

EXCELSYS COOLX® 1800

HIGH EFFICIENCY, INTELLIGENT AND RELIABLE 1800 W MODULAR POWER SUPPLIES



Advanced Energy's CoolX®1800 series, part of our Excelsys product line, is an intelligent modular power supply. The CoolX1800 delivers an incredible 1800 W in a compact 1U high package with PMBus™ digital communications, control and reliability in addition to the most comprehensive feature set and specifications available.

PRODUCT HIGHLIGHTS

Modular Power Supply

- Up to 1800 W
- Up to 12 outputs
- All outputs isolated (1850 VAC)
- Variable fan speed control

Reliability

- MTBF > 200,000 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 and DIN-Rail mounting

TYPICAL APPLICATIONS

Medical

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

Industrial

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

Audio Equipment

- Hi Rel, harsh industrial electronics, radar (marine- and ground-based), communications, test and measurement

AT A GLANCE

CX18S CX18M

Power

1800 W 1800 W

Slots

6 6

Cooling

Variable fan speed control

Parameters

**262 mm x 127 mm x 41 mm
(10.5 in x 5 in x 1U)**

Certification and Compliance

Medical (CX18M)

- IEC60601-1 3rd edition, IEC60601-1-2 4th edition (EMC)
- 2 MOPP
- Dual fused

Industrial (CX18S)

- IEC60950, IEC62368-1
- SEMI F47*

Defense/Aero (All Models)

- MIL-STD-810G

MODULES

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

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

² Max Trim 14 V when used with High Power Module

³ Max Trim 56 V when used with High Power Module

⁴ 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..

⁵ For the CmG module the max combined power of both outputs is 200 W.

⁶ For the CmH module the max combined power of both outputs is 180 W.

*SEMI F47 compliant at input voltages > 180 VAC. Consult Advanced Energy for details.

⁷ When a CmK module is used in the same pack as a CmE or CmF module, one module slot must remain unpopulated.

ELECTRICAL SPECIFICATIONS

| Input | | | | | |
|-----------------------------|---------------------------------------|------|-----|------|-------|
| Parameter | Conditions/Description | Min | Nom | Max | Units |
| Nominal Input Voltage Range | Universal Input 47-440 Hz | 100 | — | 240 | VAC |
| AC Operating Input Range | | 85 | — | 264 | VAC |
| Extended AC Operating Range | Maximum for 5 seconds | — | — | 300 | VAC |
| DC Input Voltage Range | | 120 | — | 300 | VDC |
| Input Current | 90 VAC @ 1080 W | — | — | 14.5 | A |
| Inrush Current | 230 VAC @ 1800 W | — | — | 40 | 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 | — | — | % |

| Output | | | | | |
|---------------------------------------|------------------------------------------------------------------|-----|-----|------|-------|
| Parameter | Conditions/Description | Min | Nom | Max | Units |
| Single Output Modules (1 Slot) | | | | | |
| 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 | 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 |
| Dual Output Modules (1 Slot) | | | | | |
| 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 |
| High Power Modules (3 Slots) | | | | | |
| 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 |
| Wide Trim Power Modules (1 Slot) | | | | | |
| 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 |
| High Voltage Modules (1 Slot) | | | | | |
| 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 |

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 CoolMod | — | 0.11 | — | Fpmh |
| | CoolPac + Fans | — | 0.60 | — | Fpmh |
| Warranty | 5 years | — | — | — | — |

Environmental

| Parameter | Conditions/Description | Min | Nom | Max | Units |
|-----------------------|------------------------------------------|-----|-----|------|-------|
| Operating Temperature | Operates below -20°C after 10 min warmup | -30 | — | 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 | Max | Units |
| AC Leakage Current (Input to Earth Ground) — Standard | | | | |
| Normal Condition (High Line) | Mains Voltage 264 VAC/60 Hz | 244 | 300 | µA |
| Single Fault Condition (High Line) | Mains Voltage 264 VAC/60 Hz | 435 | 600 | µA |
| AC Leakage Current (Input to Earth Ground) — Low Leakage Variant | | | | |
| Normal Condition (High Line) | Mains Voltage 264 VAC/60 Hz | — | 150 | µA |
| Single Fault Condition (High Line) | Mains Voltage 264 VAC/60 Hz | — | 300 | µA |
| Touch Current | | | | |
| Normal Condition | Mains Voltage 264 VAC/60 Hz | 14.2 | 100 | µA |
| Single Fault Condition | Mains Voltage 264 VAC/60 Hz | 246 | 500 | µA |

| EMC | | |
|----------------------------------|------------------------------------------------|---------------------------------|
| Parameter | Conditions/Description | Criteria |
| Radiated Emissions ¹ | EN 55011, EN 55022 and FCC, Class B | Compliant |
| Conducted Emissions ² | 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 |

