Precision Cooling
For *Business-Critical Continuity™*

Liebert® Air-Cooled Condensers

Technical Data Manual—50 & 60Hz

EMERSON
Network Power

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1.0 INTRODUCTION

1.1 Product Description

The Liebert condenser is a low-profile, direct-drive propeller fan-type air-cooled unit suitable for mounting outdoors. It provides for the heat rejection of either one or two separate refrigeration circuits, matching heat rejection capacity varying with the outdoor ambient temperatures and with each corresponding compressors heat rejection requirements. Constructed with an aluminum cabinet and a copper-tube aluminum fin coil, the unit is quiet and corrosion resistant. The condenser is quickly and easily installed because all internal wiring is completed at the factory with only electrical connections to be made at the job site. All electrical connections and controls are enclosed in an integral weatherproof section of the condenser.

Figure 1 Liebert two-fan condenser

1.2 Agency Listed

Standard 60Hz units are CSA certified to the harmonized U.S. and Canadian product safety standard, CSA C22.2 No 236/UL 1995 for "Heating and Cooling Equipment" and are marked with the CSA c-us logo. The units are also MEA-listed for New York City applications.

1.3 Location

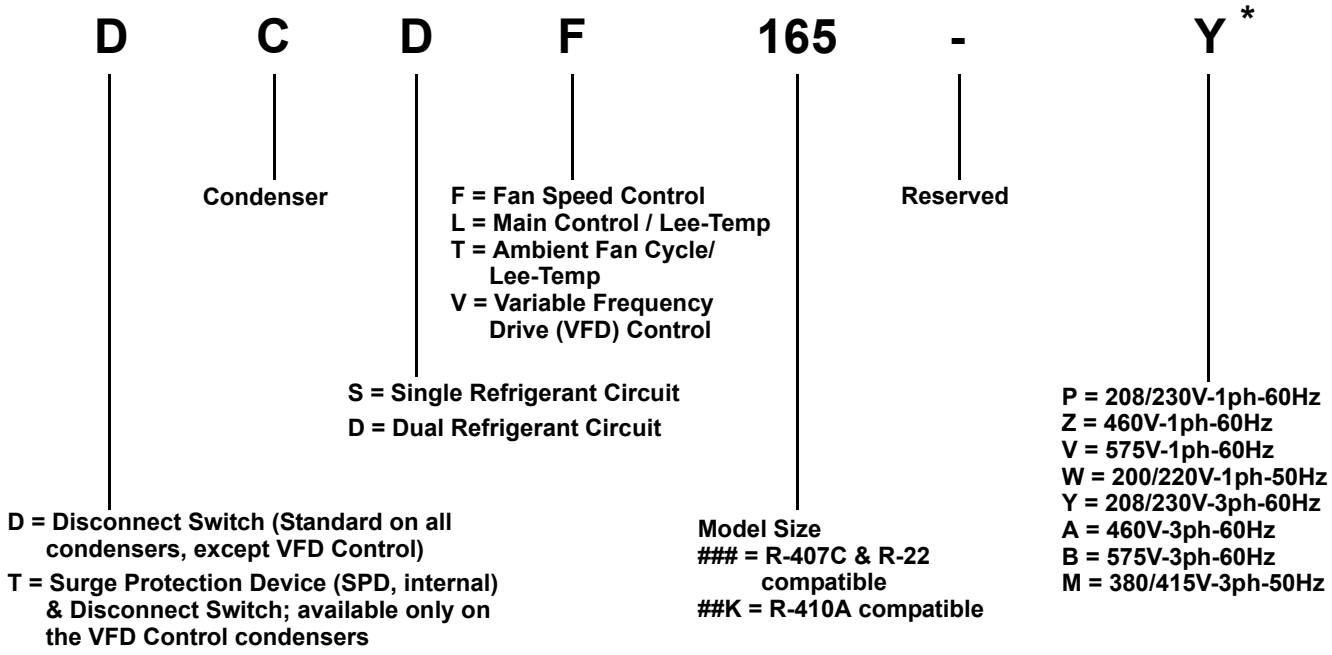
When considering installation locations, consider that these units reject heat into the atmosphere and should be located in a clean air area, away from loose dirt and foreign matter that may clog the coil. In addition, condensers must not be located in the vicinity of steam, hot air or fume exhausts. Condensers should be located no closer than 3 feet from a wall, obstruction or adjacent unit with no obstructions over the unit. Install condensers in a level position to assure proper refrigerant flow and oil return.

Do not mount condensers in areas where normal unit operating sound levels might disturb the working or residential environments of others.

Use caution when installing condensers below the indoor unit. Fan Speed and VFD condensers must not be installed more than 15ft. (4.6m) below the indoor unit; Liebert Lee-Temp condensers should be installed above or at the same level as the indoor unit. Contact the factory for assistance in specifying subcooling coils to each circuit to extend these limits.

1.4 Liebert Condenser Model Number Nomenclature

Example: DCDF165-Y



NOT ALL POSSIBLE COMBINATIONS OF MODELS, CONTROLS AND VOLTAGES ARE AVAILABLE.

*** Single-phase voltage is only voltage available as standard on Fan Speed Control 1-fan condensers**
*** Three-phase voltage is only voltage available as standard on condensers with VFD Control, Lee-temp receivers, and Fan Speed Control (2-8 fan models only).**
*** VFD Control Condensers are not available in 575-3-60.**

NOTE
Not all model/options/voltage combinations are available.

2.0 STANDARD FEATURES

2.1 Standard Features—All Condensers

Liebert condensers consist of condenser coil(s), housing, propeller fan(s) direct-driven by individual fan motor(s), electrical controls and mounting legs. Liebert air-cooled condensers provide positive refrigerant head pressure control to the Precision Cooling indoor unit by adjusting heat rejection capacity. Various methods are employed to match indoor unit type, minimum outdoor design ambient and maximum sound requirements.

2.1.1 Condenser Coil

Liebert-manufactured coils are constructed of copper tubes in a staggered tube pattern. Tubes are expanded into continuous, corrugated aluminum fins. The fins have full-depth fin collars completely covering the copper tubes, which are connected to heavy wall Type "L" headers. Inlet coil connector tubes pass through relieved holes in the tube sheet for maximum resistance to piping strain and vibration. Coils are either single circuit or dual circuit, depending on the application. The hot-gas and liquid lines are spun shut at the factory and include a factory-installed Schrader valve. Coils are factory leak-tested at a minimum of 300 psig (2068kPag), dehydrated, then filled and sealed with a nitrogen holding charge for shipment.

2.1.2 Housing

The condenser housing is fabricated from bright aluminum sheet and divided into individual fan sections by full width baffles. Structural support members, including coil support frame, motor and drive support, are galvanized steel for strength and corrosion resistance. Aluminum legs are provided for mounting unit for vertical discharge and have rigging holes for hoisting the unit into position. The unit's electrical panel is inside an integral NEMA 3R weatherproof section of the housing.

2.1.3 Propeller Fan

Aluminum propeller fan blades are secured to a corrosion-protected steel hub. Fan guards are heavy gauge, close-meshed steel wire with corrosion resistant PVC finish rated to pass a 675-hour salt spray test. Fans are secured to the fan motor shaft by a keyed hub and dual setscrews. Fan diameter is 26" (660mm) or less. The fans are factory-balanced and run before shipment.

2.1.4 Fan Motor

The condenser's fan motor is a continuous air-over design equipped with rain shield and permanently sealed bearing. Die-formed, galvanized steel supports are used for rigid mounting of the motor.

2.1.5 Electrical Controls

Electrical controls, overload protection devices and service connection terminals are factory-wired inside the integral electrical panel section of the housing. A locking disconnect switch is factory-mounted and wired to the electrical panel and controlled via an externally mounted locking door handle. An indoor unit interlock circuit enables condenser operation whenever indoor unit compressors are active. Only supply wiring and indoor unit interlock wiring are required at condenser installation.

3.0 SPECIFIC CONDENSER TYPES—FEATURES

3.1 Head Pressure Control Types

3.1.1 Fan Speed

Fan speed control utilizes a wave-chopper control to vary the air volume over the condenser coil, based on refrigerant head pressure. The fan motor next to the electrical panel (two fans on 6-fan and 8-fan models) is a single-phase, permanent split capacitor motor with motor speed adjusted in response to refrigerant pressure. The balance of fans on multi-fan units cycle on ambient thermostats. The control system provides refrigerant head pressure control for outdoor ambients as low as -20°F (-28.9 °C).

3.1.2 Variable Frequency Drive

VFD condenser control system utilizes a variable frequency drive, inverter duty fan motor operating from 0% to 100% motor RPM based on head pressure, sensed by refrigerant pressure transducers. VFD, ambient-temperature thermostat(s), motor overload protection and electrical control circuit are factory-wired in the integral control panel. VFD controls the fan adjacent to the connection end of the condenser and remains energized with active compressor operation. The balance of fans on multi-fan units cycle on ambient thermostats. This system provides refrigerant head pressure control for outdoor ambients as low as -20°F (-28.9°C).

3.1.3 Liebert Lee-Temp™ Refrigerant Control

The Liebert Lee-Temp head pressure control system is designed to maintain proper operating head pressures in outdoor temperatures down to -30°F (-34.4°C). The condensers utilize head pressure control valves, extra refrigerant and insulated refrigerant receivers with heater pads. It works by flooding the condenser coil with liquid refrigerant to a level that balances the system condensing requirements with the condenser coil surface available to reject the system heat. During the summer, the system requires the entire condenser coil surface for heat rejection and most of the refrigerant is stored in a receiver. In the winter, the same amount of heat can be rejected by only a fraction of the coil surface. As head pressure begins to fall, the control valve restricts the flow of liquid refrigerant exiting from the condenser. This extra liquid refrigerant reduces the effective condenser surface area available for heat transfer. The head pressure control valve also bypasses hot gas into the receiver to warm the liquid and maintain liquid pressure for proper operation of the expansion valve. Condenser fan controls are either fan cycling on ambient temperature or constant on. Liebert Lee-Temp control is required for Liebert Quiet-Line Condensers.

3.2 Sound Level Options

3.2.1 Standard Condenser

All fan speed and VFD condensers are standard condensers with moderate operating sound levels. Liebert Lee-Temp condensers with standard-size coils matching fan speed and VFD coil sizes are standard sound level condensers.

3.2.2 Liebert Quiet-Line Condenser

Liebert Quiet-Line condensers can help your facility meet the strictest noise codes and do so at less cost than traditional condensers with acoustical shielding. Liebert Quiet-Line condensers utilize the same reliable construction features of the standard condensers and have oversized coils and slower speed fan motors which yield the required heat rejection needed at significantly lower sound levels. Liebert Lee-Temp control is required for Liebert Quiet-Line Condensers.

