INCH-POUND
MIL-DTL-7703E
w/Amendment 1
22 March 2004
SUPERSEDING
MIL-DTL-7703E
31 January 2001

DETAIL SPECIFICATION

GUARD, SWITCH, GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the military requirements for hinged switch guards for use with toggle switches.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

DEPARTMENT OF DEFENSE

MIL-STD-202	- Test Methods for Electronic and Electrical Component Parts
MIL-STD-1285	- Marking of Electrical and Electronic Parts.

HANDBOOKS

DEPARTMENT OF DEFENSE

MIL-HDBK-454	- Standard General Guidelines for Electronic Equipment.

(Copies of these documents are available online at http://assist.daps.dla.mil/quicksearch/ or www.dodssp.daps.mil or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

Comments, suggestions or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: VAT, Post Office Box 3990, Columbus, OH 43216-5000, or emailed to switch@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at www.dodssp.daps.mil.

2.3 Non-Government publications. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents that are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI/NCSL Z540-1	- Calibration Laboratories and Measuring and Test Equipment, General Requirements for.
ANSI/ASQC Z1.4-193	- Sampling Procedures and Tables for Inspection by Attributes

(Copies of these documents are available online at http://dod.nssn.org/search.html or from the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036-8002, telephone 212-642-4900, fax 212-302-1286.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM E1119-89	- Glycol, Industrial Grade Ethylene, Standard Specification for

(Copies of these documents are available online at www.astm.org or from the American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania, 19428-2959.)

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

ISO 10012-1	- Quality Assurance Requirements for Measuring Equipment - Part 1; Meteorological Confirmation System for Measuring Equipment.

(Copies of these documents are available online at www.nssn.org/search.html or from the American National Standards Institute (ANSI), 11 West 42nd Street, New York, NY 10036-8002, telephone 212-642-4900, fax 212-302-1286.)

UNDERWRITERS' LABORATORIES, INC. (UL)

UL94	- Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

(Copies of these documents are available online at www.ul.com or from the Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062-2002.)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications or specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless specific exemption has been obtained.

3. REQUIREMENTS

3.1 MS standards. The individual item requirements shall be as specified herein and in accordance with the applicable (MS) standard. In the event of any conflict between the requirements of this specification and the MS standard, the latter shall govern (see 4.6.1).

3.2 Qualification. Switch guards furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.5 and 6.3).

3.3 Requirements for switch guards not covered by MS standards. Unless otherwise specified (see 6.2.2), switch guards furnished under this specification and not covered by MS standards shall be products which have passed the inspection specified (see 4.3).

3.4 Material. Material shall be as specified on the applicable MS standard (see 3.1). When a definite material is not specified, a suitable material shall be used which will enable the switch guards to conform to the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guaranty of the acceptance of the finished product.

3.4.1 Fungus-proof materials. All materials shall be non-fungus nutrient in accordance with MIL-HDBK-454, requirement 4. Certification that the materials used are not fungi nutrients shall be submitted to the preparing activity as part of the qualification test report.

3.5 Design and construction. The switch guards shall be of the design, construction, and physical dimensions specified (see 3.1).

3.5.1 Locking mechanism. The switch guard shall be constructed so that when it is closed, motion of the switch toggle shall be restricted as shown on the applicable MS standard (see 3.1).

3.6 Performance.

3.6.1 Operating force. When tested as specified (see 4.6.2) the operating force shall be within the limits specified on the applicable MS standard (see 3.1).

3.6.2 Hinge life. The switch guard shall satisfactorily complete 20,000 cycles of operation, without breakage or malfunction, when tested as specified (see 4.6.3). The switch guard shall be examined to insure that operation of switch guards, so designed, shall actuate the switch toggle to the position indicated on the applicable MS standard, and that switch guards not specifically designed to perform this function shall not change the position of the toggle lever of the toggle switch.

3.6.3 Hinge strength. When tested as specified (see 4.6.4), there shall be no damage to the switch guard. Failures shall not occur below 33 pounds.

3.6.4 Shock (specified pulse). When switch guards are tested as specified (see 4.6.5) they shall not transfer from the open to the closed position or from the closed to the open position. The switch guard shall not cause separation of closed contacts or closure of open contacts exceeding the specified amount of time for the switch used in this test. There shall be no evidence of damage at the conclusion of this test.

