

MODULES

CoolX CoolMods Table				
CoolMod	Vnom(V)	Set Point Adjust Range (V)	I _{max} (A)	Power (W)
CmA	5	2.5-6.0	30.0	150
CmB ¹	12	6.0-15.0	23.3	280
CmC	24	15.0-28.0	12.5	300
CmD	48	28.0-58.0	6.25	300
High Power Modules (3 Slot)				
CmE	24	22.8-25.2	37.5	900
CmF	48	45.6-50.4	18.75	900
Dual Output Modules (1 Slot)				
CmG ² V1	24	3.0-30.0	4.0	120
V2	24	3.0-30.0	4.0	120
CmH ³ V1	5	3.0-6.0	10.0	60
V2	24	3.0-30.0	4.0	120
Wide Trim Modules (1 Slot)				
CmM	5	1.0-6.0	30	150
CmN	12	1.0-15.0	23.3	280
CmP	24	1.0-28.0	12.5	300
CmQ	48	3.0-58.0	6.25	300

¹ Full dynamic specifications may not be met at full load when output voltage is trimmed above 13 V.

² For the CmG module the max combined power of both outputs is 200 W.

³ For the CmH module the max combined power of both outputs is 180 W.

ELECTRICAL SPECIFICATIONS

Input					
Parameter	Conditions/Description	Min	Nom	Max	Units
AC Operating Input Range		85	—	264	VAC
Nominal Input Voltage Range	Universal Input 47-440Hz	100	—	240	VAC
Extended AC Operating Range	Maximum for 5 seconds	—	—	300	VAC
DC Input Voltage Range		120		300	VDC
Input Current	90 VAC @ 10800 W	—	—	14.5	A
Inrush Current	230 VAC @ 1800 W	—	—	25	A
Power Factor	120 VAC @ 1400 W	0.98	—	—	—
Undervoltage Lockout	Shutdown	65	—	74	VAC
Input Fuses Rating	Dual Fused (Line and Neutral) 250 VAC	—	16	—	A
Efficiency	230 VAC, 1800 W with 6 x CmC CoolMods	91		%	
	230 VAC, 1800 W with 2 x CmF CoolMod	—	93	—	%
Capacitive Load	CmA-CmE	—	—	10	mF
	CmG, CmH	—	—	< 0.47	mF

Output					
Parameter	Conditions/Description	Min	Nom	Max	Units
Power Rating	CX18: See derating curves	—	—	1800	W
Minimum Load		0	—	—	A
Line Regulation	For ±10% change from nominal line	—	—	±0.1	%
	CmE, CmF, CmG, CmH	—	—	±0.5	%
Load and Cross Regulation	For 25% to 75% load change	—	—	±0.2	
Transient Response	For 25% to 75% load change 0.5A/uS: voltage deviation	—	—	4 (4)	%
	*CmE and CmF, Figures in () Settling Time	—	—	500(1000)	μS
Ripple and Noise	100 mV or 1.0% pk-pk. 20 MHz BW	—	—	1	%
	CmF	—	—	1.5	%
Overvoltage Protection	Tracking OVP Level (N/A in CmE and CmF, CmG, CmH)	105	—	125	%
	Latching OVP Level	125	—	160	%
Remote Sense	Max. line drop compensation (N/A in CmG and CmH)	—	—	0.5	VDC
Overshoot		—	—	1	%
Rise Time	Monotonic	—	—	10	ms
	CmG and CmH	—	—	20	ms
Turn-On Delay	From AC in	—	—	—	1000
	From Global Enable	—	—	10	—
	From CoolMod Enable	—	—	10	—
Hold-Up Time	For nominal output voltages at full load CmE and CmF combination at 1300 W	16	—	—	ms
CoolMod Power	As per CoolMod table	—	—	—	—
Output Adjustment Range	Manual: Multi-turn potentiometer. As per CoolMod table	—	—	—	—
	Vtrim: As per CoolMod table	—	—	—	—
Overcurrent Protection	Straight line with hiccup activation @ 35% Vo nom CmE, CmF, CmG, CmH: Current limit hiccup autorecovery CmM, CmN, CmP and CmQ: Straight line with hiccup activation at 70% of Vo min	110	130	150	%
Short Circuit Protection	Yes Autorecovery	—	—	—	—
OverTemperature Protection	Yes, Autorecovery (CmG, CmH latch off)	—	—	—	—

