



# Liebert® Mini-Mate2™

**2 & 3 Ton (7 & 10.5 kW) Capacity, Air, Water, Glycol,  
Chilled Water; 50 & 60 Hz**

Technical Data Manual

### **Technical Support Site**

If you encounter any installation or operational issues with your product, check the pertinent section of this manual to see if the issue can be resolved by following outlined procedures. Visit <https://www.VertivCo.com/en-us/support/> for additional assistance.

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# 1 INTRODUCTION

## 1.1 Designed to Match Computer and Electronic Equipment Needs—From Installation to Operation

Installed above the ceiling, Liebert Mini-Mate2 Thermal Management systems control the cooling, humidity and air distribution required by sensitive electronic equipment. A range of sizes and configurations is available to meet varying sites' needs.

The Liebert Mini-Mate2 is also easy to use. Advanced microprocessor technology allows easy, precise control, and menu-driven monitoring keeps you informed of system operation through the LCD readout. These features, combined with Vertiv™ quality construction and reliable components, guarantee satisfaction from installation through operation.

### Liebert Thermal Management

Liebert Thermal Management systems are designed to control the environment required for computers and other sensitive electronic equipment. The Liebert Mini-Mate2 provides complete control on a round-the-clock basis and the high sensible heat ratio required by sensitive electronic equipment.

### Easy Installation

The Liebert Mini-Mate2 is a split-system evaporator combined with an air-, water- or glycol-cooled condensing unit or is a self-contained, chilled water unit. Each split system has thermostat-type wiring to controls and condensing unit. System components are pre-charged with refrigerant and can be connected together with optional pre-charged line sets or optional sweat adapters for field refrigerant piping.

### Easy to Service

Low-maintenance components are easily accessed through removable front panels. Spare parts are always in Vertiv™ inventory and available on short notice.

### Advanced Control Technology

A menu-driven microprocessor control system provides precise temperature and humidity control and accurate alarm setpoints. Using touch-sensitive buttons, the wall-mounted monitor/control panel allows you to select and display temperature and other monitored parameters.

### High Efficiency

High sensible heat ratio, scroll compressor and precise microprocessor control allow the system to operate efficiently.

### Space Saving Design

All indoor components are installed above the ceiling, so no floor space is required.

### Reliable

The Liebert Mini-Mate2 family installed base is a testimony to the system reliability. Components include a rugged scroll compressor, high-efficiency copper tube, aluminum-fin evaporator coil and a double inlet, direct drive fan.

### Agency Listed

Standard 60Hz units are CSA certified to the harmonized U.S. and Canadian product safety standard, CSA C22.2 No 236/UL 1995 for “Heating and Cooling Equipment” and are marked with the CSA c-us logo.

### Location

When considering installation locations, consider that these units contain water and that water leaks can cause damage to sensitive equipment below. Do not mount these units above sensitive equipment. A field-supplied pan with drain must be supplied beneath cooling units and water/glycol condensers.

Do not mount units in areas where normal unit operating sound might disturb the working environment.



## 2 STANDARD FEATURES—2 & 3 TON SYSTEMS

### 2.1 Evaporator Section - Split Systems

The evaporator section is designed for ceiling installation. The cabinet and chassis are constructed of heavy gauge galvanized steel. The unit can be serviced using only one side increasing its versatility in mounting locations. Mounting brackets are factory-attached to the cabinet. Internal cabinet insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 and ASTM 1338 standards.

The evaporator section includes the evaporator coil, R-407C unit charge, filter-drier, factory-mounted disconnect switch, two-speed direct-drive blower assembly and microprocessor control with wall-mounted control box. The unit is provided with supply and return air openings for field-supplied ducting or supply/return plenum. Evaporators can be configured with canister humidifier and/or reheat. An indoor or outdoor condensing unit must be selected for each evaporator.

### 2.2 Condensing Unit Section—Split Systems

#### 2.2.1 Indoor Centrifugal Fan Condensing Units

Indoor Air-Cooled Centrifugal Fan Condensing Units include scroll compressor, factory-mounted disconnect switch, condenser coil, R-407C unit charge, belt-driven centrifugal blower assembly, high-pressure switch, Liebert Lee-Temp™ head pressure control system, hot gas bypass and liquid-line solenoid valve. Unit must be mounted indoors. Condensing unit is designed to use outdoor air with temperatures ranging from -30°F to 95°F (-34°C to 35°C).

#### 2.2.2 Outdoor Prop Fan Condensing Units

Outdoor Prop Fan Condensing Units include scroll compressor, condenser coil, R-407C unit charge, prop fan, liquid-line solenoid valve, high pressure switch, Liebert Lee-Temp head pressure control and hot gas bypass. Condensing unit is designed for outdoor locations with operating ambients ranging from -30°F to 95°F (-34°C to 35°C).

#### 2.2.3 Indoor Water/Glycol Condensing Units

Indoor Water/Glycol Condensing Units includes scroll compressor, R-407C unit charge, factory-mounted disconnect, coaxial condenser, hot gas bypass, high head pressure switch and two-way water regulating valve designed for 150psi (1034.3kPa). Condensing units can be used on either a water or glycol cooling loop.

### 2.3 Chilled Water Units

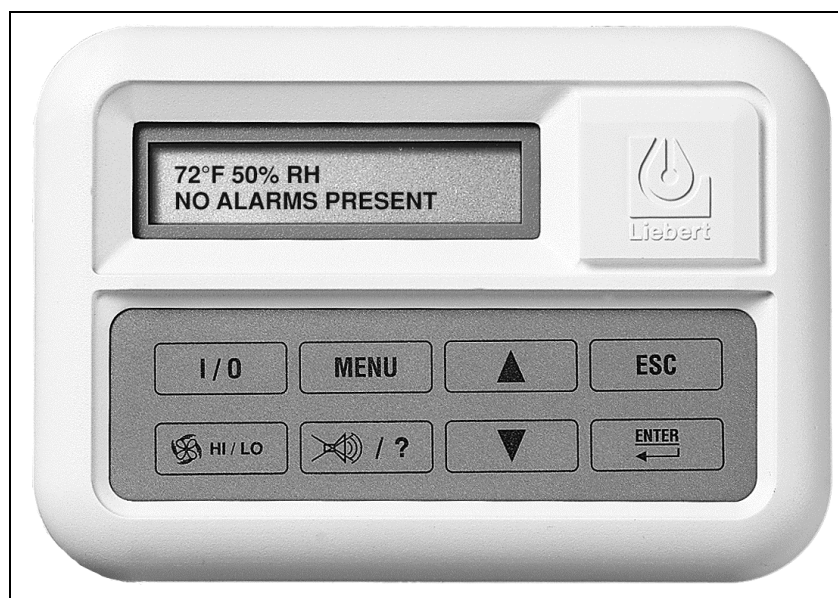
Chilled Water Units are designed for ceiling installation. The cabinet and chassis are constructed of heavy gauge galvanized steel. The unit can be serviced using only one side increasing its versatility in mounting locations. Mounting brackets are factory-attached to the cabinet. Internal cabinet insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 and ASTM 1338 standards. Chilled water models are self-contained and include a chilled water coil, two-speed, direct-drive centrifugal blower, factory-mounted disconnect switch and two-way, slow-close motorized valve. Design pressure is 300psi (2068kPa), 60psi (414kPa) close-off differential.

## 2.4 System Controls

System controls include a microprocessor control board mounted in the evaporator/chilled water unit and a wall-mounted interface with a two-line, 16-character liquid crystal display. An eight-key, membrane keypad for setpoint/program control, unit On/Off, fan speed and alarm silence is below the LCD screen. It provides temperature setpoint and sensitivity adjustment, humidity setpoint and sensitivity adjustment, digital display of temperature, humidity, setpoints, sensitivities, fan speed and alarm conditions.

The wall-box is field-wired to the microprocessor control using standard four-conductor thermostat wire (field-supplied). The temperature and humidity sensors are in the wall box, which can be installed up to 300 feet (91.4m) from the evaporator unit. The unit-mounted control board also includes common alarm terminals and shutdown terminals. The unit automatically restarts after a power outage.

**Figure 2.1 Wall-box**



### 2.4.1 Other Standard Control Features

- Adjustable auto restart
- 5 day/2 day setback
- Password protection
- Alarm enable/disable
- Self-diagnostics
- Calibrate sensors
- Predictive humidity control
- Common alarm output
- Remote shutdown terminals



## 3 OPTIONAL FACTORY-INSTALLED FEATURES— EVAPORATOR/CHILLED WATER UNITS

### 3.1 Reheat

Electric Reheat includes 304/304 stainless steel finned tubular reheat elements, with high limit safety switch.

SCR Electric Reheat uses an SCR controller and unit control software to provide full cooling with modulating of the electric reheat elements to control air temperatures. Reheat capacity is up-sized to offset the cooling capacity. (The SCR Electric Reheat is not available on chilled water, free-cooling or 575V units.)

Hot Water Reheat includes hot water coil, 2-way solenoid valve and Y-strainer.

**NOTE: This option is available only on Chilled Water units, but not with other reheat options.**

### 3.2 Humidifier

The **Canister Humidifier** includes a steam-generating type humidifier with automatic flushing circuit, inlet strainer, drain, 1" (25.4mm) air gap on fill line and solenoid valves. Humidifier problem alarm annunciates at the wall-mounted display panel.

**Remote Humidifier Contact** allows the unit's humidity controller to control a humidifier outside the unit. Power to operate the remote humidifier does not come from the Liebert Mini-Mate2. Available on units with or without internal humidifier.

### 3.3 Sensors

**Smoke Sensor** checks return air, shuts down the unit upon sensing smoke and activates visual and audible alarms at the wall-box display. This smoke sensor is not intended to function as or replace any smoke sensor system that may be required by local or national codes.

**High-Temperature Sensor** senses the return air temperature and shuts down unit if the temperature reaches 125°F (52°C). This device is not meant to replace any fire detection system that may be required by local or national codes.

### 3.4 Switches and Motors

**Filter Clog** senses pressure drop across the filters and activates visual and audible alarms at the wall-box display. The wall-box display annunciates the alarm and flashes a notification upon reaching a customer setpoint.

A **Factory-Installed Non-Fused Disconnect Switch** allows unit to be turned off for maintenance. A disconnect switch is standard for the evaporators, chilled water units and indoor condensing units, but these units may be specified without the switch.

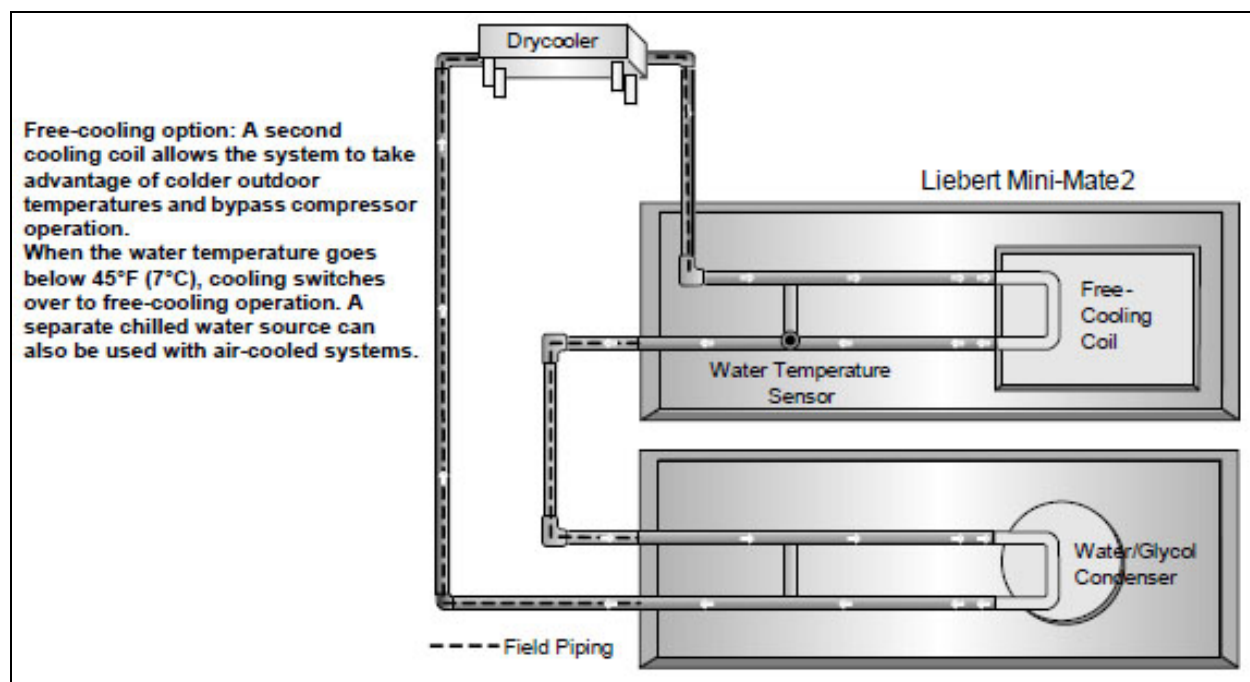
**Direct-Drive blower** can be factory-eliminated from the evaporator/chilled water cabinet for high static applications (0.9 to 1.5in. [23 to 38mm] w.g.). See [Ship-Loose Accessories—Field-Installed](#) on page 13 for the optional, externally mounted high static blower assembly.

### 3.5 Free-Cooling

Free-cooling option includes separate cooling coil, three-way slow-close valve and separate supply and return piping. Free-cooling is activated when the water temperature reaches a field-adjustable temperature, typically 45°F (7°C). The valve is rated for 300psi (2068kPa) working pressure.

Air-cooled condensing units can be matched with evaporators using free-cooling coils with chilled water sources to serve as backup cooling. When matched with a water/glycol condensing unit, a three-way water regulating valve is recommended for the condensing unit to simplify piping to the main supply pipes. The coil is designed for closed-loop applications using properly treated and circulated fluid. Not available with SCR reheat options.

**Figure 3.1 Free-cooling arrangement**



**NOTE:** If free-cooling is applied to an open water tower, an optional cupro-nickel (CuNi) coil is required to prevent premature corrosion, or a heat exchanger must separate the tower water from the free-cooling loop. The cupro-nickel coil requires an extended lead time.

### 3.6 Optional Configurations—Prop Fan Condensing Units

Outdoor Prop Fan Condensing Units are also available in the following optional configurations:

- High ambient models for providing catalog capacities at ambient temperatures up to 105°F (40°C).
- Quiet-Line models for low noise level conditions (below 58 dBA) and for providing catalog capacities at ambient temperatures up to 95°F (35°C).
- Condenser coils can be phenolic-coated for extended coil life in coastal areas.

### **3.7 Optional Configurations—Water/Glycol Condensing Units**

Indoor Water/Glycol Condensing Units are also available with the following piping options:

- Two-way water reg. valve with 350 psi (2413kPa) design pressure.
- Three-way water reg. valve with 150psi (1034kPa) design pressure.
- Three-way water reg. valve with 350psi (2413kPa) design pressure.

### **3.8 Optional Configurations—Chilled Water Units**

Chilled Water Units are also available with the following valve option:

- Three-way, slow-close, motorized chilled water valve rated for 300 psi (2068 kPa) working pressure. Valve is non-spring return.

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## 4 SHIP-LOOSE ACCESSORIES—FIELD-INSTALLED

A **High Static Blower Assembly** can be field-attached to the evaporator to provide up to 2.0" (51mm) of external static pressure on the discharge side of the evaporator. The blower box contains a centrifugal-type double-inlet blower. This blower is equipped with a belt drive and 1.5 hp single speed motor mounted to an adjustable motor base. **Note:** Unit must be ordered without the internal direct drive motor and the high static blower disables the two-speed fan operation feature.

**Filter box kit (for ducted applications)** includes filter box with duct flange connection, one MERV 8 (ASHRAE 52.2-2007) filter (20"x20"x4" [508mm x 508mm x 102mm]), and a duct flange for use on the supply air opening of the unit.

**Air Distribution Plenum** includes molded plastic three-way discharge plenum, 16"x25"x4" (406mm x 535mm x 102mm) MERV 8 filter (ASHRAE 52.2-2007), and sheet metal block-off plates for covering the duct openings on the evaporator unit. Plenum mounting requires T-bar ceiling grid.

The **Condensate Pump** is field-mounted external to the cabinet, wired to the unit power block and is equipped with a check valve. A secondary float can be field-wired to shut down the unit upon high condensate level.

A **Remote Temperature and Humidity Sensor** package includes sensors in an attractive case with 30 ft. (9 m) of cable. Can be wall or duct mounted. Remote sensors should be used when the wall box is not located in the space to be conditioned.

**NOTE: Installing the remote sensors disables the sensors included in the wall box.**

**Field-Installed Kits** available for filter clog, smoke sensor, high-temperature sensor, electric reheat and humidifier. The kits include installation instructions and are designed to be added to the evaporator unit before it is installed in the ceiling. Electric reheat kits cannot be installed in units with free-cooling.

**277-to-208V step-down transformer (37.5 amps)** allows use of 277-1-60 supply power with a 208-1-60 Prop Fan Condensing unit. The transformer is coated with epoxy and contained in an enclosed, non-ventilated electrical box with adaptable mounting brackets.

**Single-Point Power Kit** contains the necessary electrical components to interconnect the high-voltage sections of a close-coupled evaporator and an MCD condensing unit.

**Pre-Charged Refrigerant Line Set (R-407C)** contains an insulated copper suction line and a copper liquid line for interconnection of the indoor and outdoor sections. Available in 15-foot (4.5m) and 30-foot (9m) sections.

The **Refrigerant-Line Sweat Adapter Kit** contains two suction and two liquid line fittings that allow field-supplied refrigerant piping between the evaporator and condensing unit.

### 4.1 Remote Monitoring, Autochangeover, and Leak Detection Equipment

The Liebert RCM4™ is a four-point, normally open, dry contact monitoring panel. One Form-C, dry contact common alarm relay output (rated at 24 VAC, 3 Amp) is provided. Four red LEDs illuminate on the respective alarm and the alarm buzzer is silenced by a front panel switch. The RCM4 requires a 24VAC or 24VDC power source. Power supply is not included.

The **Liebert AC4™ Autochangeover Controller** provides autochangeover and autosequence control for up to four Liebert Mini-Mate2 units within a room. The Liebert AC4 will enable redundant units in an alarm condition, balance usage and test standby units at programmed intervals. Two common alarm relay outputs are available. A built-in LCD and RS-232 port for direct PC/terminal connection provides two options for configuration and monitoring of the product. The Liebert AC4 requires 24VAC input power.

The **Liebert® AC8™** is ideal for coordinated control of systems with redundant units. The Liebert AC8 enables redundant devices during an alarm condition, balances usage of devices and tests standby devices at programmable intervals. Supports four zones and can use the 4-20mA temperature sensor (TW420) for temperature staging in each zone. Two programmable output control relays are available for auxiliary control such as humidity lockout. Emergency power operation input provided for device control during an emergency. Two common alarm relay outputs are available. A built-in LCD and RS-232 port for direct PC/terminal connection provides two options for configuration and monitoring of the product.

The **Liebert ENV-DO™** interface card provides 16 discrete outputs, corresponding to status and major alarm conditions of Environmental units. The Liebert ENV-DO-ENCL1 packages one Environmental DO interface card in its own steel enclosure and the ENV-DO-ENCL2 packages two Environmental DO interface cards in one enclosure for installation external to the Liebert Mini-Mate2™. The self-contained kit includes an external 120VAC-to-24VAC power transformer. Wiring harnesses are not provided. Power and communication wiring is field-provided.

The **Liebert Liqui-tect® 410 Point Leak Detection Sensor** detects the presence of conductive liquid using a pair of corrosion-resistant, gold-plated probes mounted in a painted, height-adjustable enclosure. Dual Form-C, dry contact common alarm relays (rated at 24VAC, 3A) signal a leak detected as well as loss of power and cable fault. The Liebert Liqui-tect 410 requires an external 24VAC or 24VDC power source.

**Liebert LT460 Zone Leak Detection Kits** include one LT460 sensor, a specified length of LT500-xxY cable (maximum length is 100 ft [30.5m]) and a corresponding number of hold-down clips. The Liebert LT460 requires an external 24VAC, 0.12A power source, such as EXT-XFMR or XFMR24.

**Liebert SiteScan®** is a monitoring solution that gives you decision-making power to effectively manage the equipment critical to your business.

Liebert SiteScan enables communication from Liebert environmental and power units, as well as many other pieces of analog or digital equipment, to a front-end software package that provides real-time status and alarms so you can react quickly to changing situations.

Liebert SiteScan is designed with flexibility for both small systems and large, complex systems such as those in computer rooms, telecommunications facilities or industrial process control rooms. Contact your local Vertiv™ representative for assistance with a Liebert SiteScan system.

The **NIC-ENCL1 and NIC-ENCL2** package one or two Liebert IntelliSlot® Web/485 Cards with Adapters, respectively, in one steel enclosure for installation external to the Liebert Mini-Mate2. The Liebert IntelliSlot Web/485 Card with Adapter provides communication with Liebert Mini-Mate2 via SNMP, HTTP, RTU Modbus 485 and BACnet IP. The self-contained kit includes an external 120VAC-to-24VAC transformer as a power source. Wiring harnesses are not provided. Power and communication wiring is field-provided.

