

<b>PEARL Inspect &amp; Test Standards</b>			
<b>LOW VOLTAGE MOLDED CASE MOTOR CIRCUIT PROTECTORS</b>	Revision		
	Standard	Number	Date
	<b>1215-I</b>	3	6-2009

This standard is designed to verify that a low voltage molded case motor circuit protector is in a safe and reliable operating condition based upon the design of the original manufacturer at the time of manufacturing. PEARL testing does not verify the claims of the original equipment manufacturer as to the validity of its design criteria. In the event that the device is not in this condition then this standard cannot be used and the PEARL Reconditioning Standard needs to be followed.

**NOTE:** This standard pertains only to those breakers that can be opened for inspection, maintenance and part(s) replacement purposes. This standard does not pertain to riveted frame molded case circuit breakers and other such breakers.

PEARL does not warrant, guarantee or make any representation regarding the correctness of specifications, use for any particular purpose, quality or extent of testing, accuracy, or reliability as to any equipment, products or documentation referenced herein.

## **REFERENCES**

The following references are use in this standard. Each of these references can be found in their respective listed locations.

### Table References: Section 6000

- Table 1 US Standard bus connection bolt torque values.
- Table 2 Insulation resistance and test values for electrical apparatus.
- Table 4 Adjustable Trip Circuit Breakers Instantaneous Trip Setting Test Tolerances
- Table 11 Insulation resistance and test temperature conversion to 20°C values.

### National Electrical Code – NEC 2002 Edition

- Article 310 Conductors for General Wiring
- Table 310.17 Allowable Ampacities of Single-Insulated Conductors Rates 0 Through 2000 Volts in Free Air, Based on Ambient Air Temperatures of 30°C (86°F).

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## **I TEST EQUIPMENT**

The following test equipment is required to perform the testing requirements of this standard:

1. Insulation Resistance Test Set (Megohmmeter) 1000 Vdc minimum
2. High Current Test Set

One of the following pieces of test equipment is required to perform the contact resistance testing requirements of this standard:

1. Digital Low Resistance Ohmmeter (DLRO - 10 amp unit is sufficient.)
2. DC Current Source and a Millivoltmeter

One of the following pieces of test equipment may be required to perform the testing requirements of this standard, depending on the accessories:

1. AC Voltage Supply
2. DC Voltage Supply

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## **II EVALUATION**

These steps are used to determine what will be required to recondition this product under this standard.

### **1 INSPECTION**

#### **1.1 Case**

- 1.1.1** Ensure that the nameplate/label data is legible.
- 1.1.2** Ensure that the third party listing service label is legible.
- 1.1.3** Inspect the case for cracks, chips and unused holes.
- 1.1.4** Inspect the case for signs of overheating.
- 1.1.5** Inspect all control wire for signs of deterioration, overheating and damage.
- 1.1.6** Inspect for missing parts.
- 1.1.7** Record results on an approved PEARL Evaluation Form.

#### **1.2 Lugs**

- 1.2.1** Inspect for tightness.
- 1.2.2** Inspect for signs of overheating.
- 1.2.3** Inspect plating.
- 1.2.4** Inspect for signs of cross threads and stripped threads.
- 1.2.5** Record results on an approved PEARL Evaluation Form.

#### **1.3 Operating Mechanism**

- 1.3.1** Inspect for signs of rust and corrosion.
- 1.3.2** Inspect for excessive and inappropriate lubrication.
- 1.3.3** Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
- 1.3.4** Manually operate motor circuit protector a minimum of three (3) times while checking for proper operation of the quick-make and quick-break feature.
- 1.3.5** Record results on an approved PEARL Evaluation Form.

#### **1.4 Interphase Separators**

- 1.4.1** Inspect for dust, dirt and foreign materials.
- 1.4.2** Inspect for chips, cracks and deterioration.
- 1.4.3** Inspect for overheating.
- 1.4.4** Record results on an approved PEARL Evaluation Form.

#### **1.5 Arc Extinguishers/Chutes**

- 1.5.1** Inspect for loose and missing parts.
- 1.5.2** Inspect for dust, dirt, foreign material, cracks, chips and signs of overheating.
- 1.5.3** Inspect for excessive deterioration and carbon buildup on the metal separator.
- 1.5.4** Inspect arc runners for excessive deterioration.
- 1.5.5** Record results on an approved PEARL Evaluation Form.

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- 1.6 Arcing Contacts**
  - 1.6.1 Inspect for excessive deterioration.
  - 1.6.2 Inspect for cracks, chips and pitting.
  - 1.6.3 Check for proper alignment/seating in the closed position.
  - 1.6.4 Record results on an approved PEARL Evaluation Form.
- 1.7 Main Contacts**
  - 1.7.1 Inspect for excessive deterioration.
  - 1.7.2 Inspect for cracks, chips and pitting.
  - 1.7.3 Check for proper alignment/seating in the closed position.
  - 1.7.4 Record results on an approved PEARL Evaluation Form.
- 1.8 Current Carrying Components**
  - 1.8.1 Inspect hinge/pivot joints for signs of overheating.
  - 1.8.2 Inspect hinge/pivot joints for missing and defective parts.
  - 1.8.3 Inspect any other current carrying components for signs of overheating.
  - 1.8.4 Inspect any other current carrying components for missing and defective parts.
  - 1.8.5 Record results on an approved PEARL Evaluation Form.
- 1.9 Instantaneous Units**
  - 1.9.1 Inspect for signs of overheating.
  - 1.9.2 Inspect for corrosion and rust.
  - 1.9.3 Inspect unit for missing and defective screws, bolts, nuts, fasteners and keepers.
  - 1.9.4 Check for loose connections.
  - 1.9.5 Check for proper sizing.
- 1.10 Shunt Trip Devices (if installed)**
  - 1.10.1 Inspect shunt trip unit for missing and defective screws, bolts, nuts, fasteners and keepers.
  - 1.10.2 Inspect shunt trip unit for signs of overheating and deteriorated insulation.
  - 1.10.3 Inspect for pinched and damaged wire insulation.
  - 1.10.4 Check shunt trip unit for loose and defective terminal connectors.
  - 1.10.5 Record results on an approved PEARL Evaluation Form.
- 1.11 Undervoltage Trip Devices (if installed)**
  - 1.11.1 Inspect undervoltage trip unit for missing and defective screws, bolts, nuts, fasteners and keepers.
  - 1.11.2 Inspect undervoltage trip unit for signs of overheating and deteriorated insulation.
  - 1.11.3 Inspect for pinched and damaged wire insulation.
  - 1.11.4 Check undervoltage trip unit for loose and defective terminal connectors.
  - 1.11.5 Record results on an approved PEARL Evaluation Form.

