



**Liebert®**

## Mini-Mate2™ Thermal Management System

System Design Catalog

2-ton and 3-ton (7-kW and 10.5-kW) Capacity, Air, Water, Glycol, Chilled Water; 50 and 60 Hz

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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 site 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 control the temperature and humidity required for computers and other sensitive electronic equipment. The Liebert® Mini-Mate2 provides complete control on an around-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 cooled, water cooled 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.

### 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.

## 1.2 Agency Listed

Standard 60-Hz 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.



## 2 FEATURES AND OPTIONS

### 2.1 Standard Features

#### 2.1.1 Evaporator Section—Split Systems

The Mini-Mate2 systems consist of an evaporator section matched with an outdoor air-cooled condensing unit, indoor air-cooled condensing unit or indoor water/glycol-cooled condensing unit. The system is also available as a self-contained chilled water unit. Unit insulation meets ASHRAE 62.1 requirements for Mold Growth, Humidity & Erosion, tested per UL 181 and ASTM 1338 standards.

The evaporator unit includes an evaporator coil, filter drier, factory-mounted disconnect switch, two-speed direct drive blower assembly, and microprocessor control with wall-mounted display panel. The unit is provided with supply air and return air openings for field supplied ducting or supply/return plenum. Evaporators are designed for R-407C refrigerant and can be configured with canister humidifier and/or reheat. An indoor or outdoor condensing unit must be selected for each evaporator. Suction and liquid lines are spun closed, and filled with an inert gas holding charge.

#### 2.1.2 Condensing Unit Section—Split Systems

##### Outdoor Air Cooled Prop Fan Condensing Units

The outdoor prop fan condensing unit includes scroll compressor, condenser coil, propeller fan, liquid line solenoid valve, high pressure switch, Liebert® Lee-Temp head pressure control, and hot gas bypass. The condensing unit is designed for R-407C refrigerant and operates in outdoor locations at ambient temperatures ranging from -30°F to 95°F (-34°C to 35°C). Suction and liquid lines are spun closed, and filled with an inert gas holding charge.

##### Indoor Air Cooled Condensing Units

Indoor, air cooled, centrifugal fan condensing units include scroll compressor, condenser coil, factory-mounted disconnect switch, 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 for R-407C refrigerant and will operate with outdoor air temperatures ranging from -30°F to 95°F (-34°C to 35°C). Suction and liquid lines are spun closed, and filled with an inert gas holding charge.

##### Indoor Water/Glycol Cooled Condensing Units

Indoor Water/Glycol Condensing Units include scroll compressor, factory-mounted disconnect, coaxial condenser, hot gas bypass, high head-pressure switch, and two-way water/glycol regulating valve designed for 150 psi (1034.3 kPa). Condensing unit is designed for R-407C refrigerant and can be used on a water or glycol cooling loop. Suction and liquid lines are spun closed, and filled with an inert gas holding charge.

#### 2.1.3 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 and 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 300 psi (2068 kPa), 60 psi (414 kPa) close off differential.

## 2.1.4 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, shielded thermostat wire (field supplied). The temperature and humidity sensors are in the wall box, which can be installed up to 300 ft (91.4 m) from the evaporator unit when using a remote temperature/humidity sensor in the conditioned space. The unit-mounted control board also includes common alarm terminals and shut-down terminals. The unit automatically restarts after a power outage.

**Figure 2.1 Wall Box**



### Other Standard Control Features

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

## 2.1.5 Sensors and Switches

**High Temperature Sensor** senses the return air temperature and shuts down the 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.

**Filter Clog** senses pressure drop across the filter 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.

**Non-Fused Disconnect Switch** allows unit to be turned off for maintenance and is factory installed on evaporators, chilled water units, and indoor condensing units.



## 2.2 Optional Factory Installed Features

### 2.2.1 Evaporator/Chilled Water Unit Options

#### Reheat

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

**SCR Electric Reheat** provides tight temperature control by rapidly pulsing the 304/304 stainless steel reheat elements in small increments. A solid state relay is factory installed and wired to the microprocessor control. The compressor is locked on, with the reheat modulated to track the load. Reheat capacity is up sized to offset the cooling capacity. (The SCR Electric Reheat is not available on chilled water, free cooling, or 575-V units)

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

**NOTE: Hot water reheat is available only on chilled water units, but not with other reheat options.**

#### Humidifier

The **Canister Humidifier** includes a steam generating type humidifier with automatic flushing circuit, inlet strainer, drain, 1-in. (25.4-mm) 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.

#### 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.

#### Motors

**Direct Drive Blower** can be factory eliminated from the evaporator/chilled water cabinet for high static applications (0.9 to 1.5 in. [23 to 38 mm] w.g.). See [Ship Loose Accessories—Field Installed](#) on page 7 for the optional, externally mounted, high static blower assembly.

#### Liebert® IS-UNITY-DP BMS Monitoring Solution

The IS-UNITY-DP card is a factory installed option, providing full building management system (BMS) access via BACnet/Modbus IP and BACnet/Modbus 485. Card provides access and supports SNMP v1/v2c/v3 & Liebert® Nform™. The card is factory installed in a unit mounted external enclosure and is factory wired for communication to and powered from the Liebert® Mini-Mate2 unit. Field wiring to other systems required to access features.

## 2.2.2 Free Cooling for Evaporator Units

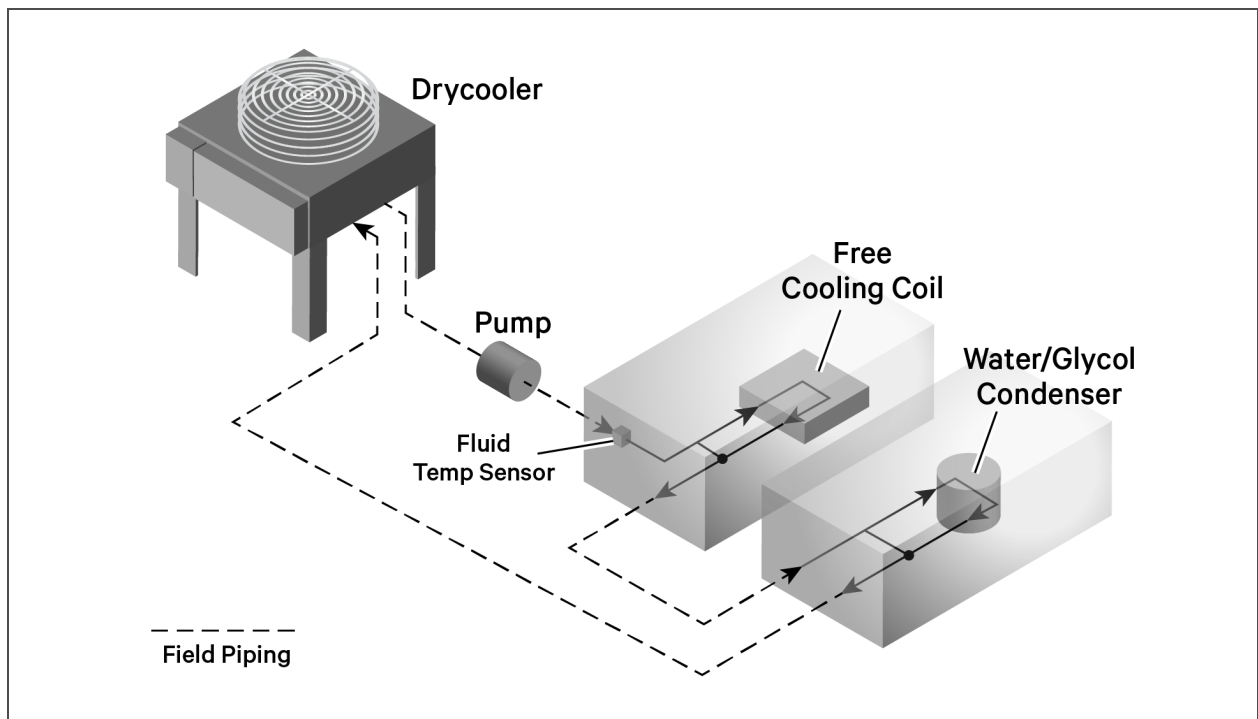
The free cooling option includes separate cooling coil, three-way slow-close valve, and separate supply and return piping. Free cooling is activated when the water temperature reaches a field adjustable temperature, typically 45°F (7°C). The valve is rated for 300 psi (2068 kPa) working pressure.

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 free cooling sources, such as external chilled water or glycol from a drycooler loop. The coil is designed for closed loop applications using properly treated and circulated fluid. Not available with SCR reheat options.

Figure 2.2 below, shows how a second cooling coil takes advantage of colder outdoor temperatures and bypasses compressor operation when using a drycooler loop. When the glycol temperature drops below the set threshold, cooling switches from compressor to free cooling operation.

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

Figure 2.2 Free Cooling Arrangement



## 2.2.3 Optional Configurations—Prop Fan Condensing Units

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

- High ambient models for providing catalog capacities at ambient temperatures up to 105°F (40°C).
- Liebert® 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 epoxy coated with UV topcoat at the factory for extended coil life in corrosive environments, such as coastal areas.

## 2.2.4 Optional Configurations—Water/Glycol Condensing Units

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

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

## 2.2.5 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.

## 2.3 Ship Loose Accessories—Field Installed

A **High Static Blower Assembly** can be field attached to the evaporator to provide up to 2.0 in. (51 mm) 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) filters (20-in. x 20-in. x 4-in. [508-mm x 508-mm x 102-mm]), and a duct flange for the supply air opening of the unit.

**Air Distribution Plenum** includes molded plastic, three-way discharge plenum, 16-in. x 25-in. x 4-in. (406-mm x 535-mm x 102-mm) 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 outside the cabinet, wired to the unit power block, and equipped with a discharge 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 mounted or duct mounted. Remote sensors must 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.**

**277 V to 208 V 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.

**Singlepoint Power Kit** contains the necessary electrical components to interconnect the high voltage sections of a close coupled evaporator and an indoor condensing unit.

### 2.3.1 Remote Monitoring, Auto Changeover, and Leak Detection Equipment

The **IS-UNITY-DP BMS Monitoring Solution** provides full building management system (BMS) access via BACnet/Modbus IP and BACnet/Modbus 485. Card provides access and supports SNMP v1/v2c/v3 and Liebert® Nform™. The unit mount kit for field installation includes the IS-UNITY-DP card, power/communication interface card, enclosure, all required power and communication wires to the Liebert® Mini-Mate2 unit, and full instructions. Field supplied wiring to other systems required to access features. The wall mount kit for field installation includes the IS-UNITY-DP card, power/communication interface card, painted enclosure, 120 V wall outlet transformer with 6-ft (2-m) low voltage power wire, and full instructions. Field supplied wiring for communication to Liebert® Mini-Mate2 and to other systems is required to access features.

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 24 VAC or 24 VDC power source. Power supply is not included.

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 24 VAC, 3 A) signal a leak detected as well as loss of power and cable fault. The Liebert® Liqui-tect 410 requires an external 24 VAC or 24 VDC power source.

**Liebert® Liqui-tect™ 460 Zone Leak Detection Kits** include one LT460 sensor, a specified length of LT500-xxY cable (maximum length is 100 ft [30.5 m]) and a corresponding number of hold down clips. The Liebert® LT460 requires an external 24-VAC, 0.12-A 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® thermal management 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.

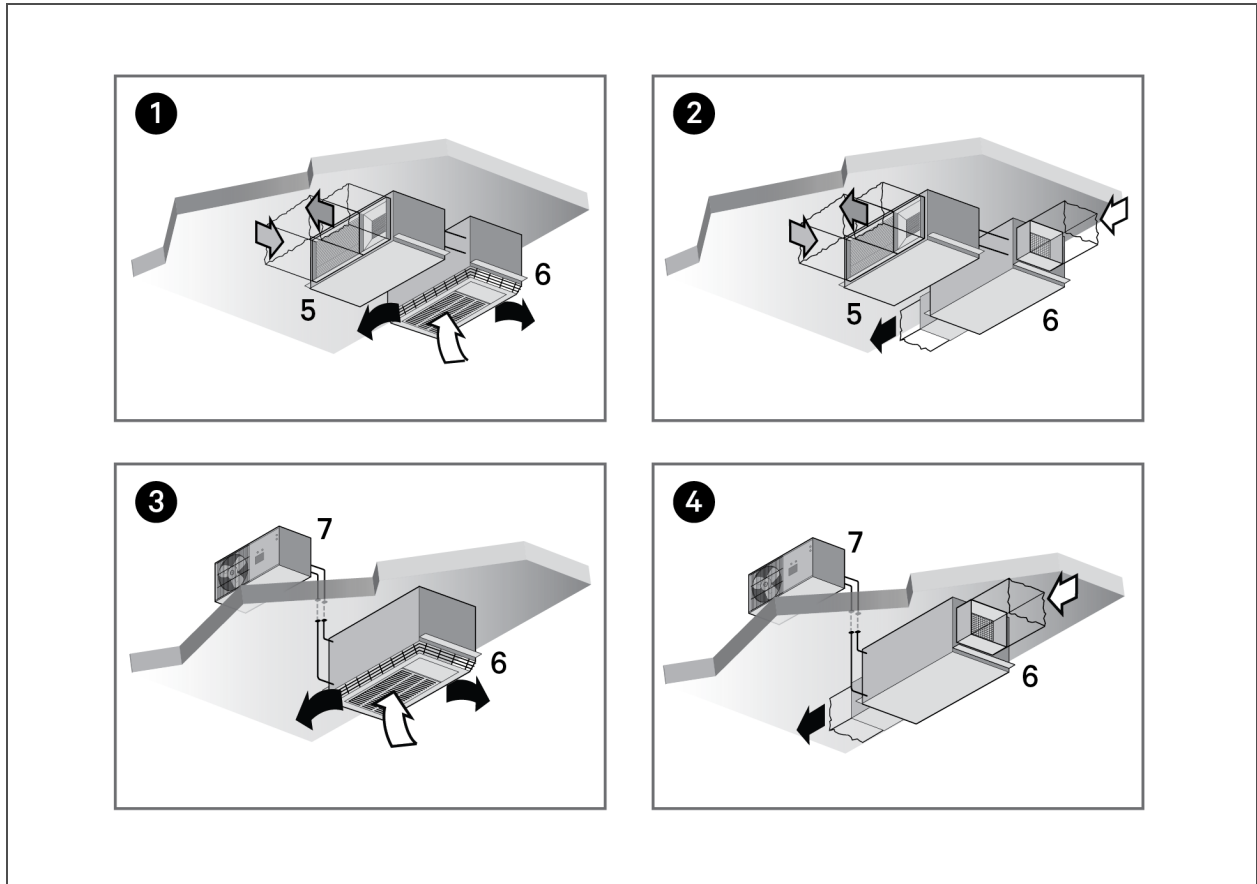
### 3 NOMENCLATURE

This section describes the model number configuration for Liebert® Mini-Mate2 units and components.

#### 3.1 System Configurations

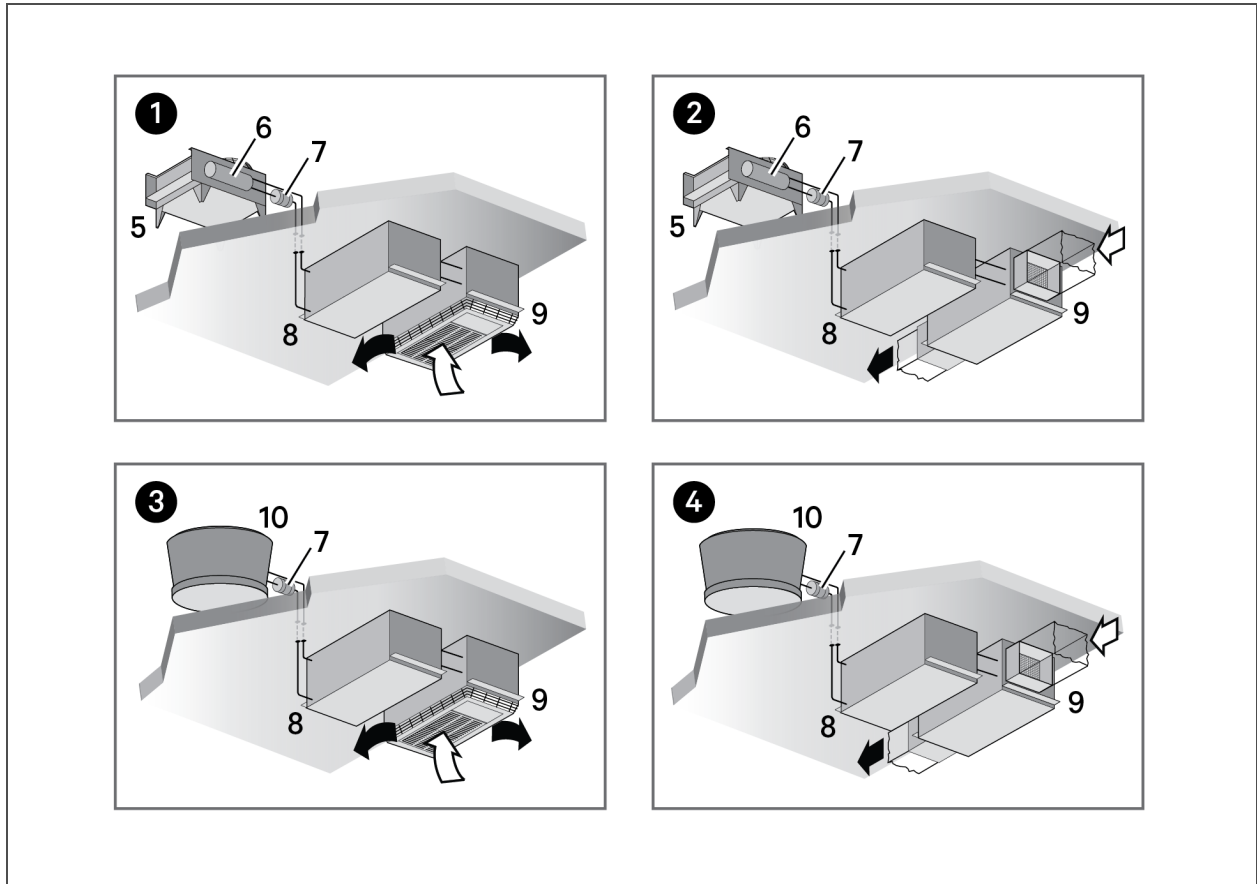
The following figures show the available capacity and cooling options for the Liebert® Mini-Mate2.

Figure 3.1 Air Cooled Units



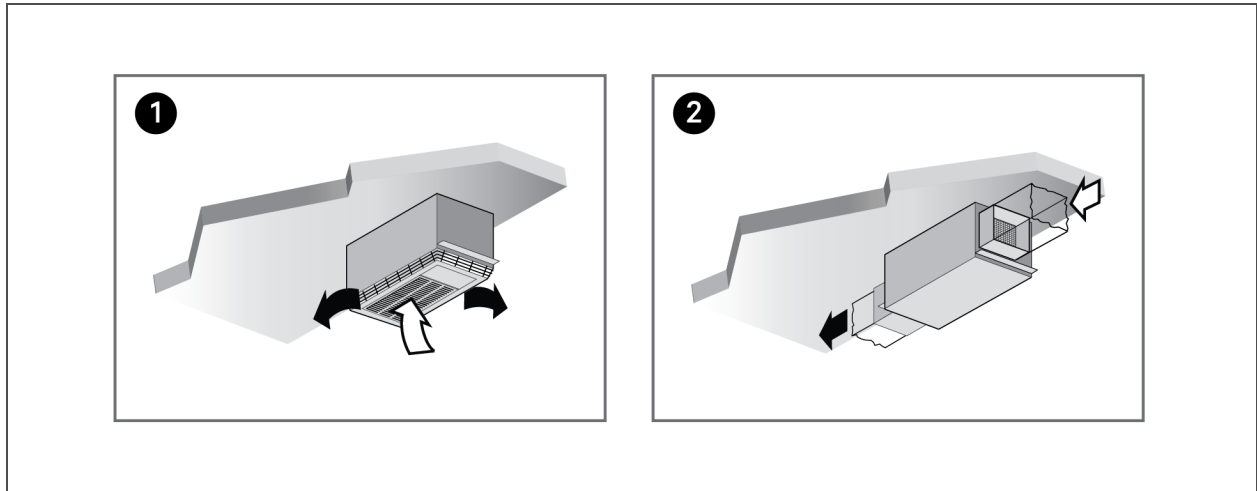
Item	Description
1	Split system (indoor condensing unit) with supply/return air plenum
2	Split system (indoor condensing unit) with ducted supply/return air
3	Split system (outdoor condensing unit) with supply/return air plenum
4	Split system (outdoor condensing unit) with ducted supply/return air
5	Indoor condensing unit
6	Evaporator
7	Outdoor condensing unit

Figure 3.2 Water/Glycol Cooled Units



Item	Description	Item	Description
1	Split system glycol cooled with supply/return air plenum	6	Expansion tank
2	Split system glycol-cooled with ducted supply/return air	7	Pump
3	Split system water-cooled with supply/return air plenum	8	Water/Glycol condensing unit
4	Split system water cooled with ducted supply/return air	9	Evaporator
5	Drycooler	10	Cooling tower

Figure 3.3 Chilled Water Units



Item	Description
1	Chilled water cooled with supply/return air plenum
2	Chilled water cooled with ducted supply/return air

## 3.2 Nomenclature for Evaporator and Chilled Water Units

Table 3.2 below describes each digit of the model number.