3.6.5 Salt spray (corrosion). When switch guards are tested as specified (see 4.6.6) there shall be no evidence of damage or excessive corrosion.

3.6.6 Temperature shock. When switch guards are tested as specified (see 4.6.7) there shall be no evidence of damage.

3.6.7 Resistance to solvents. When switch guards are tested as specified (see 4.6.8) there shall be no deterioration or other damage.

3.6.8 Vibration. When the switch guards are tested as specified (see 4.6.9) they shall not transfer from the open to the closed position or from the closed to the open position. The switch guard shall not cause separation of the closed contacts or closure of the open contacts exceeding the specified amount of time for the switch used in this test. There shall be no evidence of damage at the conclusion of this test.

3.6.9 Switch contact movement. When the switch guard is in the closed position it shall not cause the switch contacts to transfer as tested (see 4.6.3, 4.6.5 and 4.6.9).

3.7 Marking. Switch guards shall be marked in accordance with MIL-STD-1285, with the MS standard part number or manufacturer's part number, as applicable, and the manufacturer's name, trademark, or code symbol. Insert markings shall be white.

3.8 Workmanship. Switch guards shall be processed in such a manner to be free from cracked parts, sharp edges, burrs, and other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Classification of inspection. The examination and testing of switch guards shall be classified as follows:

a. Qualification inspection (see 4.4).

b. Requirements for switch guards not covered by MS standards (see 4.4.5).

c. Conformance inspection (see 4.5).

4.2 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ANSI/NCSL Z540-1, ISO 10012-1 or approved equivalent

4.3 Inspection conditions. Unless otherwise specified herein, all tests and measurements required by this specification shall be made at room ambient conditions, in accordance with the general requirements of MIL-STD-202.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.

4.4.1 Sample. For qualification inspection, the sample size shall be as specified in table I.

4.4.2 Failures. Failure of any sample to comply with the applicable requirements shall be cause for refusal to grant qualification.

TABLE I. Qualification test sequence.

Inspection	Requirement Paragraph	Test paragraph	Sample									
			1	2	3	4	5	6	7	8	9	10
Inspection of product	3.1	4.6.1	X	X	X	X	X	X	X	X	X	X
Operating force	3.6.1	4.6.2	X	X	X	X	X	X	X	X	X	X
Hinge life	3.6.2	4.6.3	X	X								
Hinge strength	3.6.3	4.6.4			X	X						
Shock (specified pulse)	3.6.4	4.6.5			X	X						
Salt spray (corrosion)	3.6.5	4.6.6					X	X				
Temperature shock	3.6.6	4.6.7							X	X		
Resistance to solvents	3.6.7	4.6.8									X	X
Vibration	3.6.8	4.6.9			X	X						
Operating force	3.6.1	4.6.2	X	X	X	X	X	X	X	X	X	X
Inspection of product	3.1	4.6.1	X	X	X	X	X	X	X	X	X	X

4.4.3 Test data. Each submission shall be accompanied by test data covering the tests listed in table I. All test data shall be submitted in triplicate.

4.4.4 Certification of material. When submitting samples for qualification, the manufacturer shall submit certification that the materials used are in accordance with the applicable specification requirements or state the materials used. The manufacturer shall submit a cross reference list of the switch guard parts and materials with the qualification test report.

4.4.5 Requirements for switch guards not covered by MS standards. Unless specified otherwise in the ordering data, the inspection requirements shall be in accordance with 4.3.

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of Group A inspection.

4.5.1.1 Group A inspection. Group A inspection shall consist of the inspections specified in table II. Statistical sampling and inspection shall be in accordance with table III, subgroup 1. Inspection of product shall be limited to checking of marking and workmanship. Of each 1,000 switch guards produced, two each shall be inspected for compliance with physical dimensions.

4.5.1.2 Inspection lot. All switch guards that appear on the same MS standard and that are offered for delivery at one time shall be considered a lot for purposes of sampling and inspection.

4.5.1.3 Rejected lots. If an inspection lot is rejected, the contractor may withdraw the lot, rework it to correct the defects or screen out the defective units, as applicable, and reinspect. Such lots shall be kept separate from new lots and shall be clearly identified as reinspected lots. Rejected lots shall be reinspected using tightened inspection.

TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test paragraph	Sampling plan
Inspection of product	3.1	4.6.1	See 4.5.1.1
Hinge strength	3.6.3	4.6.4	Subgroup I
Operating force	3.6.1	4.6.2	Subgroup I

TABLE III. Zero defect sampling plan.