ELECTRICAL SPECIFICATIONS (CONTINUED)

Auxiliary Output					
Parameter	Conditions/Description	Min	Nom	Max	Units
Nominal Output Voltage	Aux Voltage Option A	11.76	12	12.24	V
	Aux Voltage Option B	4.75	5	5.25	V
Load Regulation		—	—	±2	%
Line Regulation	For ±10% change from nominal line	—	—	±0.5	%
Maximum Output Current	Aux Voltage Option A	—	—	1.96	A
	Aux Voltage Option B	—	—	4.7	A
Maximum Output Capacitive Load		—	—	1000	µF
Output Overcurrent Protection	Hiccup	110		140	%
Short Circuit Protection	Yes, Autorecovery	—	—	—	—

Galvanic Isolation					
Parameter	Conditions/Description	Min	Nom	Max	Units
Input to Output	Reinforced (2 x MOPP); contact Advanced Energy for Hi-Pot instructions	4000	—	—	VAC
Input to Case	Basic (1 x MOPP)	1850	—	—	VAC
Output to Case	Basic (1 x MOPP)	1850	—	—	VAC
Output to Output	Basic (1 x MOPP)	1850	—	—	VAC
CmG, CmH V1-V2	Functional	500	—	—	VDC

Reliability					
Parameter	Conditions/Description	Min	Nom	Max	Units
Reliability and MTBF	MTBF of >>3 million hours, Telecordia SR-332, Issue 4 CoolPac (excludes fans)	—	0.33	—	Fpmh
Warranty	5 years	—	—	—	—

Environmental					
Parameter	Conditions/Description	Min	Nom	Max	Units
Operating Temperature	Operates to specification below -20°C after 10 min warmup	-40	—	70	°C
Storage Temperature		-40	—	85	°C
Derating	See derating curves	—	—	—	—
Relative Humidity	Non-condensing	5	—	95	%RH
Shock and Vibration	MIL-STD-810G Method 514.6	—	—	—	—
Altitude		—	—	5000	m

ELECTRICAL SPECIFICATIONS (CONTINUED)

Leakage Currents			
Parameter	Conditions/Description	Nom	Units
AC Leakage Current	Input to earth ground		
Normal Condition (High Line)	Mains Voltage 264 VAC/60 Hz	244	μA
Single Fault Condition (High Line)	Mains Voltage 264 VAC/60 Hz	435	μA
Touch Current			
Normal Condition	Mains Voltage 264 VAC/60 Hz	14.2	μA
Single Fault Condition	Mains Voltage 264 VAC/60 Hz	246	μA

EMC			
Parameter	Conditions/Description		Units
Radiated Emissions	EN 55011, EN 55022 and FCC, Class B	—	Compliant
Conducted Emissions	EN 55011, EN 55022 and FCC, Class B	—	Compliant
Power Line Harmonics	EN 61000-3-2, Class A	—	Compliant
Voltage Flicker	EN 61000-3-3	—	Compliant
ESD	EN 61000-4-2, level 4, 8 kV contact, 15 kV air	—	A
Radiated Immunity	EN 61000-4-3, level 3, 10 V/m 80-2700 MHz	—	A
Electrical Fast Transient	EN 61000-4-4, level 4, ±4 kV	—	A
Surge Immunity	EN 61000-4-5, level 4, 2 kV DM, 4 kV CM	—	A
Conducted RF Immunity	EN 61000-4-6, level 3, 10 Vemf 150 KHz-80 MHz	—	A
Power Frequency Magnetic Field	EN 61000-4-8, level 4, 30 A/m	—	A
Voltage Dips and Interruptions	EN61000-4-11	10 ms 100 ms 500 ms	A B B