3.3 Surge Protection Device—Optional

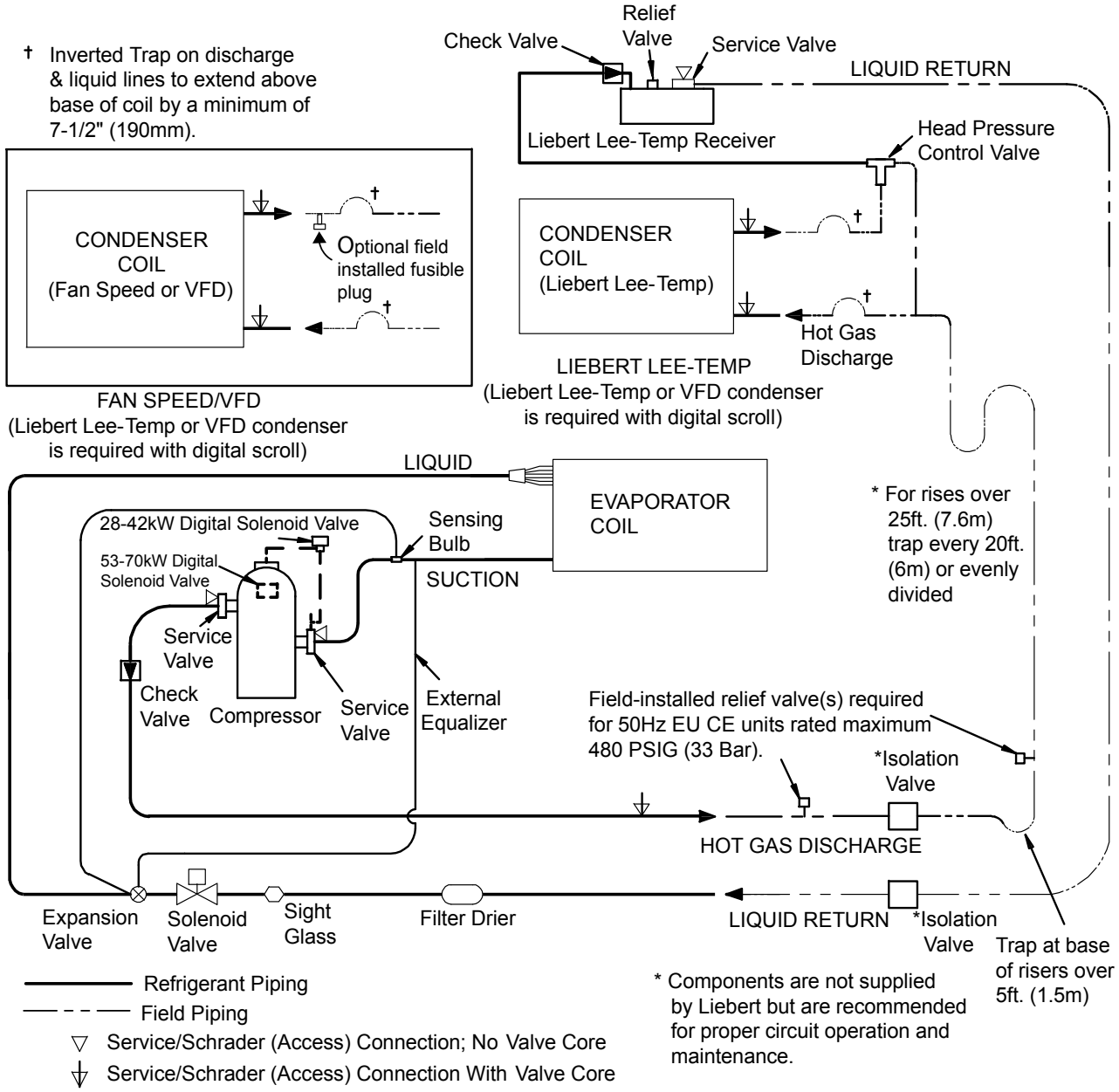
A surge protection device (SPD) is standard in the VFD condenser models only. Surge protection is necessary because rooftop voltage supply often is not conditioned the same as the voltage supply inside a data center. The SPD is designed to protect sensitive electronic condenser components from high voltage transients, up to 25kVA/phase.

An illuminated green LED indicates power supply is On and panel status is OK. An illuminated red LED indicates conditions require service and the SPD may require replacement to restore surge protection to the condenser.

3.4 Typical System Configurations

Figure 2 shows a single refrigeration circuit diagram, displaying the indoor air conditioning unit, the outdoor condenser (VFD, Fan Speed Control or Liebert Lee-Temp) and field supplied interconnection piping.

Figure 2 Piping schematic, air-cooled with scroll or digital scroll compressor models



NOTES: Schematic representation shown. Do not use for specific connection locations. Two refrigeration circuits provided. Single refrigeration circuit shown for clarit y.

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4.0 CONDENSER PERFORMANCE DATA

Table 1 Condenser performance data, 60Hz, R-407C

Model #	Total Heat Rejection, kBtuh (kW) R-407C				Fans Direct Drive				Sound Power Lw	Sound Pressure dBA
	30°F (16.7°C) TD	25°F (13.9°C) TD	20°F (11.1°C) TD	15°F (8.3°C) TD	Qty	Diam.	HP	CFM		
Standard	**90°F DB**	**95°F DB**	**100°F DB**	**105°F DB**						
083	102 (29.9)	82 (24.0)	63 (18.2)	43 (12.5)	1	26	3/4	5900	86.7	72.5
104	128 (37.3)	104 (30.4)	81 (23.5)	57 (16.7)	1	26	3/4	5500	86.6	72.5
165	208 (60.6)	167 (48.7)	127 (37.0)	87 (25.4)	2	26	3/4	11800	90.3	75.5
205	290 (84.7)	238 (69.5)	186 (54.3)	134 (39.1)	2	26	3/4	10300	91.0	75.5
251	301 (87.9)	243 (70.9)	185 (54.1)	129 (37.5)	3	26	3/4	17950	94.0	77.3
308	380 (110.9)	308 (89.9)	238 (69.3)	168 (49.0)	3	26	3/4	16650	93.8	77.3
415	601 (175.3)	491 (143.3)	383 (111.7)	278 (81.0)	4	26	3/4	20650	94.4	78.5
510	640 (186.6)	530 (154.7)	421 (122.9)	315 (91.8)	4	26	3/4	18200	94.4	78.5
616	760 (221.6)	619 (180.4)	475 (138.6)	336 (98.0)	6	26	3/4	33300	96.8	80.3
830	1200 (350.0)	983 (286.6)	765 (223.0)	555 (161.9)	8	26	3/4	41300	97.4	81.5
1010	1280 (373.3)	1061 (309.4)	846 (246.7)	627 (182.8)	8	26	3/4	36400	97.4	81.5
Liebert Quiet-Line										
063	70 (20.5)	58 (16.9)	46 (13.3)	33 (9.7)	1	26	1/4	2425	68.9	56.5
119	123 (36.0)	100 (29.1)	77 (22.6)	55 (16.2)	2	26	1/4	5250	72.6	59.5
127	141 (41.0)	116 (33.7)	90 (26.4)	66 (19.2)	2	26	1/4	4850	72.6	59.5
143	148 (43.2)	123 (35.8)	98 (28.6)	73 (21.3)	2	26	1/4	4250	72.6	59.5
214	232 (67.5)	193 (56.1)	154 (45.0)	116 (33.9)	3	26	1/4	6400	74.8	61.3
286	312 (90.9)	260 (75.7)	209 (60.9	157 (45.8)	4	26	1/4	8275	76.2	62.5
409	444 (129.4)	368 (107.2)	291 (84.8)	219 (63.8)	6	26	1/4	13750	78.4	64.3
572	623 (181.8)	519 (151.4)	417 (121.5)	312 (90.9)	8	26	1/4	17050	79.9	65.5

TD = Temperature difference between the Entering Air Temperature and Midpoint Condensing Temperature.
Capacity shown is the condenser's THR at sea level. If the condenser is a dual-circuit unit, each circuit's capacity is 1/2 of the THR shown.

Table 2 Condenser performance data, 50Hz, R-407C

Model #	Total Heat Rejection, kBtuh (kW) R-407C				Fans Direct Drive					
	30°F (16.7°C) TD	25°F (13.9°C) TD	20°F (11.1°C) TD	15°F (8.3°C) TD	Qty	Diam.	Hp	CFM	Sound Power LwA	Sound Pressure dBA
Standard	**90°F DB**	**95°F DB**	**100°F DB**	**105°F DB**						
083	91 (26.6)	73 (21.4)	56 (16.3)	39 (11.3)	1	26	3/4	4900	81.7	68.3
104	112 (32.7)	92 (26.7)	71 (20.7)	51 (14.8)	1	26	3/4	4575	82.5	69.1
165	185 (54.0)	149 (43.5)	114 (33.2)	79 (23.0)	2	26	3/4	9800	85.9	71.8
205	251 (73.2)	206 (60.0)	161 (47.1)	118 (34.4)	2	26	3/4	8475	87.2	70.6
251	270 (78.8)	218 (63.6)	167 (48.7)	117 (34.1)	3	26	3/4	14900	89.4	73.5
308	333 (97.1)	271 (79.1)	210 (61.3)	149 (43.5)	3	26	3/4	13700	89.4	73.7
415	516 (150.4)	424 (123.8)	332 (96.9)	242 (70.5)	4	26	3/4	16950	91.0	75.7
510	542 (158.1)	450 (131.2)	360 (104.9)	269 (78.4)	4	26	3/4	14900	91.0	75.7
616	667 (194.5)	543 (158.4)	420 (122.6)	299 (87.2)	6	26	3/4	27450	92.4	76.7
830	1031 (300.8)	849 (247.5)	665 (194.0)	484 (141.3)	8	26	3/4	33900	94.0	78.7
1010	1085 (316.5)	900 (262.4)	721 (210.2)	538 (156.8)	8	26	3/4	29800	94.0	78.7
Liebert Quiet-Line										
063	60 (17.5)	50 (14.5)	39 (11.4)	29 (8.4)	1	26	1/4	2000	65.6	53.2
119	108 (31.4)	87 (25.5)	68 (19.7)	50 (14.6)	2	26	1/4	4350	69.3	56.2
127	121 (35.2)	99 (28.9)	78 (22.7)	57 (16.5)	2	26	1/4	4000	69.3	56.2
143	124 (36.2)	104 (30.2)	83 (24.1)	61 (17.9)	2	26	1/4	3475	69.3	56.2
214	193 (56.2)	161 (47.0)	131 (38.1)	100 (29.1)	3	26	1/4	5225	71.5	58.0
286	258 (75.3)	216 (62.9)	174 (50.8)	132 (38.5)	4	26	1/4	6750	72.9	59.2
409	378 (110.3)	312 (91.1)	249 (72.7)	188 (54.9)	6	26	1/4	11250	75.1	61.0
572	472 (137.8)	392 (114.2)	310 (90.5)	229 (66.8)	8	26	1/4	13900	76.6	62.2

