CS1000

FANLESS, 1U, HIGH EFFIENCY 1000W SINGLE OUTPUT POWER SUPPLIES



Advanced Energy's CS1000, part of our Excelsys product line, is the latest addition to our fanless range of power supplies. The single output CS1000, delivers an incredible convection-cooled 1000 W in an open-frame U-channel form factor, eliminating acoustic noise detrimental to scientific and medical applications, as well as being ideal for applications sensitive to vibration or where fan cooling is not available.

With an extensive features set including PMBus™, digital control/ communications and analog control, the CS1000 delivers industry leading levels of performance, efficiency and reliability.

PRODUCT HIGHLIGHTS

No Fan Featured
- 1000 W with 100% natural convection cooling
- No base plate needed
- No acoustic noise or vibrations

Reliability
- High input surge protection — 4 KV line to PE for harsh environments
- Reverse energy protection — no blocking diodes required
- User selectable (5 V / 12 V) 24 W always ON auxiliary power output
- N+1 Redundancy Ready
- Can be Paralleled for higher power
- Optional Low Leakage (<150 uA)
- Safety approved to 5000 m altitude
- Programmable start-up state (Default ON or Default OFF)
- > 94% efficiency
- Five-year warranty

Flexibility
- Analog and digital management — PMBus™ monitoring and control capability
- 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, audio equipment

Hi Rel
- Harsh industrial electronics, radar (naval- and ground-based), communications, test and measurement

AT A GLANCE

	CS10S	CS10M
Power		
	1000 W	1000 W
Output Voltage		
	24V, 48V	
Cooling		
	No fan featured, convection-cooled	
Parameters		
	262mm x 127mm x 39.1 mm (10.5 in x 5 in x 1 U)	
Certifications		
Medical		
	IEC60601-1 3rd edition,	
	2 MOPP	
	Dual fused	
Industrial		
	IEC62368-1	
	ISO9001:2015	
	SEMI F47[1]	

MODELS

	CS1000-24	CS1000-48
Power (W)	1000	1000
Output Voltage (V)	24	48
Output Current (A)	41.6	20.8
Medical Approval UL/EN60601-1, 3rd Edition	Yes	Yes
Industrial Approval UL/EN62368, 2nd Edition	Yes	Yes
Vnom (V)	24	48
Description	Convection-cooled U-channel	Convection-cooled U-channel
Output Adjustment Range (V)	22 to 28	44 to 56
Dynamic Vtrim Range (V)	22 to 28	44 to 56
Iout Imax (A)	41.6	20.8
Remote Sense	Yes	Yes
Power Good	Yes	Yes
AC Good	Yes	Yes

ELECTRICAL SPECFICATIONS

Input					
Parameter	**Conditions/Description**	**Min**	**Nom**	**Max**	**Units**
AC Operating Input Range	Universal input 47-440Hz	85	—	264	VAC
Nominal Input Voltage Range	Universal input 47-440Hz	100	—	240	VAC
Extended AC Operating Range	Maximum for 5 seconds	—	—	300	VAC
Input Current	90 VAC @ 600 W	—	8	—	A
Inrush Current	230 VAC @ 1000 W	—	—	25	A
Power Factor	120 VAC @ 800 W	0.95	0.98	—	—
Undervoltage Lockout	Shutdown		65		
Voltage Sag	500ms Ridethrough	65		74	VAC
Input Fuses Rating	Dual Fused (Line and Neutral) 500VAC	—	10	—	A
Efficiency	230 VAC, 1000 W CS1000-24	—	94	—	%
	230 VAC, 1000 W CS1000-48	—	95	—	%
Output					
Power Rating	See derating curves	—	—	1000	W
Minimum Load		0	—	—	A
Line Regulation		—	—	0.25	%
Load Regulation		—	—	0.5	%

NOTES

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

ELECTRICAL SPECIFICATIONS (CONTINUED)

Output (Continued)

Parameter	Conditions/Description	Min	Nom	Max	Units
Transient Response	For 25% to 75% load change 0.5 A/uS: voltage deviation	—	—	±6	%
Ripple and Noise	20 MHz BW	—	—	1	%
Overvoltage Protection	Autorecovery	110	—	140	%
Remote Sense	Max line drop compensation	—	—	0.5	VDC
Rise Time	Monotonic	—	—	10	ms
Turn-On Delay	From AC	—	—	1000	ms
	From Global Enable	—		20	ms
Hold-Up Time	For nominal output voltages at full load	16	—	—	ms
Overcurrent Protection	Hiccup activation	105	120	130	%
Short Circuit Protection	Yes, Autorecovery	—	—	—	—
Over Temperature Protection	Yes, Autorecovery	—	—	—	—
Capacitive Load	Nominal output voltages at full load	—	—	10	mF

