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UL 489D

OUTLINE OF INVESTIGATION

FOR

US NAVAL COMMERCIAL-OFF-THE-SHELF (COTS) DESIGNATED
MOLDED-CASE CIRCUIT BREAKERS AND ACCESSORIES FOR USE ON
NON-NUCLEAR NAVAL COMBATANT SHIPS

Issue No. 1

April 27, 2012

Summary of Topics

This is the first issue of the Outline of Investigation for US Naval Commercial-Off-the-Shelf (COTS) Designated Molded-Case Circuit Breakers and Accessories for Use on Non-Nuclear Naval Combatant Ships.

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INTRODUCTION

1 Scope

1.1 These requirements cover commercial-off-the-shelf (COTS), three-pole and four-pole molded-case circuit breakers and applicable accessories (undervoltage trip release devices, shunt trip release devices, electrical (motor) operators, auxiliary switches, plug-in mounting adapter blocks/bases, drawout cassette) intended for use aboard non-nuclear Naval combatant ships in electrical assemblies (switchboards and load centers) installed on shock isolators (mounts).

1.2 Successful initial qualification testing and requalification testing of circuit breakers/accessories to the requirements of this Outline shall allow their use in shock-mounted electrical assemblies in non-nuclear Naval combatant ships.

2 Normative References

2.1 This Outline references the following COTS specifications:

- a) UL 489, the Standard for Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures
- b) UL 489 Supplement SB, Molded-Case Circuit Breakers and Circuit Breaker Enclosures (Naval Use)
- c) IEC 60947-2, Low-voltage switchgear and controlgear – Part 2: Circuit-breakers

2.2 This Outline references the following military specifications/documents. Specifications/documents can be accessed at <https://assist.daps.dla.mil/quicksearch/>.

- a) MIL-E-917, Electric Power Equipment, Basic Requirements
- b) MIL-HDBK-454, General Guidelines for Electronic Equipment
- c) MIL-STD-1399-300, Interface Standard Section 300, Electric Power, Alternating Current
- d) MIL-STD-202, Test Method Standard, Electronic and Electrical Component Parts
- e) MIL-STD-130, Department of Defense Standard Practice, Identification Marking of U.S. Military Property
- f) MIL-STD-461, Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
- g) DI-EMCS-80200, Electromagnetic Interference Test Report (EMITR)
- h) DI-EMCS-80201, Electromagnetic Interference Test Procedures (EMITP)

CONSTRUCTION

3 General

3.1 Circuit breakers and all accessories shall meet the Section 6 construction requirements of UL 489 except as modified or added to by the requirements of this Outline.

3.2 Mounting adapter blocks/bases shall be plug-in type and shall allow for rear connection of cable and/or bus bar. Drawout cassettes may also be used. Drawout cassettes shall enable the circuit-breaker to be disconnected from the main circuit, in the withdrawn position, to achieve an isolating distance.

3.3 The following materials and coatings are non-preferred and shall be identified in the qualification and requalification reports:

- a) Navy-prohibited materials as defined by MIL-E-917 Section 3.4.1 including estimated maximum weight per circuit breaker and per accessory.
- b) Insulating materials which contain halogens, e.g. chlorine, fluorine, and bromine, which evolve gases during combustion including estimated maximum weight per circuit breaker and per accessory.
- c) Corrosion-susceptible materials and coatings not in accordance with MIL-E-917 Section 3.10 requirements.
- d) Organic materials not inherently fungus resistant or validated to be fungus resistant. Refer to MIL-HDBK-454, Guideline 4.
- e) Lead free solder.

3.4 All printed circuit boards shall be conformal coated.

3.5 Aluminum conductors or terminals shall not be used.

RATINGS

4 General

4.1 Rated voltage as defined by UL 489 shall be 480VAC and/or 250 VDC as applicable.

4.2 Rated frequency as defined by UL 489 shall be 60 Hz.

4.3 Recommended frame sizes are shown in Table 4.1 of this Outline. Frame size (maximum continuous current rating) shall be verified by temperature rise testing in accordance with Sections 6 and 7 of this Outline.