Table 3 Condenser performance data, 60Hz, R-410A

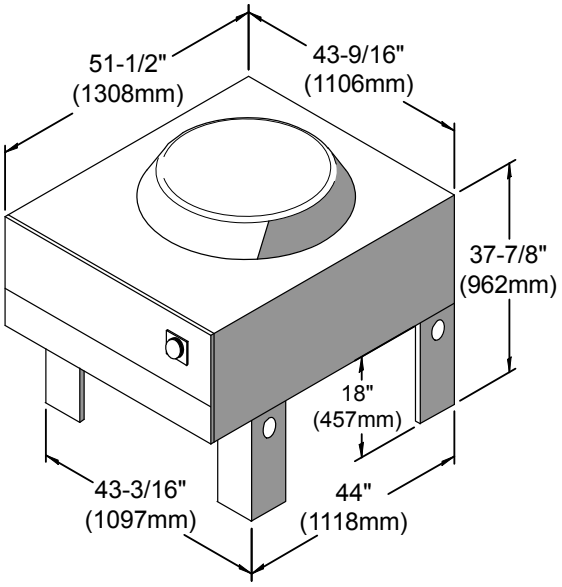
Model #	Total Heat Rejection, kW (kBtuh) R-410A				Fans Direct Drive				Sound Power Lwa	Sound Pressure dBA
	30°F (16.7°C) TD	25°F (13.9°C) TD	20°F (11.1°C) TD	15°F (8.3°C) TD	Qty	Diam.	HP	CFM		
Standard	**90°F DB**	**95°F DB**	**100°F DB**	**105°F DB**						
28K	31.6 (108)	26.4 (90)	20.5 (70)	15.0 (51)	1	26	3/4	5775	86.6	72.5
60K	74.2 (253)	60.4 (206)	46.8 (160)	34.0 (116)	2	26	3/4	11550	91.0	75.5
90K	118.6 (405)	97.2 (332)	76.0 (259)	55.0 (188)	3	26	3/4	17300	93.8	77.3

R-410A condensers are available only in 60 Hz.
TD = Temperature Difference between the Entering Air Temperature and Midpoint Condensing Temperature.
Capacity shown is the condenser's THR at sea level. If the condenser is a dual-circuit unit, each circuit's capacity is 1/2 of the THR shown.

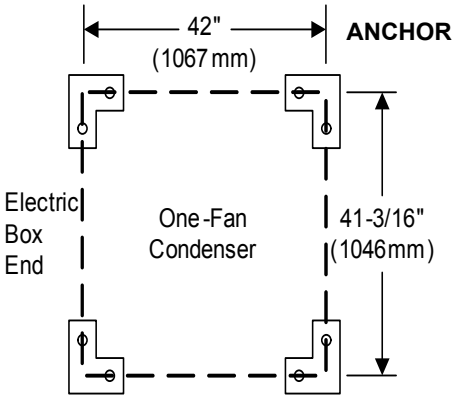
5.0 DIMENSIONS AND WEIGHTS

5.1 Condenser Dimensions and Anchor Plan

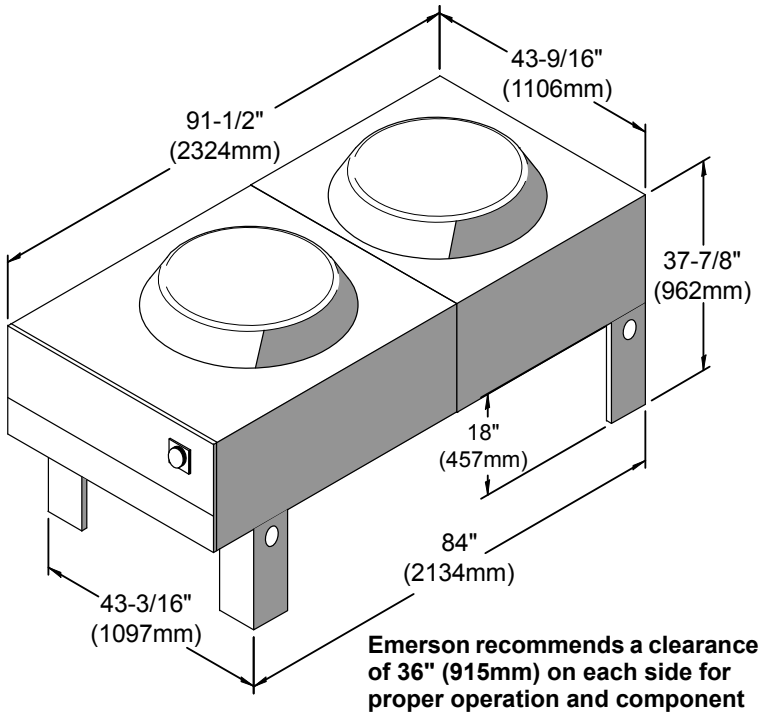
Figure 3 Condenser planning dimensional data—One-fan and two-fan units



Note:
Overall height to the top of fan guard
43-1/8" (1095mm)



See Figure 6 for typical condenser footprint dimensions.



Emerson recommends a clearance of 36" (915mm) on each side for proper operation and component access.

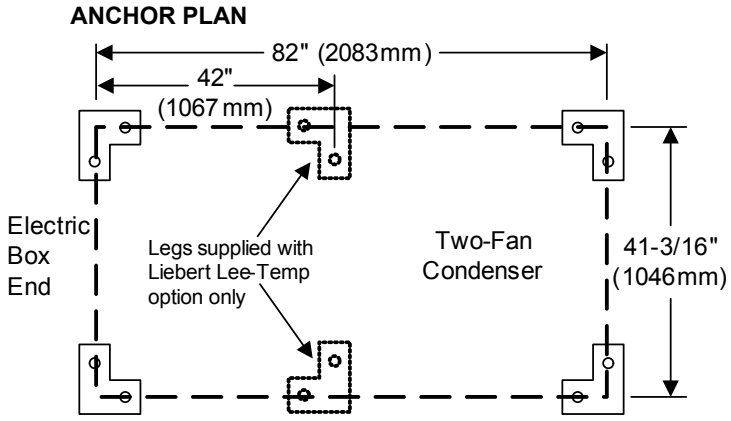


Figure 4 Condenser planning dimensional data—Three-fan and four-fan units

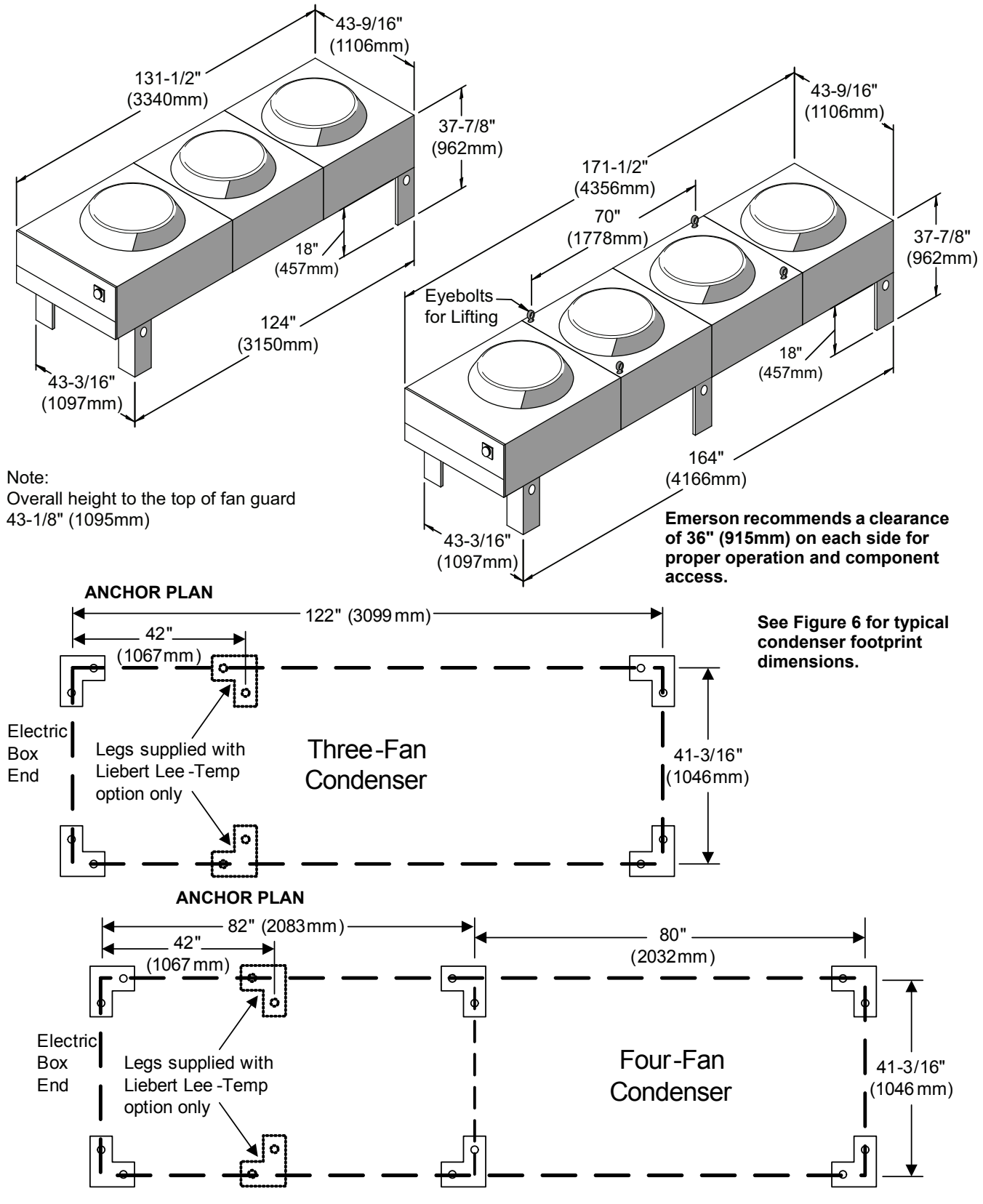
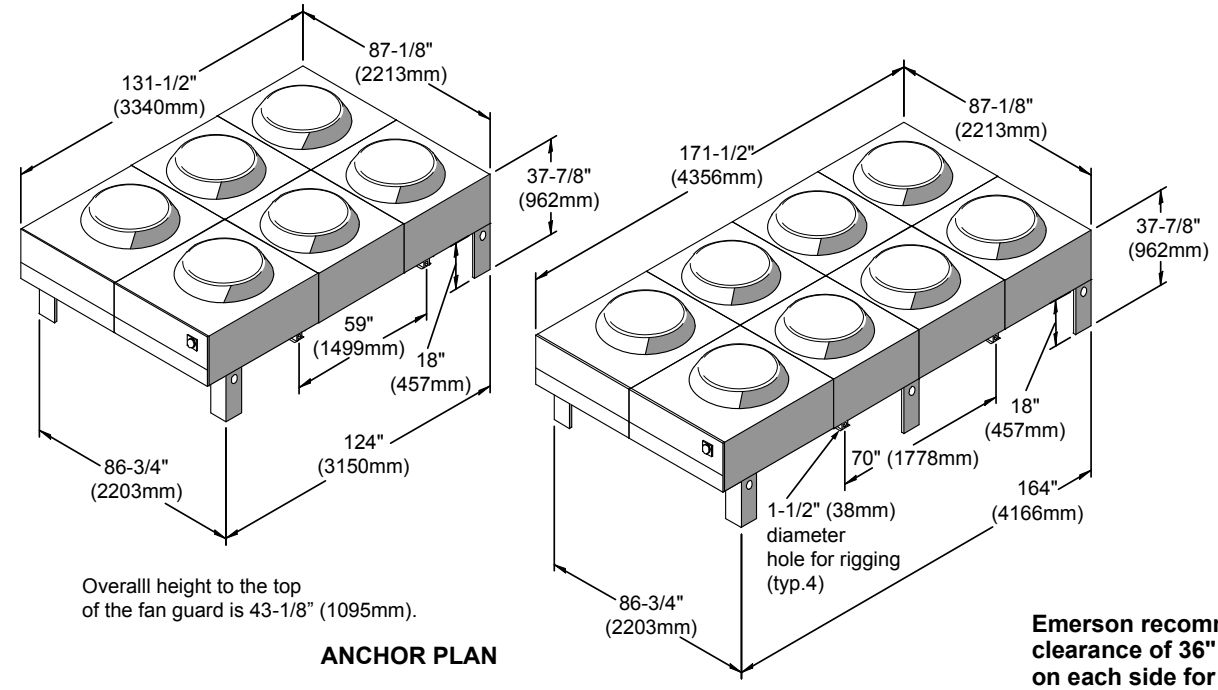