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		—	—	±0.8	%
Line Regulation	For ±10% change from nominal line	—	—	±0.25%	%
Maximum Output Current	Aux voltage option A	—	—	1.96	A
	Aux voltage option B	—	—	4.7	A
Maximum Output Capacitive Load		—	—	1000	uF
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)	1500	—	—	VAC
Output to Case	Basic (1 x MOPP)	1850	—	—	VAC
Output to Aux	Functional	1850	—	—	VDC

Reliabilty

Parameter	Conditions/Description	Min	Nom	Max	Units
Reliability and MTBF	MTBF of > 2,600 kHours, Telecordia SR-332, Issue 4	—	0.38	—	Fpmh
Warranty	5 years	—	—	—	—

ELECTRICAL SPECIFICATIONS (CONTINUED)

Environmental					
Parameter	**Conditions/Description**	**Min**	**Nom**	**Max**	**Units**
Operating Temperature	Operates to specification below -20°C after 10 min warmup	-40	—	85	°C
Storage Temperature		-40	—	85	°C
Derating	See Derating Curves including note 5	—	—	—	—
Relative Humidity	Non-condensing	5	—	95	%RH
Altitude		—	—	5000	m
Vibration	810G: Method 514.6, Procedure I (General Vibration) Category 4 Common Carrier (US Highway truck vibration exposure) Fig.514.6C-1 Category 4 Composite 2 wheeled trailer vibration exposure, Fig.514.6C-2 Category 4 Composite wheeled vehicle vibration exposure, Fig.514.6C-3				

Leakage Currents			
Parameter	**Conditions/Description**	**Nom**	**Units**
AC Leakage Current	**Input to Earth Ground**	—	—
Normal Condition (High Line)	Mains Voltage 264 VAC / 60 Hz	180	µA
Single Fault Condition (High Line)	Mains Voltage 264 VAC / 60 Hz	350	µA
Touch Current			
Normal Condition	Mains Voltage 264 VAC / 60 Hz	< 1	µA
Single Fault Condition	Mains Voltage 264 VAC / 60 Hz	180	µA

EMC		
Parameter	**Test Type/Conditions**	**Performance Criteria**
Radiated Emissions[2]	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 2, 3 V/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 3, 10 Vemf 150 KHz-80 MHz	A
Power Frequency Magnetic Field	EN 61000-4-8, level 4, 30 A/m	A

Standards and Directives	
Parameter	**Conditions/Description**
IEC/EN/UL 60601-1, Edition 3 and All National Deviations	EN60601-1 3rd Edition, UL60601-1, CSA601
	5000 m (16,400 ft) altitude, 100 V to 240 ±10% VAC
	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

