Advanced Fusion EMProve®-E1

Intermediate Class Medium Voltage
Ultra-Fast Surge Arrester

Setup and Installation

The indoor EMProve®-E1 (model UFSAXXE1-A, see Fig. 1 without sheds) is suitable for installation in equipment housing and inside buildings where pollution degree levels are very light to light.

The outdoor EMProve®-E1 (model UFSAXXE1-B, see Fig. 2 with sheds) is suitable for all installation locations exposed to the elements, where pollution degree is medium to heavy.

The EMProve®-E1 must not be used as a structural member for any other device or equipment.

The EMProve®-E1 device is intended to be mounted to the phase conductors and neutral to a solid ground reference, ideally within 1 meter of the asset that is to be protected.

Due to the fast transient E1 pulse with high di/dt current flowing in the connecting leads, one must expect additional voltages to be developed in those connecting leads. This will add to the E1 protective levels in Table 1 below, so it is important to have low inductance connecting cables. A thin wide strap connection is preferred if practical.

Example: Assume the inductance of the connecting leads is 250 nH and the 2.5 kA/20 nS current is flowing in that lead, an additional 31 kV would be added to the E1 protect level of the UFSA.

Environmental Specifications

- Temperature range (storage/operating): -40 ^{O}F (-40 ^{O}C) to 150 ^{O}F (65 ^{O}C)
- Humidity: 5 % to 95 % (noncondensing)

Electrical connections are made to the EMProve®-E1 by two NEMA compliant threaded holes on each connection flange. Various standard adapters are available at additional cost to facilitate electrical connections. Custom adapters can be designed and fabricated.

It is suggested that the bottom conductor of the EMProve®-E1 (ground connection) be made with a rigid connection to support the device from below. However, if impractical, a flexible wire or copper strap of suitable ampacity rating no longer than necessary may be used to make this connection.

The top conductor of the EMProve®-E1, phase connection may be made with either a low inductance flexible wire (or strap) of suitable ampacity rating no longer than necessary

Table 1 Typical Performance

				Electrical					
Rating	MCOV	Energy Class	[1] Standby Current	Bypass Current	Housing BIL	Reaction time	[2] DC Holdoff	E1 Protect Level	Megger
6 kV	5.1 kV	H	"< 20 µA	5.0 kA	110 kV	<6 nS	14.7 kV	54.6 kV	474 MΩ
10 kV	8.4 kV	H	"< 20 µA	5.0 kA	110 kV	<6 nS	28.5 kV	60.5 kV	749 MΩ
15 kV	12.7 kV	H	"< 20 µA	5.0 kA	110 kV	<6 nS	36.5 kV	70.0 kV	866 MΩ
*18 kV	15.3 kV	H	"< 20 µA	5.0 kA	302 kV	<6 nS	38.5 kV	85.3 kV	870 MΩ

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[1] RMS at 60 Hz [2] dv/dt of 500 V/S Typical σ = 1.1 kV (DC Holdoff) and σ = 1.9 kV (E1 protect level)

* In final development, higher voltages available upon request

		Mechanical	Fig 1, 2, and 3 below	
Rating	Height	Width	Weight	Temperature
6 kV	9 "	3 "/5.76 "	5.5 lB/6.9 lB	-40 C to +65 C
10 kV	9 "	5.76 "	6.9 lB	-40 C to +65 C
15 kV	9 "	5.76 "	6.9 lB	-40 C to +65 C
*18 kV	16 "	5.76 "	11.63 lB	-40 C to +65 C

The UFSA is designed not to require maintenance. All UFSA units have been tested to 10 or more EMP pulses at the manufacturing facility.

While testing and maintenance are not required, if every other year you want to check the UFSAs, wait until your system is down for lightning surge arrester maintenance, you can do a quick check to see if any changes to the UFSA readings have changed more than 3 standard deviations from the data in Table 1 above.

The tests must be done with the UFSA disconnected from your system and the equipment to do the tests is listed below.

- Megger – Model 1625 or equivalent
- Frequency response analyzer (BODE plot from 500 kHz to 5 MHz)
- Standard 1:1 scope probe
- Current probe – Keysight DXO1204 or equivalent

As an alternative to your testing, you may send the units to AFS, Doble Engineering or Omicron who offer testing for Utility systems and equipment.

E1 verification requires the following equipment

- Pulse generator (150 to 300 kV) capable of producing a Mil-125-188 Appendix B Pulse current (2.5 or 5 kA)
- High voltage scope probes – Northstar PVM series
- Current probes – Prodyn I-125-9A or equivalent
- Oscilloscope – Keysight 6004A or equivalent

Another option to test for E1 is to purchase spares and return units to AFS for testing or arrange with SARA, Oak Ridge National Labs, or Boeing Little Mountain test facilities for example.

Fig 1: 6 kV

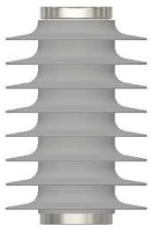

Fig 2: 6 – 15 kV

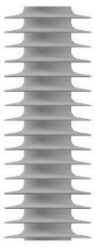

Fig 3: 18 – 36 kV

Your Favored supplier for EMProve® products

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