Appendix B

*UPS Equipment Cutsheet

*Photovoltaic Equipment and Analysis

*Trip Graphs

CATERPILLAR®

UPS 300 SERIES

Rotary UPS Equipment

MULTI MODULE SYSTEMS

300 kVA/240 kW, 60 Hz
600 kVA/480 kW, 60 Hz
900 kVA/720 kW, 60 Hz

Caterpillar® is leading the power generation marketplace with Power Quality Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost effectiveness.

FEATURES

PRODUCT FEATURES

- Smallest available footprint
- High system efficiency
- Harmonic cancellation
- Transient protection
- High-speed voltage regulation
- Power factor improvement
- Top and bottom cable entry
- 40° C rating on entire system
- Low input current distortion
- Utilizes kinetic power cell technology
- Simple installation
- Low maintenance
- Quiet operation
- Optional redundant energy storage
- Expandable for future capacity growth
- Optional generator set start module

RELIABLE POWER PROTECTION FOR CRITICAL APPLICATIONS

Cat® UPS systems provide constant power protection against surges, sags, and power interruptions that can disrupt operations or cause loss of valuable data or system capacity. Additionally, the use of the optional generator set start module can dramatically increase generator set starting reliability in a continuous power configuration.

SUPERIOR DESIGN

Superior system design and the use of robust digital components throughout the system yield the most reliable and trouble-free UPS system on the market. Protection is delivered in the industry's smallest package with the highest efficiency and superior performance.

LOWER TOTAL COST

The high operating efficiency means yearly savings versus traditional battery UPS products. In addition, lower Cat UPS heat rejection reduces up front HVAC costs and electrical consumption over the life of the product.

GENERATOR SET INTEGRATION

By cancelling harmonic distortion, the 300 Series operates seamlessly with generator sets to provide a higher total electrical load capacity without oversizing the generator set. The 300 Series effectively insulates the generator set from block loads and transient, and can improve its fault clearing capabilities. Programmable integration with standby generator sets assures greater system reliability and improves the total system operation.

WORLDWIDE PRODUCT SUPPORT

- Parts Distribution Centers are located worldwide with available service support through Caterpillar and the Cat Dealer Network.
- Factory certified service and technicians are trained to support every aspect of your Cat UPS system.

FACTORY INSTALLED STANDARD AND OPTIONAL EQUIPMENT

Standard Features	Optional Features
Battery free, flywheel energy storage	24-volt DC, generator set starting power
IGBT Based Bi-directional converter	Integral modem – remote communication
Local Emergency Power Off (EPO)	Remote notification and monitoring via Ethernet and e-mail
RS232 or RS485 serial connection	UPS View – real-time monitoring software
LCD monitor/control user interface panel	SNMP
Programmable input and output contacts	MODBUS (RTU or TCP/IP)
Redundant cooling fans	Remote Status Panel (8 status LED's)
Top/Bottom cable entry	Maintenance bypass
Back feed protection	Seismic mounting
Monitoring and alarms for all critical components w/self-diagnostics	4-wire input and output
Voltage regulation and power factor improvement	Remote EPO
Harmonic cancellation	N+1 flywheel energy storage
Static Bypass Switch	Field expandable for future capacity increases
	External synchronizing input

SPECIFICATIONS

INPUT	
Voltage	480 VAC 3-phase, 3-wire plus ground from grounded wye source (4-wire – optional)
Voltage Range	+ 10%/-15% (programmable)
Frequency	60Hz (± 10% max. – programmable)
Power Factor	0.99 at rated load and nominal voltage
Harmonic Current Distortion	
Linear load	< 3% at 100% resistive load
Non-linear load[1]	< 8% with 100% non-linear load
Surge Withstand	Meets IEEE 587/ANSI C62.41
Walk-in	1 to 15 seconds (programmable)
Bypass Source	Same as input source – Synchronized frequency, phase and voltage
Bypass Voltage Window	+ 10%/-15% (programmable within range)
OUTPUT	
Voltage	480 VAC, 3-phase, 3-wire plus ground (4-wire with optional 4-wire input)
Voltage regulation	
Steady-state	± 2% of nominal for ± 10% input and balanced or unbalanced load
Transient	± 5% of nominal for 100% load step; or loss/return of input
Recovery Time	50 millisecond maximum
Bypass Trigger	Programmable up to ± 10%

Frequency Regulation	
Normal Operation	Synchronized to input
Free Running	± 0.2% free running
Synch Window	Adjustable over a range of at least 0.3 Hz to 3 Hz
Resynchronization Slew Rate	Adjustable over a range 0.3 Hz/second to 1 Hz/second
Load Power Factor	0.8 lag to 0.9 lead for specified regulation and rating. 0.4 lag to 0.7 lead with reduced regulation or load
Voltage Unbalance & Distortion	
Balanced Load	< 1% voltage unbalance and < 1° phase displacement
50% Unbalanced Load	< 3% voltage unbalance and < 3° phase displacement
Linear Load	< 3% THD, < 2% SHD
100% Non Linear Load[1]	< 5% THD
Load Imbalance	The UPS is capable of supporting any combination of unbalanced load that does not exceed the maximum phase currents and the total output limitations of the UPS
Overload Capability (normal operation)	
10 Minutes	Up to 125%
30 Seconds	Up to 200%
1 seconds	500%
10 milliseconds	1000%

[1] In accordance with EN 50091-3

TECHNICAL DATA

		UPS300E	UPS600	UPS900
Maximum kVA		300	600	900
Maximum kW		240	480	720
Input Voltage (nominal)		480		
Output Voltage (nominal)		Same as input		
Input Current (amps)				
Nominal		297	595	892
Maximum Continuous		400	800	1200
Maximum Including Recharge		440	880	1320
Output Current		361	722	1084
System Efficiency		97%	97%	97%
System Withstand Rating		65,000 A		
Heat Rejection				
Nominal	BTU/Hr kW	25,300 7.5	50,600 14.8	75,900 22.3
Worst Case	BTU/Hr kW	52,200 15.3	104,500 30.6	156,700 45.9

DIMENSIONS AND WEIGHTS

UPS300E		
Depth	865 mm	34.0 in
Width	3,226 mm	127 in
Height	2,438 mm	96.0 in
Weight (3-wire)	3,199 kg	7,050 lb
Weight (4-wire)	3,494 kg	7,700 lb
UPS600		
Depth	865 mm	34.0 in
Width	4,318 mm	170 in
Height	2,438 mm	96.0 in
Weight (3-wire)	5,241 kg	11,550 lb
Weight (4-wire)	5,536 kg	12,200 lb
UPS900		
Depth	865 mm	34.0 in
Width	5,410 mm	213.0 in
Height	2,438 mm	96.0 in
Weight (3-wire)	7,282 kg	16,050 lb
Weight (4-wire)	7,577 kg	16,700 lb