¹ Consult AE applications for system level compliance

² Low leakage option – Class A

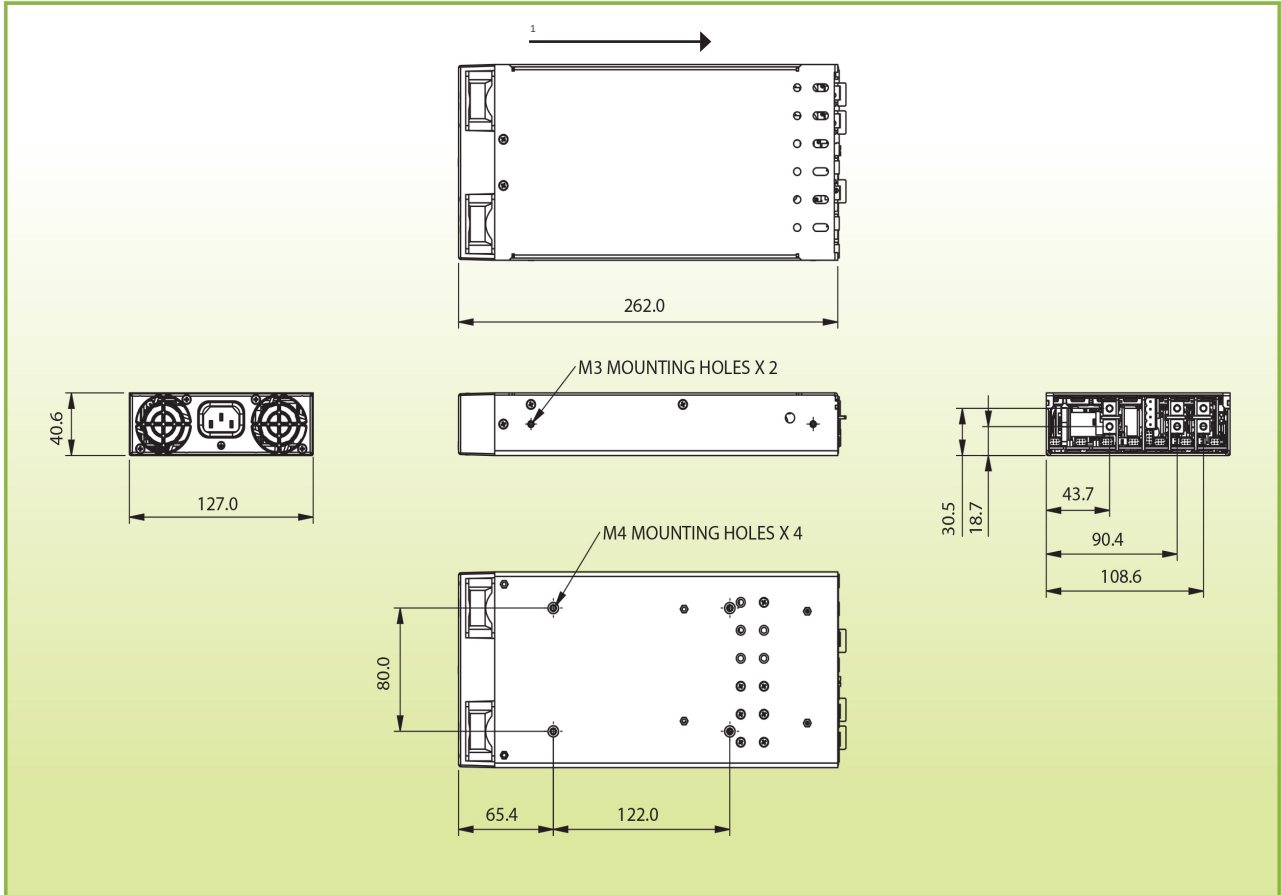
| Standards and Directives | |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Standard | Conditions/Description |
| Safety Agency Approvals | EN60601-1 3rd Edition, UL60601-1, CSA601, EN60950 2nd Edition, CSA C22.2 No. 60950-1 |
| IEC/EN 60950-1, Edition 2 | UL 60950-1/CSA 22.2 No 60950-1, Edition 2; 5,000 m (16,400 ft) altitude, 100 VAC to 240 VAC ±10% |
| 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; 5,000 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) | Screw terminal Block and IEC inlet options. | — |
| 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 | — |

