

# EXCELSYS COOLX<sup>®</sup>3000

HIGH EFFICIENCY, INTELLIGENT AND RELIABLE 3000 W MODULAR POWER SUPPLY

Advanced Energy's CoolX3000 is the latest addition to the Excelsys product line. The CoolX3000 intelligent modular power supply delivers an incredible 3000 W in a compact package. With market leading specifications and features, including PMBus™ digital communications, CoolX3000 sets the industry standard in terms of flexibility, reliability, and efficiency.



## PRODUCT HIGHLIGHTS

### Modular Power Supply

- Up to 3000 W
- Up to 24 outputs
- All outputs isolated (1850 VAC)
- Variable fan speed control

### Reliability

- MTBF > 150,000 hours
- Level 4 input surge protection
- 23.5 W always ON auxiliary power output
- Safety approved to 5000 m altitude
- 91% efficiency
- Five-year warranty

### Flexibility

- Analog and digital management — PMBus™ monitoring and control capability
- Field-configurable — plug and play power
- Series and parallel outputs for higher voltages and currents
- Mounting options — base/side

## TYPICAL APPLICATIONS

### Medical

- Clinical diagnostic equipment, medical lasers, dialysis equipment, radiological imaging, chemical chemistry

### Industrial

- Test and measurement, industrial machines, automation equipment, printing, telecommunications

### Hi Rel

- Harsh industrial electronics, radar (marine- and ground-based), communications, test and measurement

## AT A GLANCE

	C30S	C30M
<b>Power</b>	3000 W	3000 W
<b>Slots</b>	12	12
<b>Cooling</b>	Variable fan speed control	
<b>Parameters</b>	325 x 131 x 120 mm 12.8 x 5.2 x 4.7"	
<b>Certification and Compliance</b>	<b>Medical (C30M)</b> <ul style="list-style-type: none"> <li>■ IEC60601-1 3rd edition, IEC60601-1-2 4th edition (EMC)</li> <li>■ 2 MOPP</li> <li>■ Dual fused</li> </ul> <b>Industrial (C30S)</b> <ul style="list-style-type: none"> <li>■ IEC62368-1</li> <li>■ SEMI F47</li> </ul>	

MODULES

CoolX CoolMods Table				
Parameter	Vnom (V)	Set Point Adjust Range (V)	I <sub>max</sub> (A)	Power (W)
<b>Single Output Modules (1 Slot)</b>				
CmA	5	2.5-6.0	30.0	150
CmB <sup>1</sup>	12	6.0-15.0 <sup>2</sup>	23.3	280
CmC	24	15.0-28.0	12.5	300
CmD	48	28.0-58.0 <sup>3</sup>	6.25	300
<b>High Power Modules (3 Slot)</b>				
CmE <sup>4</sup>	24	24-25.2	37.5	900
CmF <sup>4</sup>	48	48-50.4	18.75	900
<b>Dual Output Modules (1 Slot)</b>				
CmG <sup>5</sup> V1	24	3.0-30.0	4.0	120
V2	24	3.0-30.0	4.0	120
CmH <sup>6</sup> V1	5	3.0-6.0	10.0	60
V2	24	3.0-30.0	4.0	120
<b>Wide Trim Modules (1 Slot)</b>				
CmA-W01	5	1.0-6.0	30	150
CmB-W01	12	1.0-15.0 <sup>2</sup>	23.3	280
CmC-W01	24	2.0-28.0	12.5	300
CmD-W01	48	3.0-58.0 <sup>3</sup>	6.25	300
<b>High Voltage Modules (1 Slot)</b>				
CmK <sup>7</sup>	200	175-205	1.0	200

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

<sup>2</sup> Max Trim 14 V when used with High Power Module

<sup>3</sup> Max Trim 56 V when used with High Power Module

<sup>4</sup> a) Only one High Power module (CmE or CmF) can be used per CoolPac.

b) During load transients starting from 0% load on the High Power modules, other modules in the CoolPac may experience an output voltage dynamic during the load change. Contact applications support for details or support.

