

DETAIL SPECIFICATION

SWITCHES, ROTARY, SNAP ACTION AND DETENT/SPRING RETURN ACTION,
GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers snap-action and detent and spring action rotary switches for use in alternating and direct current applications, with ratings as specified (see [3.1](#)).

1.2 Class. The class designation should be composed of a number indicating the current rating followed by the letters SR or SRN, the component designator for rotary switches covered by this specification (see table I).

TABLE I. Class designation.

Class	Maximum current in amperes	Maximum V ac	Maximum V dc	Positioning mechanism
1SR	10	125	120	Snap
1SRN	10	125	N/A	Detent/spring return
3SR	30	500	250	Snap
6SR	60	500	250	Snap
20SR	200	500	250	Snap

1.2.1 Positioning mechanism. Detent and spring return mechanism, designated by the letter N, should be driven directly from the handle shafts with an increment of handle and blade rotation of 90 degrees. Omission of the letter N from the class designation should mean that a snap mechanism which should activate from a handle shaft rotation of not greater than 135 degrees is required. Actuation of the snap mechanism should cause the switch blades to rotate 90 degrees to the directed position at a speed independent of the speed at which the handle shaft is turned. After the blades have moved into the directed position and the handle has been released, the handle should reverse its rotation approximately 45 degrees to correspond with the 90-degree switch throw increment.

1.3 Identification. Switches covered by this specification should be identified by a part or identifying number (PIN), (see [3.1](#) and [6.8](#)). Type designations, where assigned in addition to PINs, are for reference to identifications established in previous issues of this specification (see [3.3](#) and [6.7](#)).

<p>Comments, suggestions or questions on this document should be addressed to Defense Supply Center Columbus, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to switch@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at http://assist.daps.dla.mil/</p>

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4 or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3, 4 or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL

STANDARDS

- [FED-STD-595](#) - Colors Used in Government Procurement
- [FED-STD-H28](#) - Screw-Thread Standards for Federal Service

DEPARTMENT OF DEFENSE

SPECIFICATION

- [MIL-S-901](#) - Shock Tests, HI(High Impact) Shipboard Machinery, Equipment, and Systems, Requirements for
- [MIL-A-8625](#) - Anodic Coatings, for Aluminum and Aluminum Alloys

STANDARDS

- [MIL-STD-167-1](#) - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited)
- [MIL-STD-202](#) - Test Methods for Electronic and Electrical Component Parts
- [MIL-STD-1285](#) - Marking of Electrical and Electronic Parts

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

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

[ANSI/NCSL Z540-1](#) - Calibration Laboratories and Measuring and Test Equipment, General Requirements for.

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

[ASTM B 633](#) - Standard Specification for Zinc On Iron and Steel, Electrodeposited Coatings of

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

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

[ISO 10012-1](#) - Quality Assurance Requirements for Measuring Equipment - Part 1; Meterological Confirmation System for Measuring Equipment.

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

SOCIETY OF AUTOMOTIVE ENGINEERS

[SAE-AMS-QQ-N-290](#) - Nickel Plating (Electrodeposited)

(Copies of these documents are available online at <http://www.sae.org> or from Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, Pennsylvania, 15096-0001)

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

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, 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 [4.4](#) and [6.6](#)).

3.3 Switch types. Switches furnished under this specification shall be as specified in [3.3.1](#) and [3.3.2](#).

3.3.1 Switches covered by specification sheet and identified by PINs. Switches which are completely defined by a military specification sheet (see [3.1](#)) shall be as specified in [6.2](#).

3.3.2 Switch types not shown on a specification sheet. Where the specification sheet does not show a specific switch type (see [3.3.1](#)), the individual part requirements shall be as specified in complementary documents such as manufacturer's drawings or data sheets (see [6.2](#)). The switches shall be a product of the basic style, design and construction as the switches shown on the specification sheets and shall be acquired from a source listed on the qualified products list for the same specification sheet (see [3.2](#)). Unless otherwise specified (see [6.2](#)), the individual switch shall comply with the inspection requirements shown in [4.6](#).

3.4 Material. Unless otherwise specified (see [6.2](#)), material shall be as specified herein. When a definite material is not specified, a material which will enable the switches to meet the performance requirements of this specification shall be used. Acceptance of any constituent material shall not be construed as a guarantee of the acceptance of the finished product.

3.4.1 Metals. Metals shall be of sea water corrosion-resistant alloys or shall be zinc plated in accordance with [ASTM B 633](#); nickel plated in accordance with class 1, grade G of [SAE-AMS-QQ-N-290](#) or anodized in accordance with [MIL-A-8625](#) (aluminum alloys only), to resist corrosion.

3.4.1.1 Aluminum. Aluminum shall not be used for major structural parts, such as the front plate, bushing, shaft, detent, and shall not be used for current carrying.

3.4.1.2 Ferrous material. Ferrous material shall not be used for current carrying parts.

3.4.1.3 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, protection against electrolysis and corrosion shall be provided. The use of dissimilar metals in contact, which tend toward active electrolytic corrosion (particularly copper alloys, copper, steel used in contact with aluminums or aluminum alloy) is not acceptable. However, metal plating or metal spraying of dissimilar base metals to provide similar or suitable abutting surfaces is permitted. The use of dissimilar metals separated by a suitable insulating material is also permitted.

3.4.1.4 Lubrication.

3.4.1.4.1 Operating mechanism. The operating mechanism and other mechanical moving parts shall be lubricated with a compound that shall enable the switch to meet the performance requirements of this document. For additional information and guidance on lubricating compounds see [6.10](#).

3.4.1.4.2 Contacts. Contacts shall be lubricated to enable the switch to meet the performance requirements of this document. For additional information and guidance on lubricating compounds see [6.10](#). The method for fabricating the contacts shall result in the application of a minute amount of lubrication on the contacts.