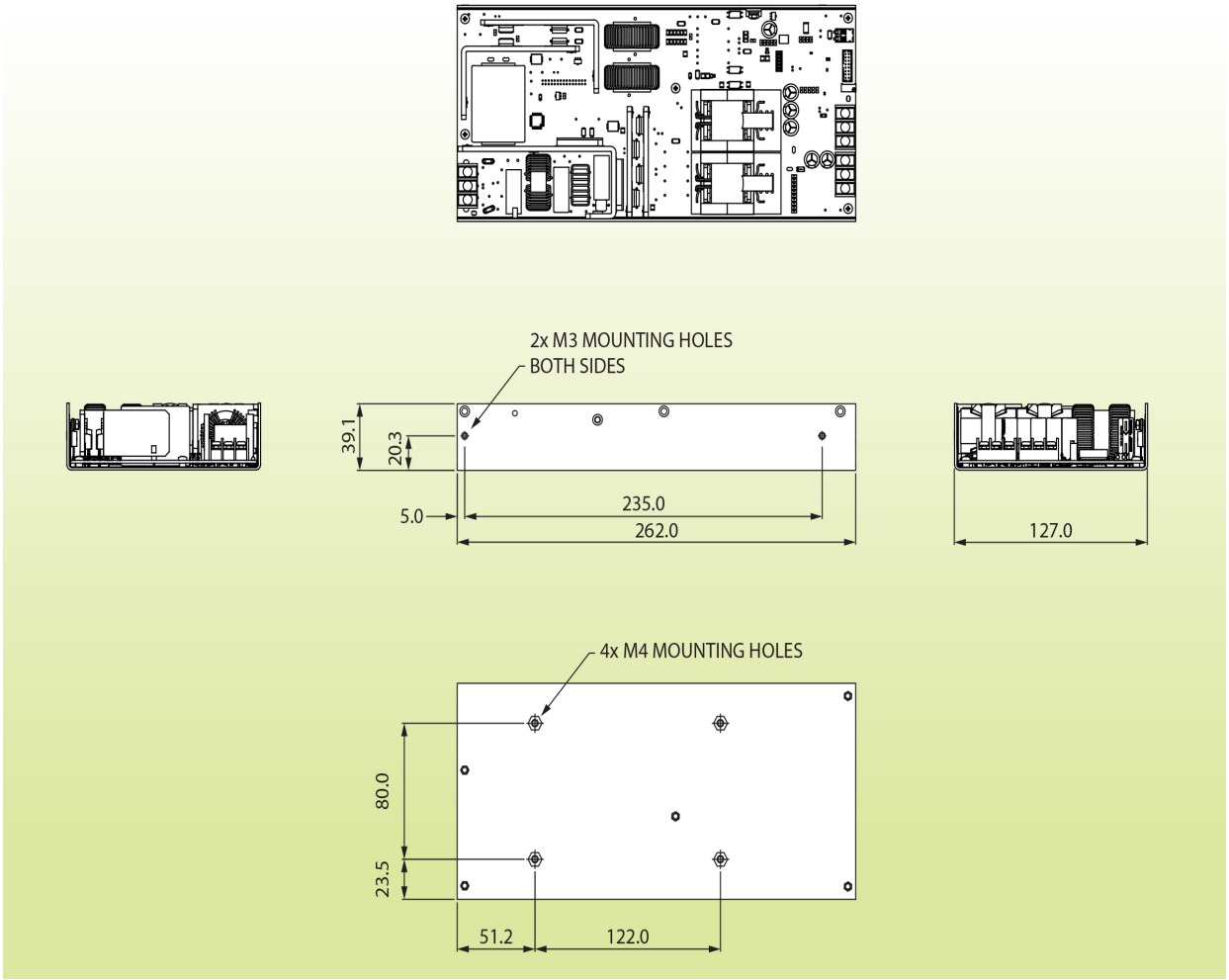
ELECTRICAL SPECIFICATIONS (CONTINUED)

Standards and Directives	
ROHS	EU DIRECTIVE 2011/65/EU RoHS compliancy
REACH	Compliant

2. Consult AE applications for system level compliance.

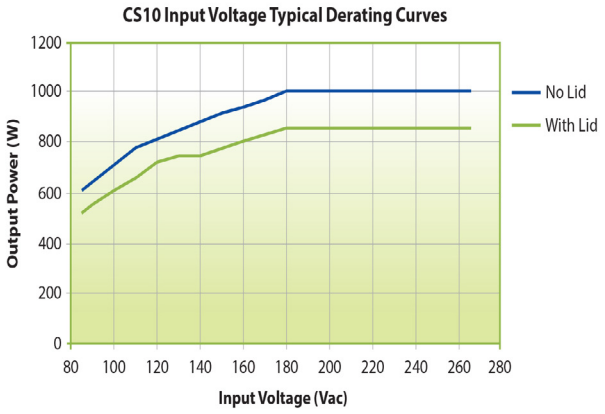
Mechanical Data		
Parameter	**Description**	**Min**
Dimensions (L x W x H)	Without Lid	262mm x 127mm x 39.1 mm (10.5 in x 5 in x 1 U)
	With Lid	262mm x 127mm x 40.8 mm (10.5 in x 5 in x 1 U)
Weight	Nominal Weight	1.3 Kg
Connectors	**Description**	**Mating Connectors (if applicable)**
AC/DC input terminal block	TYCO 2-1437667-5	—
AC/DC IEC input (Option)	IEC 320 Inlet	—
Main DC output terminal blocks	TYCO 2-1437667-5	—
System Signal Connector J13	Molex 87831-1620 16-way	Locking Molex 51110-1651; Non Locking Molex 51110-1650; Crimp Terminal: Molex p/n 50394
Auxiliary Output Connector J12	Molex 104188-0210 2pin	—
PMBus Address and Auxiliary Select J17	Molex 87758-1216 12-way Harwin-M22-2520605	Shorting Jumper: Harwin: M22-1900005
Paralleling Header J14	Harwin: M22-2510205; Cvilux: CH11022VA00-NH	Shorting Jumper: Harwin: M22-1900005