ENVIRONMENTAL

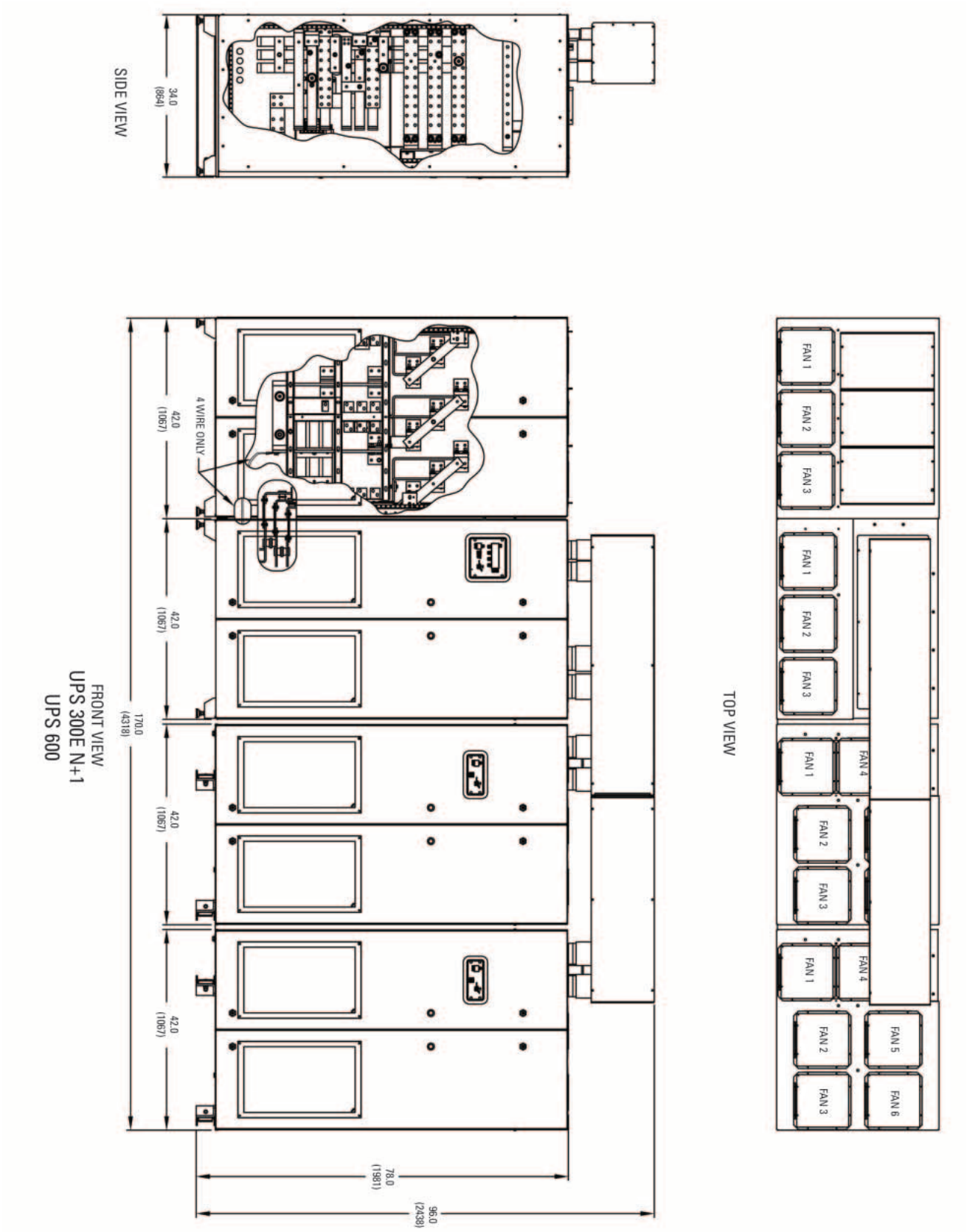
Acoustical Noise	< 75dBA at 1m (3.28 ft)
Temperature	
Operating	0° C to 40° C (4° F to 104° F)
Storage	-25° C to 70° C (-13° F to 158° F)
Humidity	5% to 95% (non-condensing)
Altitude	Up to 914.4 m (3,000 ft); (de-rate operating temperature range for higher elevation)
Emissions and Immunity	FCC Class A, Subpart J of 1Part 5/EN 50091-2

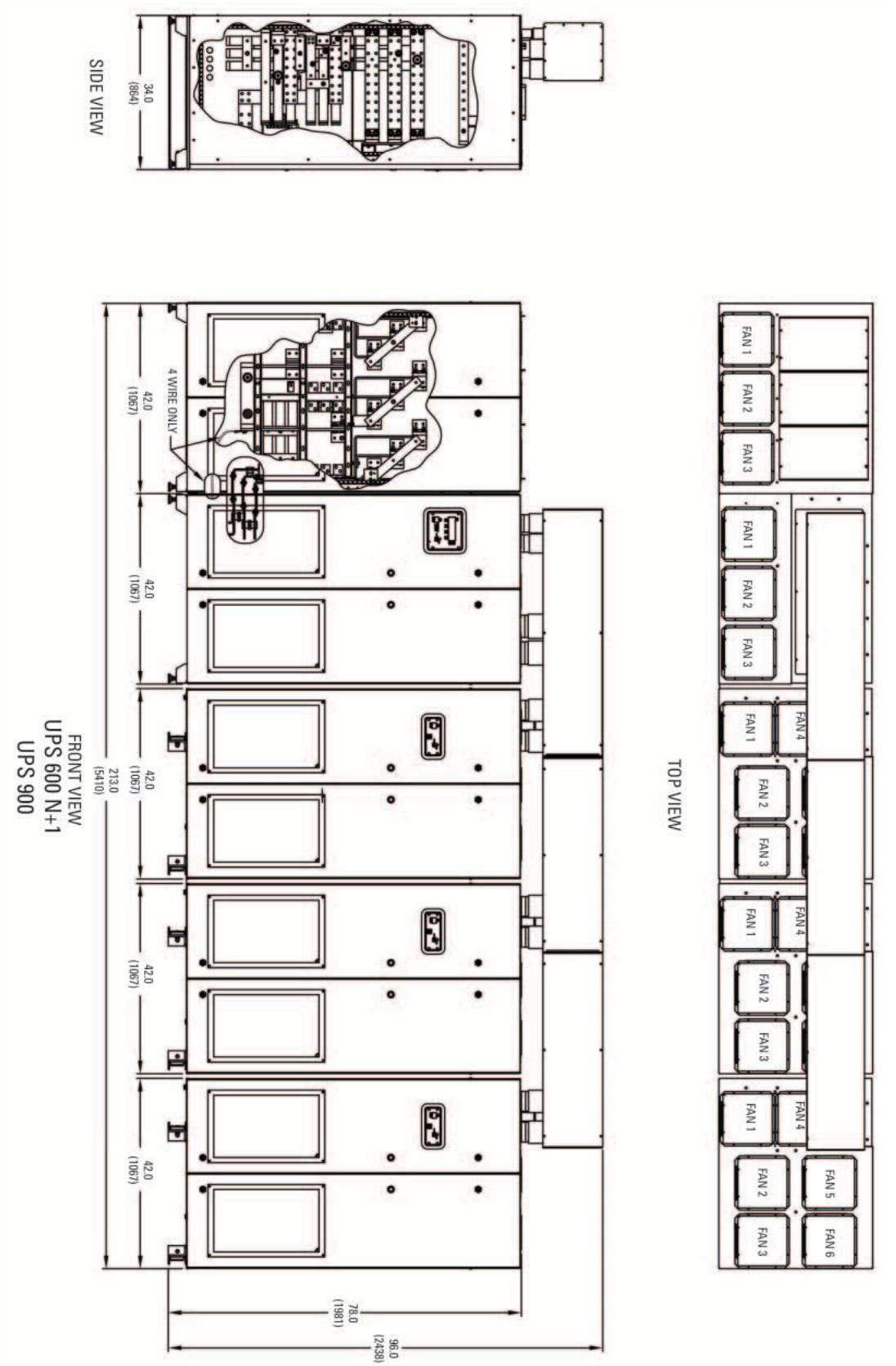
CERTIFICATIONS

UL 1778 listed
CUL CAN/CSA 22.2 No. 107.1 listed
EN50091-1-1
CE Mark

RIDE THROUGH TIMES (SEC)

Model	100% load	75% load	50% load	25% load
UPS300E UPS600 UPS900	13	17	25	50


SIDE VIEW
34.0
(864)
FRONT VIEW
UPS 300E N+1
UPS 600
4 WIRE ONLY
42.0
(1067)
42.0
(1067)
42.0
(1067)
42.0
(1067)
170.0
(4318)
78.0
(1981)
96.0
(2438)
TOP VIEW
FAN 1
FAN 2
FAN 3
FAN 1
FAN 2
FAN 3
FAN 1
FAN 4
FAN 2
FAN 3
FAN 1
FAN 4
FAN 2
FAN 3
FAN 5
FAN 6


SIDE VIEW
34.0
(864)
FRONT VIEW
UPS 600 N+1
UPS 900
4 WIRE ONLY
42.0
(1067)
213.0
(5410)
78.0
(1981)
96.0
(2438)
TOP VIEW
FAN 1
FAN 2
FAN 3
FAN 4
FAN 5
FAN 6

www.mgeups.com

MGE UPS SYSTEMS

Static UPS Equipment

EPS 8000

555/625/750/800 kVA

Where Power and Reliability Converge

EPS 8000

The EPS 8000 specifications read like a list of ideal answers to today's critical power user requirements. Featuring a true IGBT PWM inverter that feeds up to 720 kW per UPS of computer grade power (<4% THD) to your critical loads, the ***EPS 8000*** meets all your high power requirements in a compact footprint.