<sup>5</sup> For the CmG module the max combined power of both outputs is 200 W.

<sup>6</sup> For the CmH module the max combined power of both outputs is 180 W.

<sup>7</sup> When a CmK module is used in Unit A along with a CmE or CmF module, one module slot of Unit A must remain unpopulated. When a CmK module is used in Unit B along with a CmE or CmF module, one module slot of Unit B must remain unpopulated.

## ELECTRICAL SPECIFICATIONS

Input					
Parameter	Conditions/Description	Min	Nom	Max	Units
Nominal Input Voltage Range	47 to 440 Hz	200	—	240	VAC
AC Operating Input Range		180	—	264	VAC
Extended AC Operating Range	Maximum for 5 seconds	—	—	300	VAC
DC Input Voltage Range		283	—	340	VDC
Input Current	See Power Derating Curve	—	—	16	A
Inrush Current	230 VAC	—	—	50	A
Power Factor	230 VAC @ 3000 W	0.98	—	—	—
Undervoltage Lockout	Shutdown	65	—	74	VAC
Input Fuses Rating	Dual Fused (Line and Neutral) 500 VAC	—	30	—	A
Efficiency	230 VAC, 3000 W with 12 x CmC CoolMods	—	—	91	%

Output					
Parameter	Conditions/Description	Min	Nom	Max	Units
<b>Single Output Modules (1 Slot)</b>					
Line Regulation	From minimum to maximum rated voltage	—	—	±0.2	%
Load Regulation	For 0 to 100% load change	—	—	±0.4	%
Transient Response	For 25% to 75% load change, 0.5 A/μs: voltage deviation	—	—	±6	%
	For 25% to 75% load change, 0.5 A/μs: settling time	—	—	500	μs
Ripple and Noise	Peak-Peak, 20 MHz BW, 100 mV or % of nominal	—	—	1.0	%
Overvoltage Protection	Tracking OVP (autorecovery, % of setpoint)	103	—	125	%
	Hiccup OVP (% of maximum voltage)	107	—	160	%
Remote Sense	Maximum cable drop compensation	—	—	0.5	VDC
Rise Time	Monotonic	—	—	5	ms
Turn-On Delay	From AC in	—	—	1000	ms
	From Global Enable	—	—	12	ms
	From CoolMod Enable	—	—	12	ms
Hold-Up Time	For nominal output voltages at full load, see note 2	16	—	—	ms
Overcurrent Protection	Straight line current limit with hiccup protection at 35% Vo nom	105	—	130	%
Short Circuit Protection	Hiccup, Autorecovery	—	—	—	—
Overtemperature Protection	Autorecovery	—	—	—	—
Capacitive Load		—	—	10	mF
<b>Dual Output Modules (1 Slot)</b>					
Line Regulation	From minimum to maximum rated voltage	—	—	±0.5	%
Load Regulation	For 0 to 100% load change	—	—	±2	%
Transient Response	For 25% to 75% load change, 0.5 A/μs: voltage deviation	—	—	±10	%
	For 25% to 75% load change, 0.5 A/μs: settling time	—	—	1000	μs
Ripple and Noise	Peak-Peak, 20 MHz BW, 100 mV or % of nominal	—	—	2	%
Overvoltage Protection	Hiccup OVP (% of maximum voltage)	110	—	130	%
Rise Time	Monotonic	—	—	20	ms
Turn-On Delay	From AC in	—	—	1000	ms
	From Global Enable	—	—	100	ms
	From CoolMod Enable	—	—	100	ms