## 5 FLEXIBLE CONFIGURATIONS

Figure 5.1 Air-cooled condensing units—split systems

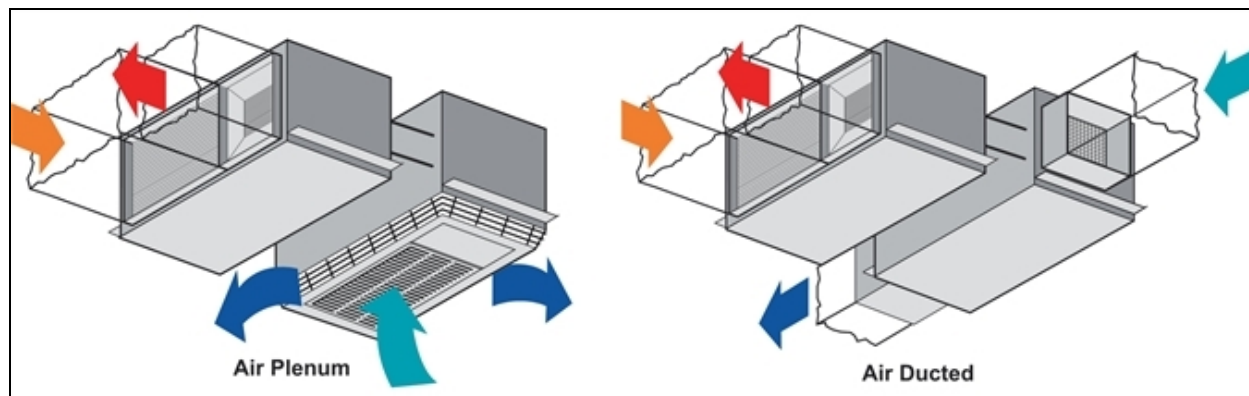


Figure 5.2 Water/glycol condensing units—split systems

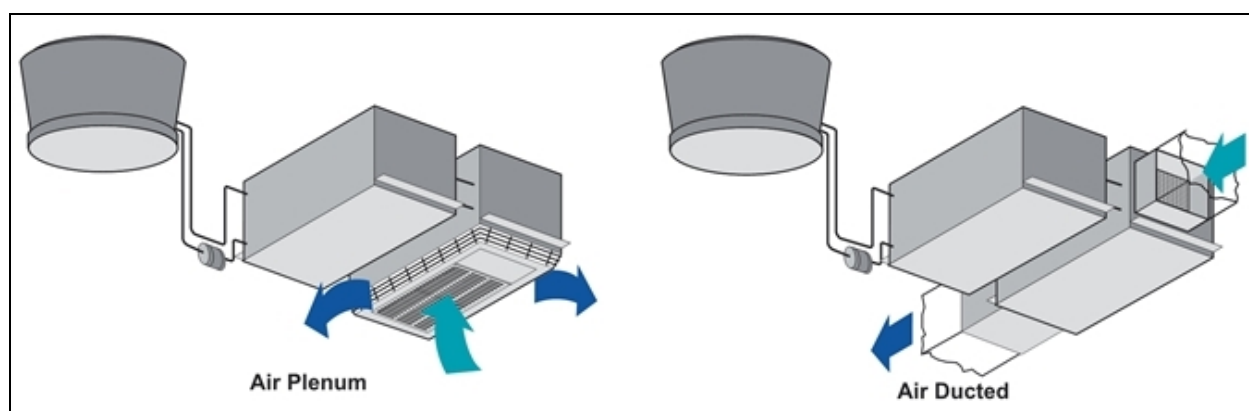
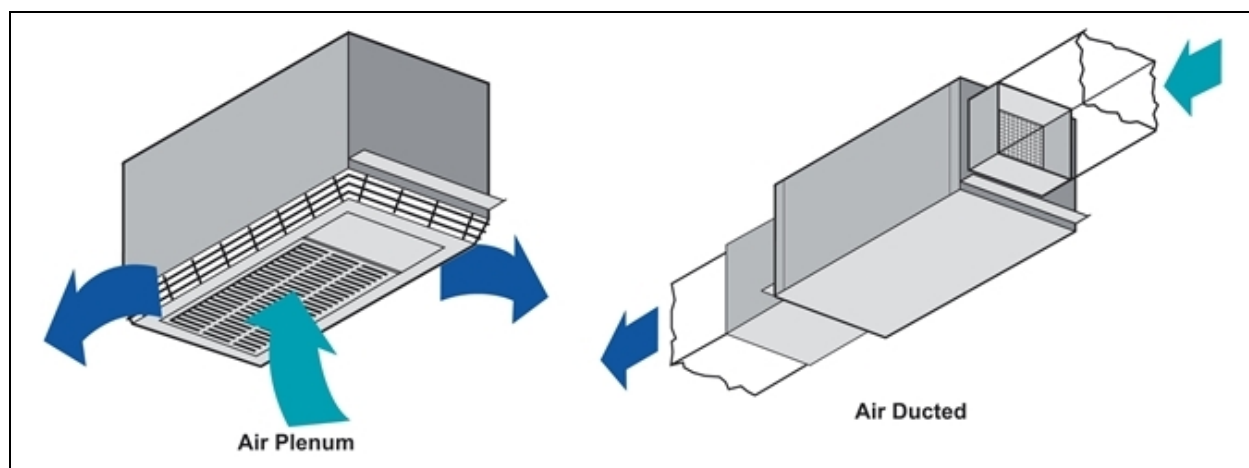


Figure 5.3 Chilled water units



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## 6 AIR-COOLED SYSTEMS—CAPACITIES AND DIMENSIONS

Table 6.1 Air-cooled data, 60Hz

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K		
	PFH - Outdoor	MCD - Indoor	PFH - Outdoor	MCD - Indoor	
DX Evaporator- Net Capacity Data - kW (Btuh) @ High Speed CFM					
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	6.70 (22,900)	6.50 (22,200)	9.90 (33,800)	9.35 (31,900)
	Sensible	6.50 (22,200)	6.35 (21,700)	9.40 (32,100)	9.10 (31,000)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	6.40 (21,800)	6.15 (20,900)	9.55 (32,500)	8.95 (30,600)
	Sensible	5.70 (19,500)	5.60 (19,100)	8.30 (28,400)	8.05 (27,500)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	6.20 (21,200)	5.95 (20,300)	9.30 (31,800)	8.75 (29,900)
	Sensible	5.20 (17,800)	5.10 (17,400)	7.70 (26,200)	7.40 (25,300)
Fan Data - Evaporator					
CFM (CMH) - High Speed	885 (1504)		1250 (2124)		
CFM (CMH) - Low Speed	800 (1359)		1000 (1699)		
Fan Motor, HP (W)	0.5 (0.38)		0.5 (0.38)		
External Static Pressure, in (mm) water gauge	0.3 (8)		0.3 (8)		
Evaporator Coil - Copper Tube/Aluminum Fin					
Face Area, ft <sup>2</sup> (m <sup>2</sup> )	3.1 (0.29)		3.1 (0.29)		
Coil Rows	3		3		
Max Face Velocity, fpm(m/s)	277 (1.4)		394 (2.0)		
Unit Refrigerant Charge, oz. (kg)	7 (0.20)		7 (0.20)		
Unit Operating Weight	225 (102)		225 (102)		
Electric Reheat Capacity (Includes Fan Motor), kW (Btuh)	Standard	SCR	Standard	SCR	
Input Voltage 208-1-60	4.7 (16040)	5.6 (19100)	4.7 (16040)	7.9 (27000)	
Input Voltage 230-1-60	5.8 (19800)	6.8 (23200)	5.8 (19800)	9.5 (32400)	
Input Voltage 277-1-60	6.3 (21500)	7.3 (24900)	6.3 (21500)	10.3 (35200)	
Input Voltage 208-3-60	N/A		5.6 (19100)	7.9 (27000)	
Input Voltage 230-3-60			6.8 (23200)	9.5 (32400)	
Input Voltage 460-3-60			7.3 (24900)	10.3 (35200)	
Humidifier Data - Steam Generator Type					
Steam capacity, lb/hr (kg/hr)	4.3 (2.0)		4.3 (2.0)		
Electrical Input Power, kW	1.5		1.5		
Evaporator Connection Sizes					
Liquid line Diameter - Aeroquip Coupling Size	3/8" - #6 Female		3/8" - #6 Female		
Suction Line Diameter - Aeroquip Coupling Size	7/8" - #11 Female		7/8" - #11 Female		
Humidifier Supply	1/4" OD Copper Compression Fitting				
Evaporator/Condensate Drain	3/4" NPT-Female				
MERV 8 Filter, External Filter Box, qty (1), Nom. Size, in. (mm)	4x20x20 (102x508x508)				

**Table 6.1 Air-cooled data, 60Hz (continued)**

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K	
Condensing Unit Type	PFH - Outdoor	MCD - Indoor	PFH - Outdoor	MCD - Indoor
MERV 8 Filter, Air Distribution Plenum, qty (1), Nom. Size-in. (mm)	4x16x25 (102x406x635)			
Condensing Unit Model Number	PFH027A-_L7	MCD24AL_H7	PFH037A-_L7	MCD36AL_H7
Condensing Unit Rating Conditions	95°F (35°C) Ambient			
Coil Face Area ft <sup>2</sup> (m <sup>2</sup> )	4.1 (0.38)	4.6 (0.43)	7.7 (0.72)	4.6 (0.43)
Rows of Coil	2	2	2	3
CFM (CMH)	2200 (3738)	1000 (1698)	3000 (5097)	1430 (2429)
Motor Hp (W)	0.20 (149)	0.33 (246)	0.20 (149)	0.5 (373)
External Static Pressure, in wg. (mm)	N/A	0.50 (13)	N/A	0.50 (13)
Unit Refrigerant Charge, oz. (kg)	134 (3.8)	134 (3.8)	213 (6.0)	213 (6.0)
Unit Operating Weight, lb. (kg)	200 (91)	230 (104)	241 (109)	240 (109)
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT				
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	7.10 (24,200)		9.50 (32,400)
	Sensible	6.60 (22,600)		9.05 (30,800)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	6.15 (20,900)		8.20 (28,000)
	Sensible	5.55 (18,900)		7.60 (25,900)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	5.55 (18,900)		7.45 (25,400)
	Sensible	4.85 (16,600)		6.70 (22,900)
Flow Rate, GPM (l/m)	4.5 (17.1)		5.9 (22.4)	
Pressure Drop, ft. water (kPa)	5.6 (16.7)		9.1 (27.2)	
Free-Cooling Coil - Copper Tube/Aluminum Fin				
Face Area, ft <sup>2</sup> (m <sup>2</sup> )	3.1 (0.28)		3.1 (0.28)	
Coil Rows	3		3	
Max Face Velocity, fpm (m/s)	294 (1.5)		294 (1.5)	
Internal Fluid Volume, gal (l)	2.0 (7.6)		2.0 (7.6)	
Water supply/return connections, in (mm) OD	7/8 (22.2)		7/8 (22.2)	
The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.				

**Table 6.2 Air-cooled data, 50Hz**

Evaporator Model	MMD35E or MMD35K		
Condensing Unit Type	PFH - Outdoor	MCD - Indoor	
DX Evaporator- Net Capacity Data - kW (Btuh) @ High Speed CFM			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	9.95 (34,000)	9.50 (32,400)
	Sensible	9.40 (32,100)	9.15 (31,300)

**Table 6.2 Air-cooled data, 50Hz (continued)**

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	9.60 (32,700)	9.10 (31,100)
	Sensible	8.35 (28,500)	8.15 (27,800)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	9.35 (31,900)	8.90 (30,400)
	Sensible	7.70 (26,200)	7.45 (25,500)
Fan Data - Evaporator			
CFM (CMH) - High Speed		1250 (2124)	
CFM (CMH) - Low Speed		1000 (1699)	
Fan Motor HP (W)		0.5 (0.38)	
External Static Pressure, in (mm) water gauge		0.3 (8)	
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.29)	
Coil Rows		3	
Max Face Velocity, fmp (m/s)		394 (2.0)	
Unit Refrigerant Charge, oz. (kg)		7 (0.20)	
Unit Operating Weight, lb (kg)		225 (102)	
Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage 220-1-50		5.3 (18090)	
Input Voltage 380-3-50		7.3 (24900)	
SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage 220-1-50		8.7 (29700)	
Input Voltage 380-3-50		10.3 (35100)	
Humidifier Data - Steam Generator Type			
Steam capacity lb/hr (kg/hr)		4.3 (2.0)	
Electrical Input Power, kW		1.5	
Evaporator Connection Sizes			
Liquid line Diameter - Aeroquip Coupling Size		3/8" - #6 Female	
Suction Line Diameter - Aeroquip Coupling Size		7/8" - #11 Female	
Humidifier Supply		1/4" OD Copper Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter, External Filter Box, qty (1), Nom. Size, in. (mm)		4x20x20 (102x508x508)	
MERV 8 Filter, Air Distribution Plenum, qty (1), Nom. Size, in. (mm)		4x16x25 (102x406x635)	
Condensing Unit Model Number		PFH036A-_L7	MCD35AL_H7
Condensing Unit Rating Conditions		95°F (35°C) Ambient	
Coil Face Area, ft <sup>2</sup> (m <sup>2</sup> )		7.7 (0.72)	4.6 (0.43)
Rows of Coil		2	3
CMF (CMH)		2500 (4248)	1430 (2429)
Motor, Hp (W)		0.20 (149)	0.5 (373)

**Table 6.2 Air-cooled data, 50Hz (continued)**

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
External Static Pressure, in. wg. (mm)		N/A	0.50 (13)
Unit Refrigerant Charge, oz. (kg)		213 (6.0)	213 (6.0)
Unit Operating Weight, lb. (kg)		241 (109)	240 (109)
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	9.50 (32,400)	
	Sensible	9.05 (30,800)	
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	8.20 (28,000)	
	Sensible	7.60 (25,900)	
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	7.45 (25,400)	
	Sensible	6.70 (22,900)	
Flow Rate - GPM (l/m)		5.9 (22.4)	
Pressure Drop - ft. water (kPa)		9.1 (27.2)	
Free-Cooling Coil - Copper Tube/Aluminum Fin			
Face Area ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.28)	
Coil Rows		3	
Max Face Velocity-fpm (m/s)		394 (2.0)	
Internal Fluid Volume - gal (l)		2.0 (7.6)	
Water supply and return connections, in (mm) OD		7/8 (22.2)	
The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.			

Figure 6.1 General arrangement, air-cooled split systems

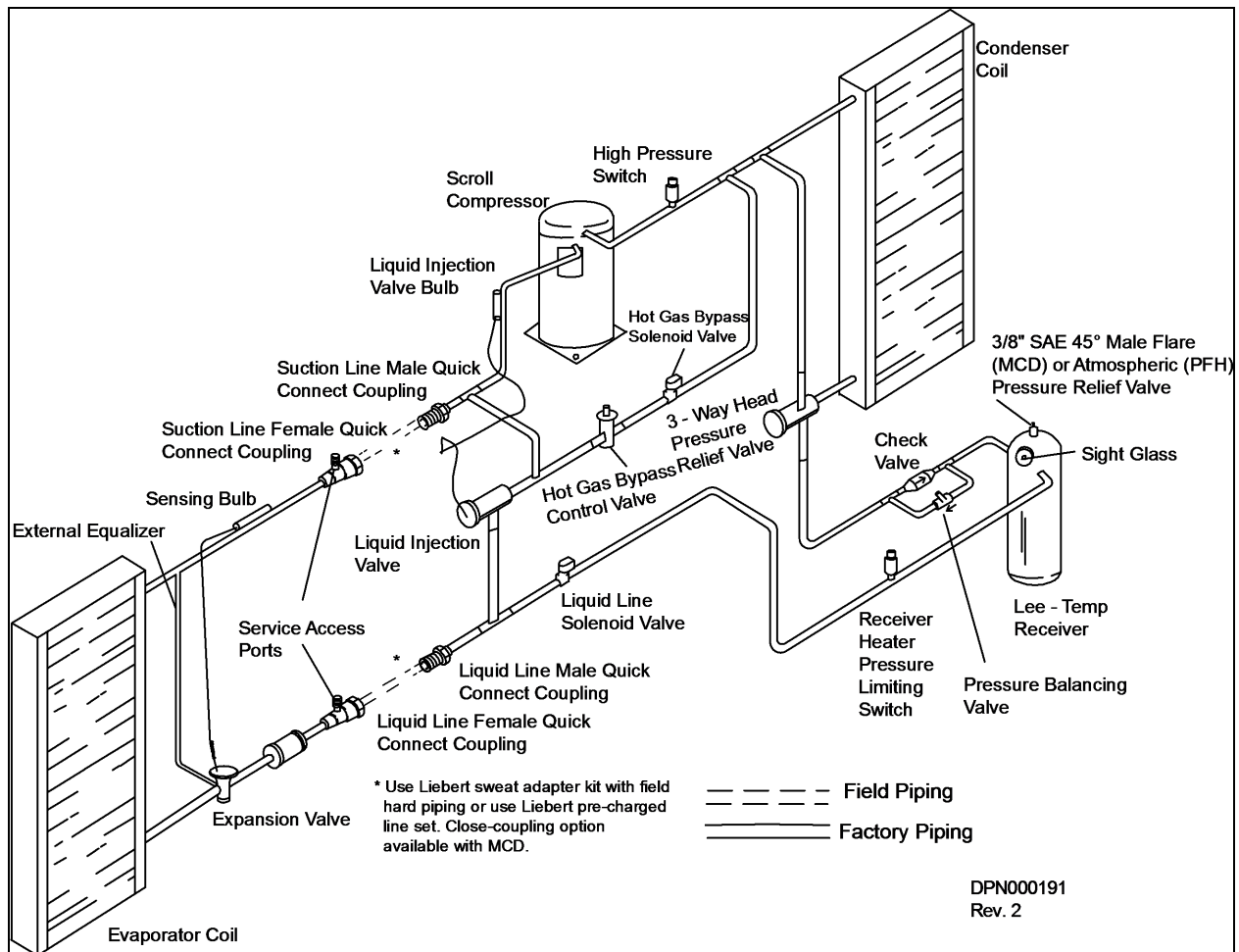


Figure 6.2 Free-cooling arrangement, air-cooled units

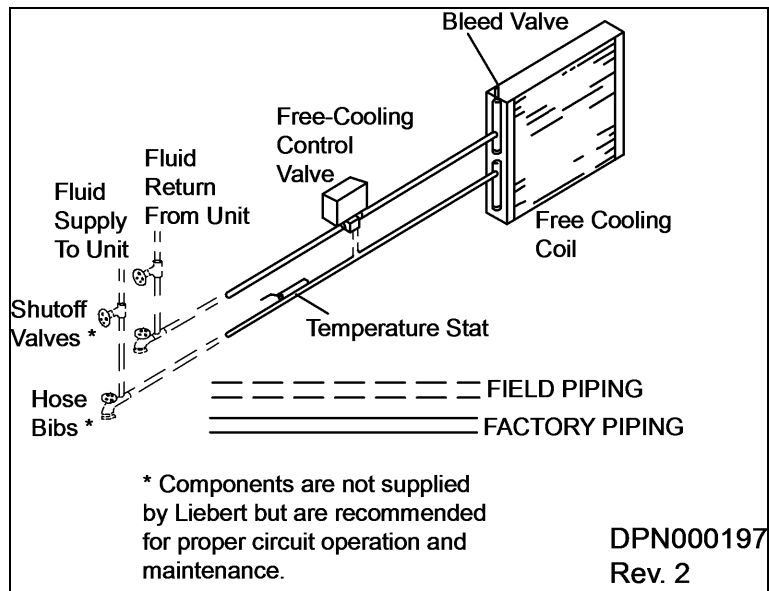
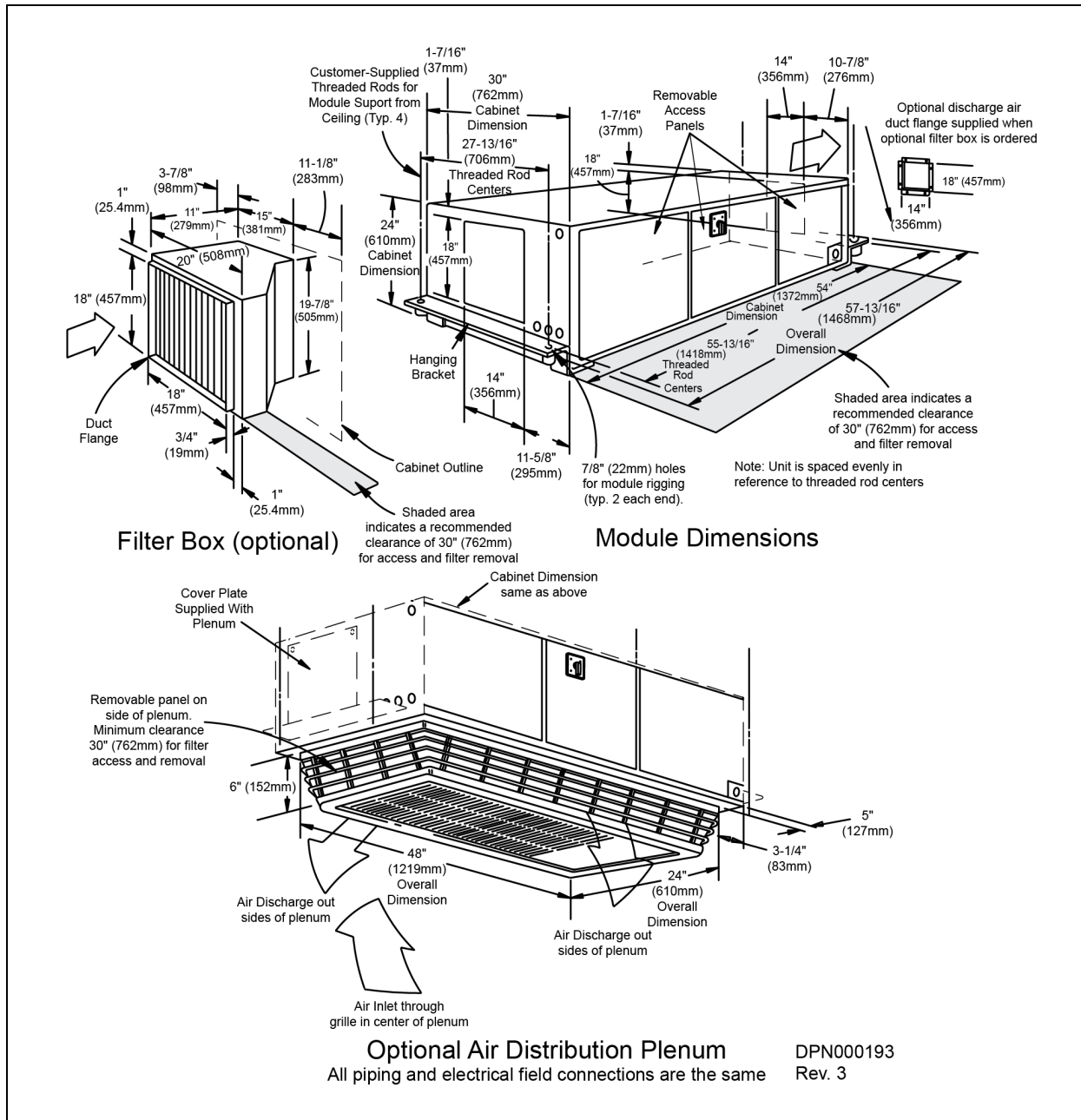


