CASCADE17-0306Y3
R134a
48 V DC
VARIABLE SPEED

Brushless DC Variable Speed Compressor Technical Data Sheet

General Information

Compressor Part Number (Stationary)	CASCADE0003	(140 per pallet)
Compressor Part Number (Mobile)	CASCADE1003	(140 per pallet)
Compressor Drawing	DCMX17	
24V Controller Part Number	030F0152	
24V Controller Part Number	030F0189	
48V Controller Part Number	030F0137	
48V Controller Part Number	030F0192	
48V Controller Part Number	030F0175	
Wiring Diagram Drawing	DEMX0028	

Application Information

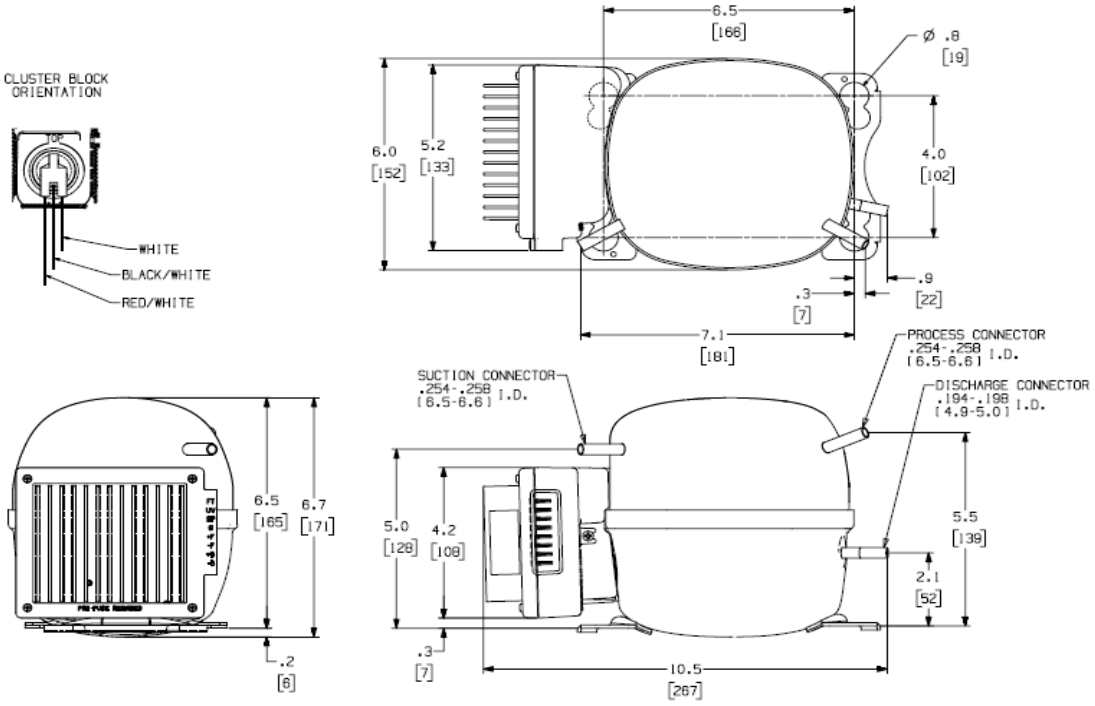
Application	LBP/MBP/HBP
Refrigerant	R134a
Evaporator Temperature Range	-40° F to 59° F (-40° C to 15° C)
Condenser Temperature Range	80° F to 150° F (26.7° C to 65.6° C)

Design

Displacement	5.01 cm^3 (0.306 in^3)
Oil Quantity	270 ml
Oil Type	POE 32cSt
Weight - Compressor/Controller	6.67 kg / 14.7 lb

	24V			48V		
Battery Protection	**Min.**	**Nominal**	**Max.**	**Min.**	**Nominal**	**Max.**
Under Voltage Shutdown	18.0	19.0	20.0	34.0	36.0	37.0
Over Voltage Shutdown	29.0	30.0	31.0	59.0	60.0	61.0