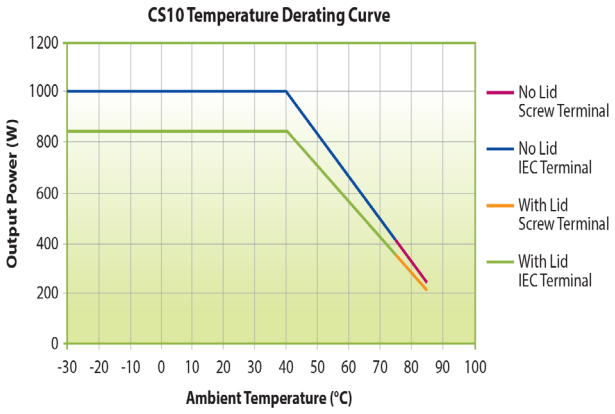
MECHANICAL DRAWINGS

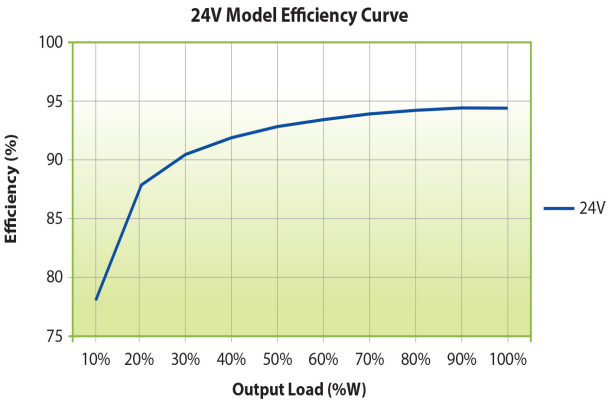


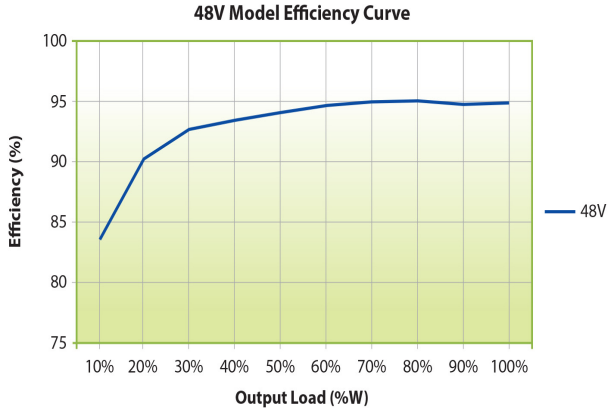
* Maximum screw penetration from base and sides must not exceed 2mm

EFFICIENCY AND DERATING CURVES



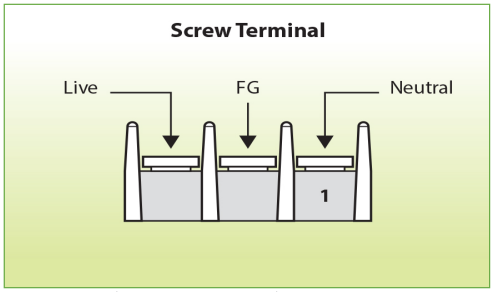




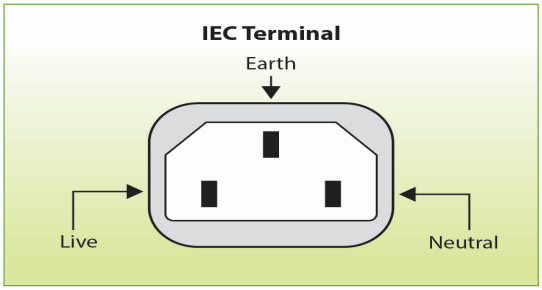


INTERFACE

Input Connectors

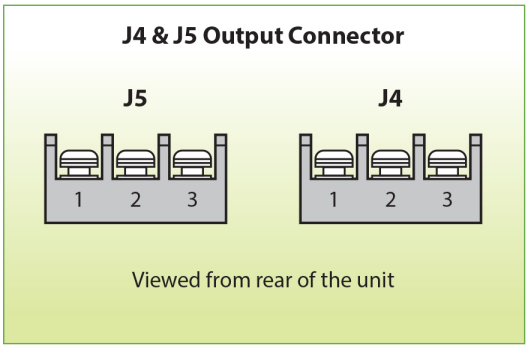


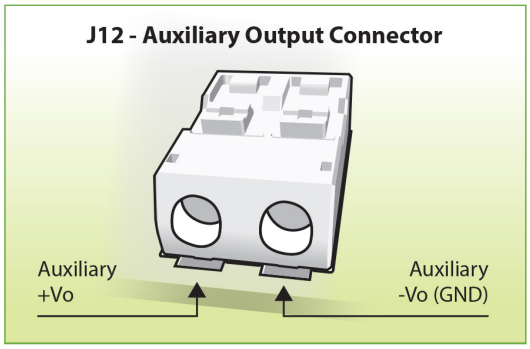
Standard (Screw Terminal)



