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SUPERSEDING
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MILITARY SPECIFICATION

SWITCHES, PRESSURE, AIRCRAFT, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the requirements of several types of aircraft pressure-actuated electrical switches.

1.2 Classification. Pressure switches covered by this specification shall be of the following types, classes as specified (see 6.2).

Type I - MS 25275 Switches, pressure, engine mounted (Type I).

Type II - MS 25276 Switches, pressure, bulkhead mounted (Type II).

Class 1 - Absolute pressure switch design.

class 2 - Differential pressure switch design.

Class 3 - Gage pressure switch design.

Class 4 - Approximate gage pressure switch design.

2. APPLICABLE DOCUMENTS

2.1 Issues of documents. The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, ESSD, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement proposal (DD Form 1426) appearing at the end of this document, or by letter.

SPECIFICATIONS

Federal

BB-N-411	Nitrogen, Technical
QQ-C-320	Chromium Plating (Electrodeposited)
QQ-N-290	Nickel Plating (Electrodeposited)
QQ-Z-325	Zinc Coating, Electrodeposited Requirements for

Military

MIL-D-1000	Drawings, Engineering and Associated Lists
MIL-E-5400	Electronic Equipment, Airborne, General Specification for
MIL-C-5541	Chemical Films for Aluminum and Aluminum Alloys
MIL-S-6872	Soldering Process, General Specification for
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series General Specification for
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
MIL-P-17555	Electronic and Electrical Equipment Accessories, and Repair Parts, Packaging and Packing of
MIL-S-23586	Sealing Compound, Electrical, Silicone Rubber, Accelerator Required
MIL-C-26482	Connector, Electrical (Circular, Minature, Quick Disconnect, Environment Resisting) Receptacles and Plugs, General Specification for
MIL-S-8932/1	Switches, Pressure, Aircraft, Absolute, Types I and 11, Class 1
MIL-S-8932/2	Switches, Pressure, Aircraft, Differential, Types I and II, Class 2
MIL-S-8932/3	Switches, Pressure, Aircraft, Gage, Types I and II, Class 3
MIL-S-8932/4	Switches, Pressure, Aircraft, Approximate Gage, Types I and II, Class 4

STANDARDS

Federal

FED STD No. 1	Standard for Laboratory Atmospheric Conditions for Testing

Military

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of US Military Property
MIL-STD-143	Specifications and Standards, Order of Precedence for the Selection of
MIL-STD-704	Aircraft Electric Power Characteristics
MIL-STD-810	Environmental Test Methods
MIL-STD-831	Test Reports, Preparation of
MIL-STD-889	Dissimilar Metals
MS 3113	Connectors, Receptacle, Electric, Solder Mounting, Miniature Bayonet Coupling
MS 25275	Switches, Pressure, Engine Mounted, (Type I)
MS 25276	Switches, Pressure, Bulkhead Mounted, (Type II)
MS 33649	Boss, Fluid Connection-Internal Straight Thread
MS 33656	Fitting End, Standard Dimensions for Flared Tube Connection and Gasket Seal

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

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the specification sheet, the later shall govern.

3.2 First article. The switches furnished under this specification shall be products, samples of which have been tested and have passed the first article tests specified herein.

3.3 Selection of specifications and standards. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-143 except as provided in 3.3.1.

3.3.1 Commercial parts. Commercial parts having suitable properties shall be used where, on the date of invitations for bids, there are no suitable standard parts. In any case, commercial parts such as screws, bolts, nuts, cotter pins, having suitable properties, may be used provided:

a. They can be replaced by the standard parts (MS or AN) without alteration.

b. The corresponding part numbers are referenced in the parts list and if practicable, on the contractor's drawings.

3.3.2 Materials. Materials shall conform to applicable specifications and shall be as specified herein. Materials for which there are no applicable specifications, or which are not specifically described herein, shall be of the best quality, of the lightest practicable weight and suitable for the purpose intended.

3.3.3 Critical materials. Non-critical materials shall be used where practicable. Where the use of a critical material is essential to meet specification requirements, the material used shall be the least critical-of those which are adequate for the purpose.

3.3.4 Non-magnetic materials. Non-magnetic materials shall be used for all parts of the switch, except where otherwise specified.

3.3.5 Metals. Metals shall be of the corrosive resistant type, or shall be suitably protected as specified herein to resist corrosion due to fuels, salt spray or atmospheric conditions, to which the switch may be subjected when in storage or during normal service life.