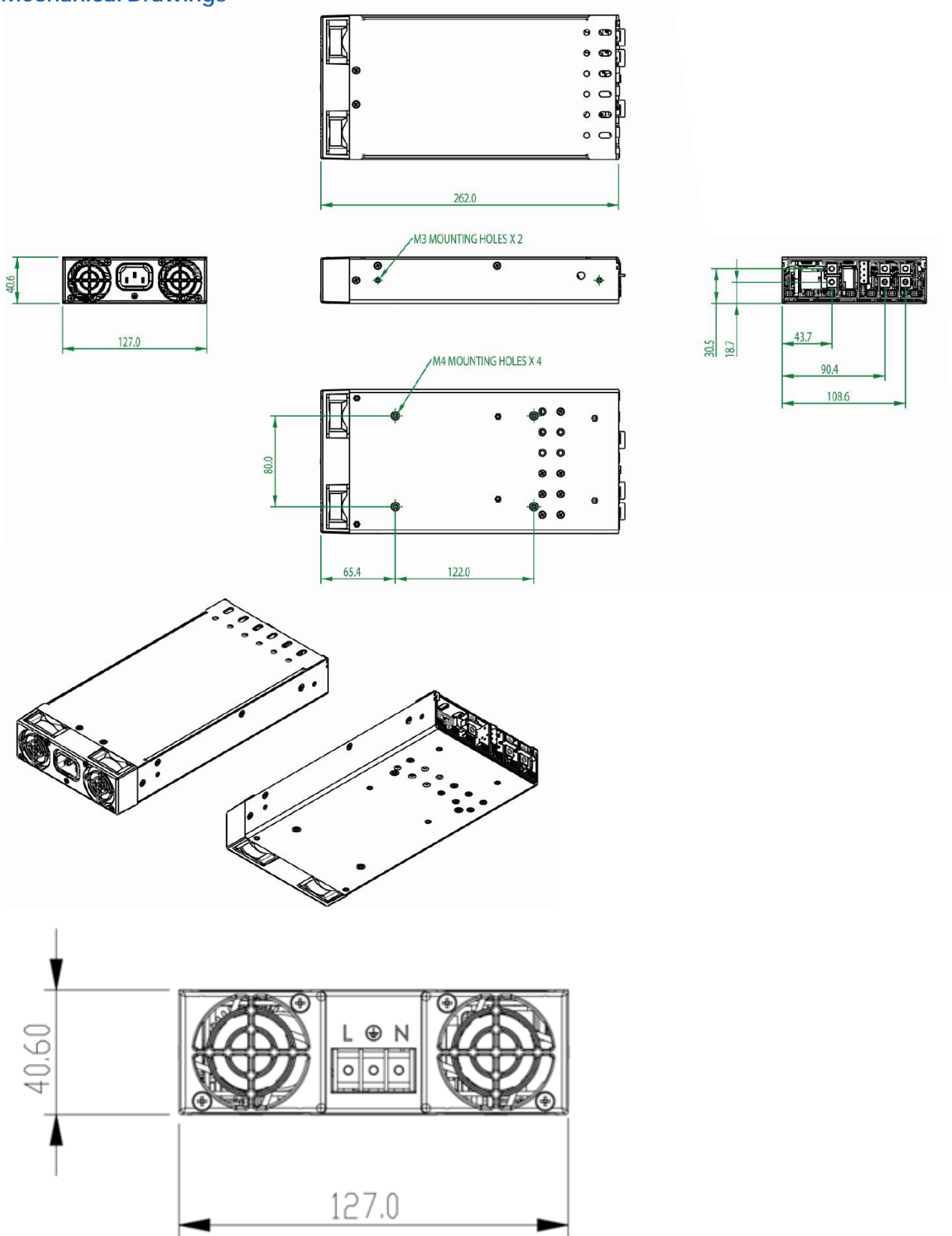
Standards and Directives	
Parameter	Conditions/Description
Safety Agency Approvals	EN60601-1 3rd Edition, UL60601-1, CSA601, EN60950 2nd Edition, CSA C22.2 No. 60950-1
IEC/EN 60950-1, Edition 2 and all national deviations	UL 60950-1/CSA 22.2 No 60950-1, Edition 2; 5000 m (16,400 ft) altitude, 100 VAC to 240 VAC ±10%
IEC/EN 60601-1, Edition 3 and all national deviations	IEC 60601-1 (2005), EN60601-1 (2006), ANSI/AAMI ES 60601-1 (2005), CAN/CSA C22.2 No. 60601-1 (2008); 5,000 m (16,400 ft) altitude, 100 VAC to 240 VAC ±10%
IEC 62368 Edition 2	IEC 62368-1 (2014) Edition 2; 5000 m (16,400 ft) altitude, 100 VAC to 240 VAC ±10%
IEC 60601-1-2 Edition 4	IEC 60601-1-2 (2014)
Protection class	Class I
ROHS	EU DIRECTIVE 2015/863 RoHS compliant
REACH-171	Compliant
Conflict Materials	Compliant with Conflict Free Sourcing Initiative

