

CoolX600™

NFF Series

Patent Pending Resonant Technology



NFF Series; No Fan Featured

- 100% natural convection cooled
- No internal or external fans needed
- No base-plate needed

No Acoustic Noise or Vibrations & Breakthrough Level Reliability

- No fans required – 600W with natural convection
- MTBF >400000 hours - 25% better, than today's leading solutions
- **High Input Surge Protection**
 - 4KV Line to PE for harsh environments
- **Reverse Energy Protection**
 - No blocking diodes required
- **24W Standby Power**
- **Safety Approved to 5000m Altitude**
- **>94% Efficiency**
- **5 Year Warranty**

Flexibility

- **Analog and Digital Management**
 - PMBus monitoring and control capability
- **Field Configurable**
 - Plug and Play Power
- **Series and Parallel Outputs**
 - Higher voltages/currents
- **Mounting Options**
 - Base/Side and DIN-Rail mounting

Certifications

- **Medical**
 - IEC60601-1 3rd Edition compliant
 - IEC60601-1-2 4th edition EMC compliant
 - 2 MOPP
 - Dual Fused
 - Suitable for Type B and BF rated applications
- **Industrial**
 - IEC60950, IEC62368-1
 - SEMI F47 compliant
- **Defence/Aero**
 - MIL810G certified
 - MIL461F, CE101, CE102⁽²⁾

TYPICAL APPLICATIONS

- **Medical;** Clinical diagnostic equipment, Medical lasers, Dialysis equipment, Radiological Imaging, Clinical Chemistry
- **Industrial;** Test and Measurement, Industrial Machines, Automation equipment, Printing, Telecommunications, Audio equipment
- **Hi Rel;** Harsh Industrial Electronics, Radar (Naval, Ground Based), Communications Test & Measurement

The **World's Only Fanless modular power supply**, the CoolX600 NFF Series is the revolutionary new Convection-Cooled modular power supply from Excelsys. It provides an incredible 600W in a compact 4.5 x 8.5 x 1U package with no fan.

The silent CoolX600 generates no acoustic noise and offers system designers best in class performance in efficiency (>94%) and unrivalled reliability in addition to the most comprehensive feature set and specifications.

The series comprises two base models. The CX06S is certified to IEC60950 2nd edition for industrial applications as well as the upcoming IEC62368-1 standard. The CX06M carries IEC60601-1 3rd edition & IEC60601-1-2 4th edition (EMC) for medical applications. The CoolX600 can be populated with up to 4 CoolMods, providing up to 4 isolated DC outputs ranging from 2.5V to 58.0V. Continuing the Excelsys tradition of flexibility, the CoolX600 is completely user and field configurable. Outputs can be adjusted to the required set point voltages and can be configured in parallel or series for higher current and/or higher voltages. CoolPacs can be paralleled for higher power and N+1 Redundancy applications. There are a range of CoolMods available including medium and high power single outputs and dual modules.

Stand-out features for medical applications include suitability for type BF rated (Body Floating) applications, input dual fusing, 2 x MOPP isolation and <300uA leakage current.

The CoolX brings user flexibility to a completely new level allowing system designers to monitor and power supply performance power supply performance using either analog and Digital Communications (PMBus™).

CoolX CoolPac

CoolPac	Slots	Power	Medical Approval IEC60601-1 3rd edition & IEC60601-1-2 4th edition (EMC)	Industrial Approval IEC60950 2nd edition	IEC62368-1 Edition 2
CX06S	4	600W	-	Yes	-
CX06M	4	600W	Yes	-	Yes

CoolX CoolMod

Model	Vnom (V)	Set Point		Power (W)
		Adjust Range (V)	I _{max} (A)	
CmA	5	2.5-6.0	21	105
CmB	12	6.0-15.0	15	180
CmC	24	15.0-28.0	8.33	200
CmD	48	28.0-58.0	4.17	200
CmE	24	22.8-25.2	25	600



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	90VAC @ 420W		6.0		A
Inrush Current	230VAC @ 600W			25	A
Power Factor	120VAC@ 500W	0.98			
Undervoltage Lockout	Shutdown	65		74	VAC
Input Fuses Rating	Dual Fused (Line and Neutral) 250VAC		8		A
Efficiency	230VAC, 600W with 3 x CmC CoolMods 230VAC, 600W with 1 x CmE CoolMod		93 94		% %