3.3.5.1 Dissimilar metals. Dissimilar metals as defined in MIL-STD-889, shall riot be used in intimate contact with each other, unless suitably protected against electrolytic corrosion by means of protective coatings.

3.3.5.2 Contacts. Unless-otherwise specified, the electrical contacts shall be made of silver or other suitable metals approved by the procuring activity. The contacts shall be capable of carrying the loads specified in the specification sheet. ,

3.3.5.3 Aluminnum alloy parts. Where practicable, aluminum alloy parts shall be covered with an anodic film conforming to MIL-A-8625. Aluminum alloys which do not anodize satisfactorily shall be coated with a chemical film in accordance with MIL-C-5541.

'3.3.5.4 iron and steel parts. Iron and steel parts shall be chromium, nickel or zinc plated in accordance with QQ-C-320, QQ-N-290 or QQ-Z-325 respectively.

3.3.5.5 Magnesium alloy parts. Magnesium alloy parts shall not be used.

3.3.6 " "Protective treatment. When materials are used in the construction of the switch that are subject to atmospheric or environmental conditions likely to cause corrosion in normal service life, they shall be protected against corrosion in a manner that will in no way prevent compliance with the performance requirements of this specification. Finishes and protective coatings which will crack, chip or scale during normal service life or are affected by extremes of atmospheric or environmental conditions shall not be used.

3.3.7 Fungus-proof materials. Materials which are nutrients for fungi shall not be used where it is practicable to avoid them. Where used, they shall be treated with a fungicidal agent acceptable to the procuring activity.

3.4 Design and construction. The switches shall be designed and constructed in accordance with the applicable detail specifications and MS. The manufacturer's discretion shall govern the internal design of the, switch." Unless otherwise specified, all switches shall be snap-action, single-pole, double-throw and shall be designed to operate while installed in any mounting attitude and at any pressure within the pressure range or ranges, specified in the detail specification. The switch shall be constructed to withstand normal strains, jars, vibrations, and such other conditions as are incident to shipping, storage, installation, and service. Each switch shall incorporate and meet all the requirements of the applicable slash sheet and those specified herein.

3.4.1 Adjustments. Unless otherwise specified, switches shall be provided with a means of adjustment. When adjustments are incorporated in such a way that they are externally accessible, they shall be designed to meet the requirements specified in the applicable MS. All adjustments shall be provided with a means for securely locking them, after initial adjustments have been made, to prevent loosening due to jars, strains, vibrations, and other conditions incident to shipping,

storage, installation, and service. All adjustment facilities shall be arranged in such a way that adjustments can be made without disturbing the hermetic seal of the switch case. Provisions shall be made for sealing the adjustments if such a feature is desired. Each switch shall be set at the factory during manufacture to the switching point(s) specified on the MS 25275 or MS 25276 as applicable and the tolerance(s) shall be as specified therein.

3.4.1.1 Pressure adjustment. Each switch shall provide a means for accurately adjusting the actuation or deactuation valve of the switch. The adjustment shall incorporate a recessed slot or hex socket, which will be filled with a potting compound conforming to MIL-S-23586. The switch shall be completely adjustable throughout the specified range so that the operating setting (the setting at which the switch operates) may be set anywhere within the pressure range and tolerances specified on the applicable MS.

3.4.2 Pressure connections. Pressure ports for all pressure switches shall incorporate bosses in accordance with MS 33649. When a separate port is required for the case pressure release, it shall be fitted with a connection conforming to MS 33656-2.

3.4.3 Case. The switch case dimensions shall not exceed the dimensions specified on MS 25275 or MS 25276 as applicable (see 6.2). The case shall be hermetically sealed and the design shall be such that the mechanism may be removed from the case, replaced, and the case resealed. The hermetric seal shall be a perfectly closed and airtight seal made between metallic and metallic, or metallic and vitreous materials. A hermetic seal is not intended to include seals accomplished by gaskets. Switches designed for normal system pressures above 150 pounds per square inch gage (psig) shall have a case fitted with a suitable pressure release valve.

3.4.3.1 Body and mounting flange. The body and mounting flange of the case shall be made of lightweight nonmagnetic metal, uniform in grain structure, and shall have a smooth surface.