Table 3.1 Nomenclature Example

1	2	3	4	5	6	7	8	9	10	11	12
M	M	D	3	6	E	N	P	R	E	D	5

Table 3.2 Nomenclature Digit Definitions for Evaporator and Chilled Water Units

Digit	Description
Digits 1 and 2 = the base unit	MM = Mini-Mate2
Digit 3 = Disconnect	D = Disconnect switch
Digit 4 and 5 = Nominal Capacity	24 = 24 kBtuh, 60 Hz evaporator 35 = 35 kBtuh, 50 Hz evaporator 36 = 36 kBtuh, 60 Hz evaporator 39 = 39 kBtuh, 3 Ton, 50 Hz, chilled water 40 = 40 kBtuh, 3 Ton, 60 Hz, chilled water
Digit 6 = Cooling type	C = Chilled water cooled E = Split system evaporator (See <a href="#">Nomenclature for Split System Condensing units</a> on page 14.) K = Split system evaporator with free cooling (See <a href="#">Nomenclature for Split System Condensing units</a> on page 14.)
Digit 7 = Refrigerant/Valve type	N = R-407C field-supplied 2 = 2-way standard pressure chilled water valve 3 = 3-way standard pressure chilled water valve
Digit 8 = Supply power	A = 460 V / 3 ph / 60 Hz (3 ton capacity only) M = 380/415 V / 3 ph / 50 Hz (3 ton capacity only) P = 208/230 V / 1 ph / 60 Hz S = 220 V / 1 ph / 50 Hz (3 ton capacity only) Y = 208/230 V / 3 ph / 60 Hz (3 ton capacity only) X = 277 V / 1 ph / 60 Hz
Digit 9 = Humidification	R = Remote Humidifier Contact (without canister humidifier) J = Canister Humidifier and Remote Humidifier Contact
Digit 10 = Reheat	0 = No reheat E = Electric reheat S = SCR reheat (for DX evaporator without free cooling option) H = Hot-water reheat (chilled water systems only)



**Table 3.2 Nomenclature Digit Definitions for Evaporator and Chilled Water Units (continued)**

Digit	Description
Digit 11 = Blower type  D = Direct drive internal blower  B = Belt drive external blower	
Digit 12 = Sensor packages  N = Base package of filter clog and high temperature sensor  2 = Smoke sensor + Base package  4 = IS-UNITY-DP (BMS) + Base Package  5 = IS-UNITY-DP (BMS) + Smoke sensor + Base package	

### 3.3 Nomenclature for Split System Condensing units

This section describes the model number configuration for Mini-Mate2 split system condensing units.

#### 3.3.1 Indoor Condensing Units for Air Cooled Split Systems

Table 3.4 below describes each digit of the model number.

Table 3.3 Indoor, Air Cooled Condensing Unit Nomenclature Example

1	2	3	4	5	6	7	8	9	10
M	C	D	3	6	A	L	A	H	N

Table 3.4 Nomenclature Digit Definitions for Indoor, Air Cooled Condensing Units

Digit	Description
Digits 1 to 2 = the base unit	MC = Mini-Mate2 condensing unit
Digit 3 = Disconnect	D = Disconnect switch
Digit 4 and 5 = Nominal Capacity	24 = 24 kBtuh, 60 Hz 35 = 35 kBtuh, 50 Hz 36 = 36 kBtuh, 60 Hz
Digit 6 = Cooling type	A = Air cooled
Digit 7 = Head pressure control	L = Liebert® Lee-Temp™ Receiver
Digit 8 = Supply power	A = 460 V / 3 ph / 60 Hz (3 ton capacity only) M = 380/415 V / 3 ph / 50 Hz (3 ton capacity only) P = 208/230 V / 1 ph / 60 Hz S = 220 V / 1 ph / 50 Hz (3 ton capacity only) X = 277 V / 1 ph / 60 Hz Y = 208/230 V / 3 ph / 60 Hz (3 ton capacity only)
Digit 9 = Hot gas bypass	H = Hot-gas bypass
Digit 10 = Refrigerant	N = R-407C field charged

### 3.3.2 Outdoor Prop Fan Condensing Units for Air Cooled Split Systems

Table 3.6 below describes each digit of the model number.

**Table 3.5 Prop-fan Condensing Unit Nomenclature Example**

1	2	3	4	5	6	7	8	9	10	11
P	F	H	0	3	7	A	—	P	L	N

**Table 3.6 Nomenclature Digit Definitions for Outdoor, Prop Fan Condensing Units**

Digit	Description
Digits 1 to 3 = the base unit	PFH = Prop fan condensing unit with hot gas bypass
Digit 4 = Sound level	0 = Standard Z = Quiet-Line
Digit 5 and 6 = Nominal Capacity	27 = 27 kBtuh, 60 Hz 36 = 36 kBtuh, 50 Hz 37 = 37 kBtuh, 60 Hz
Digit 7 = Cooling type	A = Air cooled
Digit 8 = Coil type	— = Standard coil C = Coated coil (epoxy with UV topcoat)
Digit 9 = Supply power	A = 460 V / 3 ph / 60 Hz (3 ton capacity only) B = 575 V / 3 ph / 60 Hz (3 ton capacity only, Quiet-Line not available) M = 380/415 V / 3 ph / 50 Hz (3 ton capacity only) P = 208/230 V / 1 ph / 60 Hz S = 220 V / 1 ph / 50 Hz (3 ton capacity only) Y = 208/230 V / 3 ph / 60 Hz (3 ton capacity only)
Digit 10 = Ambient rating/Control	L = 95°F Ambient, Liebert® Lee-Temp™ H = 105°F Ambient, Liebert® Lee-Temp™
Digit 11 = Refrigerant	N = R-407C field charged

### 3.3.3 Water/Glycol Cooled Condensing Units

Table 3.8 below describes each digit of the model number.

**Table 3.7 Remote, Indoor Water/Glycol Condensing Unit Nomenclature Example**

1	2	3	4	5	6	7	8	9	10
M	C	D	3	8	W	2	A	H	N

**Table 3.8 Nomenclature Digit Definitions for Indoor, Water/Glycol Cooled Condensing Units**

Digit	Description
Digits 1 to 2 = the base unit	MC = Mini-Mate2 condensing unit
Digit 3 = Disconnect	D = Disconnect switch
Digit 4 and 5 = Nominal Capacity	26 = 26 kBtu/h, 2 ton, 60 Hz 37 = 37 kBtu/h, 3 ton, 50 Hz 38 = 38 kBtu/h, 3 ton, 60 Hz
Digit 6 = Cooling type	W = Water/Glycol-cooled
Digit 7 = Head-pressure control	2 = 2-way standard pressure fluid regulating valve 3 = 3-way standard pressure fluid regulating valve D = 2-way high pressure fluid regulating valve T = 3-way high pressure fluid regulating valve
Digit 8 = Supply power	A = 460 V / 3 ph / 60 Hz (3 ton capacity only) M = 380/415 V / 3 ph / 50 Hz (3 ton capacity only) P = 208/230 V / 1 ph / 60 Hz S = 220 V / 1 ph / 50 Hz (3 ton capacity only) X = 277 V / 1 ph / 60 Hz Y = 208/230 V / 3 ph / 60 Hz (3 ton capacity only)
Digit 9 = Hot-gas bypass	H = Hot gas bypass
Digit 10 = Refrigerant	N = R-407C field charged

## 4 SYSTEM DATA

### 4.1 Air Cooled Systems—Capacity and Performance Data

Table 4.1 Air Cooled Data, 60Hz

Evaporator Model		MMD24E or MMD24K		MMD36E or MMD36K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor	PFH - Outdoor	MCD - Indoor
<b>DX Evaporator-Net Capacity Data - kW (Btuh) @ High Speed CFM</b>					
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)
<b>Fan Data - Evaporator</b>					
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)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>					
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 (16,040)	5.6 (19,100)	4.7 (16,040)	7.9 (27,000)
Input Voltage 230-1-60		5.8 (19,800)	6.8 (23,200)	5.8 (19,800)	9.5 (32,400)
Input Voltage 277-1-60		6.3 (21,500)	7.3 (24,900)	6.3 (21,500)	10.3 (35,200)
Input Voltage 208-3-60		N/A		5.6 (19,100)	7.9 (27,000)
Input Voltage 230-3-60				6.8 (23,200)	9.5 (32,400)
Input Voltage 460-3-60				7.3 (24,900)	10.3 (35,200)
<b>Humidifier Data - Steam Generator Type</b>					
Steam capacity, lb/hr (kg/hr)		4.3 (2.0)		4.3 (2.0)	
Electrical Input Power, kW		1.5		1.5	

**Table 4.1 Air Cooled Data, 60Hz (continued)**

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K	
Condensing Unit Type	PFH - Outdoor	MCD - Indoor	PFH - Outdoor	MCD - Indoor
<b>Evaporator Connection Sizes</b>				
Liquid line Diameter, O.D. Cu	3/8"		3/8"	
Suction Line Diameter, O.D. Cu	7/8"		7/8"	
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	PFH027A-_LN	MCD24AL_HN	PFH037A-_LN	MCD36AL_HN
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)
<b>Condensing Unit Connection Sizes</b>				
Liquid line Diameter, O.D. Cu	3/8"	3/8"	3/8"	3/8"
Suction Line Diameter, O.D. Cu	5/8"	5/8"	3/4"	7/8"
<b>Free Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F (7.2°C) EWT</b>				
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)	
<b>Free Cooling Coil - Copper Tube/Aluminum Fin</b>				
Face Area, ft <sup>2</sup> (m <sup>2</sup> )	3.1 (0.28)		3.1 (0.28)	
Coil Rows	3		3	

**Table 4.1 Air Cooled Data, 60Hz (continued)**

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K	
	PFH - Outdoor	MCD - Indoor	PFH - Outdoor	MCD - Indoor
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)	
Free-cooling Coil supply/return connections, in. O.D. Cu	7/8		7/8	

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 4.2 Air Cooled Data, 50Hz

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Type		PFH - Outdoor	MCD - Indoor
<b>DX Evaporator- Net Capacity Data - kW (Btuh) @ High Speed CFM</b>			
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)
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)
<b>Fan Data - Evaporator</b>			
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)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>			
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)	
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
Input Voltage 220-1-50		5.3 (18,090)	
Input Voltage 380-3-50		7.3 (24,900)	
<b>SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
Input Voltage 220-1-50		8.7 (29,700)	
Input Voltage 380-3-50		10.3 (35,100)	
<b>Humidifier Data - Steam Generator Type</b>			
Steam capacity lb/hr (kg/hr)		4.3 (2.0)	
Electrical Input Power, kW		1.5	
<b>Evaporator Connection Sizes</b>			
Liquid line Diameter, O.D. Cu		3/8"	
Suction Line Diameter, O.D. Cu		7/8"	
Humidifier Supply		1/4" OD Copper Compression Fitting	
Evaporator/Condensate Drain		3/4" NPT-Female	



**Table 4.2 Air Cooled Data, 50Hz (continued)**

Evaporator Model	MMD35E or MMD35K	
Condensing Unit Type	PFH - Outdoor	MCD - Indoor
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_LN	MCD35AL_HN
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)
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)
<b>Condensing Unit Connection Sizes</b>		
Liquid line Diameter, O.D. Cu	3/8"	3/8"
Suction Line Diameter, O.D. Cu	3/4"	7/8"
<b>Free Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F (7.2°C) EWT</b>		
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)	
<b>Free Cooling Coil - Copper Tube/Aluminum Fin</b>		
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)	
Free-cooling Coil supply and return connections, in. O.D. Cu	7/8	
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%.		

## 4.2 Water/Glycol Cooled Systems—Capacity and Performance Data

Table 4.3 Water/Glycol Cooled Data, 60Hz

Evaporator Model		MMD24E or MMD24K		MMD36E or MMD36K	
		Water Cooled	Glycol Cooled	Water Cooled	Glycol Cooled
<b>DX Evaporator - Net Capacity Data - kW (Btuh) @ High Speed CFM</b>					
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)
<b>Fan Data - Evaporator</b>					
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)	
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>					
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 (16,040)	5.6 (19,100)	4.7 (16,040)	7.9 (27,000)
Input Voltage 230-1-60		5.8 (19,800)	6.8 (23,200)	5.8 (19,800)	9.5 (32,400)
Input Voltage 277-1-60		6.3 (21,500)	7.3 (24,900)	6.3 (21,500)	10.3 (35,200)
Input Voltage 208-3-60		N/A	N/A	5.6 (19,100)	7.9 (27,000)
Input Voltage 230-3-60				6.8 (23,200)	9.5 (32,400)
Input Voltage 460-3-60				7.3 (24,900)	10.3 (35,200)
<b>Humidifier Data - Steam Generator Type</b>					
Steam capacity - lb/hr (kg/hr)		4.3 (2.0)		4.3 (2.0)	
Electrical Input Power, kW		1.5		1.5	
<b>Evaporator Connection Sizes</b>					
Liquid line Diameter, O.D. Cu		3/8"		3/8"	

**Table 4.3 Water/Glycol Cooled Data, 60Hz (continued)**

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K		
	Water Cooled	Glycol Cooled	Water Cooled	Glycol Cooled	
Suction Line Diameter, O.D. Cu	7/8"		7/8"		
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)		
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	
Water/Glycol Connection Sizes, in. O.D. Cu	7/8		7/8		
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)		
<b>Condensing Unit Connection Sizes</b>					
Liquid line Diameter, O.D. Cu	3/8"		3/8"		
Suction Line Diameter, O.D. Cu	5/8"		7/8"		
<b>Free Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F (7.2°C) EWT</b>					
Entering Fluid Conditions		45°F (7.2°C) EWT	45°F (7.2°C) EGT - 40% PG	45°F (7.2°C) EWT	45°F (7.2°C) 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)	7.90 (26,900)
	Sensible	6.60 (22,600)	5.85 (19,900)	9.05 (30,800)	7.90 (26,900)
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)	6.70 (22,800)
	Sensible	5.55 (18,900)	4.90 (16,800)	7.60 (25,900)	6.70 (22,800)
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)	6.00 (20,400)
	Sensible	4.85 (16,600)	4.35 (14,900)	6.70 (22,900)	6.00 (20,400)
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)
<b>Free Cooling Coil - Copper Tube/Aluminum Fin</b>					
Face Area, ft <sup>2</sup> (m <sup>2</sup> )		3.1 (0.28)		3.1 (0.28)	

**Table 4.3 Water/Glycol Cooled Data, 60Hz (continued)**

Evaporator Model	MMD24E or MMD24K		MMD36E or MMD36K	
	Water Cooled	Glycol Cooled	Water Cooled	Glycol Cooled
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)	
Free-cooling Coil supply and return connections, in. O.D. Cu	7/8		7/8	

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 4.4 Water/Glycol Cooled Data, 50Hz**

Evaporator Model	MMD35E or MMD35K		
	Condensing Unit Fluid	Water Cooled	Glycol Cooled
<b>DX Evaporator - Net Capacity Data - kW (Btuh) @ High Speed CFM</b>			
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)
<b>Fan Data - Evaporator</b>			
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)		
<b>Evaporator Coil - Copper Tube/Aluminum Fin</b>			
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)		
<b>Electric Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
Input Voltage 220-1-50	5.3 (18,090)		
Input Voltage 380-3-50	7.3 (24,900)		

**Table 4.4 Water/Glycol Cooled Data, 50Hz (continued)**

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Fluid		Water Cooled	Glycol Cooled
<b>SCR Reheat Capacity (Includes Fan Motor)-kW (Btuh)</b>			
Input Voltage 220-1-50		8.7 (29,700)	
Input Voltage 380-3-50		10.3 (35,100)	
<b>Humidifier Data - Steam Generator Type</b>			
Steam capacity - lb/hr (kg/hr)		4.3 (2.0)	
Electrical Input Power, kW		1.5	
<b>Evaporator Connection Sizes</b>			
Liquid line Diameter, O.D. Cu		3/8"	
Suction Line Diameter, O.D. Cu		7/8"	
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)	
<b>Condensing Unit Model Number</b>		MCD37W	
Condenser Fluid Requirements		85°F (29.4°C) EWT	110°F (43.3°C) EGT - 40% PG
THR - kW (Btuh) @ 75F/45%RH		14.0 (47,800)	13.2 (44,900)
Flow Rate, GPM (l/m)		6.6 (25.0)	11.9 (45.1)
Pressure Drop, ft. of H2O (kPa)		11.9 (35.6)	43.2 (129.2)
Water-Cooled Condensing Temperature		105°F (40.6°C)	N/A
Water/Glycol Connection Sizes, in. O.D. Cu		7/8	
Unit Volume, Gal (l)		1.2 (4.5)	
Unit Refrigerant Charge, oz. (kg)		54 (1.54)	
Unit Operating Weight, lb. (kg)		220 (100)	
<b>Condensing Unit Connection Sizes</b>			
Liquid line Diameter, O.D. Cu		3/8"	
Suction Line Diameter, O.D. Cu		7/8"	
<b>Free Cooling Coil Option Net Capacity Data - kW (Btuh) using 45°F (7.2°C) EWT</b>			
Entering Fluid Conditions		45°F (7.2°C) EWT	45°F (7.2°C) 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)

**Table 4.4 Water/Glycol Cooled Data, 50Hz (continued)**

Evaporator Model		MMD35E or MMD35K	
Condensing Unit Fluid		Water Cooled	Glycol Cooled
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)
<b>Free Cooling Coil - Copper Tube/Aluminum Fin</b>			
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)	
Free Cooling Coil Supply and Return Connections, in. O.D. Cu		7/8	
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%.			

### 4.3 Chilled Water Systems—Capacity and Performance Data

Table 4.5 Chilled Water Cooled Data, 60Hz and 50Hz

CW Model, 50 and 60 Hz		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 (16,040)
Input Voltage 230-1-60		5.8 (19,800)
Input Voltage 277-1-60		6.3 (21,500)
Input Voltage 208-3-60		5.6 (19,100)
Input Voltage 230-3-60		6.8 (23,200)
Input Voltage 460-3-60		7.3 (24,900)
Input Voltage-220-1-50		5.3 (18,090)
Input Voltage-380-3-50		7.3 (24,900)

**Table 4.5 Chilled Water Cooled Data, 60Hz and 50Hz (continued)**

CW Model, 50 and 60 Hz	MMD40C/MMD39C
<b>Hot Water Reheat Coil - Copper Tube/Aluminum Fin</b>	
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)
Face Area ft <sup>2</sup> (m <sup>2</sup> )	3.1 (0.29)
Coil Rows	1
HWRH supply and return connections, in. O.D. Cu	5/8
<b>Humidifier Data - Steam Generator Type</b>	
Steam capacity - lb/hr (kg/hr)	4.3 (2.0)
Electrical Input Power, kW	1.5
<b>Unit Connection Sizes</b>	
CW supply and return connections, in. O.D. Cu	7/8
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 4.6 Capacity Correction Factors (Based on 10°F (5.6°C) Water Rise)**

Return Air Conditions	72°F (22.2°C) /50% RH		75°F (23.9°C) /45%RH	
Entering Water Temperature	Total	Sensible	Total	Sensible
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

## 4.4 Planning Dimensions

The unit dimensions are described in the submittal documents included in the [Submittal Drawings](#) on page 53.

The following table lists the relevant documents by number and title.