COOLMOD OUTPUT

Parameter	Conditions/Description	Min	Nom	Max	Unit
Power Rating	CX06: See derating curves			600	W
Minimum Load			0		A
Line Regulation	For $\pm 10\%$ change from nominal line CmE			± 0.1 ± 0.5	%
Load & Cross Regulation	For 25% to 75% load change CmE			± 0.2 ± 0.2	%
Transient Response	For 25% to 75% load change 0.5A/ μ S: Voltage Deviation *CmE Figures in () Settling Time			4 (4) 500 (1000)	% μ S
Ripple and Noise	100mV or 1.0% pk-pk. 20MHz BW			1	%
Overvoltage Protection	Tracking OVP Level (N/A in CmE) Latching OVP Level	105 125		125 160	% %
Remote Sense	Max. line drop compensation			0.5	VDC
Overshoot				1	%
Rise Time	Monotonic			10	ms
Turn-on Delay	From AC in From Global Enable From CoolMod Enable			800 10 10	ms ms ms
Hold-up Time	For nominal output voltages at full load	20			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: Current limit hiccup autorecovery	110	130	150	%
Short Circuit Protection	Yes, Autorecovery				
OverTemperature Protection	Yes, Autorecovery				
Capacitive Load				10	mF

AUXILIARY OUTPUT

Parameter	Conditions/Description	Min	Nom	Max	Units
Nominal Output Voltage	Aux Voltage Option A Aux Voltage Option B	11.76 4.75	12 5	12.24 5.25	V V
Load Regulation				± 2	%
Line Regulation	For $\pm 10\%$ change from nominal line			± 0.5	%
Maximum Output Current	Aux Voltage Option A Aux Voltage Option B			1.96 4.7	A A
Maximum Output Capacitive Load				1000	μ F
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)	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

RELIABILITY

Parameter	Conditions/Description	Min	Nom	Max	Units
Reliability and MTBF	MTBF of >400 kHours, Telecordia SR-332, Issue 1 CoolMod CoolPac		0.52 1.08		Fpmh Fpmh
Warranty	5 Years				

ENVIRONMENTAL

Parameter	Conditions/Description	Min	Nom	Max	Units
Operating Temperature	Operates to specification below -20°C after 10 min warm-up	-40		+85	°C
Storage Temperature		-40		+85	°C
Derating	See Derating Curves including note 3				
Relative Humidity	Non-condensing	5		95	%RH
Shock & Vibration	MIL-STD810G Method 514.6				
Altitude				5000	m

LEAKAGE CURRENTS

Parameter	Conditions/Description	Min	Nom	Max	Units
AC Leakage Current	Input to earth ground			Low Leakage option (Option 4/5)	Units
Normal condition (high line)	Mains Voltage 264VAC/60Hz	254			µA
Touch Current					
Normal Condition	Mains Voltage 264VAC/60Hz	150			µA

EMC

Parameter	Conditions/Description	Criteria
Radiated Emissions	EN 55011, EN 55022 and FCC, Class B	
Conducted emissions	EN 55011, EN 55022 and FCC, Class B	
Power line harmonics	EN 61000-3-2, Class A	
Voltage flicker	EN 61000-3-3	
ESD	EN 61000-4-2, level 4, 8 kV contact, 15 kV air	A
Radiated immunity	EN61000-4-3, level 3, 10V/m	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 2, 3 Vrms	A
Power frequency magnetic field	EN 61000-4-8, level 2, 3 A/m	A

