

METRIC

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SUPERSEDING
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17 April 1984

MILITARY SPECIFICATION
SWITCHES, THERMOSTATIC

This specification is approved for use by US Army Tank-Automotive Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers a dual level high coolant temperature switch which is designed to generate an alarm by light or audible sound when fluid temperature and pressure exceed predetermined conditions (see 6.1).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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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2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation form a part of this specification to the extent specified herein.

SPECIFICATIONS

MILITARY

- MIL-S-12285/1 - Switch, Thermostatic (Long Sensor).
- MIL-S-12285/2 - Switch, Thermostatic (Short Sensor).
- MIL-F-13927 - Fungus Resistance Test; Automotive Components

STANDARDS

FEDERAL

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

MILITARY

- MIL-STD-130 - Identification Marking of US Military Property.
- MIL-STD-202 - Test Methods of Electronic and Electrical Component Parts.
- MIL-STD-889 - Dissimilar Metals.
- MIL-STD-970 - Standards and Specifications, Order of Precedence for the Selection of.
- MIL-STD-1184 - Electrical Components for Automotive Vehicles, Waterproofness Tests.

(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.)

2.2 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

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 sheets, the latter shall govern.

3.2 Qualification. 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 4.5 and 6.3).

3.3 Materials. Materials shall be as specified herein and in referenced specifications, standards and drawings. Specifications and standards for all materials, parts, and processes which are not specifically designated herein and which are necessary for the execution of this specification shall be selected in accordance with MIL-STD-970 (see 4.9.1).

3.3.1 Dissimilar metals. Except where necessary to complete an electrical circuit, the switch shall be designed and fabricated to minimize galvanic corrosion in dissimilar metal couples as specified in MIL-STD-889 (see 4.9.1).

3.3.2 Recycled, virgin and reclaimed materials. There are no requirements for the exclusive use of virgin materials. The use of recycled or reclaimed (recovered) materials is acceptable provided that all other requirements of this specification are met (see 4.9.1 and 6.4.1).

3.4 Design and construction. Switches covered by this specification shall be in accordance with MIL-S-12285/1 and/or MIL-S-12285/2 (see 4.9.2 and 6.2)

3.4.1 Threaded parts. Screw threads, of the form, number per inch, and class specified on the applicable drawing, military standard, or figure, shall be in accordance with the applicable sections of FED-STD-H28 (see 4.9.1).

3.5 Performance.

3.5.1 Calibration. The switch shall operate within the temperature ranges specified herein:

The switch shall generate an alarm by flashing a warning light or by producing an audible sound when the coolant temperature is at or above 205°F with the coolant pressure below 7 psig. The switch shall also generate an alarm by flashing a warning light or producing an audible sound when the coolant temperature is at or above 225°F with the coolant pressure at or above 7 psig. The pressure tolerance for the switch shall not be in excess of ± 0.14 psi and the temperature tolerance for the switch shall not be in excess of $\pm 5^\circ\text{F}$ (see 4.9.3).

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3.5.2 Dielectric withstanding. The switch shall operate within the temperature and pressure ranges specified in 3.5.1 with the insulation showing no evidence of cracking, charring, burning, smoking or other damage (see 4.9.4).

3.5.3 High temperature. The switch shall withstand being heated for one minute in an oil bath at $177^{\circ} \pm 3^{\circ}\text{C}$ ($350^{\circ} \pm 5^{\circ}\text{F}$), then cooled to room temperature, with the resultant change in calibration (see 3.5.1) being no more than $\pm 3^{\circ}\text{C}$ (5.4°F) (see 4.9.5).

3.5.4 Waterproofness. The switch shall withstand being submerged for 30 minutes while being operated at full rated current and voltage, with no evidence of leakage. It shall subsequently meet the requirements of 3.5.1 (see 4.9.6).

3.5.5 Corrosion. The switch shall withstand being subjected to a salt spray (fog) condition for 200 hours with the resultant change in calibration (see 3.5.1) being no more than $\pm 3^{\circ}\text{C}$ (5.4°F) (see 4.9.7).

3.5.6 Fungus. The switch shall operate as specified herein after exposure to 90 days of continuous incubation (see 4.9.8).

3.5.7 Shock. The switch shall withstand shock impact of 100 gravity units (g) with no intermittent contact, sticking of contacts or delay in functioning. The resultant change in calibration (see 3.5.1) shall be no more than $\pm 3^{\circ}\text{C}$ (5.4°F) (see 4.9.9).

