil-free, semi-hermetic centrifugal compressors. The compressor drive train shall be capable of coming to a controlled, safe stop in the event of a power failure.

2 The motor shall be of the semi-hermetic type, of sufficient size to efficiently fulfill compressor horsepower requirements. It shall be liquid refrigerant cooled with internal thermal sensing devices in the stator windings. The motor shall be compatible with variable frequency drive operation.

a If the compressor design requires a shaft seal to contain the refrigerant, the manufacturer shall supply a 20 year parts and labor warranty on the shaft seal and a lifetime refrigerant replacement warranty if a seal failure leads to refrigerant loss, or the chiller manufacturer shall assume all costs to supply and install a self contained air conditioning system in the mechanical space sized to handle the maximum heat output the open drive motor. The energy required to operate this air conditioning system shall be added to the chiller power at all rating points for energy evaluation purposes.

3 The chiller shall be equipped with an integrated Variable Frequency Drive (VFD) to automatically regulate compressor speed in response to cooling load and the compressor pressure lift requirement. Movable inlet guide vanes and variable compressor speed, shall provide unloading. The chiller controls shall coordinate compressor speed and guide vane position to optimize chiller efficiency.

4 Each compressor circuit shall be equipped with a line reactor to help protect against incoming power surges and help reduce harmonic distortion.

B Evaporator and Condenser:

1 The evaporator and condenser shall be separate vessels of the shell-and-tube type, designed, constructed, tested and stamped according to the requirements of the ASME Code, Section VIII. The tubes shall be individually replaceable and secured to the intermediate supports without rolling.

2 The evaporator shall be flooded type with [0.025 in.] OR [0.028 in.] OR [0.035 in.] wall, copper tubes rolled into carbon steel tubesheets. The water side shall be designed for a minimum of [150 psi] OR [250 psi] OR [350 psi]. The evaporator shall have [dished heads] OR [marine water boxes with removable covers] and shall be [carbon steel] OR [epoxy-coated steel]]. Water connections shall be [grooved suitable for Victaulic couplings] OR [flanged connections]. The evaporator shall have [right-hand] OR [left-hand] connections when looking at the unit control panel.

3 The condenser shall have [0.025 in.] OR [0.028 in.] OR [0.035 in.] wall copper tubes rolled into carbon steel. Water connections shall be [grooved suitable for Victaulic couplings] OR [flanged]. The water side shall be designed for a minimum of [150 psi] OR [250 psi] OR [350 psi]. The condenser shall have [dished heads with valved drain and vent connections] OR [marine water boxes with removable covers and vent and drain connections]. The condenser shall have [right-hand] OR [left-hand] connections when looking at the unit control panel.

4 Provide sufficient isolation valves and condenser volume to hold the full unit refrigerant charge in the condenser during servicing or provide a separate pumpout system and storage tank sufficient to hold the charge of the largest unit being furnished.

5 An electronic expansion valve shall control refrigerant flow to the evaporator. Fixed orifice devices or float controls with hot gas bypass are not acceptable because of inefficient control at low load conditions. The liquid line shall have moisture indicating sight glass.

6 Re-seating type spring loaded pressure relief valves according to ASHRAE-15 safety code shall be furnished. The evaporator shall be provided with single or multiple valves. The condenser shall be provided with dual relief valves equipped with a transfer valve so one relief valve can be removed for testing or replacement without loss of refrigerant or removal of refrigerant from the condenser. Rupture disks are not acceptable.

7 The evaporator, [return water head] OR [return and connection water heads], suction line, and any other component or part of a component subject to condensing moisture shall be insulated with UL recognized 3/4 inch OR 1 ½ inch closed cell insulation. All joints and seams shall be carefully sealed to form a vapor barrier. The discharge line shall be factory insulated.

8 Provide factory-mounted and wired, thermal-dispersion water flow switches on each vessel to prevent unit operation with no or low water flow.

C Vibrations

1 Provide neoprene waffle-type vibration isolators for each corner of the unit.

D Unit shall be bagged and mounted on skids for shipment.

E Power Connections

- Power connection shall be single point to a factory-mounted disconnect switch OR shall be multipoint to each compressor power panel on two-compressor units.

F Chiller Control

1 The unit shall have a microprocessor-based control system consisting of a 15-inch VGA touch-screen operator interface and a unit controller.

