

## Certificate of Performance of Protective Coatings for Voltage Regulators

The following are performance requirements and test results on test panels prepared at Eaton, Badger Drive Assembly Plant, located in Waukesha, Wisconsin, using production equipment.

The test panels were prepared from 12- and 14-gauge hot rolled, pickled, and oiled steel representative of the material used to fabricate production units. These test panels were washed and zinc phosphatized utilizing the production metal pretreatment systems. A high-build, cationic epoxy primer was applied by electrodeposition and baked for 30 minutes at a metal temperature of 350 °F. The finish coat utilized was a two-part catalyzed polyurethane applied with an air-assisted airless spray system and baked for 15 minutes at a temperature of 180 °F.

All tests were conducted in accordance with the requirements of IEEE Std C57.12.28™ Standard for Pad-Mounted Equipment – Enclosure Integrity. The tests were performed at the Eaton, Thomas A. Edison Technical Center, in Franksville, Wisconsin.

**Note:** Unless otherwise noted, the paint thickness on the test panels was 2.5 – 4.0 mils dry film thickness.

### 1. Simulated Corrosive Atmospheric Breakdown (SCAB).

This test was performed according to the guidelines outlined in the IEEE Std C57.12.28 standard. The SCAB corrosion test is a cyclic test exposing the painted test panels to a corrosive salt-water solution, thermal conditions, and elevated humidity/temperature conditions. For the pad-mounted standard, 15 cycles of exposure testing is required. After the SCAB cycle test is completed, the panel scribe lines must receive a rating greater than six according to the guidelines of ASTM D1654. The primer and primer-plus-topcoat panel sets obtained ratings of greater than eight, passing this test requirement.

### 2. Crosshatch Adhesion.

The test was conducted per ASTM D3359. The panels were scored to bare metal with a crosshatch pattern and tested by applying an adhesive tape which is then quickly removed from the painted surface. There was 100% adhesion of the paint to the substrate and intercoat adhesion between the topcoat and primer.

### 3. Humidity Tests.

Test panels were exposed for 1000 hours of 45 °C condensing humidity in accordance with ASTM D4585. All panels passed at 1000 hours with no blistering or loss of pencil hardness.

### 4. Impact Test.

The test panels were impact tested per ASTM D2794 using a Gardner Impact Tester. The panels were subjected to 80 inch pounds of direct impact and then placed into a salt-spray chamber for 24 hours. After removal from the chamber, no rust was observed on any of the impact intrusion areas meeting the test criteria.

### 5. Fluid Resistance Test.

Test panels were immersed in transformer mineral oil and Envirotemp™ FR3™ fluid for 72 hours at 100 - 105 °C. This test requires that there shall be no apparent changes, such as color shift, blisters, loss of pencil hardness, or streaking. The test panels exhibited no physical evidence of change or loss of pencil hardness after these soak tests.

### 6. Ultraviolet Accelerated Weathering Test.

IEEE Std C57.12.28™ standard requires this test only for coated surfaces on the exterior of the enclosure. Top-coated test panels were exposed according to the guidelines outlined in ASTM D4587 for 500 hours, utilizing FS-40 lamps with a cycle of four hours ultraviolet lamps on at 60 °C alternated by four hours condensing humidity at 50 °C. Loss of gloss shall not exceed 50% of the original gloss as determined by the Specular Gloss Test described in ASTM D523. The top-coated test panels passed the 500 hours test with less than 20% loss of gloss.



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**7. Abrasion Resistance - Taber Abrasion Test.**

The test panels were tested using a CS-10 wheel and a 1000 gram weight as per ASTM D4060. After 3000 cycles of abrasion, the test panels were placed into a salt-spray chamber for 24 hours. After removal from the chamber, the test panels did not exhibit any red rust on the abraded surfaces, passing the requirements of this test method.

**8. Gravelometer.**

This test was conducted according to the guidelines outlined in ASTM Standard Test Method D3170. The test panels were impacted with a specified amount of stones at an air pressure of 60 psi. After 24 hours of salt-spray exposure, the chipped paint was evaluated for rust. The size and density of the chips were then rated utilizing a chart which is in SAE Specification J400. The panels tested were rated between the specified range of 4B to 9B meeting the requirements of this test. When the recloser operates to lockout, the hydraulic mechanism releases a charged lockout spring and mechanism, preventing the plunger from resetting and the contacts from reclosing. The series-trip coil is capable of withstanding the magnetic forces generated by maximum-rated fault currents and is effectively shunted by a bypass gap for surge protection.

**Conclusion.** The primer and primer with top coat paint systems applied at the Eaton Badger Drive Assembly facility meet all the requirements of IEEE Std C57.12.28™ standard, Standard for Pad-Mounted Equipment – Enclosure Integrity.

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