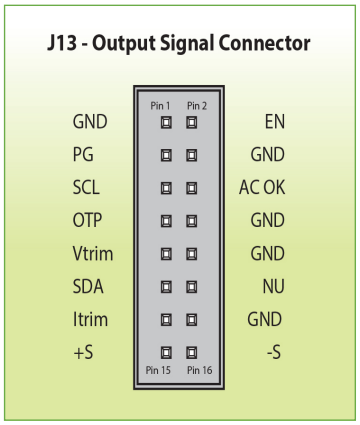
Option 1 (IEC Terminal)

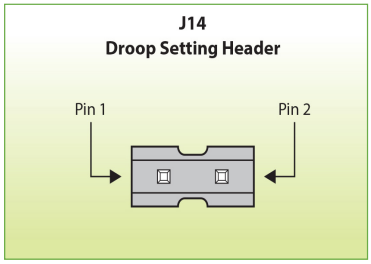
Output Connectors

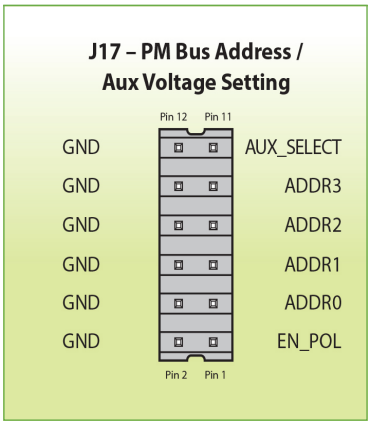




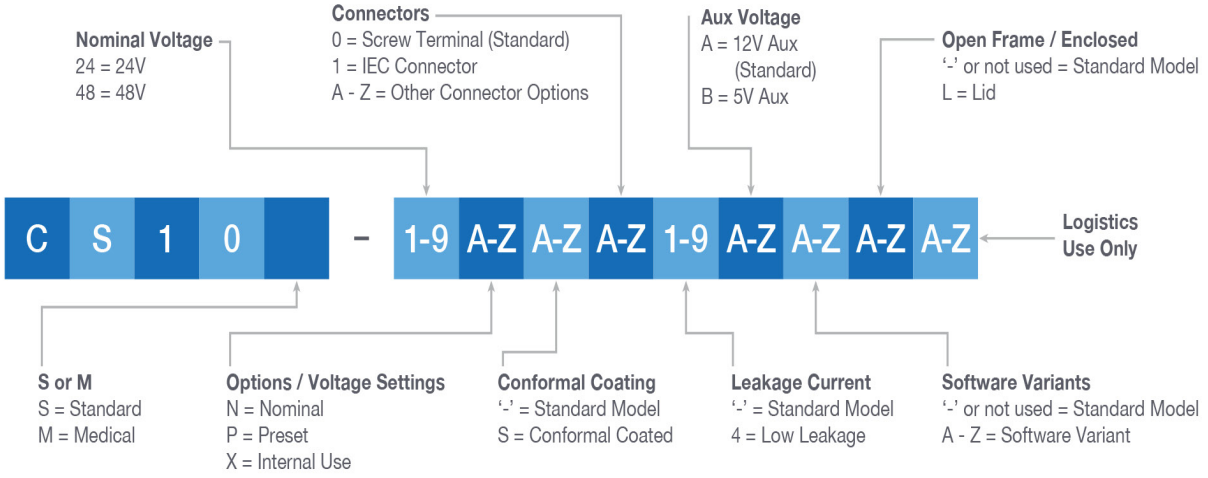
Signal Connectors







CONFIGURATION



Example 1: *CS10M-24N-0-A* = Medical 24V nominal output voltage, Screw Terminal Input Connector and 12V Aux.

Example 2: *CS10S-48P-1-B-L* = Industrial 48V output, with Preset output voltage, IEC input Connector, 5V Aux and Lid

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

Advanced Energy

For international contact information, visit advancedenergy.com

Specifications are subject to change without notice. Not responsible for errors or omissions. ©2019 Advanced Energy Industries, Inc. All rights reserved. Advanced Energy® and AE® are U.S. trademarks, and CoolX® is a U.S. and European trademark of Advanced Energy Industries, Inc.

CE

ENG-LV-CS1000-235-01-09.20