**ELECTRICAL SPECIFICATIONS (CONTINUED)**

Hold-Up Time	For nominal output voltage at full load	16	—	—	ms
Overcurrent Protection	Hiccup, Autorecovery	100	—	250	%
Short Circuit Protection	Hiccup, Autorecovery	—	—	—	—
Overtemperature Protection	Hiccup, Autorecovery	—	—	—	—
Capacitive Load		—	—	270	μF
<b>High Power Modules (3 Slots)</b>					
Line Regulation	From minimum to maximum rated voltage	—	—	±0.5	%
Load Regulation	For 0 to 100% load change	—	—	±3.5	%
Transient Response	For 25% to 75% load change, 0.5 A/μs: voltage deviation	—	—	±4	%
	For 25% to 75% load change, 0.5 A/μs: settling time	—	—	1000	μs
Ripple and Noise	Peak-Peak, 20 MHz BW, 100 mV or % of nominal	—	—	3.5	%
Overvoltage Protection	Tracking OVP (autorecovery, % of setpoint)	102	—	120	%
	Hiccup OVP (% of maximum voltage)	107	—	130	%
Remote Sense	Maximum cable drop compensation	—	—	0.5	VDC
Rise Time	Monotonic	—	—	5	ms
Turn-On Delay	From AC in	—	—	1000	ms
	From Global Enable	—	—	20	ms
	From CoolMod Enable	—	—	20	ms
Hold-Up Time	For nominal output voltage at full load	16	—	—	ms
Overcurrent Protection	Straight line current limit with hiccup protection at 35% Vo nom	105	—	130	%
Short Circuit Protection	Hiccup, Autorecovery	—	—	—	—
Overtemperature Protection	Autorecovery	—	—	—	—
Capacitive Load		—	—	2.5	mF
<b>Wide Trim Power Modules (1 Slot)</b>					
Line Regulation	From minimum to maximum rated voltage	—	—	±0.25	%
Load Regulation	For 0 to 100% load change	—	—	±0.4	%
Transient Response	For 25% to 75% load change, 0.5 A/μs: voltage deviation	—	—	±6	%
	For 25% to 75% load change, 0.5 A/μs: settling time	—	—	500	μs
Ripple and Noise	Peak-Peak, 20 MHz BW, 100 mV or % of nominal	—	—	1.0	%
Overvoltage Protection	Tracking OVP (autorecovery, % of setpoint)	103	—	125	%
	Hiccup OVP (% of maximum voltage)	107	—	160	%
Remote Sense	Maximum cable drop compensation	—	—	0.5	VDC
Rise Time	Monotonic	—	—	5	ms
Turn-On Delay	From AC in	—	—	1000	ms
	From Global Enable	—	—	12	ms
	From CoolMod Enable	—	—	12	ms
Hold-Up Time	For nominal output voltage at full load	16	—	—	ms
Overcurrent Protection	Straight line current limit with hiccup protection at 35% Vo nom	105	—	130	%
Short Circuit Protection	Hiccup, Autorecovery	—	—	—	—
Overtemperature Protection	Autorecovery	—	—	—	—
Capacitive Load		—	—	10	mF
<b>High Voltage Modules (1 Slot)</b>					
Line Regulation	From minimum to maximum rated voltage	—	—	±0.5	%
Load Regulation	For 0 to 100% load change	—	—	±1	%
Transient Response	For 25% to 75% load change, 0.5 A/μs: voltage deviation	—	—	±3.75	%
	For 25% to 75% load change, 0.5 A/μs: settling time	—	—	500	μs

## ELECTRICAL SPECIFICATIONS (CONTINUED)

Ripple and Noise	Peak-Peak, 20 MHz BW, 100 mV or % of nominal	—	—	1	%
Overvoltage Protection	Tracking OVP (autorecovery, % of setpoint)	103	—	125	%
	Hiccup OVP (% of maximum voltage)	112	—	122	%
Rise Time	Monotonic	—	—	20	ms
Turn-On Delay	From AC in	—	—	1000	ms
	From Global Enable	—	—	30	ms
	From CoolMod Enable	—	—	30	ms
Hold-Up Time	For nominal output voltage at full load	16	—	—	ms
Overcurrent Protection	Straight line current limit with hiccup protection at 35% Vo nom	105	—	130	%
Short Circuit Protection	Hiccup, Autorecovery	—	—	—	—
Overtemperature Protection	Autorecovery	—	—	—	—
Capacitive Load		—	—	10	μF

<sup>1</sup>The CoolX3000 cannot not be used to deliver continuous output power greater than 3000 W. Maximum output power from any row of outputs (6 slots on top row or 6 slots on bottom row) must not exceed 1500 W. For example, if bottom row of outputs are configured to deliver 1200 W, the top row is still limited to a max of 1500 W output power.