EPS 8000 user's will enjoy substantial cost savings as MGE's Digital Power Quality logic keeps the inverter efficiency high even when the UPS is lightly loaded. On the input side, a 12 pulse rectifier combined with MGE's data grade input filter boasts very low THD, low kVAR, and no leading power factor; making the ***EPS 8000*** ideal for generators. All of these features and more make the ***EPS 8000*** the best choice for high availability critical power systems.

MGE UPS SYSTEMS
the chosen solution for 95% of Fortune 100 companies

THE UNINTERRUPTIBLE POWER PROVIDER

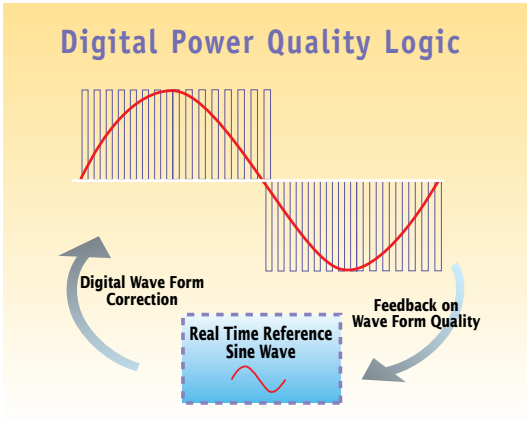
Advanced Features

- 0.9 output Power Factor
- Space saving footprint/highest kW per square foot
- High energy efficiency
- Large graphical user interface*
- 12 pulse rectifier
- Ultra low kVAR data grade input filter
- Excellent generator compatibility
- Non-linear load optimized
- IGBT PWM inverter with Digital Power Quality logic
- Precision output voltage regulation
- Advanced battery management system
- 100% step load enabled
- Integrated isolation transformer
- True front access
- Fault tolerant output
- Easy integration with most monitoring systems

* optional

MGE
UPS SYSTEMS

Digital Power Quality Logic ~ *EPS 8000 Inverter Technology Advantages*



The **EPS 8000's** superior inverter performance is a result of MGE's Digital Power Quality (DPQ) logic.

By creating the waveform from hundreds of precisely controlled pulses, the DPQ logic system continuously compares the output power to a reference sine wave applying sub cycle correction pulses to maintain precise voltage regulation. The speed, precision, and dynamic response of the DPQ logic allow the inverter to have the following truly unique performance characteristics.

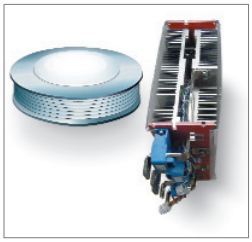
Active Harmonic Conditioning

Most loads protected by the UPS are non-linear loads, such as computer power supplies, which reflect large amounts of harmonic distortion onto the critical bus disturbing other equipment. The EPS 8000's DQP logic dynamically adjusts the output load side voltage distortion resulting in clean, distortion free (<3.5% THD) power on the critical bus.

Fault Tolerant Circuitry

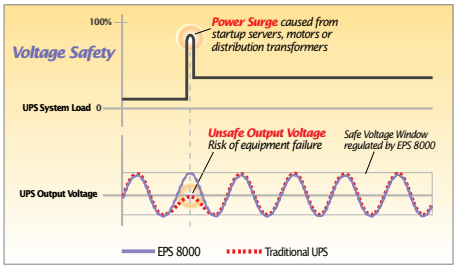
Even when protected by a breaker, a fault may take up to six or more cycles to clear and are common over the life of a UPS system. Most UPS inverters cannot respond fast enough and continue to supply the fault with inverter power overloading the power semi-conductors and causing critical component failure. The EPS 8000 inverter has a micro sub-cycle response time allowing the inverter to rapidly and safely transfer the inverter from a faulted load to the bypass source.

The added fault clearing capacity of the bypass source (typically fed by the utility), along with a robust static transfer switch that can handle up to 22 times the nominal current safely, ***clears the fault and instantly returns to protected inverter power.***



Outstanding Dynamic Load Response

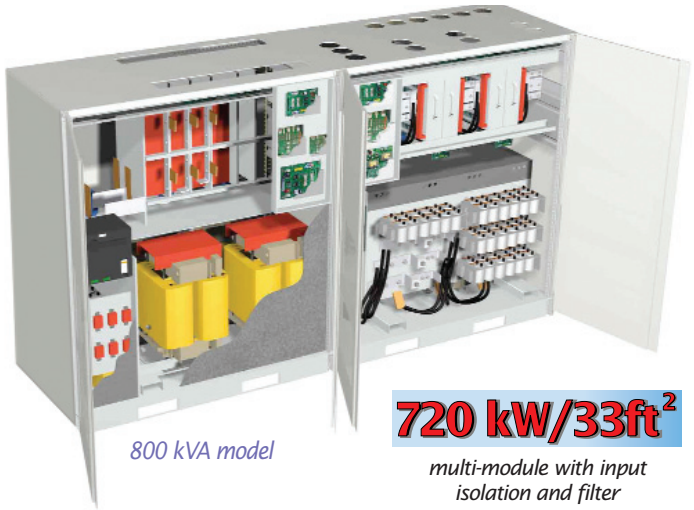
UPSs are frequently exposed to rapid load changes caused from starting motors, distribution transformers, and even large banks of servers. These step loads can cause a significant voltage decay on the output of most UPSs. Even when exposed to a 100% step load, the EPS 8000 maintains precise output voltage regulation, limiting voltage transients to under 5%.



Space saving footprint with true front access

Fitting into a space as little as 120" wide, the EPS 8000 has one of the highest power densities of any UPS. The integrated input isolation transformer and input filter eliminate the need for bulky auxiliary cabinets. All EPS 8000 components, including the transformers, are truly front accessible with no rear access requirements, ***saving even more footprint.***

- *True Front Access/No rear or side access required*
- *23 kW/square foot high power density (750/800 kVA models)*
- *121" wide including input isolation transformer and filter (multi-module/135" single module w/ bypass)*
- *Easy front thermal scanning with terminal viewing ports*



800 kVA model

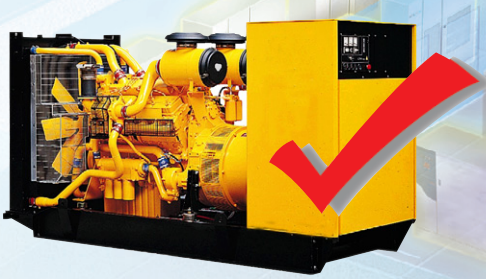
720 kW/33ft²

multi-module with input isolation and filter

Proven Data Center Power Protection

Generator Friendly Technology

By combining a low distortion 12 pulse rectifier with a passive inductive filter, the EPS 8000 limits input distortion to around 5% while minimizing kVARs to a negligible level. Even when lightly loaded, the UPS input power factor is not leading. Together, these conditions are ideal for generators and limit oversizing requirements.



