

PRODUCT DESCRIPTION

Residential/Small Community 10 kW/12kWh Energy Storage System

The overall system:

- Enhances incoming utility and auxiliary power to the home,
- Provides uninterruptable power for selected critical circuits
- Integrates an optional solar photovoltaic (PV) renewable energy
- Provides Demand Response(DR) load management capability with utility systems

The system configuration includes the following features and benefits:

- A. 10 kW/12kWh power quality conversion switchgear utilizing UPS technology.
 - a. The power conversion system is comprised of the following components:
 - i. 1 (one) Multiflex™ A: Bi-Directional DC-DC converter with 48V to 400V operating range that includes MPPT capability. Maximum power for 96VDC and above, de-rating to 50% power at 48V.
 - ii. 1 (one) Multiflex™ B: Bi-Directional DC-DC converter with 48V to 400V operating range responsible for primary Grid charge and discharge interface. Maximum power for 96VDC and above, de-rating to 50% power at 48V.
 - iii. 1 (one) Energy Router™: Hardware, firmware, and software capable of tracking energy sources and loads, and autonomously optimizing energy flows to maintain targets and optimize battery life. Communicates with Multi-Flex™ units, A/C Interface, and battery pack BMS. The Energy Router™ can also communicate with external entities such as generators, third party energy management systems, and the utility.
 - iv. 1 (one) Automatic Transfer Switch with manual bypass
 - v. 1 (one) Display/control (panel) HMI
 - vi. 1 (one) Main input circuit breaker
 - vii. 1 (one) Anti-islanding relay to insure no back feeding to the Grid
 - b. The switchgear corrects common power quality problems with the utility supply, including the following:
 - i. Automated power factor compensation
 - ii. Automated surge assist
 - iii. Frequency control
 - iv. Voltage spikes and sags
 - c. The power conversion system will be capable of paralleling **up to five units** to extend the total power and /or energy storage capability to 50 kW/60 kWh.
 - d. The power conversion system is capable of responding to utility demand response functions by utilizing the energy storage capability of the unit.
 - e. System configuration is for a 110/220 split phase electrical service. Three units may be connected to provide 220 VAC 3 phase
- B. Energy storage utilizes a string of twenty-four (24) Axion PbC Group 30HT maintenance free batteries, series connected.

- a. The battery system includes Axion's Battery Management System (BMS) and Thermal Management system integrated through a Programmable Logic Control (PLC) to the power conversion system.
 - b. The primary Axion PbC battery features include:
 - i. Longer cycle life—factor of 3-4 X **that of advanced Lead acid batteries**
 - ii. 2500 cycles @ 100% depth of discharge
 - iii. Deep discharge capability without compromising cycle life
 - iv. Excellent Partial SOC Performance
 - v. High rate charge acceptance
 - vi. Environmentally friendly—99% recyclable
 - vii. Sealed VRLA package
 - c. The batteries are housed in a lockable enclosure.
 - d. Each individual battery has a one-hour rated capacity of 0.5 kWh,
 - i. The 24 unit battery string overall is rated at 12.0 kWh.
 - e. The battery provides approximately 80 minutes of operation at the full power rating.
 - f. Batteries will be shipped separately for installation at the customer site.
- C. The system is configured to integrate two DC power system inputs:
- a. The Axion PbC battery configuration as defined in Section B, and
 - b. Optional: Up to a 10 kW Solar PV system.
 - i. The integration of solar will qualify the customer for federal and state incentives to offset the cost of the system.
 - ii. The present federal "Energy Improvement and Extension Act of 2008" provides for a 30% tax credit for solar systems installed through December 31, 2016.
 - iii. Additional state incentives may also provide for cost recovery. A summary of the state incentives can be found on the website www.dsireusa.org.
 - iv. Solar system would be provided as a separate system, with the DC output from the array electrically connected to the Multiflex unit.
- D. Capability to interface with future electric utility "Smart Grid" programs such as demand response that would enable energy conservation.
- a. Electric utilities are in the process of developing "Smart Grid" programs, most of which contain provisions for demand side management at the residential level.
 - b. The system's energy storage features and capability to integrate with utility interface requirements will enable the customer to participate in these utility programs by reducing and shifting their peak loads, deriving potential cost savings that are envisioned for program participants.
- E. The system integration is provided by through the use of the Energy Router™. This includes integration of the UPS monitoring functions, solar energy production and usage, utility smart grid interface requirements and other features to enable homeowner monitoring both from in-home and remote access capability. Major software components include:
- a. UPS operational and control
 - b. Solar energy inverter operation and control

TECHNICAL SPECIFICATION—POWER CONVERSION

Power Module	Specifications
Inverter	4-Quadrant (Bi-directional)
AC Output Voltage	Single-phase 120 VAC or Split-Phase 2220
AC Output Frequency	60 Hz or 50 Hz (-0.7Hz, + 0.5Hz)
AC Input Frequency Range	selectable between 50 and 60 Hz (-0.7 Hz, +0.5 Hz)
Maximum Continuous AC Output Power	10,000 watts
Maximum surge rating for 10 seconds	150%
DC Bus operating Range	48-400 VDC
DC Battery Nominal Voltage	288 VDC
THD	< 3%
Power Factor, Full load	>0.99
Dynamic Power Factor Control	+/- 0.8
Power Curtailment	0-100%, 1% Steps
Response Time-grid to battery operation	1/2 cycle
Operating Temperature Range	-20 °C to +40 °C
Storage Temperature Range	(-40°C to +60°C)
Maximum altitude	5000 feet , De-rating 3% per 1,000 feet above 5,000
Relative Humidity (non-condensing)	Up to 95%
Noise Level (distance of 3 feet): < 65dB(A)	< 65dB(A)
Enclosure Dimensions (HXLXW)	----" X ----" X ----"
Weight	---- lb. (----kg)
HMI Control	Specifications
Display	
Connectivity	Ethernet (Wi-Fi)
Communications	MODBUS/TCP interface for remote communications
Dimensions (H x W x D)	----" x ----" x ----"
Axion PbC Battery	Specifications
BCI Group Size—quantity	30HT—24 units
Nominal 1 hour rating	75 Ah
Battery Voltage End-of-Charge	324 VDC
Battery Voltage—Nominal Open Circuit	288 VDC
Dimensions (L X W X H)	13.5" X 6.75" X 10.75"
Weight	75 lbs.
Configuration	4 trays of 6 batteries each
Spill containment	For the enclosure