REQUIREMENT 19

DETAILED REQUIREMENTS FOR SWITCHES

19. General. This section describes detailed requirements for a DPA of commonly used switches. These requirements supplement the general requirements in section 4. Examples of typical configuration sketches are included. When applicable, specification numbers or types are referenced to assist in identification. Pre-DPA tests, such as functional tests and solderability tests, are assumed to have been satisfied by normal inspection and testing and are therefore not addressed.

19.1 Switch, snap action.

19.1.1 Method.

19.1.1.1 Seal leakage. Switches shall be tested for seal leakage in accordance with the following as applicable.

a. Hermetic seal. Hermetically sealed switches shall be tested the same as relays (reference 17.1.1.2 herein).

b. Environmental seal. Environmentally sealed switches shall be tested in accordance with the procurement specification.

c. Nonsealed. Nonsealed switches shall not be subjected to any type of seal test.

19.1.1.2 External examination. Examinations shall be performed using a microscope with 10X magnification, except when an abnormality is suspected and then 30X magnification (maximum) may be used to verify product integrity.

a. Header glass seals. The glass seals on the headers of hermetically sealed switches shall be in compliance with MIL-H-28719.

b. Protective finish and plating (as applicable).

(1) There shall be no unplated areas or discontinuities of protective finishes.

(2) The finish shall be smooth and free from chips, blisters, peeling, or rough spots.

(3) There shall be no evidence of plating flaking off.

(4) There shall be no evidence of inadequate protection against corrosion.

(5) The case shall be free from distortion and dents.

c. Part marking (as applicable). Marking shall be in accordance with MIL-STD-1285.

d. Terminals, studs, and mounting (as applicable).

(1) There shall be no bent or broken terminals.

(2) Switch terminals shall be in accordance with the detailed specification and shall be free from burrs and malformations.

(3) Screw threads, tapped holes, and threaded inserts shall be of the size shown on the detailed specification, and shall be in accordance with FED-STD-H28, unless otherwise specified. No malformed threads shall be accepted. A minimum of three full threads of engagement shall be provided.

(4) Clearance holes and hardware such as nuts, washers, etc. shall be of the size shown on the detailed specification, and shall be free of burrs and malformations.

(5) Studs, flanges, brackets, etc. shall be securely fastened to the switch case.

19.1.1.3 Sectioning. The most common hermetic, environmental, and nonhermetic types of snap action switches are opened as follows:

a. Metal enclosure (hermetic seal and environmental seal). Place one side of switch enclosure on a flat grinding (disc) surface and apply a steady firm pressure by hand until surface is ground to a point where the remaining side wall thickness (approximately 10 percent) permits easy puncture with a sharp cutting tool such as an Exacto knife blade. Prevent the grinding operation from penetrating the enclosure by testing the wall thickness frequently during the grinding with the point of the Exacto blade. (The hands, instruments used, and all external surfaces of the switch enclosure should be cleaned and free of any contaminants upon completion of the grinding operation and just prior to penetrating switch enclosure). After completion of grinding and cleaning perform the final opening step over a clean white contaminant-free bench or paper surface. Penetrate enclosure with the point of the Exacto knife blade. Orient the switch enclosure so that particles generated during opening do not enter inner areas of the switch.

b. Plastic enclosure (non-hermetic seal). Place the point of an Exacto knife blade cutting edge into the groove where the enclosure sections are joined and force cutting edge into groove around outer periphery until all bonding material (usually an epoxy type) has been cut through. Prior to separating case; orient switch enclosure with respect to gravity to minimize entry of external contamination into the interior areas.

19.1.1.4 Internal examination. NOTE: Figure 19-1 is a visual example of a switch assembly containing two subminiature non-hermetic-seal-type snap-action switches with plastic enclosures. All exposed inner surfaces of the device shall be examined for the following characteristics at 20X minimum magnification:

a. Any detectable loose particulate matter is unacceptable.

b. Loose, broken, or misaligned components; not caused by the opening procedure is unacceptable.

c. Corrosion or peeling of plating or finish is unacceptable.

d. Devices shall be considered marginally acceptable if they exhibit the following characteristics:
NOTE: Corrective action to eliminate any marginally acceptable conditions shall be initiated at the supplier when such conditions have been detected in DPA.

(1) Adhering conductive or nonconductive particles (metal burrs or case flashing).

(2) Incomplete swagging or staking of assembly components (not 360 degrees).

(3) Scratches or nicks on contact interface surface areas.

