CASCADE17-0146Y1
R134a
12/24/48 V DC
VARIABLE SPEED

Brushless DC Variable Speed Compressor Technical Data Sheet

General Information

Part Number - Mobile (Single Pack)	CASCADE0024BAAMU	
Part Number - Mobile (Pallet Pack)	CASCADE0024BAAPB	(96 per pallet)
Compressor Drawing	DCMX40-001	
Controller Part Number (12/24V)	030F0121, 030F0182, 030F0186	
Controller Part Number (48V)	030F0137, 030F0175	
Wiring Diagram Drawing	DEMX0024	

Application Information

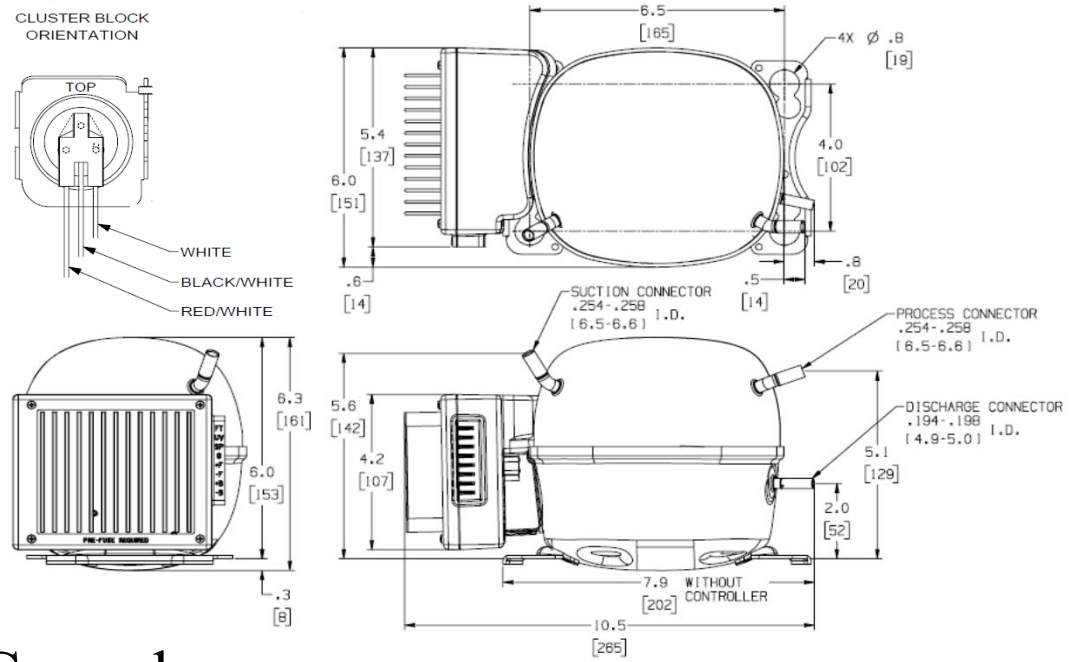
Application	LBP
Refrigerant	R134a
Evaporator Temperature Range	-34.4° C to -12.2° C (-30° F to +10° F)
Condenser Temperature Range	37.8° C to 60° C (100° F to 140° F)

Design

Displacement	2.39 cm^3 (0.146 in^3)
Oil Quantity	263 ml
Oil Type	POE 10cSt
Weight - Compressor/Controller	6.40 kg / 14.1 lb

	12V			24V		
Battery Protection	**Min.**	**Nominal**	**Max.**	**Min.**	**Nominal**	**Max.**
Over Voltage Shutdown	16.1	17.0	17.9	29.9	31.5	33.0
Under Voltage Shutdown	9.9	10.4	10.9	22.3	22.8	23.3

Compressor Dimensions - CASCADE0024



*ALTERNATE MOUNTING: 6.7" [171] L x 2.8" [70] W, Ø.64" [16]

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Performance Characteristics

CECOMAF LBP						12V
	Cooling Capacity		Power	Current	Efficiency	
RPM	BTU/hr	Watt	Watt	Amp	EER	COP
1800	95.37	27.95	29.28	2.44	3.26	0.95
3000	145.37	42.60	43.32	3.61	3.36	0.98
4200	184.66	54.12	58.92	4.91	3.13	0.92