Advantage MGE

MGE Input Filters Feature:

- **Low Input Distortion**
- **Very Low kVAR**
- **No Leading Power Factor**
- **No mechanical switching of filters**

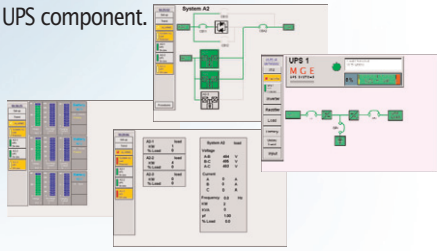
Rapid, expert Service means equals maximum uptime. MGE's 150 factory trained field technicians are strategically located throughout North America ensuring a rapid response with 7 x 24 service for customers with mission critical applications. Regular preventive maintenance visits and computer aided diagnostics assist our technicians in detecting issues before they have a chance to compromise UPS performance. MGE's dedicated Customer Care Center ensures a prompt and attentive response whatever your need may be. From scheduling maintenance visits to dispatching field technicians in the event of an emergency, a Customer Care Representative is ready to respond.

Advanced Graphical User Interface:

An optional large LCD **touch screen** complements the EPS 8000 controls to provided features including active mimic diagrams, alarm/event logs and more. The simplicity of the display allows operators of all knowledge levels to understand UPS status and operation at a glance, limiting operator errors.

Details you can understand!

Component level screens like the battery management page and the output power page provide a very detailed view of the status of each UPS component.



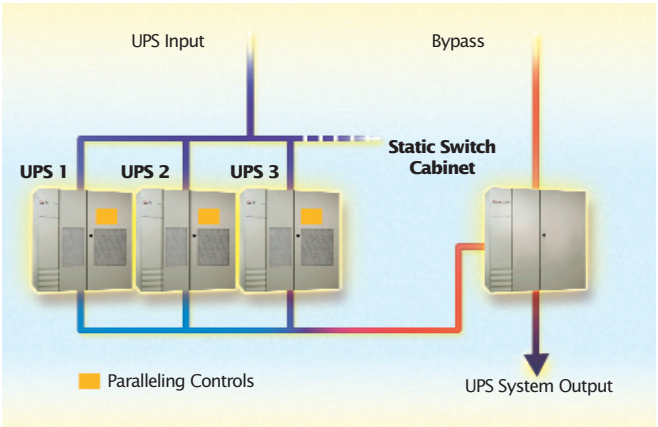
The GUI's alarm and event log *tracks all changes in UPS status, along with a corresponding time stamp. This, along with a trending record of key parameters, aids in keeping an accurate measurement of UPS performance.*

Large Power Systems Solutions

Why use the MGE Power Systems?

- Unique paralleling technology with controls/no single points of failure
- Critical Bus Synchronization for dual bus systems
- Complete product line to satisfy all project requirements
- Experienced Power Systems Design Team
- Proven track record on the world's largest projects

MGE's complete line of power system products offer the efficiency of a single vendor and benefit of a single source of project accountability!



MGE UPS SYSTEMS is the industry leader in design of large power systems.

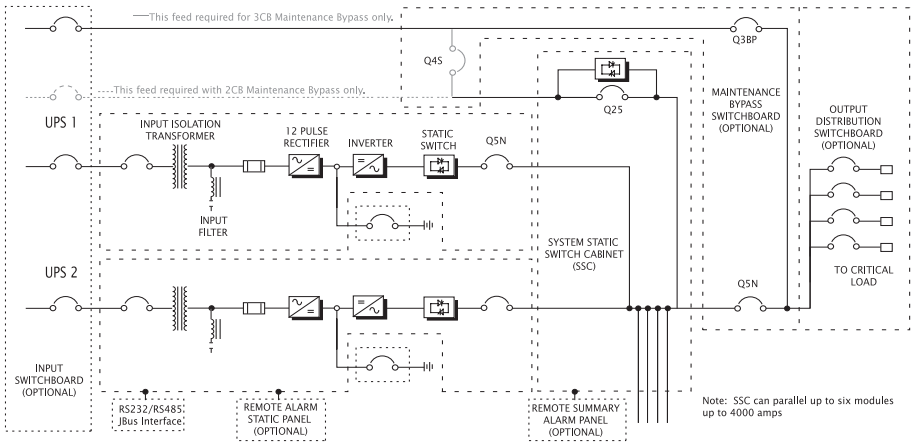
With thousands of installations worldwide, MGE consistently delivers the ultimate in reliability, availability and maintainability.

MGE UPSs can be paralleled with up to six modules for redundancy or capacity. MGE's unique Shared Parallel system places intelligence for paralleling in each individual UPS module eliminating a centralized single point of failure. The output of each UPS is centrally bussed through a Static Switch Cabinet (SSC), which also provides a seamless system transfer to a bypass source when needed.

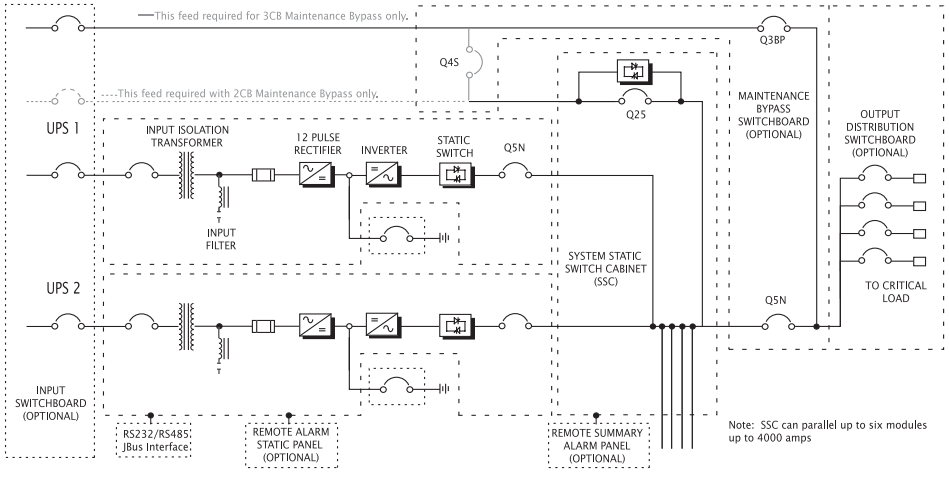
Technical Specifications	555kVA/500kW	555kVA/500kW	625kVA/562kW	625kVA/562kW	750kVA/675kW	800kVA/720kW
Input/Output Voltage[1] (V)	480/480	600/600	480/480	600/600	480/480	480/480
Nominal Input (A)	719	575	817	654	907	1061
Max Input (A)	825	663	923	741	1,043	1,134
Input CB (kAIC)	100	100	100	100	100	100
Trip/Frame Size (A)	2,000/1,200	2,000/1,000	2,000/1,200	2,000/1,000	2,000/1,600	2,000/1,600
Nominal Bypass Current (A)	668	753	752	601	900	960
Maint. Bypass CB[2] (KAIC)	65	65	65	65	65	65
Trip/Frame Size (A)	1,000/1,200	800/1,200	1,000/1,200	800/1,200	1,200/1,200	1,200/1,200
UPS Output Isolation CB[2] (KAIC)	65	65	65	65	65	65
Trip/Frame Size (A)	1,000/1,200	800/1,200	1,000/1,200	800/1,200	1,200/1,200	1,200/1,200
Max Output Current (A)	668	534	752	601	900	960
Max DC Current (A)	1,533	1,533	1,533	1,533	1,766	1,884
DC Breaker						
Trip/Frame Size (A)	1,600/2,000	1,600/2,000	1,600/2,000	1,600/2,000	2,000/2,000	2,000/2,000
System Efficiency (100%-25% load)	93%	93%	93%	93%	93%	93%
Full Load Heat Rejection (BTUs)	125,970	125,970	133,300	133,300	173,000	190,000
Multi Module Width[3] (39"Dx82"H)	121"	121"	121"	121"	121"	121"
Single Module Width[3]-Top Entry (39"Dx82"H)	121"	121"	121"	121"	135"	135"
Maintenance Bypass for single module	22"	22"	`22"	22"	8"	8"
Bottom Entry	36"	36"	36"	36"	36"	36"
Battery Disconnect Width (28"Dx90H)	36"	36"	36"	36"	36"	36"
Max. Shipping Split Width	61"	61"	61"	61"	61"	61
UPS Cabinet Weight [4](lbs)	12,200	12,200	12,200	12,200	14,000	14,000