1 Plunger Actuator
2 Guard Plunger Washer
3 Plunger Spring Retainer
5 Nut-Special
6 Spring-Compression
7 Plunger
8 Bracket
9 Spring-Compression
10 Plunger Pin
11 Contact-Movable
12 C-Spring
13 Housing
14 Header Assembly
15 Guard
16 Paint
17 Normally Closed Stationary Contact Terminal
18 Normally Closed Stationary Contact
19 Normally Open Stationary Contact
20 Normally Open Stationary Contact Terminal
21 Movable Contact Spring
22 Anchor-Stationary
23 Common Terminal
24 Washer-Plain
25 Bushing Actuator
26 Seal-Ring
27 Washer-Plain
28 Washer-Lock
29 Seal-Ring
30 Washer-Special
31 Spring-Actuator
32 Lever-Switch Actuation
33 Case-Switch
34 Rivet-Oval Head
35 Inert Gas Arc Weld
36 Glass Seal
37 Header Tubes for Terminal Solder Joint
38 Lead Wire Embedment
39 Insulation Electrical
40 Contact and Ground Wires

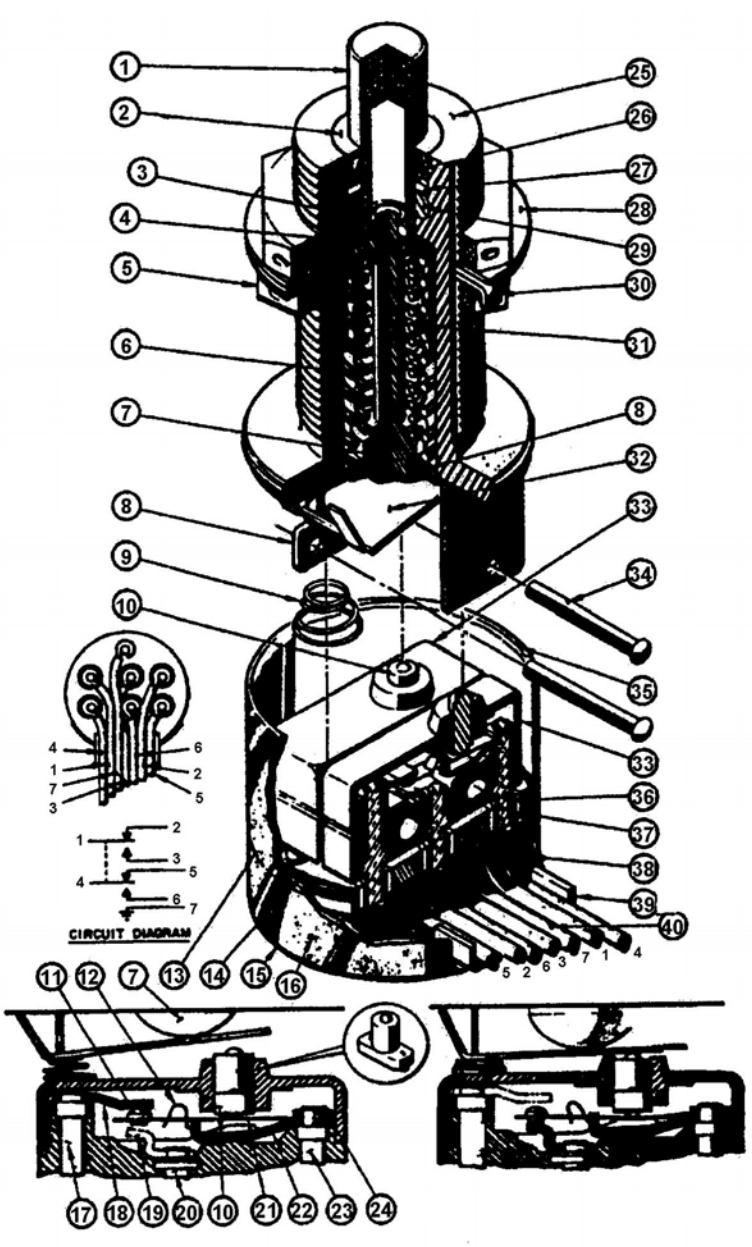

FIGURE 19-1. Switch assembly (typical).

19.2 Thermal switches.

19.2.1 Method. This section covers several manufacturers' types of thermal switches. The various types covered are depicted on figures 19-2 through 19-5. The type to be analyzed should be determined before dissection.

19.2.1.1 External examination. Thermal switches shall be examined to verify that the materials, external design and construction, physical dimensions, weight, marking, terminals, and workmanship are in accordance with the applicable detailed specification. Examination shall be performed using a microscope with 10X magnification, except when an abnormality is suspected, and then 30X magnification (maximum) may be used to verify product integrity for the following:

a. Header glass seals. The glass seals of the header shall be in accordance with MIL-H-28719.

b. Protective finish and plating.