Test Temperatures	CECOMAF	SPEER
Condensing	55°C(131°F)	40.6°C(105°F)
Evaporator	-25°C(-15°F)	-23.3°C(-10°F)
Ambient	32.2°C(90°F)	32.2°C(90°F)
Suction Gas	32.2°C(90°F)	32.2°C(90°F)
Liquid	55°C(131°F)	32.2°C(90°F)

CECOMAF LBP						24V
	Cooling Capacity		Power	Current	Efficiency	
RPM	BTU/hr	Watt	Watt	Amp	EER	COP
1800	95.37	27.95	29.28	1.22	3.26	0.95
3000	145.37	42.60	43.32	1.81	3.36	0.98
4200	184.66	54.12	58.92	2.46	3.13	0.92

SPEER						12V
	Cooling Capacity		Power	Current	Efficiency	
rpm	BTU/hr	Watt	Watt	Amp	EER	COP
1800	128.05	37.53	26.40	2.20	4.85	1.42
3000	210.21	61.61	43.20	3.60	4.87	1.43
4200	265.92	77.93	60.00	5.00	4.43	1.30

SPEER						24V
	Cooling Capacity		Power	Current	Efficiency	
rpm	BTU/hr	Watt	Watt	Amp	EER	COP
1800	128.07	37.53	26.40	1.10	4.85	1.42
3000	210.16	61.59	43.20	1.80	4.86	1.43
4200	265.94	77.94	60.00	2.50	4.43	1.30

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12/24 VDC Controller Features

4 pole sensor-less variable speed BLDC motor controller
180W maximum output power
10 - 31 VDC input range
48V motor supply (voltage boost)
12V or 24V operation (auto detect on power up)
1800 – 4200 rpm speed
0.5 - 4.75V analog speed set input (resistor programmable for fixed speed)
0°C to 45°C operating temperature
Under/Over voltage shutdown (resistor programmable under voltage thresholds)
Locked rotor detection
Thermal shutdown – for power devices
Over current shutdown – for power devices
Low speed shutdown
TTL Fault output
Pulsed Fault output (030F0182 & 030F0186 only)
LED fault indicator
Fan output, +12VDC @ 0.5A with voltage detection
Reverse polarity protection

Optional Fixed Resistor Speed Chart

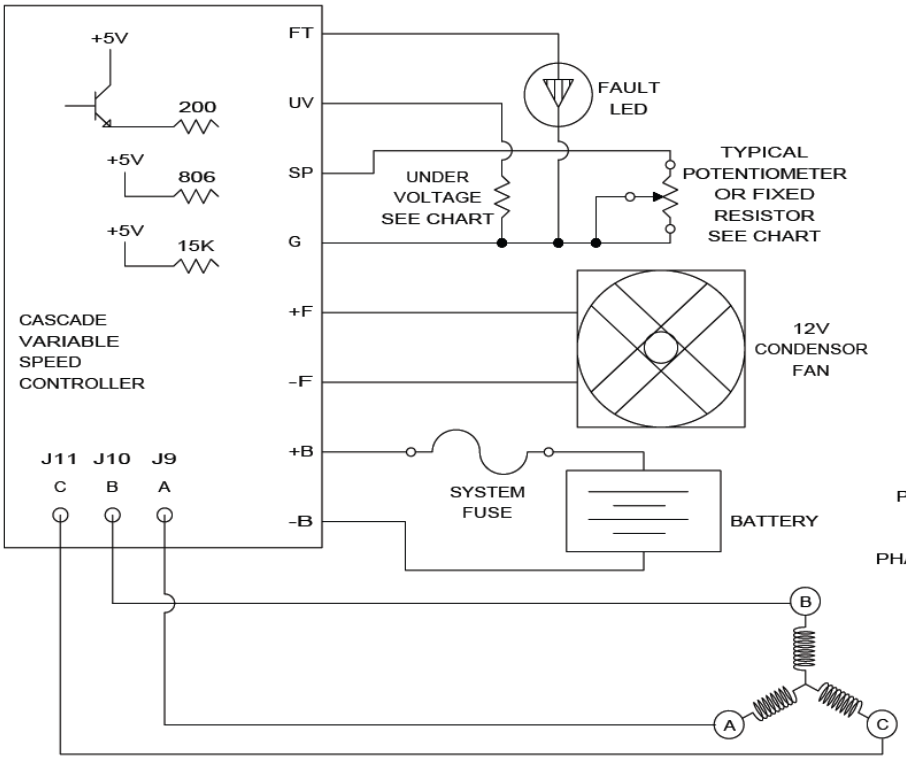
Resistor Value OHMS	Motor Speed [RPM]
200	1800
242	1900
287	2000
388	2200
510	2400
659	2600
847	2800
1090	3000
1.4k	3200
1.88k	3400
2.58k	3600
3.8k	3800
6.36k	4000
15.3k	4200