3.4.3.2 Filling medium. The filling medium shall be a mixture of 90 percent nitrogen and 10 percent helium or a filling medium approved by the procuring activity. The nitrogen used shall be in accordance with BB-N-411, Type I, Class I, grade C. The filling medium shall contain not more than .006 milligram of water vapor per liter (dew point -65°C) at the filling pressure. The absolute pressure of the filling medium in the case shall be 1 ± 0.1 atmosphere,

3.4.3*3 Case pressure release. A metal blowout device to discharge excessive case pressure shall be provided in each pressure switch within the ranges of 0-500 psi through 0-5,000 psi. This device shall operate to release the internal case pressure through an approximately 0.045 inch diameter orifice whenever the internal case pressure, relative to the atmosphere, reaches 90 ± 30 psi. The device shall not affect hermetic sealing. The design of-the blowout device shall be submitted to the procuring activity for prior approval.

3.4.4 Screw threads. Screw threads 0.060 inch or larger in diameter shall be in accordance with MIL-S-7742.

3.4.5 Electronic parts. Electronic parts and the application thereof shall be in accordance with MIL-E-5400. Parts that do not appear on approved lists in accordance with MIL-E-5400 shall not be used unless approved by the procuring activity.

3.4.5.1 Number of contacts. The pressure-sensing mechanism shall operate either two or four contacts (one or two sets) as shown in the applicable schematic specified on MS 25275 or MS 25276.

3.4.6 Voltage. The switches shall operate satisfactorily in electrical systems in which the applied voltage does not exceed the limits specified in MIL-STD-704, Category B, for the type of power designated in the detail specification sheet or applicable MS.

3.4.7 Current rating. The maximum current rating of the switch shall be as specified on the applicable MS.

3.4.8 Relay. No relay shall be connected within the case of the switch. If a relay must be utilized, it shall be located in such a manner that it is totally independent of the switch case.

3.4.9 Electrical connector. The electrical connector used shall conform to MIL-C-26482 and to MS 3113. The type connector used shall be in accordance with figures 1 and 2 of the applicable specification sheet.

3.4.10 Weight. The weight of the completely assembled switch, without connecting fittings, mounting bolts, nuts, screws) and clamps, shall not exceed the weight specified in the applicable MS.

3.4.11 Dimensions. The dimensions of the switch shall be in accordance with the applicable MS.

3.4.12 Operating range. The range throughout which the switch must be adjustable as specified on MS 25275 or MS 25276 as applicable.

3.4.13 Soldering. Soldering shall be performed in accordance with MIL-S-6872. Low temperature solders shall not be used in joints where failure would permit the escape of the fluid actuating the switch.

3.4.14 Finish. Protective coatings and finishes which will crack, chip, or scale during normal service life or due to extremes of atmospheric conditions shall not be used.

3.5 Performance.

3.5.1 Examination. When examined as specified in 4.3 and 4.5 the switches shall meet the requirements for materials, design and construction, marking and workmanship (see 3.3, 3.4, 3.7 and 3.8).

3.5.2 Proof pressure and drift. When subjected to the proof pressure (see 6.5.7), as specified in 4.3.4 the switches shall operate within the tolerances specified on the applicable MS.

3.5.3 Dielectric. When tested as specified in 4.3.5, there shall be no breakdown of insulation or any permanent damage to the switch as a result of the test.

3.5.4 Leakage. When tested as specified in 4.3.6, the leakage shall not exceed the rate specified.

3.5.5 Repeatability. When tested as specified in 4.3.7, the pressure at which the switches actuate and deactuate shall not exceed the tolerances specified on the applicable MS.

3.5.6 Range of adjustment. When tested as specified in 4.3.8, the switches shall be within the adjustable range as specified in the applicable MS.

3.5.7 Operating differential. When tested as specified in 4.3.9, the difference between the actuation and deactuation values (reference values) shall not be greater than the tolerances specified on the applicable MS.

3.5.8 Position. When tested as specified in 4.3.10, the reference values shall not be greater than specified on the applicable MS.

3.5.9 Room temperature endurance. When tested as specified in 4.4.1, the operating points shall not differ from the reference values by more than the tolerance specified on the applicable MS.

3.5.10 High temperature operation. When tested as specified in 4.5.2, the operating points shall not differ from the reference values by more than the tolerance specified on the applicable MS.

3.5.11 Low temperature operation. When tested as specified in 4.5.3, the operating points shall not differ from the reference values by more than the tolerance specified on the applicable MS.