MECHANICAL SPECIFICATIONS (CONTINUED)

Mechanical Drawings

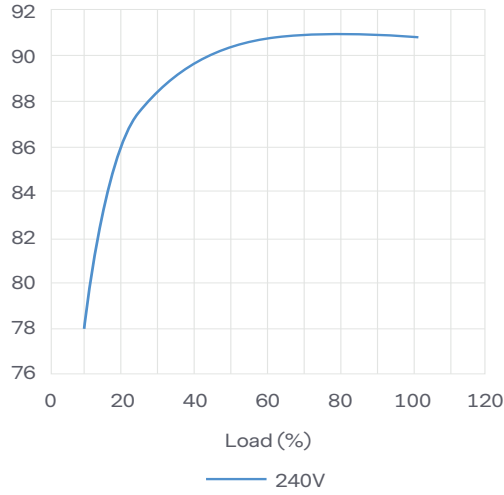


¹ Standard airflow direction

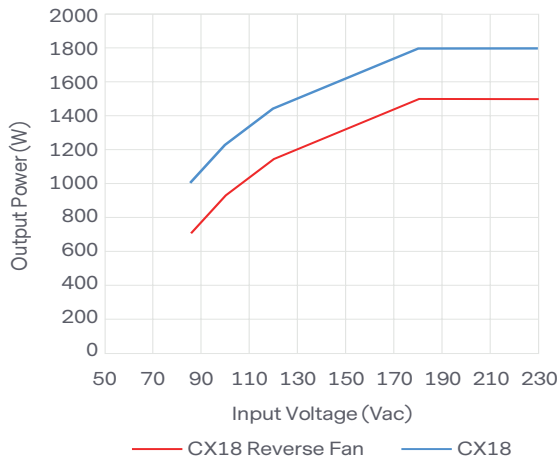
* Maximum screw penetration from base does not exceed 1.5 mm.

EFFICIENCY AND DERATING CURVES

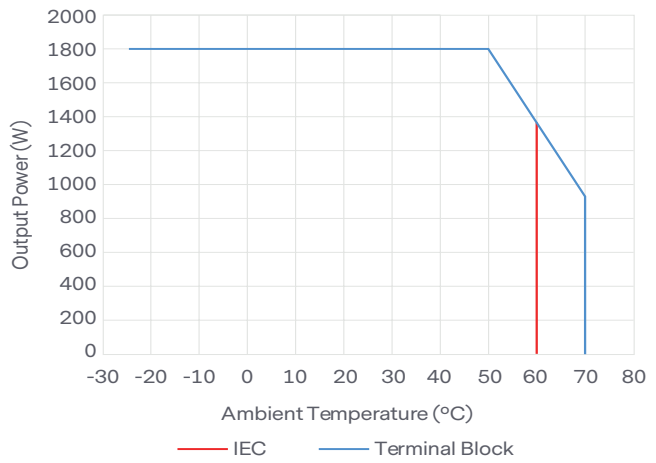
Efficiency vs Load



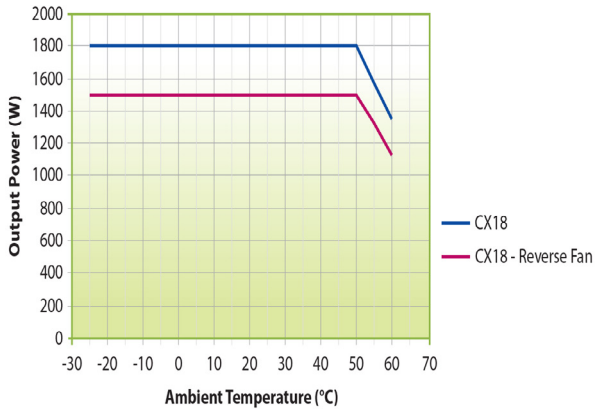
CX18 Input Voltage Typical Derating Curves