Compressor Dimensions



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

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Compressor Rating Data

LBP

Specification	ASHRAE	CECOMAF	SPEER
Voltage (VDC)	48	48	48
RPM	4200	4200	4200
Evap. Temp. (°F/°C)	-10°F / -23.3°C	-13°F / -25.0°C	-10°F / -23.3°C
Cond. Temp. (°F/°C)	130°F / 54.4°C	131°F / 55.0°C	105°F / 40.6°C
Ambient Temp. (°F/°C)	90°F / 32.2°C	90°F / 32.2°C	90°F / 32.2°C
Suction Temp. (°F/°C)	90°F / 32.2°C	90°F / 32.2°C	90°F / 32.2°C
Liquid Temp. (°F/°C)	90°F / 32.2°C	131°F / 55.0°C	90°F / 32.2°C
Cooling Capacity (BTU/watt)	563.52 / 165.153	417.3 / 122.299	636.03 / 186.402
Power (watt)	126.44	120.00	120.00
Current (amp)	2.63	2.50	2.50
Efficiency (EER/COP)	4.46 / 1.31	3.48 / 1.02	5.30 / 1.55

MBP

Specification	ASHRAE	ARI
Voltage (VDC)	48	48
RPM	4200	4200
Evap. Temp. (°F/°C)	20°F / -6.7°C	20°F / -6.7°C
Cond. Temp. (°F/°C)	130°F / 54.4°C	120°F / 48.9°C
Ambient Temp. (°F/°C)	95°F / 35.0°C	95°F / 35.0°C
Suction Temp. (°F/°C)	95°F / 35.0°C	40°F / 4.4°C
Liquid Temp. (°F/°C)	115°F / 46.1°C	120°F / 48.9°C
Cooling Capacity (BTU/watt)	1382.36 / 405.13	1208.06 / 354.047
Power (watt)	216.00	206.40
Current (amp)	4.50	4.30
Efficiency (EER/COP)	6.40 / 1.88	5.85 / 1.72

HBP

Specification	ASHRAE	ARI
Voltage (VDC)	48	48
RPM	3980	3925
Evap. Temp. (°F/°C)	45°F / 7.2°C	45°F / 7.2°C
Cond. Temp. (°F/°C)	130°F / 54.4°C	130°F / 54.4°C
Ambient Temp. (°F/°C)	95°F / 35.0°C	95°F / 35.0°C
Suction Temp. (°F/°C)	95°F / 35.0°C	65°F / 18.3°C
Liquid Temp. (°F/°C)	115°F / 46.1°C	115°F / 46.1°C
Cooling Capacity (BTU/watt)	2284.87 / 669.63	2137.68 / 626.49
Power (watt)	268.80	259.20
Current (amp)	5.60	5.40
Efficiency (EER/COP)	8.50 / 2.49	8.25 / 2.42

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Cooling Capacity (24V) - ARI HBP — **BTU/hr (Watt)**

	Evaporator Temperature												
RPM	**20°F**	**(-7°C)**	**30°F**	**(-1°C)**	**35°F**	**(2°C)**	**40°F**	**(4°C)**	**45°F**	**(7°C)**	**50°F**	**(10°C)**	**55°F**	**(13°C)**
1800	510	(149)	669	(196)	763	(223)	867	(254)	983	(288)	1113	(326)	1257	(368)
2400	679	(199)	904	(265)	1037	(304)	1183	(347)	1346	(394)	1526	(447)	1725	(505)
3000	827	(242)	1115	(327)	1285	(376)	1473	(431)	1681	(492)	1910	(559)	2161	(633)
3600	956	(280)	1305	(382)	1510	(442)	1738	(509)	1990	(583)	2266	(663)	2568	(752)
4200	1068	(313)	1474	(432)	1714	(502)	1980	(580)	2274	(666)	2596	(760)	2948	(863)

Power Consumption (24V) - ARI HBP — **Watt**

	Evaporator Temperature						
RPM	**20°F**	**30°F**	**35°F**	**40°F**	**45°F**	**50°F**	**55°F**
1800	97	109	115	120	125	129	132
2400	116	134	142	150	157	163	169
3000	151	173	183	193	202	211	218
3600	186	211	223	234	245	256	265
4200	205	232	246	259	271	283	294