Figure 6.3 Dimensions, evaporator units with direct drive blower



**Table 6.3 Net weights—split system evaporator units**

Model #		Weight, lb (kg)
60Hz	50Hz	
MM*24E	—	225 (102)
MM*24K	—	245 (111)
MM*36E	MM*35E	225 (102)
MM*36K	MM*35K	245 (111)



Figure 6.4 Dimensions, evaporator units with optional belt drive blower assembly

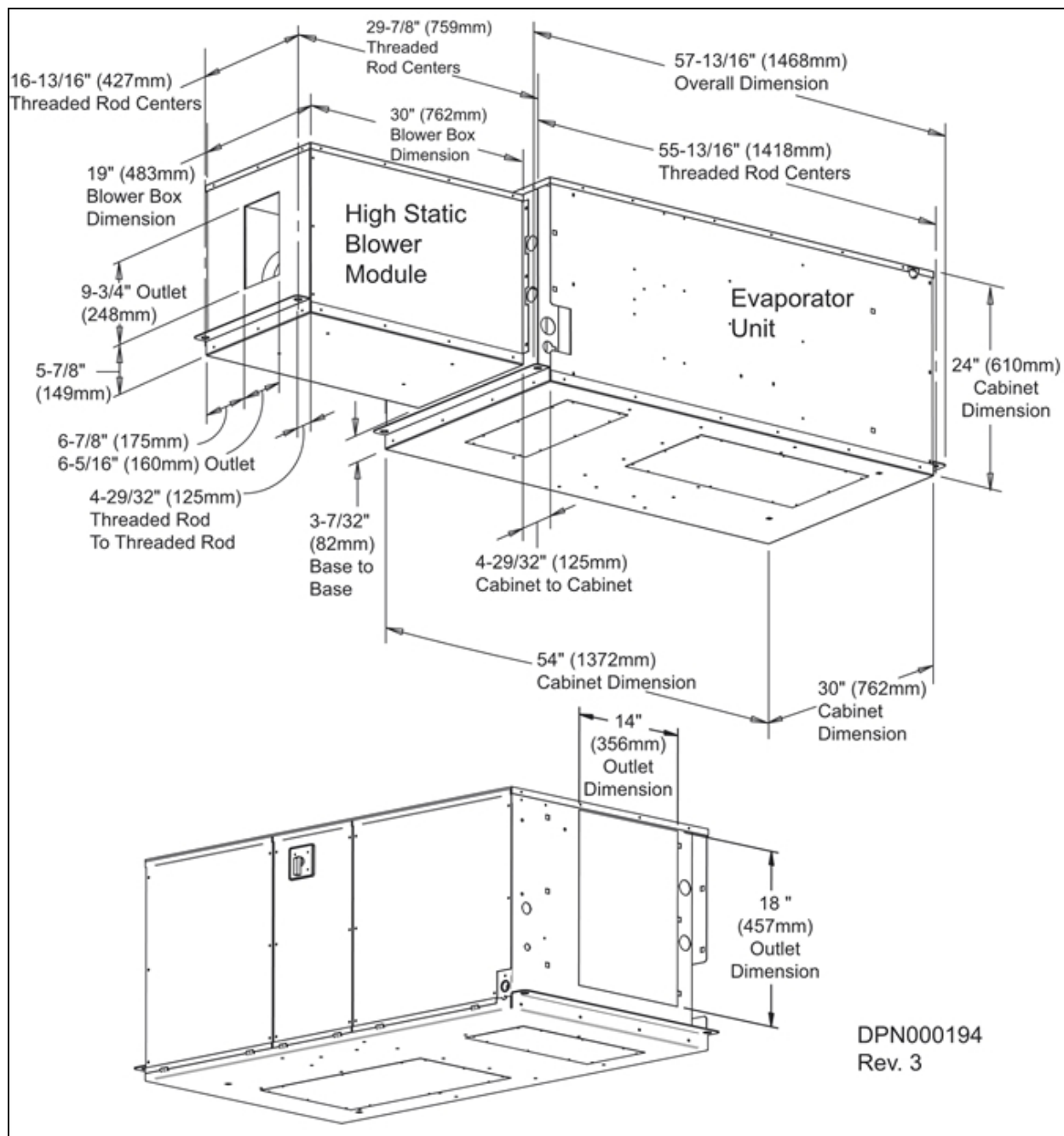


Table 6.4 Net weight, high static blower module

Unit	Net Weight lb (kg)
High Static Blower Module	85 (39)

Figure 6.5 Dimensions, indoor air-cooled condensing unit

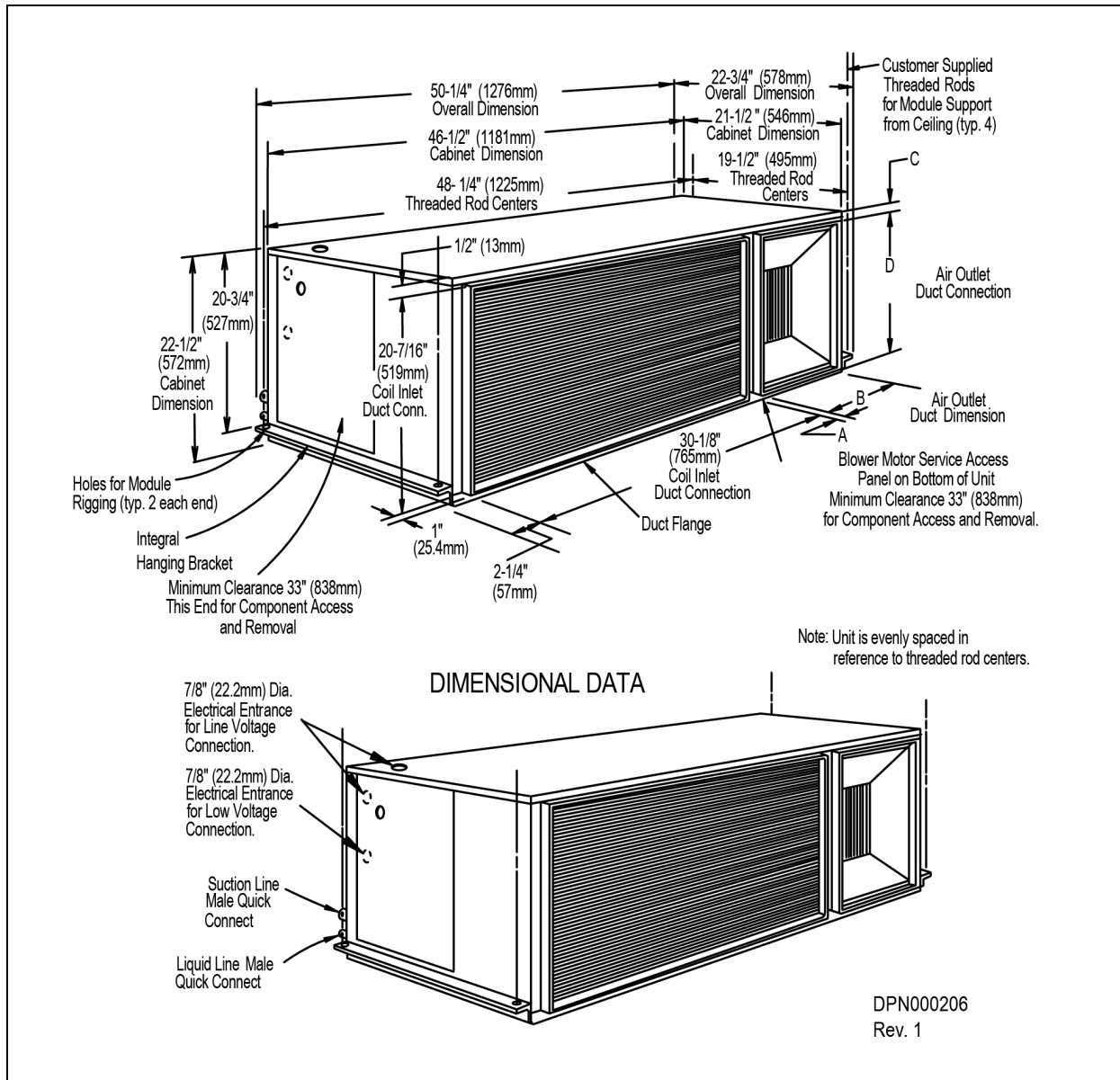


Table 6.5 Dimensions and net weights, indoor air-cooled condensing units

Model #	Dimensions, in (mm)				Net Weight lb (kg)
	A	B	C	D	
MC*24A	1- 7/16 (37)	11-7/16 (290)	1/2 (13)	20-7/16 (519)	230 (104)
MC*23A					
MC*36A					240 (109)
MC*35A					

Figure 6.6 Cabinet and floor planning dimensional data, outdoor condensing unit

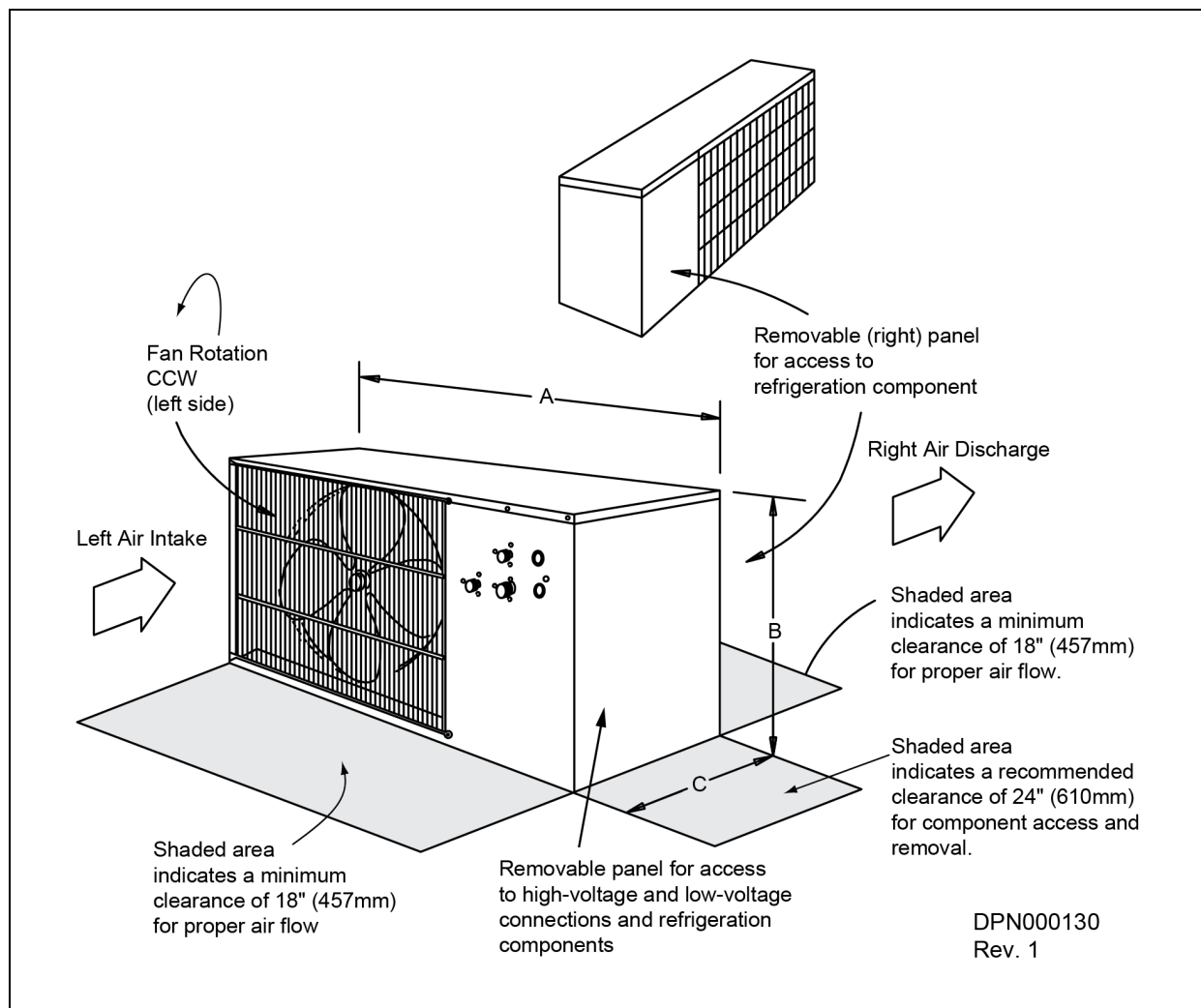


Table 6.6 Dimensions and net weights—air-cooled outdoor condensing units

Model Numbers		Dimensional Data, inches (mm)			Module Net Weight lb (kg)
60Hz	50Hz	A	B	C	
PFH027A-L	—	40 (1016)	23-1/2 (597)	18 (457)	200 (91)
PFH027A-H	—	48 (1219)	31 (787)	18 (457)	241 (109)
PFHZ27A-L	—				
PFH037A-L	PFH036A-L	53 (1343)	36-1/4 (918)	18 (457)	351 (159)
PFH037A-H	PFH036A-H				
PFHZ37A-L	PFHZ36A-L				

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## 7 WATER/GLYCOL SYSTEMS—CAPACITIES AND DIMENSIONS

Table 7.1 Water/glycol data, 60Hz

Evaporator Model		MMD24E or MMD24K		MMD36E or MMD36K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled	Water-Cooled	Glycol-Cooled
DX Evaporator - Net Capacity Data - kW (Btuh) @ High Speed CFM					
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	7.60 (26,000)	6.25 (21,300)	11.0 (37,600)	9.05 (30,900)
	Sensible	6.95 (23,700)	6.20 (21,200)	9.95 (33,900)	8.95 (30,500)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	7.30 (24,900)	5.90 (20,200)	10.6 (36,300)	8.70 (29,600)
	Sensible	6.15 (20,900)	5.50 (18,800)	8.85 (30,200)	7.95 (27,100)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	7.10 (24,300)	5.75 (19,700)	10.4 (35,500)	8.45 (28,900)
	Sensible	5.65 (19,300)	5.00 (17,100)	8.20 (27,900)	7.30 (24,900)
Fan Data - Evaporator					
CFM (CMH), High Speed		885 (1504)		1250 (2124)	
CFM (CMH), Low Speed		800 (1359)		1000 (1699)	
Fan Motor, hp (W)		0.5 (0.38)		0.5 (0.38)	
External Static Pressure, in (mm) water gauge		0.3 (8)		0.3 (8)	
Evaporator Coil - Copper Tube/Aluminum Fin					
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.29)		3.1 (0.29)	
Coil Rows		3		3	
Max Face Velocity, fpm (m/s)		277 (1.4)		394 (2.0)	
Unit Refrigerant Charge, oz. (kg)		7 (0.20)		7 (0.20)	
Unit Operating Weight, lb (kg)		225 (102)		225 (102)	
Electric Reheat Capacity (Includes Fan Motor), kW (Btuh)		Standard	SCR	Standard	SCR
Input Voltage 208-1-60		4.7 (16040)	5.6 (19100)	4.7 (16040)	7.9 (27000)
Input Voltage 230-1-60		5.8 (19800)	6.8 (23200)	5.8 (19800)	9.5 (32400)
Input Voltage 277-1-60		6.3 (21500)	7.3 (24900)	6.3 (21500)	10.3 (35200)
Input Voltage 208-3-60		N/A	N/A	5.6 (19100)	7.9 (27000)
Input Voltage 230-3-60				6.8 (23200)	9.5 (32400)
Input Voltage 460-3-60				7.3 (24900)	10.3 (35200)
Humidifier Data - Steam Generator Type					
Steam capacity - lbs/hr (kg/hr)		4.3 (2.0)		4.3 (2.0)	
Electrical Input Power, kW		1.5		1.5	
Evaporator Connection Sizes					
Liquid line Diameter - Aeroquip Coupling Size		3/8" - #6 Female		3/8" - #6 Female	
Suction Line Diameter - Aeroquip Coupling Size		7/8" - #11 Female		7/8" - #11 Female	
Humidifier Supply		1/4" OD Copper Compression Fitting		1/4" OD Copper Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female		3/4" NPT-Female	
MERV 8 Filter, External Filter Box, qty (1), Nom. Size, in. (mm)		4x20x20 (102x508x508)		4x20x20 (102x508x508)	

**Table 7.1 Water/glycol data, 60Hz (continued)**

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K	
Condensing Unit Fluid	Water-Cooled	Glycol-Cooled	Water-Cooled	Glycol-Cooled
MERV 8 Filter, Air Distribution Plenum, qty (1), Nom. Size, in. (mm)	4x16x25 (102x406x635)		4x16x25 (102x406x635)	
Condensing Unit Model Number	MCD26W		MCD38W	
Condenser Fluid Requirements	85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG	85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG
THR - kW (Btuh) @ 75F/45%RH	9.55 (32,500)	9.05 (30,800)	13.7 (46,700)	13.0 (44,400)
Flow Rate, GPM (l/m)	8.1 (30.7)	8.5 (32.2)	6.6 (25.0)	10.9 (41.3)
Pressure Drop, ft. of H2O (kPa)	17.8 (53.2)	23.9 (71.5)	12.3 (36.8)	36.1 (107.9)
Water-Cooled Condensing Temperature	105°F (40.6°C)	N/A	105°F (40.6°C)	N/A
Connection Sizes, in. (mm) OD	7/8 (22.2)		7/8 (22.2)	
Unit Volume, Gal (l)	1.2 (4.5)		1.2 (4.5)	
Unit Refrigerant Charge, oz. (kg)	41 (1.16)		54 (1.54)	
Unit Operating Weight, lb. (kg)	175 (79)		220 (100)	
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT				
Entering Fluid Conditions	45°F (29.4°C) EWT	45°F EGT - 40% PG	45°F (29.4°C) EWT	45°F EGT - 40% PG
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	7.10 (24,200)	5.85 (19,900)	9.50 (32,400)
	Sensible	6.60 (22,600)	5.85 (19,900)	9.05 (30,800)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	6.15 (20,900)	4.90 (16,800)	8.20 (28,000)
	Sensible	5.55 (18,900)	4.90 (16,800)	7.60 (25,900)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	5.55 (18,900)	4.45 (15,100)	7.45 (25,400)
	Sensible	4.85 (16,600)	4.35 (14,900)	6.70 (22,900)
Flow Rate - GPM (l/m)	4.5 (17.1)	8.5 (32.2)	5.9 (22.4)	10.9 (41.3)
Pressure Drop, ft. water (kPa)	5.6 (16.7)	23.9 (71.5)	9.1 (27.2)	36.2 (108.2)
Free-Cooling Coil - Copper Tube/Aluminum Fin				
Face Area, ft <sup>2</sup> (m <sup>2</sup> )	3.1 (0.28)		3.1 (0.28)	
Coil Rows	3		3	
Max Face Velocity, fpm (m/s)	294 (1.5)		394 (2.0)	
Internal Fluid Volume, gal (l)	2.0 (7.6)		2.0 (7.6)	
Water supply and return connections, in (mm) OD	7/8 (22.2)		7/8 (22.2)	
The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.				

**Table 7.2 Water/glycol data, 50Hz**

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled
DX Evaporator- Net Capacity Data - kW (Btuh) @ High Speed CFM			
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	11.3 (38,700)	9.20 (31,400)
	Sensible	10.1 (34,400)	9.00 (30,700)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	11.0 (37,400)	8.80 (30,100)
	Sensible	9.00 (30,700)	8.00 (27,300)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	10.7 (36,600)	8.60 (29,400)
	Sensible	8.30 (28,400)	7.35 (25,100)
Fan Data - Evaporator			
CFM (CMH), High Speed		1250 (2124)	
CFM (CMH), Low Speed		1000 (1699)	
Fan Motor HP (W)		0.5 (0.38)	
External Static Pressure, in (mm) water gauge		0.3 (8)	
Evaporator Coil - Copper Tube/Aluminum Fin			
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.29)	
Coil Rows		3	
Max Face Velocity, fpm (m/s)		394 (2.0)	
Unit Refrigerant Charge, oz. (kg)		7 (0.20)	
Unit Operating Weight, lb (kg)		225 (102)	
Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage 220-1-50		5.3 (18090)	
Input Voltage 380-3-50		7.3 (24900)	
SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)			
Input Voltage 220-1-50		8.7 (29700)	
Input Voltage 380-3-50		10.3 (35100)	
Humidifier Data - Steam Generator Type			
Steam capacity - lbs/hr (kg/hr)		4.3 (2.0)	
Electrical Input Power, kW		1.5	
Evaporator Connection Sizes			
Liquid line Diameter - Aeroquip Coupling Size		3/8" - #6 Female	
Suction Line Diameter - Aeroquip Coupling Size		7/8" - #11 Female	
Humidifier Supply		1/4" OD Copper Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	
MERV 8 Filter, External Filter Box, qty (1), Nom. Size, in. (mm)		4x20x20 (102x508x508)	
MERV 8 Filter, Air Distribution Plenum, qty (1), Nom. Size, in. (mm)		4x16x25 (102x406x635)	
Condensing Unit Model Number		MCD37W	
Condenser Fluid Requirements		85°F (29.4°C) EWT	110°F (43.3°C) EGT - 4.0% PG
THR - kW (Btuh) @ 75F/45%RH		14.0 (47,800)	13.2 (44,900)

**Table 7.2 Water/glycol data, 50Hz (continued)**

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Fluid		Water-Cooled	Glycol-Cooled
Flow Rate, GPM (l/m)		6.6 (25.0)	11.9 (45.1)
Pressure Drop, ft. of H <sub>2</sub> O (kPa)		11.9 (35.6)	43.2 (129.2)
Water-Cooled Condensing Temperature		105°F (40.6°C)	N/A
Connection Sizes, in. (mm) OD		7/8 (22.2)	
Unit Volume, Gal (l)		1.2 (4.5)	
Unit Refrigerant Charge, oz. (kg)		54 (1.54)	
Unit Operating Weight, lb. (kg)		220 (100)	
Free-Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F EWT			
Entering Fluid Conditions		45°F (29.4°C) EWT	45°F EGT - 40% PG
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	9.50 (32,400)	8.25 (28,000)
	Sensible	9.05 (30,800)	8.25 (28,000)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	8.20 (28,000)	7.00 (23,800)
	Sensible	7.60 (25,900)	7.00 (23,800)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	7.45 (25,400)	6.30 (21,500)
	Sensible	6.70 (22,900)	6.30 (21,500)
Flow Rate - GPM (l/m)		5.9 (22.4)	11.9 (45.1)
Pressure Drop - ft. water (kPa)		9.1 (27.2)	44.3 (132.5)
Free-Cooling Coil - Copper Tube/Aluminum Fin			
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.28)	
Coil Rows		3	
Max Face Velocity, fpm (m/s)		394 (2.0)	
Internal Fluid Volume, gal (l)		2.0 (7.6)	
Water supply and return connections, in (mm) OD		7/8 (22.2)	
The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ± 5%.			



