

INCH-POUND

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SUPERSEDING

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DEPARTMENT OF DEFENSE

TEST METHOD STANDARD

METHOD 312, LIFE, INTERMEDIATE CURRENT SWITCHING



AMSC N/A

FSC 59GP



MIL-STD-202-312

FOREWORD

1. This standard is approved for use by all Departments and Agencies of the Department of Defense.
2. This entire standard has been revised. This revision has resulted in many changes to the format, but the most significant one is the splitting the document into test methods. See MIL-STD-202 for the change summary.
3. Comments, suggestions, or questions on this document should be emailed to std202@dla.mil or addressed to: Commander, Defense Logistics Agency, DLA Land and Maritime, ATTN: VAT, P.O. Box 3990, Columbus, OH 43218–3990. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

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METHOD 312
INTERMEDIATE CURRENT SWITCHING

1. SCOPE

1.1 Purpose. This test is conducted for the purpose of determining the electrical contact reliability of such items as electromechanical relays, switches, etc., under intermediate current (formerly known as "minimum current") switching conditions under which the contacts operate. An intermediate current switching circuit is one in which there is insufficient voltage and stored energy to cause contact arcing during opening or closing of mating contacts, but which have sufficient energy to cause melting of the contact material. Normal arcing of contacts at rated load levels often act to burn off any oxide or other film on the contacts or provide localized melting at the point of contact, so that contact resistance does not rise drastically. Without this arcing of the contacts, oxides and other contaminant films can build up on contacts in component parts which have not been sealed adequately or which have contaminating materials and vapors trapped within the enclosure due to improper manufacturing techniques. Such contacts will develop unacceptably high contact resistance under intermediate current loads, unless the contact force and wipe are sufficiently heavy to overcome any effect of contamination. Intermediate current switching is the range in which a large percentage of loads occur. Therefore, it is extremely important that an intermediate current switching test be imposed on all electromechanical relays and switches, which are to be used in this range. Relays and switches, which pass both low level and full rated load tests, frequently fail when used in the intermediate current switching range.

1.2 Precautions. Full rated load and low level life tests are not a substitute for the intermediate current switching test. Successful testing at low level and full rated loads in no way reflects the capability of the relay or switch at intermediate current loads. Statements or titles for component parts, such as "low level to full rated load" shall not be used in specifications, unless intermediate current switching capability has been demonstrated by the requirement for testing by this method.

CAUTION: A low-level run-in test is not equivalent to intermediate current testing and conversely intermediate current capability does not indicate low level capability.

2. APPLICABLE DOCUMENTS

This section not applicable to this standard.

3. DEFINITIONS

This section not applicable to this standard.

4. GENERAL REQUIREMENTS

4.1. Apparatus.

4.1.1 Test circuit. Monitoring of the specified contact resistance of each pair of mating contacts shall be accomplished on each cycle. Each contact shall be monitored on each closure. The apparatus, which cyclically operates the contacts, shall be capable of automatically cycling the contacts at the rate specified. Resistive load voltage shall be applied to the contacts and shall be 3.0 V dc to 10.0 V dc at 100 ± 10.0 milliamperes (mA) such as by means of a well regulated power supply which will provide the low voltage, controllable, and well defined voltage source. Voltage, when required to energize coils in order to actuate the contacts, shall be as specified. Both normally open and normally closed contacts of double-throw switching parts shall be tested. Multipole contacts shall be connected with all normally open pairs of contacts loaded and all normally closed pairs of contacts loaded.

4.1.2 Monitoring apparatus. The monitoring apparatus shall be capable of indicating resistances greater than a particular value specified. During each closure, the contact potential shall be monitored 10 milliseconds (ms) or more after the end of specified contact bounce. The apparatus shall provide and record either manually or automatically, the following information:

- a. Number of contact closures with contact load applied.
- b. If required, number of times contacts have performed as specified prior to failure to perform as specified.
- c. Sticking of contacts, when intended to be in the "open" condition, unless otherwise specified. Sticking of contacts shall be defined as any failure of closed contacts to open as required during the cycling, or indication across such contacts of less than 90 percent of the applied open-circuit contact voltage.

4.2 Procedure. Each pair of contacts shall be operated for 25,000 cycles (see note below) at the specified cycling rate. The duty cycle shall be approximately 50 percent "on" and 50 percent "off". The component parts shall be tested in a temperature chamber at the rated maximum ambient operating temperature with the required test load (see 4.1.1). When specified, the final half of the test cycles shall be tested at room ambient temperature. Each pair of contacts shall be individually monitored on each operation for failure-to-break (FTB) and for failure-to-make (FTM) the test load, using the apparatus in 4.1.1 and 4.1.2. FTB shall be defined as a voltage drop across the contacts of less than 90 percent of the applied voltage when the contacts are intended to be open. FTM shall be defined as a voltage drop across the contacts greater than 0.1 times the maximum allowable contact resistance (in ohms), when the contacts are intended to be closed. The voltage drop across the contacts shall be monitored for at least 50 percent of the time the contacts are closed and for at least 50 percent of the time the contacts are open, unless the monitoring apparatus can be demonstrated to be capable of settling to a stable reading in a shorter period of time. Any FTB or FTM shall either be recorded or shall automatically stop the actuating apparatus.

NOTE: Because the test is conducted for only 25,000 operations, it must not be inferred that the relays or switches, so tested, are suitable for only 25,000 operations in the intermediate current range. Quite the contrary, if the 25,000 operations test is passed satisfactorily, the relays or switches can be expected to be capable of switching intermediate current loads well beyond the full rated load life cycles specified.

5. DETAILED REQUIREMENTS

5.1. Summary. The following details are to be specified in the individual specification:

- a. Maximum contact resistance allowed (see 4.1.1).
- b. Coil energizing voltage (see 4.1.1).
- c. Cycling rate (see 4.1.1).
- d. Contact bounce, if applicable (see 4.1.2).
- e. If monitoring of contacts for sticking is not applicable (see 4.1.2c).
- f. Whether final half of cycles is to be tested at room ambient temperature (see 4.2).
- g. Rated maximum operating ambient temperature (see 4.2).

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Supersession data. The main body and 38 parts of this revision of MIL-STD-202 replace superseded MIL-STD-202.

Custodians:

Army - CR
Navy - EC
Air Force - 85
DLA - CC

Preparing activity:

DLA – CC

(Project 59GP-2015-042)

Review activities:

Army - AR, AT, AV, CR4, MI, SM, TE
Navy - AS, OS, SH
Air Force - 19, 99
NSA - NS

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