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## 2 TESTING

### 2.1 Insulation Resistance

2.1.1. Perform an insulation resistance at test values specified in Table 2 of Section 6000 as follows:

2.1.1.1. Circuit breaker in the open position

2.1.1.1.1. Line to load

2.1.1.2. Circuit breaker in the closed position

2.1.1.2.1. Phase to phase

2.1.1.2.2. Phase to Ground

2.1.2. Correct for temperature, if necessary (Table 11).

2.1.3 Record results on an approved PEARL Evaluation Form

2.1.4 Compare test results to manufacturer's recommendations or Table 2 of Section 6000.

### 2.2 Contact Resistance

2.2.1 Perform a contact resistance, millivolt drop test or watt-loss test from line to load on each phase of a closed motor circuit protector.

2.2.2 Record results on an approved PEARL Evaluation Form.

2.2.3 Compare test results to manufacturer's recommendations.

2.2.4 A PEARL recognized method is comparing the test results of each pole. Results should be within 50% for any of the poles. Any industrial standard used shall provide at least the same integrity as the PEARL recognized standard of comparing the test results of each pole and ensuring that they are within 50% of each other.

### 2.3 Instantaneous Trip Test

2.3.1 Perform an instantaneous pickup test. Note: this test is done with fuses removed and the blown fuse feature defeated, if applicable.

2.3.2 Perform an instantaneous trip test to the motor circuit protector. Note: this test is done with fuses removed and the blown fuse feature defeated, if applicable.

2.3.3 Use specific length and size of wire that meet or exceeds manufacturer's guidelines or NEC, Article 310, Table 310.17.

2.3.4 Record results on an approved PEARL Evaluation Form.

2.3.5 Compare results to manufacturer's recommendations or Table 4 of Section 6000.

### 2.4 Shunt Trip Test (if installed)

2.4.1 Close motor circuit protector.

2.4.2 Connect appropriate voltage source to shunt trip input leads.

2.4.3 Increase voltage until shunt trip unit operates. Verify that the device operates properly at its minimum rated voltage.

2.4.4 Record results on an approved PEARL Evaluation Form.

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- 2.5 Undervoltage Unit** (if installed)
- 2.5.1** Connect voltage source to undervoltage input leads.
  - 2.5.2** Apply rated voltage to the undervoltage unit.
  - 2.5.3** Close motor circuit protector.
  - 2.5.4** Decrease voltage until undervoltage unit operates and trips the motor circuit protector.
  - 2.5.5** Verify that the device operates properly within its rated voltage range.
  - 2.5.6** Record results on an approved PEARL Evaluation Form.

**NOTE:** If the original equipment manufacturer has designed the breaker to have field interchangeable trip units, then the device may be replaced as necessary. Otherwise, if changes are made to the trip unit then the PEARL Reconditioning Standards need to be followed.

**2.6 Checks and Adjustments**

- 2.6.1** Make all checks and adjustments per manufacturer's recommendations. In the absence of a manufacturer's recommendations, any check or adjustment made will be based upon procedures that will ensure the original manufacturer's design.
- 2.6.2** All checks and adjustments must be within the guidelines recommended in order for the product to become a PEARL labeled product.
- 2.6.3** Record results on an approved PEARL Evaluation Form.

**2.7 Torque**

- 2.7.1** Check all screw and bolt connections for the proper torque per manufacturer's recommendations or Table 1 of Section 6000.
- 2.7.2** Record results on an approved PEARL Evaluation Form.

**2.8 Final Operation**

- 2.8.1** Ensure that all components, structures, devices and assemblies are complete and equipment is ready for service prior to beginning operations.
- 2.8.2** Manually operate breaker a minimum of ten (10) times while checking for proper operation of the quick-make and quick-break feature.
- 2.8.3** All devices must operate properly in order for the product to become a PEARL labeled product.
- 2.8.4** Record results on appropriate PEARL Evaluation Form.

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### **3 EVALUATION REVIEW**

In order for the device to be eligible for the Inspect & Test Quality Seal, the device needs to have passed all of the preceding Inspection (1) and Testing (2) points. Any failures in the process will require that the device be “Reconditioned” at which time the PEARL Reconditioning Standard needs to be followed.

### **III PEARL CERTIFICATION**

This product has now been inspected and tested and has passed all tests under the PEARL Inspect & Test Standard. The green PEARL Inspect & Test Quality Seal may now be placed on the device.