[1] Also Available 380V/50Hz/800kVA [2]add to single module width [3]dimensions include isolation transformer & input filter [4]exact weight subject to module configuration

EPS 8000 Single Module



EPS 8000 Multi-Module



Standard Features

- Input isolation transformer
- Low kVAR input filter
- IGBT PWM inverter w/Digital Power Quality logic
- 12 pulse rectifier
- Serial and dry contact communications interface
- Computer aided diagnostics
- Advanced battery management
- No rear access
- Redundant fan assemblies

Input

Input Voltage	480 or 600 VAC (3ph,3/4W + GRD) +10/–15%
Frequency (Hz)	60 Hz ±10%
Power Factor	0.9 lagging, .95 with filter 4 kVAR max leading
Input Current Distortion	5% max. THD at full load

Output

Power Factor	0.9
Voltage	480 or 600 VAC (3ph, 3/4W + GRD)
Frequency	60 Hz (selectable ± 5%) 0.1% free running
Voltage Regulation	+/- 0.5% steady state (±2.5% 100% step load)
Voltage Distortion	4% max for non-linear loads w/crest factor of 3.5 2% max linear load
Inverter Overload	125% for 10 minutes, 150% for 1 minute,
Unbalanced Load	Up to 100% 120˚ ±3% (unbalanced load) max. angle displacement, ± 2.5% max. voltage deviation

Bypass Input

Voltage	+10/–15% UPS output voltage (3ph, 3/4W + GRD)
Frequency	60Hz (±0.25 Hz up to 2 Hz)

DC Rating

Nominal Voltage	480 VDC

Environmental Specifications

Operating Temperature	0˚C to 40˚C (32ºF to 104ºF)
Non-operating:	–20ºC to +45ºC (–4º to 113ºF)
Audible Noise	75 dB @ 5'
Relative Humidity	0–90% non-condensing

Options

- Graphical User Interface with Network Connection
- Battery Disconnect
- External Maintenance Bypass
- Critical Bus Synchronization Module
- Remote Alarm Status Panel
- Output Distribution (Panelboard or CB)
- Continuous Duty and Overlap System Static Switch Cabinet (SSC)
- SNMP/Network Management Card
- Bottom Cable Entry
- Seismic Anchors
- Battery Monitoring

MGE UPS SYSTEMS THE UNINTERRUPTIBLE POWER PROVIDER

USA (headquarters)
1660 Scenic Avenue
Costa Mesa, CA 92626
tel (800) 523-0142
(714) 557-1636
fax (714) 557-9788

CANADA
#9, 2798 Thamesgate Dr.
Mississauga, ON L4T 4E8
tel (905) 672-0990
(877) 672-0990
fax (905) 672-7667

MEXICO
Ave. Congreso de la Union
#524 Colonia Santa Anita
Mexico D.F 08300
tel (5255) 538-9687
fax (5255) 530-7625

BRAZIL • Sao Paulo Office
Avenida Guido Caloi 1985
(Galpao 23), Guarapiranga
Sao Paulo–SP,
05802-140-Brazil
tel (55) 11-5515-9255
fax (55) 11-5515-9250

www.mgeups.com
info@mgeups.com

EPS 8k
Revision 104
Effective: October 2006

U.S. Ordering:	International Ordering:
Phone: 800-229-0453	Phone: (618) 893-1717
email: info@advancedenergyonline.com	email: info@advancedenergyonline.com

Power Generation
- Photovoltaic Power Modules
- Photovoltaic Module Mounts
- Wind Power
- Micro-Hydro Power
- Fossil Fuel Backup Generators

Power Storage
- Commercial & Industrial Batteries
- Battery Chargers & Accessories
- Small Batteries & Chargers

Power Conversion
- Inverters - DC to AC
- Transformers - AC & DC

Control & Distribution
- Charge Controls
- Overcurrent Protection
- Switches, Timers & Relays
- Metering
- Wiring Products

Packaged Systems
- RV Power Kits
- Power Panels & Power Modules
- Portable Power Kits
- Stand Alone Power Systems
- Grid Tied Power & Backup Systems

Applications
- Water Pumping
- Lighting
- Energy Efficient Utilities

Resources
- Appropriate Technology Books & Videos
- Support Center

BP Solar Modules -

Photovoltaic Power Modules

Founded in 1973, Solarex is the first organization to have applied photovoltaic technology to commercial needs on Earth. As a wholly owned subsidiary of BP Amoco, Solarex (now called BP Solar) is the largest manufacturer of polycrystalline silicon PV modules and cells and the leader in the manufacture and commercialization of single and tandem junction thin film silicon technology and modules. BP Solar has ISO 9001-certified manufacturing facilities in Australia and the U.S., and power systems operating on every continent. BP Solar has over twenty-five years of research, development and manufacturing experience in advanced polycrystalline silicon technology. BP Solar's polycrystalline solar cells are manufactured with SEMIX™ process cast silicon which gives them attractive large crystal grains and low impurities. The cells are covered with a highly conductive silver paste grid, backed with a strong, conductive aluminum layer and topped with an anti-reflective coating to enhance efficiency. Every cell is tested and categorized by its output current at a reference voltage. Power losses in modules due to mismatched cells are virtually eliminated.

.

The BP275 75 watt modules are made with 36 conventional single-crystal silicon cells.
The BP585 85 watt modules are made with 36 laser-grooved buried-grid single-crystal silicon cells, which are currently the most efficient

commercially available cell in the world. Their efficiency is 20% higher than other typical single crystal cells in full sun, and they give significantly better performance in low light and overcast conditions. This high efficiency translates into cost savings on mounting structures, especially on trackers. Both panels have in each conduit-ready junction box has two waterproof cable clamps and by-pass diodes, so no special module interconnects are required. The face of these modules are tempered, high light transmission glass and the rear is a triple lamination of PVF, polyester and PVF. Output is 12 volts. Dimensions: 46.8" x 20.9" x 1.5". 20 year warranty. UL Listed.

Solarex SX Series

· 36 polycrystalline silicon solar cells.
· Engineered for industrial use.
· Dual voltage capability at 6 and 12VDC. (SX-5 & 10 available in 12VDC only).
· Rugged Universal frames. (SX-5 & SX-10 offered with the "multimount " frame only.)
· Conduit-ready, high-capacity junction box with six terminal connection. (SX-5 & SX-10 have an epoxy-potted junction box and come with 15' of cable.)
· 20 year power warranty on 40 to 85 Watt modules. (10 year on 5 to 30 Watt modules.)
· UL Listed / FM approved / IEC61215 / TÜV. Class C fire rating on 40 to 85 watt modules.
· M, D and U refer to the frame style. M is multimount, D is direct and U is universal.

BP Solar Modules

Prices are all list. Contact us for sale prices.