3.5.8 Vibration. The switch shall withstand simple harmonic motion having an amplitude of 0.03 ± 10 percent ohms or 50g peak, whichever is less, along each of three mutually perpendicular axes with no intermittent contact, sticking of contacts or delay in functioning. The resultant change in calibration (see 3.5.1) shall be no more than $\pm 3^{\circ}\text{C}$ (5.4°F) (see 4.9.10).

3.5.9 Endurance. The switch, when connected in series with a 28 volt direct current (vdc) power source and a 3 candle power (cp) 24v lamp, shall withstand the cyclic thermal exposures specified below with a resultant change in calibration (see 3.5.1) of not more than $\pm 3^{\circ}\text{C}$ (5.4°F) (see 4.6.4).

- a. 2500 cycles of alternating immersion in circulating oil baths at temperature of 11°C (20°F) above and below the switch operating temperature at a frequency which will produce "on" and "off" cycling.
- b. 25,000 cycles of alternating immersion in circulating oil baths at temperatures 38°C (100.4°F) and -12°C (10°F) below the switch operating temperature at a frequency of one cycle every four minutes.

3.6 Marking. Each switch shall be marked, in accordance with MIL-STD-130, with the manufacturer's name trade-mark or Federal manufacturer's code, the operating temperature limits, and the Army part number (see 4.9.2).

3.7 Workmanship. Workmanship shall be such as to assure a finished product free of burrs, scratches, rust, and sharp edges (see 4.9.1).

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 as specified herein. Except as otherwise specified in the contract or purchase order (see 6.2), 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 or witness any of the inspections set forth in the specification where such inspections are deemed necessary to assure 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 responsibilities of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as a 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.

4.2 Classification of inspection. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.5).
- b. Quality conformance inspection (QCI) (see 4.6).
- c. Control tests (see 4.7).
- d. Inspection of packaging (see 4.8).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed under the following standard (room) ambient conditions:

- a. Temperature: 25 ± 10°C.
- b. Relative humidity: Uncontrolled room ambient.
- c. Atmospheric pressure: Site pressure.

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4.4 Testing apparatus. Testing apparatus shall include a mounting manifold, a 3 candlepower (cp), 24-volt indicating lamp, connected to a 28-volt direct current (dc) source of electrical energy; laboratory thermometers; pressure gages; and temperature sensors with pressure interlock. Separate temperature controls and heating or cooling apparatus shall be provided for the mounting manifold and bath. Instruments such as voltmeters, ammeters and thermometers shall be of the laboratory type (and shall be accurate to within 0.5 percent (%) of full scale deflection and within 1% of indicated values).

4.5 Qualification inspection. For qualification inspection, the manufacturer shall furnish three samples. The sample specimens shall be representative of the units proposed to be furnished to the Government. Qualification inspection shall be conducted by the manufacturer under Government surveillance. Qualification inspection shall consist of the inspections specified in table I and tests shall be conducted in accordance with the test sequence specified in table II.

TABLE I. Classification of inspections.

Title	Requirement	Inspection	Qualification	Q C I		Control tests	Inspection of packaging
				Exam	Tests		
<u>Group A:</u>							
Materials, design construction Examination	3.3 thru 3.3.2 3.4.1 and 3.7 3.4 and 3.6	4.9.1 4.9.2	X X	X			
<u>Group B (Performance):</u>							
Calibration	3.5.1	4.9.3	X		X		
Dielectric withstanding	3.5.2	4.9.4	X				
<u>Group C (Environmental):</u>							
High temperature	3.5.3	4.9.5	X			X	
Waterproofness	3.5.4	4.9.6	X		X		
Corrosion	3.5.5	4.9.7	X				
Fungus	3.5.6	4.9.8	X				
Shock	3.5.7	4.9.9	X		X		
Vibration	3.5.8	4.9.10	X			X	

TABLE I. Classification of inspections - Continued.

Title	Requirement	Inspection	Qualification	Q C I		Control tests	Inspection of packaging
				Exam	Tests		
<u>Group D (Life):</u> Endurance	3.5.9	4.9.11	X				
<u>Group E (Packaging):</u> Inspection of packaging	5.1	4.8					X

TABLE II. Qualification sequence of testing.

Sample No.	Paragraph	Test
1	4.9.3 4.9.5 4.9.10 4.9.3 4.9.8	Calibration High temperature Vibration Calibration Fungus
2	4.9.3 4.9.11 4.9.7	Calibration Endurance Corrosion
3	4.9.3 4.9.9 4.9.6 4.9.4	Calibration Shock Waterproofness Dielectric withstanding

4.6 QCI. QCI shall include the examination of 4.6.1 and the tests of 4.6.2 (see 6.2). Noncompliance with any of the specified requirements in sections 3 and 5 shall be cause for rejection.