**Table 4.7 Dimension Planning Drawings**

Document Number	Title
<b>Split-system Evaporators/Chilled Water Units</b>	
DPN000193	Evaporator/Chilled Water Unit and Filter Box Option Dimensions, All Direct Drive Blower Units
DPN000194	Evaporator/Chilled Water Unit Dimensions, All Belt Drive Blower Units
<b>Outdoor Condensing Units</b>	
DPN004418	Cabinet Dimensions, Prop Fan Condensing Unit with Horizontal Air Discharge
DPN003094	Optional Anchorage Plan, Prop Fan Condensing Unit with Horizontal Air Discharge
<b>Indoor Condensing Units</b>	
DPN004420	Cabinet Dimensions, Air Cooled Units
DPN004421	Cabinet Dimensions, Water/Glycol Cooled Units

## 5 ELECTRICAL DATA

### 5.1 Evaporators and Chilled Water Units Electrical Data

Table 5.1 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	
	MMD24E	MMD36E MMD40C	MMD24E	MMD36E MMD40C	MMD24E	MMD36E MMD40C	MMD24E	MMD36E MMD40C
<b>Cooling Only</b>								
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
<b>with Electric Reheat</b>								
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
<b>with SCR Reheat<sup>3</sup></b>								
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
<b>with Humidifier</b>								
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
<b>with Electric Reheat and Humidifier</b>								
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
<b>with SCR Reheat<sup>3</sup> and Humidifier</b>								
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
<b>Notes:</b>								
1. For units with Hot Water Reheat (available only on MMD40C units), use appropriate values from "Cooling only" or "with Humidifier" categories.								
2. Use MMD24E and MMD36E for MMD24K & MMD36K, respectively, except with SCR reheat.								
3. SCR Reheat not available with MMD24K, MMD36K or MMD40C.								

**Table 5.2 Belt Drive Split System Evaporator or Chilled Water Unit Electrical Data, with High Static Blower Box, 60Hz**

	208/230 - 1 ph - 60Hz		277 - 1 ph - 60Hz		208/230 - 3 ph - 60Hz		460 - 3 ph - 60Hz	
Base Evaporator Model Number	MMD24E	MMD36E MMD40C	MMD24E	MMD36E MMD40C	MMD24E	MMD36E MMD40C	MMD24E	MMD36E MMD40C
<b>Cooling Only</b>								
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
<b>With Electric Reheat</b>								
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
<b>With SCR Reheat<sup>4</sup></b>								
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
<b>With Humidifier</b>								
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
<b>With Electric Reheat and Humidifier</b>								
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
<b>With SCR Reheat<sup>4</sup> and Humidifier</b>								
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
<b>Notes:</b>								
1. Belt drive data includes externally mounted high static blower box, powered from unit.								
2. For units with Hot Water Reheat (available only on MMD40C units), use appropriate values from "Cooling only" or "with Humidifier" categories.								
3. Use MMD24E and MMD36E for MMD24K & MMD36K, respectively, except with SCR reheat.								
4. SCR Reheat not available with MMD24K, MMD36K or MMD40C.								

**Table 5.3 Belt Drive Split System Evaporator or Chilled Water Unit Electrical Data, 50Hz**

	220 - 1Ph - 50Hz	380/415 - 3Ph-50Hz
Base Evaporator Model Number	MMD35E MMD39C	MMD35E MMD39C
Cooling Only		
FLA	2.8	1.4
With Electric Reheat		
FLA	27.8	11.1
With SCR Reheat <sup>3</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>3</sup>		
FLA	50.9	19.0
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. For units with Hot Water Reheat (available only on MMD39C units), use appropriate values from "Cooling only" or "with Humidifier" categories.</li> <li>2. Use MMD35E for MMD35K, except with SCR reheat.</li> <li>3. SCR Reheat not available with MMD35K or MMD39C.</li> </ol>		

**Table 5.4 Belt Drive Split System Evaporator or Chilled Water Unit Electrical Data, 50Hz**

	<b>220 - 1 ph - 50Hz</b>	<b>380/415 - 3 ph - 50Hz</b>
<b>Base Evaporator Model Number</b>	<b>MMD35E MMD39C</b>	<b>MMD35E MMD39C</b>
<b>Cooling Only</b>		
FLA	7.0	2.6
<b>With Electric Reheat</b>		
FLA	32.0	12.3
<b>With SCR Reheat<sup>4</sup></b>		
FLA	48.7	16.5
<b>With Humidifier</b>		
FLA	13.4	6.3
<b>With Electric Reheat and Humidifier</b>		
FLA	38.4	16.0
<b>With SCR Reheat and Humidifier<sup>4</sup></b>		
FLA	55.1	20.2
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>1. Belt drive data includes externally mounted high static blower box, powered from unit.</li> <li>2. For units with Hot Water Reheat (available only on MMD39C units), use appropriate values from "Cooling only" or "with Humidifier" categories.</li> <li>3. Use MMD35E for MMD35K, except with SCR reheat.</li> <li>4. SCR Reheat not available with MMD35K or MMD39C.</li> </ol>		

## 5.2 Indoor Condensing Units Electrical Data

Table 5.5 Indoor Condensing Unit Electrical Data, 60Hz and 50Hz

	60Hz				50Hz	
	208/230-1ph-60Hz	277-1ph-60Hz	208/230-3ph-60Hz	460-3ph-60Hz	220-1ph-50Hz	380/415-3ph-50Hz
Model	MCD24A	MCD24A	MCD24A	MCD24A	—	—
FLA	14.3	12.7	—	—	13.2	5.7
WSA	17.3	15.3	—	—	—	—
OPD	25	25	—	—	N/A	N/A
Model	MCD36A	MCD36A	MCD36A	MCD36A	MCD35A	MCD35A
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	—	—
Model	MCD26W	MCD26W	MCD26W	MCD26W	—	—
FLA	12.0	10.4	—	—	—	—
WSA	15.0	13.0	—	—	—	—
OPD	25	20	—	—	—	—
Model	MCD38W	MCD38W	MCD38W	MCD38W	MCD37W	MCD37W
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	—	—

### 5.3 Outdoor Condensing Units Electrical Data

Table 5.6 Outdoor Condensing Unit Electrical Data, 60Hz and 50Hz

Model #	Nom. Capac., 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
<b>Standard 95°F (35°C) ambient</b>								
PFH027A_LN	2	FLA	13.4	—	—	—	—	—
		WSA	16.4	—	—	—	—	—
		OPD	25	—	—	—	—	—
PFH037A_LN PFH036A_LN	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	—	—
<b>High Ambient 105°F (41°C) ambient</b>								
PFH027A_HN	2	FLA	15.4	—	—	—	—	—
		WSA	18.4	—	—	—	—	—
		OPD	30	—	—	—	—	—
PFH037A_HN PFH036A_HN	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	—	—
<b>Quiet-Line 95°F (35°C) ambient</b>								
PFHZ27A_LN	2	FLA	12.9	—	—	—	—	—
		WSA	15.9	—	—	—	—	—
		OPD	25	—	—	—	—	—
PFHZ37A_LN PFHZ36A_LN	3	FLA	18.0	12.9	7.1	—	18.0	6.9
		WSA	22.3	15.9	8.7	—	—	—
		OPD	35	25	15	—	—	—



## 5.4 Electrical Data for Air ooled Systems Using a Single Point Power Kit

Table 5.7 Air Cooled Using Single Point Power Kit, Evaporator with Direct Drive Blowers and Indoor Condensing Unit, 60Hz

	208/230 - 1 ph - 60Hz		277 - 1 ph - 60Hz		208/230 - 3 ph - 60Hz		460 - 3 ph - 60Hz	
Base Evaporator Model Number	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E
Condensing Unit Model Number	MCD24A	MCD36A	MCD24A	MCD36A	MCD24A	MCD36A	MCD24A	MCD36A
<b>Cooling Only</b>								
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
<b>With Electric Reheat</b>								
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
<b>With SCR Reheat<sup>2</sup></b>								
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
<b>With Humidifier</b>								
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
<b>With Electric Reheat and Humidifier</b>								
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
<b>With SCR Reheat and Humidifier<sup>2</sup></b>								
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
<b>Note:</b>								
1. Use MMD24E and MMD36E for MMD24K & MMD36K, respectively, except with SCR reheat.								
2. SCR Reheat not available with MMD24K or MMD36K.								

Table 5.8 Air Cooled Using Single Point Power Kit, Evaporator with Belt Drive Blowers and Indoor Condensing Unit, 60Hz

Base Evaporator Model Number	208/230 - 1 ph - 60Hz		277 - 1 ph - 60Hz		208/230 - 3 ph - 60Hz		460 - 3 ph - 60Hz		
	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E	
Condensing Unit Model Number	MCD24A	MCD36A	MCD24A	MCD36A	MCD24A	MCD36A	MCD24A	MCD36A	
<b>Cooling Only</b>									
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	
<b>With Electric Reheat</b>									
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	
<b>With SCR Reheat<sup>3</sup></b>									
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	
<b>With Humidifier</b>									
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	
<b>With Electric Reheat and Humidifier</b>									
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	
<b>With SCR Reheat and Humidifier<sup>3</sup></b>									
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	
<b>Notes:</b>									
1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.									
2. Use MMD24E and MMD36E for MMD24K & MMD36K, respectively, except with SCR reheat.									
3. SCR Reheat not available with MMD24K or MMD36K.									

**Table 5.9 Air Cooled Using Single Point Power Kit, Evaporator with Direct Drive Blowers and Indoor Condensing Unit, 50Hz**

	220 - 1 ph - 50Hz	380/415 - 3 ph - 50Hz
<b>Base Evaporator Model Number</b>	<b>MMD35E</b>	<b>MMD35E</b>
<b>Condensing Unit Model Number</b>	<b>MCD35A</b>	<b>MCD35A</b>
<b>Cooling Only</b>		
FLA	22.9	9.2
<b>With Electric Reheat</b>		
FLA	47.9	18.9
<b>With SCR Reheat<sup>2</sup></b>		
FLA	64.6	23.1
<b>With Humidifier</b>		
FLA	29.3	12.9
<b>With Electric Reheat and Humidifier</b>		
FLA	47.9	18.9
<b>With SCR Reheat and Humidifier<sup>2</sup></b>		
FLA	71.0	26.8
<b>Notes:</b> 1. Use MMD35E for MMD35K, except with SCR reheat. 2. SCR Reheat not available with MMD35K.		

**Table 5.10 Air Cooled Using Single Point Power Kit, Evaporator with Belt Drive Blowers and Indoor Condensing Unit, 50Hz**

	220 - 1 ph - 50Hz	380/415 - 3 ph - 50Hz
<b>Base Unit Model Number</b>	<b>MMD35E</b>	<b>MMD35E</b>
<b>Condensing Unit Model Number</b>	<b>MCD35A</b>	<b>MCD35A</b>
<b>Cooling Only</b>		
FLA	27.1	10.4
<b>With Electric Reheat</b>		
FLA	52.1	20.1
<b>With SCR Reheat<sup>3</sup></b>		
FLA	68.8	24.3
<b>With Humidifier</b>		
FLA	33.5	14.1
<b>With Electric Reheat and Humidifier</b>		
FLA	52.1	20.1
<b>With SCR Reheat and Humidifier<sup>3</sup></b>		
FLA	75.2	28.0
<b>Notes:</b> <ol style="list-style-type: none"> <li>Belt drive data includes externally mounted high static blower box, powered from evaporator unit.</li> <li>Use MMD35E for MMD35K, except with SCR reheat.</li> <li>SCR Reheat not available with MMD35K.</li> </ol>		

## 5.5 Electrical Data for Water/Glycol Cooled Systems Using a Single Point Power Kit

Table 5.11 Water/Glycol Cooled Using Single Point Power Kit, Evaporator with Direct Drive Blowers and Indoor Condensing Unit, 60Hz

	208/230 - 1 ph - 60Hz		277 - 1 ph - 60Hz		208/230 - 3 ph - 60Hz		460 - 3 ph - 60Hz	
Base Unit Model Number	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E
Condensing Unit Model Number	MCD26W	MCD38W	MCD26W	MCD38W	MCD26W	MCD38W	MCD26W	MCD38W
<b>Cooling Only</b>								
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
<b>With Electric Reheat</b>								
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
<b>With SCR Reheat<sup>2</sup></b>								
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
<b>With Humidifier</b>								
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
<b>With Electric Reheat and Humidifier</b>								
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
<b>With SCR Reheat and Humidifier<sup>2</sup></b>								
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
<b>Notes:</b>								
1. Use MMD24E and MMD36E for MMD24K & MMD36K, respectively, except with SCR reheat.								
2. SCR Reheat not available with MMD24K or MMD36K.								

**Table 5.12 Water/Glycol Cooled Using Single Point Power Kit, Evaporator with Belt Drive Blowers and Indoor Condensing Unit, 60Hz**

	208/230 - 1 ph - 60Hz		277 - 1 ph - 60Hz		208/230 - 3 ph - 60Hz		460 - 3 ph - 60Hz	
Base Evaporator Model Number	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E	MMD24E	MMD36E
Condensing Unit Model Number	MCD26W	MCD38W	MCD26W	MCD38W	MCD26W	MCD38W	MCD26W	MCD38W
<b>Cooling Only</b>								
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
<b>With Electric Reheat</b>								
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
<b>With SCR Reheat<sup>3</sup></b>								
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
<b>With Humidifier</b>								
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
<b>With Electric Reheat and Humidifier</b>								
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
<b>With SCR Reheat and Humidifier<sup>3</sup></b>								
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
<b>Notes:</b>								
1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.								
2. Use MMD24E and MMD36E for MMD24K & MMD36K, respectively, except with SCR reheat.								
3. SCR Reheat not available with MMD24K or MMD36K.								

**Table 5.13 Water/Glycol Cooled Using Single Point Power Kit, Evaporator with Direct Drive Blowers and Indoor Condensing Unit, 50Hz**

	220 - 1 ph - 50Hz	380/415 - 3 ph - 50Hz
<b>Base Evaporator Model Number</b>	<b>MMD35E</b>	<b>MMD35E</b>
<b>Condensing Unit Model Number</b>	<b>MCD37W</b>	<b>MCD37W</b>
<b>Cooling Only</b>		
FLA	19.9	7.8
<b>With Electric Reheat</b>		
FLA	44.9	17.5
<b>With SCR Reheat<sup>2</sup></b>		
FLA	61.6	21.7
<b>With Humidifier</b>		
FLA	26.3	11.5
<b>With Electric Reheat and Humidifier</b>		
FLA	44.9	17.5
<b>With SCR Reheat and Humidifier<sup>2</sup></b>		
FLA	68.0	25.4
<b>Notes:</b> 1. Use MMD35E for MMD35K, except with SCR reheat. 2. SCR Reheat not available with MMD35K.		

**Table 5.14 Water/Glycol Cooled Using Single Point Power Kit, Evaporator with Belt Drive Blowers and Indoor Condensing Unit, 50Hz**

	220 - 1 ph - 50Hz	380/415 - 3 ph - 50Hz
<b>Base Evaporator Model Number</b>	<b>MMD35E</b>	<b>MMD35E</b>
<b>Condensing Unit Model Number</b>	<b>MCD37W</b>	<b>MCD37W</b>
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
<b>Notes:</b> <ol style="list-style-type: none"> <li>1. Belt drive data includes externally mounted high static blower box, powered from evaporator unit.</li> <li>2. Use MMD35E for MMD35K, except with SCR reheat.</li> <li>3. SCR Reheat not available with MMD35K.</li> </ol>		



## 5.6 Electrical Field Connections

Electrical service must conform to national and local electrical codes.

The electrical connections are described in the submittal documents included in the [Submittal Drawings](#) on page 53.

The following table lists the relevant documents by number and title.

**Table 5.15 Electrical Field Connection Drawings**

Document Number	Title
<b>Evaporator and Chilled-water Units</b>	
DPN000195	Electrical Connections
DPN000196	Single Point Power Kit for Close Coupled Units
DPN004851	Arrangement and Dimensions, Unit Mounted IS-UNITY-DP for BMS Communication
DPN004911	Arrangement and Dimensions, Wall Mounted IS-UNITY-DP for BMS Communication
DPN004854	Electrical Connections, IS-UNITY-DP for BMS Communication
<b>Split System Indoor Condensing Units</b>	
DPN000207	Electrical Connections, Air Cooled units
DPN000209	Electrical Connections, Water/Glycol Cooled Units

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## 6 PIPING

The pipe connection locations, piping general arrangement and schematics are described in the submittal documents included in the [Submittal Drawings](#) on page 53.

The following tables list the relevant documents by number and title.

**Table 6.1 Piping General Arrangement Drawings**

Document Number	Title
DPN004409	General Arrangement, Water/Glycol Cooled
DPN004410	General Arrangement, Air Cooled and Chilled Water
DPN000197	General Arrangement, Free Cooling and Hot Water Reheat Options
DPN003822	Multiple Drycoolers and Cooling Units on Common Glycol Loop

**Table 6.2 Piping Connection Drawings**

Document Number	Title
<b>Evaporator and Chilled Water Units</b>	
DPN004303	Piping Connections
<b>Split System Indoor Condensing Units</b>	
DPN004420	Piping Connections, Air cooled Condensing Unit
DPN004421	Piping Connections, Water/Glycol Cooled Condensing Unit
<b>Condensate-pump Connection</b>	
DPN004445	Field Installed Pump Connection

## 6.1 Refrigerant Piping Data

### 6.1.1 Refrigerant Charge Requirements

Table 6.3 R-407C Refrigerant Unit charge

Model #		Charge R-407C, oz (kg)
60Hz	50Hz	
MMD24E/K	—	7 (0.198)
MMD36E/K	MMD35E/K	7 (0.198)
MCD24AL_HN	—	134 (3.80)
MCD36AL_HN	MCD35AL_HN	213 (6.04)
MCD26W_HN	—	41 (1.16)
MCD38W_HN	MCD37W_HN	54 (1.54)
PFH027A_LN	—	134 (3.80)
PFH027A_HN	—	213 (6.04)
PFHZ27A_LN	—	213 (6.04)
PFH037A_LN	PFH036A_LN	213 (6.04)
PFH037A_HN	PFH036A_HN	426 (12.08)
PFHZ37A_LN	PFHZ36A_LN	426 (12.08)

1. Use **Table 6.4** below to determine the charge to be added for field fabricated refrigerant lines.

Table 6.4 Line Charges of R-407C Refrigerant Using Type-L Copper Tube

Line Size, OD, in.	Liquid Line, lb/100 ft (kg/30 m)	Suction Line, lb/100 ft (kg/30 m)
3/8	3.6 (1.6)	—
1/2	6.7 (3.0)	0.2 (0.1)
5/8	10.8 (4.8)	0.3 (0.1)
3/4	16.1 (7.2)	0.4 (0.2)
7/8	22.3 (10.0)	0.5 (0.3)
1-1/8	38.0 (17.0)	0.9 (0.4)
1-3/8	57.9 (25.9)	1.4 (0.7)

Source: DPN003099 Rev. 1

### 6.1.2 Refrigerant Line Sizes and Equivalent Lengths

The following tables list information required to field install the refrigerant piping for the system.

The pipe connection sizes for your equipment are included in the appropriate submittal documents included in the [Submittal Drawings](#) on page 53.

**Table 6.5 Recommended refrigerant line sizes, O.D. cu by equivalent length**

Equivalent Length, ft(m)	2 Ton		3 Ton	
	Suction	Liquid	Suction	Liquid
50 (15)	7/8"	3/8"	7/8"	1/2"
75 (23)	7/8"	3/8"	7/8"	1/2"
100 (30)	7/8"	1/2"	1-1/8" <sup>2</sup>	1/2"
125 (38)	7/8"	1/2"	1-1/8" <sup>2</sup>	1/2"
150 (45)	7/8"	1/2"	1-1/8" <sup>2</sup>	1/2"

1. Consult factory for proper line sizing for runs longer than 150 ft (45 m).  
 2. Downsize vertical riser one trade size (1-1/8" to 7/8").  
 3. Suction-line and liquid-line sizing based on < 3-psi pressure drop in each and on suction-line refrigerant velocities >700 FPM(3.6 m/s), horizontal and 1000 FPM (5.1 m/s) vertical.

Source: DPN000788 Rev. 13

**Table 6.6 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

### 6.1.3 Piping when Condensing Unit is Above or Below Evaporator

Refer to [Pipe Length and Condensing Unit Elevation Relative to Evaporator](#) on the next page, for the maximum vertical rise/fall between condensing unit and evaporator.