Lot size		Minimum number of samples to be tested	
		Subgroup 1	Subgroup 2
1 -	8	5	All
9 -	15	5	13
16 -	25	5	13
26 -	50	5	13
51 -	90	7	13
91 -	150	11	13
151 -	280	13	20
281 -	500	16	29
501 -	1200	19	34
1,201 -	3200	23	42
3,201 -	10,000	29	50
10,001 -	35,000	35	60

4.6 Methods of inspection.

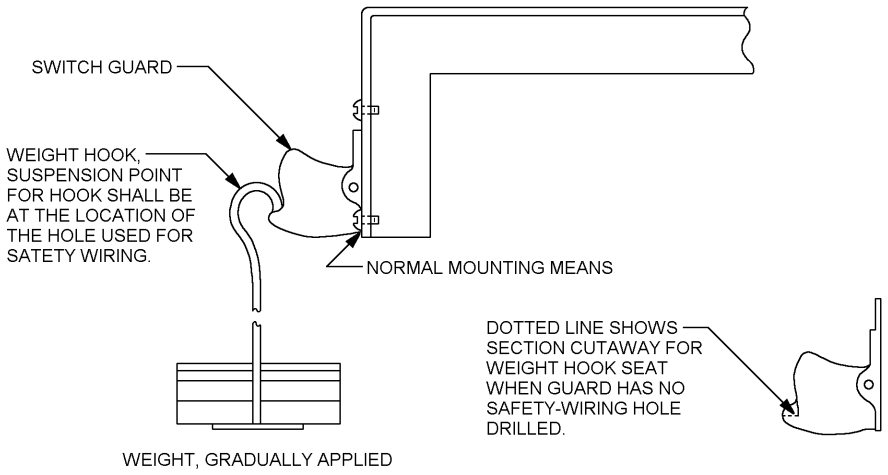
4.6.1 Inspection of product. Switch guards shall be examined to determine compliance with materials, workmanship, marking and the applicable MS standard requirements.

4.6.2 Operating force (see 3.6.1). The force required to open or close the switch guard shall be measured by applying the force in the following directions:

a. Open - tangent to the radius of the switch guard lever in a plane perpendicular to the plane of the mounting plate.
b. Close - horizontal to the plane of the mounting plate.

4.6.3 Hinge life (see 3.6.2 and 3.6.9). Switch guards shall complete 20,000 cycles of operation at a rate not to exceed one cycle per second. The switch guards shall be mounted on a metal panel with any Military Standard switch, for which it is designed. The switch guards shall be mounted such that at least 1 1/2 threads of the switch bushing are exposed. Each cycle shall consist of moving the switch guard from the fully closed to the fully open position and then return to the fully closed position. Switch guards that are spring loaded to the closed position shall return to the closed position by spring action. The switch contacts shall be monitored for movement during this test. Contact chatter shall be monitored in accordance with method 310, test condition A of MIL-STD-202.

4.6.4 Hinge strength (see 3.6.3). Switch guards shall be mounted as shown in figure 1. A force, which shall be gradually increased to 33 pounds, shall be applied to the outer edge of the switch guard and in the direction that continues to open the switch guard.



4.6.5 Shock (specified pulse) (see 3.6.4 and 3.6.9). Switch guards shall be tested in accordance with MIL-STD-202, method 213. The following details shall apply:

1. Mounting - The switch guards shall be mounted on a metal panel with any Military Standard switch for which it is designed. The switch guards shall be mounted such that at least 1 1/2 threads of the switch bushing are exposed. The switch guards shall be tested in the closed position.

2. Test condition - B.

3. Switch guards with maintained positions - One half shall be tested in the closed position while the other half shall be tested in the open position.

4. Measurements during shock - Switch stability shall be continuously monitored during shock. Contact chatter shall be monitored in accordance with method 310, test condition A of MIL-STD-202. If more than one contact pair is being monitored simultaneously by one contact chatter indicator, open contact pairs shall be connected in parallel and closed contact pairs shall be connected in series during this test. In the event of an indication for a contact opening greater than specified, the test shall be modified by applying successive identical blows in the same plane to monitor contacts of each switch guard and switch combination to determine which switch guard is defective. Switch guards shall also be examined during the shock test for movement from the original position.

5. Measurements after shock - Switch guards shall be examined for evidence of broken, deformed, displaced or loose parts.