3.5.12 Vibration. When tested as specified in 4.5.4, there shall be no opening of closed contacts or closing of open contacts during the test. At the conclusion of the test, the switch shall be electrically operative without damage. "

3.5.13 Shock . When tested as specified in 4.5.5, there shall be no opening of closed contacts or closing of open contacts during the test. At the conclusion of the test the switch shall be electrically operative and there shall be no damage.

3.5.14 Salt spray. When tested as specified in 4.5.6 there shall be no evidence of corrosion.

3.5.15 Burst pressure. When tested as specified in 4.5.7, there shall be no leakage as indicated by a gage or manometer connected into the line.

3.5.16 Proof pressure. When tested as specified in 4.5.8 there shall be no evidence of valve leakage or damage to the switch.

3.5.17 Endurance. When tested as specified in 4.5.9 the switch contacts shall break a power load equivalent to that specified on the applicable MS. Also when tested as specified in 4.5.9 the operating pressures shall not differ from the reference values by more than the tolerances specified on the applicable MS.

3.5.18 Case pressure release. When tested as specified in 4.5.10 there shall be no evidence of valve leakage or damage to the switch. When tested as specified in 4.5.10, the pressure blowout device shall operate at a pressure of 90 ± 30 psig. There shall be no damage to the switch.

3.6 Interchangeability. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacture's part number shall be government by the drawing number requirements of MIL-D-1000.

3.7 Identification of product. A nameplate shall be securely attached to the exterior of the case and shall be legibly and durably marked in accordance with MIL-STD-130 and shall include the information specified in the applicable specification sheet.

3.8 Workmanship. The switch, including all parts and accessories, shall be constructed and finished to produce an item free from all defects which would affect proper functioning in service. Particular attention shall be given to neatness and thoroughness of soldering, wiring, impregnation of coils, marking of parts and assemblies, welding and brazing, painting, riveting, machine screw assemblies, and freedom of parts from burrs and sharp edges.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification when such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

* 4.2 Classification of inspection. Inspection of the switches shall be classified as follows:

a. First article inspection: First article inspection consists of examination and tests performed after the award of contract on sample switches to determine that the switches meet the requirements of this specification. The sample shall be representative in design, performance and configuration of the switches which will be produced on the manufacturer's production line.

b. Quality conformance inspection. Quality conformance inspection consists of examination and tests performed on switches manufactured and submitted for acceptance under contract.

* 4.3 First article inspection. The first article inspection of the switches shall consist of all the examinations and tests of this specification performed in the order listed herein.

4.3.1 First article inspection sample. First article inspection samples shall consist of three switches of each manufacturer's part number manufactured in accordance with this specification. The samples shall be forwarded at the contractor's expense for first article inspection and shall have been previously subjected only to the individual inspection, The samples shall be forwarded to the laboratory designated by the procuring activity, in the contract or purchase order (see 6.3).

4.3.1.1 First article inspection identification. The first article samples shall be plainly identified by durable tags, securely attached and marked with the following information;

Sample for First Article Inspection
Switch, Pressure, Aircraft Type and Class
Submitted by (Manufacturer's nameplate) for
First Article Inspection in accordance with
MIL-S-8932A under contract or order number
Manufacturer's Part Number

4.3.2 First article inspection. The first article inspection shall consist of the individual and quality conformance tests (see 4.4) and the following tests.

4.3.3 Examination of product. Each switch shall be examined externally to determine conformance with the applicable MS and with all the requirements of this specification not covered by tests (see 3.5.1).

4.3.4 Proof pressure and drift. The switch shall be subjected to the following (see 3.5.2).

a. The switch shall be operated and the pressure at which it actuates noted. A pressure equal to the normal system pres-

sure shall be slowly applied and released. One minute after release of pressure, the actuation pressure shall once again be determined and it shall not differ from the previously noted value by more than the tolerance specified on the applicable MS.

b. A pressure equal to proof pressure (see 6.7.7) shall be slowly applied and released after 2 minutes. Two minutes after the pressure release, the actuation pressure shall be determined, and it shall not differ from the value specified in (a) by more than the tolerance specified on the applicable MS.

4.3.5 Dielectric strength. During production, prior to sealing the case, a 500 (volts alternating current) at 60 Hz shall be applied for 1 minute between any two terminals not electrically connected and between any terminal and ground (see 3.5.3). After the case is sealed, a voltage of 200 VAC (volts alternating current) at 60 Hz shall be applied for 5 seconds between arty two terminals not electrically connected and between any terminal and ground.