Figure 7.1 General arrangement, water/glycol split systems

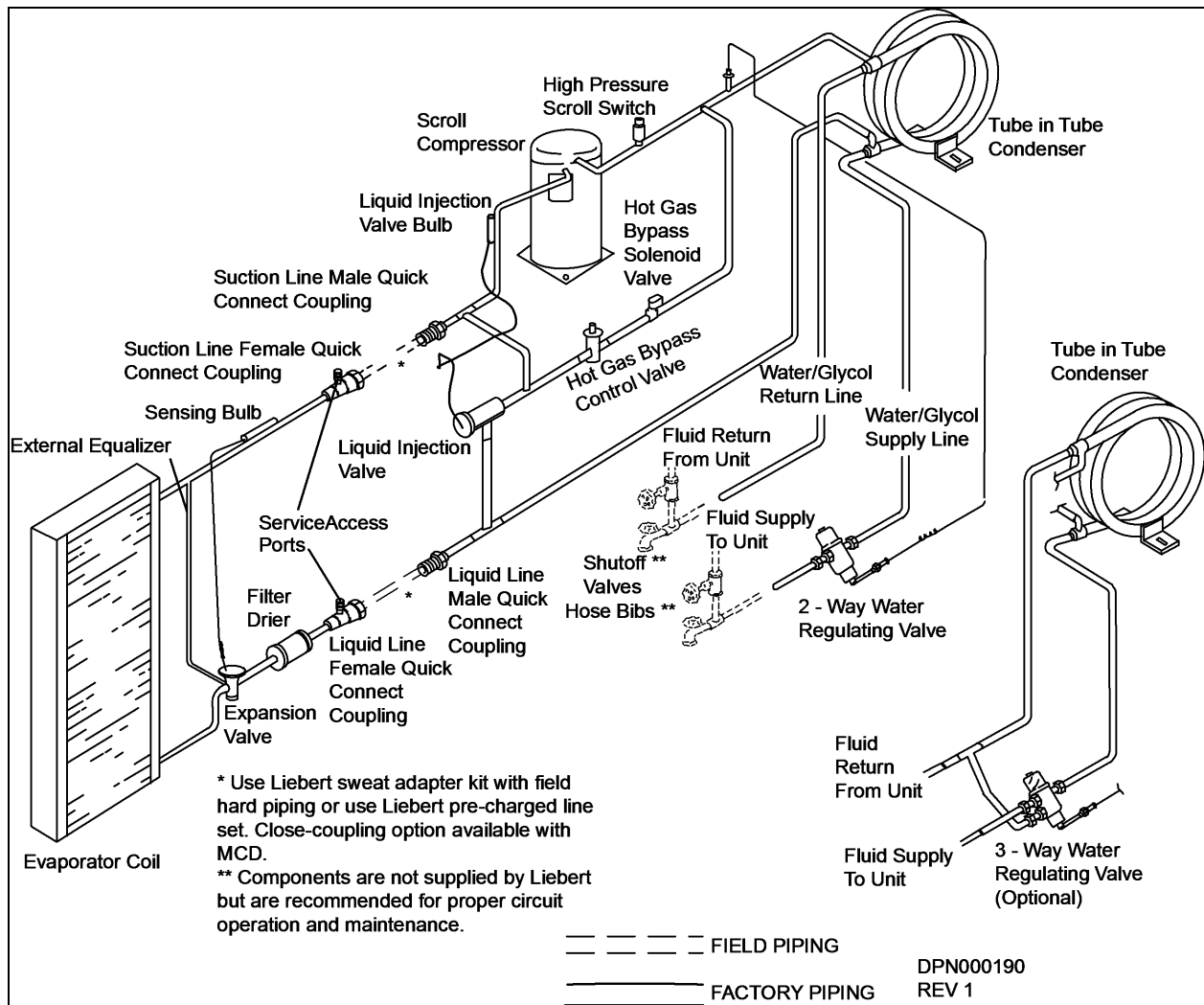


Figure 7.2 General arrangement, free-cooling coil with water/glycol condensing units

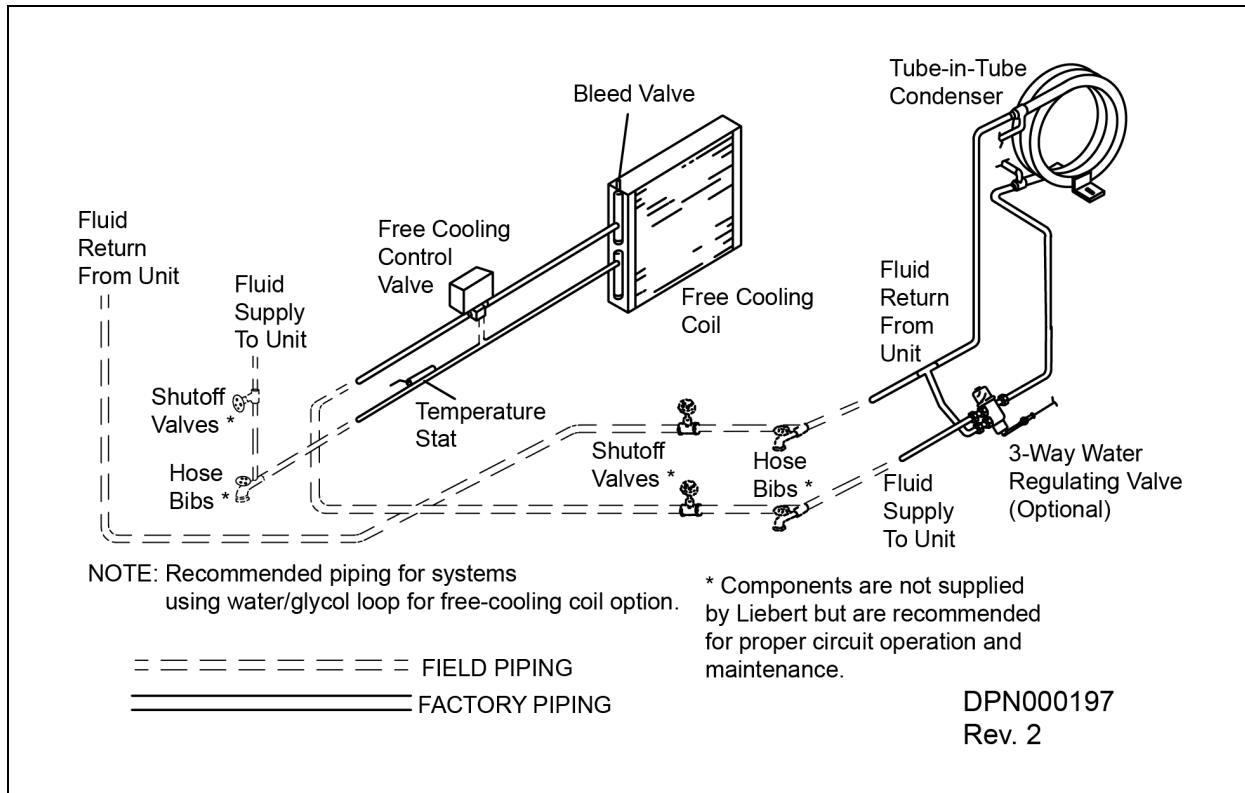
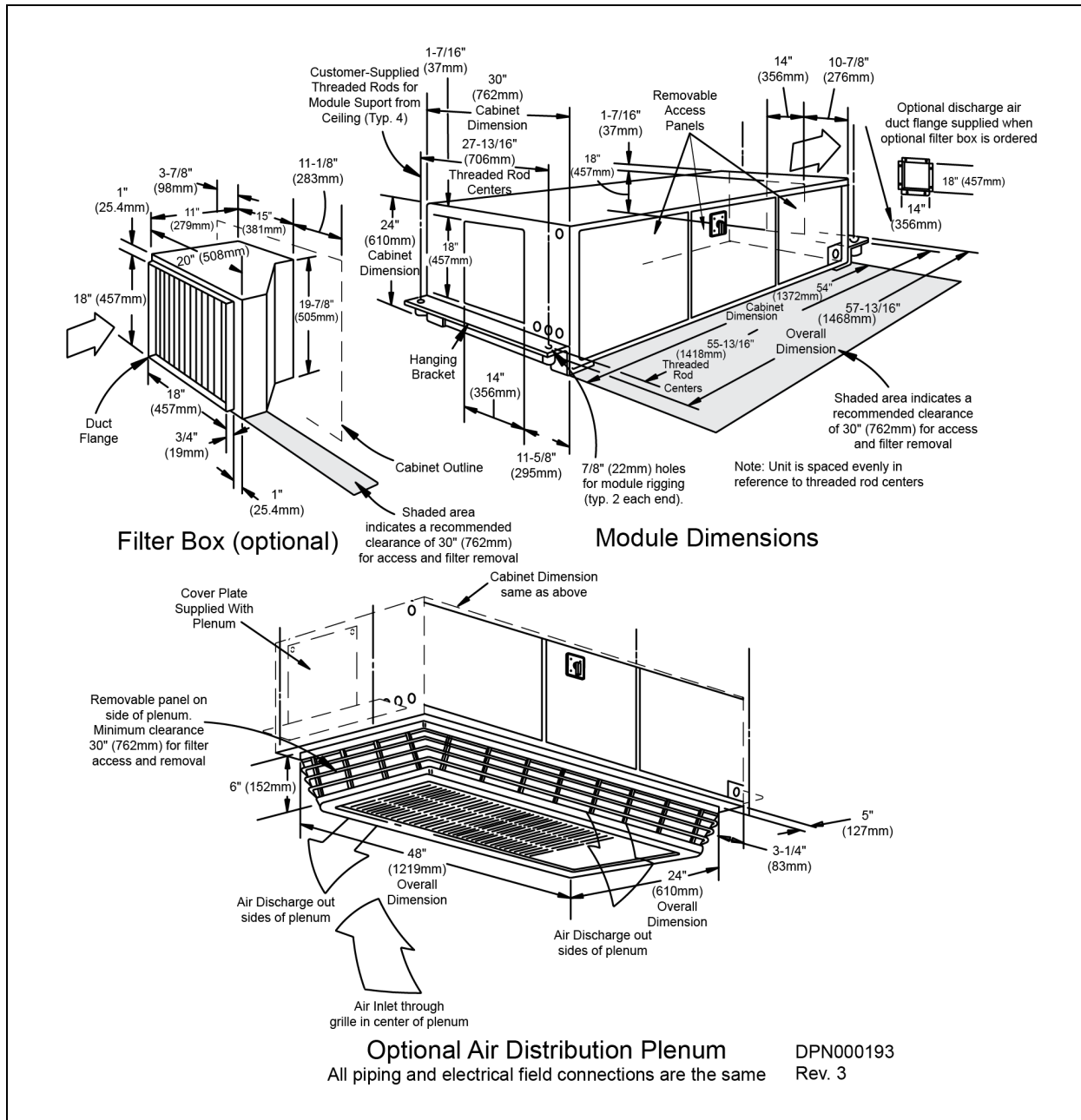


Figure 7.3 Dimensions, evaporator units with direct drive blower



**Table 7.3 Net weights—  
split system evaporator  
units**

Model #		Weight lb (kg)
60Hz	50Hz	
MM*24E	—	225 (102)
MM*24K	—	245 (111)
MM*36E	MM*35E	225 (102)
MM*36K	MM*35K	245 (111)

Figure 7.4 Dimensions, evaporator units with optional belt drive blower assembly

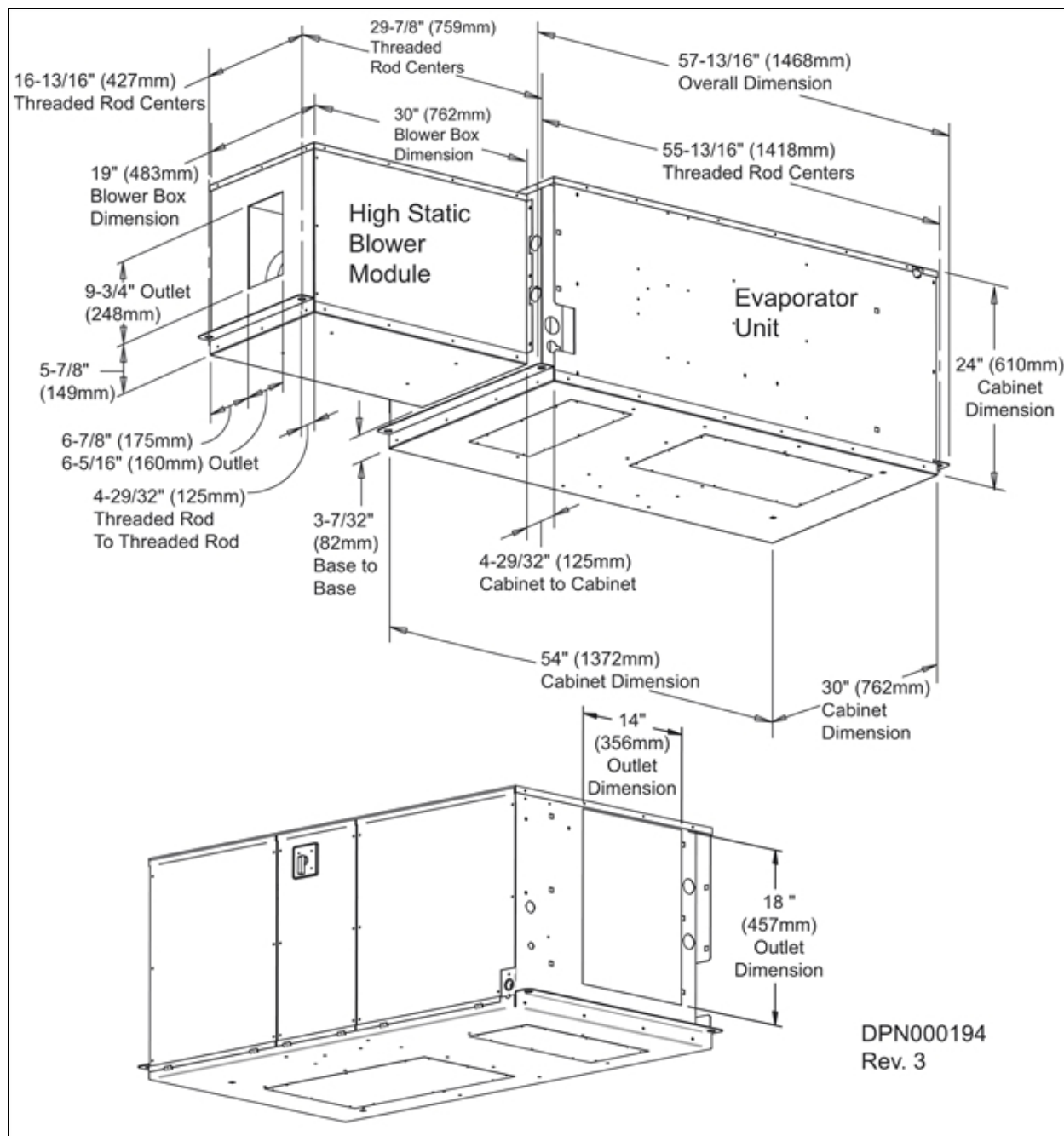


Table 7.4 Net weight, high static blower module

Unit	Net Weight lb (kg)
High Static Blower Module	85 (39)

Figure 7.5 Cabinet dimensions and piping data, water/glycol indoor condensing module

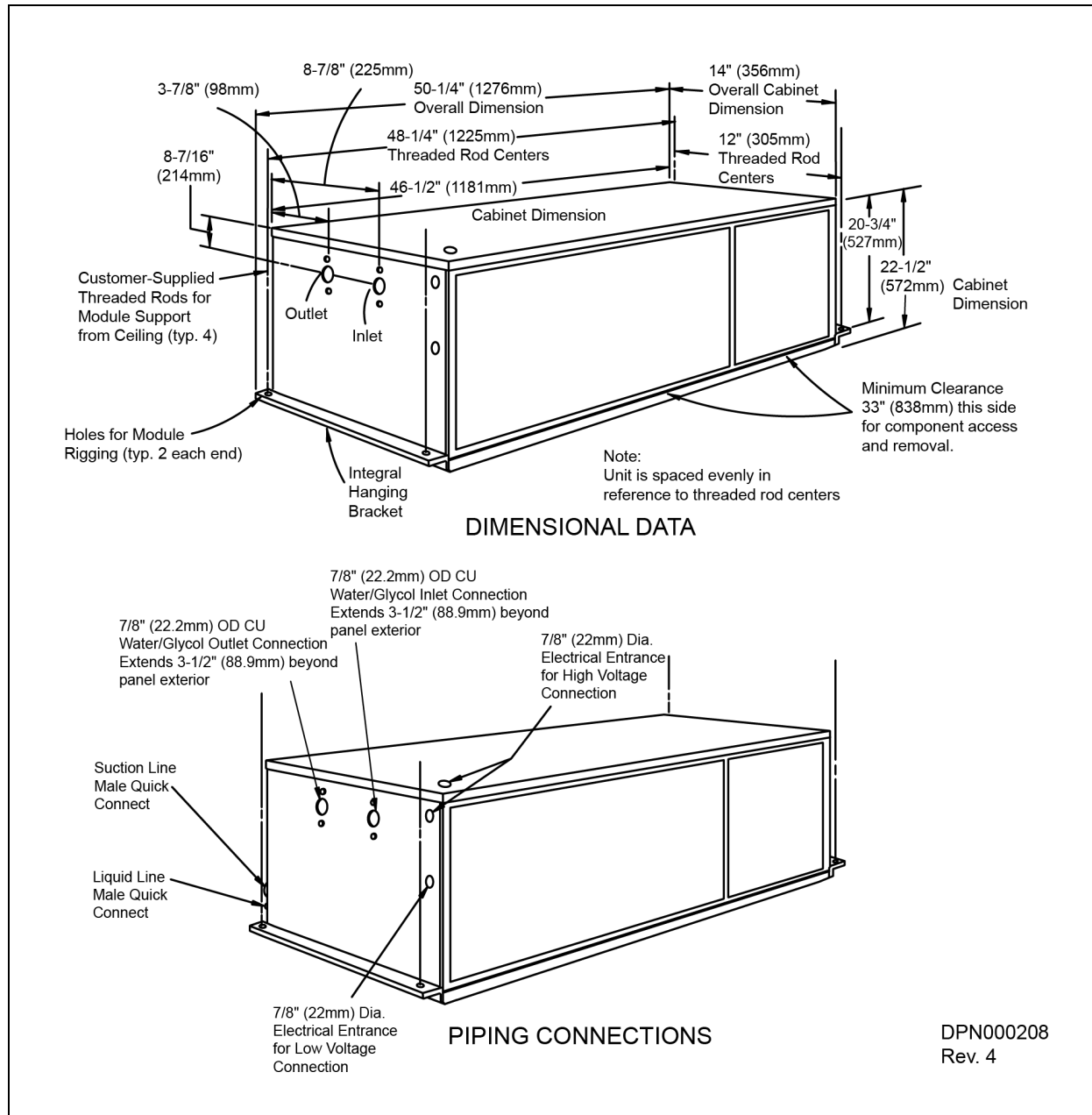


Table 7.5 Net weight, indoor water/glycol-cooled condensing unit

Model #		Weight lb (kg)
60Hz	50Hz	
MC*26W	—	175 (79)
MC*38W	MC*37W	220 (100)

## 8 CHILLED WATER SYSTEMS—CAPACITIES AND DIMENSIONS

Table 8.1 Chilled water data, 60 and 50Hz

CW Model, 50 & 60Hz		MMD40C/MMD39C
Net Capacity Data - kW (Btuh) based on 45°F (7.2°C) EWT & 10°F (5.6°C) temperature rise		
80°F DB, 62.8°F WB (26.7°C DB, 17.1°C WB) 38%RH	Total	10.1 (34,600)
	Sensible	9.40 (32,100)
Flow Rate, GPM (l/m)		7.2 (27.3)
Pressure Drop, ft. water (kPa)		13.1 (39.2)
75°F DB, 61°F WB (23.9°C DB, 16.1°C WB) 45%RH	Total	8.25 (28,200)
	Sensible	7.60 (26,000)
Flow Rate, GPM (l/m)		5.9 (22.4)
Pressure Drop - ft. water (kPa)		9.3 (27.8)
72°F DB, 60°F WB (22.2°C DB, 15.5°C WB) 50%RH	Total	7.10 (24,200)
	Sensible	6.50 (22,200)
Flow Rate, GPM (l/m)		5.2 (19.7)
Pressure Drop, ft. water (kPa)		7.2 (21.5)
Fan Data - Evaporator		
CFM (CMH)		1250 (2124)
CFM (CMH), Low Speed		1000 (1699)
Fan Motor, hp (kW)		0.5 (0.38)
External Static Pressure, in (mm) water gauge		0.3 (8)
CW Coil - Copper Tube/Aluminum Fin		
Face Area ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.29)
Coil Rows		3
Max Face Velocity, fpm (m/s)		391 (2.0)
Electric Reheat Capacity (Includes Fan Motor)- kW (Btuh)		
Input Voltage 208-1-60		4.7 (16040)
Input Voltage 230-1-60		5.8 (19800)
Input Voltage 277-1-60		6.3 (21500)
Input Voltage 208-3-60		5.6 (19100)
Input Voltage 230-3-60		6.8 (23200)
Input Voltage 460-3-60		7.3 (24900)
Input Voltage-220-1-50		5.3 (18090)
Input Voltage-380-3-50		7.3 (24900)
Hot Water Reheat Coil - Copper Tube/Aluminum Fin		
Capacity (with fan motor heat) using 180°F (82°C) EWT, kW (Btuh)		16.1 (54,900)
Flow Rate - GPM (l/m)		4.0 (15.2)
Pressure Drop, ft. water (kPa)		8.5 (25.4)

**Table 8.1 Chilled water data, 60 and 50Hz (continued)**

CW Model, 50 & 60Hz	MMD40C/MMD39C
Face Area ft <sup>2</sup> (m <sup>2</sup> )	3.1 (0.29)
Coil Rows	1
HWRH supply and return connections, in (mm) OD	5/8 (15.9)
Humidifier Data - Steam Generator Type	
Steam capacity - lbs/hr (kg/hr)	4.3 (2.0)
Electrical Input Power, kW	1.5
Unit Connection Sizes	
CW supply and return connections, in (mm) OD	7/8 (22.2)
Humidifier Supply	1/4" OD Copper Compression Fitting
Evaporator/Condensate Drain	3/4" NPT-Female
Unit Internal Fluid Volume, gal (l)	2.0 (7.6)
MERV 8 Filter, External Filter Box, qty (1), Nom. Size, in. (mm)	4x20x20 (102x508x508)
MERV 8 Filter, Air Distribution Plenum, qty (1), Nom. Size, in. (mm)	4x16x25 (102x406x635)
Unit Operating Weight	230 (104)
Unit Valve Types	On/Off Slow Close: 2- & 3-Way
Valve Size	1"
Valve Cv	7.0
Max. Static Operating Pressure, psi (kPa)	300 (2068)
Close-Off Pressure, psi (kPa)	60 (414)
The net capacity data has fan motor heat factored in for all ratings and the entering air conditions of 75°F (23.9°C), 45%RH, is the standard rating condition for ASHRAE 127-2007. All capacities are nominal values; actual performance will be ±5%.	