<sup>2</sup>In configurations that have a CmE or CmF on both output rails, 16 ms Hold-up is achieved when the total power draw is less than 2600 W (1300 W from each output rail). All other configuration have 16 ms over the total power range.

Auxiliary Output					
Parameter	Conditions/Description	Min	Nom	Max	Units
Auxiliary Output Voltage	Aux Voltage Option A	11.6	12	12.4	V
	Aux Voltage Option B	4.8	5	5.2	V
Load Regulation		—	—	±2	%
Line Regulation	For ±10% change from nominal line	—	—	±0.5	%
Ripple and Noise	Peak-Peak, 20 MHz BW, % of nominal	—	—	4	%
Maximum Output Current	Aux Voltage Option A	—	—	1.96	A
	Aux Voltage Option B	—	—	4.7	A
Load Capacitance		—	—	1000	μF
Output Overcurrent Protection	Hiccup	105	—	145	%
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	Operational	500	—	—	VDC

Reliability					
Parameter	Conditions/Description	Min	Nom	Max	Units
Reliability and MTBF	Telecordia SR-332, Issue 4	—	0.11	—	Fpmh
	CoolMod	—	1.16	—	Fpmh
Warranty	5 years	—	—	—	—

ELECTRICAL SPECIFICATIONS (CONTINUED)

Environmental					
Parameter	Conditions/Description	Min	Nom	Max	Units
Operating Temperature		-30	—	50	°C
Storage Temperature		-25	—	85	°C
Derating	C30: Derate from 50°C	—	50	60	°C
Relative Humidity	Non-condensing	5	—	95	%RH
Vibration		—	—	25	Grms
Altitude		—	—	5000	m

Leakage Currents					
Parameter	Conditions/Description	Nom	Max	Units	
<b>AC Leakage Current</b>	<b>Input to earth ground</b>				
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	
<b>Touch Current</b>					
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	Criteria
Radiated Emissions <sup>1</sup>	EN 55011, EN 55022 and FCC, Class B	Compliant
Conducted Emissions <sup>2</sup>	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 A 100 ms B 500 ms B