Current (24V) - ARI HBP — **Amp**

	Evaporator Temperature						
RPM	**20°F**	**30°F**	**35°F**	**40°F**	**45°F**	**50°F**	**55°F**
1800	4.03	4.56	4.79	5.01	5.20	5.36	5.49
2400	4.85	5.58	5.92	6.24	6.53	6.79	7.03
3000	6.31	7.21	7.63	8.04	8.42	8.77	9.10
3600	7.75	8.79	9.29	9.77	10.22	10.65	11.05
4200	8.52	9.68	10.24	10.77	11.29	11.78	12.23

Efficiency (24V) - ARI HBP — **BTU/hr/W (W/W)**

	Evaporator Temperature												
RPM	**20°F**	**(-7°C)**	**30°F**	**(-1°C)**	**35°F**	**(2°C)**	**40°F**	**(4°C)**	**45°F**	**(7°C)**	**50°F**	**(10°C)**	**55°F**	**(13°C)**
1800	5.27	(1.54)	6.12	(1.79)	6.63	(1.94)	7.21	(2.11)	7.88	(2.31)	8.66	(2.53)	9.55	(2.80)
2400	5.83	(1.71)	6.75	(1.98)	7.30	(2.14)	7.91	(2.32)	8.59	(2.52)	9.36	(2.74)	10.23	(3.00)
3000	5.46	(1.60)	6.45	(1.89)	7.01	(2.05)	7.64	(2.24)	8.32	(2.44)	9.07	(2.66)	9.90	(2.90)
3600	5.14	(1.51)	6.18	(1.81)	6.77	(1.98)	7.41	(2.17)	8.11	(2.37)	8.86	(2.60)	9.68	(2.84)
4200	5.22	(1.53)	6.34	(1.86)	6.98	(2.04)	7.66	(2.24)	8.39	(2.46)	9.19	(2.69)	10.04	(2.94)

*** all points are at 35°C (95°F) ambient temperature, 18.33°C (65°F) suction, 8.33°C (15°F) subcooling, 54.4°C (130°F) condenser**

Performance Coefficients (24V) - ARI HBP

Coefficient	Capacity (BTU/Hr)	Power (Watts)	Current (Amperes)	Mass Flow (Lbs/Hr)
C1	-4.670246E+03	9.312153E+02	3.880064E+01	-5.519332E+01
C2	2.270078E+00	-3.530809E-01	-1.471170E-02	2.343978E-02
C3	-4.078010E-05	1.125397E-04	4.689152E-06	1.053870E-06
C4	1.491240E-09	-1.203363E-08	-5.014029E-10	-1.423450E-10
C5	5.744458E+01	1.272918E+00	5.303840E-02	7.427631E-01
C6	7.619751E-01	-7.430002E-02	-3.095833E-03	1.221310E-02
C7	1.675645E-03	-1.069313E-04	-4.455476E-06	1.596830E-05
C8	7.577070E+01	-1.533902E+01	-6.391258E-01	9.246937E-01
C9	-3.092477E-01	1.199676E-01	4.998650E-03	-3.224010E-03
C10	-1.849960E-05	-3.049691E-04	-1.270707E-05	-3.575090E-06
C11	4.937360E-04	-5.905496E-07	-2.460506E-08	6.952660E-06
C12	2.623460E-08	-4.641899E-09	-1.934126E-10	2.824980E-10
C13	2.168080E-06	-1.849499E-07	-7.706233E-09	4.152890E-08
C14	-3.257240E-06	1.537266E-07	6.405294E-09	-4.353890E-08
C15	-2.722064E-03	-1.315693E-03	-5.482053E-05	-5.283120E-05
C16	-3.091785E-02	1.063213E-03	4.430045E-05	-3.808630E-04
C17	-1.498459E+00	1.870774E-02	7.794865E-04	-2.039489E-02
C18	-3.817860E-06	5.040583E-07	2.100244E-08	-4.659280E-08
C19	-1.549500E-04	2.452104E-05	1.021711E-06	-3.551910E-06
C20	7.098440E-08	-2.096573E-08	-8.735706E-10	3.584980E-10
C21	1.182310E-04	-4.098304E-06	-1.707626E-07	1.516540E-06
C22	-7.298534E-03	5.699281E-04	2.374708E-05	-1.132120E-04
C23	8.152023E-03	-2.438960E-04	-1.016231E-05	1.128520E-04

