

INCH-POUND

MIL-S-12211E  
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 SUPERSEDING  
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## MILITARY SPECIFICATION

## SWITCH, PRESSURE

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

## 1. SCOPE

1.1 Scope. This specification covers two types of automotive pressure switches (see 6.1). Type I switches operate when fluid pressures drop below predetermined values and type II switches operate when fluid pressures exceed predetermined values.

1.2 Classification. Switches furnished under this specification shall be of the following types and classes as specified (see 6.2). All switches shall be (waterproof).

Type I	- Sufficiently low pressure closes contacts.
Type II	- Sufficiently high pressure closes contacts.
Class 1	- High vibration (see 6.4).
Class 2	- Low vibration (see 6.4).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Tank-Automotive Command, ATTN: AMSTA-GDS, Warren, MI 48397-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document, or by letter.

AMSC N/A

FSC 5930

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## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 8.2).

## SPECIFICATIONS

## MILITARY

MIL-F-13927 - Fungus Resistance Test: Automotive Components.

## STANDARDS

## FEDERAL

FED-STD-H28 - Screw Thread Standards for Federal Services.

## MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.  
 MIL-STD-130 - Identification Marking of US Military Property.  
 MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.  
 MIL-STD-889 - Dissimilar Metals.  
 MIL-STD-1184 - Electrical Components for Automotive Vehicles: Waterproofness Tests.  
 MIL-STD-45662 - Calibration Systems Requirements.  
 MS27152 - Switch, Pressure-Warning, Low Air Pressure 60 PSI, SPST, Waterproof.  
 MS75082 - Switch, Pressure-Stoplight, Vehicular, Air Brake System, 24 Volt, Waterproof.  
 MS75083 - Switch, Pressure-Stoplight, Vehicular, Hydraulic Brake System, 24 Volt, Waterproof.  
 MS90530 - Switch, Pressure-Warning SPST, Waterproof, 24 Volt, DC.

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(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, (ATTN: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issue are those cited in the solicitation.

## DRAWINGS

## ARMY

7321326	- Sending Unit, Low Oil Pressure Warning.
11669414	- Switch, Pressure.

(Copies of drawings required by contractors in connection with specific procurement functions should be obtained from the procuring activity, or as directed by the contracting officer.)

2.2 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 which 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 SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B117	- Salt Spray (Fog) Testing, Method of. (DoD Adopted)
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(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA, 19103.)

(Nongovernment standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

3.1 Qualification. The switches furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable qualified products list at the time of award of contract (see 4.4 and 6.3).

3.2 Materials. Materials shall be as specified herein and in referenced specifications, standards and drawings. Material shall be free of defects which adversely affect performance or serviceability of the finished product (see 4.8.1).

3.2.1 Dissimilar metals. Dissimilar metals shall be protected from galvanic corrosion in accordance with requirements of MIL-STD-889 (see 4.8.1)

3.2.2 Recycled, virgin and reclaimed materials. There are no requirements for the exclusive use of virgin materials; however, all materials shall be new and unused. The use of recycled or reclaimed (recovered) materials is acceptable provided that all other requirements of this specification are met (see 6.5.2).

3.3 Design and construction. Switches shall conform to MS27152, MS75062, MS75063 or MS90530, Drawings 7321328 or 11669414; or to other applicable standards or drawings, as specified (see 4.8.1, 4.8.2 and 6.2).

3.3.1 Threaded parts. Screw threads of the form, number per inch, and class specified on the applicable drawing or military standard shall be in accordance with FED-STD-H28 (see 4.8.2).

3.3.2 Rating. The switch shall be operated in nominal 24 volts (V) direct current (dc) electrical systems, and shall operate a nominal 6 watt (3 candlepower) lamp, or loads as specified on applicable MS standards or drawings (see 4.8.2).