<sup>1</sup> Consult AE applications for system level compliance

<sup>2</sup> Low leakage option – Class A

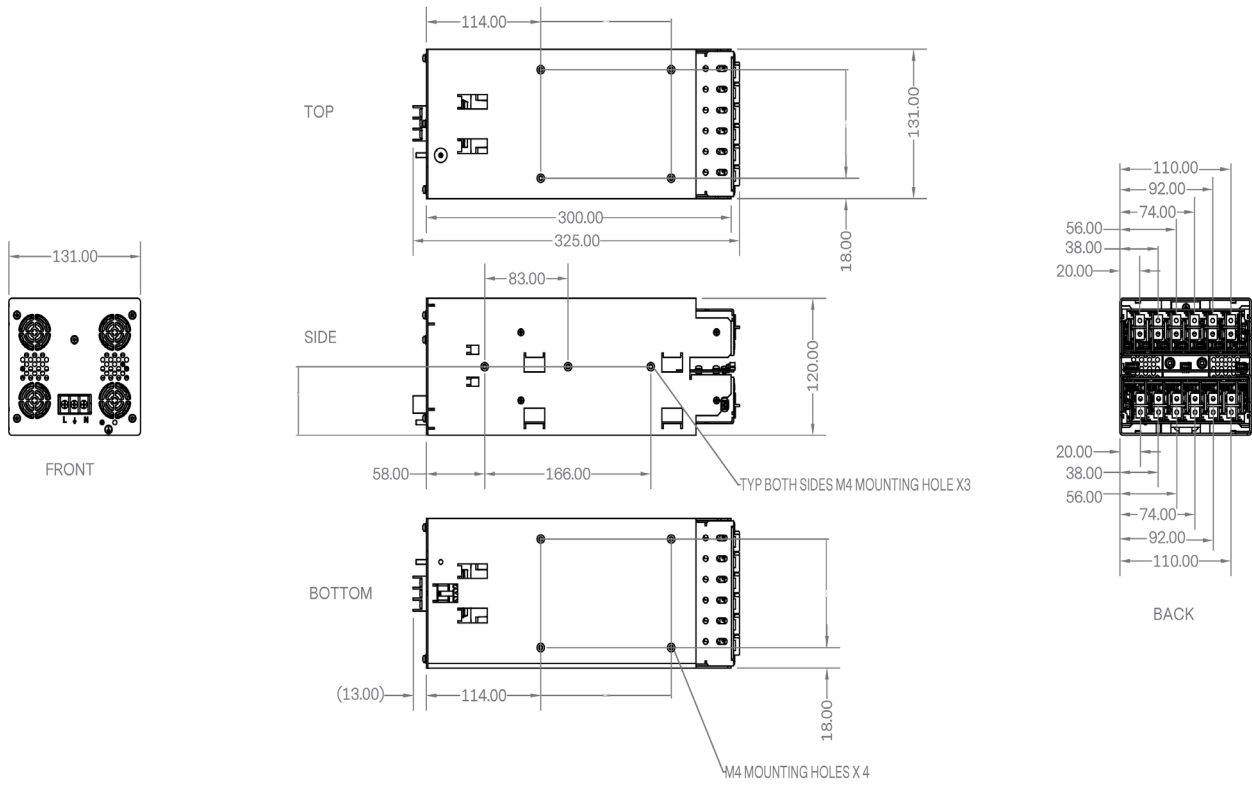
Standards and Directives	
Standard	Conditions/Description
Safety Agency Approvals	EN60601-1 3rd Edition, UL60601-1, CSA601,
IEC/EN 60601-1, Edition 3	IEC 60601-1 (2005), EN60601-1 (2006), ANSI/AAMI ES 60601-1 (2005), CAN/CSA C22.2 No. 60601-1 (2008); 5,000 m (16,400 ft) altitude, 100 VAC to 240 VAC ±10%
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	325 x 131 x 120 mm (12.8 x 5.2 x 4.7 in)
Weight	Nominal Weight: CoolPac + 12 x CoolMods	3.5 kg
Connectors	Description	Mating Connectors (if applicable)
AC/DC IEC input (Option)	Screw terminal Block	—
Main DC output terminal block (CmA-CmF, CmM-CmQ)	M4 Screws	—
Main DC output terminal block (CmG, CmH)	Camden - CTB9350/4A	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-002TP.0.5S or SPH-002T-P05S
Auxiliary Output Connector J1	Molex 1041880210 2pin	—
Signal Board Connector J11	Molex 87833-0831 8-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
Signal Board Reverse Polarity Header J13	Harwin M22-2010305	M22-1900005, 2 x 1 2.00 mm Pitch

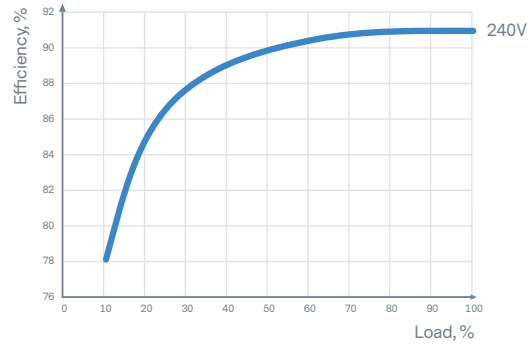
MECHANICAL SPECIFICATIONS (CONTINUED)