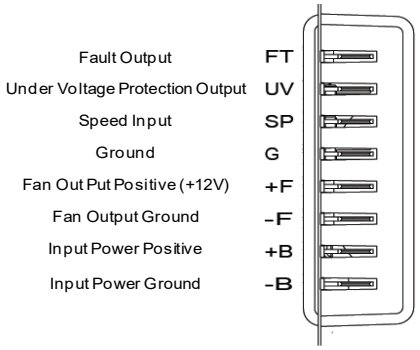
LED Fault Indicator Output

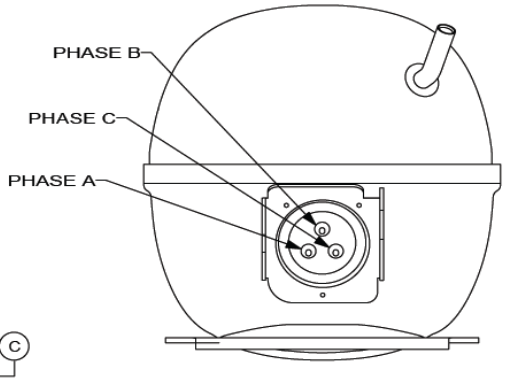
Motor Fault	1 Flash
Under Voltage	2 Flashes
Over Voltage	3 Flashes
Over Temperature	4 Flashes
Over Current/Power	5 Flashes
Fan Voltage Error	6 Flashes
General Hardware Error	7 Flashes
System Integrity Fault	8 Flashes

Use the formula below to find the resistor value needed to achieve a specific speed for the controller.

$$\frac{934960 - 806 \bullet Speed\_Desired}{Speed\_Desired - 4360}$$







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48 VDC Controller Features

4 pole sensor-less variable speed BLDC motor controller
420W maximum output power
39-60 VDC input range
1800 – 4200 rpm speed
1.0 - 4.75V analog speed set input (resistor programmable for fixed speed)
0°C to 45°C operating temperature
Up to 55°C operating temperature with airflow (min. 1.5 m/s)
Under/Over voltage shutdown (resistor programmable under voltage thresholds)
Locked rotor detection
Thermal shutdown – for power devices
Over current shutdown – for power devices
Low speed shutdown
TTL Fault output
LED fault indicator
Fan output, +12VDC @ 0.5A with voltage detection
Reverse polarity protection

Optional Fixed Resistor Speed Chart

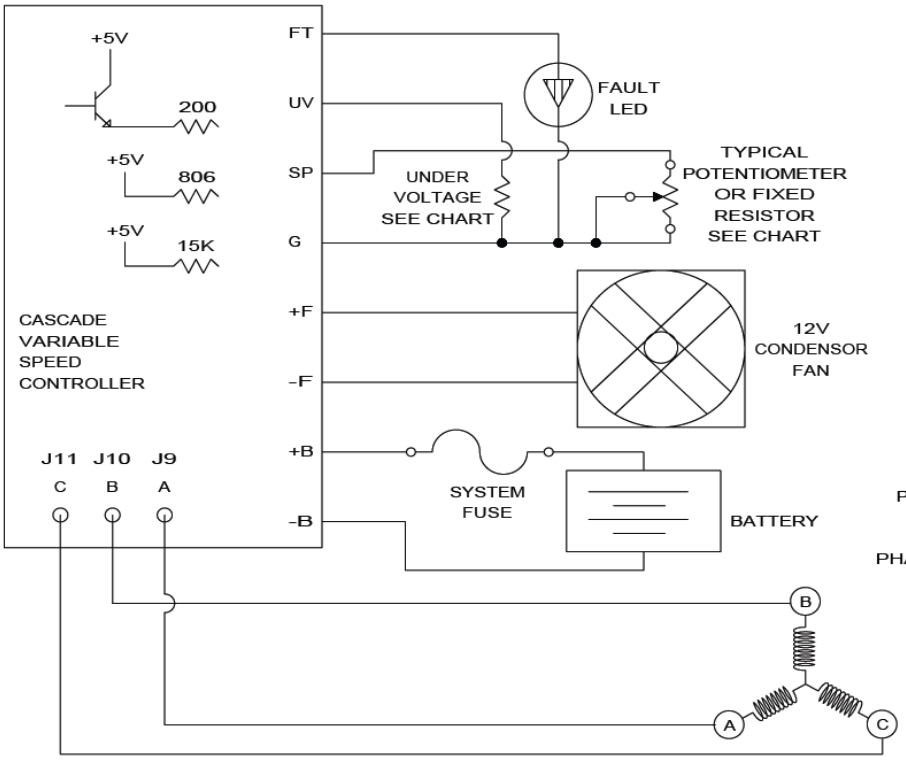
Resistor Value OHMS	Motor Speed [RPM]
0	3000
200	1800
242	1900
287	2000
388	2200
510	2400
659	2600
847	2800
1090	3000
1.4k	3200
1.88k	3400
2.58k	3600
3.8k	3800
6.36k	4000
15.3k	4200