4.6.6 Salt spray (corrosion) (see 3.6.5). Switch guards shall be tested in accordance with MIL-STD-202, method 101. The following details and exceptions shall apply:

a. Test condition letter - A.

b. Examination after exposure - Switch guards shall be examined for warping, cracking, mechanical defects and excessive corrosion. Excessive corrosion is defined as corrosion which interferes with mechanical performance, or in the case of plated metals, corrosion which has passed through the plating and attacked the base metal.

4.6.7 Temperature shock (see 3.6.6). Switch guards shall be heated to 71° ±2°C and maintained for five hours. Switch guards shall then be immediately placed in a temperature maintained at -62° ±2°C for 20 minutes. Switch guards shall then be removed and examined for warping, cracking and mechanical defects.

4.6.8 Resistance to solvents (see 3.6.7). Switch guard plastic parts shall be completely submerged in each of the following for 24 hours, which shall consist of one cycle; each part shall be tested for only one cycle:

a. MIL-DTL-83133 – Turbine Fuels, Aviation, Kerosene Types, NATO F-34(JP-8), NATO F-35, and JP-8 + 100 or Commercial Jet-A-1.

b. Skydrol 500 B-4.

c. MIL-PRF-87252 - Coolant Fluid, Hydrolytically Stable, Dielectric.

d. ASTM-E1119 - Ethylene Glycol, Technical Uninhibited.

They shall then be examined for warping, cracking and mechanical damage.

4.6.9 Vibration (see 3.6.8 and 3.6.9). Switch guards shall be tested in accordance with method 204 of MIL-STD-202. The following details and exceptions shall apply:

a. Mounting - The switch guards shall be mounted on a metal panel with any Military Standard switch for which it is designed. The switch guards shall be mounted such that at least 1 1/2 threads of the switch bushing are exposed. The switch guards shall be tested in the closed position.

b. Test condition - A.

c. Switch guards with maintained positions - One half shall be tested in the closed position while the other half shall be tested in the open position.

d. Measurements during shock - Switch stability shall be continuously monitored during vibration. Contact chatter shall be monitored in accordance with method 310, test condition A of MIL-STD-202. If more than one contact pair is being monitored simultaneously by one contact chatter indicator, open contact pairs shall be connected in parallel and closed contact pairs shall be connected in series during this test. In the event an indication for a contact opening greater than specified, the test shall be modified by testing each switch guard and switch combination separately in order to determine which switch guard is defective. Switch guards shall also be examined during the vibration test for movement from the original position.

e. Measurements after vibration - Switch guards shall be examined for evidence of broken, deformed, displaced or loose parts.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Departments or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended use. Switch guards covered by this specification are intended for use in preventing accidental operation of switches and also to serve as switch locks. The switch guards covered in this specification are military unique due to the fact that these items must be able to withstand exposure to extreme environmental conditions and corrosive materials. In addition these military requirements are verified under a qualification system. Commercial components are not designed to withstand these military environmental conditions.

6.2 Ordering data. Procurement documents should specify the following:

6.2.1 Switch guards covered by MS standards.

a. Title, number, and date of this specification.

b. Title, number and date of the applicable MS standard, and the MS standard part number (see 3.1).

6.2.2 Requirements for switch guards not covered by MS standards.

a. Title, number and date of this specification.

b. Manufacturer's part number.

c. Details of design, construction and physical dimension.

d. Inspection requirements.

1. The laboratory at which inspection is to be performed.

2. Samples and submission of data, if other than that specified.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products that are, at the time of award of contract, qualified for inclusion in Qualified Products List 7703, whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from Defense Supply Center Columbus, Post Office Box 3990, ATTN: DSCC-VQP, Columbus, Ohio 43216-5000 or by email sent to vqp.chief@dla.mil

6.4 Subject term (key word) listing.

Lock-out
Hinged
Fuel
Ethylene
Fungus-proof
Protector
Safety

6.5 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where modifications from this amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

6.6 Dissimilar metals. Dissimilar metals and compatible couples are defined in MIL-HDBK-889.

6.7 Marginal notation. The margins of this specification are marked with vertical lines to indicate where modifications from this amendment were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

Custodians:
Army - CR
Navy - AS
Air Force - 11
DLA - CC

Preparing activity:
DLA - CC

(Project 5930-1799)

Review activities:
Air Force – 99

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