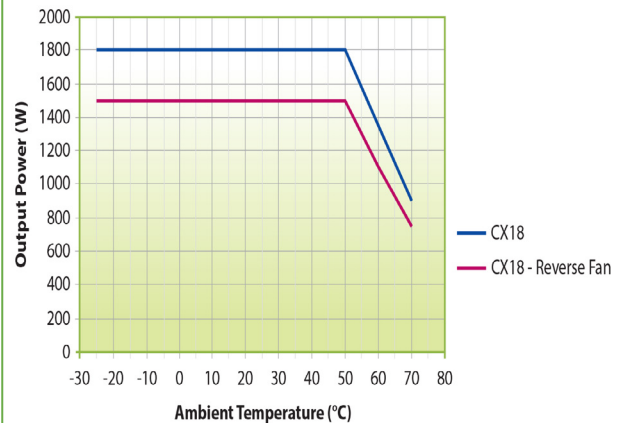
CX18 Temperature Derating Curve



CX18 Temperature Derating Curve IEC Connector

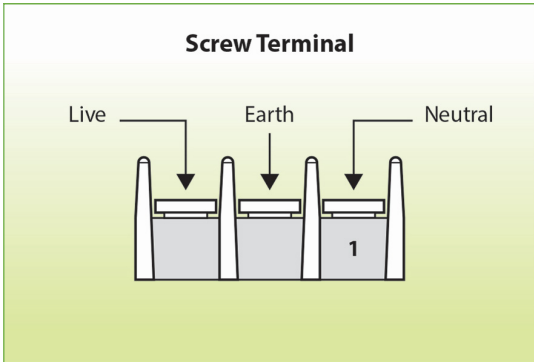


CX18 Temperature Derating Curve Screw Terminal Connector

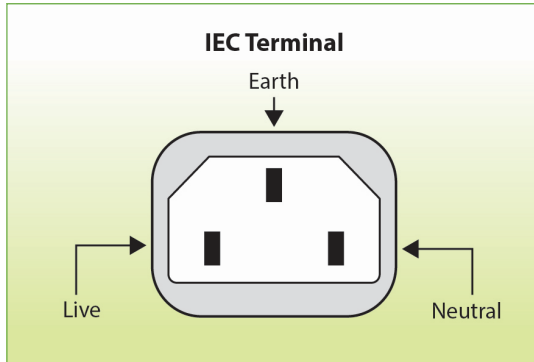


INTERFACE

Input Connectors

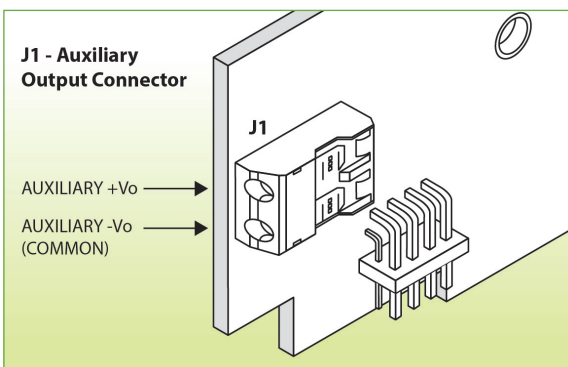