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 (48V) - ARI HBP — **BTU/hr (Watt)**

	Evaporator Temperature												
RPM	**20°F**	**(-7°C)**	**30°F**	**(-1°C)**	**35°F**	**(2°C)**	**40°F**	**(4°C)**	**45°F**	**(7°C)**	**50°F**	**(10°C)**	**55°F**	**(13°C)**
1800	510	(149)	669	(196)	763	(223)	867	(254)	983	(288)	1113	(326)	1257	(368)
2400	679	(199)	904	(265)	1037	(304)	1183	(347)	1346	(394)	1526	(447)	1725	(505)
3000	827	(242)	1115	(327)	1285	(376)	1473	(431)	1681	(492)	1910	(559)	2161	(633)
3600	956	(280)	1305	(382)	1510	(442)	1738	(509)	1990	(583)	2266	(663)	2568	(752)
4200	1068	(313)	1474	(432)	1714	(502)	1980	(580)	2274	(666)	2596	(760)	2948	(863)

Power Consumption (48V) - ARI HBP — **Watt**

	Evaporator Temperature						
RPM	**20°F**	**30°F**	**35°F**	**40°F**	**45°F**	**50°F**	**55°F**
1800	95	107	113	118	122	126	129
2400	114	131	139	147	154	160	165
3000	148	170	180	189	198	207	214
3600	182	207	219	230	241	251	260
4200	201	228	241	254	266	277	288

Current (48V) - ARI HBP — **Amp**

	Evaporator Temperature						
RPM	**20°F**	**30°F**	**35°F**	**40°F**	**45°F**	**50°F**	**55°F**
1800	1.98	2.24	2.35	2.46	2.55	2.63	2.69
2400	2.38	2.74	2.90	3.06	3.20	3.33	3.44
3000	3.09	3.53	3.74	3.94	4.13	4.30	4.46
3600	3.80	4.31	4.56	4.79	5.01	5.22	5.42
4200	4.18	4.75	5.02	5.28	5.53	5.77	6.00

Efficiency (48V) - ARI HBP — **BTU/hr/W (W/W)**

	Evaporator Temperature												
RPM	**20°F**	**(-7°C)**	**30°F**	**(-1°C)**	**35°F**	**(2°C)**	**40°F**	**(4°C)**	**45°F**	**(7°C)**	**50°F**	**(10°C)**	**55°F**	**(13°C)**
1800	5.38	(1.57)	6.24	(1.83)	6.76	(1.98)	7.35	(2.15)	8.04	(2.35)	8.83	(2.58)	9.74	(2.85)
2400	5.95	(1.74)	6.89	(2.02)	7.44	(2.18)	8.06	(2.36)	8.76	(2.57)	9.55	(2.80)	10.43	(3.05)
3000	5.57	(1.63)	6.58	(1.93)	7.15	(2.09)	7.79	(2.28)	8.48	(2.48)	9.25	(2.71)	10.09	(2.96)
3600	5.24	(1.53)	6.31	(1.85)	6.91	(2.02)	7.56	(2.21)	8.27	(2.42)	9.04	(2.65)	9.87	(2.89)
4200	5.32	(1.56)	6.47	(1.89)	7.11	(2.08)	7.81	(2.29)	8.56	(2.51)	9.37	(2.74)	10.24	(3.00)

*** all points are at 35°C (95°F) ambient temperature, 18.33°C (65°F) suction, 8.33°C (15°F) subcooling, 54.4°C (130°F) condenser**