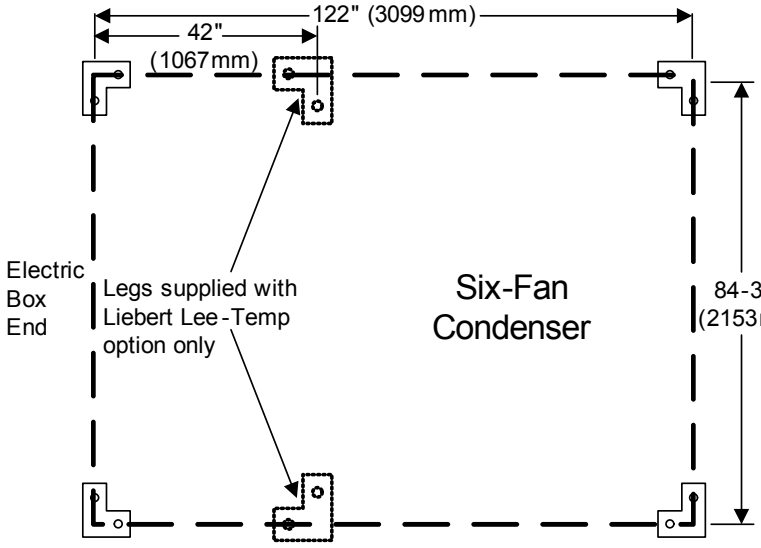
Figure 5 Condenser planning dimensional data—Six- and eight-fan units



Overalll height to the top of the fan guard is 43-1/8" (1095mm).

Emerson recommends a clearance of 36" (915mm) on each side for proper operation and component access.

ANCHOR PLAN



See Figure 6 for typical condenser footprint dimensions.

ANCHOR PLAN

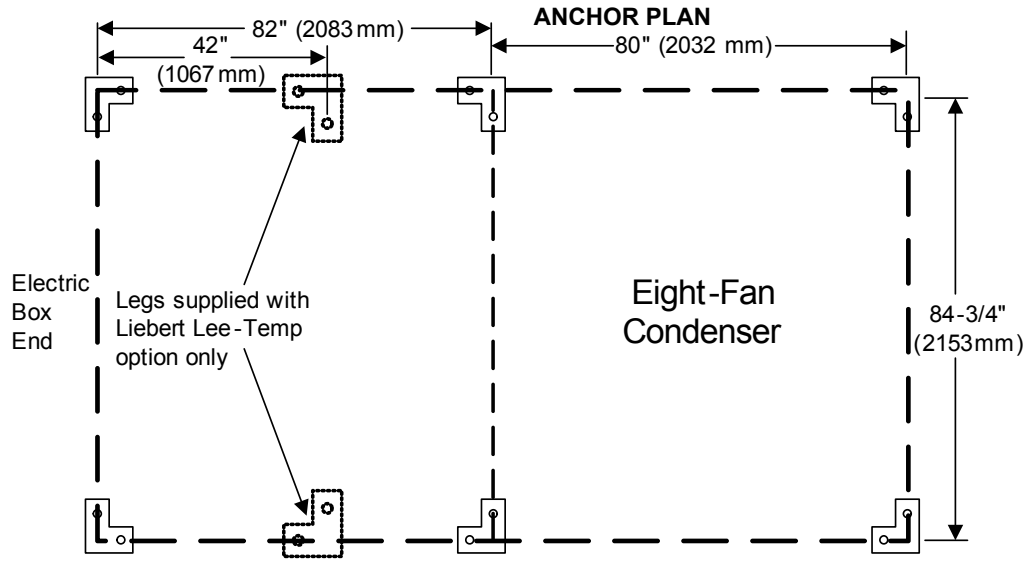
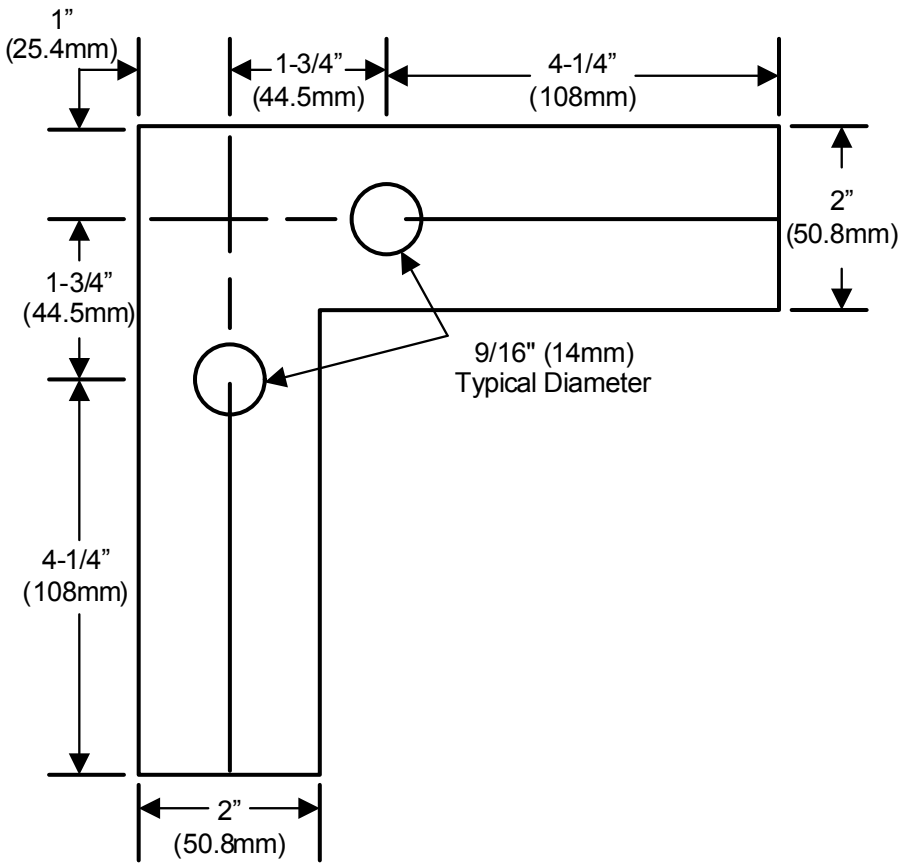


Figure 6 Typical condenser footprint—dimensions



5.2 Condenser Weights and Connection Sizes

Table 4 Condenser net weights and pipe connection sizes

Model #	Number of Fans	Number of Circuits	Connection Size, OD, In.		Net Weight lb (kg)
			Hot Gas	Liquid	
Standard Models					
083	1	1	7/8	5/8	295 (134)
104	1	1	1-1/8	5/8	315 (143)
104	1	2	7/8	1/2	315 (143)
165	2	1	1-1/8	7/8	425 (193)
165	2	2	7/8	5/8	425 (193)
205	2	1	1-1/8	7/8	495 (225)
205	2	2	1-1/8	7/8	495 (225)
251	3	1	1-1/8	7/8	500 (227)
251	3	2	1-1/8	7/8	500 (227)
308	3	1	1-5/8	1-1/8	670 (304)
308	3	2	1-3/8	1-1/8	670 (304)
415	4	1	1-3/8	1-1/8	840 (381)
415	4	2	1-3/8	1-1/8	840 (381)
510	4	1	2-1/8	1-5/8	1190 (540)
510	4	2	1-5/8	1-1/8	1190 (540)
616 *	6	1	(2) 1-5/8	(2) 1-1/8	1380 (626)
616	6	2	1-5/8	1-1/8	1380 (626)
830	8	2	1-3/8	1-1/8	1750 (794)
1010	8	2	2-1/8	1-5/8	2640 (1197)
Liebert Quiet-Line Models					
063	1	1	1-1/8	5/8	315 (143)
119	2	1	1-1/8	7/8	425 (193)
119	2	2	7/8	5/8	425 (193)
127	2	1	1-1/8	7/8	495 (225)
127	2	2	1-1/8	7/8	495 (225)
143	2	1	1-1/8	7/8	515 (234)
143	2	2	1-1/8	7/8	515 (234)
214	3	1	1-5/8	1-1/8	840 (381)
214	3	2	1-1/8	7/8	840 (381)
286	4	1	2-1/8	1-1/8	1105 (501)
286	4	2	1-1/8	7/8	1105 (501)
409	6	2	1-5/8	1-1/8	1380 (626)
572	8	2	2-1/8	1-1/8	2430 (1102)
R-410A Models					
28K	1	1	1-1/8	7/8	325 (147)
60K	2	1	1-1/8	7/8	475 (215)
90K	3	1	1-1/8	7/8	675 (306)

* Interconnection piping (field-supplied and installed) required. Configure piping for parallel refrigerant flow between condenser sections.