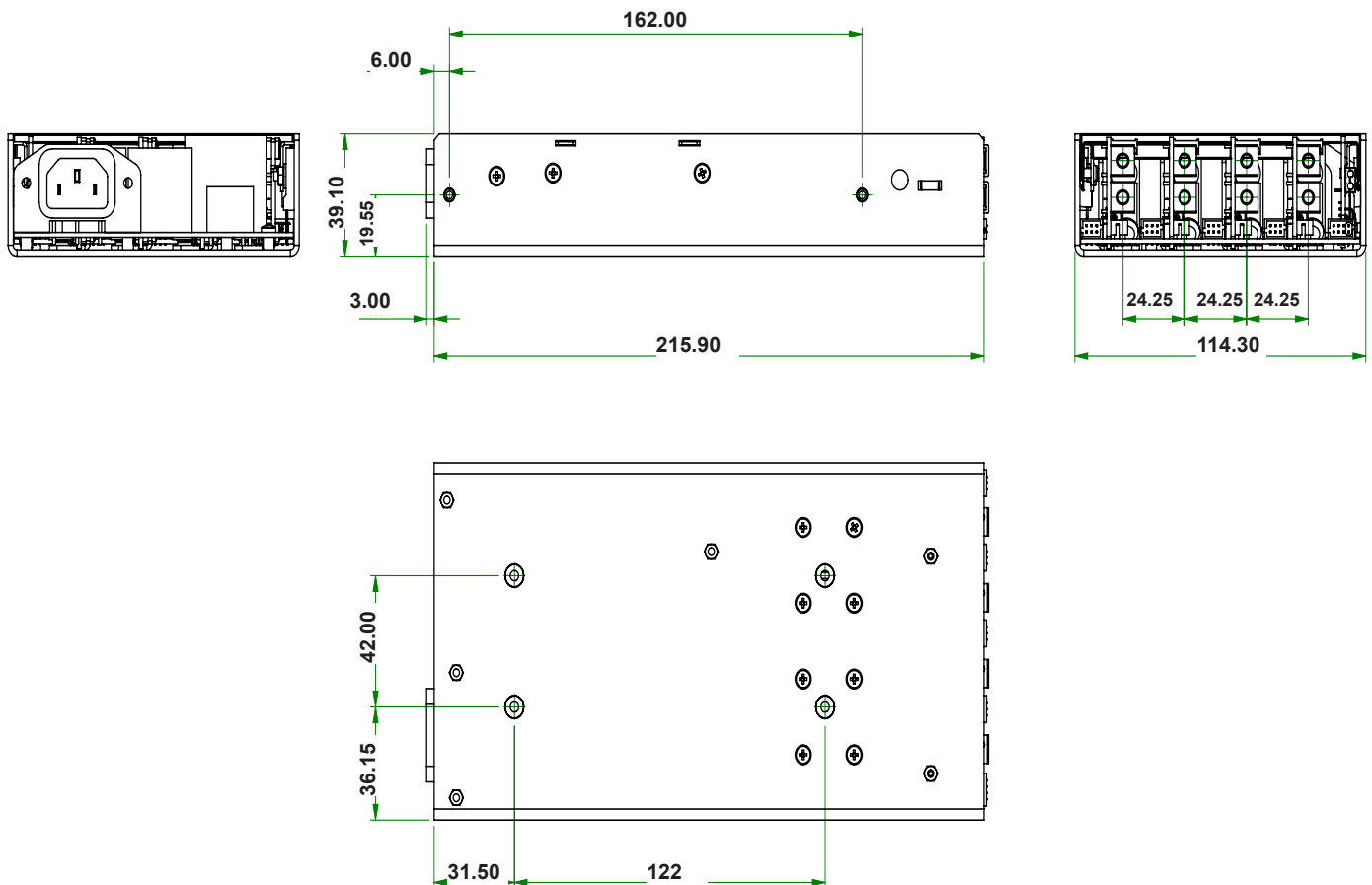
STANDARDS & DIRECTIVES

Parameter	Conditions/Description
Safety Agency Approvals	EN60601-1 3rd Edition, UL60601-1, CSA601, See note 1 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 V to 240 ±10% Vac
IEC/EN 60601-1, Edition 3 and all national deviations	See Note 1 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 V to 240 Vac ±10%
IEC 62368 Edition 2	IEC 62368-1 (2014) Edition 2 5000 m (16,400 ft) altitude, 100 V to 240 ±10% Vac
IEC 60601-1-2 Edition 4	IEC 60601-1-2 (2014)
Protection class	Class I
WEEE	Waste Electrical and Electronic Equipment Directive (WEEE) 2002/96/EC
ROHS	EU DIRECTIVE 2011/65/EC RoHS compliancy

1) Designed to support Type B and Type BF Applied Part End Product Requirements
2) Contact factory for characterisation information