4.3.6 Leakage. Each switch shall be tested for case leakage with a mass spectrometer or an equivalent, at least equally sensitive, quantative leak test. Where a nitrogen-helium mixture is utilized as the filling medium, the detected leak rate shall not exceed 0.10 micron cubic foot per hour at one atmosphere [see 3.5.4). The immersion test method 512 of. MIL-STD-810B may be used upon approval of the procuring activity.

4.3.7 Repeatability. The switch shall be connected for operation to a suitable pressure source. The switch shall not be connected to a relay. The procedure shall be as follows (see 3.5.5).

a. With the pressure applied, the adjustment screw shall be turned so that actuation of the switch is caused at the lower portion of the operating range. The switch shall then be operated in accordance with 4.4.3. A pressure sufficient to actuate the switch shall be applied 10 times; the pressure at which the switch actuates and deactuates shall be recorded. These values and the operating differential (see 6.7.2) shall not differ from the initial operating pressure settings by more than the tolerance specified on the applicable MS.

b. Repeat procedure (a) with the actuating point set near the middle of the operating range of the switch.

c. Repeat procedure (a) with the actuating point set in the high portion of the operating range of the switch.

4.3.8 Range of adjustment. The switch shall be set to the upper and lower limits of adjustment and pressure shall be applied to determine if the adjustable range is within the operating range specified on the applicable MS (see 3.5.6).

4.3.9 Operating differential.

4.3.9.1 Initial setting. If the pressure at which the switch should operate is specified by the procuring activity, the switch shall be set as near to the specified value as possible. If the value at which the switch should operate is not specified by the procuring activity, the operating point shall be set at any value within the specified range that is desired. All switches shall not be tested at the same pressure and the setting shall be varied on different samples.

4.3.9.2 Procedure. The switch shall be operated as specified in 4.4.3. The actuation and deactuation pressures and the operating differential (see 6.7.2) shall be noted. The operating differential shall be not greater than the tolerance specified on the applicable MS (see 3.5.7).

4.3.9.3 Reference values. The preceding actuating and deactuating pressures shall hereafter be called the reference values.

4.3.10 Position. The switch shall be operated to determine its actuation pressure in each of three mutually perpendicular axes. The actuation and deactuation pressures shall be determined as specified in 4.4.3 and noted in each position. They shall not differ from the reference values by more than the tolerance specified on the applicable MS (see 3.5.8).

4.4 Test conditions.

4.4.1 Atmospheric conditions. Unless otherwise specified, all tests required by this specification shall be made in accordance with Federal Standard No. 1.

4.4.2 Operating conditions. Unless otherwise specified, actuation of the switch shall always be achieved under conditions of rated current and voltage. The pressure variation necessary to produce actuation shall be as specified on the applicable KS. Unless otherwise specified, applied pressure shall not exceed the proof pressure. On switches that incorporate two or more independent sets of contacts which operate at different pressures, the operating pressure shall be determined for each set of contacts when tests involve the determination of operating pressures.

4.4.3 Procedure for operation. The pressure connection(s) for each sensor shall be connected to a device capable of applying to the sensor a pressure specified on the applicable MS. The pressure shall be slowly increased until the switch actuates. The pressure shall then be increased to the normal system pressure and slowly decreased until the switch deactuates.

4.5 Environmental.

4.5.1 Room temperature endurance. The switch shall be operated for 20,000 cycles under rated current with the pressure applied ringing from O "to 80 percent of the range specified on the applicable MS. The cycling rate shall not exceed 60 cycles per minute (cpm). Upon completion of each 5000 ± 100 cycles, the operating points of the switch shall be determined as specified in 4.4.3 and they shall not differ from the reference values by more than the tolerance specified on the applicable MS (see 3.5.9).

4.5.2 High temperature operation. The switch shall be subjected to the following (see 3.5.10).

Procedure I: This procedure shall be used unless otherwise specified by the procuring activity. The pressure switch shall be. placed in a test chamber and the internal temperature of the chamber raised to 125° ± 5°C for a minimum of 16 hours, and while still at the high temperature, the pressure at which the switch operates shall be determined as specified in 4.4.3, and shall not differ from the reference values by more than the tolerance specified on the applicable MS. If the switch operated satisfactorily, it shall then be subjected to 3,000 cycles of operation? at a cycling rate of 30 + 10 cpm, with rated current applied. At the conclusion of the 3,000 cycles of operation, the pressure at which the switch operates shall be determined as specified in 4.4.3, and shall not differ from the reference values by more than the tolerance specified on the applicable MS. With the temperature still maintained at 125° ± 5°C, 97 ± 3 percent of the normal system pressure specified on the applicable MS shall be applied to the pressure sensor(s) for 20 hours. At the conclusion of the 20-hour period, the pressure at which the switch operates, determined as specified in 4.4.3, shall not differ from the reference values specified by more than the tolerance specified on the applicable MS.