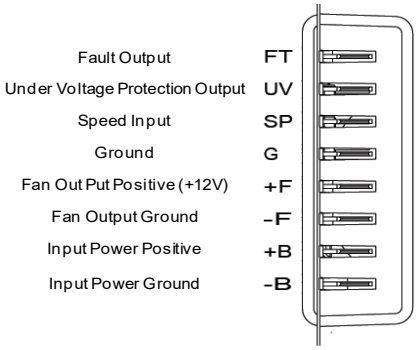
LED Fault Indicator Output

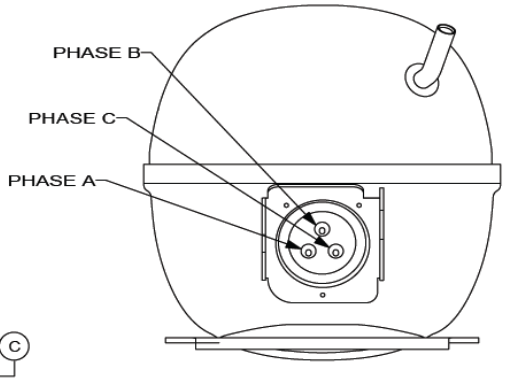
Motor Fault	1 Flash
Under Voltage	2 Flashes
Over Voltage	3 Flashes
Over Temperature	4 Flashes
Over Current/Power	5 Flashes
Fan Voltage Error	6 Flashes
General Hardware Error	7 Flashes
System Integrity Fault	8 Flashes

Use the formula below to find the resistor value needed to achieve a specific speed for the controller.

$$\frac{934960 - 806 \bullet Speed\_Desired}{Speed\_Desired - 4360}$$







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Cooling Capacity (12V) - ASHRAE LBP — BTU/hr (Watt)

Evaporator Temperature

RPM	-30°F	(-34°C)	-20°F	(-29°C)	-10°F	(-23°C)	-5°F	(-21°C)	0°F	(-18°C)	5°F	(-15°C)	10°F	(-12°C)
1800			83	(24)	139	(41)	162	(47)	185	(54)	210	(62)	241	(70)
2400	21	(6)	111	(33)	176	(52)	205	(60)	235	(69)	269	(79)	308	(90)
3000	42	(12)	135	(40)	207	(61)	241	(71)	277	(81)	318	(93)	365	(107)
3600	64	(19)	157	(46)	234	(69)	272	(80)	314	(92)	360	(105)	414	(121)
4200	87	(25)	180	(53)	259	(76)	300	(88)	345	(101)	397	(116)	457	(134)

Power Consumption (12V) - ASHRAE LBP — Watt

Evaporator Temperature

RPM	-30°F	-20°F	-10°F	-5°F	0°F	5°F	10°F
1800		22.7	29.6	32.0	33.8	35.2	36.3
2400	17.4	27.5	35.3	38.5	41.5	44.2	46.9
3000	25.5	35.3	43.8	47.8	51.8	55.8	60.0
3600	34.2	43.5	52.6	57.3	62.3	67.5	73.2
4200	40.9	49.7	59.3	64.6	70.4	76.8	84.0

Current (12V) - ASHRAE LBP — Amp

Evaporator Temperature

RPM	-30°F	-20°F	-10°F	-5°F	0°F	5°F	10°F
1800		1.89	2.46	2.67	2.82	2.94	3.02
2400	1.45	2.29	2.94	3.21	3.46	3.69	3.91
3000	2.13	2.94	3.65	3.98	4.31	4.65	5.00
3600	2.85	3.63	4.39	4.78	5.19	5.63	6.10
4200	3.41	4.14	4.94	5.38	5.87	6.40	7.00