4.6.1 Examination Switches shall be examined for defects specified in table III (see 6.2).

4.6.2 QCI tests. Switches shall be subjected to the QCI tests specified in table I.

4.7 Control tests. Switches shall be new and subjected to the control tests specified in table I (see 6.2).

TABLE III. Classification of defects.

Category	Defect	Method of inspection
Critical	NONE	
<u>Major</u> 101	Incorrect dimensions affecting installation (see 3.4).	SIE 1/
<u>Minor</u> 201	Incorrect dimensions not affecting installation (see 3.4).	SIE
202	Improper marking (see 3.6).	Visual

1/ SIE = Standard Inspection Equipment

4.8 Inspection of packaging. The Government inspector shall at unscheduled intervals, inspect all materials and processes, involved in the preparation for delivery, to determine conformance to requirements of section 5. Any evidence of deviation from specified requirements shall be cause for refusal to conduct further inspection until objective evidence has been provided by the contractor that corrective action has been taken (see 5.1)

4.9 Methods of inspection.

4.9.1 Materials, design, and construction. Conformance to 3.3 through 3.3.2, 3.4.1 and 3.7 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.

4.9.2 Examination. Conformance to 3.4 and 3.6 shall be determined by examination for the defects specified in table III.

4.9.3 Calibration. To determine conformance to 3.5.1, the sample shall be mounted as specified in 4.4 in such a position that the circulating oil-bath will cover it to the smaller end of the tapered thread. The switch shall be connected through the indicator lamp to the voltage supply. The initial oil-bath temperature shall be a minimum of 6°C (10.8°F) below the rated temperature of the switch. Oil bath temperature shall be increased at a rate no greater than 0.56°C (1°F) per minute. The temperature at which the switch contacts close the circuit shall be recorded.

4.9.4 Dielectric withstanding. To determine conformance to 3.5.2, the switches shall be tested in accordance with MIL-STD-202, method 301. The following conditions are applicable:

- a. The switch temperature shall be maintained at $14^{\circ} \pm 3^{\circ}\text{C}$ ($25^{\circ} \pm 5^{\circ}\text{F}$) below the rated contact closing temperature.
- b. A potential of 440 volts root mean square (vrms) shall be applied.
- c. The potential shall be 60 cycles per second (cps), alternating current (ac).
- d. One conductor shall be attached to the switch terminal and one to the switch body.
- e. After the voltage application the switch shall be examined and the calibration checked as specified in 4.9.1.

4.9.5 High temperature resistance. To determine conformance to 3.5.3, the switch shall be heated for one minute at $177^{\circ} \pm 3^{\circ}\text{C}$ ($350^{\circ} \pm 5^{\circ}\text{F}$) in an oil bath, cooled to room temperature, and then tested as specified in 4.9.3.

4.9.6 Waterproofness. To determine conformance to 3.5.4, the switch shall be subjected to the waterproofness test specified in MIL-STD-1184 for type II, class 2 components. Subsequently, the switch shall be tested as specified in 4.9.3.

4.9.7 Corrosion. To determine conformance to 3.5.5, the switch shall be subjected to the salt spray (fog) test specified in MIL-STD-202, method 101, except that the test duration shall be 200 hours. After the test, the switch shall be tested as specified in 4.9.3. Resultant change in calibration (see 3.5.1) shall be no more than $\pm 3^{\circ}\text{C}$ (5.4°C).

4.9.8 Fungus. To determine conformance to 3.5.6, the switch shall be subjected to the fungus resistance test for class 1, method B, components specified in MIL-F-13927. After 90 days of continuous incubation the switch shall be tested as specified in 4.9.3. Resultant change in calibration (see 3.5.1) shall be no more than $\pm 3^{\circ}\text{C}$ (5.4°F).

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4.9.9 Shock. To determine conformance to 3.5.7, the switch shall be mounted to simulate actual mounting in use. The unit shall be subjected to the shock test as specified in MIL-STD-202, method 202, in such manner that an impact of 100g will be obtained. The test shall be repeated 10 times and applied in the vertical axis while the test unit is in its normal mounting orientation. Subsequently the switch shall be subjected to the test specified in 4.9.3 Resultant change in calibration (see 3.5.1) shall be no more than $\pm 3^{\circ}\text{C}$ (5.4°C).