Performance Coefficients (48V) - ARI HBP

Coefficient	Capacity (BTU/Hr)	Power (Watts)	Current (Amperes)	Mass Flow (Lbs/Hr)
C1	-4.670246E+03	9.132208E+02	1.902543E+01	-5.519332E+01
C2	2.270078E+00	-3.462581E-01	-7.213709E-03	2.343978E-02
C3	-4.078010E-05	1.103650E-04	2.299270E-06	1.053870E-06
C4	1.491240E-09	-1.180110E-08	-2.458570E-10	-1.423450E-10
C5	5.744458E+01	1.248320E+00	2.600675E-02	7.427631E-01
C6	7.619751E-01	-7.286427E-02	-1.518005E-03	1.221310E-02
C7	1.675645E-03	-1.048650E-04	-2.184690E-06	1.596830E-05
C8	7.577070E+01	-1.504262E+01	-3.133878E-01	9.246937E-01
C9	-3.092477E-01	1.176494E-01	2.451029E-03	-3.224010E-03
C10	-1.849960E-05	-2.990760E-04	-6.230760E-06	-3.575090E-06
C11	4.937360E-04	-5.791380E-07	-1.206480E-08	6.952660E-06
C12	2.623460E-08	-4.552200E-09	-9.483760E-11	2.824980E-10
C13	2.168080E-06	-1.813760E-07	-3.778660E-09	4.152890E-08
C14	-3.257240E-06	1.507560E-07	3.140760E-09	-4.353890E-08
C15	-2.722064E-03	-1.290269E-03	-2.688060E-05	-5.283120E-05
C16	-3.091785E-02	1.042668E-03	2.172220E-05	-3.808630E-04
C17	-1.498459E+00	1.834624E-02	3.822120E-04	-2.039489E-02
C18	-3.817860E-06	4.943180E-07	1.029830E-08	-4.659280E-08
C19	-1.549500E-04	2.404720E-05	5.009840E-07	-3.551910E-06
C20	7.098440E-08	-2.056060E-08	-4.283450E-10	3.584980E-10
C21	1.182310E-04	-4.019110E-06	-8.373140E-08	1.516540E-06
C22	-7.298534E-03	5.589150E-04	1.164410E-05	-1.132120E-04
C23	8.152023E-03	-2.391830E-04	-4.982970E-06	1.128520E-04

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 (48V) - ASHRAE LBP — **BTU/hr (Watt)**

Evaporator Temperature

RPM	-40°F	(-40°C)	-30°F	(-34.4°C)	-20°F	(-28.9°C)	-10°F	(-23.3°C)	0°F	(-17.8°C)	5°F	(-15°C)	10°F	(-12.2°C)
1800					175	(51)	254	(74)	361	(106)	412	(121)	453	(133)
2400			164	(48)	199	(58)	312	(91)	458	(134)	530	(155)	594	(174)
3000	251	(73)	184	(54)	245	(72)	389	(114)	571	(167)	662	(194)	746	(219)
3600	271	(79)	222	(65)	305	(89)	476	(139)	689	(202)	798	(234)	901	(264)
4200	304	(89)	269	(79)	370	(108)	564	(165)	804	(236)	929	(272)	1048	(307)

Power Consumption (48V) - ASHRAE LBP — **Watt**

Evaporator Temperature

RPM	-40°F	-30°F	-20°F	-10°F	0°F	5°F	10°F
1800			48	61	76	84	91
2400		51	60	75	93	103	112
3000	59	62	74	92	113	124	135
3600	68	74	88	109	134	147	160
4200	76	84	102	126	155	171	186

Current (48V) - ASHRAE LBP — **Amp**

Evaporator Temperature

RPM	-40°F	-30°F	-20°F	-10°F	0°F	5°F	10°F
1800			1.00	1.27	1.59	1.75	1.90
2400		1.05	1.25	1.57	1.95	2.14	2.32
3000	1.24	1.29	1.54	1.91	2.36	2.59	2.81
3600	1.43	1.53	1.84	2.28	2.80	3.07	3.34
4200	1.58	1.74	2.12	2.63	3.24	3.56	3.87