Efficiency (12V) - ASHRAE LBP — BTU/hr/W (W/W)

Evaporator Temperature

RPM	-30°F	(-34°C)	-20°F	(-29°C)	-10°F	(-23°C)	-5°F	(-21°C)	0°F	(-18°C)	5°F	(-15°C)	10°F	(-12°C)
1800			3.67	(1.07)	4.70	(1.38)	5.06	(1.48)	5.47	(1.60)	5.97	(1.75)	6.63	(1.94)
2400	1.23	(0.36)	4.04	(1.18)	4.99	(1.46)	5.33	(1.56)	5.67	(1.66)	6.08	(1.78)	6.57	(1.92)
3000	1.66	(0.49)	3.83	(1.12)	4.73	(1.39)	5.05	(1.48)	5.36	(1.57)	5.70	(1.67)	6.08	(1.78)
3600	1.86	(0.55)	3.62	(1.06)	4.45	(1.30)	4.75	(1.39)	5.04	(1.47)	5.33	(1.56)	5.66	(1.66)
4200	2.13	(0.62)	3.61	(1.06)	4.38	(1.28)	4.65	(1.36)	4.90	(1.44)	5.16	(1.51)	5.44	(1.59)

*** all points are at 32.2°C (90°F) ambient, 32.2°C (90°F) suction temperature, 22.2°C (40°F) subcooling, 54.4°C (130°F) condenser**

Performance Coefficients (12V) - ASHRAE LBP

Coefficient	Capacity (BTU/Hr)	Power (Watts)	Current (Amperes)	Mass Flow (Lbs/Hr)
C1	-2.358132E+03	-6.476596E+02	-5.397163E+01	-2.513047E+01
C2	1.520949E+00	-2.896618E-02	-2.413849E-03	1.566362E-02
C3	-3.003280E-05	1.654752E-05	1.378960E-06	-2.905075E-07
C4	1.502638E-09	-1.921756E-09	-1.601463E-10	1.729447E-11
C5	-9.092651E+01	7.587934E+00	6.323278E-01	-8.399066E-01
C6	4.220367E-02	1.292411E-01	1.077010E-02	1.695604E-03
C7	3.181015E-03	1.314242E-04	1.095202E-05	3.755620E-05
C8	3.284589E+01	1.799743E+01	1.499785E+00	3.395230E-01
C9	-8.038277E-02	-1.572455E-01	-1.310380E-02	-6.967798E-04
C10	-2.672858E-04	4.630518E-04	3.858765E-05	-3.479881E-06
C11	-8.886435E-04	2.143779E-05	1.786482E-06	-8.894770E-06
C12	2.830319E-09	-4.473376E-10	-3.727814E-11	3.437094E-11
C13	-2.341001E-06	2.007991E-07	1.673326E-08	-2.243456E-08
C14	3.052792E-06	-8.129419E-08	-6.774515E-09	3.038437E-08
C15	6.768640E-02	-9.306251E-04	-7.755209E-05	6.927089E-04
C16	-2.036331E-02	5.303071E-05	4.419226E-06	-2.109753E-04
C17	1.194597E+00	-1.261315E-01	-1.051096E-02	1.027170E-02
C18	-6.622377E-07	4.005049E-08	3.337541E-09	-8.411343E-09
C19	3.373231E-04	-1.736619E-05	-1.447183E-06	3.351148E-06
C20	6.132017E-08	7.686468E-09	6.405390E-10	2.134388E-10
C21	7.590068E-05	-7.873929E-07	-6.561608E-08	8.102220E-07
C22	-4.169238E-04	-1.185347E-03	-9.877894E-05	-1.433626E-05
C23	-3.870153E-03	4.924808E-04	4.104006E-05	-3.032197E-05

Performance Equation

$$Y=C_1+C_2x_1+C_3x_1^2+C_4x_1^3+C_5x_2+C_6x_2^2+C_7x_2^3+C_8x_3+C_9x_3^2+C_{10}x_3^3+C_{11}x_1x_2x_3+C_{12}x_1^2x_2x_3+C_{13}x_1x_2^2x_3+C_{14}x_1x_2x_3^2+C_{15}x_1x_2+C_{16}x_1x_3+C_{17}x_2x_3+C_{18}x_1^2x_2+C_{19}x_1x_2^2+C_{20}x_1^2x_3+C_{21}x_1x_3^2+C_{22}x_2^2x_3+C_{23}x_2x_3^2$$

x_1 = RPM
x_2 = E_t (°F)
x_3 = C_t (°F)