Procedure II: Whenever procedure II is specified [see 6.2), the testing methods specified in procedure I shall be repeated, except that a temperature of 200° ± 5°C shall be substituted for 125° ± Sot.

4.5.3 Low temperature operation. The switch shall be placed in a chamber which is then cooled to and maintained at -65° ± 5°C for 20 hours. At the completion of the 20 hour period the temperature shall be raised to -55° ± 5°C for 4 hours. At the end of this period and while still at this temperature, the pressure at which the switch operates, determined as specified in 4.4.3, shall not differ from the reference values by more than the tolerance specified on the applicable MS (see 3.5.11).

4.5.4 Vibration. The switch shall be subjected to vibration testing in accordance with MIL-STD-810 method 514, figure 514.2-2 and Table 514.2-2. The switch shall be mounted on a vibration test stand and connected to a suitable pressure source. A pressure equal to

the pressure valve that is midway between the on and off valve(s) of the switch shall be applied. While operating, the switch shall be subjected to vibration in each of the mutually perpendicular axes. The switch shall have the pressure slowly increased and decreased, while being vibrated. As the pressure approaches the operating point, the switch shall be carefully observed to see if contact flutter exists. The transition for "on" to "off" and "off" to "on" shall be positive (without flutter). The resonant frequencies of the switch shall be determined for each axis while varying the frequency of the applied vibration slowly through the range and at vibratory accelerations specified. When resonance is revealed, the switch shall be vibrated in the axis at which it is revealed for 2 hours and with the applied double amplitude or vibratory accelerations specified. This period of vibration shall be accomplished in sequence for each of the two remaining mutually perpendicular axes of vibration. When more than one resonant frequency is encountered with vibration applied along any one axis, the test shall be conducted at the most severe resonant frequency. When resonant frequencies are not apparent within the specified frequency range, the switch shall be vibrated twice as long as those specified for resonance at a frequency of 55 Kz and at an amplitude of 0.060 inch. During the vibration period, the switch shall be observed for contact chattering or switch operation (see 3.5.12). At the end of the test period, the switch shall be free of any defects produced by the testing procedure. The operating points shall be determined as specified in 4.4.3 and they shall not differ from the reference values by more than the tolerance specified on the applicable MS.

4.5.5 Shock . The switch shall be subjected to shock test Method 516 of MIL-STD-810 using an acceleration of 25g. Prior to each application of shock, the switch shall be pressurized to a point just below the actuating point, and then to a point just above the deactuating point and observed for switch operation (see 3.5.13). At the conclusion of the test, the pressure at which the switch operates shall be determined as specified in 4.4.3, and shall not differ from the reference values by more than the tolerance specified on the applicable MS (see 3.5.13).

4.5.6 Salt spray. The switch shall be subjected to salt spray test Method 509 of MIL-STD-810 (see 3.5.14). All ports shall be closed during this test.

4.5.7 Burst pressure. The switch shall successfully withstand a burst pressure equal to 150 percent over its normal operating system's pressure for 3 minutes (see 3.5.15}.

4.5.8 Proof pressure. A pressure of 75 ± 5 psig shall be applied to the case pressure release valve for 10 minutes. The pressure shall then be released and the leakage test of 4.3.6 shall be performed (see 3.5.16).

4.5.9 Endurance. The switch shall be subjected to 100,000 cycles of pressure, each cycle ranging from zero to 80 percent of normal system pressure. The pressure cycling shall be conducted at the rate of not more than 60 cpm. 'During this test,. the switch contacts shall break a power load equivalent to that specified on the applicable MS. At the conclusion of the test, the switch shall be operated to determine the operating pressures as specified in 4.4.3. These pressures shall not differ from the reference values by more than the tolerance specified on the applicable MS. The 23,000 cycles accomplished as specified in 4.7.9 and 4.7.10 shall be considered as part of the 100,000 total cycles (see 3.5.17).