   (1) There shall be no unplated areas or discontinuities of protective finish.

   (2) The finish shall be smooth and free from chips, blisters, peeling, or rough spots.

   (3) There shall be no evidence of plating flaking off.

   (4) There shall be no evidence of inadequate protection against corrosion.

   (5) The case shall be free from distortion and dents.

c. Marking. Marking shall be in accordance with MIL-STD-1285.

d. Terminals.

   (1) There shall be no bent or broken terminals.

   (2) Thermal switch terminals shall be in accordance with the detailed specification and shall be free from burrs and malformations.

   (3) Screw threads, tapped holes, and threaded inserts shall be of the size shown on the detailed specification, and shall be in accordance with FED-STD-H28, unless otherwise specified. No malformed threads shall be accepted. A minimum of three full threads of engagement shall be provided.

   (4) Clearance holes and hardware such as nuts, washers, etc. shall be of the size shown on the detailed specification, and shall be free of burrs and malformations.

   (5) Studs, flanges, brackets, etc. shall be securely fastened to the thermal switch case.

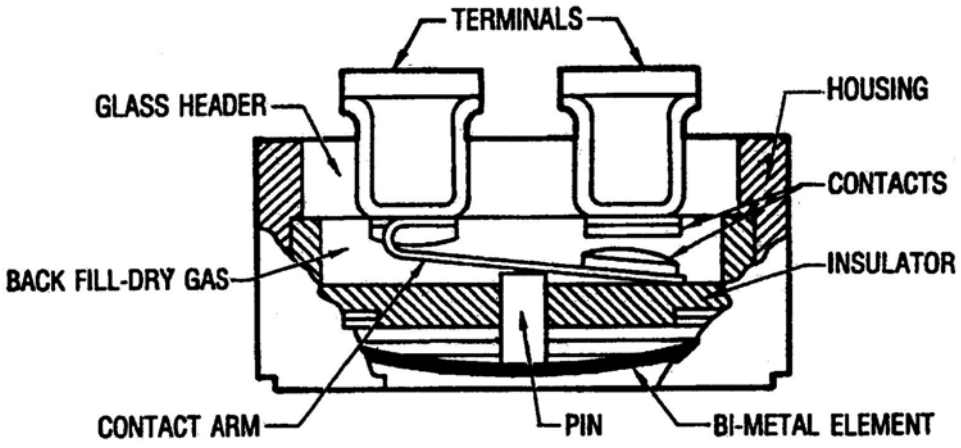

FIGURE 19-2. Type A, Thermal Switch Cross-sectional view.

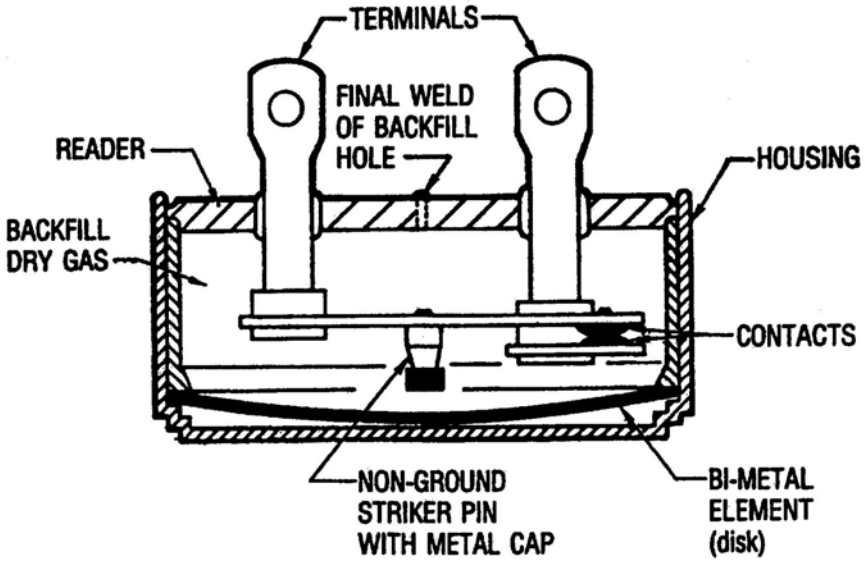

FIGURE 19-3. Type B, Thermal Switch Cross-sectional View.