Name	Wattage Peak (watts)	Item Number	Price
SX20U	**20**	**11.3523**	**$300**
SX30U	**30**	**11.3525**	**$325**
SX60U	**60**	**11.3529**	**$400**
BP-275	**75**	**11.3580**	**$450**
BP-585	**85**	**11.3585**	**$550**
BP3150	**150**	**11.3617**	**$750**
BP3160	**160**	**11.3619**	**$800**

Sun Power | Water Power | Wind Power | System Components | Design Resources | Water Pumps
Lighting | Batteries | Fans - AC - Heating | Large Appliances | Small Appliances | Miscellaneous

Home | **Catalog** | **Ordering** | **Specials** | **Company Info** | **Resources** | **Search**

U.S. Ordering: Phone: 800-229-0453 email: info@advancedenergyonline.com	**International Ordering:** Phone: (618) 893-1717 email: info@advancedenergyonline.com
Mailing Address: Advanced Energy Solutions, Inc. 186 Gates Road Pomona IL 62975-2506	**Tech Support:** U.S. Phone: (618) 893-1717 email: tech@advancedenergyonline.com

U.S. Ordering:	International Ordering:
Phone: 800-229-0453	Phone: (618) 893-1717
email: info@advancedenergyonline.com	email: info@advancedenergyonline.com

Power Generation
- Photovoltaic Power Modules
- Photovoltaic Module Mounts
- Wind Power
- Micro-Hydro Power
- Fossil Fuel Backup Generators

Power Storage
- Commercial & Industrial Batteries
- Battery Chargers & Accessories
- Small Batteries & Chargers

Power Conversion
- Inverters - DC to AC
- Transformers - AC & DC

Control & Distribution
- Charge Controls
- Overcurrent Protection
- Switches, Timers & Relays
- Metering
- Wiring Products

Packaged Systems
- RV Power Kits
- Power Panels & Power Modules
- Portable Power Kits
- Stand Alone Power Systems
- Grid Tied Power & Backup Systems

Applications
- Water Pumping
- Lighting
- Energy Efficient Utilities

Resources
- Appropriate Technology Books & Videos
- Support Center

Utility Intertie 3-Phase Inverters

Trace 3-Phase Power Module Systems

The TRACE Power Module System is a "balance of system" package designed to permit seamless system integration. Aimed at meeting a broad range of applications, the modular design facilitates installation standardization while permitting maximum flexibility. It allows isolation of components, wiring and safety circuitry in a lockable cabinet while maintaining access to all the breakers.

These Power Modules are a three-phase configuration of three Sine-Wave inverters in a stacked, three module, pre-wired system. Includes three phase monitoring software, SWCA Communications Adapter, 3-stage battery charger, and automatic AC transfer relay. For stand-alone or utility-interactive applications. Floor Mount: 19" deep (48 cm), 34" wide (85 cm), 57" high (143 cm) Unit weight: 527 or 560 lbs (240 or 255 kg.) Depending on Model.

Name	Wattage (watts)	Hertz (Hz)	Input Voltage (volts)	Output Voltage (volts)	Weight (LBS)	Price
PM-SW4048/3PH	12000.	60	48	/240	7173	$15,457.00
PM-SW5548/3PH	16000.	60	48	/240	8226	$17,125.00

Trace Technologies PV Series Grid-Tied 3-Phase Inverters

The Trace Technologies PV Series of Utility interactive photovoltaic inverters have quickly set the standard for grid tied solar power systems from 10 kW and up. Reliability, efficiency and performance are among the reasons that increasing numbers of electric utilities and other energy producers and users are looking to Trace Technologies for their photovoltaic power conversion needs. Features: automatic morning wakeup and evening shutdown, peak power tracking, power limiting during enhanced irradiance conditions, and full instrumentation of input and output parameters displayed locally or remotely. Each model complies with the applicable industry standards, including IEEE 519, IEEE 929 and the National Electrical Code. The flexibility of the many user programmable protective function set-points allows the inverter to be paralleled with most utility distribution systems with little or no additional protective hardware required. Peak power tracking is 300-600 VDC for this line. All these inverters are 208 VAC and 60 Hz units.

PV Series Grid-Tied Inverters (for systems without batteries)

Name	Wattage (watts)	Length (IN)	Width (IN)	Height (IN)	Weight (LB)	Price
PV-100208	100000.	31	27	68	1700	$51,795.00
PV-150208	150000.	40	27	86	3700	$67,595.00
PV-20208	20000.	14	14	28	175	$13,134.00
PV-225208	225000.	40	27	86	3900	$81,295.00
PV-30208	30000.	27	20	68	1000	$17,155.00
PV-300208	300000.	40	27	86	3900	$89,895.00
PV-50208	50000.	27	20	68	1300	$28,485.00
PV-10208	10000.	16	12	26	75	$6,925.00
PV-15208	15000.	24	14	28	175	$10,387.00
PV-500208	500000.	40	27	86	3700	$150,298.00

Trace Technologies PV/Hybrid Series 3-Phase Inverters

The Trace Technologies PV/Hybrid series of power processing systems provide complete power conversion and system control solutions. For applications from 30 kVA to 300 kVA, the PV/Hybrid series offers the reliability, efficiency and performance necessary for truly autonomous power system operation. The PV/Hybrid series delivers a unique combination of features available only from Trace Technologies. PV array peak power tracking, battery charge control, engine load management and synchronous load transfers between the inverter and the generator are integrated into a single unit. Connect your battery bank, PV array, standby generator and load to the PV/Hybrid, and your power system is up and running. For most loads, the inverter's voltage regulation, frequency regulation and voltage waveform characteristics significantly exceed that delivered by the standby generator, even in the presence of severe phase imbalance. Peak power tracking is 300-600 VDC for these inverters. All these inverters are 480 VAC, 3 phase, 3 wire, 60 Hz units.

PV/Hybrid Series Inverters

Name	Wattage (watts)	Length (IN)	Width (IN)	Height (IN)	Weight (LB)	Price
HY-100	100000.	40	27	86	1700	$112,495.00
HY-150	150000.	80	27	86	3700	$152,993.20
HY-225	225000.	80	27	86	3900	$208,073.20
HY-30	30000.	27	20	68	1000	$50,993.20
HY-300	300000.	80	27	86	3900	$244,793.20
HY-50	50000.	27	20	68	1300	$64,729.20

Sun Power | Water Power | Wind Power | System Components | Design Resources | Water Pumps
Lighting | Batteries | Fans - AC - Heating | Large Appliances | Small Appliances | Miscellaneous

Home | **Catalog** | **Ordering** | **Specials** | **Company Info** | **Resources** | **Search**

BP 3160

160 Watt Photovoltaic Module

High-efficiency photovoltaic module using silicon nitride multicrystalline silicon cells.

