PEARL Reconditioning Standards			
LOW VOLTAGE MAGNETIC STARTERS COMBINATION	Revision		
	Standard	Number	Date
	1530	5	11-2008

The term "reconditioning" is defined as "the process of returning electrical equipment to safe and reliable operating condition based on the design of the original manufacturer at the time of manufacturing."

NOTE: If fuses are installed, they are to be properly designed and rated with respect to voltage and interrupting rating for the device and specific application for which they are intended, and must be approved by the customer for said purpose. The final determination is ultimately the responsibility of the end user.

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 11: Insulation resistance and test temperature conversion to 20°C values.

The Following PEARL Standards are referenced in this standard and should be followed if applicable.

PEARL Standard References

Section 1100: *Low Voltage Disconnect Switches*
Section 1200: *Molded Circuit Breakers*
Section 1400: *Low Voltage Transformers*
Standard 1420 – Low Voltage Transformer Control Power
Standard 1430- Low Voltage Transformers Instrumentation Voltage
Section 1700: *Protection Relays*
Section 1800: *Low Voltage Contractors and Relays*
Section 1900: *Apparatus Accessories*

I TEST EQUIPMENT

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

1. Insulation Resistance Test Set (Megohmeter) 1000 Vdc minimum

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

1. AC Voltage Supply
2. AC Current Supply with means to perform timing test
3. AC 3-Phase Voltage Supply
4. DC Voltage Supply
5. Digital Low Resistance Ohmmeter (DLRO - 10 amp unit is sufficient.)

II RECONDITION EVALUATION

These steps are required to determine if the product can be reconditioned and if so, establish what must be done to recondition the product.

1 INSPECTION

1.1 Frame/Enclosure

1.1.1 Ensure that the nameplate data is legible.
1.1.2 Ensure that the third party listing service label is legible.
1.1.3 Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
1.1.4 Inspect for rust and corrosion.
1.1.5 Check for plumb and square.
1.1.6 Inspect for unused openings.
1.1.7 Record results on an approved PEARL Evaluation Form.

1.2 Operating Mechanism

1.2.1 Inspect for signs of rust and corrosion.
1.2.2 Inspect for excessive and inappropriate lubrication.
1.2.3 Inspect for missing screws, bolts, nuts, fasteners, retainers and keepers.
1.2.4 Manually operate mechanism three (3) times while checking for proper operation of the quick-make and quick-break feature.
1.2.5 Record results on an approved PEARL Evaluation Form.

1.3 Low Voltage Disconnect Switch (if applicable)

1.3.1 Low voltage disconnect switches will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1100.
1.3.2 Record results on an approved PEARL Evaluation Form.

1.4 Molded Case Circuit Breaker (if applicable)

1.4.1 Molded case circuit breakers will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1200.
1.4.2 Record results on an approved PEARL Evaluation Form.

1.5 Molded Case Motor Circuit Protector (if applicable)

1.5.1 Molded case motor circuit protectors will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1200.
1.5.2 Record results on an approved PEARL Evaluation Form.

1.6 Molded Case Switch (if applicable)

1.6.1 Molded case switches will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1200.
1.6.2 Record results on an approved PEARL Evaluation Form.