MECHANICAL SPECIFICATIONS

Mechanica Data		
Parameter	Description	
Dimensions (L x W x H)	L x W x H	267 mm x 127 mm x 41 mm (10.5" x 5" x 1U)
Weight	Nominal Weight: CoolPac + 6 x CoolMods	1.6 Kg
Connectors	Description	Mating Connectors (if applicable)
AC/DC IEC input (Option)	IEC 320 Inlet	—
Main DC output terminal block (CmA-CmF, CmM-CmQ)	M4 Screws	—
Main DC output terminal block (CmG, CmH)	Camden - CTB9350/4A	—
Output Signal Connector (CmG, CmH)	Molex - 87833-0831	Camden - CTB9200/4A or Würth Elektronik - 691 352 710 004
System Signal Connector J1007	Molex 87833-0831 8-way	Locking Molex 51110-0860; Non Locking Molex 51110-0850; Crimp Terminal: Molex p/n 50394 or Molex 51110-0856 which includes locking tab and polarization keying
Output Signal Connectors J1001-1006	Molex 87833-0631 6-way	Locking Molex 51110-0660; Non Locking Molex 51110-0650; Crimp Terminal: Molex p/n 50394 or Molex 51110-0656 which includes locking tab and polarization keying
Output Signal Connector (CmG, CmH)	Molex 87833-0831 8-way	Locking Molex 51110-0860; Non Locking Molex 51110-0850 Crimp Terminal: Molex p/n 50394 or Molex 51110-0856 which includes locking tab and polarization keying
Output Sense Connectors J3	JST-S2BPH-K(LF)(SN)	JST PHR2. Crimp Terminal JST BPH-002TP0.5S or SPH-002T-P05S
Auxiliary Output Connector J1	Molex 1041880210 2pin	

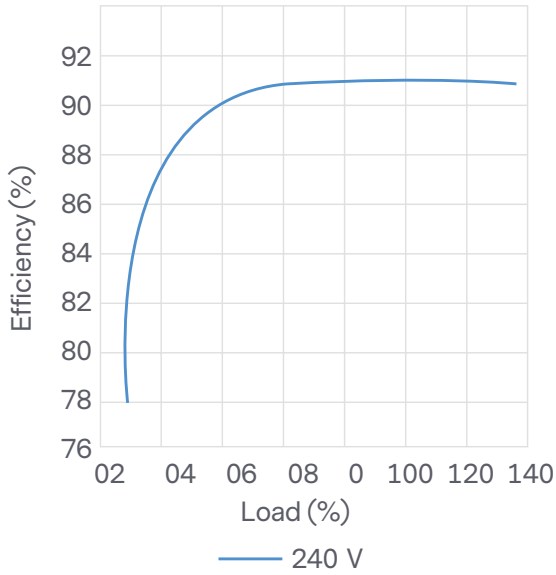
MECHANICAL SPECIFICATIONS (CONTINUED)