Table 5 Liebert Lee-Temp receiver weights and cross-reference to condenser

Condenser Model #	Receiver Part #	Receivers per Condenser	Weight per Receiver lb. (kg)
Standard Models			
DCSL083	1C19982P1	1	100 (45)
DCSL104	1C19982P1		100 (45)
DCSL165	W-0050		125 (57)
DCSL205	W-0050		125 (57)
DCSL251	W-0050		125 (57)
DCSL308	W-0060		145 (66)
DCSL415	185011P1		260 (118)
DCSL616	W-0410 [1]		200 (91)
DCSL616	179701P1 [2]		424 (192)
DCDL104	1C19982P1	2	100 (45)
DCDL165	1C19982P1		100 (45)
DCDL205	W-0050		125 (57)
DCDL251	1C19982P1		100 (45)
DCDL308	W-0050		125 (57)
DCDL415	W-0060		145 (66)
DCDL510	W-0410		200 (91)
DCDL616	W-0060		145 (66)
DCDL830	185011P1		260 (118)
Liebert Quiet-Line Models			
DCSL063	1C19982P1	1	100 (45)
DCST119	W-0050		125 (57)
DCSL127	W-0050		125 (57)
DCSL143	W-0060		145 (66)
DCST214	W-0410		200 (91)
DCST286	W-0410		200 (91)
DCDL119	1C19982P1	2	100 (45)
DCDL127	1C19982P1		100 (45)
DCDL143	W-0050		125 (57)
DCDT214	W-0050		125 (57)
DCDL286	W-0060		145 (66)
DCDT409	W-0410		200 (91)
DCDT572	W-0410		200 (91)
R-410A Models			
DCSL28K	195315P1	1	125 (57)
DCSL60K	195316P1		145 (66)
DCSL90K	196702P1		200 (91)

1. Matchup for 35 to 105°F (2 to 41°C) design temperature range.
2. Matchup for -30 to 105°F (-34 to 41°C) design temperature range.

6.0 ELECTRICAL DATA

Table 6 60Hz electrical condenser data

Model #		083, 104, 28K			165, 205, 60K			251, 308, 90K			415, 510			616			830, 1010		
# of Fans		1			2			3			4			6			8		
Input Voltage	ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
Fan Speed Controlled																			
208/230	1	4.8	6.0	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
460		2.5	3.1	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
575		1.9	2.4	15	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
208/230	3	—	—	—	8.3	9.5	15	11.8	13.0	15	15.3	16.5	20	23.6	24.8	30	30.6	31.8	40
460		—	—	—	4.2	4.8	15	5.9	6.5	15	7.6	8.2	15	11.8	12.4	15	15.2	15.8	20
575		—	—	—	3.3	3.8	15	4.7	5.2	15	6.1	6.6	15	9.4	9.9	15	12.2	12.7	15
VFD Controlled																			
208/230	3	3.7	4.6	15	7.2	8.1	15	10.7	11.6	15	14.2	15.1	20	N/A	N/A	N/A	N/A	N/A	N/A
460		1.8	2.3	15	3.5	4.0	15	5.2	5.7	15	6.9	7.4	15	N/A	N/A	N/A	N/A	N/A	N/A
Liebert Lee-Temp Controlled/Fan-Cycling																			
208/230	3	3.5	4.4	15	7.0	7.9	15	10.5	11.4	15	14.0	14.9	20	21.0	21.9	25	28.0	28.9	35
460		1.7	2.1	15	3.4	3.8	15	5.1	5.5	15	6.8	7.2	15	10.2	10.6	15	13.6	14.0	20
575		1.4	1.8	15	2.8	3.2	15	4.2	4.6	15	5.6	6.0	15	8.4	8.8	15	11.2	11.6	15

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

Table 7 60Hz condenser electrical data, Liebert Quiet-Line

Model #		063			119, 127, 143			214			286			409			572		
# of Fans		1			2			3			4			6			8		
Input Voltage	ph	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD	FLA	WSA	OPD
208/230	3	1.8	2.3	15	3.6	4.1	15	5.4	5.9	15	7.2	7.7	15	10.8	11.3	15	14.4	14.9	20
460		0.9	1.1	15	1.8	2.0	15	2.7	2.9	15	3.6	3.8	15	5.4	5.6	15	7.2	7.4	15
575		0.7	0.9	15	1.4	1.6	15	2.1	2.3	15	2.8	3.0	15	4.2	4.4	15	5.6	5.8	15

FLA = Full Load Amps; WSA = Wire Size Amps; OPD = Maximum Overcurrent Protection Device

Table 8 50Hz condenser full load amp values

Condenser Control Type		Fan Speed Controlled		VFD Controlled		Liebert Lee Temp Controlled/Fan-Cycling		Liebert Quiet-Line (Liebert Lee-Temp Controlled/Fan-Cycling)		
Model #	# of Fans	Input Voltage - Phase		Input Voltage - Phase		Input Voltage - Phase		Model #	Input Voltage - Phase	
		200/220-1	380/415-3	200/230-3	380/415-3	200/230-3	380/415-3		200/230-3	380/415-3
083, 104	1	4.0	-	3.7	1.8	3.5	1.7	063	1.8	0.9
165, 205	2	—	3.7	7.2	3.5	7.0	3.4	119, 127, 143	3.6	1.8
251, 308	3	—	5.4	10.7	5.2	10.5	5.1	214	5.4	2.7
415, 510	4	—	7.1	14.2	6.9	14.0	6.8	286	7.2	3.6
616	6	—	10.8	—	—	21.0	10.2	409	10.8	5.4
830, 1010	8	—	14.2	—	—	28.0	13.6	572	14.4	7.2

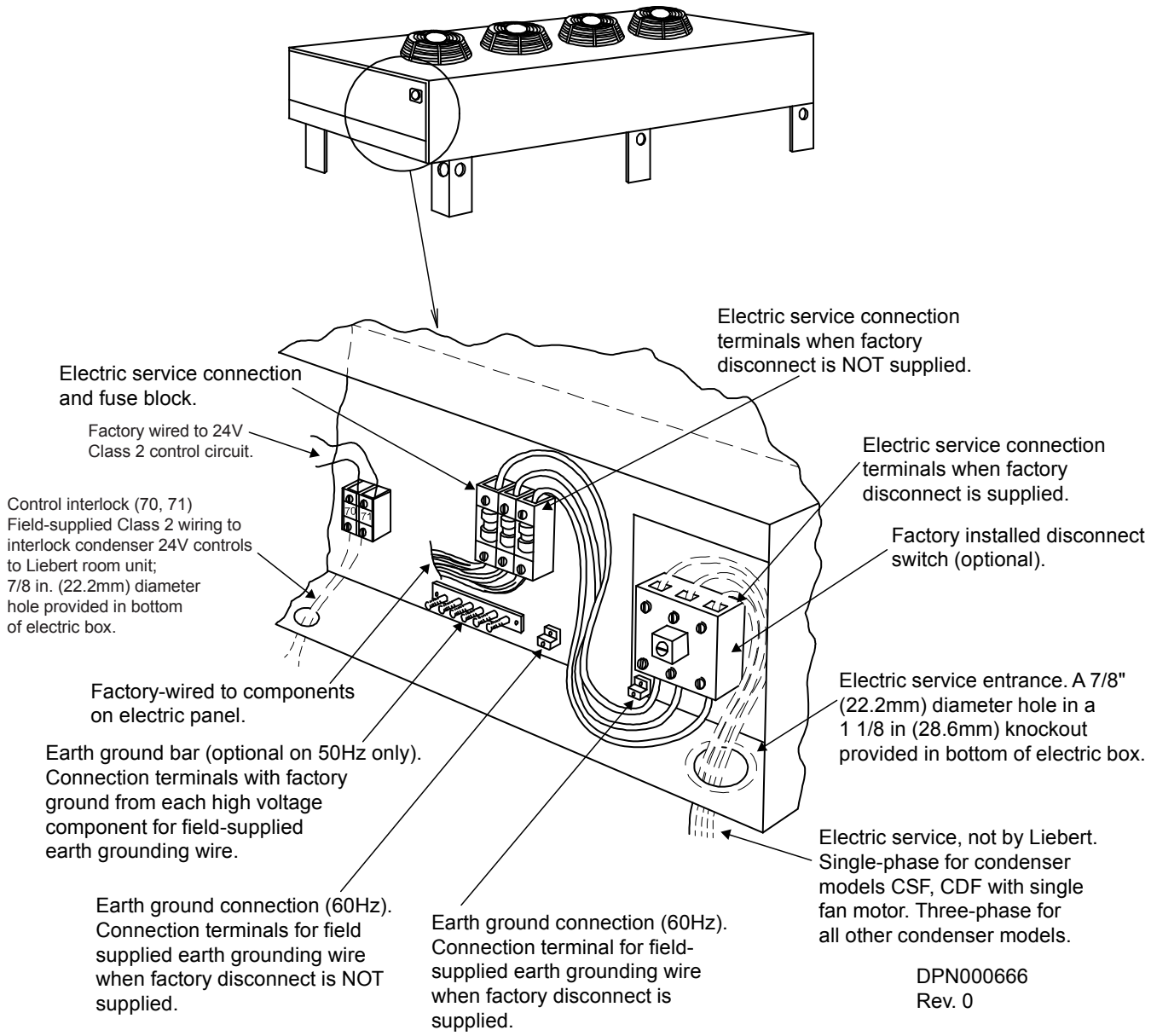
Table 9 Liebert Lee-Temp receiver electrical data, 50Hz and 60Hz

Rated Voltage - Single Phase	120			200/208/230		
Watts/Receiver	150	300	450	150	300	450
Full Load Amps	1.4	2.8	4.2	0.7	1.4	2.1
Wire Size Amps	1.8	3.5	5.3	0.9	1.8	2.7
Maximum Overcurrent Protection Device, Amps	15	15	15	15	15	15

The Liebert Lee-Temp receiver requires a separate power feed for heaters. The condenser is not designed to supply power to the receiver.