Efficiency (48V) - ASHRAE LBP — **BTU/hr/W (W/W)**

Evaporator Temperature

RPM	-40°F	(-40°C)	-30°F	(-34.4°C)	-20°F	(-28.9°C)	-10°F	(-23.3°C)	0°F	(-17.8°C)	5°F	(-15°C)	10°F	(-12.2°C)
1800					3.64	(1.07)	4.16	(1.22)	4.73	(1.38)	4.89	(1.43)	4.96	(1.45)
2400			3.29	(0.96)	3.31	(0.97)	4.14	(1.21)	4.91	(1.44)	5.16	(1.51)	5.32	(1.56)
3000	4.23	(1.24)	3.11	(0.91)	3.32	(0.97)	4.23	(1.24)	5.04	(1.48)	5.33	(1.56)	5.52	(1.62)
3600	3.96	(1.16)	3.25	(0.95)	3.46	(1.01)	4.35	(1.27)	5.13	(1.50)	5.41	(1.58)	5.62	(1.65)
4200	4.01	(1.18)	3.55	(1.04)	3.64	(1.07)	4.46	(1.31)	5.17	(1.52)	5.44	(1.59)	5.64	(1.65)

*** 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	1.439917E+02	3.993305E+02	8.319385E+00	-2.074191E+01
C2	3.780987E-01	-1.708198E-01	-3.558747E-03	3.385990E-03
C3	8.312860E-05	7.552512E-06	1.573440E-07	1.012017E-06
C4	-7.274915E-09	-1.188415E-09	-2.475864E-11	-8.875691E-11
C5	-1.431013E+02	2.550715E+01	5.313989E-01	-1.592733E+00
C6	-1.400124E+00	-1.366639E-01	-2.847165E-03	-1.443033E-02
C7	-7.426529E-03	-4.828953E-04	-1.006032E-05	-9.565699E-05
C8	1.327090E+01	-3.587050E+00	-7.473022E-02	6.977212E-01
C9	-1.534663E-01	-2.224086E-02	-4.633512E-04	-6.123037E-03
C10	4.471164E-04	2.280625E-04	4.751301E-06	1.667690E-05
C11	-8.929842E-04	8.766174E-05	1.826286E-06	-1.029706E-05
C12	-2.347898E-08	6.138899E-10	1.278937E-11	-3.249251E-10
C13	-2.505505E-06	-1.090235E-07	-2.271322E-09	-2.301941E-08
C14	4.135404E-06	-3.973950E-07	-8.279062E-09	5.058627E-08
C15	5.535411E-02	-4.419872E-03	-9.208068E-05	5.891468E-04
C16	-6.285692E-03	3.103097E-03	6.464784E-05	-6.641243E-05
C17	2.553633E+00	-4.755095E-01	-9.906449E-03	2.953747E-02
C18	2.518773E-06	-2.258632E-08	-4.705483E-10	3.730210E-08
C19	3.646494E-04	1.758211E-05	3.662940E-07	3.558250E-06
C20	-7.059656E-08	3.855037E-08	8.031326E-10	-8.872556E-10
C21	2.289344E-05	-1.427376E-05	-2.973700E-07	2.785405E-07
C22	9.626481E-03	9.891815E-04	2.060795E-05	9.450119E-05
C23	-1.141565E-02	2.202465E-03	4.588469E-05	-1.351959E-04

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)

CASCADE17-0306Y3

Controller Features

4 pole sensor-less variable speed BLDC motor controller
420W maximum output power
030F0137 & 030F0175: 39 - 60 VDC input range, 030F0152: 19 - 30 VDC input range
1800 – 4200 rpm speed
1.0 - 4.75V analog speed set input (resistor programmable for fixed speed)
030F0137 & 030F0152: 0°C to 45°C operating temperature
030F0175 (LBP/MBP): 0°C to 55°C operating temperature (min. fan cooling / airflow across heatsink is 1.5 m/s)
030F0175 (HBP): 0°C to 46.1°C operating temperature (min. fan cooling / airflow across heatsink is 3 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
Pulsed Fault output (030F0189 & 030F0192 only)
LED fault indicator
Fan output, +12VDC @ 0.5A with voltage detection
Reverse polarity protection

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.

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

Optional Fixed Resistor Speed Chart

Resistor Value OHMS	Motor Speed [RPM]	
0	3000	48V ONLY
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