Marine Circuit Breakers - SAE J1428 JUN83

SAE Recommended Practice
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PREPRINT

Report of the Marine Technical Committee, Electrical Systems Subcommittee, approved June 1983.

1. Scope—This recommended practice covers the requirements of magnetic or thermal circuit breakers for use in marine applications for 50 V DC or less.

2. Purpose—The purpose of this recommended practice is to ensure that the specified circuit breakers will reliably provide overcurrent protection.

3. General—Circuit breakers will normally be mounted in either enclosed accommodation spaces, open cockpits, or engine spaces. Environmental requirements differ depending upon the mounting location. Manufacturer's rating for ambient temperature variation should be considered when choosing a circuit breaker. Additionally, the electrical circuit parameters may vary and consideration must be given to available short circuit current, as well as system voltage, to ensure reliable repetitive operation of the circuit breaker under fault conditions. There are also general mechanical and electrical requirements which must be met to ensure that the device is suitable for electrical service in a marine application.

4. Definitions

4.1 Circuit Breaker—A device designed to interrupt a circuit when the current exceeds a predetermined value.

4.2 Trip-Free Mechanism—A mechanism by which the breaker mechanism will trip when subjected to a fault current, opening the circuit in a manner that the contacts will not remain closed, even if the operating handle (or reset device) is held in the "on" or "reset" position.

4.3 Manual Reset Mechanism—Manual reset circuit breakers are non-cycling units which are initially opened by overcurrents, but which remain open until manually reset.

4.4 Manufacturer's Must Trip Rating—The maximum trip time at the minimum must trip current specified by the manufacturer measured in minutes.

4.5 Non-Trip Time—The minimum time the breaker must carry rated current measured in minutes.

5. Construction Requirements

5.1 Environmental Tests

5.1.1 TYPE C—Marine circuit breakers shall be constructed of corrosion resistant materials, shall be tested to ASTM D1735 for 100 h and meet the requirements of paragraphs 7.1 and 7.2. Marine circuit breakers complying with this recommended practice are designated Type C.

5.1.2 TYPE B—A weatherproof marine circuit breaker is recommended for use in areas where the circuit breaker will be subjected to rain, spray, or splashing. To be considered weatherproof, when mounted in the manufacturer's recommended manner, the circuit breaker shall be mounted in the spray (reference ASTM B117, steps 7 and 8) for 96 h. At the completion of the test, the external portion of the circuit breaker shall be washed with fresh water and dried. There shall not be more than 10 mA flowing when tested in accordance with paragraph 7.1 and the device shall meet the requirements of paragraph 7.2. Weatherproof circuit breakers complying with this recommended practice are designated Type B.

5.1.3 TYPE A—A watertight marine circuit breaker is recommended for any application where the circuit breaker may become submerged. To be considered a watertight circuit breaker, the circuit breaker must pass paragraph 7.3 and then be submerged 14 in below the surface of 5% solution of salt water for 1 h. After removal from the solution, the external portion of the circuit breaker is to be washed with fresh water and dried. The circuit breaker must then meet the requirements of paragraphs 7.1 and 7.2. Watertight circuit breakers complying with this recommended practice are designated Type A.

5.2 The breaker operating mechanism shall be of the trip-free type.

5.3 Automatic reset devices are not to be used except if the circuit breaker is furnished as an integral part of another piece of equipment for the purpose of providing running overload or over temperature protection.

5.4 Termination Means

5.4.1 Blade terminals shall be flat blades complying with SAE J858a and shall, when tested in accordance with SAE J378c, Section 7, with a mating wire termination, withstand a disconnect force of 6 lb for 1 min.

5.4.2 Screw type terminations shall have a minimum of number 8 screw size.

5.4.3 External solder lugs must provide for insertion or wrapping of the wire to form a mechanical lock.

5.4.4 External leads which are terminated internally, shall be considered pigtails and, if the exposed wire is less than 7 in long, shall not be smaller than number 18 gage stranded. Longer lengths shall not be smaller than number 16 gage stranded wire and shall meet the ampacity of the circuit breaker.

5.5 Markings—The breaker shall be marked with the following information:

5.5.1 Manufacturer's identification.

5.5.2 Rated current as designated in Table 1.

5.5.3 Voltage rating.

5.5.4 Amperage interrupting capacity as in paragraph 7.3.

5.5.5 Marine circuit breakers that are to be qualified as external ignition protected, shall comply with and be marked as prescribed in SAE J1171.

5.5.6 Marine circuit breakers complying with this recommended practice shall be marked with their DC ratings, and the words "MARINE" and "SAE Type A," "SAE Type B," or "SAE Type C," whichever is applicable, arranged in any suitable manner. If marking of the circuit breaker is not practicable, except for the manufacturer's identification, the markings may alternatively appear on the smallest packaging of the circuit breaker.

6. Mounting Location Requirements

6.1 Enclosed Accommodation Spaces—Devices intended for mounting in these locations shall meet the following as *minimum* requirements:

6.1.1 ENVIRONMENTAL TESTS—See paragraph 5.1.1 of this recommended practice (Type C device).

6.2 Open Cockpits—Devices intended for mounting in these locations shall meet the following as *minimum* requirements.

6.2.1 ENVIRONMENTAL TESTS—See paragraph 5.1.2 of this recommended practice (Type B device).

6.3 Engine Spaces, Battery Spaces, Fuel Tank Spaces, and Compartments Containing Fuel System Components—Devices intended for mounting in these locations shall meet the following as *minimum* requirements:

6.3.1 ENVIRONMENTAL TEST—See paragraph 5.1.2 of this recommended practice (Type B device).

6.3.2 EXTERNAL IGNITION PROTECTION PER SAE J1171. The SAE J1171 test shall be run at the completion of the electrical test requirements, Section 7 of this recommended practice. SAE J1171 is not required in installations that have diesel fuel as the only fuel source.

7. Electrical Test Requirements

7.1 Dielectric Test—The sample breaker is to be tested as follows:

7.1.1 DIELECTRIC VOLTAGE WITHSTAND—The device shall be capable of withstanding for 1 min the application of a 60 Hz essentially sinusoidal potential of 500 V rms between:

7.1.1.1 Live parts and mounting (if metallic) with the contacts open and closed.

7.1.1.2 Terminals of opposite polarity with the contacts opened.

7.1.1.3 Live parts of different circuits.

Leakage of the breaker dielectric material in excess of 5 mA constitutes a failure.

7.1.2 TEST PROCEDURE—The device is to be tested by a suitable 500 volt-ampere or larger capacity transformer, whose output voltage is essentially sinusoidal and can be varied. The applied potential is to be increased from zero until the required test value is reached, and is to be held at that level for 1 min. The increase in the applied potential is to be at a substantially uniform rate and as rapidly as is consistent with its value being correctly indicated by the voltmeter. A test transformer with a capacity of less than 500 volt-amperes may be used if provided with a suitable voltmeter to directly measure the applied potential.

7.2 Calibration—Devices are to be calibrated at 25 ± 2°C (77°F) using wire from Table 2.

7.2.1 The breaker shall trip in accordance with Table 1.

7.3 Short Circuit—Devices to be tested shall be connected to a DC test source with voltage and current availabilities as indicated in Table 3.

TABLE 1

Current Rating in Amperes	Maximum Tripping Time in Minutes 200%	Manufacturer's Must Trip Rating	Non-Trip Time in Minutes
0–30	2	60	240
31–50	4	60	240
51–100	6	120	240
101–225	8	120	240