Performance

Rated power (P_{max})	160W
Power tolerance	± 5%
Nominal voltage	24V
Limited Warranty[1]	25 years

Configuration

B BP 3160B	Bronze frame with output cables and polarized Multicontact (MC) connectors
S BP 3160S	Clear universal frame with output cables and polarized Multicontact (MC) connectors
L BP 3160L	Unframed laminate version of BP 3160S
U BP 3160U	Clear universal frame with standard junction box

Electrical Characteristics[2]	BP 3160
Maximum power (P_{max})[3]	160W
Voltage at Pmax (V_{mp})	35.1V
Current at Pmax (I_{mp})	4.55A
Warranted minimum P_{max}	152W
Short-circuit current (I_{sc})	4.8A
Open-circuit voltage (V_{oc})	44.2V
Temperature coefficient of I_{sc}	(0.065±0.015)%/ °C
Temperature coefficient of V_{oc}	-(160±20)mV/°C
Temperature coefficient of power	-(0.5±0.05)%/ °C
NOCT (Air 20°C; Sun 0.8kW/m^2 ; wind 1m/s)	47±2°C
Maximum series fuse rating	15A (S, L); 20A (U)
Maximum system voltage	600V (U.S. NEC & IEC 61215 rating) 1000V (TÜV Rheinland rating)

Mechanical Characteristics

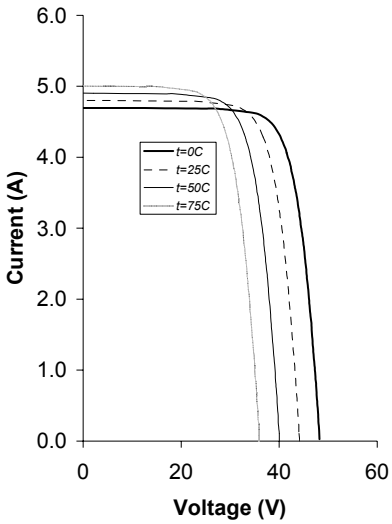
Dimensions	**B,S,U**	Length: 1593mm (62.8")	Width: 790mm (31.1")	Depth: 50mm (1.97")
	L	Length: 1580mm (62.2")	Width: 783mm (30.8")	Depth: 19mm (0.75")
Weight	**B,S,U**	15.0 kg (33.1 pounds)		
	L	12.4 kg (27.3 pounds)		
Solar Cells	**B,S,L,U**	72 cells (125mm x 125mm) in a 6x12 matrix connected in series		
Output Cables	**B,S,L**	RHW AWG# 12 (4mm^2) cable with polarized weatherproof DC rated Multicontact connectors; asymmetrical lengths - 1250mm (-) and 800mm (+)		
Junction Box	**U**	Standard junction box with 6-terminal connection block; IP 54, accepts PG 13.5, M20, ½ inch conduit, or cable fittings accepting 6-12mm diameter cable. Terminals accept 2.5 to 10mm^2 (8 to 14 AWG) wire.		
Diodes	**B,S,L,U**	Three 9A, 45V Schottky by-pass diodes included		
Construction	**B,S,L,U**	Front: High-transmission 3mm (1/8th inch) tempered glass; Back: Tedlar; Encapsulant: EVA		
Frame	**B,S,U**	Anodized aluminum alloy type 6063T6 Universal frame; Color: bronze (B); silver (S,U)		

1. Warranty: Power output for 25 years. Freedom from defects in materials and workmanship for 5 years. See our website or your local representative for full terms of these warranties.
2. These data represent the performance of typical BP 3160 products, and are based on measurements made in accordance with ASTM E1036 corrected to SRC (STC.)
3. During the stabilization process that occurs during the first few months of deployment, module power may decrease by up to 3% from typical P_{max}.

Quality and Safety

ESTI	Module power measurements calibrated to World Radiometric Reference through ESTI (European Solar Test Installation at Ispra, Italy)
CE	Manufactured in ISO 9001-certified factories; conforms to European Community Directives 89/33/EEC, 73/23/EEC, 93/68/EEC; certified to IEC 61215
TÜV	Framed modules certified by TÜV Rheinland as Safety Class II (IEC 60364) equipment for use in systems up to 1000 VDC
UL	Listed by Underwriter's Laboratories for electrical and fire safety (Class C fire rating)
FM	Approved by Factory Mutual Research in NEC Class 1, Division 2, Groups C & D hazardous locations (U)

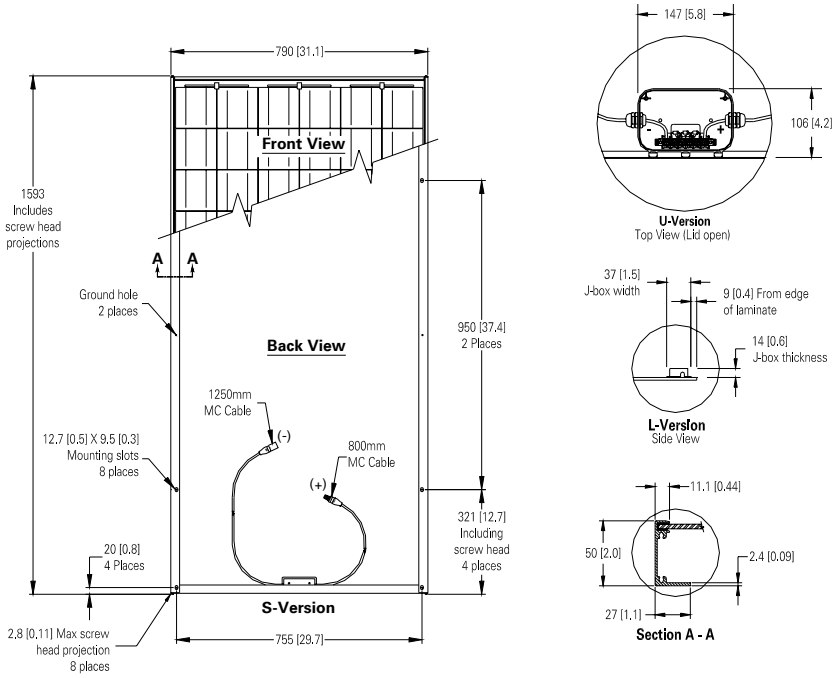
BP 3160 I-V Curves



Qualification Test Parameters

Temperature cycling range	-40°C to +85°C (-40°F to 185°F)
Humidity freeze, damp heat	85% RH
Static load front and back (e.g. wind)	50psf (2400 pascals)
Front loading (e.g. snow)	113psf (5400 pascals)
Hailstone impact	25mm (1 inch) at 23 m/s (52mph)

Dimensions in brackets are in inches. Unbracketed dimensions are in millimeters. Overall tolerances ±3mm (1/8")



Included with each module: self-tapping grounding screws, instruction sheet, and warranty document.

Note: This publication summarizes product warranty and specifications, which are subject to change without notice.

bp solar

Frequently Asked Questions on the New Federal Solar Tax Credits

This FAQ sheet should answer many of the questions facing companies in the solar energy industry about the federal solar tax credits. ***While we have to be very clear that SEIA cannot offer you tax advice, which can ultimately only come from your tax professional*** , this document should provide some initial guidance based on the legislative text.

In the coming weeks, SEIA will be working with the IRS to obtain formal guidance on these issues, and will keep you informed about the forms and procedures you will need to claim this valuable credit.

We encourage you to send questions to us at info@seia.org, so that we can obtain clarity on these key issues for you as soon as possible.

Business Credit vs. Residential Credit

	Old Incentive	New Incentive	Credit window	Cap	Eligible technologies
Business credit	10%	30%	1/1/06 - 12/31/07 at 30%; reverts to permanent 10% thereafter	No cap	PV, CSP, solar hybrid lighting, solar domestic water heating (excluding pool heating)
Residential credit	None	30%	1/1/06 - 12/31/07	$2,000 per system/ for each solar technology	PV, solar domestic water heating (excluding pool heating)

1. *What are the dates of the credit? Is it applicable to existing systems?*

The credits become available for systems that are "placed in service" - activated between January 1, 2006, and December 31, 2007. If the installation is on a new home, the "placed in service" date is the date of occupancy by the homeowner.

Systems that have already been installed are not eligible.

2. *What about systems that have been purchased but not installed?*

Should you sell / buy a system and even start work this year, but do not complete "original installation" of the system or "place it in service" until Jan. 1, it will qualify for the credit.

SOLAR ENERGY INDUSTRIES ASSOCIATION
805 15TH ST.. NW # 510
WASHINGTON. DC 20005
(202) 682 – 0556 (P)
(202) 682 – 0559 (F)
HTTP://WWW.SEIA.ORG

3. Can this credit be applied to capacity additions? (i.e. I have a 1.5 kW system and I want to add 1.5 kW more.) Similarly, can I apply this credit to used equipment going into a new installation?