3.4 Performance.3.4.1 Calibration (see 4.8.3).

3.4.1.1 Type I switches. Type I switches shall close on decreasing pressure within the pressure range specified on the applicable MS standard or drawing, and shall remain closed while the pressure is below the lower value specified therein. Type I switches shall open on subsequently increasing pressure at not less than the lower value and not more than 2 pounds per square inch (psi) above the upper value (see 4.8.3.1).

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3.4.1.2 Type II switches. Type II switches shall close on increasing pressure, within the actuation range specified on the applicable MS standard or drawing and shall remain closed while the pressure is above the upper value specified therein. Type II switches shall open on subsequently decreasing pressure at not more than the upper value and not less than 2 psi below the lower value (see 4.8.3.2).

3.4.2 Terminal strength. Terminals shall withstand a force of 25 pounds without becoming deformed more than 1/16 inch or evidencing damage to the switch body. The switch shall subsequently meet the requirements of 3.4.1.1 or 3.4.1.2, as applicable (see 4.8.4).

3.4.3 Pressure overload. Switches shall withstand a pressure overload, as specified on the applicable MS standard or drawing for 1 minute. After overloading, the change in switch opening or closing pressure shall be not more than 8 percent (%). If no overload pressure is specified, pressure shall be 10 times actuating pressure. Switches, conforming to MS90530 type I, class 2, actuating and overload pressures shall conform to table I (see 4.8.5).

TABLE I. Pressures for type I, class 2 of MS90530.

Actuating pressure (psi)	Overload pressure (psi)
4 - 8	50
9 - 13	50
15 - 19	50
23 - 27	50
28 - 32	100
44 - 50	100
60 - 65	150

3.4.4 High voltage. Switches shall withstand 220 V root mean square (rms) at 60 hertz (Hz) for 1 minute without evidence of sparking, arcing, burning, smoking, charring, or other insulation damage (see 4.8.6).

### 3.5 Environmental conditions.

3.5.1 Corrosion resistance. Switches shall withstand 200 hours of salt spray with no degradation in performance (see 4.9.1).

3.5.2 Fungus resistance. Switches shall withstand 90 days of exposure to fungus with no degradation in performance (see 4.9.2).

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3.5.3 Waterproofness. Switches shall meet the requirements specified for type II, class 2 components of MIL-STD-1184 and evidence no leakage (see 4.9.3).

3.5.4 Extreme temperature resistance. Switches shall open and close within the pressure ranges specified herein or on the applicable MS standard or drawing, within a temperature range of minus (-) 65 to plus (+) 250 degrees Fahrenheit (°F) (see 4.9.4).

3.5.5 Shock resistance. Switches shall withstand an acceleration force of 50 gravity units (g's) applied once in each direction of each axis of the switch. During shock application, switches shall be energized and a pressure of 10 psi above the upper actuation pressure specified on the applicable MS standard or drawing or table I, as applicable, shall be applied to type I switches. Similarly, a pressure of 10 psi below the lower actuation pressure shall be applied to type II switches. Switches shall not actuate during shock application and shall evidence no loosened, distorted or broken parts (see 4.9.5).

3.5.6 Vibration resistance.

3.5.6.1 Class 1 switches. Class 1 switches shall withstand vibration amplitude of 0.03 inches or 50 g's, whichever is less, in a cycle range of 10 to 3500 Hz, applied in each direction of each axis of the switch. During vibration, switches shall be energized and pressure applied as specified in 3.5.5. Switches shall not actuate during vibration and shall evidence no loosened, distorted or broken parts (see 4.9.6.1).

3.5.6.2 Class 2 switches. Class 2 switches shall withstand vibration as specified in 3.5.6.1, except amplitude, frequency and conditions shall be as specified in test condition A, method 204 of MIL-STD-202 (see 4.9.6.2).