MECHANICAL DATA		
Parameter	Description	
Dimensions (L x W x H)	L x W x H	215.9mm x 114.3mm x 39.1mm 4.5" x 8.5" x 1U
Weight	Nominal Weight: CoolPac + 4 x CoolMods	1,000g
Connectors	Description	Mating Connectors (if applicable)
AC/DC input terminal block	TE 2-1437667-S, DINKLE DT-35-B07W-03	
AC/DC IEC input (Option)	IEC 320 Inlet	
Main DC output terminal block (CmA-CmE)	M4 Screws	
System Signal Connector J1005	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 & Polarization Keying
Output Signal Connectors J1001-1004	Output Signal Connectors J1001-1004	Locking Molex 51110-0660; Non Locking Molex 51110-0650; Crimp Terminal: Molex p/n 50394 or Molex 51110-0656 which includes Locking Tab & Polarization Keying
Output Sense Connectors J3	JST-S2BPH-K(LF)(SN)	JST PHR2. Crimp Terminal JST BPH-002T-P.0.5S or SPH-002T-P.05S
Auxiliary Output Connector J1	Molex 1041880210 2pin	

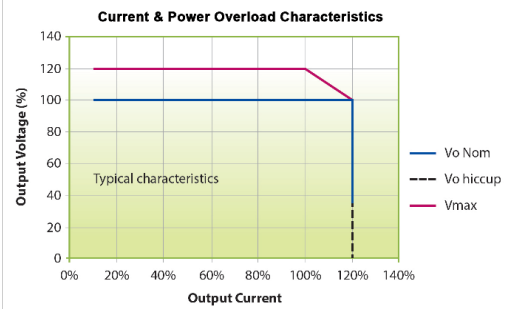
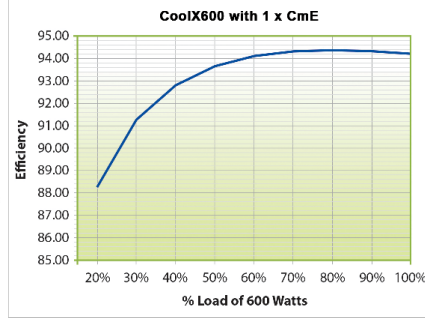
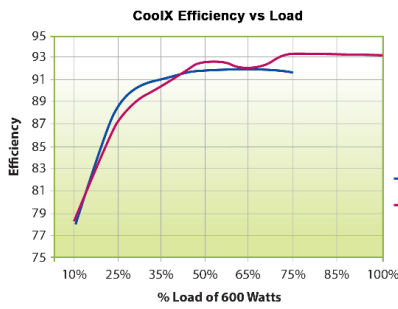
CoolX Mechanical Drawings



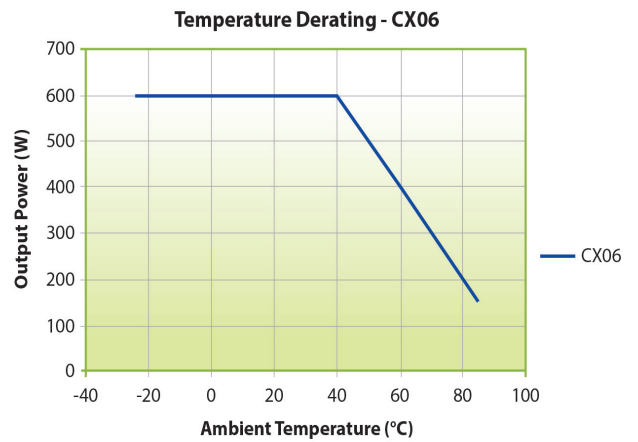
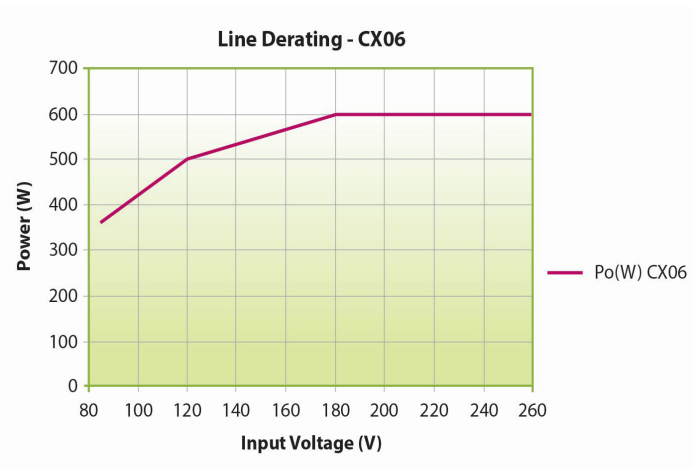
Drawing shows Input Connection Option1 (IEC). Standard Input connector is Screw terminal. Contact Excelsys for additional mechanical drawings including 3D drawing files.