Mechanical Drawings

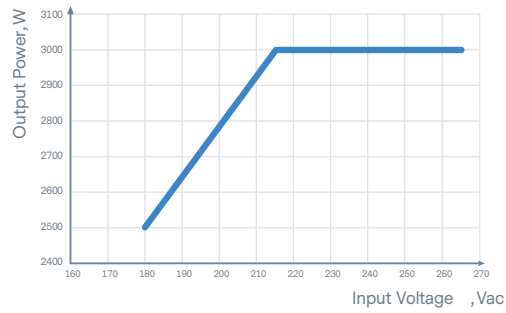


EFFICIENCY AND DERATING CURVES

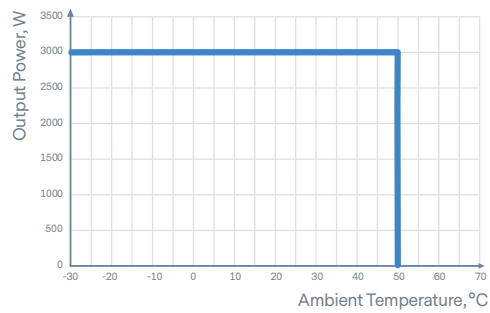
Efficiency vs Load



C30 Input Voltage Derating Curve



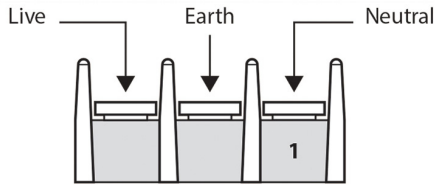
C30 Temperature Derating Curve



# INTERFACE

## Input Connectors

### Screw Terminal



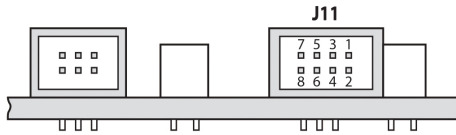
Standard (Screw Terminal)

**Note:** Screw Terminal Earth is Functional Earth only. The Protective Earth connection is located on the faceplate of the chassis.

## CoolPac Connectors

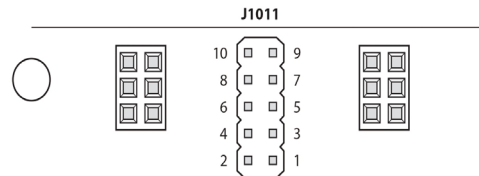
### J11 - System Signal Connector

- |                      |               |
|----------------------|---------------|
| 1 - COMMON           | 5 - PG GLOBAL |
| 2 - SCL (PMBUS CLK)  | 6 - FAN FAIL  |
| 3 - CONTROL          | 7 - OTP       |
| 4 - SDA (PMBUS DATA) | 8 - AC FAIL   |



### J1011 - PMBus Address Header

- |             |              |
|-------------|--------------|
| 10 - COMMON | 9 - ADDR_3   |
| 8 - COMMON  | 7 - ADDR_2   |
| 6 - COMMON  | 5 - ADDR_1   |
| 4 - COMMON  | 3 - ADDR_0   |
| 2 - COMMON  | 1 - PRG_DATA |



### J1001, J1002, J1003, J1004, J1005 & J1006

#### J1001

- 1 - COMMON
- 2 - PG1
- 3 - COMMON
- 4 - EN1
- 5 - ITRIM1
- 6 - VTRIM1

#### J1002

- 1 - COMMON
- 2 - PG2
- 3 - COMMON
- 4 - EN2
- 5 - ITRIM2
- 6 - VTRIM2

#### J1003

- 1 - COMMON
- 2 - PG3
- 3 - COMMON
- 4 - EN3
- 5 - ITRIM3
- 6 - VTRIM3

#### J1004

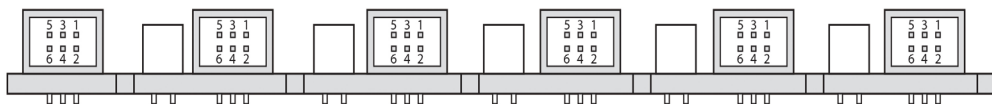
- 1 - COMMON
- 2 - PG4
- 3 - COMMON
- 4 - EN4
- 5 - ITRIM4
- 6 - VTRIM4