3.6 Endurance. Switches shall evidence no malfunction after being cycled 10,000 times from 0 psi to twice the actuation pressure specified on the applicable MS standard or drawing, then back to 0 psi. The changes in the pressure at which the switch contacts open and close shall be no more than 8% of the actuation pressure specified on the applicable MS standard or drawing (see 4.10).

3.7 Marking. The switch shall be marked in accordance with MIL-STD-130 and as specified on the applicable military drawing or standard. Marking shall include the following information, in the order shown (see 4.8.2):

Switch, pressure  
 Military part number  
 Type, grade and class  
 Actuating pressure limits  
 Manufacturer's part number.  
 Manufacturer's name.  
 US

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3.8 Workmanship. Workmanship shall be of a quality which will assure a product free of burrs, rust, scratches, chips, sharp edges, loose or defective connectors, cracked insulation, faulty soldering, or other defects which will affect serviceability or appearance. Crimping shall be performed in a workmanlike manner (see 4.8.2).

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examination and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.1.2 Inspection equipment. Unless otherwise specified in the contract (see 6.2), the contractor is responsible for the provision and maintenance of all inspection equipment necessary to assure that supplies and services conform to contract requirements. Inspection equipment must be capable of repetitive measurements to an accuracy of 10% of the measurement tolerance. Calibration of inspection equipment shall be in accordance with MIL-STD-45662.

4.2 Classification of inspections:

- a. Qualification inspection (see 4.4).
- b. Quality conformance inspections (see 4.5).
  1. Examination (see 4.5.2).
  2. Tests (see 4.5.3).
- c. Control tests (see 4.6).

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4.3 Inspection conditions. Unless otherwise specified (see 6.2), all inspections shall be conducted under the following conditions:

- a. Air temperature  $77 + 15^{\circ}\text{F}$  ( $25 + 8^{\circ}\text{C}$ )
- b. Barometric pressure  $28.5 + 2$  inches mercury ( $725 + 50$  mm Hg)  
- 3 - 75
- c. Relative humidity  $50 + 30\%$

4.3.1 Voltage. Calibration and endurance tests shall be conducted at a source voltage of  $28 + 0.5$  V dc.

4.4 Qualification inspection (see 6.3). A qualification sample of four switches of each type, and class to be qualified shall be furnished for qualification testing. The switches shall be representative of switches proposed to be furnished under contract. Qualification testing shall be conducted under Government surveillance by the contractor, or by an authorized testing facility at a site approved by the Government. Inspection shall consist of examination for the defects specified in table IV and testing as specified in table II, in the order listed in table III.

TABLE II. Classification of inspections.

Title	Requirement	Inspection	Qualification	Quality conformance		Control
				Examination	Tests	
Material and construction	3.2, 3.2.1 and 3.3	4.8.1	X			
Defects	3.3 thru 3.3.2, -3.7 and 3.8	4.8.2	X	X		X
Calibration	3.4.1	4.8.3				
Type I switches	3.4.1.1	4.8.3.1	X		X	X
Type II switches	3.4.1.2	4.8.3.2	X		X	X
Terminal strength	3.4.2	4.8.4	X			
Pressure overload	3.4.3	4.8.5	X		X	
High voltage	3.4.4	4.8.6	X		X	
Environmental conditions	3.5	4.9				
Corrosion resistance	3.5.1	4.9.1	X			
Fungus resistance	3.5.2	4.9.2	X			
Waterproofness	3.5.3	4.9.3				
Qualification		4.9.3.1	X			
Quality conformance		4.9.3.2			X	



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TABLE II. Classification of inspection - Continued.

Title	Requirement	Inspection	Qualification	Quality conformance		Control
				Examination	Tests	
Extreme temperature	3.5.4	4.9.4	X			
Shock resistance	3.5.5	4.9.5	X		X	
Vibration resistance	3.5.6	4.9.6				
Class 1	3.5.6.1	4.9.6.1	X			X
Class 2	3.5.6.2	4.9.6.2	X			X
Endurance	3.6	4.10	X			X

4.4.1 Failure. Failure of any qualification sample to pass any of the inspections specified herein may be cause, at the option of the Government, for refusal to conduct additional inspections until the faults revealed by the inspection have been corrected.