This is not entirely clear at present. However, the language would suggest that both scenarios are allowed - the credits apply to the amount of expenditure on solar energy property in a given year. SEIA will work with the IRS to develop regulations favorable to the solar industry. We will pass on additional information as it becomes available.

4. How does the residential cap on expenditures operate?

An individual can take the 30% credit up to a $2,000 cap for photovoltaics, while also taking the credit up to a separate $2,000 cap for solar water heating. The credit may be carried over to future years.

Business entities have no cap on the total credit amount, provided they have a sufficient tax liability. Businesses have 2 years in which to take the credit.

5. How does the credit work with existing state credits or utility incentives?

The credit applies to the basis remaining after any state or utility incentives available to the taxpayer have been taken.

Example: a $10,000 system that receives $5,000 in state incentives would be eligible for a $1,500 Federal credit.

6. Are there any changes to the business solar tax credit other than percent?

The business solar tax credit will continue to be administered as before; all that has changed is the percentage increase to 30%. Operation and legal technicalities of the business credit are well established. An accountant or tax professional familiar with these rules should be able to inform you on any specific issues.

Contact: Rhone Resch, rresch@seia.org or Noah Kaye, nkaye@seia.org

Congress Extends Federal Solar Energy Tax Credits Through End of 2008

(WASHINGTON, DC) - In its waning hours, the 109th Congress today passed legislation that would extend the 30% solar energy investment tax credit (ITC) for homeowners and businesses for one additional year, through the end of 2008.

The Solar Energy Industries Association (SEIA) applauded the one-year extension of the solar ITC in H.R. 6111, the "Tax Relief and Health Care Act of 2006." At the same time, the industry cautioned that the lifespan of the credits is too short to encourage significant industry growth and cost reductions.

"While this bill does not constitute a long-term solar growth policy, it does provide some breathing room for solar projects in the 12- to 18-month pipeline," said Rhone Resch, SEIA President. "It ensures that the solar industry will continue to grow at a record rate in 2007. The passage of this bill with an extension of the solar ITC is recognition by Congress that solar is indispensable to our clean energy future."

An eight-year extension of the ITC will remain the solar industry's top legislative priority in 2007. A long-term extension is essential to reducing the cost of solar energy, as it would create market conditions that allow solar companies to make investments and drive down costs through economies of scale. A longer duration will also be needed to help stimulate the development of large-scale concentrating solar power projects.

SEIA's Resch expressed optimism that the 110th Congress would enact an eight-year extension as contained in S. 2677 and H.R. 5206, the "Securing America's Energy Independence Act," a bill which gained a bipartisan group of 80 House and 15 Senate cosponsors this year.

"This bill is a patch, and emphasizes the importance for Congress to enact long-term, comprehensive clean energy legislation when they return in January," said Resch. "We look forward to working with the next Congress, to craft a comprehensive and effective policy blueprint for a self-sustaining clean energy infrastructure in the United States."

****

The bill contains the following provisions:

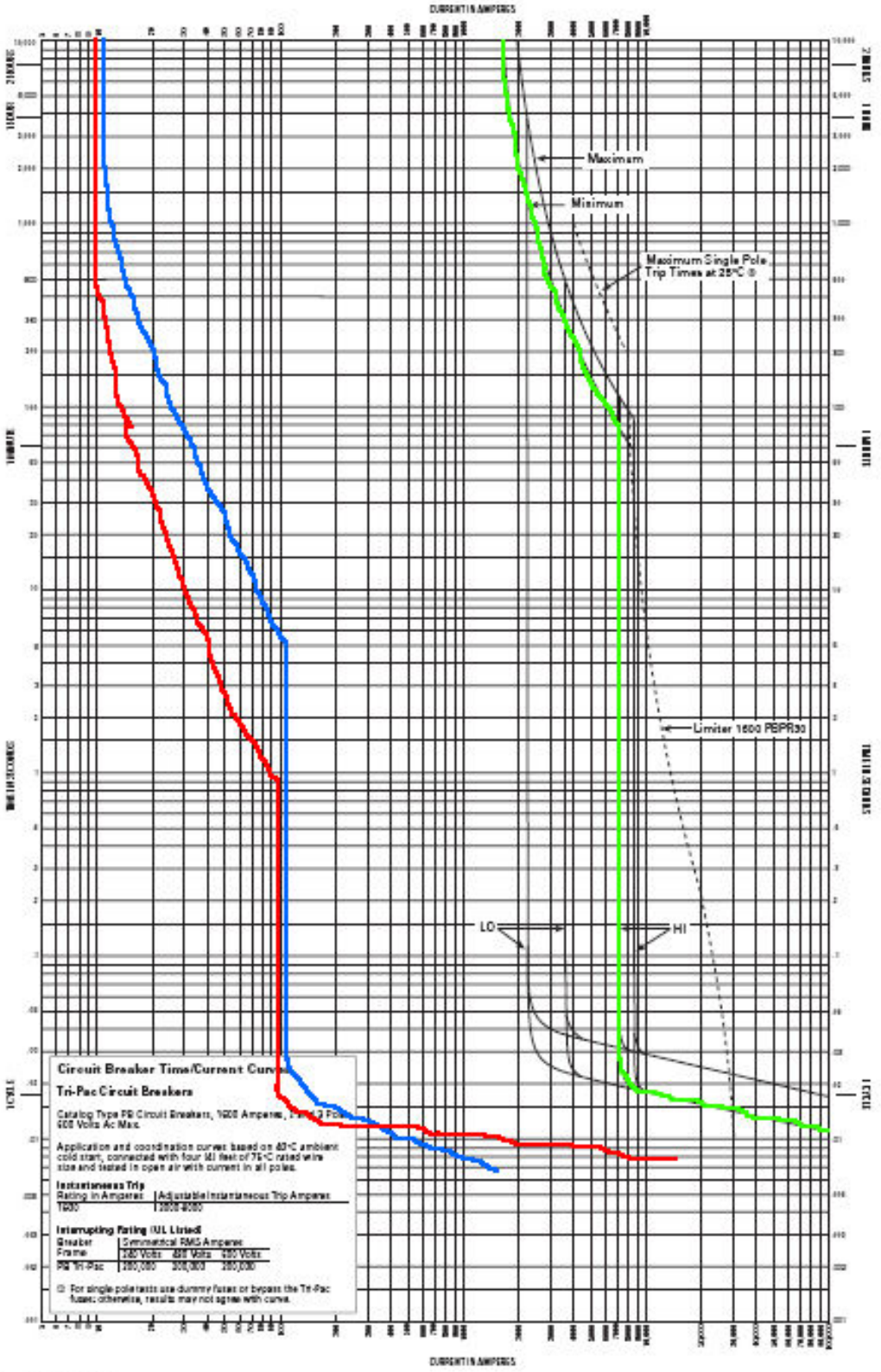
Residential Solar Tax Credit: Extends a 30-percent tax credit, created in the Energy Policy Act of 2005, for the purchase of residential solar water heating, photovoltaic equipment, and fuel cell property. Expires after December 31, 2008.

Business Solar Tax Credit and Fuel Cell Tax Credit: Extends a 30-percent business credit, established in the Energy Policy Act of 2005, for the purchase of fuel cell power plants, solar energy property, and fiber-optic property used to illuminate the inside of a structure. After December 31, 2008, the credit reverts to a permanent 10-percent level.

AB DE-ION Tri-Pac® Circuit Breakers

Type PB, 1600 Amperes, 2 and 3 Poles

1600A Ckt. Bkr.
400A Ckt. Bkr.
100A 3P Ckt. Bkr.



Curve No. SC-3604-76B

October 1997