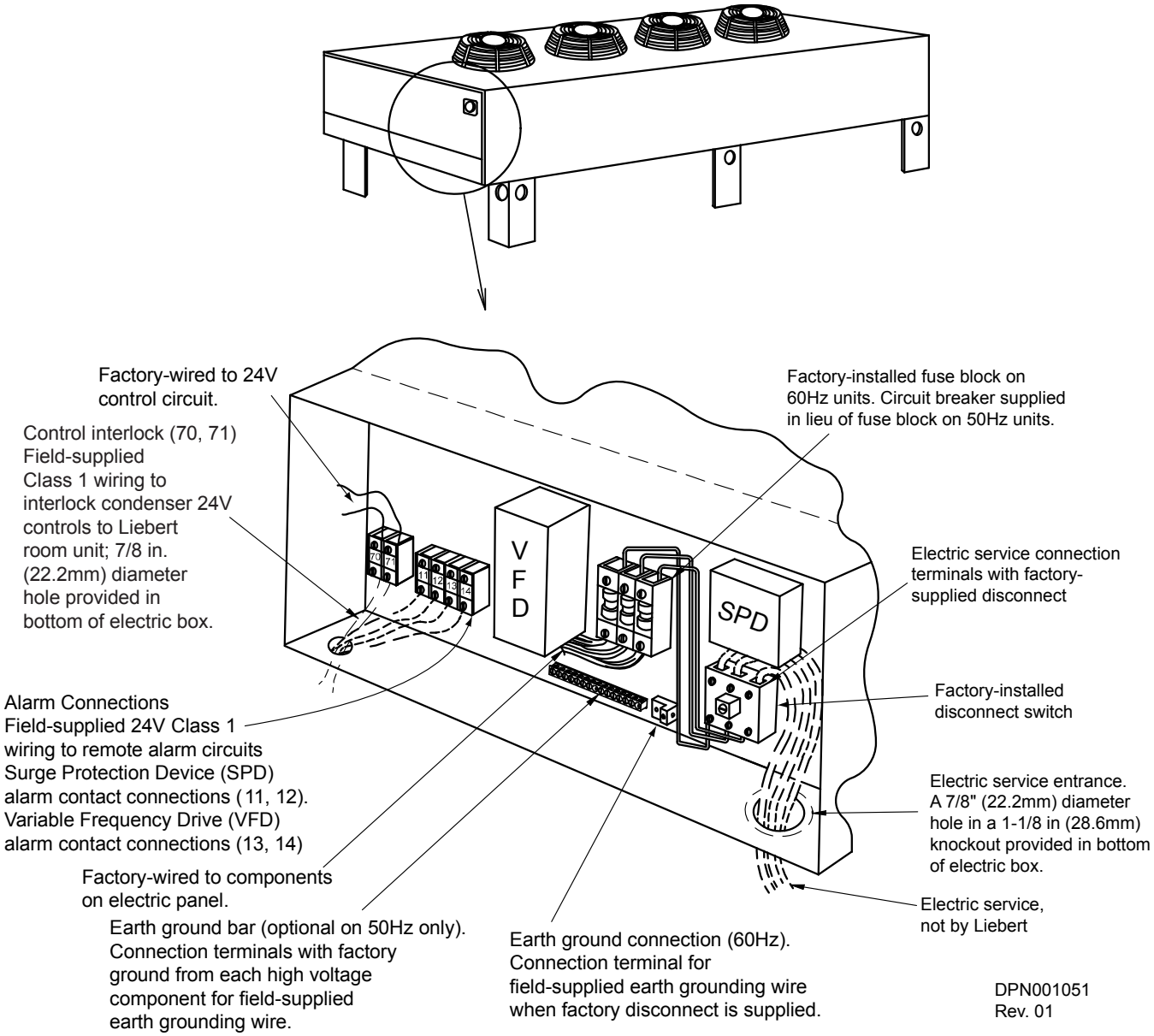
6.1 Electrical Connections

Figure 7 Electrical field connections for Fan Speed Control Condensers



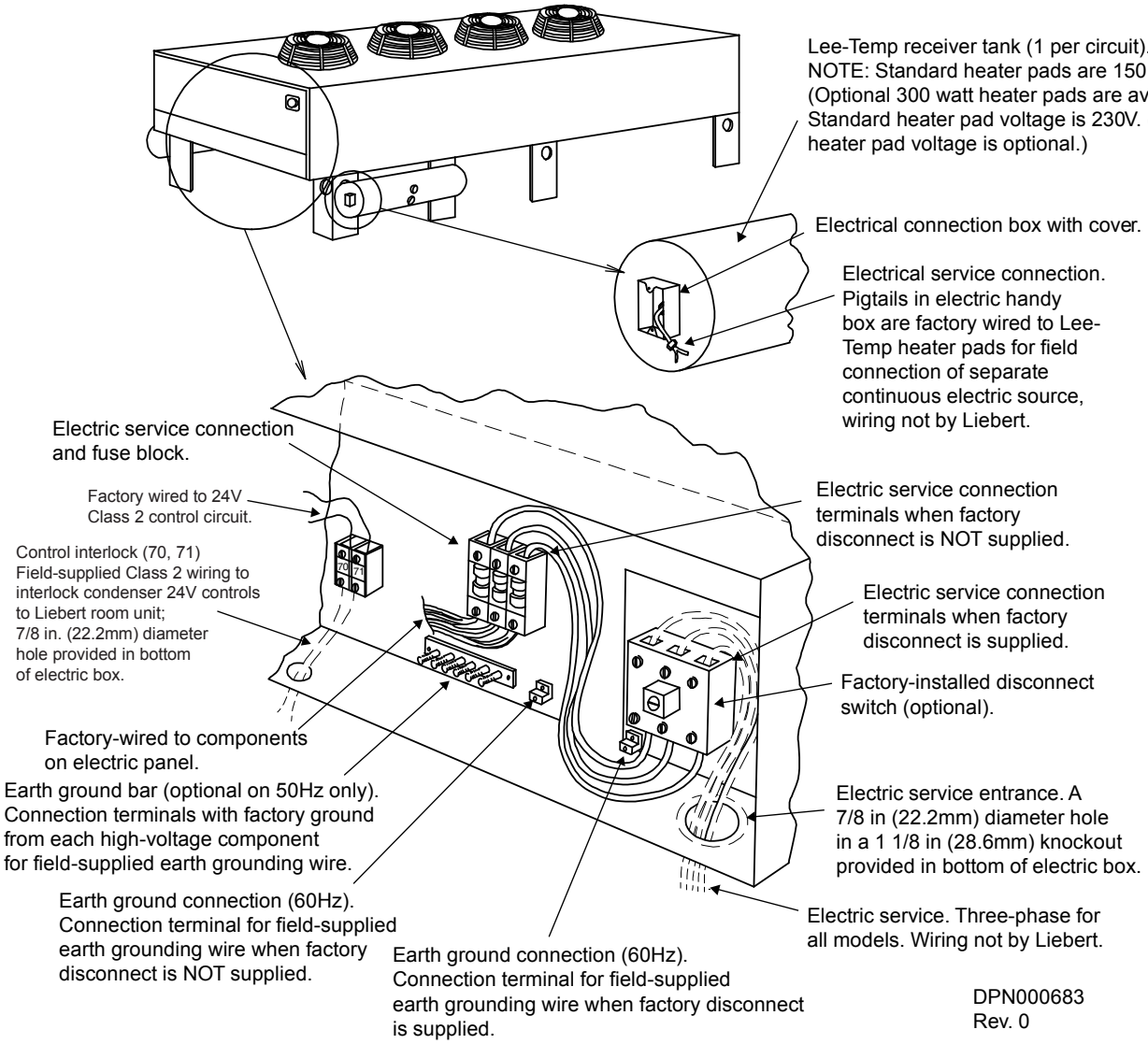
NOTE: Refer to specification sheet for full load amp. and wire size amp. ratings.

Figure 8 Electrical field connections for VFD control condensers



NOTE: Refer to specification sheet for full load amp. and wire size amp. ratings.

Figure 9 Electrical field connections for Liebert Lee-Temp control condensers



NOTE: Refer to specification sheet for full load amp. and wire size amp. ratings.