4.5 Quality conformance inspections.4.5.1 Sampling.

4.5.1.1 Lot formation. An inspection lot shall consist of all the switches of one type and part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.5.1.2 Sampling for examination. Samples for quality conformance examination shall be selected in accordance with general inspection level II of MIL-STD-105.

4.5.1.3 Sampling for tests. Samples for tests shall be selected in accordance with level L6 of MIL-STD-105.

TABLE III. Order of qualification testing.

Specimen	Paragraph no.	Test
a	4.8.3	Calibration
	4.9.4	Extreme temperature
	4.8.3	Calibration
	4.10	Endurance
	4.8.3	Calibration

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TABLE III. Order of qualification testing - Continued.

Specimen	Paragraph no.	Test
b	4.8.3	Calibration
	4.8.4	Terminal strength
	4.9.3	Waterproofness
	4.9.1	Corrosion
	4.8.6	High voltage
	4.8.3	Calibration
c	4.8.3	Calibration
	4.9.5	Shock
	4.9.6	Vibration
	4.8.3	Calibration
	4.8.6	High voltage
	4.8.3	Calibration
d	4.8.3	Calibration
	4.8.5	Pressure overload
	4.8.3	Calibration
	4.9.2	Fungus
	4.8.6	High voltage
	4.8.3	Calibration

4.5.2 Examination.

4.5.2.1 Acceptable quality level. Each sample selected in accordance with 4.5.1.2 shall be examined to determine conformance to the following acceptable quality levels (AQL).

<u>Classification</u>	<u>AQL</u>
Major	1.0
Minor	2.5

4.5.2.2 Classification of defects. For examination purposes, defects shall be classified as specified in table IV.

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TABLE IV. Classification of defects.

Category	Defect	Method of examination
Critical	None	
<b>Major</b>	<b><u>AQL 1.0% Defective</u></b>	
101	Dimensions affecting installation not within tolerance (see 3.3).	SIE 1/
102	Improper threading (see 3.3.1).	Visual or gage
103	Rating not as specified (see 3.3.2).	SIE
104	Faulty workmanship affecting performance (see 3.8).	Visual
<b>Minor</b>	<b><u>AQL 2.5% Defective</u></b>	
201	Dimensions not affecting installation not within tolerance (see 3.3).	SIE
202	Improper marking (see 3.7).	Visual
203	Faulty workmanship affecting appearance (see 3.8).	Visual

1/ SIE = Standard Inspection Equipment.

4.5.3 Tests. Samples selected in accordance with 4.5.1.3 shall be subjected to the quality conformance examinations and tests specified in table II, in the following sequence and shall conform to an AQL of 6.5 on the basis of percent defective.

4.8.3	Calibration
4.8.5	Pressure overload
4.8.3	Calibration
4.9.3	Waterproofness
4.8.6	High voltage

4.6 Control tests. Control tests shall be conducted on 4 switches from each lot of 500 units consecutively produced, except that not less than 4 nor more than 8 units shall be selected in a 30-day period.

4.6.1 Testing. Switches selected in accordance with 4.6 shall be examined for the defects of table IV and then divided equally between the two test sets of table V and subjected to the tests in the order specified.

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TABLE V. Order of control tests.

Test set 1	Test set 2
4.8.3 Calibration	4.8.3 Calibration
4.10 Endurance	4.9.5 Shock
4.8.3 Calibration	4.9.6 Vibration
	4.8.3 Calibration

4.7 Failure. Failure of any switches to pass any of the specified inspections shall be cause for the Government to refuse acceptance of the production quantity represented, until action taken by the contractor to correct defects and prevent recurrence has been approved by the Government.