19.2.1.2 Suggested sectioning. CAUTION: The introduction of foreign particles during opening can result in unacceptable conditions during the micro-clean inspection of 19.2.1.3. To avoid damage or deformation of the thermal switch, the use of holding devices such as wire, clamps, or pliers is prohibited. Remove all adjunct sealants for thermal switch headers prior to opening and then do the following:

a. Place temperature-sensing side on a flat grinding surface and apply a steady firm pressure by hand. The grinding operation must not penetrate the case, but should only remove sufficient wall material thickness so the remaining wall thickness (approximately 10 percent) can be readily cut through with a sharp cutting instrument such as an Exacto knife blade.

b. During grinding, vacuum off the affected areas continually or as often as possible in order to remove loose metallic particles that could disrupt later examinations. To avoid damage to the thermal switch enclosure, it should be firmly held by hand during each step of the opening procedure.

   NOTE: do not attempt to make the final opening of the thermal switch in a shop area.

c. Take the thermal switch to the clean room area where the final inspection (19.2.1.3) is to occur.
   NOTE: A specially cleaned area should be dedicated to the inspection. Personnel traffic shall be limited to those involved in the inspection. All equipment and material such as microscopes, filters, containers, tweezers, etc. shall be thoroughly cleaned prior to entering the area.

d. Using adhesive tape and a vacuum remove all loose (or potentially loose) particles from around the machined surfaces. Examine the affected areas at 30X magnification to verify that no loose particles are present.

e. Once it has been verified at 30X magnification that the thermal switch exterior is free of particles, do not handle it without using finger cots or lint-free rubber gloves.

19.2.1.3 Internal examination. Refer to figures 19-2 through 19-5 for illustrations of thermal switch constructions. All exposed inner surfaces of the device shall be examined for the following characteristics at 20X minimum magnification.

a. Loose particles (conductive or nonconductive), not caused by opening, within the switch or cover that are larger than 0.13 mm (.005 inches) in their longest dimension.

b. Loose, broken, or misaligned components not caused by opening are unacceptable.

c. Evidence of contamination film that can be detected by 20X magnification is unacceptable.

d. Corrosion or peeling of plating or finish is unacceptable.

e. For type C thermal switches only: Loctite on adjustment screw area other than adjacent to nut, where it is normally applied to secure adjustment screw, is unacceptable. (Loctite is not applicable to types A and B thermal switches).