#### J1005

- 1 - COMMON
- 2 - PG5
- 3 - COMMON
- 4 - EN5
- 5 - ITRIM5
- 6 - VTRIM5

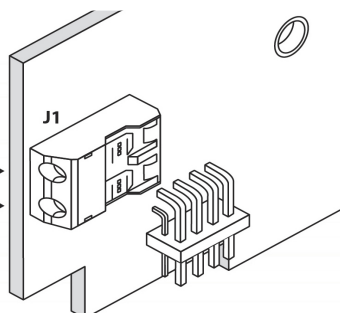
#### J1006

- 1 - COMMON
- 2 - PG6
- 3 - COMMON
- 4 - EN6
- 5 - ITRIM6
- 6 - VTRIM6



### J1 - Auxiliary Output Connector

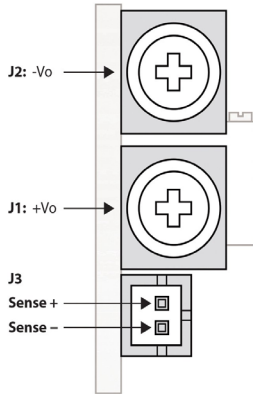
- AUXILIARY +Vo
- AUXILIARY -Vo (COMMON)



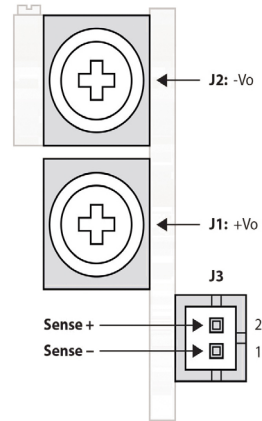
INTERFACE (CONTINUED)

CoolMod Connectors

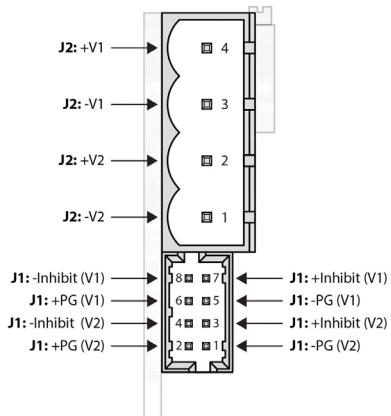
**CmA, CmB, CmC, CmD  
Output Connectors**



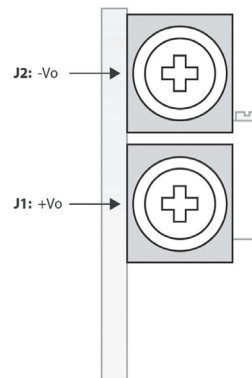
**CmE & CmF  
Output Connectors**



**CmG & CmH Output Connectors**



**CmK  
Output Connectors**

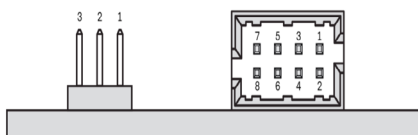


**J11 - Signal-Board  
System Signal Connector**

- 1 - COMMON
- 2 - SCL (PMBUS CLK)
- 3 - CONTROL
- 4 - SDA (PMBUS DATA)
- 5 - PG GLOBAL
- 6 - FAN FAIL
- 7 - OTP
- 8 - AC FAIL

**J13 - Signal-Board  
Revers-Polarity Header**

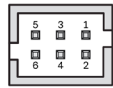
- 1-2 - SHORT, REVERSE POLARITY
- 2-3 - SHORT, NORMAL POLARITY



\*For reverse polarity mode, a shunting header must be placed on each CX18 comms board to short J1011 pin 1 to 2.