4.8 Methods of inspection.

4.8.1 Materials and construction. Conformance to 3.2, 3.2.1, and 3.3 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.8.2 Defects. Conformance to 3.3, through 3.3.2, 3.7 and 3.8 shall be determined by examination for the defects listed in table IV. Examination shall be visual, tactile, or by measurement with standard inspection equipment.

4.8.3 Calibration. To determine conformance to 3.4.1, the switch shall be connected to a variable pressure supply and electrically connected to the power source and load specified in 3.3.2. The switch shall then be tested in accordance with 4.8.3.1 or 4.8.3.2 as applicable.

4.8.3.1 Type I switches. To determine conformance to 3.4.1.1, type I switches shall be subjected to the following procedure: Starting at a pressure 10 psi above the upper actuation pressure specified on the applicable MS standard or drawing, the pressure shall be gradually decreased to a point 10 psi below the lower actuation pressure specified. For switches where minimum operating pressure is 10 psi or less, the lower test pressure shall be zero psi. The pressure shall then be increased to the point 10 psi above the upper pressure specified. During both phases of the operational cycle, a light tapping of the switch, to cause actuation, is permissible. The point at which the switch opens and closes shall be recorded.

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4.8.3.2 Type II switches. To determine conformance to 3.4.1.2, type II switches shall be subjected to the following procedure: Starting at a pressure 10 psi below the lower actuation pressure specified on the applicable MS or drawing, the pressure shall be gradually increased to a pressure 10 psi above the upper actuation pressure specified. The pressure shall then be decreased to the point 10 psi below the lower actuation pressure specified. For switches where the minimum actuation pressure is 10 psi or less, the lower test pressure shall be zero psi. During both phases of the operational cycle, a light tapping of the switch, to cause actuation, is permissible. The point at which the switch closes and opens shall be recorded.

4.8.4 Terminal strength. To determine conformance to 3.4.2, the switch shall be securely mounted. A cable with a suitable mating connection shall be attached to each switch terminal. The force, specified in 3.4.2, shall be applied to each cable in a direction perpendicular to the terminal connector pin. Confirm that no damage to the switch body is evidenced and that there is not more than 1/16 inch deformation to the terminals. Subsequently the switch shall be subjected to the applicable test of 4.8.3 to verify performance.

4.8.5 Pressure overload. To determine conformance to 3.4.3, the switch shall be subjected to the specified overload for 1 minute. Subsequently, the switch opening and closing pressure shall be determined, and shall be within 8% of the specified values.

4.8.6 High voltage. To determine conformance to 3.4.4, with the switch contacts open, 220 V rms at 60 Hz shall be applied for 1 minute between each terminal and the switch body. If there are two terminals, the same voltage shall be applied for 1 minute between each separate terminal and the non-current-carrying part of the switch, with the switch contacts open.

#### 4.9 Environmental conditions.

4.9.1 Corrosion resistance. To determine conformance to 3.5.1, the switch shall be subjected to 200 hours of salt spray in accordance with ASTM B117. Subsequently, the switch shall pass the tests of 4.8.6 and 4.8.3.

4.9.2 Fungus resistance. To determine conformance to 3.5.2, the switch shall be exposed to 90 days of fungus incubation conforming to MIL-F-13927, method B, class 1 or 3. Subsequently, the switch shall pass the tests of 4.8.6 and 4.8.3.

#### 4.9.3 Waterproofness.

4.9.3.1 Waterproofness for qualification. To determine conformance to 3.5.3, switches shall be subjected to the waterproofness test for type II, class 2 components specified in MIL-STD-1184.

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4.9.3.2 Waterproofness for quality conformance. To determine conformance to 3.5.3, switches shall be immersed in the salt water solution specified in MIL-STD-1184 and shall be subjected to an internal pressure of 6 psi and observed for leakage. Leakage will be indicated by air bubbles escaping from the interior of the compartment. Bubbles which are the result of entrapped air on the various exterior surfaces of the component shall not be considered a leak.