When installing remote condensing units above the evaporator, trap the suction gas line at the evaporator as shown in **Figure 6.1** on the next page. This trap will retain refrigerant oil during the "Off" cycle. When the unit starts, oil in the trap is carried up the vertical riser and returns to the compressor. For rises over 25 ft (7.6 m), trap every 20 ft (6 m) or evenly divided.

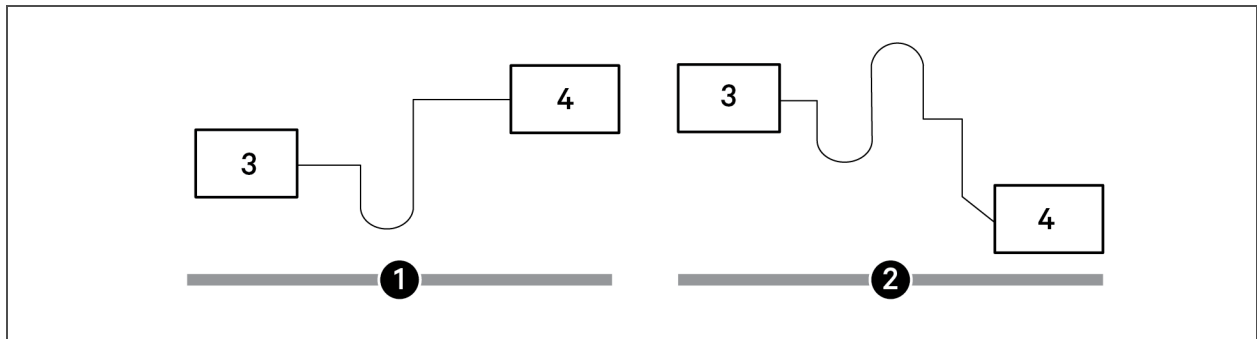
When installing remote condensing units below the evaporator, trap the suction gas line with an inverted trap the height of the evaporator as shown **Figure 6.1** on the next page. This prevents refrigerant migration to the compressor during "Off" cycles. The maximum recommended vertical level drop to condensing unit is 15 ft (4.6 m).

Table 6.7 Pipe Length and Condensing Unit Elevation Relative to Evaporator

Nominal System Size, ton	Maximum Equivalent Pipe Length, ft (m)	Maximum Condensing Unit Level Above Evaporator, ft (m)	Maximum Condensing Unit 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 (46 m). Suction and liquid lines may require additional specialty items when vertical lines exceed 20 ft (6 m) and/or condensing unit installation is more than 15 ft (4.6 m) below the evaporator. Contact Vertiv Technical Support for assistance.

Figure 6.1 Refrigerant Piping Diagram when Condenser is Above or Below Evaporator



NOTE: Any horizontal pipe must be pitched down toward the condensing unit at a minimum rate of 1/2 in. (13 mm) per 10 ft (3 m) to assure oil return to compressor.

Item	Description
1	Condensing unit above evaporator
2	Condensing unit below evaporator
3	Evaporator
4	Condensing unit

## 6.2 Glycol Loop Piping

Contact Vertiv Application Engineering for assistance in choosing correct drycooler models. See DPN003822 included in the [Submittal Drawings](#) on page 53.

## APPENDICES

### Appendix A: Technical Support and Contacts

#### A.1 Technical Support/Service in the United States

##### Vertiv Group Corporation

24x7 dispatch of technicians for all products.

1-800-543-2378

##### Liebert Thermal Management Products

1-800-543-2778

##### Liebert Channel Products

1-800-222-5877

##### Liebert AC and DC Power Products

1-800-543-2378

#### A.2 Locations

##### United States

Vertiv Headquarters

1050 Dearborn Drive

Columbus, OH, 43085, USA

##### Europe

Via Leonardo Da Vinci 8 Zona Industriale Tognana

35028 Piove Di Sacco (PD) Italy

##### Asia

7/F, Dah Sing Financial Centre

3108 Gloucester Road, Wanchai

Hong Kong

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## Appendix B: Submittal Drawings

The submittal drawings are in the order of document part number (DPN). **Table B.1** below, groups the drawings by topic/application.

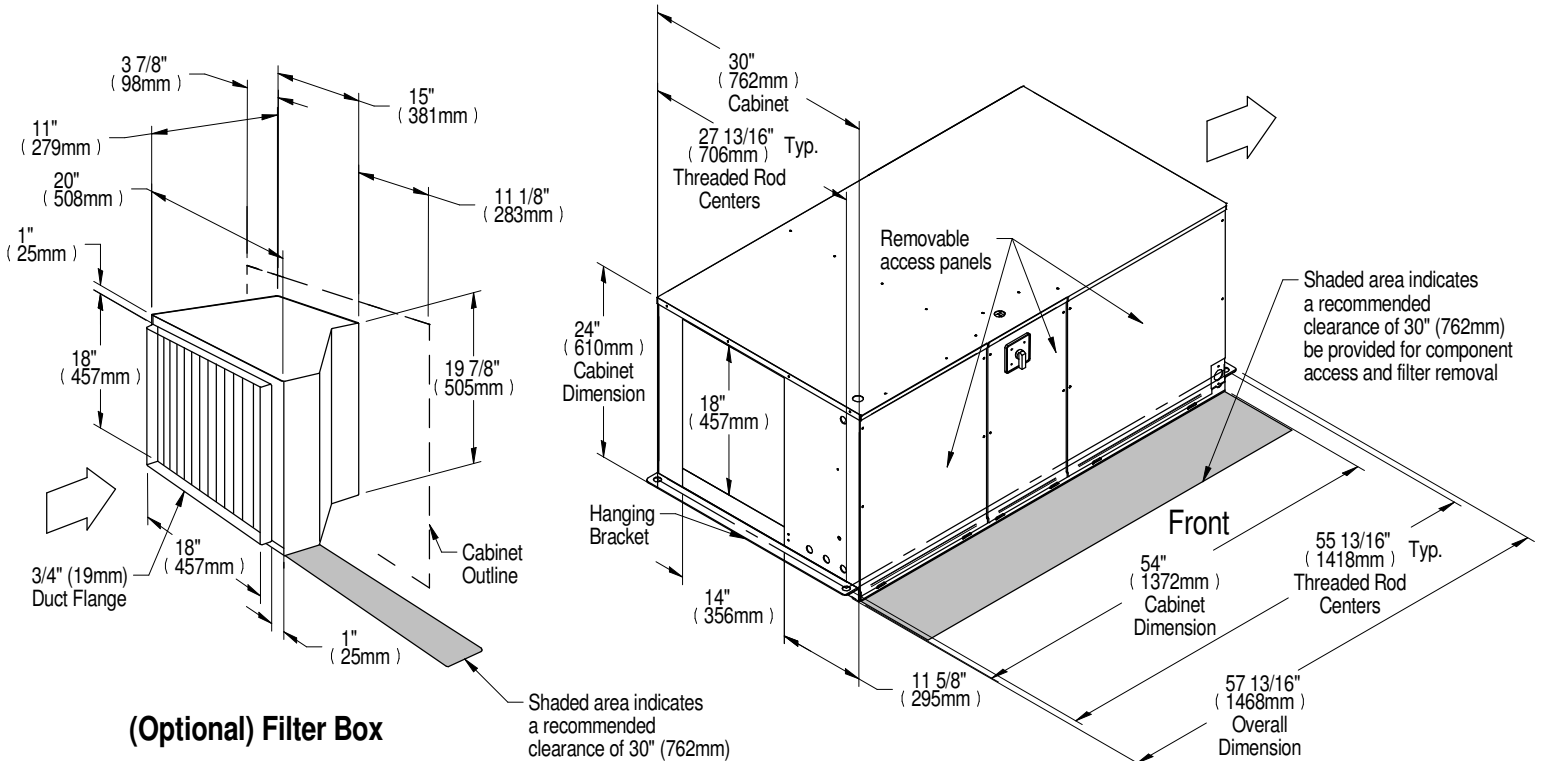
**Table B.1 Submittal-drawings Contents**

Document Number	Title
<b>Planning Dimensions - Split-system Evaporators/Chilled Water Units</b>	
DPN000193	Evaporator/Chilled Water and Option Dimensions, All Direct Drive Blower Units
DPN000194	Evaporator/Chilled Water Dimensions, All Belt Drive Blower Units
<b>Planning Dimensions - Indoor Condensing Units</b>	
DPN004420	Cabinet Dimensions, Air Cooled Units
DPN004421	Cabinet Dimensions, Water/Glycol Cooled Units
<b>Planning Dimensions - Outdoor Condensing Units</b>	
DPN004418	Cabinet Dimensions, Prop Fan Condensing Unit with Horizontal Air Discharge
DPN003094	Optional Anchorage Plan, Prop Fan Condensing Unit with Horizontal Air Discharge
<b>Piping General Arrangement</b>	
DPN004409	General Arrangement, Water/Glycol Cooled
DPN004410	General Arrangement, Air Cooled and Chilled Water
DPN000197	General Arrangement, Free Cooling and Hot Water Reheat Options
DPN003822	Multiple Drycoolers and Cooling Units on Common Glycol Loop
<b>Piping Connections - Evaporator and Chilled-water Units</b>	
DPN004303	Piping Connections
<b>Condensate-pump Connection</b>	
DPN004445	Field Installed Pump Connection
<b>Piping Connections - Split-system Indoor Condensing Units</b>	
DPN004420	Piping Connections, Air Cooled Condensing Unit
DPN004421	Piping Connections, Water/Glycol Cooled Condensing Unit
<b>Electrical Connections - Evaporator and Chilled-water Units</b>	
DPN000195	Electrical Connections
DPN000196	Single Point Power Kit for Close Coupled Units
DPN004851	Arrangement and Dimensions, Unit Mounted IS-UNITY-DP for BMS Communication
DPN004911	Arrangement and Dimensions, Wall Mounted IS-UNITY-DP for BMS Communication
DPN004854	Electrical Connections, IS-UNITY-DP for BMS Communication
<b>Electrical Connections - Split-system Indoor Condensing Units</b>	
DPN000207	Electrical Connections, Air Cooled
DPN000209	Electrical Connections, Water/Glycol Cooled Units

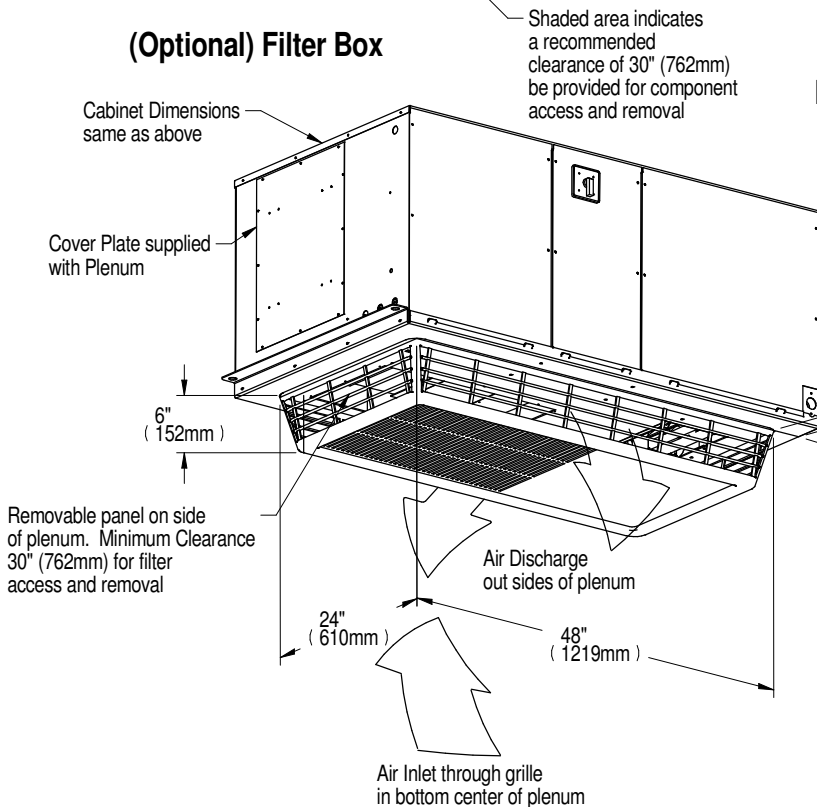
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# LIEBERT MINI-MATE2

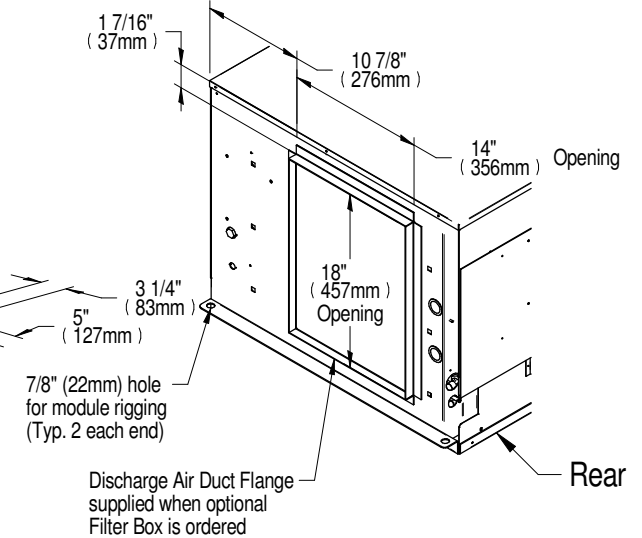
## CABINET DIMENSIONAL DATA 2 & 3 TON AIR, WATER/GLYCOL & CHILLED WATER MODELS W/ DIRECT DRIVE BLOWER



### (Optional) Filter Box



### Module Dimensional Data

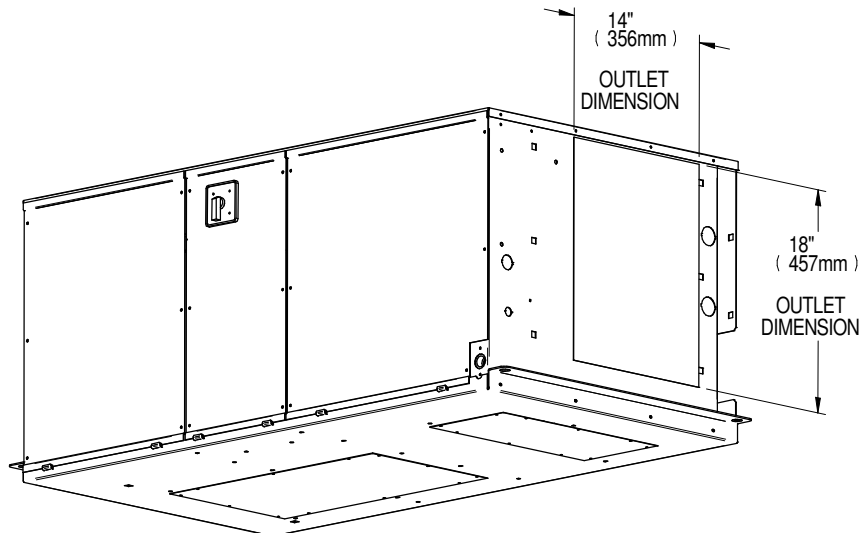
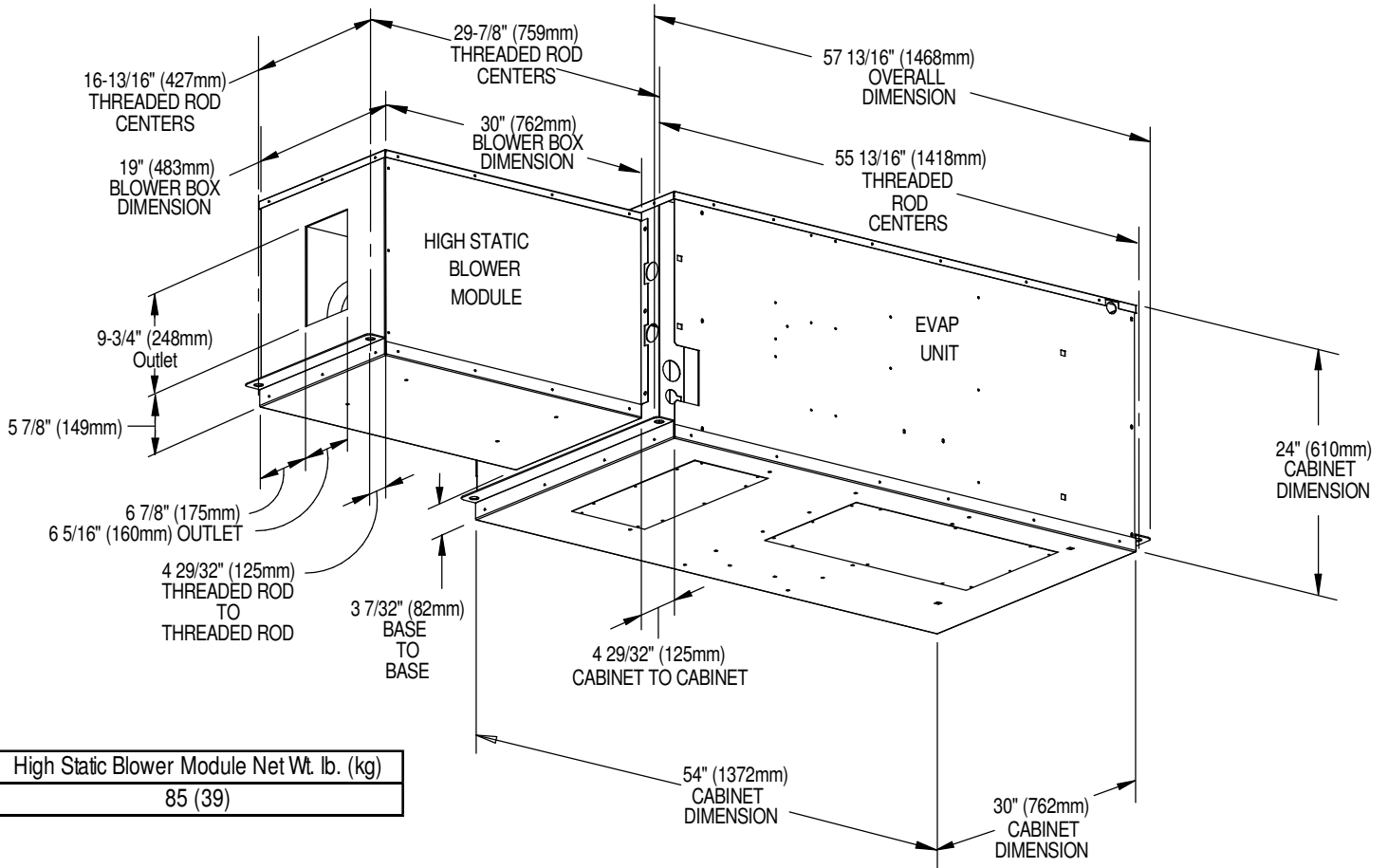


**Optional Air Distribution Plenum**  
All Piping & Electrical connections are the same

Model #		Unit Net Wt. lb. (kg)
60 HZ	50 HZ	
MM*24E	NA	225 (102)
MM*36E	MM*35E	
MM*40C	MM*39C	230 (104)

