

Active Surge Monitor

Surge Protective Device Monitoring

Guide Specifications

1.0 GENERAL

1.1 Summary : These specifications describe the electrical and mechanical requirements for a voltage/circuit monitor. The specified system shall provide effective and accurate voltage quality measurements via LCD front panel display and on-board web server. The monitoring system shall be suitable for use as within a Surge Protective Device (SPD) rated Type 1 and Type 2 per ANSI/UL 1449 Fourth Edition.

1.2 Standards : The specified system shall be designed, manufactured, tested and installed in compliance with the following codes and standards:

Underwriters Laboratories (UL); UL60950,
Canadian Underwriters Laboratories (cUL) for Type 2 devices
American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE); C37.90.1, C12.20

International Electrotechnical Commission (IEC); 50081-2, 61000-3, 61000-4, 61326,
Federal Communications Commission; (FCC part 15 class B, EN55011)

1.3 System Description: The monitoring system shall be constructed using a microprocessor based design. A clear and visible LCD display with navigation buttons on the front panel shall provide access to past and present power quality & surge protection data. The system shall provide for connection via Ethernet, RS-485, and Form C. Voltage quality events beyond a configurable threshold shall be detected, measured, and recorded within the device. The system shall include all equipment and software to allow data/measurement viewing on the units display, with a direct connected PC, or from a networked remote location.

1.4 Submittals

1.4.1 Documentation: These specifications are based on the ASCO Active Surge Monitor (ASM) system. All other manufacturers shall submit for 10-day pre-approval, a detailed compliance or exception statements to all provisions of this specification to allow consideration. Failure to do so will result in product disapproval. Any deviation from the published specification will result in an applicable deduct applied.

1.4.2 Equipment Manual: The manufacturer shall furnish an installation manual with installation, startup, and operating instructions for the specified system.

1.4.3 Drawings: Electrical and mechanical drawings shall be provided by the manufacturer that show unit dimensions, weights, component and connection locations, mounting provisions, connection details and wiring diagram.

1.5 Quality Assurance: The manufacturer shall be ISO 9001:2015 certified. The specified assembly shall be designed and manufactured in the USA by a qualified manufacturer of SPD monitoring products and line conditioning equipment. The manufacturer shall have been engaged in the design and manufacturer of such products for a minimum of 30 years.

1.6 Warranty: The manufacturer shall provide a full ten-year warranty from date of shipment against any part failure when installed in compliance with manufacturer's written instructions, UL Listing requirements and any applicable national, state or local electrical codes.

1.7 Electrical Requirements

1.7.1 Nominal system operating voltage: The systems nominal operating voltage

range shall be from 80VAC to 600VAC.

1.7.2 Maximum Continuous Operating Voltage (MCOV): The systems maximum continuous operating voltage (MCOV) shall be greater than 115% of the nominal system operating voltage to ensure the ability of the system to withstand temporary RMS over-voltage (swell conditions).

1.7.3 Operating Frequency: The operating frequency range of the system shall be at least 45 - 67 Hz.

1.8 Environmental Requirements

Storage Temperature:	-40 to +85°C (-40 to +185°F)
Operating Temperature (Meter):	-25 to +70°C (-13 to +158°F)
Operating Temperature (Display):	-10 to +50°C (+14 to +122°F)
Relative Humidity:	5% to 95% @ 40°C (non-condensing)
Audible Noise:	less than 45dB at 5 feet (1.5m)
Operating Altitude:	0 to 6,561 feet (2000m) above sea level

2.0 PRODUCTS

2.1 Acceptable Manufacturers: The listing of specific manufacturers does not imply acceptance of their products that do not meet the performance and/or physical characteristic requirements of this specification. Manufacturers listed are not relieved from meeting these specifications in their entirety.

Any and all substitutions for products in compliance by manufacturers not listed must be submitted and pre-approved by the Engineer ten (10) days prior to bid date.