1.7 Current Carrying Components

1.7.1 Inspect line and load connections for signs of overheating.

1.7.2 Inspect line and load connections for missing and defective parts.

1.7.3 Inspect hinge/pivot joints for signs of overheating.

1.7.4 Inspect hinge/pivot joints for missing and defective parts.

1.7.5 Inspect any other current carrying components for signs of overheating.

1.7.6 Inspect any other current carrying components for missing and defective parts.

1.7.7 Record results on an approved PEARL Evaluation Form.

1.8 Interlocks

1.8.1 Check all enclosures for interlock function.

1.8.2 Record results on an approved PEARL Evaluation Form.

1.9 Devices

1.9.1 Instrumentation and controls

1.9.1.1 Inspect all indicator lights, push buttons, switches and control devices for:

1.9.1.1.1 Damage

1.9.1.1.2 Proper ratings

1.9.1.1.3 Loose connection**s**

1.9.1.2 Inspect all control wiring for signs of:

1.9.1.2.1 Deterioration

1.9.1.2.2 Overheating

1.9.1.2.3 Loose connections

1.9.1.3 Verify accuracy and legibility of all applicable wiring schematics and drawings.

1.9.1.4 Record results on an approved PEARL Evaluation Form.

1.9.2 Control Power Transformers (if applicable)

1.9.2.1 Control power transformers will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1400.

1.9.2.2 Record results on an approved PEARL Evaluation Form.

1.9.3 Instrumentation Transformers (if applicable)

1.9.3.1 Instrumentation transformers will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1400.

1.9.3.2 Record results on an approved PEARL Evaluation Form.

1.9.4 Current Transformers (if applicable)

1.9.4.1 Current transformers will be evaluated in accordance with PEARL Reconditioning Standards found in Sections 1400.

1.9.4.2 Record results on an approved PEARL Evaluation Form.

1.9.5 Control Relays (if applicable)

1.9.5.1 Control relays will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1800.

1.9.5.2 Record results on an approved PEARL Evaluation Form.

1.9.6 Protective Relays

1.9.6.1 Protective relays will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1700.

1.9.6.2 Record results on approved PEARL Evaluation Form**.**

1.9.7 Contactors

1.9.7.1 Control relays will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1800.

1.9.7.2 Record results on an approved PEARL Evaluation Form.

1.9.8 Meters (if applicable)

1.9.8.1 Meters will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1900.

1.9.8.2 Record results on an approved PEARL Evaluation Form.

1.9.9 Fuse Assembly (if applicable)

1.9.9.1 Verify the accuracy and legibility of all markings.

1.9.9.2 Inspect line and load connections for signs of overheating.

1.9.9.3 Inspect for missing and defective parts.

1.9.9.4 Inspect insulation structure for signs of overheating and deterioration.

1.9.9.5 Inspect fuse clips for signs of damage or deterioration.

1.9.9.6 Inspect for corrosion.

1.9.9.7 Record results on an approved PEARL Evaluation Form.

2 TESTING

2.1 Insulation Resistance

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

2.1.1.1 Phase to ground

2.1.1.2 Phase to phase

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 Low Voltage Disconnect Switch (if applicable)

2.2.1 Low voltage disconnect switches will be tested in accordance with PEARL Reconditioning Standards found in Section 1100.

2.2.2 Record results on an approved PEARL Evaluation Form.

2.3 Molded Case Circuit Breaker (if applicable)

2.3.1 Molded case circuit breakers will be tested in accordance with PEARL Reconditioning Standards found in Section 1200.

2.3.2 Record results on an approved PEARL Evaluation Form.

2.4 Molded Case Motor Circuit Protector (if applicable)

2.4.1 Molded case motor circuit protectors will be tested in accordance with PEARL Reconditioning Standards found in Section 1200.

2.4.2 Record results on an approved PEARL Evaluation Form.

2.5 Molded Case Switch (if applicable)

2.5.1 Molded case switches will be evaluated in accordance with PEARL Reconditioning Standards found in Section 1200.

2.5.2 Record results on an approved PEARL Evaluation Form.

2.6 Control Power Transformers (if applicable)

2.6.1 Control power transformers will be tested in accordance with PEARL Reconditioning Standards found in Section 1400.

2.6.2 Record results on an approved PEARL Evaluation Form.

2.7 Instrumentation Transformers (if applicable)

2.7.1 Instrumentation transformers will be tested in accordance with PEARL Reconditioning Standards found in Section 1400.

2.7.2 Record results on an approved PEARL Evaluation Form.

2.8 Current Transformers (if applicable)

2.8.1 Current transformers will be tested in accordance with PEARL Reconditioning Standards found in Section 1400.

2.8.2 Record results on an approved PEARL Evaluation Form.

2.9 Protective Relays

2.9.1 Protective relays will be tested in accordance with PEARL Reconditioning Standards found in Section 1700.

2.9.2 Record results on an approved PEARL Evaluation Form.

2.10 Control Relays (if applicable)

2.10.1 Control relays will be tested in accordance with PEARL Reconditioning Standards found in Section 1800.

2.10.2 Record results on an approved PEARL Evaluation Form.

2.11 Contactors

2.11.1 Contactors will be tested in accordance with PEARL Reconditioning Standards found in Section 1800.

2.11.2 Record results on an approved PEARL Evaluation Form.

2.12 Meters (if applicable)

2.12.1 Meters will be reconditioned in tested with PEARL Reconditioning Standards found in Section 1900.

2.12.2 Record results on an approved PEARL Evaluation Form.

III RECONDITIONING PROCEDURES

The following procedures are in a recommended order and are required to recondition this product. PEARL recognizes that, based on actual product design and as found condition, some of these procedures may not be applicable. The testing requirement must be completed before the product can be labeled as a PEARL reconditioned product.