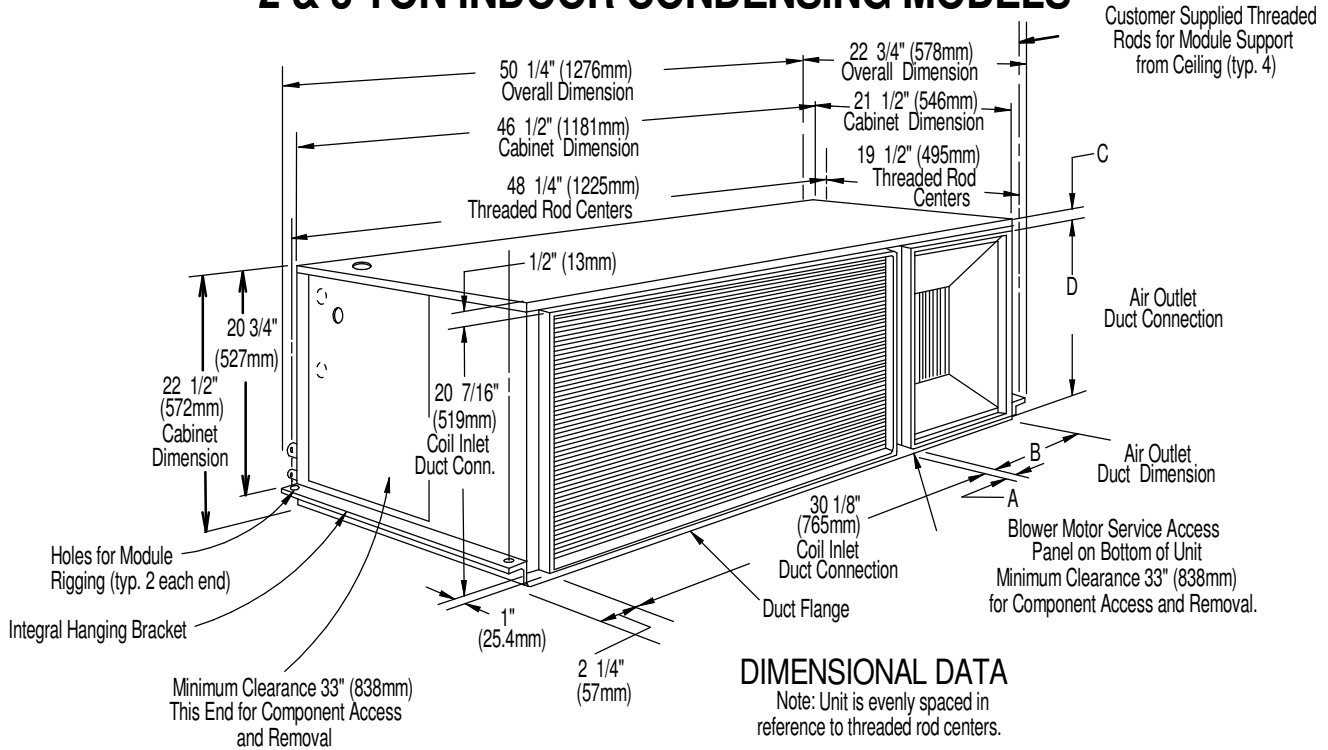
# LIEBERT MINI-MATE2

## CABINET DIMENSIONAL DATA BELT DRIVE BLOWER ASSEMBLY 2 & 3 TON AIR, WATER/GLYCOL & CHILLED WATER MODELS

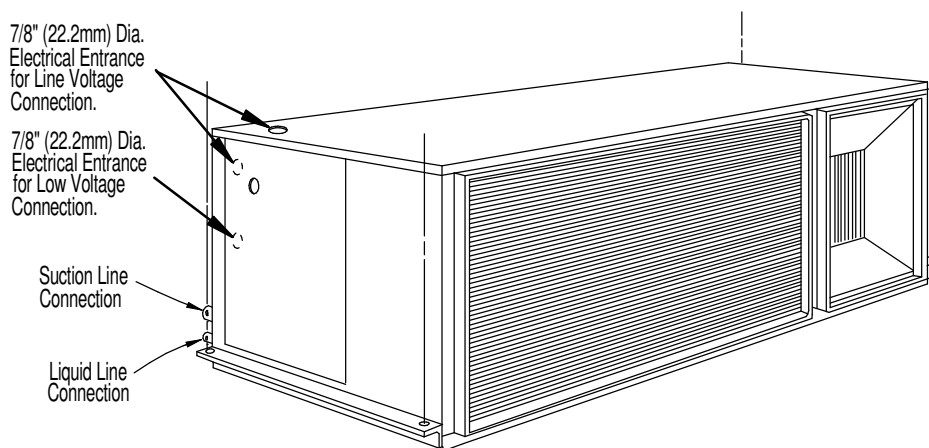


# LIEBERT MINI-MATE2

## CABINET DIMENSIONAL DATA & PRIMARY CONNECTION LOCATIONS 2 & 3 TON INDOOR CONDENSING MODELS



Model #	Dimensions in. (mm)				Unit Net Wt. lbs. (kg)	Refrigeration Connection Sizes O.D. Cu	
	A	B	C	D		Suction	Liquid
MC*24A					230 (104)	5/8"	3/8"
MC*36A	1-7/16 (37)	11-7/16 (290)	1/2 (13)	20-7/16 (519)	240 (109)	7/8"	
MC*35A							
MC*40A	1-5/8 (41)	11-3/4 (298)	3/4 (19)	20-1/4 (514)			
MC*39A							

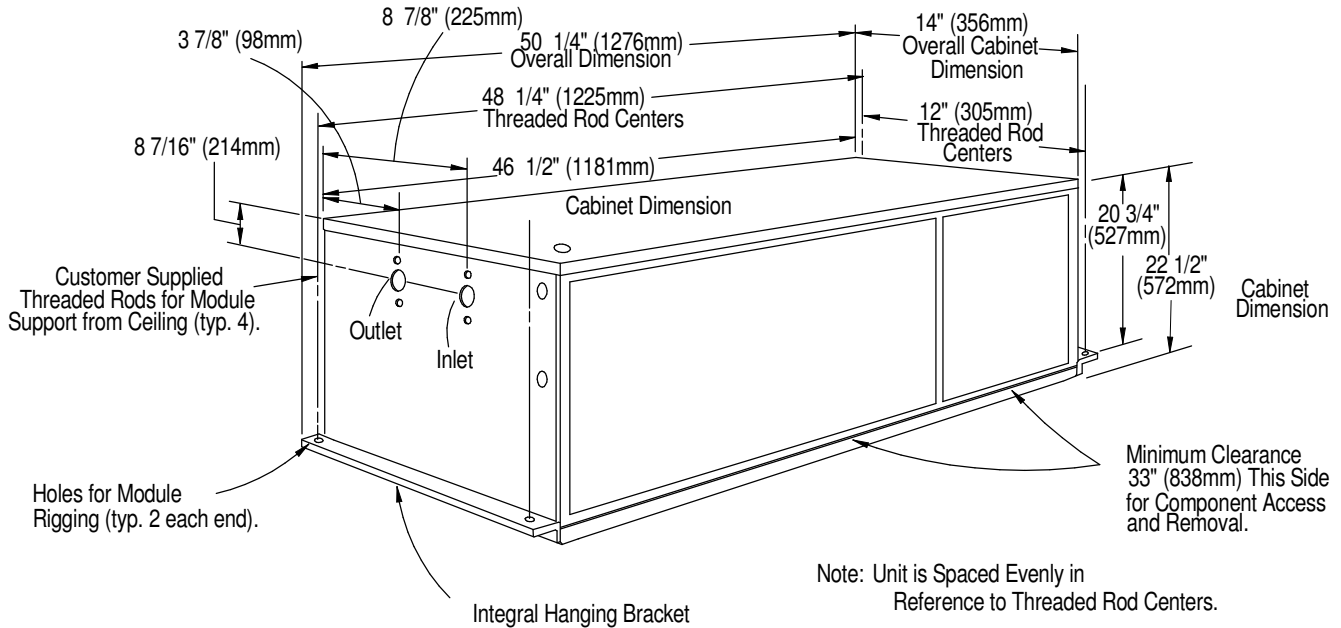


### PIPING CONNECTIONS

# LIEBERT MINI-MATE2

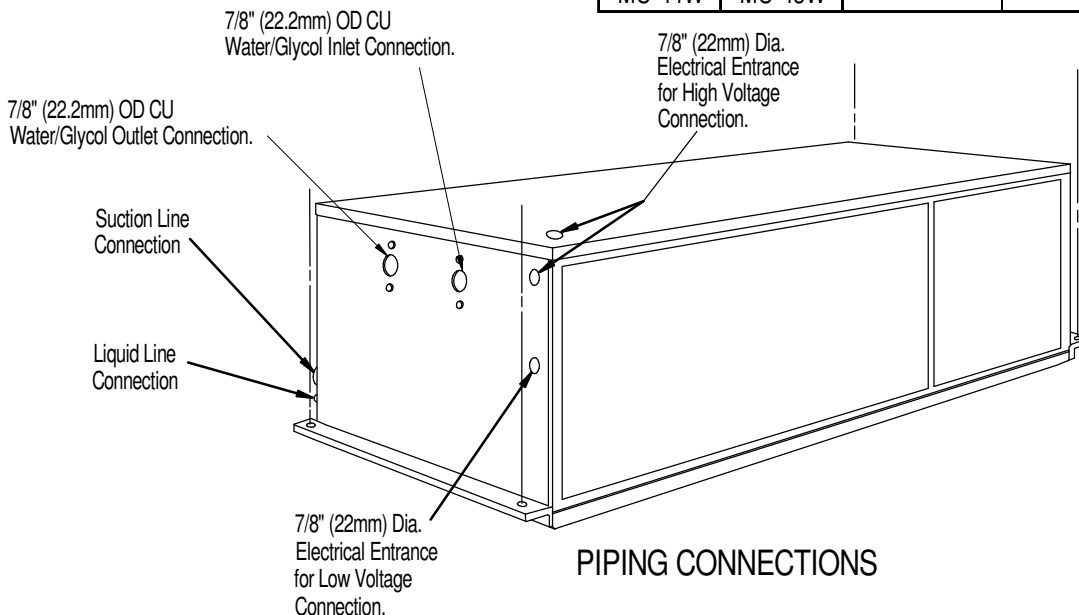
## CABINET DIMENSIONAL DATA & PRIMARY CONNECTION LOCATIONS

### 2 & 3 TON WATER/GLYCOL COOLED INDOOR CONDENSING MODULE

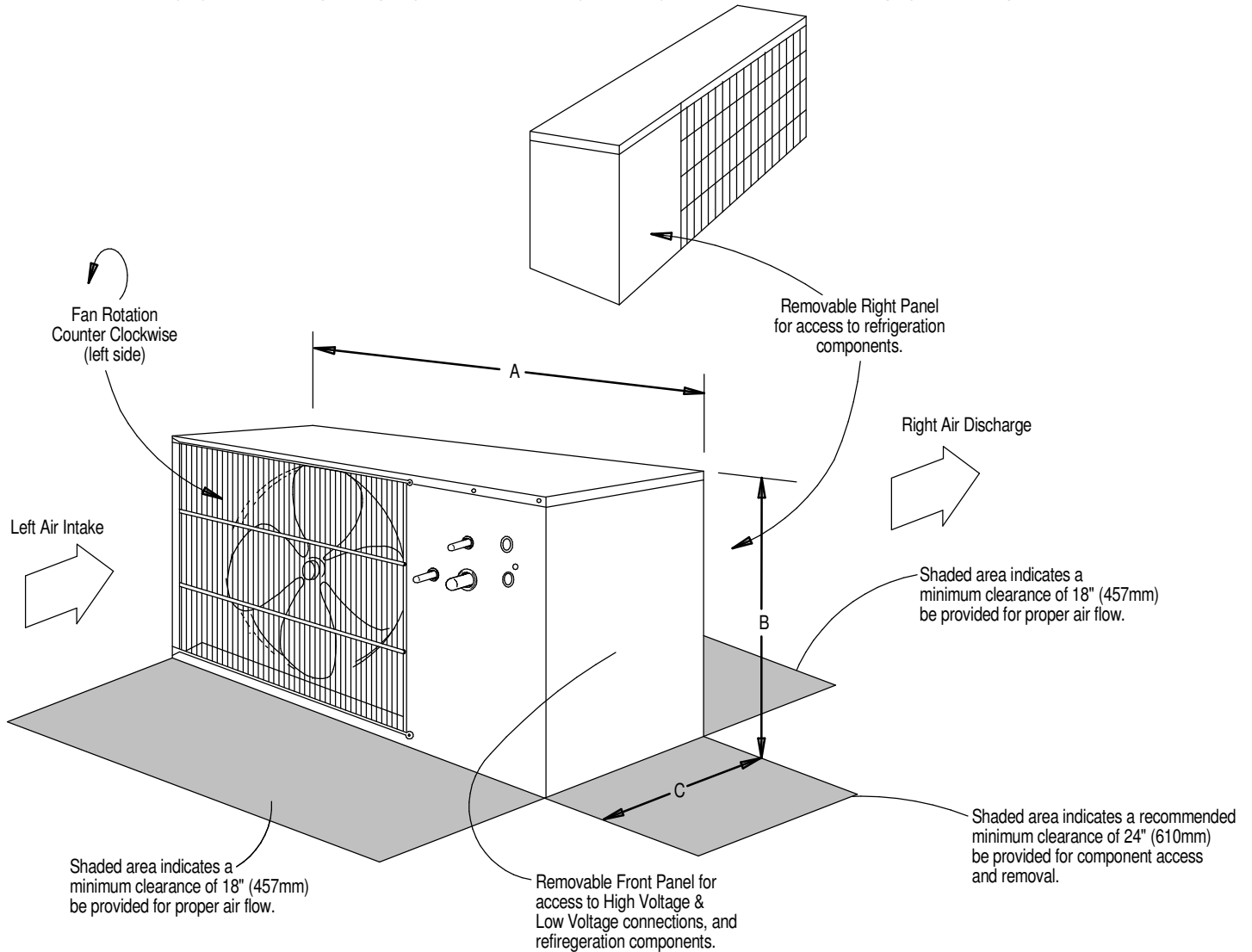


#### DIMENSIONAL DATA

Model #		Unit Net Weight lbs. (kg)	Refrigerant Connection Sizes O.D. Cu	
60 Hz	50 Hz		Suction	Liquid
MC*26W	N/A	175 (79)	5/8"	3/8"
MC*38W	MC*37W	220 (100)	7/8"	
MC*44W	MC*43W			

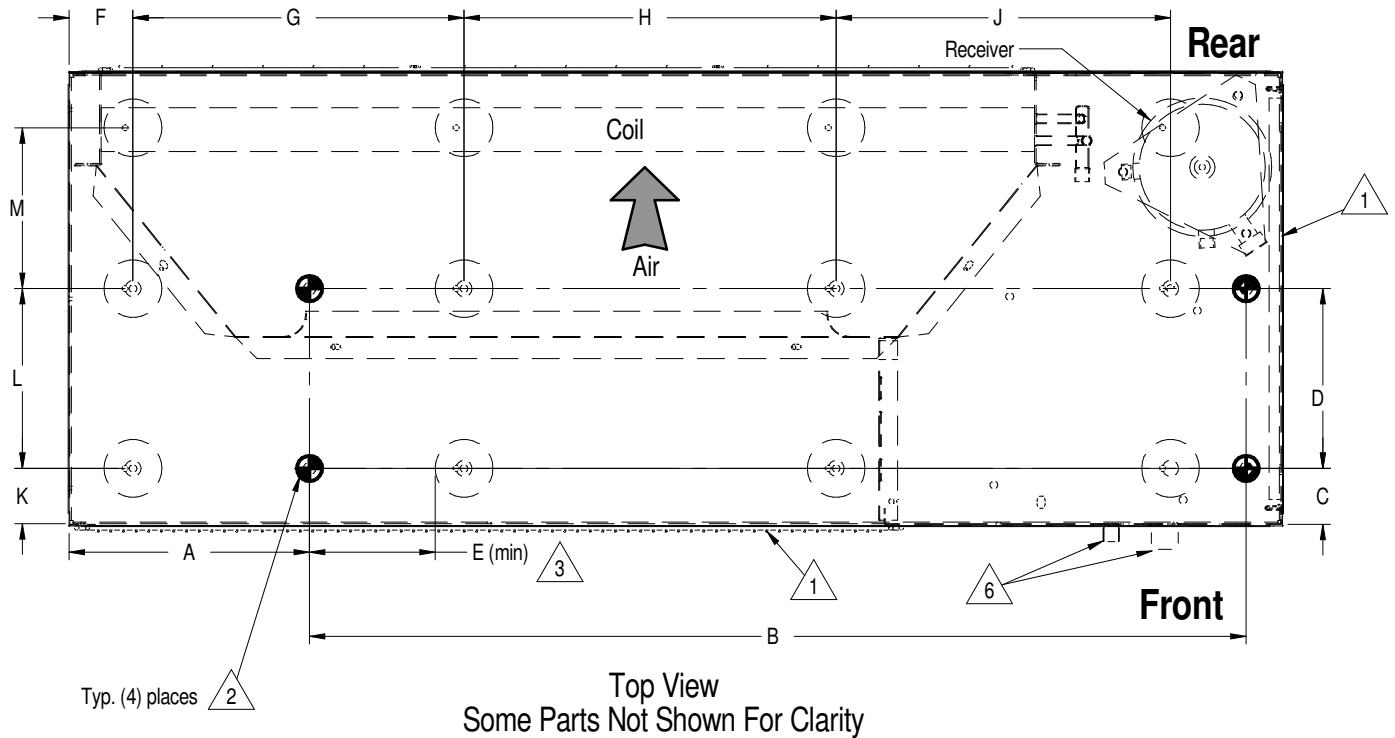


## CABINET DIMENSIONAL DATA CONDENSING UNIT W/ HORIZONTAL AIR DISCHARGE



MODEL NUMBERS		DIMENSIONAL DATA IN. (mm)			MODULE WEIGHT
60 HZ	50HZ	A	B	C	lbs. (kg) net
PFH014A-L	NA	40 (1016)	23 1/2 (597)	18 (457)	200 (91)
PFH020A-L	NA				
PFH027A-L	NA				
PFH027A-H	NA	48 (1219)	31 (787)	18 (457)	241 (109)
PFHZ27A-L	NA				
PFH037A-L	PFH036A-L				
PFH042A-L	PFH041A-L	53 (1343)	36 1/4 (918)	18 (457)	351 (159)
PFH037A-H	PFH036A-H				
PFHZ37A-L	PFHZ36A-L				
PFH042A-H	PFH041A-H	53 (1343)	36 1/4 (918)	18 (457)	351 (159)
PFHZ42A-L	PFHZ41A-L				
PFH067A-L	PFH066A-L				

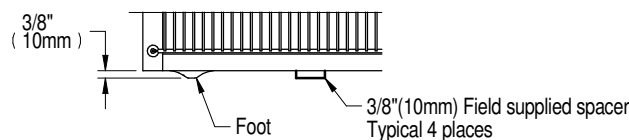
## OPTIONAL ANCHORAGE PLAN



MODEL NUMBERS		DIMENSIONAL DATA IN. (mm)											
60 HZ	50HZ	A	B	C	D	E (min)	F	G	H	J	K	L	M
PFH014A-L	NA	8-5/8 (219)	30-1/4 (769)	2-1/2 (64)	8-1/2 (216)	1 (25)	6-1/2 (165)	13-13/16 (351)	15 (381)	NA	2-1/2 (64)	15-1/16 (382)	NA
PFH020A-L													
PFH027A-L													
PFH027A-H													
PFHZ27A-L	PFH036A-L	9-9/16 (242)	37-1/8 (943)	2-1/4 (57)	7-1/8 (181)	1-7/8 (47)	2-9/16 (64)	13-1/8 (333)	14-3/4 (375)	13-1/4 (337)	2-1/4 (57)	7-1/8 (181)	6-3/8 (162)
PFH037A-L													
PFH042A-L	PFH041A-L	9-5/16 (236)	43 (1092)	2-5/16 (58)	7-1/8 (181)	2-9/16 (65)	2-1/2 (63)	15-1/16 (383)	15-11/16 (398)	15-3/8 (391)	2-5/16 (58)	7-1/8 (181)	6-3/8 (162)
PFH037A-H	PFH036A-H												
PFHZ37A-L	PFHZ36A-L												
PFH042A-H	PFH041A-H												
PFHZ42A-L	PFHZ41A-L	9-5/16 (236)	43 (1092)	2-5/16 (58)	7-1/8 (181)	2-9/16 (65)	2-1/2 (63)	15-1/16 (383)	15-11/16 (398)	15-3/8 (391)	2-5/16 (58)	7-1/8 (181)	6-3/8 (162)
PFH067A-L	PFH066A-L												