**Table 8.2 Capacity Correction Factors  
(based on 10°F (5.6°C) water rise)**

EWT	72°F (22.2°C) /50%		75°F (23.9°C) /45%RH	
	TCC	SCC	TCC	SCC
42°F (5.6°C)	1.25	1.13	1.23	1.12
43°F (6.1°C)	1.15	1.09	1.14	1.08
44°F (6.7°C)	1.07	1.04	1.07	1.04
45°F (7.2°C)	1.00	1.00	1.00	1.00
46°F (7.8°C)	0.92	0.96	0.94	0.96
47°F (8.3°C)	0.85	0.91	0.87	0.92
48°F (8.9°C)	0.78	0.85	0.82	0.88
49°F (9.4°C)	0.74	0.81	0.77	0.83



Figure 8.1 General arrangement, chilled water split systems

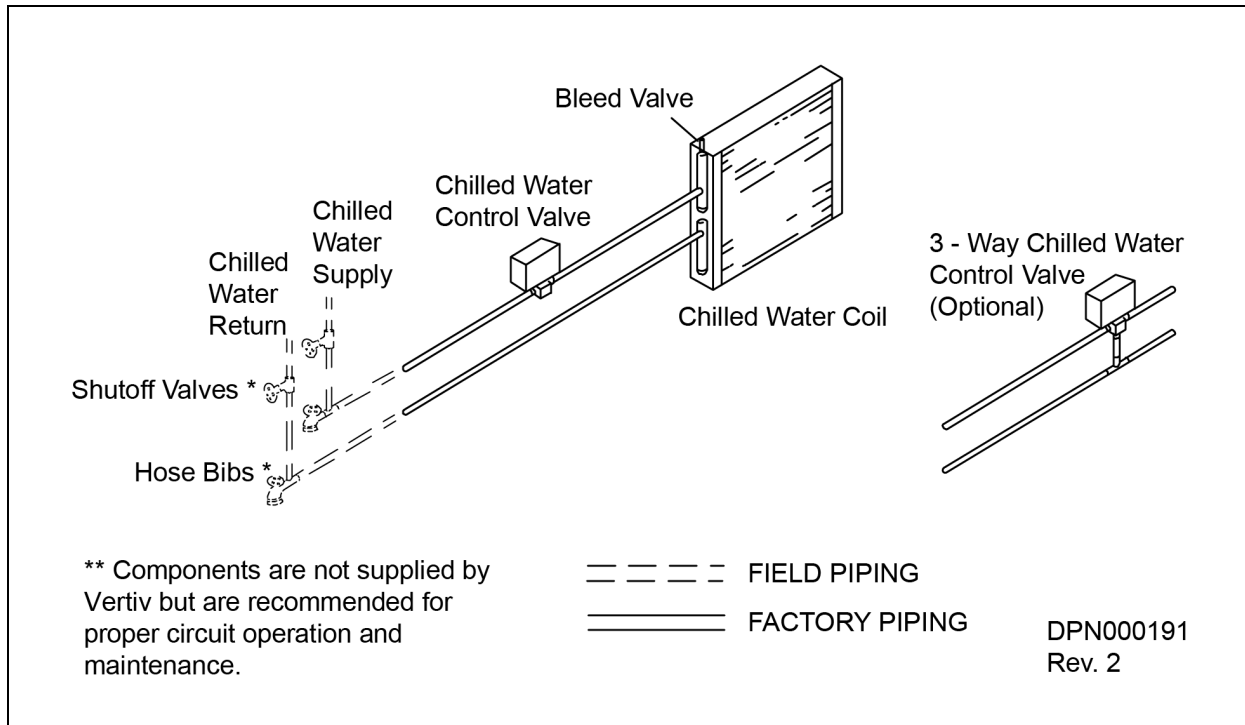


Figure 8.2 General arrangement, hot water reheat, chilled water units

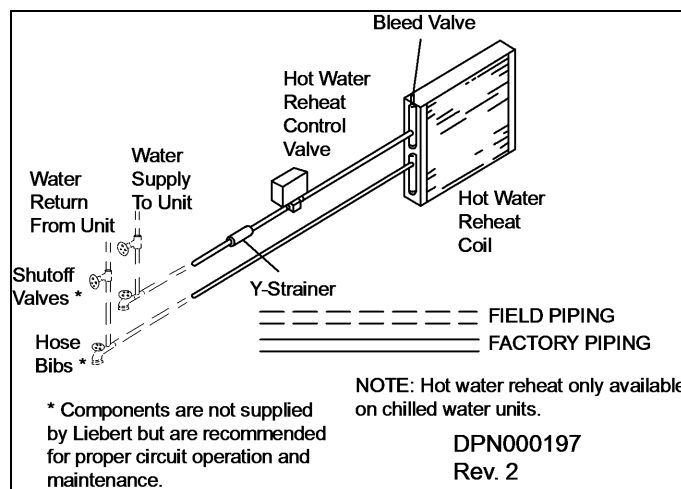


Figure 8.3 Dimensions, chilled water units with direct drive blower

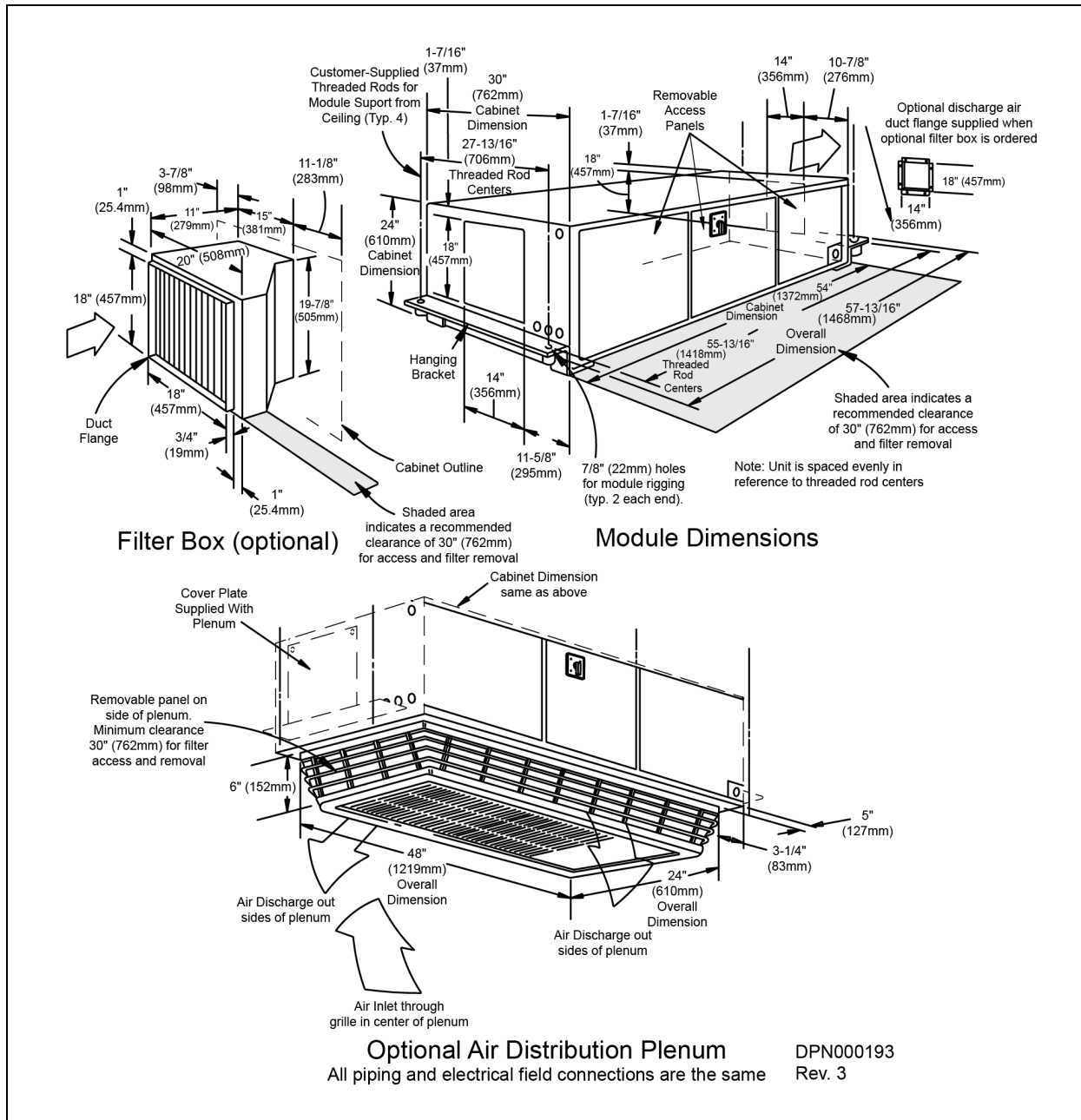


Table 8.3 Chilled water units with direct drive blower weights

Model #		Net Weight lb (kg)
60Hz	50Hz	
MM*40C	MM*39C	230 (104)

Figure 8.4 Dimensions, chilled water units with optional belt drive blower assembly

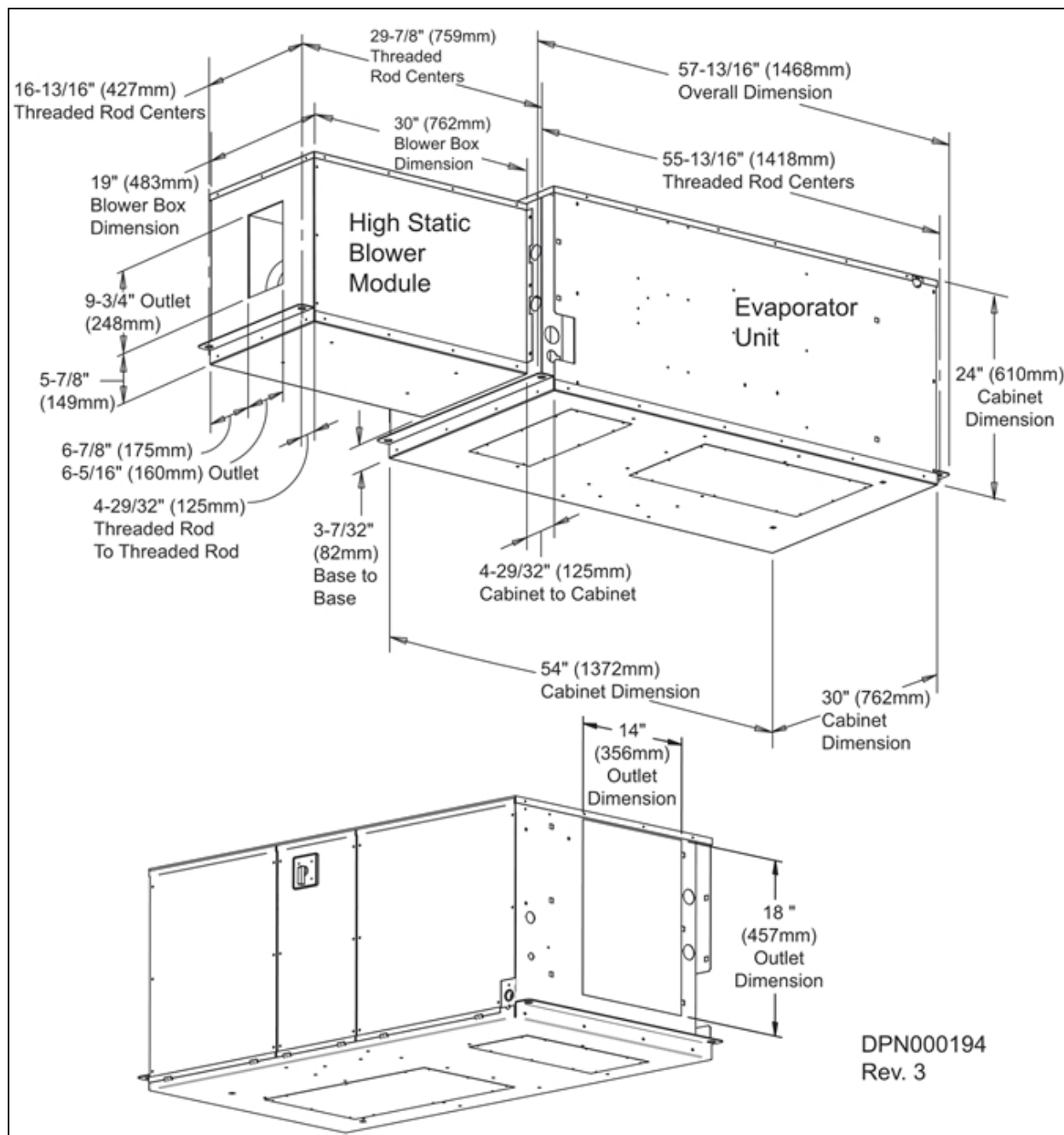


Table 8.4 Net weight, high static blower module

Unit	Net Weight lb (kg)
High Static Blower Module	85 (39)

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## 9 ELECTRICAL DATA

Table 9.1 Direct drive split system evaporator or chilled water unit electrical data, 60Hz

Base Evaporator Model Number	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Cooling Only								
FLA	2.8	2.8	2.3	2.3	—	2.8	—	1.4
WSA	3.5	3.5	2.9	2.9	—	3.5	—	1.8
OPD	15	15	15	15	—	15	—	15
with Electric Reheat								
FLA	27.8	27.8	24.0	24.0	—	19.6	—	9.8
WSA	34.8	34.8	30.0	30.0	—	24.5	—	12.3
OPD	35	35	35	35	—	25	—	15
with SCR Reheat <sup>†</sup>								
FLA	32.0	44.5	27.6	38.4	—	26.9	—	13.5
WSA	40.0	55.6	34.5	48.0	—	33.6	—	16.9
OPD	45	60	35	50	—	35	—	20
with Humidifier								
FLA	9.2	9.2	8.0	8.0	—	9.2	—	4.8
WSA	11.5	11.5	10.0	10.0	—	11.5	—	6.0
OPD	15	15	15	15	—	15	—	15
with Electric Reheat and Humidifier								
FLA	34.2	34.2	29.7	29.7	—	26.0	—	13.2
WSA	42.8	42.8	37.1	37.1	—	32.5	—	16.5
OPD	45	45	40	40	—	35	—	20
with SCR Reheat <sup>†</sup> and Humidifier								
FLA	38.4	50.9	33.3	44.1	—	33.3	—	16.9
WSA	48.0	63.6	41.6	55.1	—	41.6	—	21.1
OPD	50	70	45	60	—	45	—	25
* Specify disconnect or no disconnect								
Notes:								
1. Use MM*36E electrical data for MM*40C chilled water units								
2. For units with Hot Water Reheat (available only on MM*40C units), use appropriate values from “Cooling only” or “with Humidifier” categories.								
3. Use MM*24E and MM*36E for MM*24K & MM*36K, respectively, except with SCR reheat.								
4. SCR Reheat not available with MM*24K, MM*36K or MM*40C.								

**Table 9.2 Belt drive split system evaporator or chilled water electrical data, with high static blower box, 60Hz**

Base Evaporator Model Number	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Cooling Only								
FLA	9.2	9.2	6.4	6.4	—	4.8	—	2.1
WSA	11.5	11.5	8.0	8.0	—	6.0	—	2.6
OPD	20	20	15	15	—	15	—	15
with Electric Reheat								
FLA	34.2	34.2	28.1	28.1	—	21.6	—	10.5
WSA	42.8	42.8	35.1	35.1	—	27.0	—	13.1
OPD	45	45	40	40	—	30	—	15
with SCR Reheat <sup>5</sup>								
FLA	38.4	50.9	31.7	42.5	—	28.9	—	14.2
WSA	48.0	63.6	39.6	53.1	—	36.1	—	17.8
OPD	50	70	40	60	—	40	—	20
with Humidifier								
FLA	15.6	15.6	12.1	12.1	—	11.2	—	5.5
WSA	19.5	19.5	15.1	15.1	—	14.0	—	6.9
OPD	25	25	20	20	—	15	—	15
with Electric Reheat and Humidifier								
FLA	40.6	40.6	33.8	33.8	—	28.0	—	13.9
WSA	50.8	50.8	42.3	42.3	—	35.0	—	17.4
OPD	60	60	45	45	—	40	—	20
with SCR Reheat <sup>5</sup> and Humidifier								
FLA	44.8	57.3	37.4	48.2	—	35.3	—	17.6
WSA	56.0	71.6	46.8	60.3	—	44.1	—	22.0
OPD	60	80	50	70	—	45	—	25
* Specify disconnect or no disconnect								
Notes:								
1. Belt drive data includes externally mounted high static blower box, powered from unit.								
2. Use MM*36E electrical data for MM*40C chilled water units.								
3. For units with Hot Water Reheat (available only on MM*40C units), use appropriate values from “Cooling only” or “with Humidifier” categories.								
4. Use MM*24E and MM*36E for MM*24K & MM*36K, respectively, except with SCR reheat.								
5. SCR Reheat not available with MM*24K, MM*36K or MM*40C.								

**Table 9.3 Direct drive split system evaporator or chilled water electrical data, 50Hz**

Base Evaporator Model Number	220 - 1Ph - 50Hz	380/415 - 3Ph-50Hz
	MM*35E	MM*35E
Cooling Only		
FLA	2.8	1.4
with Electric Reheat		
FLA	27.8	11.1
with SCR Reheat <sup>4</sup>		
FLA	44.6	15.3
with Humidifier		
FLA	9.2	5.1
with Electric Reheat and Humidifier		
FLA	34.2	14.8
with SCR Reheat and Humidifier <sup>4</sup>		
FLA	50.9	19.0
* Specify disconnect or no disconnect		
Notes:		
<ol style="list-style-type: none"> <li>1. Use MM*35E electrical data for MM*39C chilled water units.</li> <li>2. For units with Hot Water Reheat (available only on MM*39C units), use appropriate values from “Cooling only” or “with Humidifier” categories.</li> <li>3. Use MM*35E for MM*35K, except with SCR reheat.</li> <li>4. SCR Reheat not available with MM*35K or MM*39C.</li> </ol>		

**Table 9.4 Belt drive split system evaporator or chilled water electrical data, 50Hz**

Base Evaporator Model Number	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
	MM*35E	MM*35E
Cooling Only		
FLA	7.0	2.6
with Electric Reheat		
FLA	32.0	12.3
with SCR Reheat <sup>5</sup>		
FLA	48.7	16.5
with Humidifier		

**Table 9.4 Belt drive split system evaporator or chilled water electrical data, 50Hz (continued)**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
<b>Base Evaporator Model Number</b>	<b>MM*35E</b>	<b>MM*35E</b>
FLA	13.4	6.3
with Electric Reheat and Humidifier		
FLA	38.4	16.0
with SCR Reheat and Humidifier <sup>5</sup>		
FLA	55.1	20.2
* Specify disconnect or no disconnect		
Notes:		
<ol style="list-style-type: none"> <li>1. Belt drive data includes externally mounted high static blower box, powered from unit.</li> <li>2. Use MM*35E electrical data for MM*39C chilled water units.</li> <li>3. For units with Hot Water Reheat (available only on MM*39C units), use appropriate values from “Cooling only” or “with Humidifier” categories.</li> <li>4. Use MM*35E for MM*35K, except with SCR reheat.</li> <li>5. SCR Reheat not available with MM*35K or MM*39C.</li> </ol>		

**Table 9.5 Indoor condensing unit electrical data, 60 and 50Hz**

Model	60Hz				50Hz	
	208/230-1ph-60Hz	277-1ph-60Hz	208/230-3ph-60Hz	460-3ph-60Hz	220-1ph-50Hz	380/415-3ph-50Hz
	MC*24A	MC*24A	MC*24A	MC*24A	—	—
FLA	14.3	12.7	—	—	13.2	5.7
WSA	17.3	15.3	—	—	—	—
OPD	25	25	—	—	N/A	N/A
	MC*36A	MC*36A	MC*36A	MC*36A	MC*35A	MC*35A
FLA	20.8	16.6	15.7	7.8	20.1	7.8
WSA	25.1	20.2	18.7	9.4	—	—
OPD	40	30	30	15	—	—
	MC*26W	MC*26W	MC*26W	MC*26W	—	—
FLA	12.0	10.4	—	—	—	—
WSA	15.0	13.0	—	—	—	—
OPD	25	20	—	—	—	—
	MC*38W	MC*38W	MC*38W	MC*38W	MC*37W	MC*37W
FLA	17.1	14.3	12.0	6.4	17.1	6.4
WSA	21.4	17.9	15.0	8.0	—	—
OPD	35	30	25	15	—	—
* Specify disconnect or no disconnect						