2 The touch-screen shall display the unit operating parameters, accept setpoint changes (multi-level password protected) and be capable of resetting faults and alarms. The following parameters shall be displayed on the home screen and also as trend curves on the trend screen:

- Entering and leaving chilled water temperatures
- Entering and leaving condenser water temperatures
- Evaporator saturated refrigerant pressure
- Condenser saturated refrigerant pressure
- Percent of 100% speed (per compressor)
- % of rated load amps for entire unit

3 In addition to the trended items above, all other important real-time operating parameters shall also be shown on the touch-screen. These items shall be displayed on a chiller graphic showing each component. At a minimum, the following critical areas must be monitored:

- Compressor actual speed, maximum speed, percent speed
- Evaporator water in and out temperatures, refrigerant pressure and temperature
- Condenser water in and out temperatures, refrigerant pressure and temperature
- Liquid line temperature
- Chilled water setpoint
- Compressor and unit state and input and output digital and analog values

4 A fault history shall be displayed using an easy to decipher, color coded set of messages that are date and time stamped. The alarm history shall be downloadable from the unit's USB port. An operating and maintenance manual specific for the unit shall be viewable on the screen.

5 All setpoints shall be viewable and changeable (multi-level password protected) on the touch screen and include setpoint description and range of set values.

6 Automatic corrective action to reduce unnecessary cycling shall be accomplished through preemptive control of low evaporator or high discharge pressure conditions to keep the unit operating through abnormal transient conditions.

7 The chiller shall be capable of cycling and loading up to seven other similar chillers through a local network and also provide automatic control of: evaporator and condenser pumps (primary and standby), up to 3 stages of cooling tower fan cycling control and a tower modulating bypass valve or cooling tower fan variable frequency drive.

8 Optionally, the factory mounted controller(s) shall support operation on a BACnet®, Modbus® or LONWORKS® network via one of the data link / physical layers listed below as specified by the successful Building Automation System (BAS) supplier.

- Modbus
- BACnet MS/TP master (Clause 9)
- BACnet IP, (Annex J)
- BACnet ISO 8802-3, (Ethernet)
- LonTalk® FTT-10A. The unit controller shall be LONMARK ® certified.

9 The information communicated between the BAS and the factory mounted unit controllers shall include the reading and writing of data to allow unit monitoring, control and alarm notification as specified in the unit sequence of operation and the unit points list.

10 For chillers communicating over a LONMARK network, the corresponding LONMARK eXternal Interface File (XIF) shall be provided with the chiller submittal data.

11 All communication from the chiller unit controller as specified in the points list shall be via standard BACnet objects. Proprietary BACnet objects shall not be allowed. BACnet communications shall conform to the BACnet protocol (ANSI/ASHRAE135-2001). A BACnet Protocol Implementation Conformance Statement (PICS) shall be provided along with the unit submittal.

2.5. OPTIONAL ITEMS

A The following optional items shall be furnished:

1 [Open crate] OR [Open crate with bag] OR [totally enclosed export crate] OR [totally enclosed export crate with bag]

2 Pumpout unit, with or without storage vessel

3 Refrigerant monitor

4 IBC Certification: The chiller shall be certified to the following codes and standards; 2009 IBC, 2010 CBC, ICC-ES AC-156, ASCE 7-05. The chiller must be mounted to a rigid base and may use r neoprene pads.

5 OSHPD Certification: The chiller shall be OSHPD Pre-Approved per OSP-0116-10 and be so labeled. The chiller shall meet a minimum seismic design spectral response acceleration of 1.60 SDS. The chiller must be mounted to a rigid base and may use neoprene waffle vibration pads.

6 Certified performance test in accordance with procedures and to the tolerances contained in AHRI Standard 550/590.

-- OR --

6 Witness performance test in accordance with procedures and to the tolerances contained in AHRI Standard 550/590.

PART 3 - EXECUTION

3.1 INSTALLATION

A installing contractor to:

1 Install per manufacturer's requirements, shop drawings, and contract documents.

2 Adjust chiller alignment on foundations, or subbases as called for on drawings.

3 Arrange piping to allow for dismantling to permit head removal and tube cleaning.

4 Coordinate electrical installation with electrical contractor.

5 Coordinate controls with control contractor.

6 Provide all material required for a fully operational and functional chiller.

3.2 START-UP

A Factory Start-Up Services: Provide for as long a time as is necessary to ensure proper operation of the unit, but in no case for less than two full working days. During the period of start-up, the start-up technician shall instruct the owner's representative in proper care and operation of the unit.

McQuay Training and Development

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

Warranty

All Daikin McQuay equipment is sold pursuant to its standard terms and conditions of sale, including Limited Product Warranty. Consult your local Daikin McQuay Representative for warranty details. Refer to Form 933-43285Y. To find your local Daikin McQuay Representative, go to www.daikinmcquay.com.

This document contains the most current product information as of this printing. For the most up-to-date product information, please go to www.daikinmcquay.com.

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