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Cooling Capacity (24V) - ASHRAE LBP														BTU/hr (Watt)
	Evaporator Temperature													
RPM	-30°F	(-34°C)	-20°F	(-29°C)	-10°F	(-23°C)	-5°F	(-21°C)	0°F	(-18°C)	5°F	(-15°C)	10°F	(-12°C)
1800			83	(24)	139	(41)	162	(47)	185	(54)	210	(62)	241	(70)
2400	21	(6)	111	(33)	176	(52)	205	(60)	235	(69)	269	(79)	308	(90)
3000	42	(12)	135	(40)	207	(61)	241	(71)	277	(81)	318	(93)	365	(107)
3600	64	(19)	157	(46)	234	(69)	272	(80)	314	(92)	360	(105)	414	(121)
4200	87	(25)	180	(53)	259	(76)	300	(88)	345	(101)	397	(116)	457	(134)

Power Consumption (24V) - ASHRAE LBP								Watt
	Evaporator Temperature							
RPM	-30°F	-20°F	-10°F	-5°F	0°F	5°F	10°F	
1800		22.7	29.6	32.0	33.8	35.2	36.3	
2400	17.4	27.5	35.3	38.5	41.5	44.2	46.9	
3000	25.5	35.3	43.8	47.8	51.8	55.8	60.0	
3600	34.2	43.5	52.6	57.3	62.3	67.5	73.2	
4200	40.9	49.7	59.3	64.6	70.4	76.8	84.0	

Current (24V) - ASHRAE LBP							Amp
	Evaporator Temperature						
-30°F	-20°F	-10°F	-5°F	0°F	5°F	10°F	
	0.94	1.23	1.33	1.41	1.47	1.51	
0.73	1.15	1.47	1.61	1.73	1.84	1.95	
1.06	1.47	1.83	1.99	2.16	2.33	2.50	
1.42	1.81	2.19	2.39	2.59	2.81	3.05	
1.71	2.07	2.47	2.69	2.93	3.20	3.50	

Efficiency (24V) - ASHRAE LBP														BTU/hr/W (W/W)
	Evaporator Temperature													
RPM	-30°F	(-34°C)	-20°F	(-29°C)	-10°F	(-23°C)	-5°F	(-21°C)	0°F	(-18°C)	5°F	(-15°C)	10°F	(-12°C)
1800			3.67	(1.07)	4.70	(1.38)	5.06	(1.48)	5.47	(1.60)	5.97	(1.75)	6.63	(1.94)
2400	1.23	(0.36)	4.04	(1.18)	4.99	(1.46)	5.33	(1.56)	5.67	(1.66)	6.08	(1.78)	6.57	(1.92)
3000	1.66	(0.49)	3.83	(1.12)	4.73	(1.39)	5.05	(1.48)	5.36	(1.57)	5.70	(1.67)	6.08	(1.78)
3600	1.86	(0.55)	3.62	(1.06)	4.45	(1.30)	4.75	(1.39)	5.04	(1.47)	5.33	(1.56)	5.66	(1.66)
4200	2.13	(0.62)	3.61	(1.06)	4.38	(1.28)	4.65	(1.36)	4.90	(1.44)	5.16	(1.51)	5.44	(1.59)

*** all points are at 32.2°C (90°F) ambient, 32.2°C (90°F) suction temperature, 22.2°C (40°F) subcooling, 54.4°C (130°F) condenser**