**Table 9.6 Outdoor condensing unit electrical data, 60 and 50Hz**

Model #	Nominal Capacity Tons	Electrical Characteristic	60Hz				50Hz	
			208/230-1- 60	208/230-3- 60	460-3- 60	575-3- 60	220-1- 50	380/415-3- 50
Standard 95°F (35°C) ambient								
PFH027A__ L7	2	FLA	13.4	—	—	—	—	—
		WSA	16.4	—	—	—	—	—
		OPD	25	—	—	—	—	—
PFH037A__ L7 PFH036A__ L7	3	FLA	18.5	13.4	7.1	5.8	18.4	7.0
		WSA	22.8	16.4	8.7	7.0	—	—
		OPD	35	25	15	15	—	—
High Ambient 105°F (41°C) ambient								
PFH027A__ H7	2	FLA	15.4	—	—	—	—	—
		WSA	18.4	—	—	—	—	—
		OPD	30	—	—	—	—	—
PFH037A__ H7 PFH036A__ H7	3	FLA	20.5	15.4	8.1	5.8	20.5	8.1
		WSA	24.8	18.4	9.7	7.0	—	—
		OPD	40	30	15	15	—	—
Quiet-Line 95°F (35°C) ambient								
PFHZ27A__ L7	2	FLA	12.9	—	—	—	—	—
		WSA	15.9	—	—	—	—	—
		OPD	25	—	—	—	—	—
PFHZ37A__ L7 PFHZ36A__ L7	3	FLA	18.0	12.9	7.1	—	18.0	6.9
		WSA	22.3	15.9	8.7	—	—	—
		OPD	35	25	15	—	—	—

Figure 9.1 Single-point power kit - optional

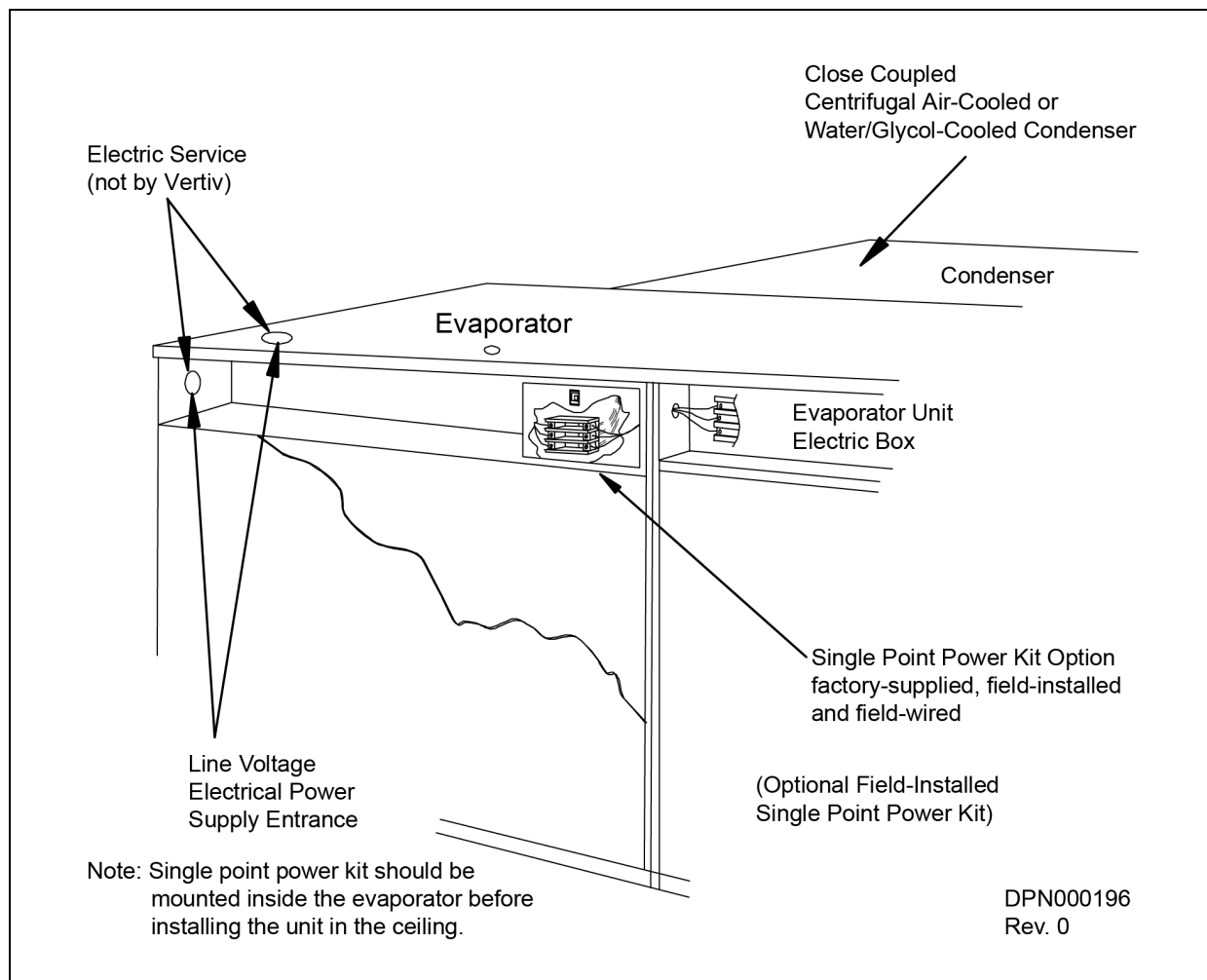


Table 9.7 Electrical data, 60Hz air-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
Base Evaporator Model Number	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Condensing Unit Model Number	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A
Cooling Only								
FLA	17.1	23.6	15.0	18.9	—	18.5	—	9.2
WSA	20.1	27.9	17.6	22.5	—	21.5	—	10.8
OPD	30	40	25	35	—	30	—	15
with Electric Reheat								
FLA	42.1	48.6	36.7	40.6	—	35.3	—	17.6
WSA	51.4	59.1	44.7	49.6	—	42.5	—	21.3
OPD	60	60	45	50	—	50	—	25

**Table 9.7 Electrical data, 60Hz air-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit (continued)**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
Base Evaporator Model Number	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Condensing Unit Model Number	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A
with SCR Reheat <sup>2</sup>								
FLA	46.3	65.3	40.3	55.0	—	42.6	—	21.3
WSA	56.6	80.0	49.2	67.6	—	51.6	—	25.9
OPD	60	80	50	70	—	50	—	30
with Humidifier								
FLA	23.5	30.0	20.7	24.6	—	24.9	—	12.6
WSA	26.5	34.3	23.3	28.2	—	27.9	—	14.2
OPD	35	50	30	40	—	35	—	20
with Electric Reheat and Humidifier								
FLA	42.1	48.6	36.7	40.6	—	35.3	—	17.6
WSA	51.4	59.1	44.7	49.6	—	42.5	—	21.3
OPD	60	60	45	50	—	50	—	25
with SCR Reheat and Humidifier <sup>2</sup>								
FLA	52.7	71.7	46.0	60.7	—	49.0	—	24.7
WSA	63.0	86.4	54.9	73.3	—	58.0	—	29.3
OPD	70	90	60	80	—	60	—	30
* Specify disconnect or no disconnect								
Note:								
1. Use MM*24E and MM*36E for MM*24K & MM*36K, respectively, except with SCR reheat.								
2. SCR Reheat not available with MM*24K or MM*36K.								

**Table 9.8 Electrical data, 60Hz air-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
Base Evaporator Model Number	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Condensing Unit Model Number	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A
Cooling Only								
FLA	23.5	30.0	19.1	23.0	—	20.5	—	9.9
WSA	26.5	34.3	21.7	26.6	—	23.5	—	11.5
OPD	35	50	30	40	—	35	—	15
with Electric Reheat								
FLA	48.5	55.0	40.8	44.7	—	37.3	—	18.3

**Table 9.8 Electrical data, 60Hz air-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit (continued)**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
Base Evaporator Model Number	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Condensing Unit Model Number	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A	MC*24A	MC*36A
WSA	57.8	65.5	48.8	53.7	—	44.5	—	22.0
OPD	60	70	50	60	—	50	—	25
with SCR Reheat <sup>3</sup>								
FLA	52.7	71.7	44.4	59.1	—	44.6	—	22.0
WSA	63.0	86.4	53.3	71.7	—	53.6	—	26.6
OPD	70	90	60	80	—	60	—	30
with Humidifier								
FLA	29.9	36.4	24.8	28.7	—	26.9	—	13.3
WSA	32.9	40.7	27.4	32.3	—	29.9	—	14.9
OPD	40	50	35	45	—	40	—	20
with Electric Reheat and Humidifier								
FLA	48.5	55.0	40.8	44.7	—	37.3	—	18.3
WSA	57.8	65.5	48.8	53.7	—	44.5	—	22.0
OPD	60	70	50	60	—	50	—	25
with SCR Reheat and Humidifier <sup>3</sup>								
FLA	59.1	78.1	50.1	64.8	—	51.0	—	25.4
WSA	69.4	92.8	59.0	77.4	—	60.0	—	30.0
OPD	70	100	60	80	—	70	—	35
* Specify disconnect or no disconnect								
Notes:								
1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.								
2. Use MM*24E and MM*36E for MM*24K & MM*36K, respectively, except with SCR reheat.								
3. SCR Reheat not available with MM*24K or MM*36K.								

**Table 9.9 Electrical data, 50Hz air-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
Base Evaporator Model Number	MM*35E	MM*35E
Condensing Unit Model Number	MC*35A	MC*35A
Cooling Only		
FLA	22.9	9.2
with Electric Reheat		

**Table 9.9 Electrical data, 50Hz air-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit (continued)**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
Base Evaporator Model Number	MM*35E	MM*35E
Condensing Unit Model Number	MC*35A	MC*35A
FLA	47.9	18.9
with SCR Reheat <sup>2</sup>		
FLA	64.6	23.1
with Humidifier		
FLA	29.3	12.9
with Electric Reheat and Humidifier		
FLA	47.9	18.9
with SCR Reheat and Humidifier <sup>2</sup>		
FLA	71.0	26.8
* Specify disconnect or no disconnect		
Notes:		
1. Use MM*35E for MM*35K, except with SCR reheat.		
2. SCR Reheat not available with MM*35K.		

**Table 9.10 Electrical data, 50Hz air-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
Base Unit Model Number	MM*35E	MM*35E
Condensing Unit Model Number	MC*35A	MC*35A
Cooling Only		
FLA	27.1	10.4
with Electric Reheat		
FLA	52.1	20.1
with SCR Reheat <sup>3</sup>		
FLA	68.8	24.3
with Humidifier		

**Table 9.10 Electrical data, 50Hz air-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit (continued)**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
Base Unit Model Number	MM*35E	MM*35E
Condensing Unit Model Number	MC*35A	MC*35A
FLA	33.5	14.1
with Electric Reheat and Humidifier		
FLA	52.1	20.1
with SCR Reheat and Humidifier <sup>3</sup>		
FLA	75.2	28.0
* Specify disconnect or no disconnect		
Notes:		
1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.		
2. Use MM*35E for MM*35K, except with SCR reheat.		
3. SCR Reheat not available with MM*35K.		

**Table 9.11 Electrical data, 60Hz water/glycol-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
Base Unit Model Number	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
Condensing Unit Model Number	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W
Cooling Only								
FLA	14.8	19.9	12.7	16.6	—	14.8	—	7.8
WSA	17.8	24.2	15.3	20.2	—	17.8	—	9.4
OPD	25	40	25	30	—	25	—	15
with Electric Reheat								
FLA	39.8	44.9	34.4	38.3	—	31.6	—	16.2
WSA	49.1	55.4	42.4	47.3	—	38.8	—	19.9
OPD	50	60	45	50	—	45	—	20
with SCR Reheat <sup>2</sup>								
FLA	44.0	61.6	38.0	52.7	—	38.9	—	19.9
WSA	54.3	76.3	46.9	65.3	—	47.9	—	24.5
OPD	60	80	50	70	—	50	—	25
with Humidifier								
FLA	21.2	26.3	18.4	22.3	—	21.2	—	11.2
WSA	24.2	30.6	21.0	25.9	—	24.2	—	12.8
OPD	35	45	30	40	—	35	—	15

**Table 9.11 Electrical data, 60Hz water/glycol-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit (continued)**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
<b>Base Unit Model Number</b>	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
<b>Condensing Unit Model Number</b>	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W
with Electric Reheat and Humidifier								
FLA	39.8	44.9	34.4	38.3	—	31.6	—	16.2
WSA	49.1	55.4	42.4	47.3	—	38.8	—	19.9
OPD	50	60	45	50	—	45	—	20
with SCR Reheat and Humidifier <sup>2</sup>								
FLA	50.4	68.0	43.7	58.4	—	45.3	—	23.3
WSA	60.7	82.7	52.6	71.0	—	54.3	—	27.9
OPD	70	90	60	80	—	60	—	30
* Specify disconnect or no disconnect								
Notes:								
1. Use MM*24E and MM*36E for MM*24K & MM*36K, respectively, except with SCR reheat.								
2. SCR Reheat not available with MM*24K or MM*36K.								

**Table 9.12 Electrical data, 60Hz water/glycol-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
<b>Base Evaporator Model Number</b>	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
<b>Condensing Unit Model Number</b>	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W
Cooling Only								
FLA	21.2	26.3	16.8	20.7	—	16.8	—	8.5
WSA	24.2	30.6	19.4	24.3	—	19.8	—	10.1
OPD	35	45	25	35	—	30	—	15
with Electric Reheat								
FLA	46.2	51.3	38.5	42.4	—	33.6	—	16.9
WSA	55.5	61.8	46.5	51.4	—	40.8	—	20.6
OPD	60	70	50	60	—	45	—	20
with SCR Reheat <sup>3</sup>								
FLA	50.4	68.0	42.1	56.8	—	40.9	—	20.6
WSA	60.7	82.7	51.0	69.4	—	49.9	—	25.2
OPD	70	90	60	70	—	50	—	30

**Table 9.12 Electrical data, 60Hz water/glycol-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit (continued)**

	208/230 - 1 Ph - 60Hz		277 - 1 Ph - 60Hz		208/230 - 3 Ph - 60Hz		460 - 3 Ph - 60Hz	
<b>Base Evaporator Model Number</b>	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E	MM*24E	MM*36E
<b>Condensing Unit Model Number</b>	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W	MC*26W	MC*38W
with Humidifier								
FLA	27.6	32.7	22.5	26.4	—	23.2	—	11.9
WSA	30.6	37.0	25.1	30.0	—	26.2	—	13.5
OPD	40	50	35	40	—	35	—	15
with Electric Reheat and Humidifier								
FLA	46.2	51.3	38.5	42.4	—	33.6	—	16.9
WSA	55.5	61.8	46.5	51.4	—	40.8	—	20.6
OPD	60	70	50	60	—	45	—	20
with SCR Reheat and Humidifier <sup>3</sup>								
FLA	56.8	74.4	47.8	62.5	—	47.3	—	24.0
WSA	67.1	89.1	56.7	75.1	—	56.3	—	28.6
OPD	70	90	60	80	—	60	—	30
* Specify disconnect or no disconnect								
Notes:								
1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.								
2. Use MM*24E and MM*36E for MM*24K & MM*36K, respectively, except with SCR reheat.								
3. SCR Reheat not available with MM*24K or MM*36K.								

**Table 9.13 Electrical data, 50Hz water/glycol-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
<b>Base Evaporator Model Number</b>	MM*35E	MM*35E
<b>Condensing Unit Model Number</b>	MC*37W	MC*37W
Cooling Only		
FLA	19.9	7.8
with Electric Reheat		
FLA	44.9	17.5
with SCR Reheat <sup>2</sup>		
FLA	61.6	21.7
with Humidifier		



**Table 9.13 Electrical data, 50Hz water/glycol-cooled systems using single-point power kit, evaporator with direct-drive blowers and indoor condensing unit (continued)**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
<b>Base Evaporator Model Number</b>	MM*35E	MM*35E
<b>Condensing Unit Model Number</b>	MC*37W	MC*37W
FLA	26.3	11.5
with Electric Reheat and Humidifier		
FLA	44.9	17.5
with SCR Reheat and Humidifier <sup>2</sup>		
FLA	68.0	25.4
* Specify disconnect or no disconnect		
Notes:		
1. Use MM*35E for MM*35K, except with SCR reheat.		
2. SCR Reheat not available with MM*35K.		

**Table 9.14 Electrical data, 50Hz water/glycol-cooled systems using single-point power kit, evaporator with belt-drive blowers and indoor condensing unit**

	220 - 1 Ph - 50Hz	380/415 - 3 Ph - 50Hz
<b>Base Evaporator Model Number</b>	MM*35E	MM*35E
<b>Condensing Unit Model Number</b>	MC*37W	MC*37W
Cooling Only		
FLA	24.1	9.0
with Electric Reheat		
FLA	49.1	18.7
with SCR Reheat <sup>3</sup>		
FLA	65.8	22.9
with Humidifier		
FLA	30.5	12.7
with Electric Reheat and Humidifier		
FLA	49.1	18.7
with SCR Reheat and Humidifier <sup>3</sup>		
FLA	72.2	26.6
* Specify disconnect or no disconnect		
Notes:		
1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.		
2. Use MM*35E for MM*35K, except with SCR reheat.		
3. SCR Reheat not available with MM*35K.		

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## 10 REFRIGERANT PIPING

**Table 10.1 Refrigerant charge**

Model #		Charge R-407C oz (kg)
60Hz	50Hz	
MM*24E/K	—	7 (0.198)
MM*36E/K	MM*35E/K	7 (0.198)
MC*24AL_H7	—	134 (3.80)
MC*36AL_H7	MC*35AL_H7	213 (6.04)
MC*26W_H7	—	41 (1.16)
MC*38W_H7	MC*37W_H7	54 (1.54)
PFH027-_L7	—	134 (3.80)
PFH027-_H7	—	213 (6.04)
PFHZ27-_L7	—	213 (6.04)
PFH037-_L7	PFH036-_L7	213 (6.04)
PFH037-_H7	PFH036-_H7	426 (12.08)
PFHZ37-_L7	PFHZ36-_L7	426 (12.08)

**Table 10.2 Recommended refrigerant line sizes**

Equivalent Length, ft (m)	2 Ton		3 Ton	
	Suction	Liquid	Suction	Liquid
50 (15.2)	7/8"	3/8"	7/8"	1/2"
100 (30.5)	7/8"	1/2"	1-1/8" <sup>2</sup>	1/2"
150 (45.7)	7/8"	1/2"	1-1/8" <sup>2</sup>	1/2"

1. Suction line and liquid line sizing based on < 3 psi pressure drop in each and horizontal suction line refrigerant velocities >700FPM (3.6m/s).

2. Suction size should be reduced one pipe size for vertical riser sections to maintain suction line velocity > 1000FPM (5.1m/s) for proper oil return.

**Table 10.3 Pipe length and condenser elevation relative to evaporator**

Nominal System Size Tons	Max. Equiv. Pipe Length ft. (m)	Maximum PFH Level Above Evaporator, ft. (m)	Maximum PFH Level Below Evaporator, ft. (m)
2	150 (45)	40 (12)	15 (4.6)
3	150 (45)	50 (15)	15 (4.6)

Maximum recommended total equivalent pipe length is 150 ft (46m). Suction and liquid lines may require additional specialty items when vertical lines exceed 20 ft. (6m) and/or condensing unit installation is more than 15 ft. (4.6m) below the evaporator. Contact Vertiv™ Application Engineering for assistance.

**Table 10.4 Line charges - refrigerant per 100 ft. (30m) of Type L copper tube**

Line Size, O.D., in.	R-407C, lb/100 ft. (kg/30m)	
	Liquid Line	Suction Line
3/8	3.7 (1.7)	—
1/2	6.9 (3.1)	—
5/8	11.0 (5.0)	0.4 (0.2)
3/4	15.7 (7.1)	0.6 (0.3)
7/8	23.0 (10.4)	1.0 (0.4)
1-1/8	—	1.7 (0.7)
1-3/8	—	2.7 (1.1)

**Table 10.5 Refrigerant charge in Liebert pre-charged R-407C line sets**

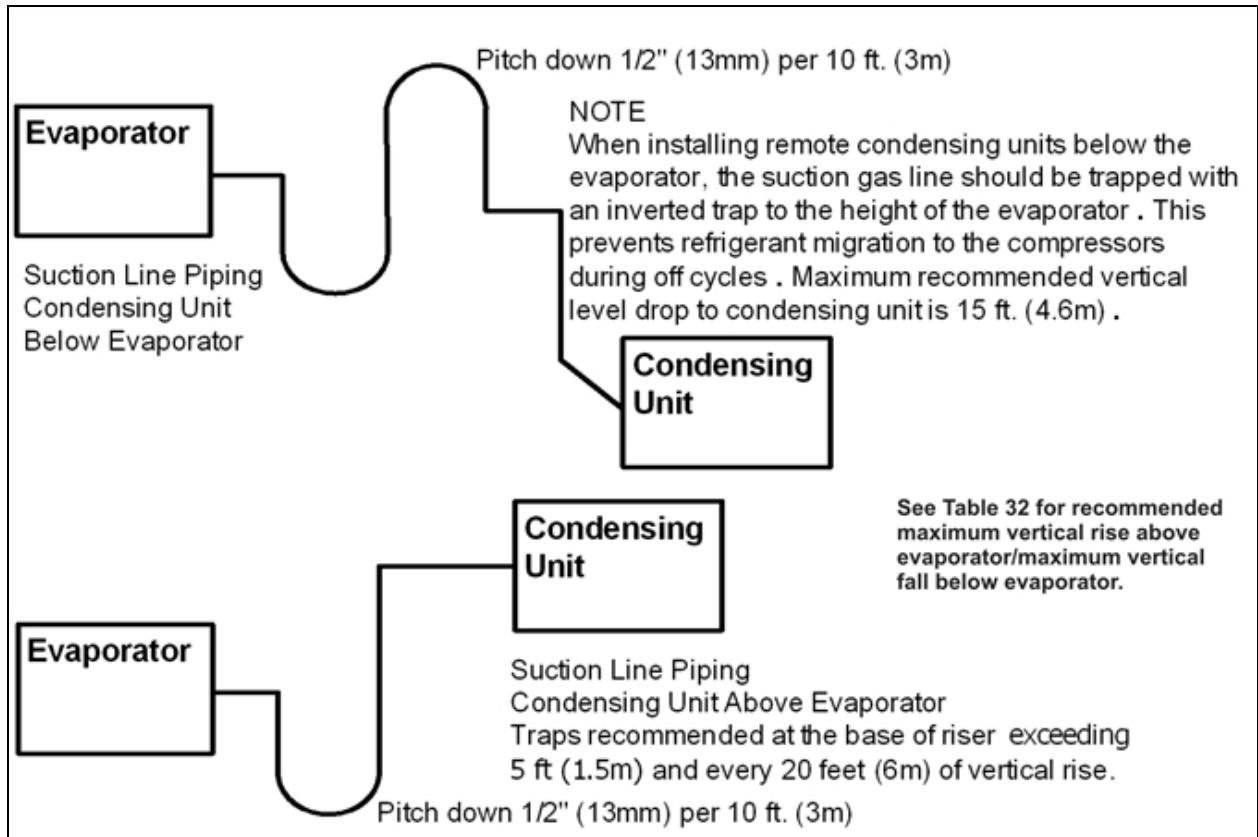
Line Size, in.	Length, ft. (m)	Charge R-407C, oz (kg)
3/8 liquid	15 (4.5)	5 (0.14)
	30 (9)	10 (0.28)
5/8 or 7/8 suction	15 (4.5)	5 (0.14)
	30 (9)	10 (0.28)

**Table 10.6 Equivalent lengths for various pipe fittings, ft (m)**

Copper Pipe OD, in.	90 Degree Elbow Copper	90 Degree Elbow Cast	45 Degree Elbow	Tee	Gate Valve	Globe Valve	Angle Valve
1/2	0.8 (0.24)	1.3 (0.39)	0.4 (0.12)	2.5 (0.76)	0.26 (0.07)	7.0 (2.13)	4.0 (1.21)
5/8	0.9 (0.27)	1.4 (0.42)	0.5 (0.15)	2.5 (0.76)	0.28 (0.08)	9.5 (2.89)	5.0 (1.52)
3/4	1.0 (0.3)	1.5 (0.45)	0.6 (0.18)	2.5 (0.76)	0.3 (0.09)	12.0 (3.65)	6.5 (1.98)
7/8	1.45 (0.44)	1.8 (0.54)	0.8 (0.24)	3.6 (1.09)	0.36 (0.1)	17.2 (5.24)	9.5 (2.89)
1-1/8	1.85 (0.56)	2.2 (0.67)	1.0 (0.3)	4.6 (1.4)	0.48 (0.14)	22.5 (6.85)	12.0 (3.65)
1-3/8	2.4 (0.73)	2.9 (0.88)	1.3 (0.39)	6.4 (1.95)	0.65 (0.19)	32.0 (9.75)	16.0 (4.87)
1-5/8	2.9 (0.88)	3.5 (1.06)	1.6 (0.48)	7.2 (2.19)	0.72 (0.21)	36.0 (10.97)	19.5 (5.94)

Refrigerant trap = Four times equivalent length of pipe per this table.