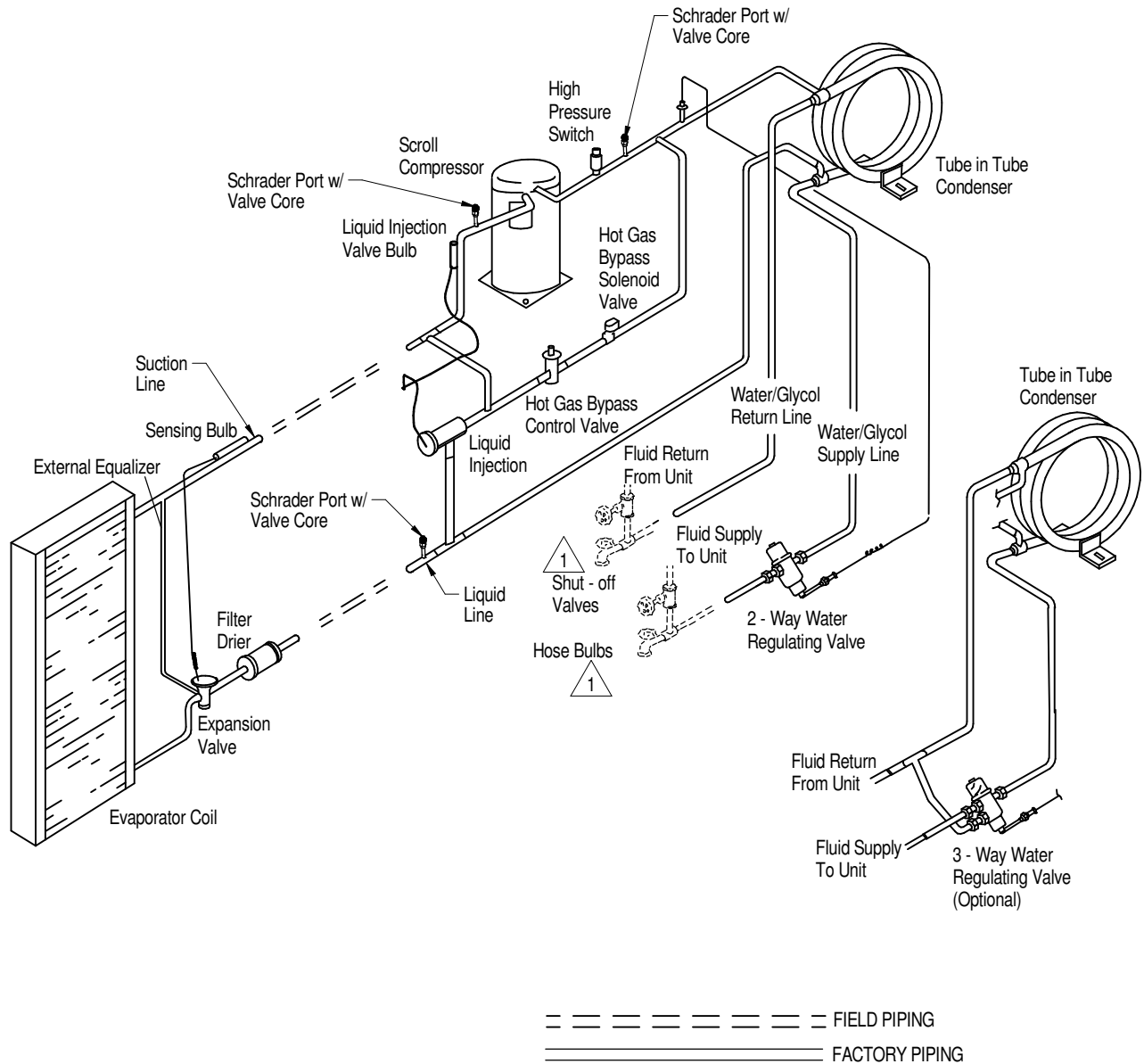
**Notes:**

1. Front Grille and Right End Panel will need to be removed to access anchor holes, Top panel may be removed for additional access. All removed parts must be reinstalled.
2. 1/2"(13mm) Diameter hole, use for unit anchor.
3. All dimensions have a tolerance of  $\pm 1/16"$ .
4. F, G, H, J, K, L and M dimensions are for the foot locations.
5. The use of this anchor plan is optional and installer will assume responsibility for suitable anchorage.
6. Supply and return piping connections





## GENERAL ARRANGEMENT DIAGRAM 2 & 3 TON SPLIT SYSTEMS WATER/GLYCOL COOLED MODELS

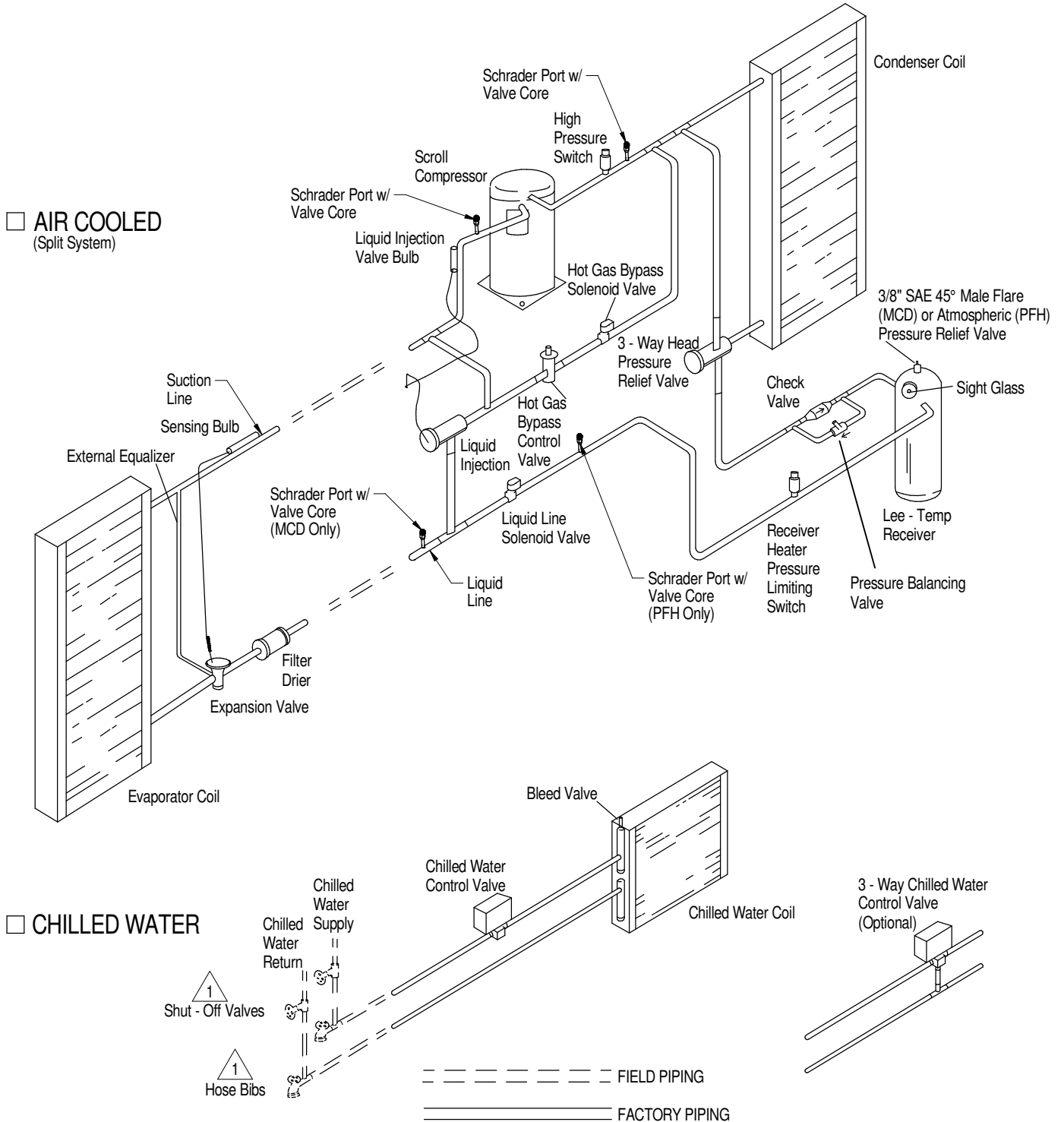


Notes:

1. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.

## GENERAL ARRANGEMENT DIAGRAM

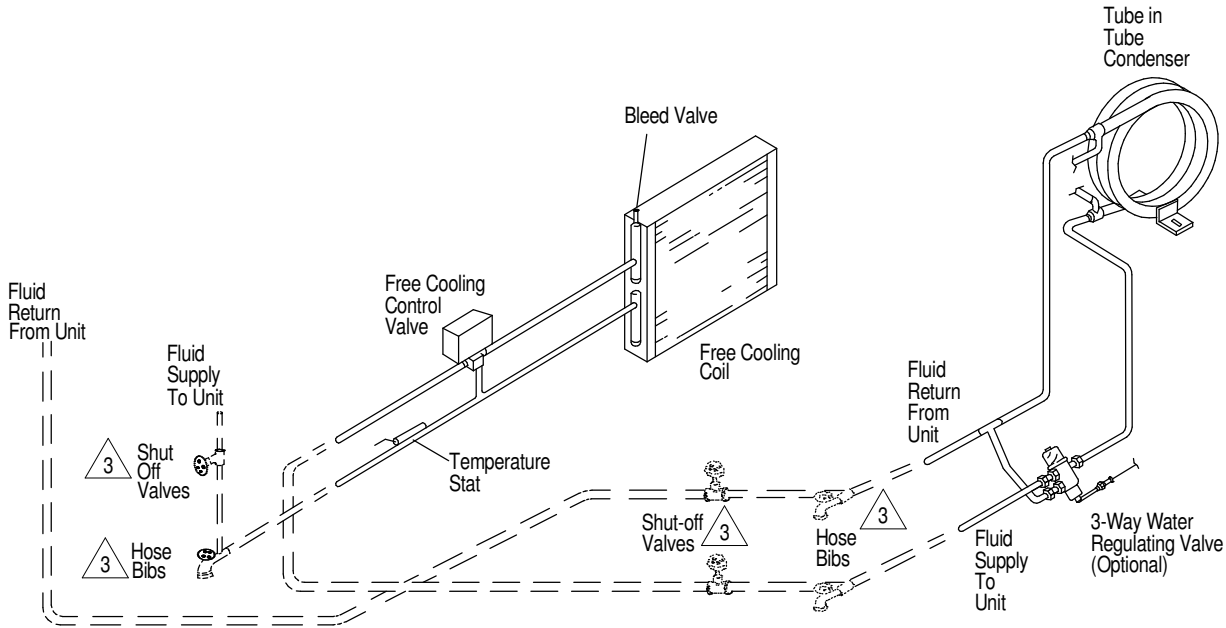
### 2 & 3 TON SPLIT SYSTEMS AIR COOLED & CHILLED WATER MODELS



Notes:

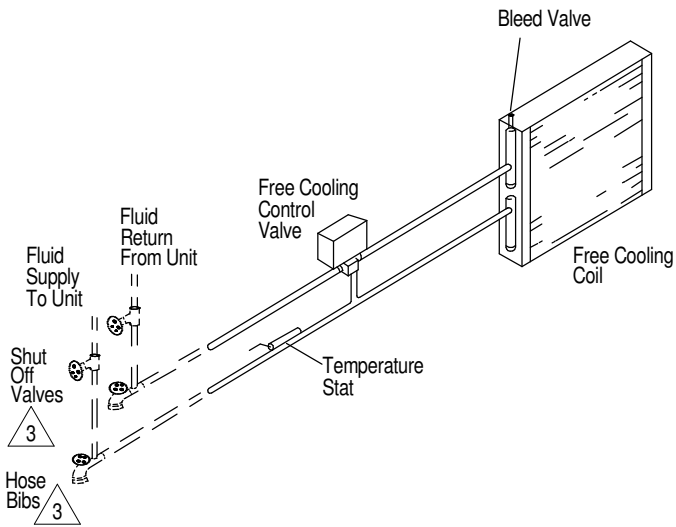
1. Components are not supplied by Liebert but are required for proper circuit operation and maintenance.

## GENERAL ARRANGEMENT DIAGRAM 2 & 3 TON FREE COOLING OR HOT WATER REHEAT COIL OPTIONS

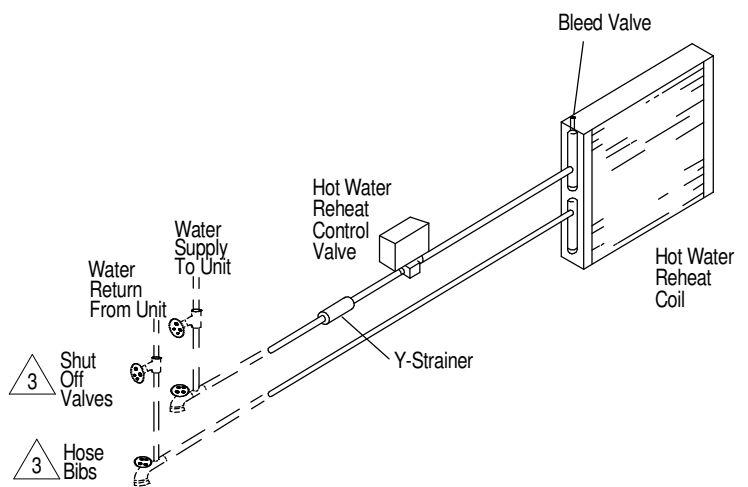


□ OPTIONAL FREE COOLING COIL(3-WAY VALVE)  
ON WATER/GLYCOL UNITS

Recommended piping for units  
with Free Cooling option and  
Water/Glycol Condenser



□ OPTIONAL FREE COOLING COIL (3-WAY VALVE)  
ON AIR COOLED UNITS



□ OPTIONAL HOT WATER REHEAT(2-WAY VALVE)

--- FIELD PIPING  
==== FACTORY PIPING

**Notes:**

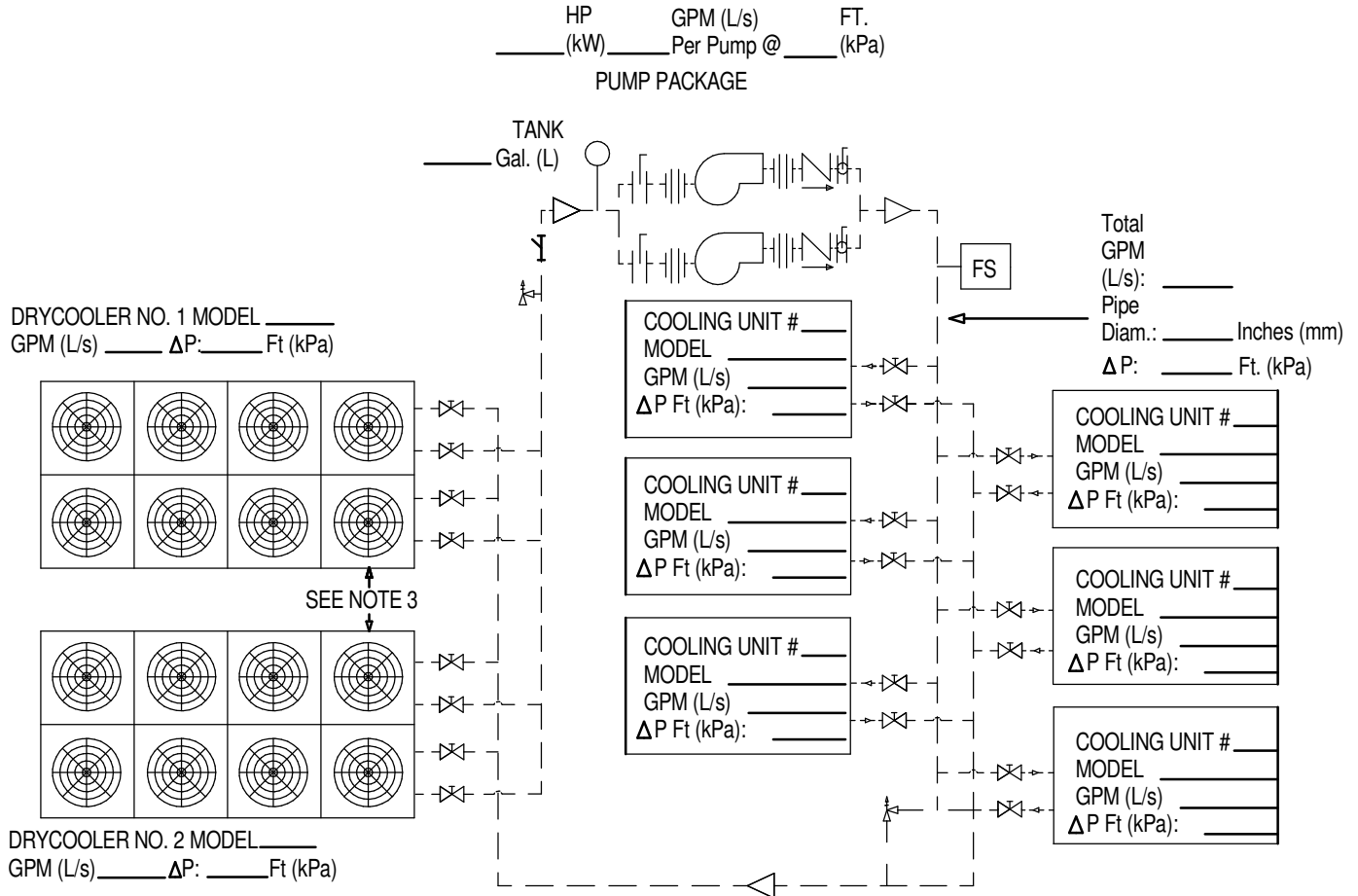
1. Each module is available with only one of the above options.
2. Hot Water Reheat is only available on Chilled Water units.

△ Components are not supplied by Liebert, but are required for proper circuit operation and maintenance.



# LIEBERT DRYCOOLER

## PIPING SCHEMATIC MULTIPLE DRYCOOLERS & COOLING UNITS ON COMMON GLYCOL LOOP



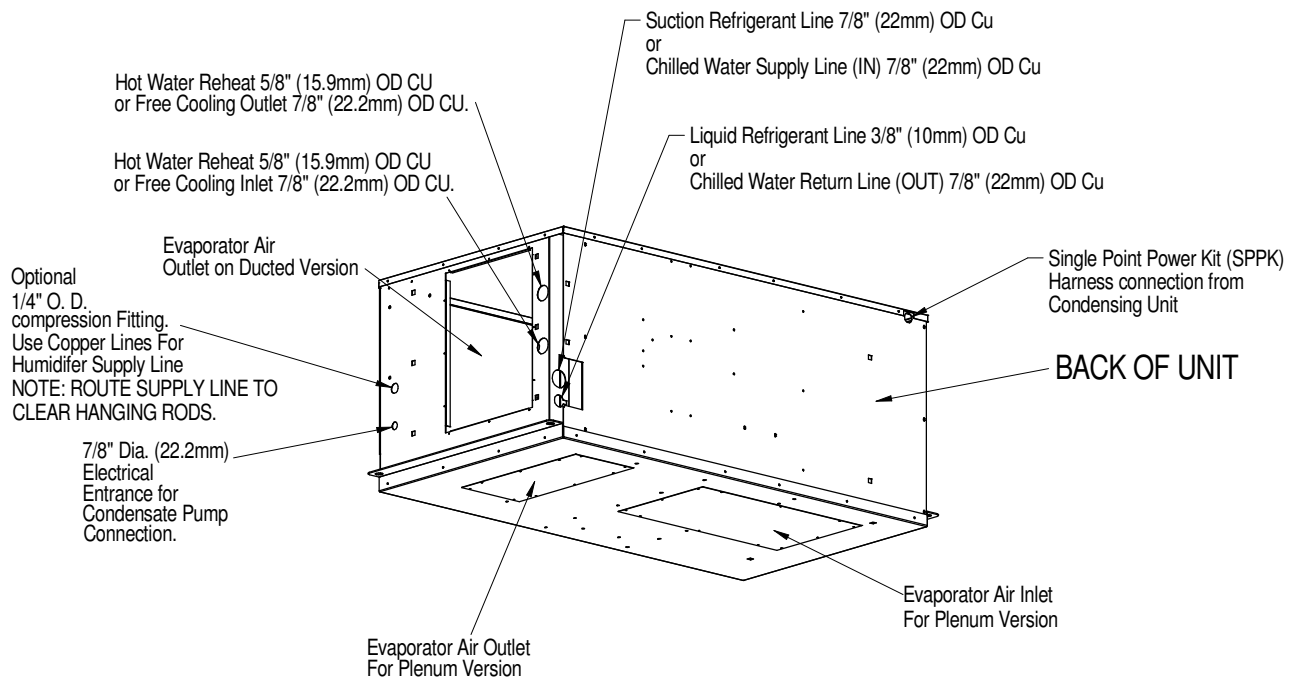
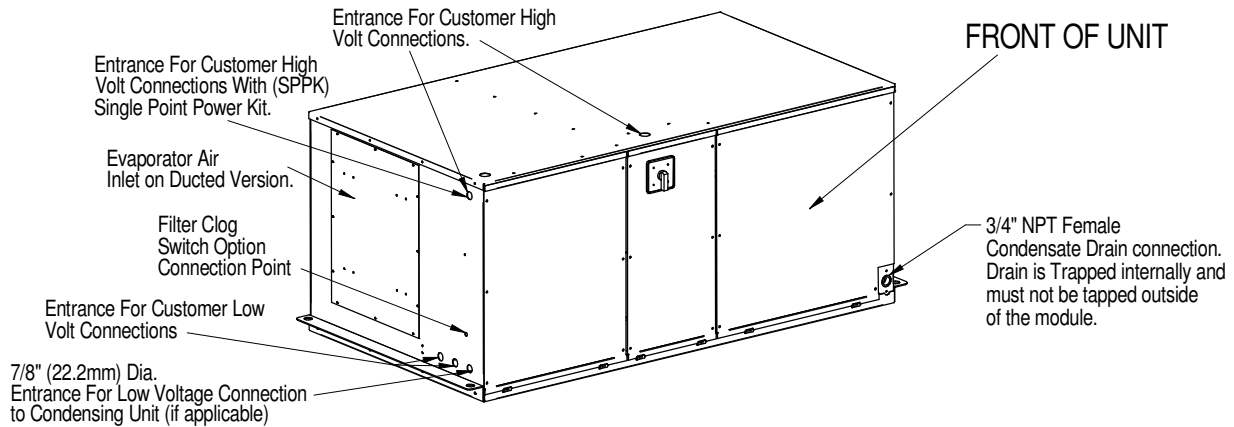
### LEGEND