7.0 Refrigerant Piping and Charge Planning

Figure 10 VFD and Fan Speed Control condenser piping

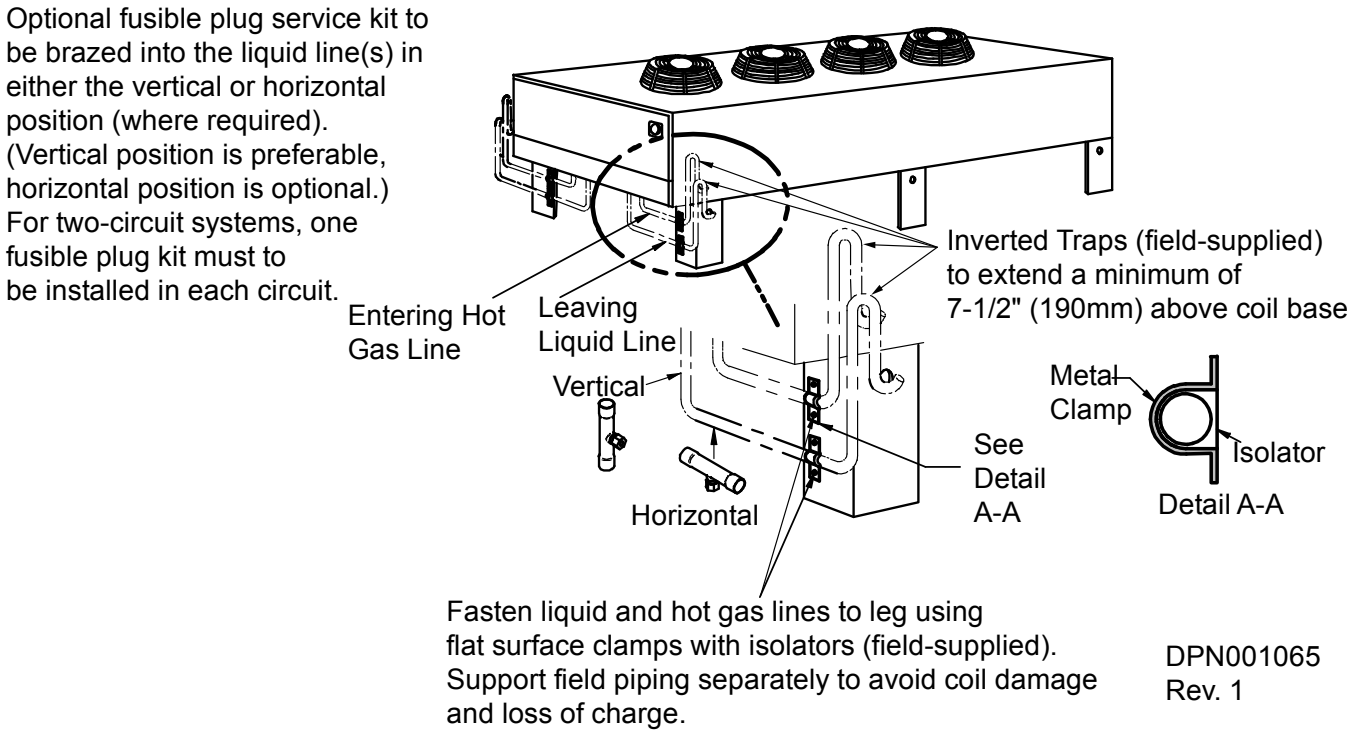


Figure 11 Liebert Lee-Temp head pressure control condenser piping

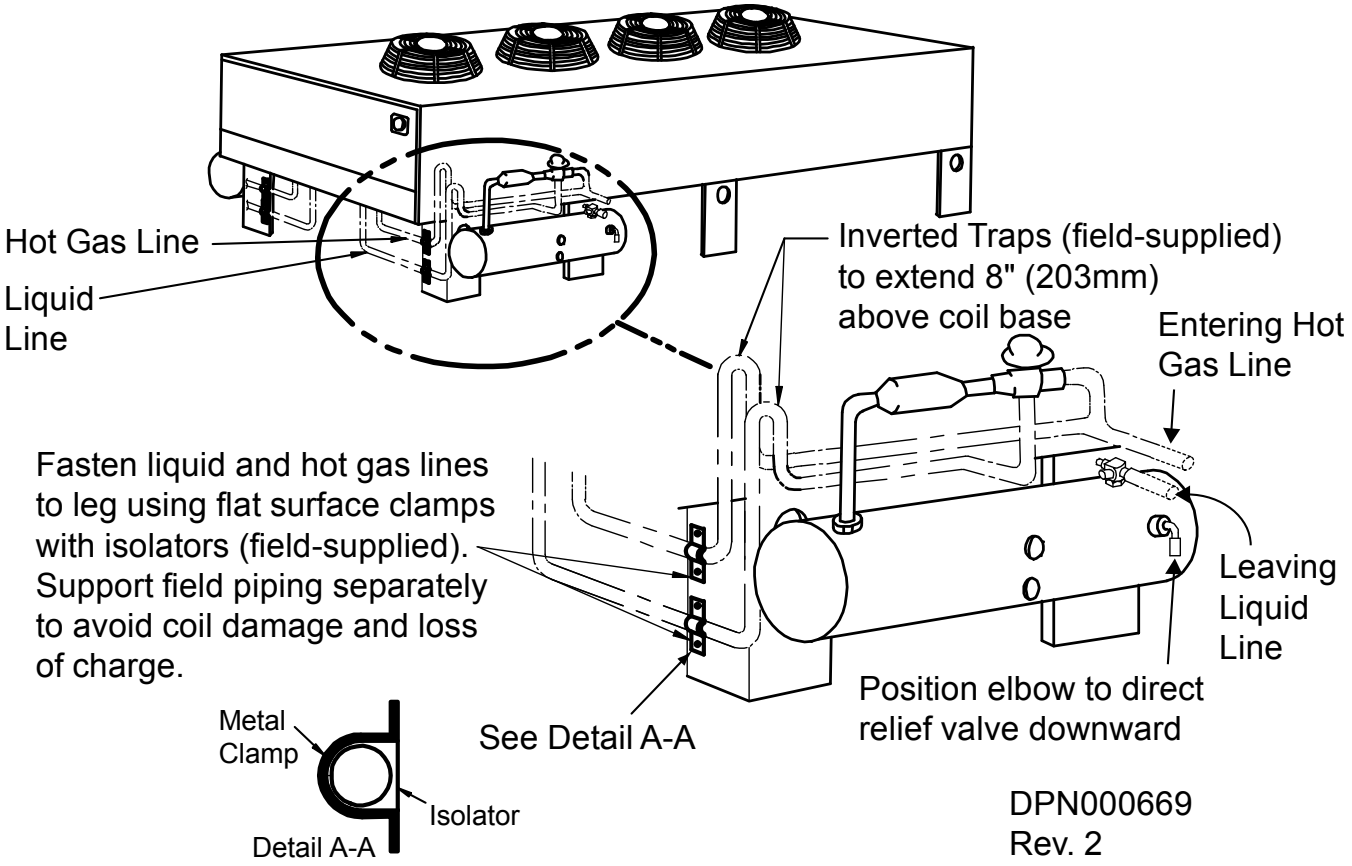
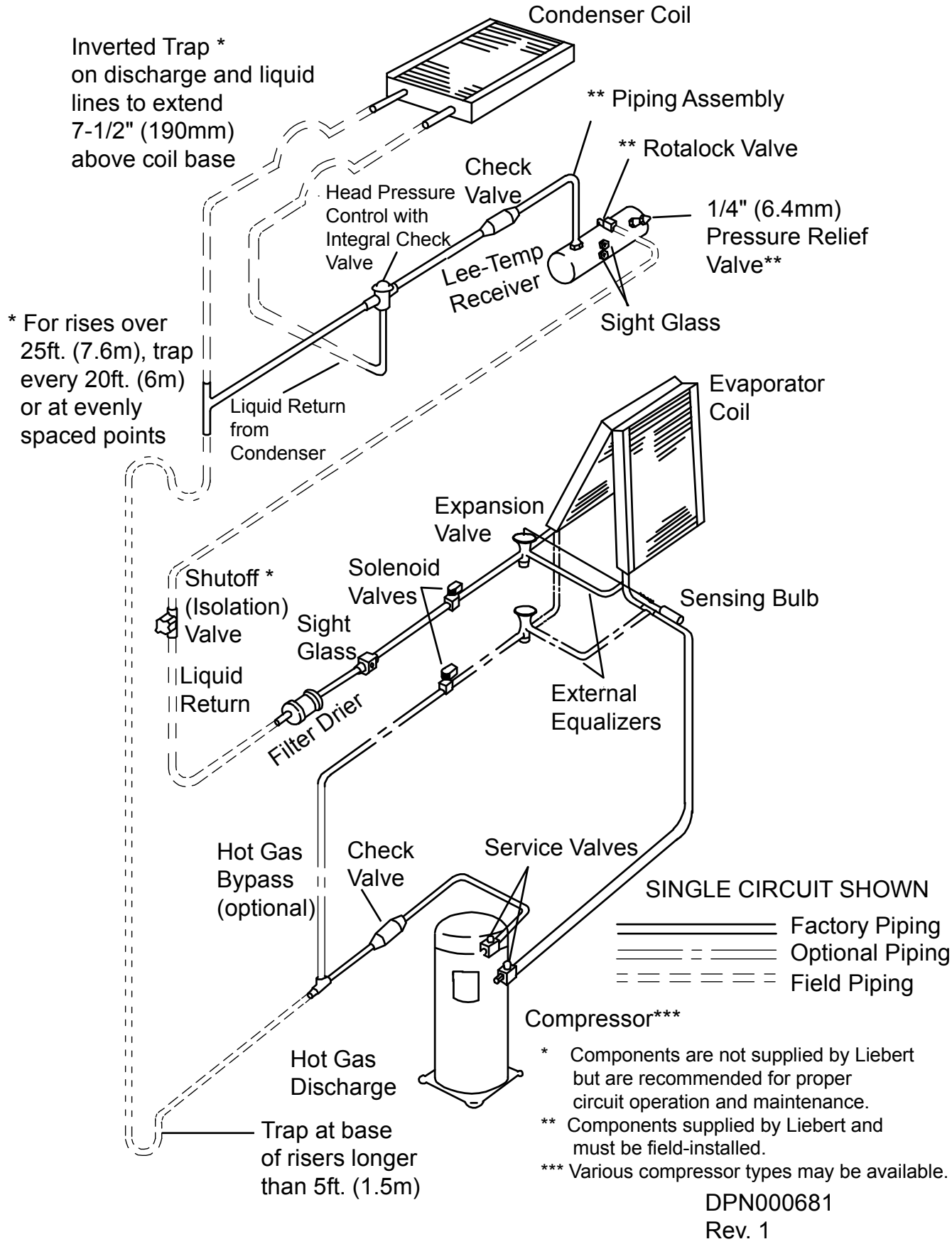


Figure 12 General arrangement—Air-cooled models with Liebert Lee-Temp control



7.1 Refrigerant Charge Planning Values

Planning for the refrigerant requirements of the completed system is the addition of the charges from Indoor Unit, Condenser (including Liebert Lee-Temp receiver, if used) and the interconnecting piping. **Tables 10**, **12**, **11** and **13** andprovide the approximate charge required for the condensers and the interconnecting piping. Consult indoor unit manuals for indoor unit charge requirements.

These values can be used for obtaining adequate refrigerant for the system, but should not be used for final charging. Consult indoor unit manual for charging procedures.

Table 10 R-22 and R-407C refrigerant required, approximate

Standard Condenser Models	Approximate R-22 Refrigerant Needed				Approximate R-407C Refrigerant Needed			
	Single Circuit lb (kg)		Dual Circuit lb/circuit (kg/circuit)		Single Circuit lb (kg)		Dual Circuit lb/circuit (kg/circuit)	
	FSC or VFD	Lee-Temp (includes receiver)	FSC or VFD	Lee-Temp (includes receiver)	FSC or VFD	Lee-Temp (includes receiver)	FSC or VFD	Lee-Temp (includes receiver)
083	5 (2.3)	27 (12.3)	3 (1.4)	NA	5 (2.3)	26 (11.8)	3 (1.4)	NA
104	8 (3.6)	39 (17.7)	7 (3.2)	21 (9.5)	8 (3.6)	37 (16.8)	7 (3.2)	20 (9.0)
165	15 (6.8)	53 (24.0)	5 (2.3)	27 (12.3)	15 (6.8)	50 (22.7)	5 (2.3)	26 (11.8)
205	20 (9.1)	76 (34.5)	7 (3.2)	56 (25.3)	19 (8.6)	72 (32.7)	7 (3.2)	54 (24.4)
251	19 (8.6)	75 (34.0)	10 (4.6)	38 (17.2)	18 (8.2)	71 (32.2)	10 (4.6)	36 (16.3)
308	29 (13.2)	113 (51.3)	11 (5.0)	58 (26.3)	28 (12.7)	107 (48.5)	11 (5.0)	55 (24.9)
415	54 (24.5)	210 (95.0)	25 (11.3)	107 (48.4)	51 (23.1)	200 (90.8)	24 (10.9)	102 (46.2)
510	72 (32.7)	N/A	30 (13.6)	149 (67.6)	68 (30.8)	N/A	29 (13.2)	142 (64.4)
616	N/A	N/A	27 (12.3)	113 (51.3)	N/A	See **Table 11**	26 (11.8)	108 (49.0)
830	N/A	N/A	53 (24)	210 (95.1)	N/A	N/A	51 (23.1)	200 (90.8)
1010	N/A	N/A	60 (27.2)	154 (69.9)	N/A	N/A	57 (25.9)	147 (66.7)
Liebert Quiet-Line Condenser Models								
063	N/A	39 (17.7)	N/A	NA	N/A	37 (16.8)	N/A	NA
119	N/A	50 (22.7)	N/A	27 (12.3)	N/A	48 (21.8)	N/A	26 (11.8)
127	N/A	76 (34.5)	N/A	38 (17.2)	N/A	72 (32.6)	N/A	36 (16.3)
143	N/A	126 (57.2)	N/A	64 (29.0)	N/A	120 (54.5)	N/A	61 (27.7)
214	N/A	161 (73.0)	N/A	81 (36.7)	N/A	153 (69.4)	N/A	77 (34.9)
286	N/A	196 (88.9)	N/A	125 (56.7)	N/A	186 (84.4)	N/A	119 (54.0)
409	N/A	N/A	N/A	152 (68.9)	N/A	N/A	N/A	148 (67.2)
572	N/A	N/A	N/A	196 (88.9)	N/A	N/A	N/A	186 (84.4)

Table 11 R-407C refrigerant required for DCSL616 condensers for Liebert XDC, approximate

Model #	Liebert Lee-Temp Receiver	Receiver Tank Length, in. (mm)	Refrigerant Per Circuit (inc. receiver), lb. (kg)
DCSL616	W-0410	48 (1219)	164 (75)
	179701P1	96 (2438)	254 (115.2)

Table 12 R-410A refrigerant required, approximate

Single-Circuit Model	VFD, lb (kg)	Liebert Lee-Temp (inc. receiver), lb (kg)
28K	7 (3.2)	41 (18.6)
60K	16 (7.3)	75 (34.0)
90K	25 (11.3)	109 (49.4)

Table 13 Interconnecting piping refrigerant charge

Line Size, O.D., in.	R-22, lb/100 ft. (kg/30m)		R-407C, lb/100 ft. (kg/30m)		R-410A, lb/100 ft. (kg/30m)	
	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line	Liquid Line	Hot Gas Line
3/8	3.8 (1.7)	—	3.7 (1.7)	—	—	—
1/2	7.3 (3.3)	—	6.9 (3.1)	—	5.0 (2.1)	—
5/8	11.7 (5.3)	2.1 (1.0)	11.0 (5.0	2.2 (1.0)	10.0 (4.2)	1.1 (0.51)
3/4	16.6 (7.5)	3.0 (1.4)	15.7 (7.1)	3.1 (1.3)	13.0 (5.7)	1.5 (0.67)
7/8	24.4 (11.1)	4.4 (2.0)	23.0 (10.4)	4.5 (1.9)	—	2.3 (1.0)
1-1/8	41.4 (18.9)	7.8 (3.5)	39.3 (17.8)	7.8 (3.5)	—	3.9 (1.8)
1-3/8	63.3 (28.7)	11.8 (5.4)	59.8 (27.1	11.8 (5.4)	—	—
1-5/8	—	16.7 (7.6)	—	16.7 (7.6)	—	—

GUIDE SPECIFICATIONS

Air-Cooled Liebert Condensers with Direct-Drive Propeller Fan

1.0 GENERAL

1.1 Summary

These specifications describe requirements for a Liebert air-cooled condenser for a Liebert Precision Cooling system. The condenser shall be designed to reject waste heat to outdoor air and to control refrigerant head pressure as outdoor ambient conditions change.