1 RECONDITIONING

1.1 Frame/Enclosure

1.1.1 Disassemble to clean.
1.1.2 Clean all parts of contamination and corrosion.
1.1.3 Prepare the frame/enclosure to paint, as necessary.
1.1.4 Paint frame/enclosure.

1.2 Operating Mechanism

1.2.1 Disassemble operating mechanism, as necessary.
1.2.2 Clean operating mechanism.
1.2.3 Replace any defective parts.
1.2.4 Replate operating mechanisms parts, as necessary.
1.2.5 Assemble operating mechanism.
1.2.6 Apply proper lubrication.
1.2.7 Manually operate bus duct enclosed circuit breaker three (3) times while checking for proper operation of the quick-make and quick-break feature.

1.3 Missing or Defective Components, Parts and Hardware

1.3.1 Replace or repair any missing or defective components, parts and hardware found during the inspection phase of this standard.

1.4 Low Voltage Disconnect Switch (if applicable)

1.4.1 Low voltage disconnect switches will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1200.

1.5 Molded Case Circuit Breaker (if applicable)

1.5.1 Molded case circuit breakers will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1200.

1.6 Molded Case Motor Circuit Protector (if applicable)

1.6.1 Molded case motor circuit protectors will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1200.

1.7 Molded Case Switch (if applicable)

1.8.1 Molded case switches will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1200.

1.8 Fuse Assembly (if applicable)

1.8.1 Remove defective line side fuse clips.
1.8.2 Remove defective load side fuse clips.
1.8.3 Clean, replate or replace any defective fuse clips.
1.8.4 Reinstall fuse clips.
1.8.5 Check for proper tension of fuse clips.

1.9 Current Carrying Components

1.9.1 Line and load connections.

1.9.1.1 Clean and degrease.

1.9.1.2 Replate, as necessary.

1.9.2 Hinge/pivot joints.

1.9.2.1 Clean and degrease.

1.9.2.2 Replate, as necessary.

1.9.3 Other current carrying components.

1.9.3.1 Clean and degrease.

1.9.3.2 Replate, as necessary.

1.10 Instrumentation and Controls

1.10.1 Repair or replace missing or defective indicator lights, push buttons, switches and control devices.

1.10.2 Replace or repair missing or defective control wiring.

1.11 Control Power Transformers (if applicable)

1.11.1 Control power transformers will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1400.

1.12 Instrumentation Transformers (if applicable)

1.12.1 Instrumentation transformers will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1400.

1.13 Current Transformers (if applicable)

1.13.1 Current transformers will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1400.

1.14 Protective Relays

1.14.1 Protective relays will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1700.

1.15 Control Relays (if applicable)

1.15.1 Control relays will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1800.

1.16 Contactors

1.16.1 Contactors will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1800.

1.17 Meters (if applicable)

1.17.1 Meters will be reconditioned in accordance with PEARL Reconditioning Standards found in Section 1900.

1.18 Lubrication

1.18.1 Lubricate hinges.

1.19 Torque

1.19.1 Check all screw and bolt connections for the proper torque per manufacturer's recommendations or industrial standards (Table 1).

1.19.2 Record results on an approved PEARL Reconditioning Test Form.

1.20 Final Assembly

1.20.1 Ensure that frame/enclosure is plumb and square.

1.20.2 Cover any unused openings.

1.20.3 Ensure that the nameplate/label data is complete, correct and legible.

2 TESTING

2.1 Insulation Resistance

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

2.1.1.1 Phase to ground

2.1.1.2 Phase to phase

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

2.1.3 Record results on an approved PEARL Reconditioning Test Form.

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

2.1.5 The test results must be within the guidelines recommended in order for the product to become a PEARL labeled product.

2.2 Operation

2.2.1 Verify the proper operation of all major electrical and mechanical components.

2.2.2 Verify the proper electrical operation of all indicator lights.

2.2.3 Verify the proper electrical operation of all control switches.

2.2.4 Verify the proper electrical operation of all push buttons.

2.2.5 Verify the proper operation of all other accessories, including, but not limited to auxiliary contacts, power poles and timers.

2.2.6 Verify the proper electrical operation of any control relay.

2.2.7 Verify the protective function of any protective relay.

2.2.8 Record results on an approved PEARL Reconditioning Test Form.

IV PEARL CERTIFICATION

This product has now been reconditioned under the PEARL Reconditioning Standard. The blue PEARL Reconditioning Quality Seal may now be placed on the device.