Performance Coefficients (24V) - ASHRAE LBP

Coefficient	Capacity (BTU/Hr)	Power (Watts)	Current (Amperes)	Mass Flow (Lbs/Hr)
C1	-2.358132E+03	-6.476596E+02	-2.698582E+01	-2.513047E+01
C2	1.520949E+00	-2.896618E-02	-1.206924E-03	1.566362E-02
C3	-3.003280E-05	1.654752E-05	6.894799E-07	-2.905075E-07
C4	1.502638E-09	-1.921756E-09	-8.007315E-11	1.729447E-11
C5	-9.092651E+01	7.587934E+00	3.161639E-01	-8.399066E-01
C6	4.220367E-02	1.292411E-01	5.385048E-03	1.695604E-03
C7	3.181015E-03	1.314242E-04	5.476008E-06	3.755620E-05
C8	3.284589E+01	1.799743E+01	7.498927E-01	3.395230E-01
C9	-8.038277E-02	-1.572455E-01	-6.551898E-03	-6.967798E-04
C10	-2.672858E-04	4.630518E-04	1.929382E-05	-3.479881E-06
C11	-8.886435E-04	2.143779E-05	8.932412E-07	-8.894770E-06
C12	2.830319E-09	-4.473376E-10	-1.863907E-11	3.437094E-11
C13	-2.341001E-06	2.007991E-07	8.366628E-09	-2.243456E-08
C14	3.052792E-06	-8.129419E-08	-3.387258E-09	3.038437E-08
C15	6.768640E-02	-9.306251E-04	-3.877605E-05	6.927089E-04
C16	-2.036331E-02	5.303071E-05	2.209613E-06	-2.109753E-04
C17	1.194597E+00	-1.261315E-01	-5.255481E-03	1.027170E-02
C18	-6.622377E-07	4.005049E-08	1.668770E-09	-8.411343E-09
C19	3.373231E-04	-1.736619E-05	-7.235914E-07	3.351148E-06
C20	6.132017E-08	7.686468E-09	3.202695E-10	2.134388E-10
C21	7.590068E-05	-7.873929E-07	-3.280804E-08	8.102220E-07
C22	-4.169238E-04	-1.185347E-03	-4.938947E-05	-1.433626E-05
C23	-3.870153E-03	4.924808E-04	2.052003E-05	-3.032197E-05

Performance Equation

$$Y=C_1+C_2x_1+C_3x_1^2+C_4x_1^3+C_5x_2+C_6x_2^2+C_7x_2^3+C_8x_3+C_9x_3^2+C_{10}x_3^3+C_{11}x_1x_2x_3+C_{12}x_1^2x_2x_3+C_{13}x_1x_2^2x_3+$$
$$C_{14}x_1x_2x_3^2+C_{15}x_1x_2+C_{16}x_1x_3+C_{17}x_2x_3+C_{18}x_1^2x_2+C_{19}x_1x_2^2+C_{20}x_1^2x_3+C_{21}x_1x_3^2+C_{22}x_2^2x_3+C_{23}x_2x_3^2$$

x_1 = RPM
x_2 = E_t (°F)
x_3 = C_t (°F)

CASCADE17-0146Y1

MASTERFLUX

Cooling Capacity (48V) - ASHRAE LBP														BTU/hr (Watt)
	Evaporator Temperature													
RPM	-30°F	(-34°C)	-20°F	(-29°C)	-10°F	(-23°C)	-5°F	(-21°C)	0°F	(-18°C)	5°F	(-15°C)	10°F	(-12°C)
1800			83	(24)	139	(41)	162	(47)	185	(54)	210	(62)	241	(70)
2400	21	(6)	111	(33)	176	(52)	205	(60)	235	(69)	269	(79)	308	(90)
3000	42	(12)	135	(40)	207	(61)	241	(71)	277	(81)	318	(93)	365	(107)
3600	64	(19)	157	(46)	234	(69)	272	(80)	314	(92)	360	(105)	414	(121)
4200	87	(25)	180	(53)	259	(76)	300	(88)	345	(101)	397	(116)	457	(134)

Power Consumption (48V) - ASHRAE LBP								Watt
	Evaporator Temperature							
RPM	-30°F	-20°F	-10°F	-5°F	0°F	5°F	10°F	
1800		20.9	27.2	29.4	31.1	32.4	33.4	
2400	16.0	25.3	32.5	35.4	38.2	40.7	43.1	
3000	23.5	32.5	40.3	44.0	47.6	51.4	55.2	
3600	31.4	40.1	48.4	52.7	57.3	62.1	67.4	
4200	37.7	45.7	54.5	59.4	64.8	70.7	77.2	

Current (48V) - ASHRAE LBP							Amp
	Evaporator Temperature						
-30°F	-20°F	-10°F	-5°F	0°F	5°F	10°F	
	0.43	0.57	0.61	0.65	0.68	0.70	
0.33	0.53	0.68	0.74	0.79	0.85	0.90	
0.49	0.68	0.84	0.92	0.99	1.07	1.15	
0.66	0.83	1.01	1.10	1.19	1.29	1.40	
0.78	0.95	1.14	1.24	1.35	1.47	1.61	