CoolX can be mounted on its base, vertically or on its side. CoolX can also be mounted on the Excelsys DIN Rail accessory (Z744). Mounting holes size are M4. Maximum allowable torque for mounting screws is 2Nm, and maximum allowable penetration depth is 2mm

CoolX 600 Efficiency, Derating and Power Limit Curves

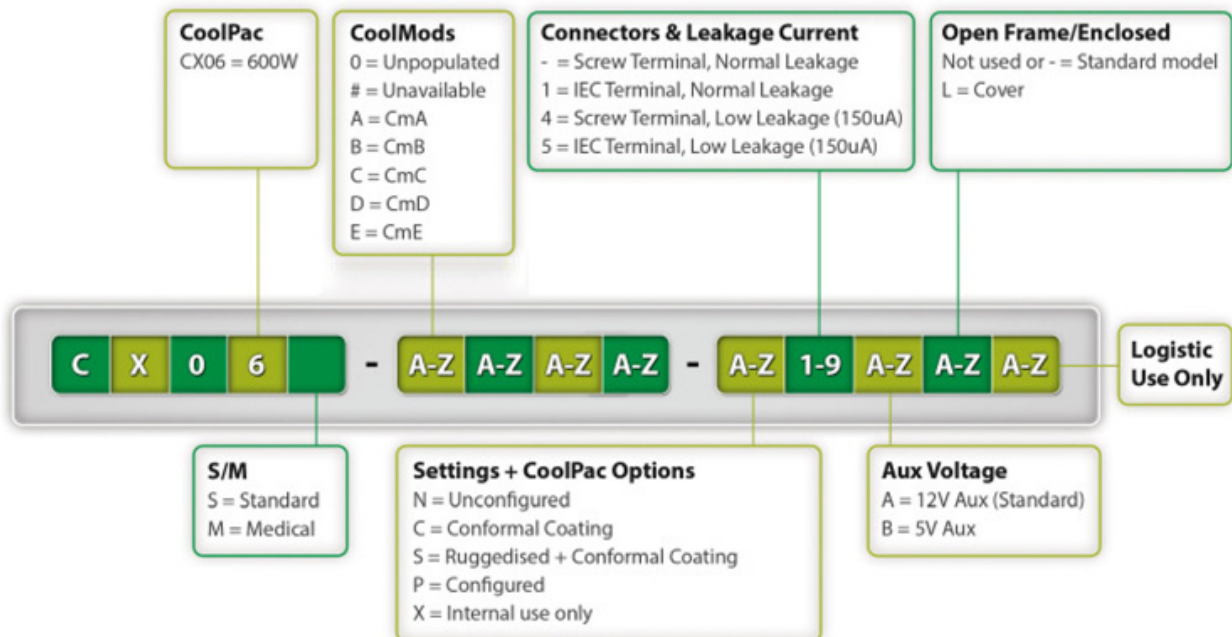


CoolX Derating



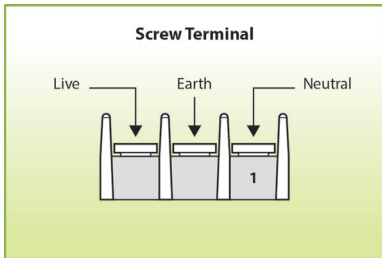
3) Enhanced thermal performance with system fans & base plate cooling. Consult Excelsys for details.