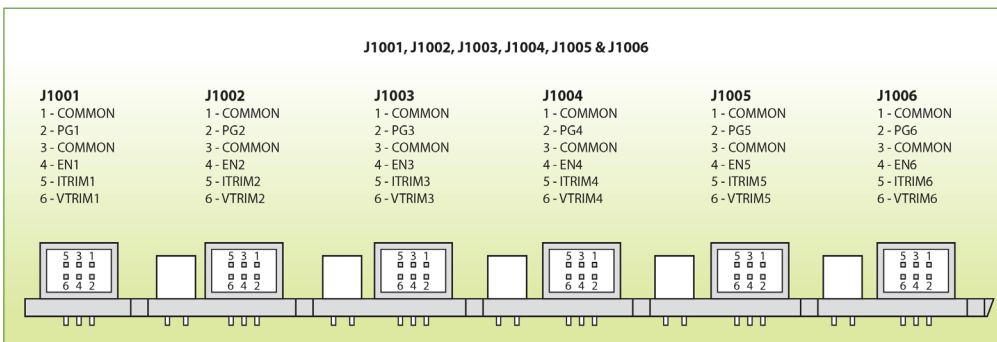
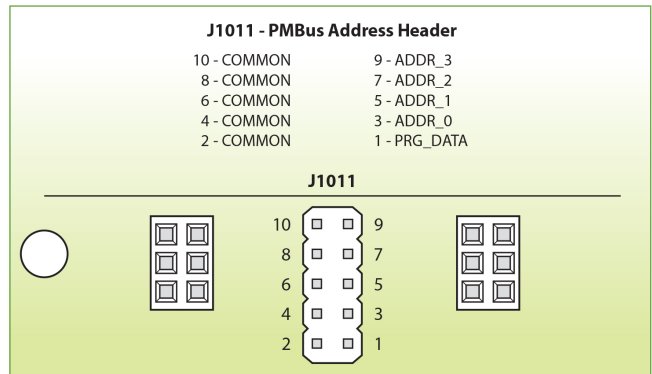
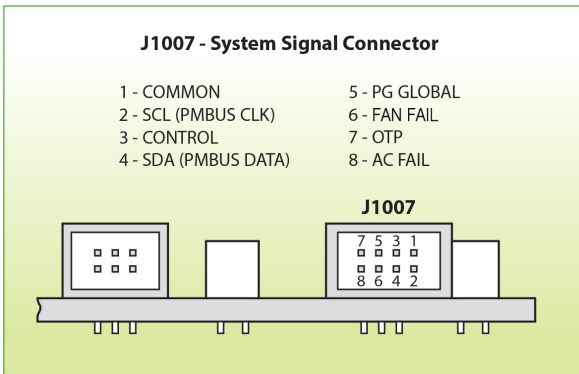


Standard (Screw Terminal)



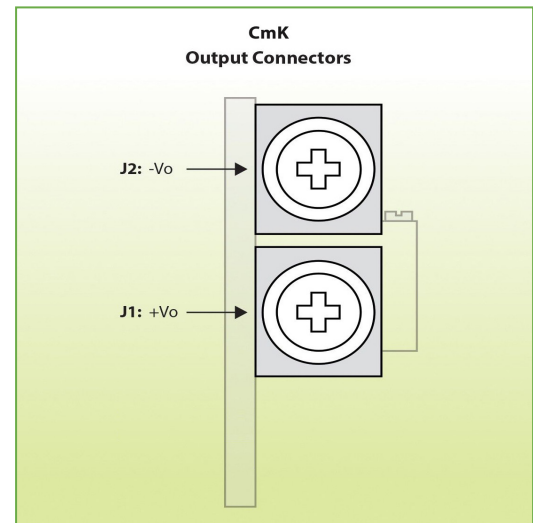
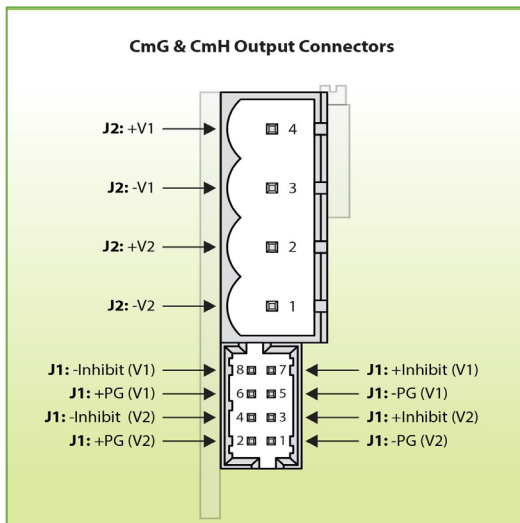
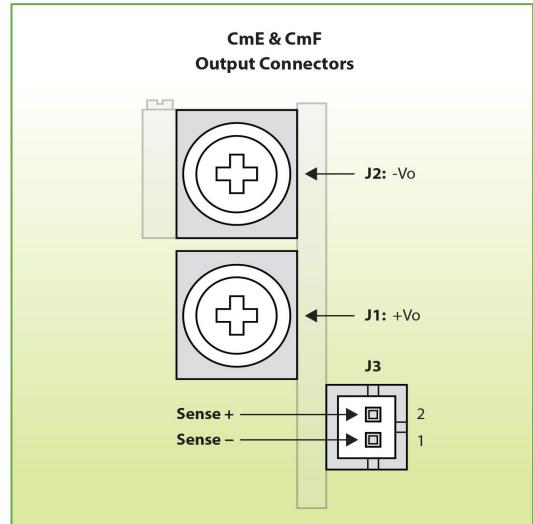
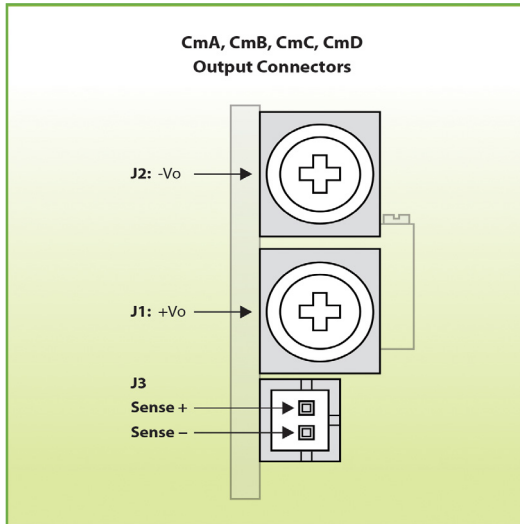
Option 1 (IEC Terminal)