Efficiency (48V) - ASHRAE LBP														BTU/hr/W (W/W)
	Evaporator Temperature													
RPM	-30°F	(-34°C)	-20°F	(-29°C)	-10°F	(-23°C)	-5°F	(-21°C)	0°F	(-18°C)	5°F	(-15°C)	10°F	(-12°C)
1800			3.98	(1.17)	5.11	(1.49)	5.50	(1.61)	5.94	(1.74)	6.49	(1.90)	7.21	(2.11)
2400	1.34	(0.39)	4.39	(1.28)	5.42	(1.59)	5.79	(1.70)	6.17	(1.81)	6.61	(1.93)	7.14	(2.09)
3000	1.81	(0.53)	4.16	(1.22)	5.14	(1.51)	5.49	(1.61)	5.83	(1.71)	6.19	(1.81)	6.61	(1.94)
3600	2.02	(0.59)	3.93	(1.15)	4.84	(1.42)	5.17	(1.51)	5.47	(1.60)	5.79	(1.70)	6.15	(1.80)
4200	2.31	(0.68)	3.93	(1.15)	4.76	(1.39)	5.05	(1.48)	5.33	(1.56)	5.61	(1.64)	5.91	(1.73)

*** all points are at 32.2°C (90°F) ambient, 32.2°C (90°F) suction temperature, 22.2°C (40°F) subcooling, 54.4°C (130°F) condenser**

Performance Coefficients (48V) - ASHRAE LBP

Coefficient	Capacity (BTU/Hr)	Power (Watts)	Current (Amperes)	Mass Flow (Lbs/Hr)
C1	-2.358132E+03	-5.958468E+02	-1.241348E+01	-2.513047E+01
C2	1.520949E+00	-2.664889E-02	-5.551852E-04	1.566362E-02
C3	-3.003280E-05	1.522372E-05	3.171608E-07	-2.905075E-07
C4	1.502638E-09	-1.768015E-09	-3.683365E-11	1.729447E-11
C5	-9.092651E+01	6.980899E+00	1.454354E-01	-8.399066E-01
C6	4.220367E-02	1.189019E-01	2.477122E-03	1.695604E-03
C7	3.181015E-03	1.209103E-04	2.518964E-06	3.755620E-05
C8	3.284589E+01	1.655763E+01	3.449507E-01	3.395230E-01
C9	-8.038277E-02	-1.446659E-01	-3.013873E-03	-6.967798E-04
C10	-2.672858E-04	4.260076E-04	8.875159E-06	-3.479881E-06
C11	-8.886435E-04	1.972277E-05	4.108909E-07	-8.894770E-06
C12	2.830319E-09	-4.115506E-10	-8.573971E-12	3.437094E-11
C13	-2.341001E-06	1.847351E-07	3.848649E-09	-2.243456E-08
C14	3.052792E-06	-7.479065E-08	-1.558139E-09	3.038437E-08
C15	6.768640E-02	-8.561751E-04	-1.783698E-05	6.927089E-04
C16	-2.036331E-02	4.878825E-05	1.016422E-06	-2.109753E-04
C17	1.194597E+00	-1.160410E-01	-2.417521E-03	1.027170E-02
C18	-6.622377E-07	3.684645E-08	7.676343E-10	-8.411343E-09
C19	3.373231E-04	-1.597690E-05	-3.328520E-07	3.351148E-06
C20	6.132017E-08	7.071551E-09	1.473240E-10	2.134388E-10
C21	7.590068E-05	-7.244015E-07	-1.509170E-08	8.102220E-07
C22	-4.169238E-04	-1.090520E-03	-2.271916E-05	-1.433626E-05
C23	-3.870153E-03	4.530823E-04	9.439215E-06	-3.032197E-05

Performance Equation

$$Y=C_1+C_2x_1+C_3x_1^2+C_4x_1^3+C_5x_2+C_6x_2^2+C_7x_2^3+C_8x_3+C_9x_3^2+C_{10}x_3^3+C_{11}x_1x_2x_3+C_{12}x_1^2x_2x_3+C_{13}x_1x_2^2x_3+C_{14}x_1x_2x_3^2+C_{15}x_1x_2+C_{16}x_1x_3+C_{17}x_2x_3+C_{18}x_1^2x_2+C_{19}x_1x_2^2+C_{20}x_1^2x_3+C_{21}x_1x_3^2+C_{22}x_2^2x_3+C_{23}x_2x_3^2$$

x_1 = RPM
x_2 = E_t (°F)
x_3 = C_t (°F)

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