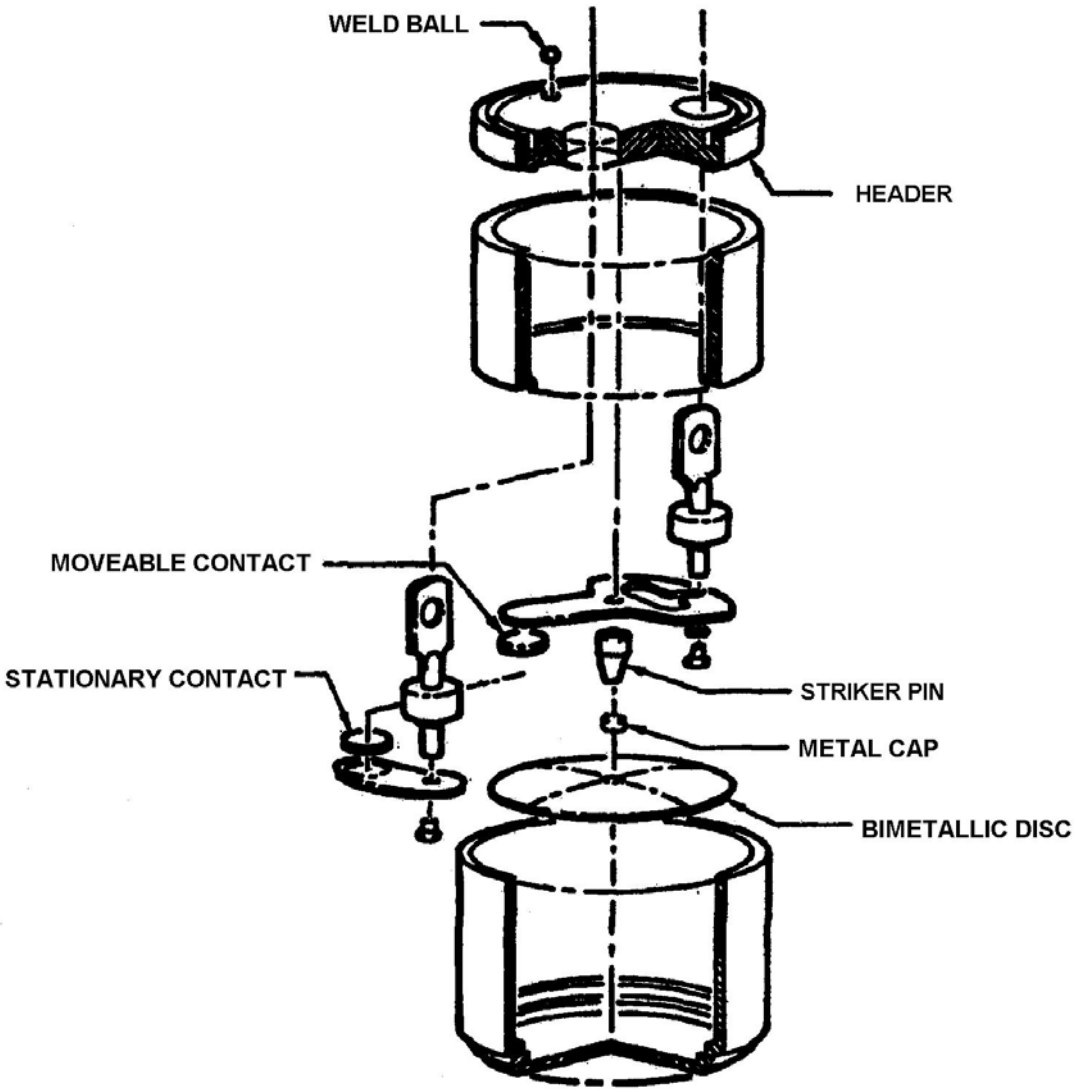

FIGURE 19-4. Type B thermal switch exposed view.

1 COVER
2 DISK
3 ADJUSTING SCREW (WITH HEX FLANGE)
4 RIVET
5 MOVEABLE ARM
6 STAND OFF BUMP (2 ON BASE)
7 BASE
8 RETAINING NUT (MOLDED INTO BASE)
9 CUP
10 CONNECTOR
11 INSULATOR
12 WELD JOINT
13 BARREL
14 SEAL GLASS
15 LEAD WIRE
16 TERMINAL FEED-THRU
17 WELD (FINAL SEAL)
18 TERMINAL EXTENSIONS
19 STATIONARY CONTACT
20 MOVABLE CONTACT
21 INSULATOR BEAD
22 SPRING
23 MOUNTING BRACKET

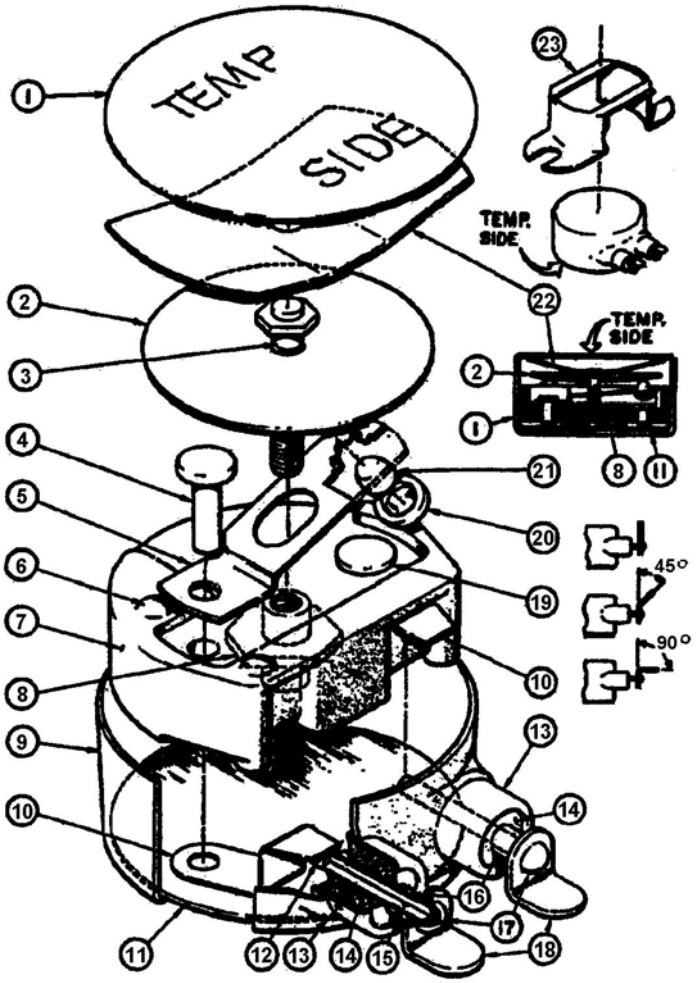

FIGURE 19-5. Type C thermal switch exploded and cross-sectional views.