Mechanical Drawings

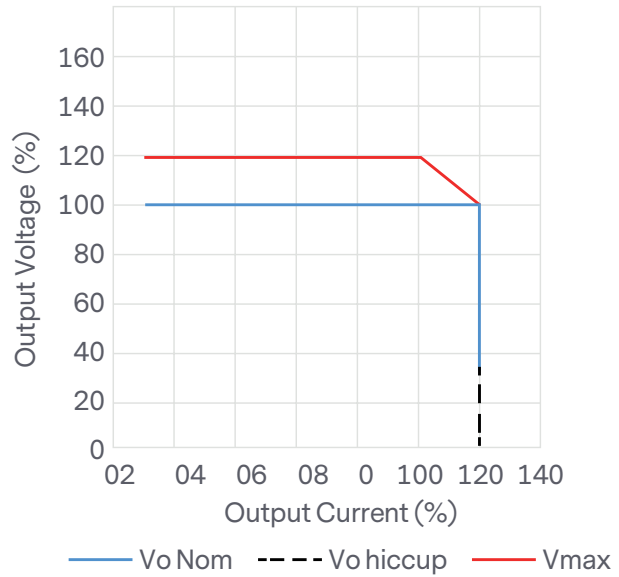


INTERFACE

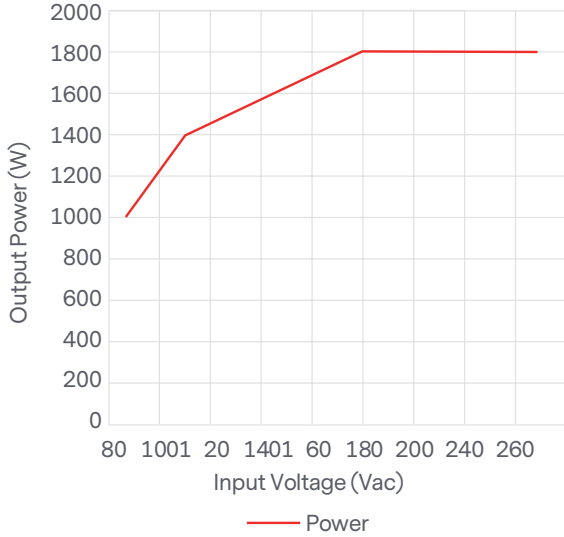
Efficiency vs Load



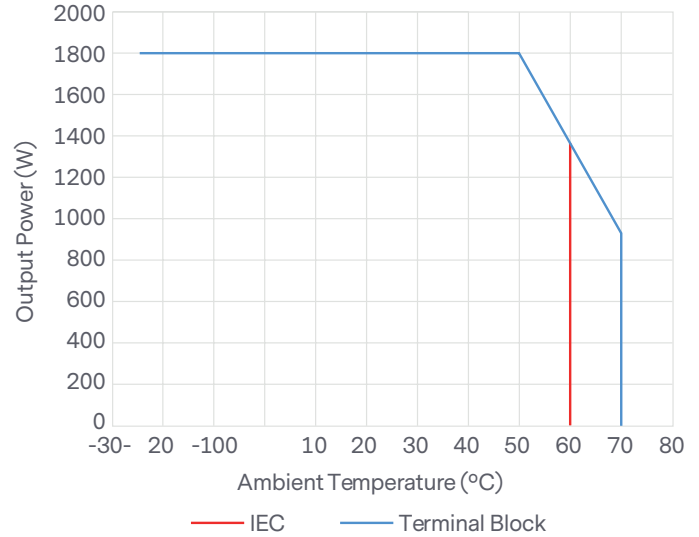
Current & Power Overload Characteristics



CX18 Input Voltage Typical Derating Curves

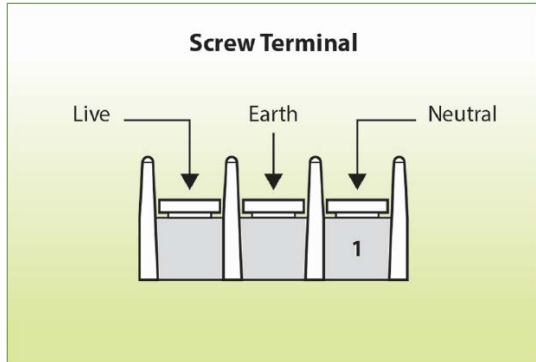


CX18 Temperature Derating Curve

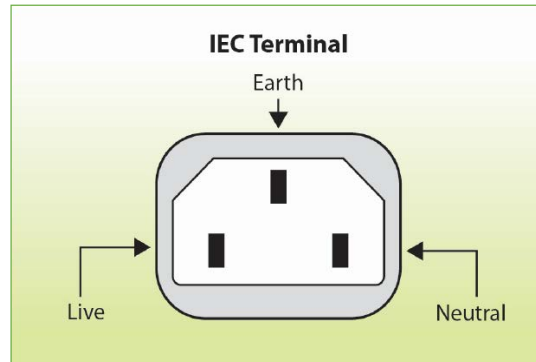


INTERFACE (CONTINUED)