INTERFACE (CONTINUED)

Output Conections



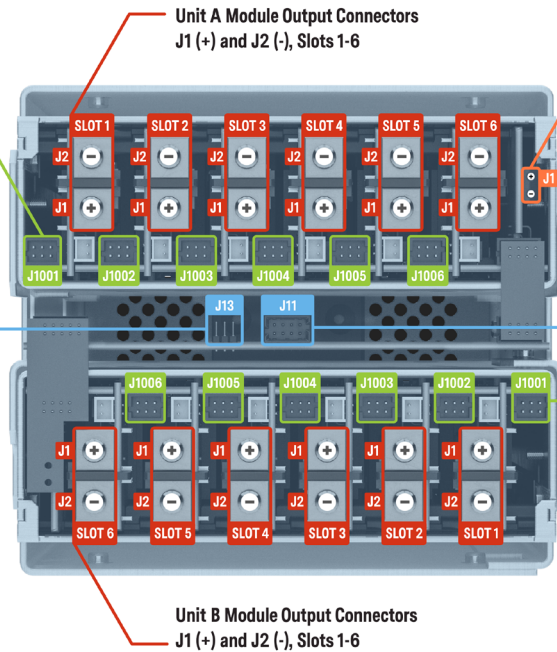
**J100x - Upper Module Signal Connectors**

- 1 - COMMON
- 2 - PGx
- 3 - COMMON
- 4 - ENx
- 5 - ITRIMx
- 6 - VTRIMx
- x = 1 to 6



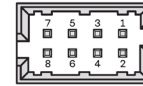
**J13 - Signal-Board Revers-Polarity Header**

- 1-2 - SHORT, REVERSE POLARITY
- 2-3 - SHORT, NORMAL POLARITY



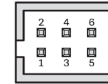
**Unit A Module Output Connectors J1 (+) and J2 (-), Slots 1-6**

**J1 - AUX Output Connector**



**J11 - Signal-Board System Signal Connector**

- 1 - COMMON
- 2 - SCL (PMBUS CLK)
- 3 - CONTROL
- 4 - SDA (PMBUS DATA)
- 5 - PG GLOBAL
- 6 - FAN FAIL
- 7 - OTP
- 8 - AC FAIL

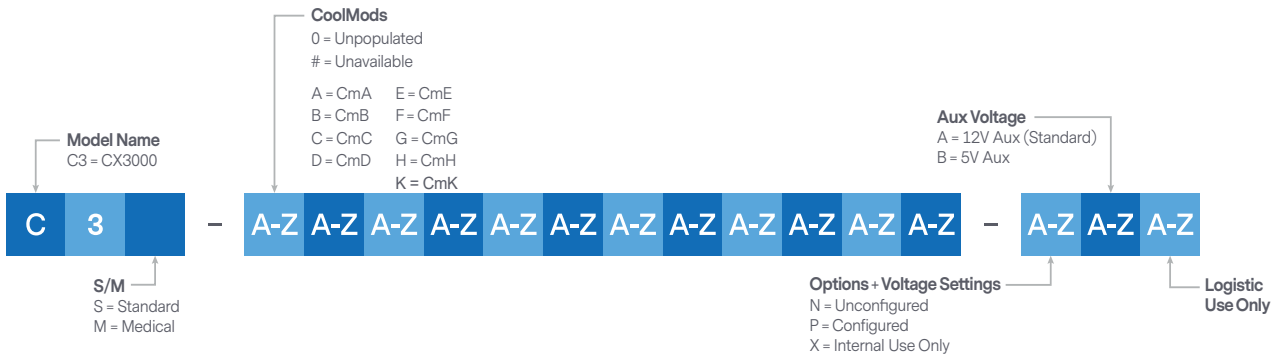


**J100x - Lower Module Signal Connectors**

- 1 - COMMON
- 2 - PGx
- 3 - COMMON
- 4 - ENx
- 5 - ITRIMx
- 6 - VTRIMx
- x = 1 to 6

**Unit B Module Output Connectors J1 (+) and J2 (-), Slots 1-6**

CONFIGURATION



\*CmE or CmF High Power Module (3 slot module) can only occupy Slots D/E/F of Unit A or Unit B.

Example of standard product part number with 12V Aux(six A modules, and six B modules):

C3SAAAAAABBBBBBNA

Example of Medical part number with 5V Aux (one CmE module populated & 6 other modules):

C3M000##EABCDABNB



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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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