- GATE VALVE
- CHECK VALVE
- BUTTERFLY VALVE
- RELIEF VALVE
- UNION
- BALL OR FLOW CONTROL VALVE
- FLOW SWITCH
- $\Delta P$ : PRESSURE DROP
- STRAINER/FILTER

### NOTES:

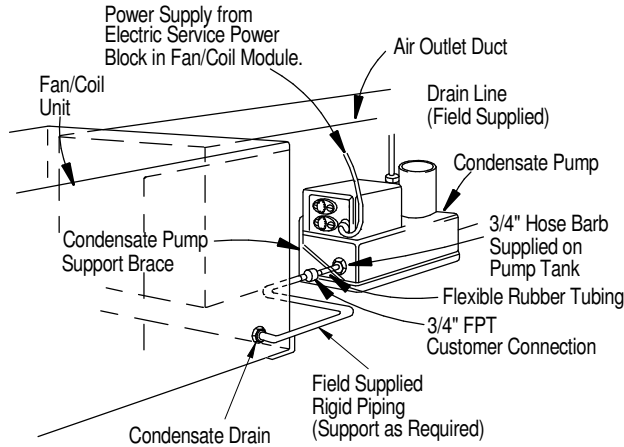
1. PRESSURE AND TEMPERATURE GAUGES (OR PORTS FOR SAME) ARE RECOMMENDED TO MONITOR COMPONENT PRESSURE DROPS AND PERFORMANCE.
2. FLOW MEASURING DEVICES, DRAIN AND BALANCING VALVES TO BE SUPPLIED BY OTHERS AND LOCATED AS REQUIRED.
3. SEE PRODUCT LITERATURE FOR INSTALLATION GUIDELINES AND CLEARANCE DIMENSIONS.
4. DRAWING SHOWS DUAL PUMP PACKAGE. ALTERNATE PUMP PACKAGES WITH MORE PUMPS MAY BE CONSIDERED, CONSULT SUPPLIER.
5. DEPENDING ON THE DRYCOOLER COIL CIRCUITING IT MAY HAVE 2 IN/OUT OR 4 IN/OUT CONNECTION POINTS.
6. INSTALL EXPANSION OR COMPRESSION TANK AT THE HIGHEST POINT OF THE SYSTEM.

## PRIMARY CONNECTION LOCATIONS 2 & 3 TON AIR, WATER/GLYCOL & CHILLED WATER MODELS

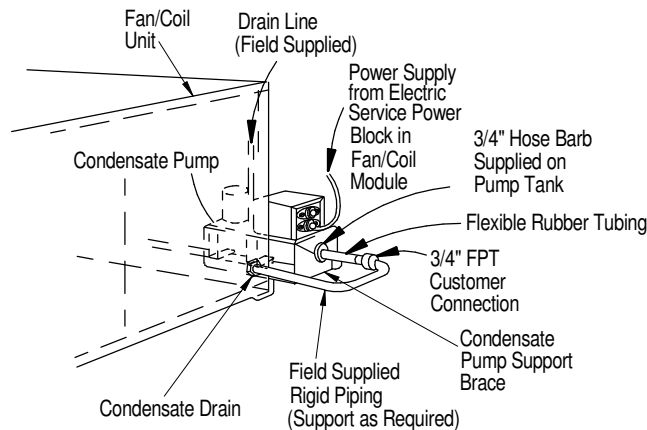


# LIEBERT MINI-MATE2

## SMALL SYSTEMS 2 & 3 TON CONDENSATE PUMP CONNECTION (OPTIONAL FIELD INSTALLED)



**CONDENSATE PUMP (FIELD INSTALLED)  
ON UNIT WITH AIR OUTLET DUCTWORK**



**CONDENSATE PUMP (FIELD INSTALLED)  
ON UNIT WITH AIR DISTRIBUTION PLENUM**

**Notes:**

1.  $\Phi 3/4"$  (19mm) Flexible Rubber Tubing Assembly (supplied with pump kit) must be installed on pump end of rigid piping (support as required).
2. Refer to DPN003401 for Installation Instructions.

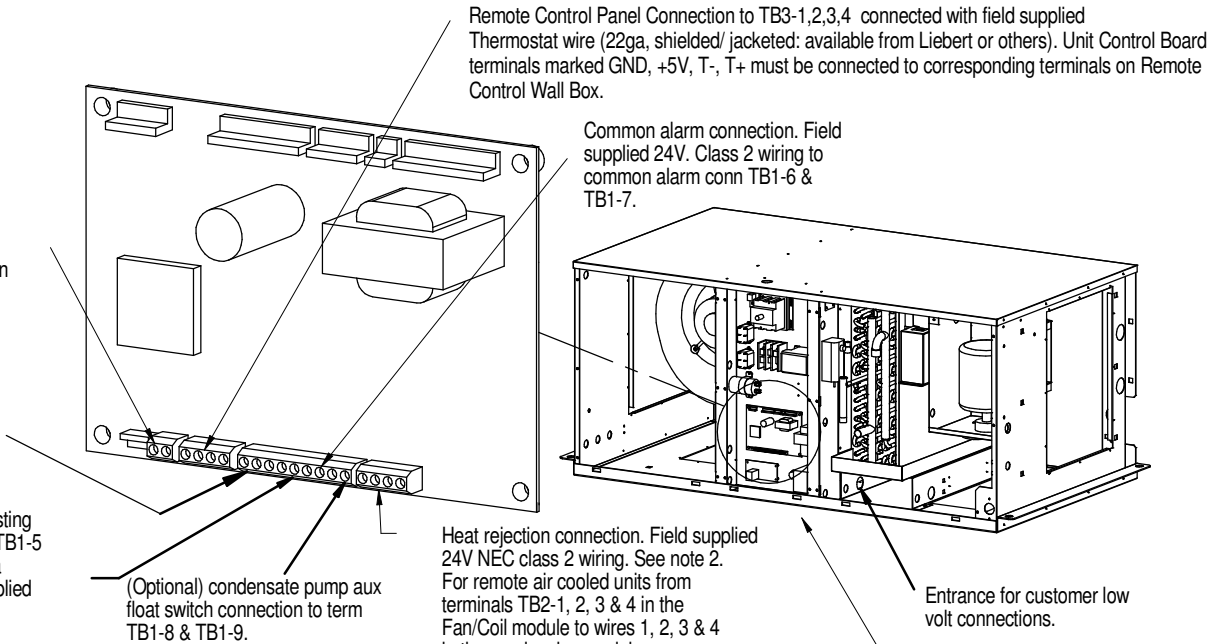
# LIEBERT MINI-MATE2

## ELECTRICAL FIELD CONNECTIONS 2 & 3 TON MODELS

Site monitoring connection. Terminals TB4-1(+) TB4-2(-) are for connection of a 2 wire, twisted pair, communication cable (available from Liebert or others) to optional IS-UNITY-DP, iCOM CMS, or SiteScan.

Customer remote alarm connection field supplied 24V, Class 2 wiring to conn TB1-1, TB1-2 & TB1-3.

Remote unit shutdown. Replace existing jumper between terminals TB1-4 & TB1-5 with normally closed switch having a minimum 75VA rating. use field supplied 24V class 1 wire.



Field supplied unit disconnect switch when factory unit disconnect switch is not supplied

Factory installed disconnect switch.

Electric service not by Liebert

Earth ground connection  
Connection terminal for field supplied earth grounding wire.

High Volt Power Connections. Electric service connection terminals.

Entrance For Customer High Volt Connections.

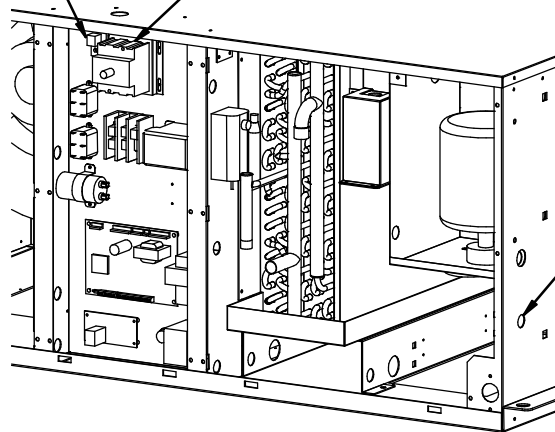
Drycooler/Circulating pump control circuit TB70-71. Optional w/Econ-O-Cycle models. Use field supplied 24V class 2 wire.

Field supplied, field wired thermostat wire to remote wall box

Entrance For Customer Low Voltage Connections

Field supplied 24V (NEC class 2 wiring) to condensing module. (if applicable)

Optional IS-UNITY-DP OR iCOM CMS connection to terminals 20 and 21 on left outside of electric box. Field supplied 24V Class 2 wiring.

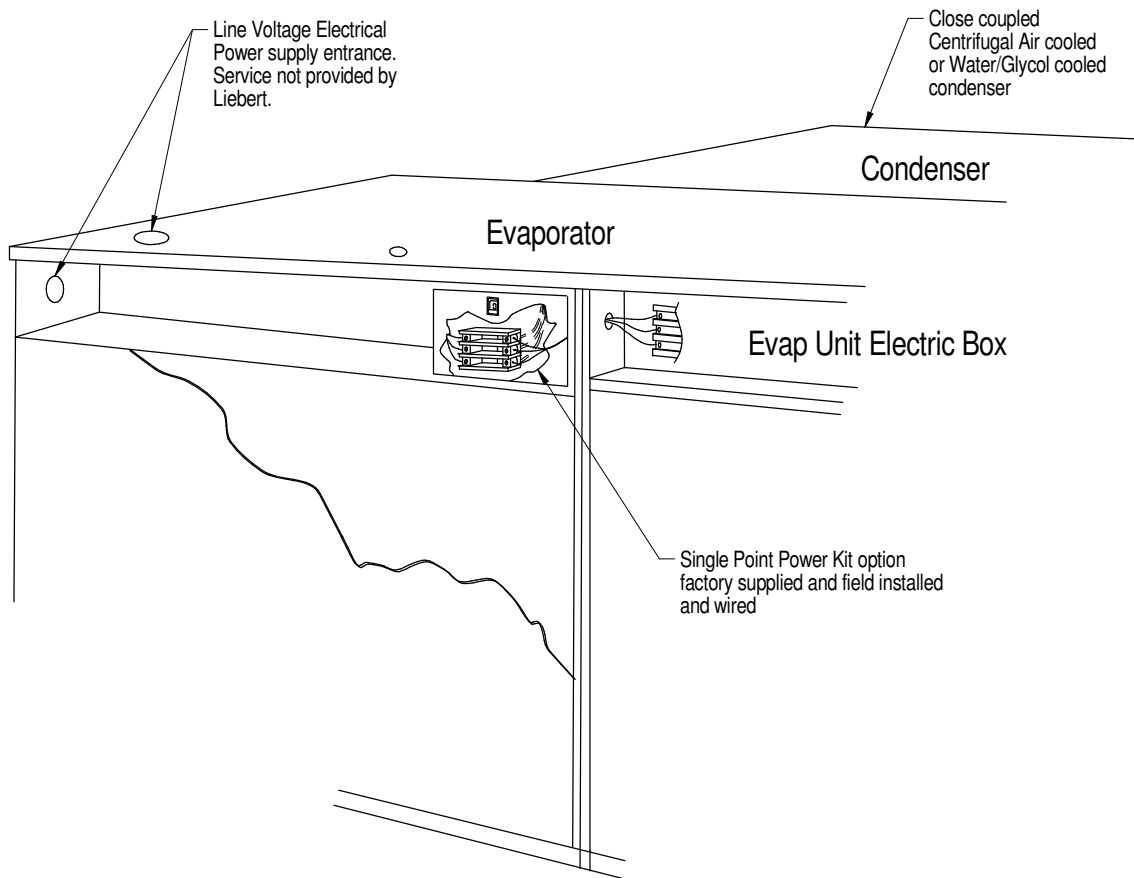


**NOTES:**

1. Refer to specification sheet for full load amp and wire size amp ratings.
2. Control voltage wiring must be a minimum of 16GA (1.3mm) for up to 75' (23m) or not to exceed 1 volt drop in control line.

# LIEBERT MINI-MATE2

## SINGLE POINT POWER KIT ALL 2 & 3 TON MODELS



**(Optional Field Installed)  
Single Point Power Kit**

**Notes:**

1. Single Point Power Kit should be mounted inside the evaporator before installing the unit in the ceiling.

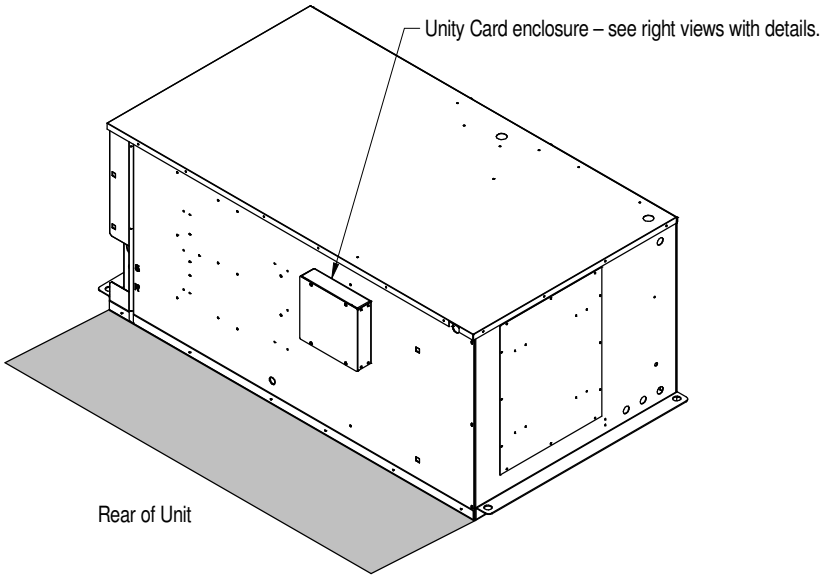




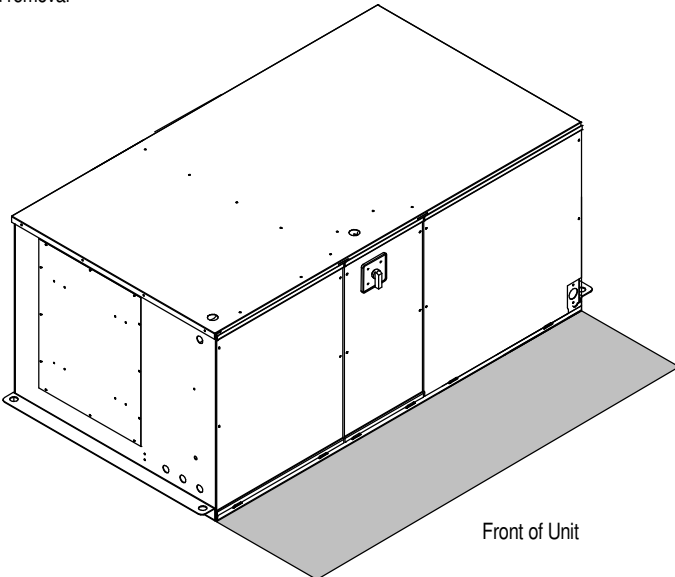
**VERTIV**

# LIEBERT MINI-MATE2

## GENERAL ARRANGEMENT & DIMENSIONAL DATA UNIT MOUNTED IS-UNITY-DP ON 2 & 3 TON FOR BMS CONNECTIVITY



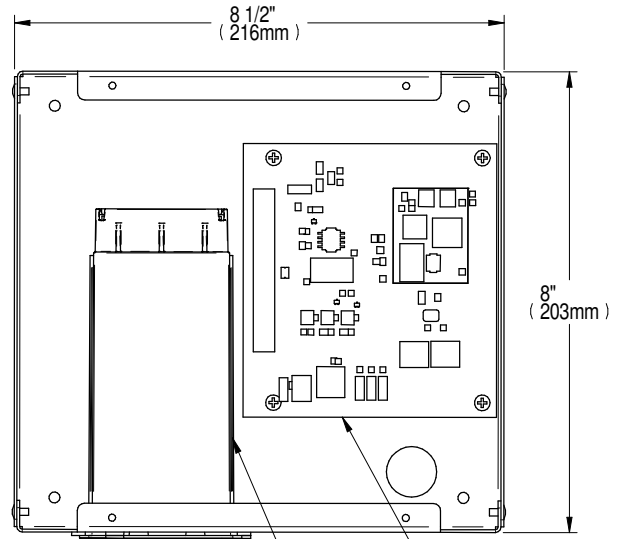
Shaded area indicates a recommended clearance of 30" (762mm) for component access and removal



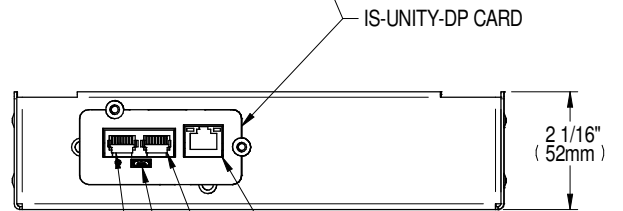
Shaded area indicates a recommended clearance of 30" (762mm) for component access and removal

**Notes:**

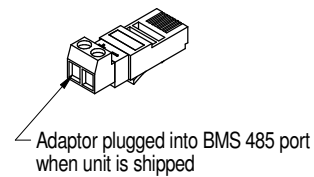
1. Refer to DPN004854 for field communication connections.



Cover removed for clarity. Removal not required for making field communication connections.