Input Connectors

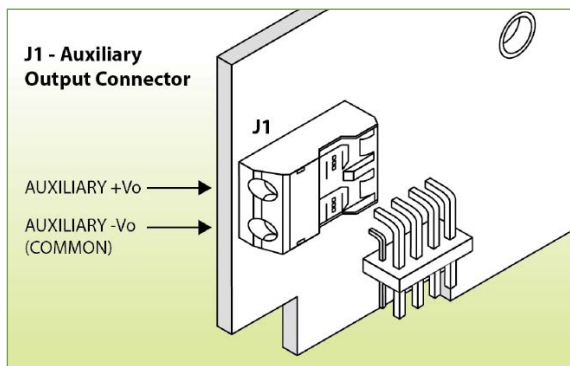
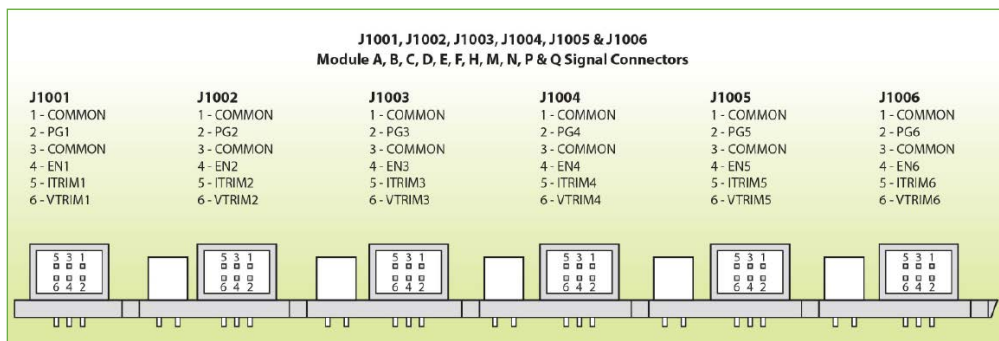
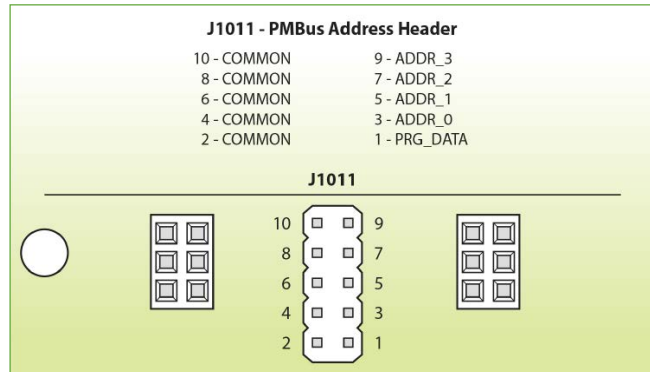
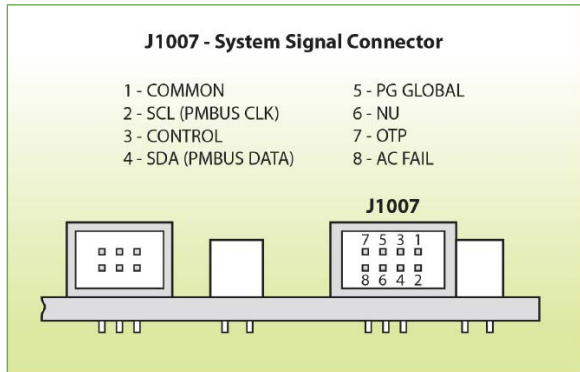


Standard (Screw Terminal)