4.9.4 Extreme temperatures. To determine conformance to 3.5.4, the switch shall be subjected to the tests specified in a and b, below.

- a. Low temperature. Switch shall be conditioned for 4 hours at  $-60 \pm 5^{\circ}\text{F}$  and while still in ambient air at that temperature shall be operated for 100 cycles (see definition of 6.5.1) using the load current specified in 3.3.2.
- b. High temperature. Switch shall be conditioned for 4 hours at  $+245 \pm 5^{\circ}\text{F}$  and while still in ambient air at that temperature shall be operated for 100 cycles (see definition of 6.5.1) using the load current specified in 3.3.2.

4.9.5 Shock. To determine conformance to 3.5.5, the switch shall be mounted as in intended operation, and subjected to the sawtooth waveform shock test described in test condition I, method 213 of MIL-STD-202. An acceleration force of 50 g's shall be applied once in each direction of three mutually perpendicular axes, one of which will be along the centerline of the switch. During the test, the following conditions shall apply: The electrical load shall be a lamp load, as specified in 3.3.2. A pressure of 10 psi above the upper actuation pressure specified on the applicable MS standard or drawing shall be applied to type I switches. A pressure of 10 psi below the lower actuation pressure specified on the applicable MS standard or drawing shall be applied to type II switches. During each impact the indicating lamp shall be observed for evidence of circuit closure. After the test, the switch shall be examined for defects listed in 3.5.5.

4.9.6 Vibration resistance.

4.9.6.1 Vibration, class 1. To determine conformance to 3.5.6.1, the switch shall be mounted in a test fixture simulating actual mounting in use and shall be connected in a series circuit with a 24 V (nominal) power source and applicable indicating lamp. Care shall be taken to see that the mounting is free of resonances over the frequency range. While energized, the switch shall be subjected to a simple harmonic motion having an amplitude of 0.03 inches or 50 g's peak, whichever is less. Tolerance of + 10% is permissible for the amplitude. The vibrational frequency shall be varied over the range from 10 to 3500 Hz. Rate of frequency shall be logarithmic. When there is no provision for logarithmic cycling, other automatic cycling rates of frequency change may be used. The vibrational cycle from 10 to 3500 and back

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to 10 Hz shall be accomplished in 20 + 2 minutes. This scanning cycle shall be repeated three times in order that critical frequencies may be identified, recorded, and checked. After the scanning cycles, the switch shall be vibrated at the critical frequency for 2 hours. If there is more than one critical frequency, the 2-hour period shall be divided equally between the critical frequencies. If there are more than three critical frequencies, the three most critical shall be selected and the switch vibrated for 40 minutes at each of the frequencies selected. If no critical frequency is identified, the specimen shall be vibrated at 50 g's acceleration, with frequency cycled from 10 to 3500 and back to 10 Hz. Rate of change of frequency shall be logarithmic, or where there is no provision for logarithmic cycling, other automatic cycling rates of frequency change may be used. Time for each cycle shall be 20 + 2 minutes. Duration of the test shall be 2 hours (8 complete cycles). The following test conditions shall apply: The load shall be that specified in 3.3.2. A pressure of 10 psi above the upper actuation pressure specified on the applicable MS standard or drawing shall be applied to type I switches. A pressure 10 psi below the lower actuation pressure specified on the applicable MS standard or drawing shall be applied to type II switches. The indicating lamp shall be observed periodically during the test for evidence of circuit closure. After the test, switches shall be examined for defects specified in 3.5.6.1. This test procedure shall be accomplished along each of three mutually perpendicular axes. Total vibrating time shall be 9 hours (3 hours along each axis).