4.5.10 Case pressure release. The pressure blowout device shall be tested by actual injection of pressure into the switch case. The device shall operate at a pressure of 90 ± 30 psig. There shall be no evidence of fracture to the switch case. (See 3.5.18).

4.6 Quality conformance tests. The quality conformance tests shall consist of the individual tests (4.6.1) and the sampling tests (4.6.2).

4.6.1 Individual tests. The individual tests of the switches shall consist of the following tests conducted on each switch:

Examination of product	4.3.3
Proof press and drift	4.3.4
Dielectric strength	4.3.5
Leakage	4.3.6

4.6.2 Sampling tests.

4.6.2.1 Sampling plan A. Samples shall consist of 3 switches selected at random from each lot of 100 or less, which have passed the individual tests. A lot shall consist of identical switches with the same manufacturer's part number, manufactured under essentially the same conditions . and submitted essentially at the same time. Switches which have been subjected to the sampling plan A tests shall not be delivered on contract until they have been rebuilt and resubmitted to all individual tests.

4.6.2.1.1 Sampling plan A tests. The sampling plan A tests shall consist of the following tests conducted on each sample:

Position.	4.3.10
Repeatability	4.3.7
Range of adjustment	4.3.8
Operating differential	4.3.9
Room temperature endurance	4.5.1
High temperature operation	4.5.2
Low temperature operation	4.5.3
Vibration . . . . . , ... ,	4.5.4

4.6.2.2 Sampling plan E. Unless otherwise specified, 3 switches selected at random from the first 15 switches produced on contract and submitted within 10 days after manufacture shall be forwarded to the laboratory specified (see 6.2). Each sample shall be plainly identified by a securely attached durable tag marked with the following information:

Submitted by (Manufacturer's name, date) for production test in accordance with Contract No. _____.

4.6.2.2.1 Sampling plan B tests. The sampling plan B tests of the switches shall consist of the following tests conducted on each sample:

Sampling plan A	4.6.2.1.1
Shock	4.5.5
Salt spray.	4.5.6
Burst pressure	4.5.7
Case pressure release	4.5.10
Endurance	4.5.9

4.7 Rejection and retest. The instructions on reworking or resubmitting rejected items shall be as specified in the contract.

* 4.8 Inspection of packaging. The sampling and inspection of the preservation-packaging and interior package marking shall be in accordance with the Group A and B quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification and the marking requirements of MIL-STD-129.

5. PACKAGING

5.1 Preservation-packaging. Preservation-packaging shall be Level A or C as specified (see 6.2).

* 5.1.1 Level A. The switches shall be preserved and packaged in accordance with MIL-E-17555.

* 5.1.2 Level C. The switches shall be preserved and packaged in accordance with MIL-E-17555.

* 5.2 Packing. Packing shall be Level A, B or C as specified (see 6.2).

* 5.2.1 Level A. The switches shall be packed in accordance with MIL-E-17555 (see 6.2).

* 5.2.2 Level B. The switches shall be packed in accordance with MIL-E-17555 (see 6.2).

* 5.2.3 Level Co Switches packaged as specified in 5.1 shall be packed in a manner to insure carrier acceptance and safe delivery at destinations. Containers shall be in accordance with Consolidated Freight Classification Ratings, Rules and Regulations or regulations of other carriers applicable to the mode of transportation.

5.3 Marking. In addition to the marking required by MIL-E-17555. Interior packages and shipping containers shall be marked in accordance with the requirements of MIL-STD-129. The use of labels for identification marking on exterior shipping containers is not permitted.

6. NOTES AND CONCLUDING MATERIAL

6.1 Intended use. The pressure switches are intended for use in aircraft to operate equipment such as pumps and valves, and indicators such as lights. They may be operated by liquid or gaseous materials and may be used in ac or dc systems.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number and date of this specification and the applicable specification sheet.

b. MS Part Number.

c. Type and class of switch [see 1.2).

d. Data requirements (see 3.2 and 4.3.1).

e. Levels of packaging and packing required (see 5.1).

f. Name of the activity to which first article samples shall be forwarded (see 4.3.1 and 4.3.1.1).

g. Whether sampling plan B is to be omitted (see 4.5.2.2).

h. Selection of Procedure I or Procedure II of the high temperature operation (see 4.5.2).

i. Operating pressure (see 4.3.8).

j. Type of fluid or gas to be used for pressurization of the switches.

k. Items of data required (see 6.3).