4.9.10 Vibration. To determine conformance to 3.5.8, 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 vdc (nominal) power source and applicable indicator. Care shall be taken to see that the mounting is free from 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 50g peak, whichever is less. Tolerance of ± 10 percent is permissible for the amplitude. The vibrational frequency shall be varied over the range from 10 to 3500 cps. Rate of frequency change 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 to 10 cps shall be accomplished in 20 ± 2 minutes. This scanning cycle shall be repeated three times in order that critical (see 6.4.3) frequencies may be identified, recorded and checked. After the scanning cycles, the switch shall be vibrated at the critical frequency for two hours. If there is more than one critical frequency, the two 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 50g acceleration, with frequency cycled from 10 to 3500 and back to 10 cps. 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 two hours (six complete cycles). At the end of the two hour vibrational period, the switch shall be subjected to the test specified in 4.9.3. This test procedure shall be accomplished along each of three mutually perpendicular axes. Total vibrating time shall be nine hours (three hours along each side).

4.9.11 Endurance. To determine conformance to 3.5.9, the sample shall be mounted as specified in 4.4 and positioned so that it is covered by the circulating oil bath to the smaller end of the tapered thread. Connect the switch in series to the lamp and the voltage supply. The switch shall be subjected to 2500 and 25,000 cycles respectively, of exposure to the conditions specified in 3.5.9a and 3.5.9b. The measured calibration shall remain the same as the recorded calibration (see 4.9.3) within $\pm 3^{\circ}\text{C}$ (5.4°F).

5 PACKAGING

5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing, and marking for the desired level of protection shall be in accordance with the applicable packaging requirements specified by the contracting authority (see 4.8 and 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. The switches covered by this specification are intended primarily for use in the lubricating oil of air-cooled, internal combustion engines to warn of excessive lubricating oil temperatures. However, if designed and built for other operating conditions, they may be used to warn of excessive temperatures in other fluids.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and, if required, the specific issue of individual documents referenced (see 2.1.1).
- c. Army part number (see 3.4).
- d. Switching temperature (see 3.4).
- e. Applicable drawing (see 3.4)
- f. Responsibility and place of inspection if other than specified (see 4.1).
- g. Sample size for QCI examination and acceptance tests (see 4.6 and 6.5.1).
- h. QCI acceptance criteria (see 4.6).
- i. Control test sample size frequency of tests, and disposition of lots covered by the sample size of defective items (see 4.7 and 6.5.2).
- j. 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 set for opening of bids, qualified for inclusion in QPL 12285 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 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.

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6 4 Definitions

6.4.1 Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.3.2).

6.4.2 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 4.3 Critical frequency. Critical frequency is a resonant frequency developed in the transmitter such that amplitude exceeds that of the applied vibration. The greater the amplitude the more highly loaded the transmitter and the more critical the vibration environment.

6.5 Inspection. The following information is presented as guidance for the contracting officer in specifying sampling and acceptance procedures for QCI and control testing in acquisition documents.

6.5.1 QCI.

6.5.1.1 Sampling

6.5.1.1.1 Lot formation. A lot should consist of all switches of one part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

6.5.1.1.2 Sampling for examination. Samples for quality conformance examination should be selected in accordance with MIL-STD-105.

6.5.1.1.3 Sampling for testing. Samples for quality conformance testing should be selected in accordance with inspection level S-3 of MIL-STD-105 from each lot that has passed the examination specified in table II.

6.5.1.2 Examination.

6.5.1.2.1 Acceptable quality level (AQL). Each switch selected in accordance with 6.5.1.1.2 should be examined for the defects listed in table III to determine conformance to the following AQL's:

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

6.5.1.2.2 Tests. Samples selected in accordance with 6.5.1.1.3, should be subjected to the tests specified in 4.9.3, 4.9.6, and 4.9.9 in that order, using an AQL of 6.5 based on percent defective.

6.5.2 Control tests. Control test samples should be selected at the rate of five of each 500 switches produced, except that not less than five nor more than ten switches shall be selected in any 30-day period. Samples should be subjected to the tests specified in 4.9.5 and 4.9.10 in the order listed.

6.6 Subject term (key word) listing.

- Endurance
- Fungus
- High temperature
- Marking
- Recycled, virgin and reclaimed material
- Shock
- Vibration

6.7 AMC policy on AQLs/LTPDs. This specification is certified to be in compliance with current Army Materiel Command (AMC) policy for the elimination of AQLs/LTPDs (Acceptable Quality Levels/Lot Tolerance Percent Defectives) from military specifications.

6.8 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:
Army - AT

Preparing activity:
Army - AT

(Project 5930-A658)

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NOTE This form shall not be used to submit requests for waivers, deviations or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements. **FSC-5930**

DOCUMENT IDENTIFIER (Number) AND TITLE

MIL-S-12285D(AT); Switches, Thermostatic

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