Figure 10.1 Refrigerant piping diagram

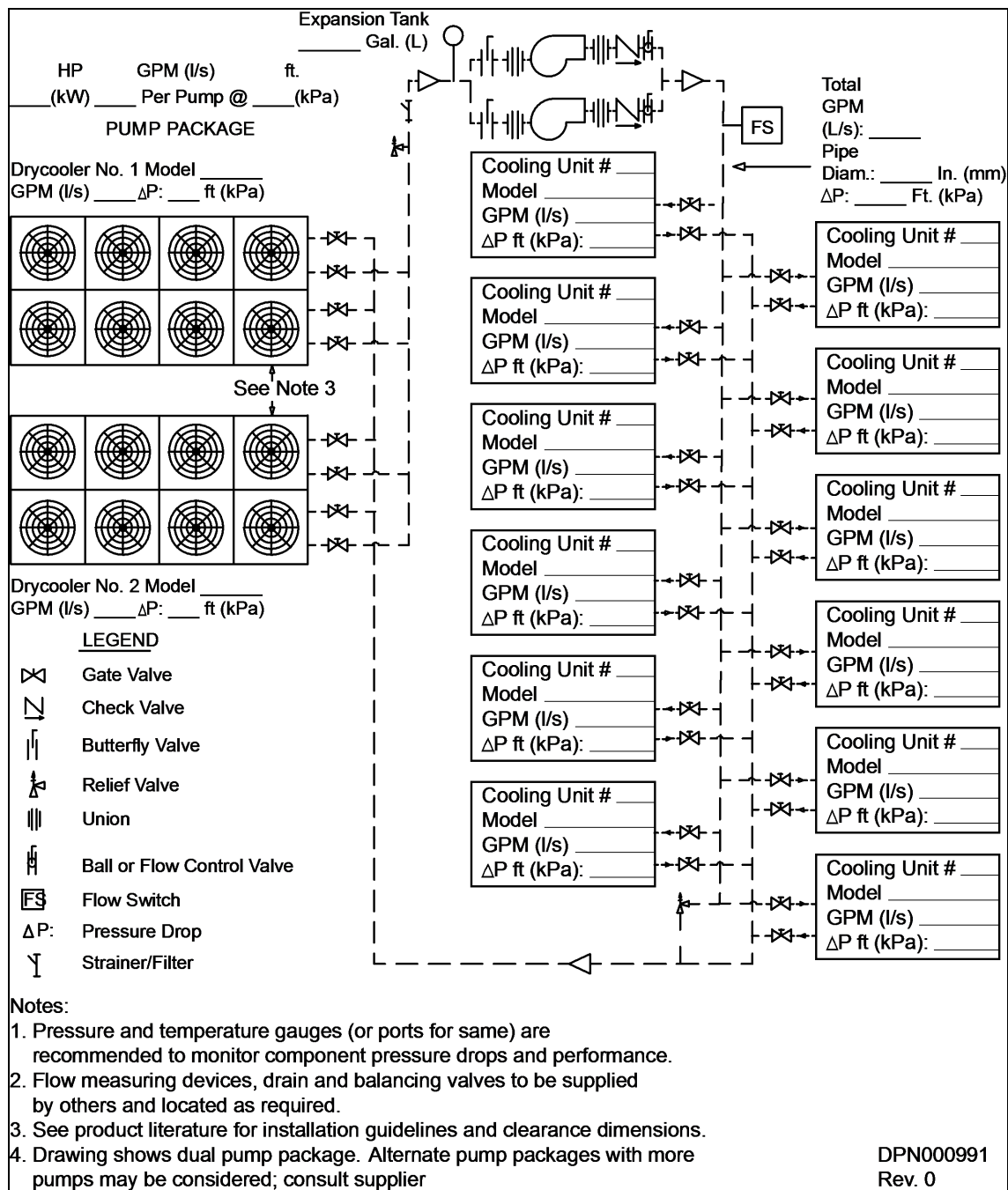


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# 11 GLYCOL LOOP PIPING

Contact Vertiv™ Application Engineering for assistance in choosing correct drycooler models. Refer to Figure 11.1 below.

Figure 11.1 Heat rejection loop, multiple drycoolers and multiple indoor units



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## 12 MODEL NUMBER NOMENCLATURE—ALL SYSTEMS

Figure 12.1 Model number nomenclature—Evaporator units

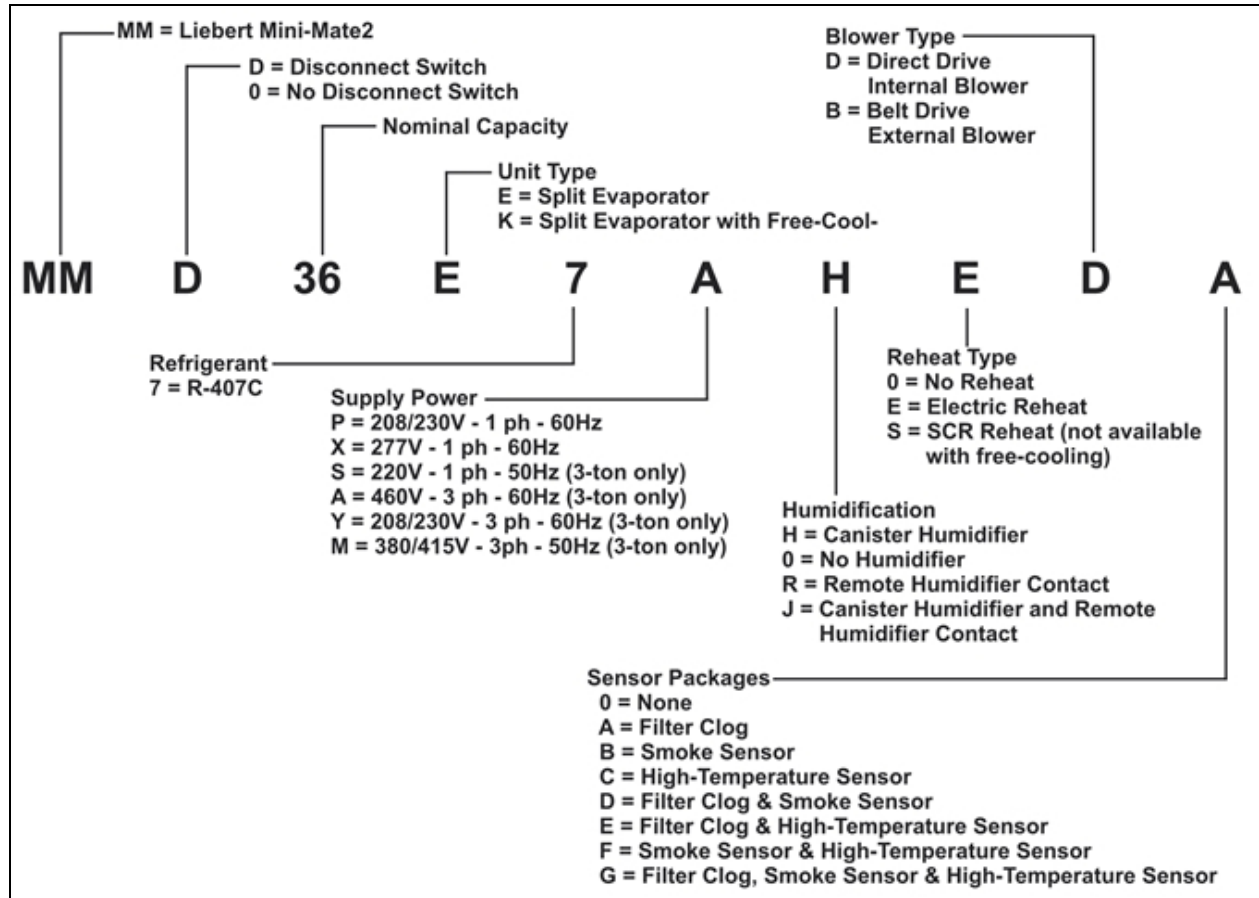


Figure 12.2 Model number nomenclature—Air-cooled, indoor condensing units

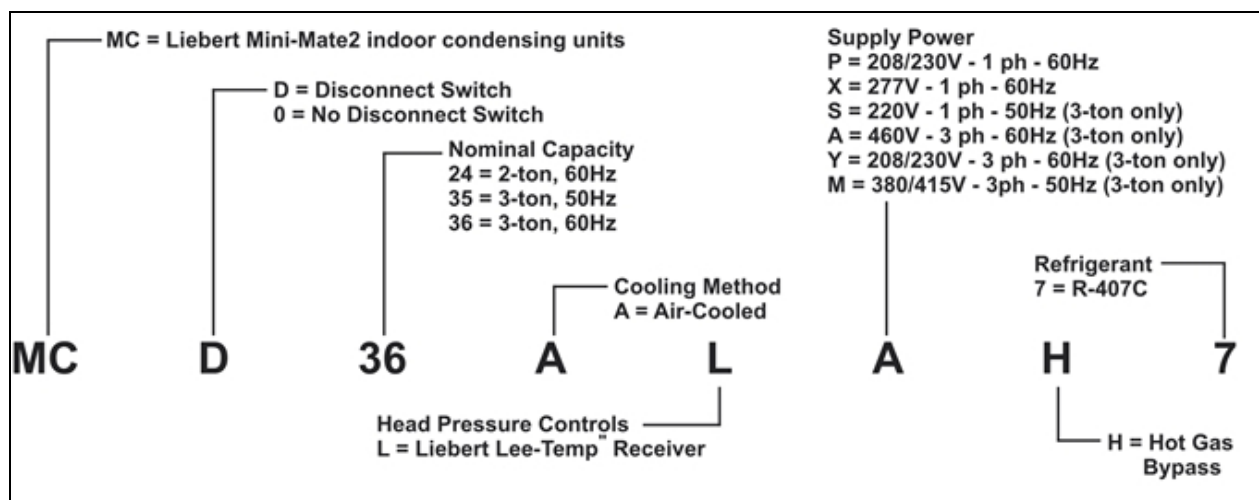


Figure 12.3 Model number nomenclature—Outdoor air-cooled prop fan condensing units

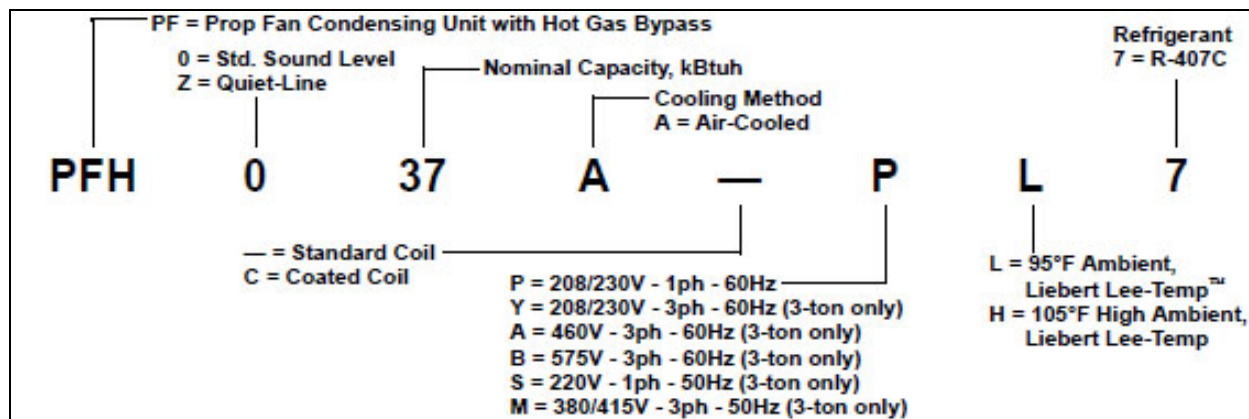


Figure 12.4 Model number nomenclature—Water/glycol-cooled condensing units

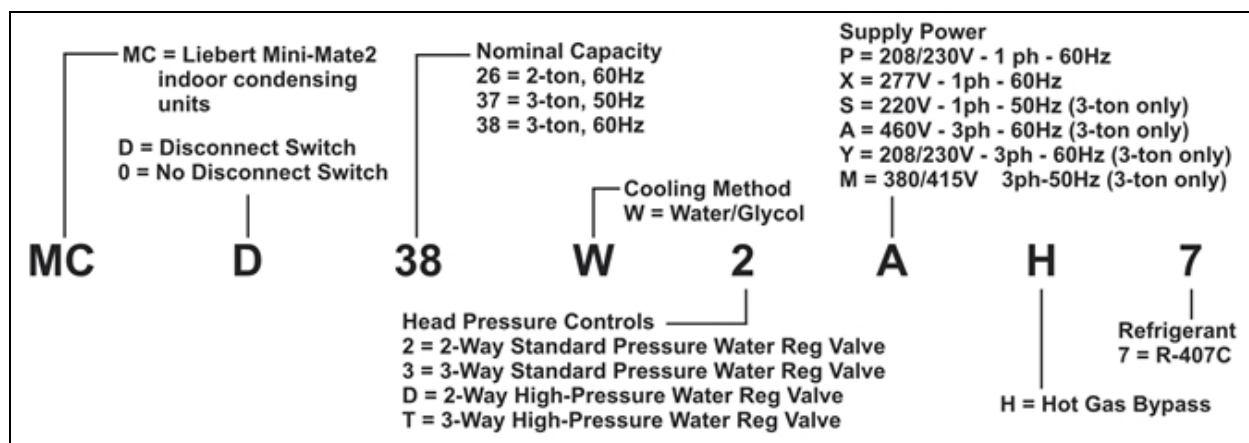
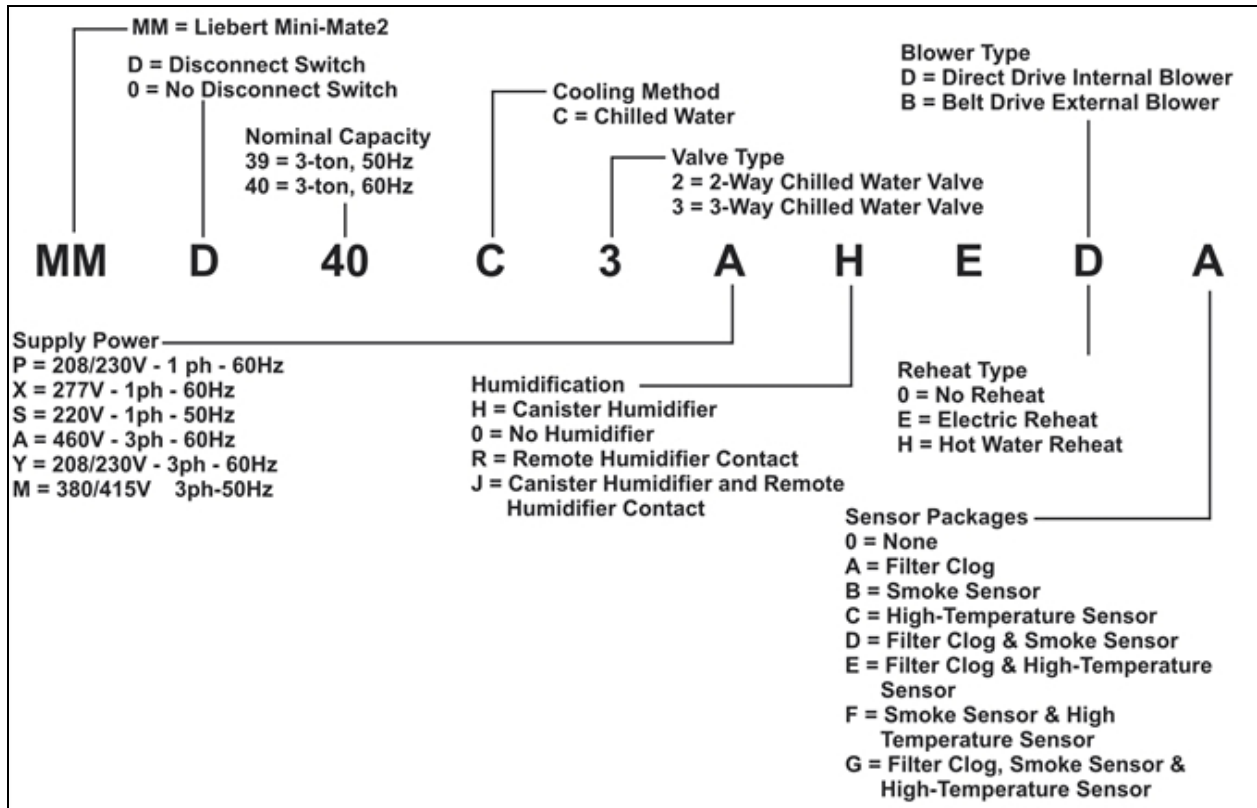


Figure 12.5 Model number nomenclature—Chilled water units



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## APPENDICES

### Appendix A: Guide Specifications for Liebert Mini-Mate2 - 2- and 3-Ton

The following are the guide specifications for the Liebert Mini-Mate2 2- and 3-ton capacity.

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# Liebert<sup>®</sup> Mini-Mate2<sup>™</sup> —2- and 3-Ton

## GUIDE SPECIFICATIONS

### 1.0 GENERAL

#### 1.1 SUMMARY

These specifications describe requirements for a ceiling-mounted Thermal Management system. The system shall be designed to control temperature conditions in rooms containing electronic equipment, with good insulation and vapor barrier. The system is also available with an optional humidity control system.

The manufacturer shall design and furnish all equipment in the quantities and configurations shown on the project drawings.

#### 1.2 DESIGN REQUIREMENTS

The Thermal Management system shall be a Liebert Mini-Mate2 factory-assembled unit. On direct expansion models, the refrigeration system shall be split, with the compressor located in a remote or close-coupled condensing unit. Refer to Section 2.3 for condensing unit guide specifications.

The evaporator section shall be designed for above dropped-ceiling installation. Condensing units shall be designed for either outdoor or above-dropped-ceiling installation.

The system shall have a net total cooling capacity of \_\_\_\_\_ BTU/hr (kW) and a net sensible cooling capacity of \_\_\_\_\_ BTU/hr (kW), based on entering air conditions of \_\_\_\_\_°F (°C) dry bulb and \_\_\_\_\_°F (°C) wet bulb. Net capacities shall include losses due to fan motor heat. The system cooling capacity shall be factory-certified per ASHRAE 127-2007 testing.

The unit is to be supplied for operation on a \_\_\_\_\_ volt, \_\_\_\_\_ phase, \_\_\_\_\_ Hz power supply.

System shall be supplied with CSA Certification to the harmonized U.S. and Canadian product safety standard CSA C22.2 No 236/UL 1995 for “Heating and Cooling Equipment” and marked with the CSA c-us logo (60Hz only).

The system model number(s) shall be:

Evaporator \_\_\_\_\_

Condensing Unit \_\_\_\_\_

#### 1.3 SUBMITTALS

Submittals shall be provided after the agreement of the proposal and shall include: Single-Line Diagrams; Dimensional, Electrical and Capacity data; Piping and Electrical Connection Drawings.

#### 1.4 QUALITY ASSURANCE

The specified system shall be factory-tested before shipment. Testing shall include, but shall not be limited to: Quality Control Checks, “Hi-Pot” Test (two times rated voltage plus 1000 volts, per NRTL agency requirements), and Metering Calibration Tests. The system shall be designed and manufactured according to world-class quality standards. The manufacturer shall be ISO 9001 certified.

#### 1.5 ACCEPTABLE ALTERNATIVES

Acceptable alternatives shall be permitted with engineer's prior approval only. Contractor to submit a detailed summary form listing all variations to include size deviations, electrical load differences, functional and component changes and savings to end user.

## 2.0 PRODUCT

### 2.1 STANDARD FEATURES/ALL SYSTEMS

#### 2.1.1 Evaporator Cabinet Construction

The cabinet and chassis shall be constructed of heavy gauge galvanized steel, and shall be serviceable from one side. Mounting brackets shall be integral to the cabinet design. Internal cabinet insulation shall meet ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 and ASTM 1338 standards.