4.9.6.2 Vibration, class 2. To determine conformance to 3.5.6.2, the switch shall be mounted in a test fixture simulating actual mounting in use and shall be connected in a series circuit with a 24 V (nominal) power source and applicable indicator. Care shall be taken to see that the mounting is free of resonances over the frequency range. The switch shall then be subjected to the vibration test described in test condition A, method 204 of MIL-STD-202. The following test conditions shall apply: The load shall be that specified in 3.3.2. A pressure of 10 psi above the upper actuation pressure specified on applicable MS standard or drawing shall be applied to type I switches. A pressure of 10 psi below the lower actuation pressure specified on the applicable MS standard or drawing shall be applied to type II switches. The indicating lamp shall be observed periodically during the test for evidence of circuit closure. After the test, switches shall be examined for defects specified in 3.5.6.1

4.10 Endurance. To determine conformance to 3.6, the switch shall be connected to the lamp load current specified in 3.3.2 and to a variable pressure fluid supply line. The switch shall then be cycled, 10,000 times, from 0 psi to twice the upper actuation pressure specified on the applicable MS standard or drawing, and back to 0 psi. During the test, the switch shall be observed periodically for evidence of malfunction.

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## 5. PACKAGING

5.1 ~~Preservation, packaging, packing, and marking.~~ Preservation, packaging, packing, and marking for the desired level shall be in accordance with the applicable packaging requirements specified by the contracting authority (see 6.2).

## 6. NOTES

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

6.1 Intended use. Pressure switches covered by this specification are intended primarily to actuate warning lamps or other warning devices to indicate abnormal oil pressures in internal combustion engines, changes of air pressure in brake systems and hydraulic brake stoplight switches. The switches may also be used with other fluids to monitor torque converters, lubricating systems, and control mechanism of automatic and semi-automatic transmissions.

6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type and class of switch required (see 1.2).
- c. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- d. Applicable MS standard or drawing (see 3.3).
- e. If responsibility for inspection equipment should be other than as specified (see 4.1.2).
- f. Selection of applicable level and packaging requirements (see 5.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in the applicable QPL 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 purchase orders for the products covered by this specification. The activity responsible for the QPL is the Commanding General, US Army Tank-Automotive Command, ATTN: AMSTA-GDS, Warren, MI 48397-5000 and information pertaining to qualification of products may be obtained from that activity (see 3.1).

6.4 Classes. Class 1 switches are provided for high load vibration requirements (50 g's at 3400 Hz) most often encountered in tracked vehicles. Class 2 switches are provided for low vibration load environments (10 g's at 500 Hz) and are generally adequate for wheeled vehicles.



## MIL-S-12211E

6.5 Definitions.

6.5.1 Cycling. Cycling, as used herein, shall mean opening and subsequent closing of contacts. Switch cycling frequency shall be the maximum which will allow the electrical contacts to open and close, with the contacts open during half of each cycle.

6.5.2 Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.5.3).

6.5.3 Solid waste. "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) (Source: Federal Acquisition Regulations, section 23.402).

6.5.4 Recurring major defects. A major defect is recurring when the same defect occurs more than once in the same sample, or when the defect occurs in two successive samples. A major defect may be considered recurring when the historical inspection records ("P" chart or equivalent) reflect such a condition. Recurring major defects shall be cause for the entire lot or lots to be inspected for the recurring defects.

6.5.5 Recurring minor defects. A minor defect is recurring if it occurs more than twice in the same sample or when the defect occurs in four successive samples. Recurring minor defects shall be cause for the entire lot or lots to be inspected for the recurring defects.

6.6 Subject term (key word) listing.

Instrumentation, automotive, safety  
Lamps, warning instruments  
Warning device, waterproof

6.7 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MIL-S-12211E

Custodian:  
Army - AT  
Air Force - 11

Review activities:  
Army - ME, MI  
Air Force - 85  
DLA - ES

User activity:  
Navy - MC, YD

Preparing activity:  
Army - AT

(Project 5930-1373)

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DOCUMENT IDENTIFIER AND TITLE		
MIL-S-12211E; Switch, Pressure		
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		<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT
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