



Standard Specification for Insulation Resistance Monitor for Shipboard Electrical Motors and Generators¹

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1. Scope

1.1 This specification covers monitoring devices (monitors) for the automatic detection and signaling of low insulation resistance values in idle electrical motors or generators, or both.

1.2 Monitors are intended for permanent installation in both existing or new panels and controller enclosures designed for marine application.

1.3 The values stated in SI units are to be regarded as the standard. The values given in parentheses are for information only.

1.4 The following safety hazards caveat pertains only to the test method described in this specification: *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *UL Standard*:²

UL 94 Test for Flammability of Plastic Materials for Parts in Devices and Appliances

2.2 *IEEE Standards*:³

IEEE 45 Recommended Practice for Electrical Installations on Shipboard

IEEE 100 Standard Dictionary of Electrical and Electronics Terms

2.3 *Government Standard*:

Title 46 Code of Federal Regulations Shipping⁴

3. Terminology

3.1 *Definitions*—In general, definitions shall be in accordance with IEEE 100 (see Section 2).

3.2 *Definitions of Terms Specific to This Standard*:

3.2.1 *idle machine*—rotary machine, when not rotating, owing to the absence of energy.

3.2.2 *monitor*—device, generally located in a motor starter, control panel, or main switchboard, that senses the leakage resistance of electrical machine windings to ground, while the monitored machine stands idle.

4. Monitor Classification

4.1 *Type*—The insulation resistance monitors covered by this specification shall be of the following types:

4.1.1 *Type I*—Alternating current motor monitors.

4.1.2 *Type II*—Alternating current generator monitors.

4.1.3 *Type III*—Direct current motor monitors.

4.1.4 *Type IV*—Direct current generator monitors.

4.2 *Duty Rating*—All monitors shall be capable of continuous duty operations as defined in accordance with IEEE 100.

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² Available from Underwriters Laboratories (UL), 333 Pfingsten Rd., Northbrook, IL 60062-2096, <http://www.ul.com>.

³ Available from Institute of Electrical and Electronics Engineers, Inc. (IEEE), 445 Hoes Ln., P.O. Box 1331, Piscataway, NJ 08854-1331, <http://www.ieee.org>.

⁴ Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

5. Ordering Information

5.1 Monitoring devices shall be ordered by including the following information:

5.1.1 *Purpose or Use of Monitor(s)*—Application as motor or generator monitor.

5.1.2 Line voltage and frequency.

5.1.3 Control voltage and frequency.

5.1.4 Type of starter (if motor monitor).

5.1.5 Winding configuration (if motor monitor).

5.1.6 Location of monitor.

5.1.7 *Sensitivity*—Set for 1 megohm (optional setting, if requested, from 0.1 to 5 M).

5.1.8 Remote monitoring devices.

5.1.9 Special options requested (that is, test buttons, elevated ambient temperature usage, and so forth.).

6. Materials and Manufacture

6.1 *General*—Materials used in the construction of insulation resistance monitors are to be manufactured and tested in accordance with IEEE 45. Materials conforming to other recognized standards will be subject to approval by the procuring agency, provided they are not less effective.

6.2 *Flame-Retardant Materials*—Enclosure materials used in the construction of the monitors are to be flame-retardant in accordance with UL 94, and have a minimum flame rating of 94V-1 for monitors being installed within a motor controller enclosure, or switchgear-type enclosure, or a minimum rating of 94-5V for monitors not installed within such an enclosure.

6.3 *Electrical Insulation*—Electrical insulation materials used and application thereof shall be in accordance with the requirements of IEEE 45.

6.4 *Current Carrying Terminals*—All monitor current carrying terminals shall be made of corrosion resistant material in accordance with CFR 46, Subchapter J.

6.5 *Electrical Isolation*—Monitors shall isolate their measuring circuit from the line voltage, while the motor is operating, by the use of an integral isolating relay.

7. General Design Requirements

7.1 *Environment:*

7.1.1 *Temperature*—The rating of the monitor shall be based on an ambient temperature of 50°C (122°F).

7.1.1.1 *Operating Temperature Range*—Monitors shall operate over the range from 0 to 50°C (32 to 122°F). (See 10.1.2 for operation range.)

7.1.2 *Sealing*—~~The monitor housing upon final assembly~~ Upon final assembly, the monitor housing shall protect the internal components against foreign matter and shall be so constructed so as to prevent tampering.

7.1.3 *Inclination*—Monitors shall operate when inclined at any angle at inclination angles up to 60° in any direction from the normal operating position.

7.1.4 *Humidity*—Monitors shall operate at a constant relative humidity of up to minimum 90 %.

7.1.5 *Vibration*—Monitors shall operate in the presence of acceptable operational shipboard ~~vibration~~, vibration without mechanical damage, control chatter, or other defects.

7.2 *Operating Voltage/Accuracy:*

7.2.1 *Monitor Relays*—Monitor relays shall pick up and hold from 80 % rated line voltage upwards with the coil at its maximum operating temperature and shall operate satisfactorily in the range from 80 to 120 % of rated line voltage.

7.2.2 *Design Voltage Characteristics*—Monitors shall be designed for application on 60 Hz ~~ac~~ AC and ~~dc~~ DC current systems and be designed to operate on electrical systems having standard voltages acceptable to the U.S. Coast Guard. (See 46 CFR 111.)

7.2.3 *Operating Accuracy*—Monitors shall alarm within 610 % of the ordered set point indicated on the label plate, when operated in accordance with 7.2.1.

7.3 *Installation Instructions:*

7.3.1 The monitor vendor shall submit complete installation instructions with each monitor ~~shipped~~, shipped including drawings as necessary, denoting the following information:

7.3.1.1 Application as a motor or generator monitor.

7.3.1.2 Line voltage level to be applied to monitor.

7.3.1.3 Type designation of monitor supplied.

7.3.1.4 Clearly identify where the connections are to be made to the equipment being monitored.

8. Construction Specifications

8.1 *General:*