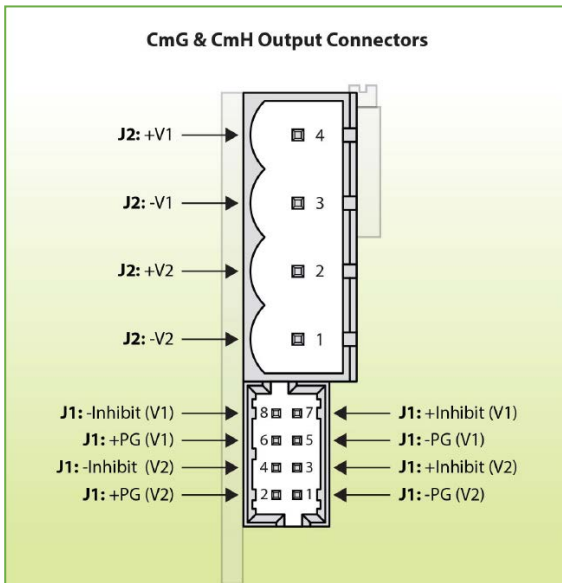
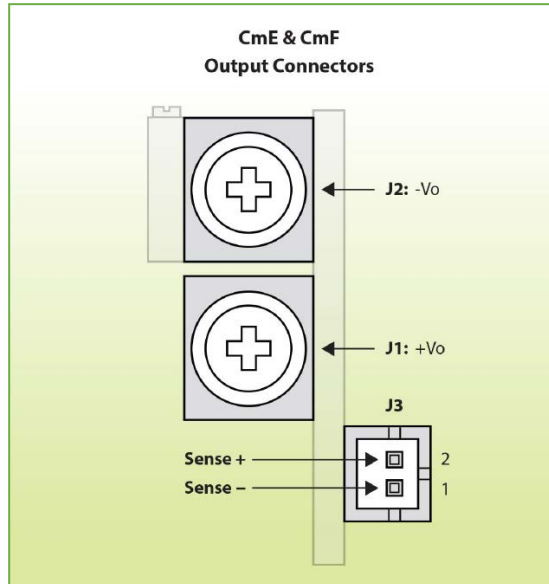
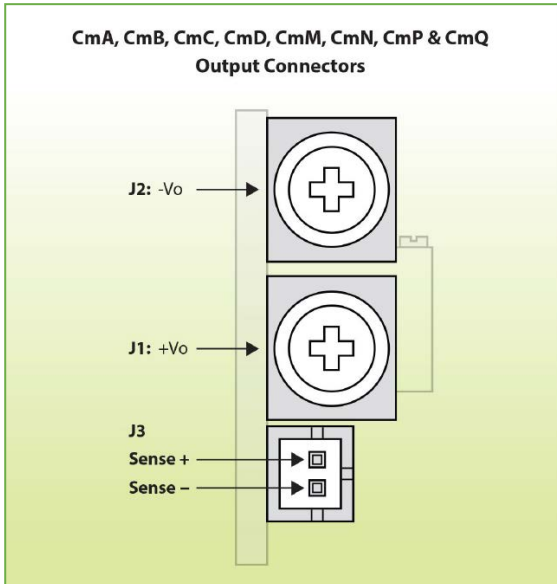
Option 1 (IEC Terminal)

CoolPac Connectors

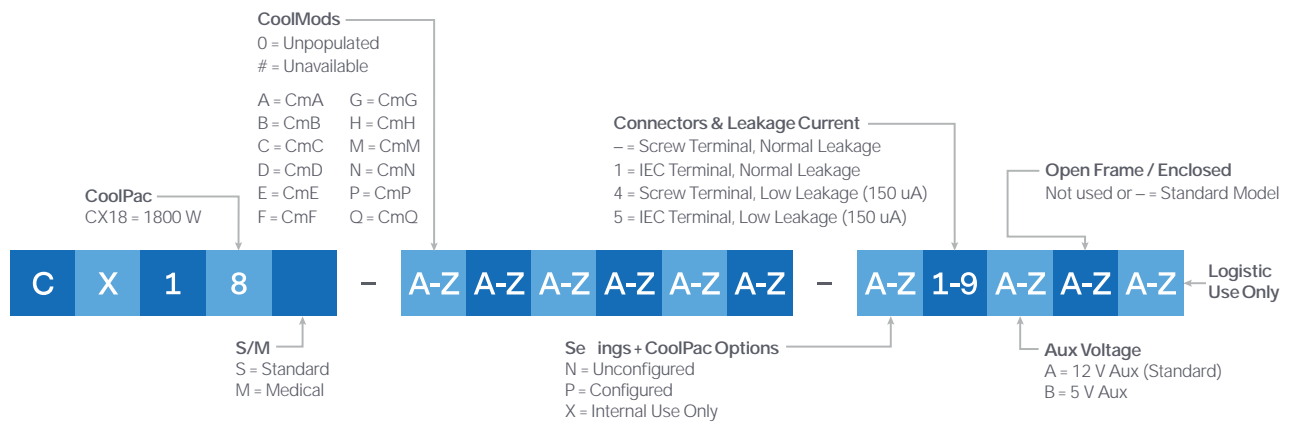


INTERFACE (CONTINUED)

CoolMod Connectors



CONFIGURATION



*Contact Advanced Energy for conformal coating and ruggedized options.



ABOUT ADVANCED ENERGY

Advanced Energy (AE) has devoted more than three decades to perfecting power for its global customers. AE designs and manufactures highly engineered, precision power conversion, measurement and control solutions for mission-critical applications and processes.

AE's power solutions enable customer innovation in complex semiconductor and industrial thin film plasma manufacturing processes, demanding high and low voltage applications, and temperature-critical thermal processes.

With deep applications know-how and responsive service and support across the globe, AE builds collaborative partnerships to meet rapid technological developments, propel growth for its customers and power the future of technology.

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