#### 2.1.2 Air Distribution

The air distribution system shall be constructed with a quiet, direct-drive fan assembly equipped with double-inlet blower, self-aligning ball bearings and lifetime lubrication. Fan motor shall be permanent-split capacitor, high-efficiency type, equipped with two speeds for airflow modulation. The microprocessor controller shall use the lower fan speed for precise dehumidification control. Fan speed shall also be user selectable from the wall controller.

Each system shall be capable of delivering \_\_\_\_CFM (\_\_\_\_ CMH) at high fan speed. The fan motor shall be \_\_\_\_ HP (\_\_\_\_ W).

System shall be suitable for supply and return air plenum or ducted supply and return air distribution. Refer to 2.5.2 - Air Filter Box, 2.5.3 - Air Distribution Plenum and 2.5.4 - High Static Blower Assembly.

#### 2.1.3 Microprocessor Control

The control system shall be microprocessor-based, factory-wired into the system and tested prior to shipment. The wall-mounted controller shall include a 2-line by 16-character character liquid crystal display (LCD) providing continuous display of operating status and alarm condition and shall be capable of displaying values in °F or °C. An 8-key membrane keypad for setpoint/ program control, fan speed selection and unit On/Off shall be located below the display. Controller shall be password protected to prevent unauthorized set point adjustments. Field-supplied 4-conductor thermostat wire shall be used to connect the wall-mounted controller to the unit control board.

Temperature and humidity sensors shall be located in the wall controller, which shall be capable of being located up to 300 ft (91.4m) from the evaporator unit when using a remote temperature/humidity sensor in the conditioned space.

##### 2.1.3.1 Monitoring

The LCD shall provide On/Off indication, operating mode indication (cooling, heating, humidifying, dehumidifying), fan speed indication and current day, time, temperature and humidity (if applicable) indication. The monitoring system shall be capable of relaying unit operating parameters and alarms to the Liebert iCOM-CMS or Liebert® SiteScan monitoring systems.

##### 2.1.3.2 Control Setpoint Parameters

- Temp. Setpoint 65-85°F (18-29°C)
- Temp. Sensitivity 1-9.9 °F (1-5°C)
- Humidity Setpoint 20-80% RH
- Humidity Sensitivity 1-30% RH

##### 2.1.3.3 Unit Controls

###### 2.1.3.3.1 Compressor Short-Cycle Control

The control system shall prevent compressor short-cycling by a 3-minute timer from compressor stop to the next start.



### **2.1.3.3.2 Common Alarm and Remote On/Off**

A common alarm relay shall provide a contact closure to a remote alarm device. Two (2) terminals shall also be provided for remote On/Off control. Individual alarms shall be “enabled” or “disabled” from reporting to the common alarm.

### **2.1.3.3.3 Setback Control**

The control shall be user-configurable to use a manual setpoint control or a programmable, time-based setback control. The setback control will be based on a 5 day/2 day programmed weekly schedule with capability of accepting 2 events per program day.

### **2.1.3.3.4 Temperature Calibration**

The control shall include the capabilities to calibrate the temperature and humidity sensors and adjust the sensor response delay time from 0 to 90 seconds. The control shall be capable of displaying temperature values in °F or °C.

### **2.1.3.3.5 System Auto Restart**

For startup after power failure, the system shall provide automatic restart with a programmable (up to 9.9 minutes in 6-second increments) time delay. Programming can be performed either at the wall-mounted controller or from the central, site-monitoring system.

## **2.1.4 Alarms**

### **2.1.4.1 Unit Alarm**

The control system shall monitor unit operation and activate an audible and visual alarm in the event of the following factory preset alarm conditions:

- High Temperature
- Low Temperature
- High Humidity
- Low Humidity
- High Water Alarm - Lockout Unit Operation
- High Head Pressure
- Loss of Power
- Compressor Short Cycle

### **2.1.4.2 Custom Alarms (2x)**

- Humidifier Problem
- Filter Clog
- Water Detected
- Smoke Detected
- Custom 1
- Custom 2

User-customized text can be entered for the two (2) custom alarms.

### **2.1.4.3 Alarm Controls**

Each alarm (unit and custom) shall be individually enabled or disabled (except for high head pressure and high water in condensate pan) and can be programmed for a time delay of 0 to 255 seconds of continuous alarm condition to be recognized as an alarm. Each alarm can also be enabled or disabled to activate the common alarm (except high head pressure and high water in condensate pan).

#### **2.1.4.4 Audible Alarm**

The audible alarm shall annunciate at the wall-mounted controller any alarm that is enabled by the operator.

#### **2.1.4.5 Common Alarm**

A programmable common alarm shall be provided to interface user selected alarms with a remote alarm device. Alarms shall be enabled or disabled from reporting to the common alarm.

#### **2.1.4.6 Remote Monitoring**

All alarms shall be communicated to the Liebert® remote monitoring system with the following information: date and time of occurrence, unit number and present temperature and humidity.

## 2.2 DIRECT EXPANSION SYSTEM EVAPORATOR COMPONENTS

### 2.2.1 Direct Expansion Coil

The evaporator section shall include evaporator coil, thermostatic expansion valve and filter drier.

The evaporator coil shall have 3.1 sq. ft. (0.29 sq.m) face area, 3 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of \_\_\_\_ fpm (m/s) at \_\_\_\_ CFM (CMH). An externally equalized thermostatic expansion valve shall control refrigerant flow. The evaporator coil shall be factory-charged with R-407C refrigerant and sealed. The evaporator unit can be coupled directly with a ceiling mounted condensing unit or mounted remote to the condensing unit.

The coil assembly shall be mounted in a condensate drain pan with an internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the evaporator upon high water condition

## 2.2 CHILLED WATER SYSTEM COMPONENTS

### 2.2.1 Chilled Water Control Valve

The control valve shall be a motorized, slow-close On/Off type to reduce water hammer. Design pressure shall be 300 psig (2068 kPa) static pressure, with a maximum close-off pressure of 60 psig (414 kPa).

Valve shall be non-spring return.

### 2.2.2 Chilled Water Coil

The cooling coil shall have a minimum of 3.1 sq.ft. (0.29 sq.m) face area, 3 rows deep. It shall be constructed of copper tubes and aluminum fins and have a maximum face velocity of 391 fpm (2.0 m/s) at 1250 CFM (2124 CMH). The coil shall be supplied with 45°F (7.2°C) entering water temperature. The coil shall be supplied with \_\_\_\_\_ GPM (l/s) of chilled water and the pressure drop shall not exceed \_\_\_\_\_ PSI (kPa).

The coil assembly shall be mounted in a condensate drain pan with an internally trapped drain line. The evaporator drain pan shall include a factory-installed float switch to shut down the unit upon high water condition.

## 2.3 INDOOR AIR-COOLED CENTRIFUGAL FAN CONDENSING UNIT

Condensing unit components shall include condenser coil, scroll compressor, high-pressure switch, Liebert® Lee-Temp™ refrigerant receiver, head pressure control valve, hot gas bypass system and liquid line solenoid valve. The cabinet and chassis shall be constructed of heavy gauge galvanized steel, and shall be serviceable from one side. Mounting brackets shall be integral to the cabinet design and be designed for ceiling mounting.

The hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low-load conditions. The hot gas bypass shall be completely contained in the condensing unit. Field installed third refrigerant line shall not be acceptable. Hot gas bypass shall be automatically deactivated upon a call for dehumidification.

High pressure switch shall protect the unit from abnormal refrigerant pressure conditions and shall deactivate the compressor and annunciate an alarm at the wall controller. The blower shall continue to circulate air. The wall controller shall be used to manually restart the compressor function after the automatic pressure switch resets. Three high head pressure alarms in a rolling 12-hour period shall lock out the manual restart feature until power is cycled to the evaporator unit.

A pressure balancing valve shall be factory installed to reduce the chance of high pressure cut-out due to excessive refrigerant migration to the receiver due to changing outdoor temperatures during off-cycles.

All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing, dehydration or charging shall be required. Condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34°C). The condensing unit can be mounted directly to the evaporator or can be mounted remote to the evaporator.

The condensing coil shall be constructed of copper tubes and aluminum fins. The condenser fan shall be centrifugal type, double inlet, direct drive and shall operate at 1050 RPM (890 RPM @ 50 Hz). The condenser fan shall be designed for \_\_\_\_ CFM (CMH) at \_\_\_\_" (mm) w.g. external static pressure.

### 2.3 OUTDOOR AIR-COOLED PROP FAN CONDENSING UNIT

The condensing unit shall be designed for outdoor use with either roof or ground level mounting. The condensing unit is constructed of galvanized and galvaneal painted steel for corrosion resistance. Removable exterior panels shall allow access to the electric panel or refrigeration components for service or maintenance. Both inlet and outlet air grilles shall be heavy duty steel with a durable polyester coating.

Condensing unit components shall include a condenser coil, a direct-drive propeller-type fan, a scroll compressor, high-pressure switch, Liebert® Lee-Temp™ receiver and head pressure control valve, hot gas bypass system and liquid line solenoid valve. The condensing coil shall be constructed of copper tubes and aluminum fins.

The hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low-load conditions. In split systems, the hot gas bypass shall be completely contained in the condensing unit. Field installed third refrigerant line shall not be acceptable. Hot gas bypass shall be automatically deactivated upon a call for dehumidification.

High pressure switch shall protect the unit from abnormal refrigerant pressure conditions and shall deactivate the compressor and annunciate an alarm at the wall controller. The blower shall continue to circulate air. The wall controller shall be used to manually restart the compressor function after the automatic pressure switch resets. Three high head pressure alarms in a rolling 12-hour period shall lock out the manual restart feature until power is cycled to the evaporator unit.

A pressure balancing valve shall be factory installed to reduce the chance of high pressure cut-out due to excessive refrigerant migration to the receiver due to changing outdoor temperatures during off-cycles.

All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing, dehydration or charging shall be required. Condensing unit shall be designed for 95°F (35°C) ambient and be capable of operation to -30°F (-34.4°C).

The condenser coil shall be constructed of copper tubes and aluminum fins.

(Option) The condensing unit shall be designed to operate at a sound level less than 58 dBA.

(Option) The outdoor condensing unit shall be designed for design ambient operation of 105°F (40.6°C).

(Option) The coils shall be phenolic-coated for extended coil life in coastal areas.

### 2.3 INDOOR WATER/GLYCOL-COOLED CONDENSING UNIT

The water/glycol condensing unit shall include a scroll compressor, high-pressure switch, coaxial condenser, water-regulating valve, hot gas bypass system and liquid line solenoid valve. The cabinet and chassis shall be constructed of heavy gauge galvanized steel, and shall be serviceable from one side. Mounting brackets shall be integral to the cabinet design and be designed for ceiling mounting.

The hot gas bypass circuit shall be provided to reduce compressor cycling and improve operation under low-load conditions. In split systems, the hot gas bypass shall be completely contained in the condensing unit. Field installed third refrigerant line shall not be acceptable. Hot gas bypass shall be automatically deactivated upon a call for dehumidification.

High pressure switch shall protect the unit from abnormal refrigerant pressure conditions and shall deactivate the compressor and annunciate an alarm at the wall controller. The blower shall continue to circulate air. The wall controller shall be used to manually restart the compressor function after the automatic pressure switch resets. Three high head pressure alarms in a rolling 12-hour period shall lock out the manual restart feature until power is cycled to the evaporator unit.

All components shall be factory-assembled, charged with R-407C refrigerant and sealed. No internal piping, brazing dehydration or charging shall be required.

The water/glycol condensing unit shall be equipped with a coaxial condenser having a total system pressure drop of \_\_\_\_\_ ft. of water (kPa) and a flow rate of \_\_\_\_\_ GPM (l/s) with \_\_\_\_\_ °F (°C) entering water/glycol temperature.

The condenser circuit shall be pre-piped with a [(2-way) (3-way)] regulating valve which is head-pressure actuated.

The condenser water/glycol circuit shall be designed for a static operating pressure of [(150PSI (1034kPa)) (350 PSI (2413kPa))].

## **2.4 FACTORY-INSTALLED OPTIONS**

### **2.4.1 Steam Generating Humidifier**

The Thermal Management system shall be equipped with a steam generating humidifier that is controlled by the microprocessor control system. It shall be complete with disposable canister, all supply and drain valves, 1" (25.4mm) air gap on fill line, inlet strainer, steam distributor and electronic controls. The need to change canister shall be annunciated on the wall-mounted controller. The humidifier shall have a capacity of 4.3 lb/hr (2.0 kg/h). An LED light on the humidifier assembly shall indicate cylinder full, overcurrent detection, fill system fault and end of cylinder life conditions. The canister flush water shall not drain into the coil drain pan, due to risk of aggressive corrosion of the evaporator coil. The humidifier wand shall be mounted over the coil drain pan.

### **2.4.2 Electric Reheat**

The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb temperature conditions when the system is calling for dehumidification. The reheat section shall include a UL-approved safety switch to protect the system from overheating. A ground current detector shall be factory installed to shut-down the entire unit if a ground fault in the reheat system is detected.

The capacity of the reheat coils shall be \_\_\_\_\_ BTU/HR (kW), with unit input voltage of \_\_\_\_\_ V, controlled in one stage.

### **2.4.3 Hot Water Reheat**

The hot water reheat coil shall have copper tubes and aluminum fins with a capacity of \_\_\_\_\_ BTU/HR (kW) when supplied with \_\_\_\_\_ °F (°C) entering water temperature at \_\_\_\_\_ GPM (l/s) flow rate. Maximum pressure drop shall be \_\_\_\_\_ PSI (kPa). The control system shall be factory prepiped with a 2-way solenoid valve and cleanable Y-strainer. The hot water reheat coil shall only be available on chilled water units.

### **2.4.4 SCR Electric Reheat**

The electric reheat shall be low-watt density, 304/304 stainless steel, finned-tubular and shall be capable of maintaining room dry bulb conditions when the system is calling for dehumidification. The reheat section shall include a UL-approved safety switch to protect the system from overheating. A ground current detector shall be factory installed to shut-down the entire unit if a ground fault in the reheat system is detected.

The SCR (Silicon Controlled Rectifier) controller shall proportionally control the reheat elements to maintain the selected room temperature. The rapid cycling made possible by the SCR controller provides precise temperature control, and the more constant element temperature improves heater life. The unit microprocessor control shall operate the SCR controller, while cooling is locked on. The capacity of the reheat coils shall be \_\_\_\_\_ BTU/HR (kW), with input voltage of \_\_\_\_\_ V. Not available on chilled water or free-cooling units.

#### **2.4.5 Disconnect Switch, Non-Locking**

The non-automatic, non-locking, molded case circuit interrupter shall be factory mounted in the high-voltage section of the electrical panel. The switch handle shall be accessible from the unit front and mounted on:

- \_\_\_\_\_ the evaporator/chilled water unit
- \_\_\_\_\_ the indoor air-cooled centrifugal condensing unit
- \_\_\_\_\_ the water/glycol condensing unit

#### **2.4.6 High-Temperature Sensor**

The high-temperature sensor shall immediately shut down the system when high temperatures (125°F, 51.7°C) are detected. The high-temperature sensor shall be mounted with the sensing element in the return air.

#### **2.4.7 Smoke Sensor**

The smoke sensor shall immediately shut down the Thermal Management system and activate the alarm system when activated. The sensing element shall be located in the return air compartment. This smoke sensor shall not function or replace any room smoke detection system that may be required by local or national codes.

#### **2.4.8 Filter Clog Switch**

The filter clog switch senses pressure drop across the filters and shall annunciate the controller upon exceeding the adjustable setpoint.

#### **2.4.9 Free-Cooling-Dual Cooling Coil**

A free-cooling coil shall be integral to the evaporator cabinet, and shall be constructed of copper tubes and aluminum fins. The coil shall be rated at \_\_\_\_\_ BTU/HR (kW) sensible cooling capacity with a 45°F (22°C), \_\_\_% glycol solution. The coil shall require \_\_\_\_\_ GPM (l/s) and the total unit pressure drop shall not exceed \_\_\_\_\_ feet of water (kPa) when in the free cooling mode. Free-cooling shall be activated by a temperature stat and shall include factory-piped three-way valve and separate supply and return piping.

Coil shall be designed for closed-loop applications using properly treated and circulated fluid. Not available with SCR reheat. An optional Cu-Ni coil shall be required to prevent premature corrosion if applied to open water tower loop.

A heat exchanger and pump shall be field-supplied to isolate the open water tower loop from the free-cooling loop.

### **2.5 SHIP-LOOSE ACCESSORIES**

#### **2.5.1 Remote Sensors**

The unit shall be supplied with remote temperature and humidity sensors. The sensors shall be connected to the unit by a \_\_\_\_\_ ft. (m) shielded cable.

### 2.5.2 Air Filter Box

The evaporator section shall be supplied with an air filter box for use with ducted installations. Two (2) filters shall be included 4" x 20" x 25" (102 mm x 508mm x 635mm) each, deep-pleated type, with a MERV 8 rating, based on ASHRAE 52.2-2007.

### 2.5.3 Air Distribution Plenum

The evaporator section shall be supplied with an air distribution plenum with integral filter. The plenum shall be 24" x 48" (610mm x 1219mm) in size and shall provide 3-way air distribution, for installation into a standard 24" x 48" (610mm x 1219mm) ceiling grid. Filter size shall be 4" x 16" x 25" (102 mm x 406mm x 535 mm), deep pleated type with MERV 8 rating, based on ASHRAE 52.2-2007.

### 2.5.4 High Static Blower Assembly

A blower box shall be field attached to the evaporator to provide up to 2.0" (51mm) of external static pressure on the discharge side of the evaporator. The blower box shall contain a centrifugal type, double inlet blower, with belt drive and single speed motor, mounted to an adjustable motor base.

### 2.5.5 Condensate Pump

The condensate pump shall have the capacity of \_\_\_\_\_ GPH (\_\_\_\_ l/h) at \_\_\_\_ ft. head (\_\_\_\_ kPa). It shall be complete with integral float switch, pump, motor assembly and reservoir. A secondary float switch on the condensate pump shall tie into the unit to provide an alarm on the wall-mounted controller and shut down the unit upon high water in the basin of the pump. Condensate pump shall be powered from the Liebert Mini-Mate2. A separate electrical feed is not acceptable.

### 2.5.6 Refrigerant Line Sets

Pre-charged refrigerant line sets shall be provided by Liebert in proper lengths for application. Line set length shall be [(15 ft. (4.5m)) (30 ft. (9m))], not to exceed 45 ft (13.5m) in total length.

### 2.5.7 Refrigerant Line Sweat Adapter Kit

A refrigerant line sweat adapter kit shall be provided to permit custom field piping lengths & quick connections between the evaporator and condensing unit.

### 2.5.8 Single Point Power Kit

A Single Point Power Kit shall be provided for a close-coupled system to allow a single electrical feed to supply power to both the evaporator and indoor close-coupled (attached) condensing unit.

### 2.5.9 Step-Down Transformer

A step-down transformer shall be provided for Outdoor Condensing Unit needing 277V input power voltage. The transformer shall be coated with epoxy and contained in an enclosed, non-ventilated electrical box with adaptable mounting brackets, suitable for outdoor mounting.

### 2.5.10 Remote Monitoring and Control—iCOM CMS and BMS

The Liebert iCOM CMS system shall provide hardware, Web Interface, Administration Portal, and Mobile Apps to remotely view, control, and monitor the Liebert Mini-Mate2 system. The CMS web card shall be field mounted with communications wiring routed from the Liebert Mini-Mate2 system to the CMS control board, low voltage power provided from the Liebert Mini-Mate2 unit, and Ethernet cable providing network access to the world-wide web or to a BMS if required. The iCOM CMS Mobile App shall provide real-time, read-only data from each Liebert Mini-Mate2 registered and wired to an iCOM CMS system. Notifications shall be provided via SMS text message or email to each registered User who has been added to the Administration portal and assigned to receive alarm notifications from a unit. BMS protocols available on iCOM CMS shall be BACnet IP, BACnet MSTP, Modbus TCP/IP, and Modbus RTU.

The iCOM CMS Web Interface shall be used to register systems to the Mobile Cloud, remotely access unit-level display settings via a web URL which shall provide read/write capability to the Liebert Mini-Mate2 system for setpoints, alarms, sensor calibration and other settings found on the unit level display.

### **2.5.11 Liebert® SiteScan® Site Monitoring System**

A Liebert SiteScan Site Monitoring System Model \_\_\_\_\_ shall be provided for remote monitoring of the Liebert Mini-Mate2 unit and monitoring of other Liebert support equipment. The Liebert SiteScan shall have the capability to monitor and change (at the user direction) the temperature and humidity setpoints and sensitivities of each unit. The printer shall provide the user with chronological alarm information. It shall also be capable of being programmed to print out environmental conditions or operating modes at each unit.

### **2.5.12 Drycooler**

The Liebert® drycooler shall be a low-profile, direct-drive propeller fan-type air-cooled unit. The drycooler shall be constructed with an aluminum cabinet and a copper-tube aluminum fin coil and multiple direct drive fans. All electrical connections and controls shall be enclosed in an integral weather resistant electric control panel section of the drycooler. The unit is quiet and corrosion-resistant.

The drycooler shall be designed for \_\_\_\_\_°F (°C) ambient.

### **2.5.13 Glycol Pump Package**

The system shall include a centrifugal pump mounted in a weatherproof and vented enclosure. The pump shall be rated for \_\_\_\_\_ gpm (l/s) at \_\_\_\_\_ ft. (kPa) of head, and operate on \_\_\_\_\_ volt, \_\_\_\_\_ phase, \_\_\_\_\_ Hz.

## **3.0 EXECUTION**

### **3.1 INSTALLATION OF AIR CONDITIONING UNIT**

#### **3.1.1 General**

Install air conditioning unit in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.

#### **3.1.2 Electrical Wiring**

Install and connect electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's electrical connection diagram submittal to electrical contractor. Install and wire per local and national codes.

#### **3.1.3 Piping Connections**

Install and connect devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's piping connection diagram submittal to piping contractor.

#### **3.1.4 Supply and Drain Water Piping**

Connect water supply and drains to air conditioning unit. Unit drain shall be trapped internally.

#### **3.1.5 Field-Supplied Pan**

A field-supplied pan with drain shall be installed beneath cooling units installed without air distribution plenum and beneath water/glycol condensing units..

### **3.2 FIELD QUALITY CONTROL**

Startup air conditioning unit in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements.







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