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

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

The condenser model number shall be: _____

1.2 Design Requirements

The condenser shall be a factory-assembled unit, complete with integral electrical panel, designed for outdoor installation. (The condenser shall be a draw-through design.)

The condenser shall have a total heat rejection capacity of _____ kW (kBtuh) rated at an outdoor ambient of _____ °F (°C) and a midpoint condensing temperature of _____ °F (°C) and a refrigerant flow to produce a subcooling of 5°F (2.8°C)

The unit is to be supplied for operation using a _____ volt_____ phase, _____Hz power supply.

1.3 Submittals

Submittals shall be provided with the proposal and shall include: 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 1000V, 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.

2.0 PRODUCT

2.1 Standard Features—All Condensers

Condenser shall consist of condenser coil(s), housing, propeller fan(s) direct-driven by individual fan motor(s), electrical controls and mounting legs. The Liebert air-cooled condenser shall provide positive refrigerant head pressure control to the Precision Cooling indoor unit by adjusting heat rejection capacity. Various methods shall be available to match indoor unit type, minimum outdoor design ambient and maximum sound requirements.

2.1.1 Condenser Coil

Liebert-manufactured coil shall be constructed of copper tubes in a staggered tube pattern. Tubes are expanded into continuous, corrugated aluminum fins. The fins have full-depth fin collars completely covering the copper tubes, which are connected to heavy wall Type "L" headers. Inlet coil connector tubes pass through relieved holes in the tube sheet for maximum resistance to piping strain and vibration. Coil shall be [(single circuit) (dual circuit)]. The hot-gas and liquid lines shall be spun shut and shall include a factory-installed Schrader valve. Coils shall be factory leak-tested at a minimum of 300 psig (2068kPag), dehydrated, then filled and sealed with a nitrogen holding charge for shipment. Field relief of the Schrader valve shall indicate a leak-free system.

2.1.2 Housing

The condenser housing shall be constructed of bright aluminum sheet and divided into individual fan sections by full-width baffles. Structural support members, including coil support frame, motor and drive support, are galvanized steel for strength and corrosion resistance. Aluminum legs shall be provided to mount unit for vertical air discharge and have rigging holes for hoisting the unit into position. An electrical panel shall be inside an integral NEMA 3R weatherproof section of the housing.

2.1.3 Propeller Fan

Propeller fan shall have aluminum blades secured to corrosion protected steel hub. Fans shall be secured to the fan motor shaft by means of the keyed hub and dual setscrews. Fan diameter shall be 26" (660mm) or less. Fans shall be factory-balanced and run before shipment. Fan guards shall be heavy gauge, close-meshed steel wire with corrosion resistant PVC finish that shall be rated to pass a 675-hour salt spray test.

2.1.4 Fan Motor

Fan motor shall be continuous air-over design and shall be equipped with rain shield and permanently sealed bearing. Motors shall be rigidly mounted on die-formed galvanized steel supports.

2.1.5 Electrical Controls

Electrical controls, overload protection devices and service connection terminals shall be provided and factory wired inside the integral electrical panel section of the housing. A locking disconnect switch shall be factory-mounted and wired to the electrical panel and controlled via an externally mounted locking door handle. An indoor unit interlock circuit shall enable condenser operation whenever indoor unit compressors are active. Only supply wiring and indoor unit interlock wiring are required at condenser installation.

2.2 Specific Features by Condenser Type

2.2.1 Variable Frequency Drive (VFD) Condenser (1-4 Fan)

The VFD condenser shall have a variable frequency drive controlling one inverter duty, variable speed motor and On/Off fan motor(s) (for multiple fan models only) to vary the airflow across the coil. The VFD shall use one or more pressure transducers to sense refrigerant pressure to adjust fan speed to a positive head pressure control range. The inverter duty motor shall have permanently lubricated ceramic ball bearings. The Liebert variable frequency drive control system shall provide overload protection for the variable speed motor. On/Off fan motor(s) shall have individual internal overload protection and shall be controlled by ambient air thermostat(s) increasing/decreasing condenser capacity in stepped increments. Motors shall have a TEAO enclosure and a full speed of 1140Hz @ 60Hz (950Hz @ 50Hz). An internal Surge Protection Device (SPD) shall protect the VFD from power surges. Alarm contacts for the SPD and VFD shall be provided for monitoring of system components.

The VFD Control system shall provide positive startup and operation in ambient temperature as low as -20°F (-28.9°C). The air-cooled condenser shall have a ____ volt, ____ ph ____ Hz power supply.

2.2.2 Fan Speed Control (FSC) Condenser (1 Fan)

The FSC condenser shall have a fan speed controller sensing refrigerant pressure and varying the speed of a FSC duty motor. Motor shall be single-phase and include built-in overload protection. Motor shall have an ODP enclosure and have a full speed of 1100Hz @ 60Hz (920Hz @ 50Hz).

The fan speed control system shall provide positive startup and operation in ambient temperature as low as -20°F (-28.9°C). The air-cooled condenser shall have a ____ volt, 1 ph, ____ Hz power supply.

2.2.3 Fan Speed Control (FSC) Condenser (2, 3 or 4 Fans)

The FSC condenser shall have a fan speed controller sensing refrigerant pressure and varying the speed of an FSC duty motor. Additional fan motors shall be fixed speed, cycled On/Off by ambient air thermostats to further vary the airflow across the coil. The FSC motor shall be single-phase and include built-in overload protection. FSC motor shall have an ODP enclosure and a full speed of 1100Hz @ 60Hz (920Hz @ 50Hz). The fixed speed motors shall be three-phase and have individual internal overload protection. Fixed speed motors shall have a TEAO enclosure and a full speed of 1140Hz @ 60Hz (950Hz @ 50Hz).

The Lee-Temp control system shall provide positive startup and operation in ambient temperature as low as -20°F (-28.9°C). The air-cooled condenser shall have a ____ volt, 3 ph, ____ Hz power supply.

2.2.4 Fan Speed Control (FSC) Condenser (6 & 8 Fans)

The FSC condenser shall have two fan speed controllers, each sensing the refrigerant pressure of its associated refrigerant circuit and independently varying the speed of the FSC duty motor. Additional motors shall be fixed speed, cycled On/Off by ambient air thermostats to further vary the airflow across the coil. The FSC motors shall be single-phase and include built-in overload protection. FSC motors shall have an ODP enclosure and a full speed of 1100Hz @ 60Hz (920Hz @ 50Hz). The fixed speed motors shall be three-phase and have individual internal overload protection. Fixed speed motors shall have a TEAO enclosure and a full speed of 1140Hz @ 60Hz (950Hz @ 50Hz).

The fan speed control system shall provide positive startup and operation in ambient temperature as low as -20°F (-28.9°C). The air-cooled condenser shall have a ____ volt, 3 ph, ____ Hz power supply.

2.2.5 Liebert Lee-Temp Condensers (All Fan Quantities)

Liebert Lee-Temp condensers shall consist of fixed speed fan motor(s), controlled by internal contactor(s). Fans shall run full speed whenever compressors are running. The fixed speed motors shall be three-phase and provide individual internal overload protection. Fixed speed motors shall have a TEAO enclosure and a full speed of 1140Hz @ 60Hz (950Hz @ 50Hz).

Each refrigerant circuit shall have an insulated, heated receiver tank with sight glasses, pressure relief valve, rotalock valve for refrigerant charge isolation and piping assembly with head pressure operated 3-way valve and check valve. Components shall be field-assembled to the condenser. The 3-way valve shall sense refrigerant head pressure and adjust the flooding charge in the condenser coil to adjust the condenser heat rejection capacity. The Liebert Lee-Temp heater shall be [(150W) (300W)], include an integral thermostat to maintain refrigerant temperature at a minimum of 85°F (29°C) and requires a separate power supply of [(208/230-1-60) (120-1-60 volt) (200/230-1-50) (110-1-50)].

This system shall allow system startup and positive head pressure control with ambient temperatures as low as -30°F (-34.4°C).

2.2.6 Liebert Quiet-Line Condensers (All Fan Quantities)

Liebert Quiet-Line condensers shall consist of fixed speed fan motor(s), controlled by internal contactor(s). One fan per refrigerant circuit shall run at full speed with the compressor(s). Additional fan motors may be full speed or cycled based on ambient temperatures. Motors shall have a TEAO enclosure, provide individual overload protection and have a full speed of 570rpm @ 60Hz (475rpm @ 50Hz).

Each refrigerant circuit shall have an insulated, heated receiver tank with sight glasses, pressure relief valve, rotalock valve for refrigerant charge isolation and piping assembly with head pressure operated 3-way valve and check valve. Components shall be field assembled to the condenser. The 3-way valve shall sense refrigerant head pressure and adjust the flooding charge in the condenser coil to adjust the condenser heat rejection capacity. The Liebert Lee-Temp heater shall be [(150W) (300W)], include an integral thermostat to maintain refrigerant temperature at a minimum of 85°F (29°C) and requires a separate power supply of [(208/230-1-60) (120-1-60 volt) (200/230-1-50) (110-1-50)].

This system shall allow system startup and positive head pressure control with ambient temperatures as low as -30°F (-34.4°C).

3.0 EXECUTION

3.1 Installation of Air Conditioning Unit

3.1.1 General

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

3.1.2 Electrical Wiring

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

3.1.3 Piping Connections

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

3.1.4 Field Quality Control

Start cooling units in accordance with manufacturer's startup instructions. Test controls and demonstrate compliance with requirements. These specifications describe requirements for a computer room environmental control system. The system shall be designed to maintain temperature and humidity conditions in the rooms containing electronic equipment.

The manufacturer shall design and furnish all equipment to be fully compatible with heat dissipation requirements.

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