CoolPac Connectors

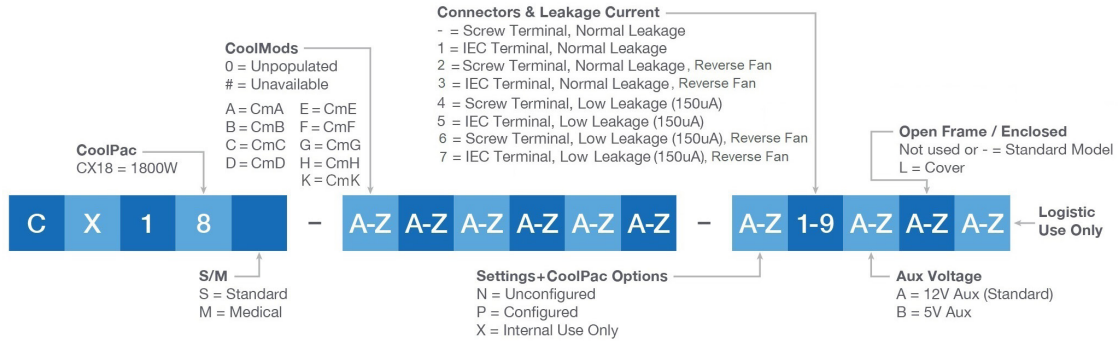


INTERFACE (CONTINUED)

CoolMod Connectors



CONFIGURATION



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

Configuration Example 1

CoolX part number CX18S-ADG##E-N-A specifies the following product;

- CX18S 1800W IEC62368 approved
- Slot 1: CmA: 2.5-6.0 V (150 W)
- Slot 2: CmD: 28-58 V (300 W)
- Slot 3: CmG: Dual output 3-30 V (120 per channel)
- Slot 4: Not Available (CmE is three slot CoolMod module)
- Slot 5: Not Available (CmE is three slot CoolMod module)
- Slot 6: CmE: 22.8-25.2 V (900 W)
- Option N: Nominal Output voltage settings
- Option A: 12 V/(1.96 A) Bias Supply Voltage

Configuration Example 2

CoolX part number CX18M-BABBDC-N-B specifies the following product;

- CX18M 1800W IEC60601-1 approved
- Slot 1: CmB: 6-15 V (280 W)
- Slot 2: CmA: 2.5-6.0 V (150 W)
- Slot 3: CmB: 6-15 V (280 W)
- Slot 4: CmB: 6-15 V (280 W)
- Slot 5: CmD: 28-58 V (300 W)
- Slot 6: CmC: 15-28 V (300 W)
- Option N: Nominal Output voltage setting
- Option B: 5 V/(4.7 A) Nominal Output voltage setting



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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.

PRECISION | POWER | PERFORMANCE | TRUST

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