Electric monitoring systems manufactured by one of the following manufacturers will be acceptable:

1. ASCO – **Active Surge Monitor**

2.2 Measurements: Each device shall provide the following real-time measurements visible on the units front panel display as well as the units WebServer:

- a. **RMS voltage** line-to-neutral and line-to-line for each phase and average of all three phases calculated every 100ms to $\pm 1\%$ accuracy.
- b. **Crest Factor** for each line-to-neutral expressed as a percentage.
- c. **Voltage Unbalance** for each line-to-neutral expressed as a percentage.
- d. **Voltage Total Harmonic Distortion (VTHD)** for each line-to-neutral and line-to-line expressed as a percentage calculated every 100ms to $\pm 1\%$ accuracy.
- e. **Frequency** shall be 45-67Hz with ± 1 Hz accuracy averaged a 1-second intervals.
- f. **Harmonic Distortion** for each line-to-neutral and line-to-line voltage, provided as individual odd harmonic magnitudes from fundamental to the 13th harmonic. The total odd, total even, and total overall harmonic distortion shall be provided; all readings given as a percentage.
- g. **SPD Health Status** for each phase and neutral-to-ground given as a percentage, ranging from 0-100%.

2.3 Event Logging: Each device shall identify and save a record of each power quality event detected by the system. A Date/Time stamp and event duration/magnitude shall be provided with each recorded event.

- a. **Sag & Swell** - voltage sag/swell that drops below/exceeds the nominal voltage by a user configurable percentage. A totalized count with reset function shall be included for sags and swells.
- b. **Surge/Transient** – provide phase affected & severity categorized as an ANSI/IEEE category C, B, or A surge event. A totalized count with reset function shall be included for surges/transients.

- c. **Phase Loss/Outage** - user configurable threshold, provides the percentage deviation, duration, & mode affected
- d. **Voltage Interruption/Dropout** – user configurable threshold, provides the percentage deviation & phase affected
- e. **Voltage Harmonics (VTHD)** – user configurable thresholds, provides the harmonic number, percentage deviation & phase affected.
- f. **Over/Under Frequency** - user configurable threshold, provides the Hz deviation.
- g. **Temporary Overvoltage (TOV)** - user configurable threshold, provides peak severity & average severity, reported as percentage deviation from nominal & mode affected
- h. **Overvoltage** - user configurable threshold, provides peak severity & average severity, reported as percentage deviation from nominal & mode affected
- i. **Neutral Bond** – user configurable threshold, provides peak severity & average severity, reported as RMS voltage
- j. **Protection Failure** – including mode affected, severity, and related voltage parameters at the moment of failure.

2.4 Communication & Connection: The monitoring system shall provide for communication & connection with the following systems:

2.4.1 RJ-45 Ethernet Port

- a. SNMP & SMTP via TCP/IP
- b. MODBUS TCP
- c. Webserver with web pages & system information embedded

2.4.2 5-pin Isolated RS-485 port

- a. MODBUS RTU

2.4.3 Form C dry contacts: Provides a minimum of two (2) complete sets of Form C dry contacts, 24VAC & 24VDC at 2A. (NO, COM, NC)

2.5 System Software: The monitoring system shall be equipped with an Embedded Webpage to provide the user with web access to real-time and logged data. The system firmware/software must be user updateable, with the current and previous versions accessible on the manufacturers website.

2.5.1 Email Notification

Monitoring system software shall provide email notification for up to 5 email addresses, for user configured events.

2.6 Standard Features:

2.6.1 Unit Status Indicators—device shall be equipped with red and green solid state indicators monitoring all phases and N-G (where applicable). Indicators must be mounted within the enclosure and must be externally visible.

2.6.2 Delta Sigma A/D Conversion – the metering system shall provide high-resolution Delta Sigma A/D Conversion.

2.6.3 Logging Memory – The meter shall provide memory reserved for event logging. Logging memory shall be capable of storing on board a minimum of 2000 events.

3.0 EXECUTION

3.1 Installation: The contractor shall follow the device manufacturer’s recommended installation practices as found in the installation, operation and maintenance manual and comply with all applicable State, National, and Local Building Codes. All power supply and communication wiring shall be installed in conduit.

- 3.2 Factory Testing:** All standard factory tests shall be performed in accordance with the latest version of NEMA and UL standards.
- 3.3 Field Testing:** Provide functional testing including verification that all systems are operating properly and the web server is reading and recording data.

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