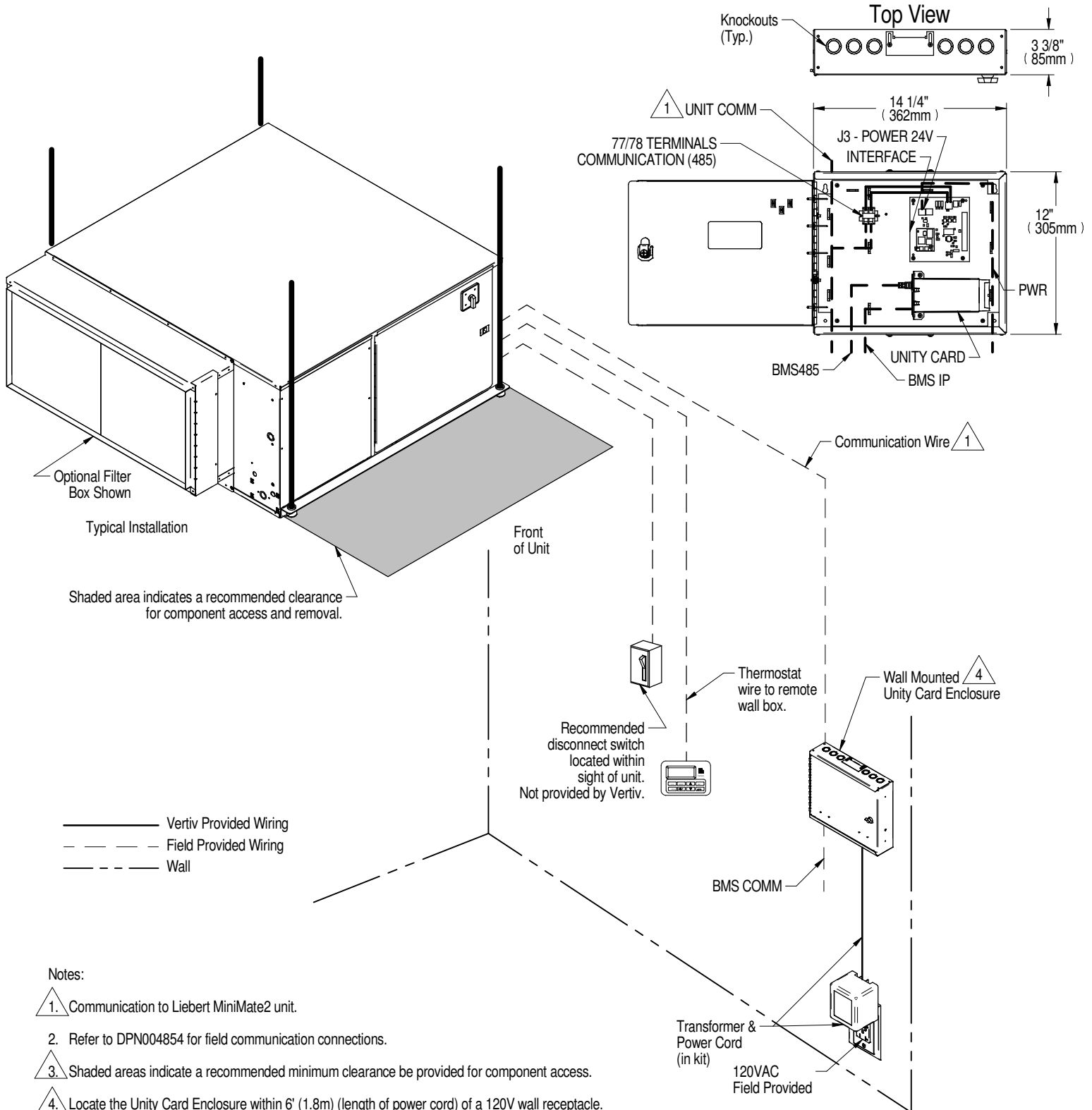


### BOTTOM VIEW



# LIEBERT MINI-MATE2

## GENERAL ARRANGEMENT & DIMENSIONAL DATA WALL MOUNTED IS-UNITY-DP CARD FOR BMS CONNECTIVITY

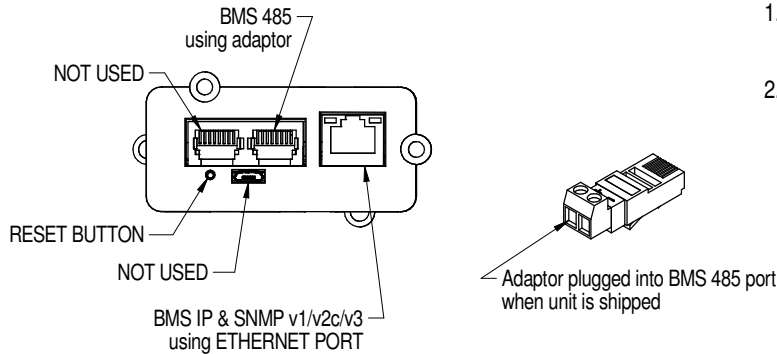


**Notes:**

1. Communication to Liebert MiniMate2 unit.
2. Refer to DPN004854 for field communication connections.
3. Shaded areas indicate a recommended minimum clearance be provided for component access.
4. Locate the Unity Card Enclosure within 6' (1.8m) (length of power cord) of a 120V wall receptacle.

## BMS COMMUNICATION CONNECTION OPTIONS LIEBERT MINI-MATE2 & DATAMATE

**BMS IP/485**  
(1 Cooling Unit only)



1. Building Management System (BMS) Protocols
  - \*BACNet over IP/485
  - \*Modbus over IP/485
2. Communication wiring is field supplied
  - IP - use CAT5e cable or greater
  - 485 - use EIA 485 rated, shielded, twisted pair cable, 22-18AWG.
  - Must be rated to meet local codes and conditions.

### UNIT TO INTERFACE BOARD CONNECTIONS

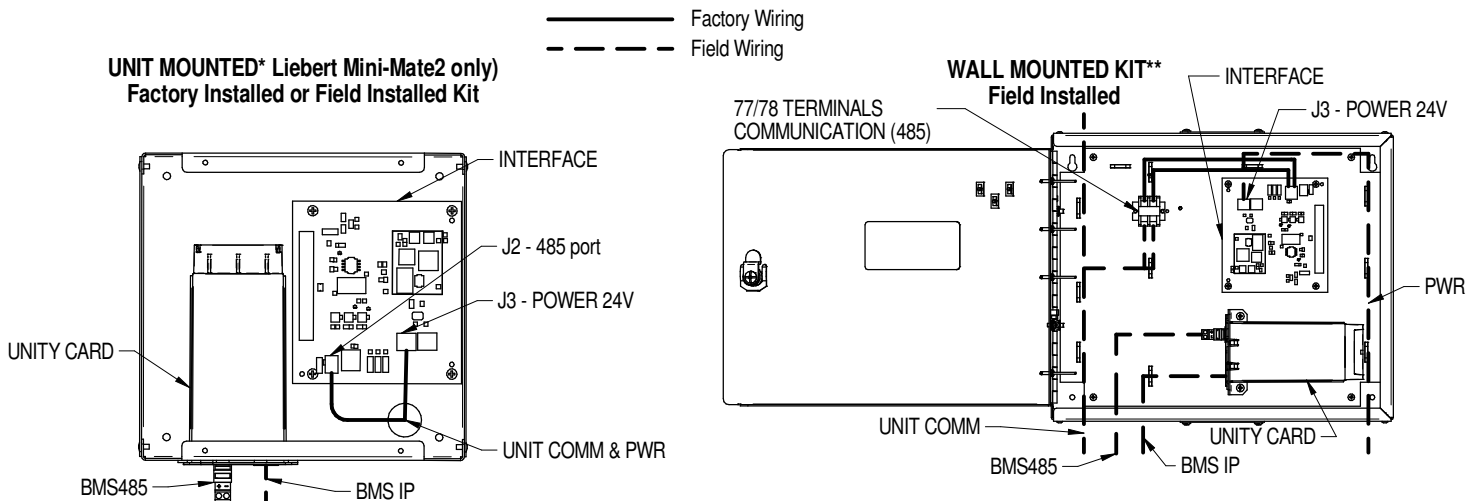
	UNIT		UNIT MOUNTED KITS*		WALL MOUNTED KITS**	
	TERMINAL/PLUG	POSITION	TERMINAL/PLUG	POSITION	TERMINAL/PLUG	POSITION
<b>Liebert Mini-Mate2 1-5 Ton</b>						
COMMUNICATION (485)	TB4	1 / 2	J2	2 / 1	77 / 78	N/A
POWER 24V	20, 21	N/A	J3	1 / 2	J3	1 / 2
<b>Liebert Mini-Mate2 8 Ton</b>						
COMMUNICATION (485)	77, 78	N/A	J2	2 / 1	77 / 78	N/A
POWER 24V	TB1	4 / 8	J3	1 / 2	J3	1 / 2
<b>Liebert DataMate</b>						
COMMUNICATION (485)	TB5	77 / 78	N/A	N/A	77 / 78	N/A
POWER 24V	N/A	N/A	N/A	N/A	J3	1 / 2

#### Notes

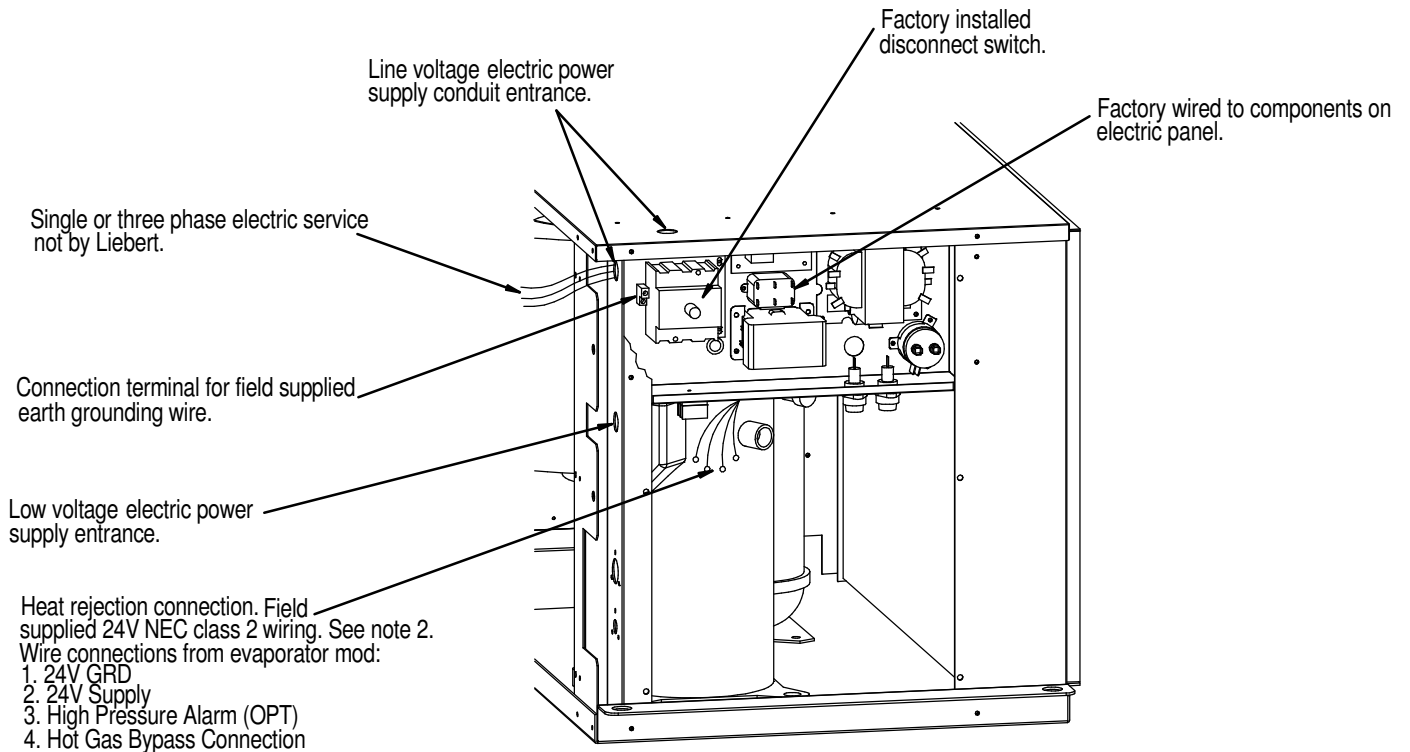
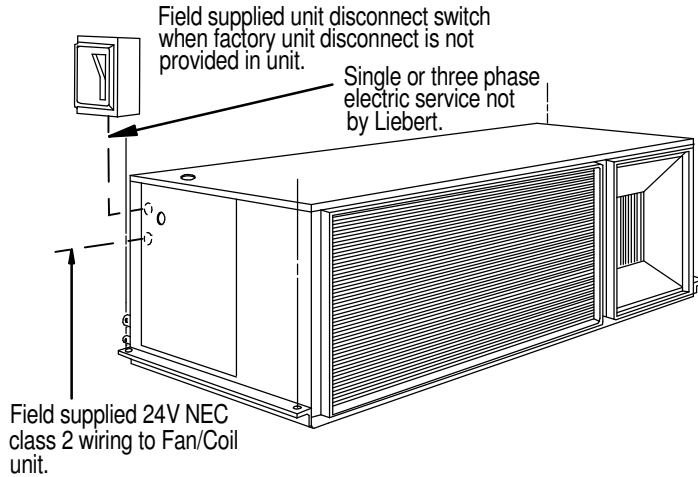
Terminals are presented in order of connection. For example, TB4-1 connects to J2-2.

\* Unit mounted kits are provided with Unit Comm & power wire harnesses; BMS Comm are field provided.

\*\* Wall mounted kits are provided with power wire harness and 120 Volt wall outlet transformer. Unit Comm & BMS Comm are field provided.



## ELECTRICAL FIELD CONNECTIONS 2 & 3 TON AIR COOLED INDOOR CONDENSING MODULE



Left End View

**NOTES:**

1. Refer to specification sheet for full load amp and wire size amp. ratings.
2. Control voltage wiring must be a minimum of 16GA (1.3mm) for up to 75'(23m) or not to exceed 1 volt drop in control line.

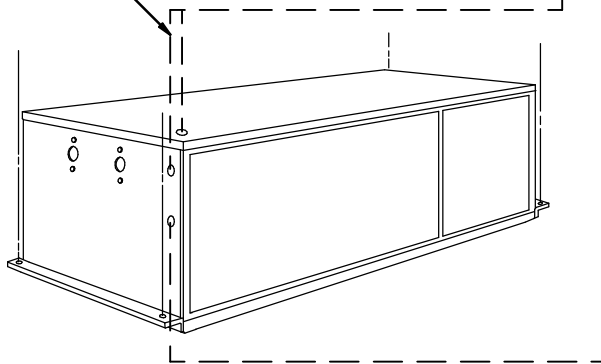
## ELECTRICAL FIELD CONNECTIONS

### 2 & 3 TON WATER/GLYCOL COOLED INDOOR CONDENSING MODULE

Single or three phase electric service not by Liebert



Field supplied unit disconnect switch when factory unit disconnect is not provided in unit.



- Field supplied 24V NEC class 1 wiring to Fan/Coil unit.
- Field supplied 24V NEC class 1 wiring to Drycooler (Glycol cooled units only).

Earth ground connection.  
Connection terminal for field supplied earth grounding wire.

Line voltage electric power supply entrance.

Factory wired to components on electric panel.

Optional factory installed disconnect switch.

Low voltage electric power supply entrance.

Remote Drycooler connection.  
Terminals 70 & 71 supplied for connection to remote Drycooler, use field supplied 24V NEC class 1 wiring (Glycol cooled units only).

Heat Rejection Connection.  
Field supplied 24V NEC class 2 wiring.  
See note 2.  
Wire connections from evaporator mod:  
1. 24V GND  
2. 24V Supply  
3. High Pressure Alarm (OPT)  
4. Hot Gas Bypass Connection

**NOTES:**

1. Refer to specification sheet for full load amp and wire size amp ratings.
2. Control voltage wiring must be a minimum of 16GA (1.3mm) for up to 75' (23m) or not to exceed 1 volt drop in control line.

## **Appendix C: Guide Specifications**

The following are the guide specifications for the Liebert® Mini-Mate2.

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# Liebert® Mini-Mate2™ —2- and 3-Ton

## GUIDE SPECIFICATIONS

### 1 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 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 IS-UNITY-DP 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 Electrical Switches and Sensors**

### **2.1.4.1 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.

### **2.1.4.2 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.

### **2.1.4.3 Filter Clog Switch**

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

## **2.1.5 Alarms**

### **2.1.5.1 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

**2.1.5.2 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.

**2.1.5.3 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).

**2.1.5.4 Audible Alarm**

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

**2.1.5.5 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.

**2.1.5.6 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 \_\_\_\_\_ (CMH). An externally equalized thermostatic expansion valve shall control refrigerant flow. The refrigerant piping shall be spun-closed and filled with a nitrogen holding charge. Field relief of the Schrader valves shall indicate a leak-free system. Evaporator and condensing unit shall be field piped using copper lines, brazed, evacuated and field charged with R-407C refrigerant. The evaporator unit can be coupled directly with the 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

## 2.3 CHILLED WATER SYSTEM COMPONENTS

### 2.3.1 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.

### 2.3.2 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.

## 2.4 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. A non-automatic, non-locking, molded case disconnect switch shall be factory mounted in the high voltage section of the electrical panel. The switch handle shall be accessible from the unit front. 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.

The refrigerant piping shall be spun-closed and filled with a nitrogen holding charge. Field relief of the Schrader valves shall indicate a leak-free system. Evaporator and condensing unit shall be field piped using copper lines, brazed, evacuated and field charged with R-407C refrigerant. 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.

## 2.5 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 galvalume 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.

The refrigerant piping shall be spun-closed and filled with a nitrogen holding charge. Field relief of the Schrader valves shall indicate a leak-free system. Evaporator and condensing unit shall be field piped using copper lines, brazed, evacuated and field charged with R-407C refrigerant. 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 epoxy-coated for extended coil life in corrosive environments, such as coastal areas. Factory-applied E-coat using immersion and baking process shall provide a flexible epoxy-coating to all coil surfaces. Coil color shall be black and shall be protected from solar UV ray degradation with a factory-applied UV topcoat.

## 2.6 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. A non-automatic, non-locking, molded case disconnect switch shall be factory mounted in the high voltage section of the electrical panel. The switch handle shall be accessible from the unit front. 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.

The refrigerant piping shall be spun-closed and filled with a nitrogen holding charge. Field relief of the Schrader valves shall indicate a leak-free system. Evaporator and condensing unit shall be field piped using copper lines, brazed, evacuated and field charged with R-407C refrigerant.

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))].

## 2.7 FACTORY-INSTALLED OPTIONS

### 2.7.1 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.

### 2.7.2 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.

### 2.7.3 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.

### 2.7.4 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.

### 2.7.5 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.

### 2.7.6 REMOTE MONITORING AND CONTROL – IS-UNITY-DP AND BMS

The IS-UNITY-DP BMS Monitoring Solution shall provide SNMP v1/v2c/v3, BACnet IP, BACnet MSTP, Modbus TCP/IP, and Modbus RTU monitoring capability to the Liebert Mini-Mate2 system. Card shall employ Ethernet and RS-485 networks to monitor and manage a wide range of operating parameters pertaining to the cooling system. The Unity card shall provide access to the Liebert Mini-Mate2 remotely via a web interface and shall support Liebert Nform™ connectivity. The IS-UNITY-DP card shall be factory mounted inside an enclosure on the outside of the Liebert Mini-Mate2 unit and shall be factory wired for power and unit communications. Ethernet cable providing network access to the world-wide web or to a BMS shall be field wired.

### 2.7.7 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.

## 2.8 SHIP-LOOSE ACCESSORIES

### 2.8.1 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.

### 2.8.2 Air Filter Box

The evaporator section shall be supplied with an air filter box for use with ducted installations. One (1) filter shall be included 4" x 20" x 20" (102 mm x 508mm x 508mm), deep-pleated type, with a MERV 8 rating, based on ASHRAE 52.2-2007..

### 2.8.3 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.

### 2.8.4 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.

### 2.8.5 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.

### 2.8.6 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.

### 2.8.7 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.

### 2.8.8 Remote Monitoring and Control – IS-Unity-DP and BMS – Field-installed Unit-mount Kit

The IS-UNITY-DP BMS Monitoring Solution shall provide SNMP v1/v2c/v3, BACnet IP, BACnet MSTP, Modbus TCP/IP, and Modbus RTU monitoring capability to the Liebert Mini-Mate2 system. Card shall employ Ethernet and RS-485 networks to monitor and manage a wide range of operating parameters pertaining to the cooling system. The Unity card shall provide access to the Liebert Mini-Mate2 remotely via a web interface and shall support Liebert Nform™ connectivity. The unit-mount external enclosure kit for field-installation shall include the IS-UNITY-DP card, power/communication interface card, galvanized steel enclosure, power and communication wire harnesses and full instructions. Field-supplied wiring for communication from the Liebert Mini-Mate2 to other systems shall be required to access features.



### **2.8.9 Remote Monitoring and Control – IS-Unity-DP and BMS – Field-installed Wall-mount Kit**

The IS-UNITY-DP BMS Monitoring Solution shall provide SNMP v1/v2c/v3, BACnet IP, BACnet MSTP, Modbus TCP/IP, and Modbus RTU monitoring capability to the Liebert Mini-Mate2 system. Card shall employ Ethernet and RS-485 networks to monitor and manage a wide range of operating parameters pertaining to the cooling system. The Unity card shall provide access to the Liebert Mini-Mate2 remotely via a web interface and shall support Liebert Nform™ connectivity. The wall-mount kit for field-installation shall include the IS-UNITY-DP card, power/communication interface card, painted enclosure, 120V wall outlet transformer with 6ft (2m) low voltage power wire, and full instructions. Power shall be supplied from unit using field-supplied wiring or from single phase power (120 V) source using included transformer. Field-supplied wiring for communication to the Liebert Mini-Mate2 and to other systems shall be required to access features.

### **2.8.10 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.

### **2.8.11 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.

### **2.8.12 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 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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