* 6.3 Data . For the information of contractors and contracting officers, any the data specified in (a) applicable documents listed in Section 2 of this specification, or (b) referenced lower tier documents, need not be prepared for the Government and shall not be furnished to the Government unless specified in the contract or order. The data to be furnished shall be listed on DD Form 1423 (Contractor Data Requirements List) which shall be attached to and made a part of the contract or order. NAVWEPS Form 4200/15 (Drawings, Lists and Specifications Required) shall be attached where applicable.

* 6.4 First article test provisions. The manufacture of switches on contract shall not commence until the samples submitted are pronounced satisfactory by the procuring activity. When a contractor is in continuous production of the switch from contract to contract, the submission of further first article samples on subsequent contracts may be waived at the discretion of the procuring activity. Approval of first article samples or the waiving of first article tests does not reduce the requirements for acceptance testing.

6.4.1 It shall be understood that the switches supplied under contract or order shall be identical to the corresponding first article sample in design, construction, quality, material, workmanship and method of manufacture. Deviation from the standards of the first article sample shall be made only by the procuring activity.

* 6.5 Precedence of documents. When the requirements of the contract, this specification, or applicable subsidiary specifications are in conflict, the following precedence shall apply:

a. Contract. The contract shall have precedence over any specification.

b. This specification, This specification shall have precedence over all applicable subsidiary specifications. Any deviation from this specification, or from subsidiary specifications where applicable, shall be specifically approved in writing by the procuring activity.

c. Referenced specifications. Any referenced specification shall have precedence over all applicable subsidiary specifications referenced therein. All referenced specifications shall apply to the extent specified.

6.6 Classes of pressure switches.

6.6.1 Class 1 - absolute pressure switch. A switch which responds to the difference between applied pressure and a vacuum. The applied pressure acts through a pressure port against one side of a pressure sensor. The vacuum is sealed in the switch and acts against the opposing side of the pressure sensor (see 1.2).

6.6.2 Class 2 - differential pressure switch. A switch which responds to the difference between two pressures, applied through separate ports against opposing sides of a pressure sensor (see 1.2).

6.6.3 Class 3 - gage pressure switch. A switch which responds to the difference between an applied pressure, and a pressure of one atmosphere. The applied pressure acts through a pressure port against one side of a pressure sensor. The opposing side of the sensor is vented to the atmosphere (see 1.2).

6.6.4 Class 4 - approximate gage pressure switch. A switch which responds to the difference between an applied pressure, and a pressure of one atmosphere. The applied pressure acts through a pressure port against one side of the sensor. The pressure of one atmosphere acts against the opposing side of the sensor and is sealed into the switch (see 1.2).

6.7 Definitions.

6.7.1 Absolute pressure. This is defined as the difference between a given pressure and a perfect vacuum (zero pressure absolute). It may be determined by adding gage pressure to barometric pressure and is expressed as psia.

6.7.2 Differential pressure. This is defined as the alteration between two applied pressures and is expressed as paid.

6.7.3 Gage pressure. This is defined as the difference between an absolute pressure and ambient barometric pressure and is expressed as psig.

6.7.4 Approximate gage pressure. This is defined as the difference between an absolute pressure and a reference pressure of one atmosphere.

6.7.5 Ambient pressure. This is defined as the surrounding adjacent pressure. Ambient pressure is not necessarily atmospheric.

6.7.6 Normal system pressure. This is defined as that maximum pressure to which a pressure switch is subjected throughout its service life. It serves as a basis for the calculation of proof and surge pressures.

6.7.7 Proof pressure. A pressure value equal to 50 percent over the normal system pressure is defined as proof pressure.

6.7.8 Burst pressure. A pressure value equal to 150 percent over the normal pressure is defined as burst pressure.

6.7.9 Reference values. The term "reference values" is used in this specification to mean the pressure at which the switch is set to actuate or deactuate.

6.7.10 Adjustable range. The adjustable range of a switch is the limiting range of pressures within which both the actuation and the deactuation point may be adjusted.

6.7.11 Operating differential. The operating differential is the difference between the two pressures at which the switch actuates and deactuates.

Custodians:
Army - AV
Navy - AS

Reviewer Activity:
Army - AV
Army - As

User Activities:
Army - AV
Navy - AS

Preparing Activity
Navy - As

Project No. 1650-0348

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- ☐ OTHER *(Specify)*: _____

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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional

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