Configuring Your CoolIX

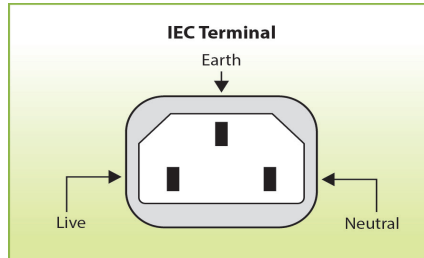


CoolX Connectors

Input Connectors

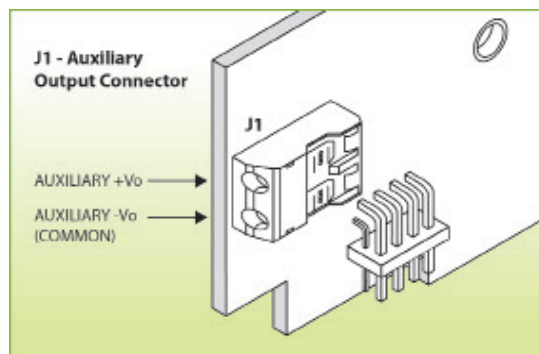
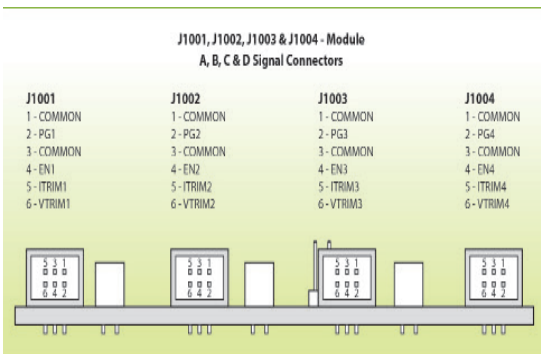
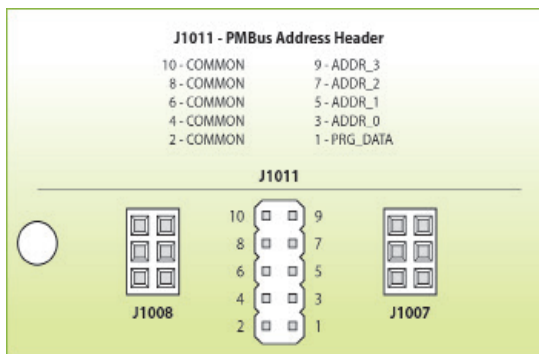
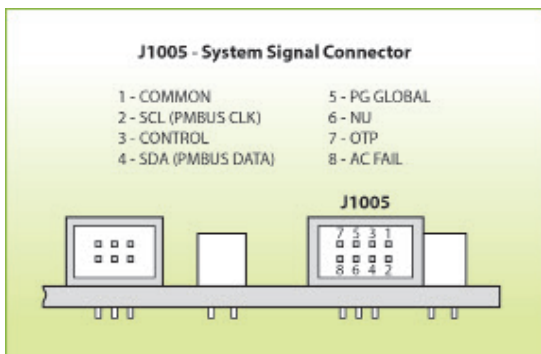


Standard (Screw Terminal)

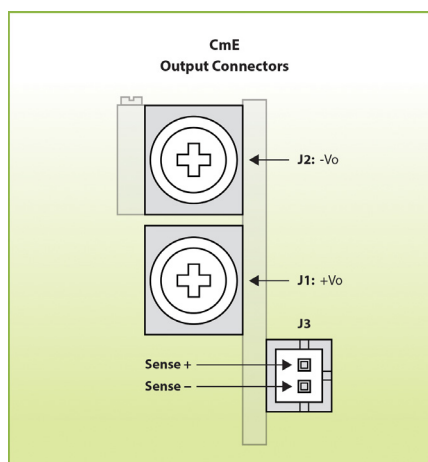
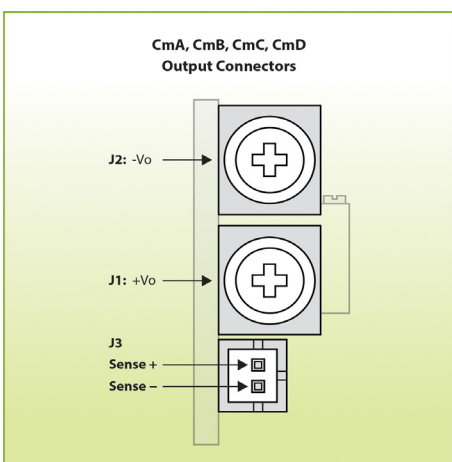


Option 1 (IEC Terminal)

CoolPac Connectors



CoolMod Connectors



Specifications are subject to change
REV 2.0.1

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