3.4.1.5 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of switch components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.16](#)).

3.4.2 Insulation.

3.4.2.1 Plastic laminates. Plastic laminates when used, shall be selected to enable the switch to meet performance requirements of this specification. For additional information and guidance on plastic laminates see [6.11](#).

3.4.2.2 Plastic molding. Plastic molding material shall be selected to enable the switch to meet performance requirements of this specification. Color shall be gray, approximating color chip Number 26307 of [FED-STD-595](#). Molded parts shall be free of flash. For additional information and guidance on plastic molding see [6.12](#).

3.4.2.3 Fungus-resistance. Insulation material shall be non-fungus nutrient.

3.4.2.4 Flammable material. Insulation material shall be fire retardant.

3.5 Design and construction. Switches shall be of closed construction so that the switching mechanism and the switching contacts are fully enclosed (except terminals and unused terminal locations), to prevent foreign matter from entering the switch mechanism or interfering with the contacts. Switches shall be constructed to ensure proper operation when mounted in any position. The switches shall be of the design, construction, class, and physical dimensions specified (see [3.1](#)) and the switch circuit configuration shall conform to the applicable switching characteristics specified (see [3.1](#) and [6.2](#)).

3.5.1 Assembled switches. Parts of the assembled switch shall work freely and the switch shall be positive in action.

3.5.2 Relation of parts. In assembling the switch, the relationship between the handle shaft assembly and the switch blades shall be as specified in [3.1](#) so that the shaft or handle positions will agree with the mounting of switches in electrical switchboards and equipment.

3.5.3 Contact mating. The moving switch blade contacts shall mate with both sides of the stationary contacts at the contact engagement areas with uniform positive pressure.

3.5.4 Threaded parts. Unless otherwise specified (see [3.1](#) and [6.2](#)), threaded parts shall be in accordance with [FED-STD-H28](#). Wherever possible, unified screw threads shall be used. Where a special diameter-pitch combination is required, the thread shall be of American National Form and of any pitch which is used in the fine-thread series.

3.5.4.1 Engagement of threaded parts. Threaded parts shall engage at least three full threads in soft metals like aluminum and its alloys. Not less than two full threads shall be used in harder materials such as brass or steel. When a screw mates with a plastic part, a threaded metal insert shall be molded therein.

3.5.5 Locking of screw-thread assemblies. Unless otherwise specified (see [3.1](#)), except for terminal hardware screw-thread assemblies shall be rendered resistant to loosening under vibration. Unless otherwise specified (see [3.1](#)), bronze, stainless steel or plated steel split type, or internal-tooth lockwashers shall be provided under nuts or screw heads. The use of locknuts is permitted in lieu of lockwashers.

3.5.6 Terminal Hardware. The terminal hardware shall be as specified (see [3.1](#) and [6.2](#)). If the terminal hardware is not assembled to the switch, it shall be placed in a bag and firmly secured to the switch.

3.5.7 Moving contact material. Moving contact material shall be selected to enable the switch to meet performance requirements of this specification. For additional information and guidance on moving contact material see [6.13](#).

3.5.8 Stationary contact material. Stationary contact material shall be selected to enable the switch to meet performance requirements of this specification. Threaded holes shall have not less than three full threads. For additional information and guidance on stationary contact material see [6.14](#).

3.5.9 Contact studs. For rear connected switches, the contact studs shall allow the switch to meet the performance requirements of this document. For additional information and guidance on contact studs material see [6.15](#).

3.5.10 Handles. Unless otherwise specified (see [6.2](#)), switches shall be provided with handles as specified (see [3.1](#)).

3.5.11 Operating shafts. The operating shaft shall be insulated from current carrying members.

3.5.12 Rear support for front mounted switch assemblies. Rear support is recommended for front mounted switch assemblies where the total number of decks, including spacers, exceeds 9 and shall have features which will readily allow attachment of brackets or other supports to the rear of the switch.

3.6 Performance.

3.6.1 Operation. Class SR switches shall transfer from one position to the next adjacent position, in either direction, when the handle shafts are rotated not more than 135 degrees from the initial position. Class SRN switches shall transfer similarly when the handle shafts are rotated 60 to 90 degrees. Unless otherwise specified, the rest positions of switch handles shall be integral multiples of 90 degrees, with a non-cumulative tolerance of plus or minus 3 degrees, from the off or normal positions (see [3.1](#)). Switches having limited rotation (stop) or momentary positions (spring return to a detented position) shall not change circuit continuity, open or closed as specified, when rotated into a stop from the adjacent detented or momentary position.

3.6.1.1 Momentary position return. The handle shaft shall return to the rest position, within plus or minus 5 degrees and each contact shall return to the condition (open or closed) that is normal in the rest position (see [4.7.1.1](#)). After return to rest position, handle shaft float shall not exceed 3 degrees. This requirement is applicable to classes 1SR and 1SRN only.

3.6.1.2 Stop strength (applicable to switches with stops). The stop shall not be overrun, and there shall be no damage to the switch or malfunction of operation (see [4.7.1.2](#) and [6.2](#)).

3.6.1.3 Transfer time (applicable to snap action transfer only). The transfer time shall not exceed ten milliseconds ([4.7.1.3](#)).

3.6.2 Salt spray (corrosion). There shall be no evidence of excessive corrosion (see [4.7.2](#)). Excessive corrosion is defined as corrosion which interferes with the electrical or mechanical performance, or, in the case of plated metals, corrosion which has passed through the plating and exposed the base metal. After the test, mounting and terminal hardware shall be readily removable.

3.6.3 Vibration. There shall be no opening of closed contacts in excess of 10 microseconds. There shall be no change in shaft position or evidence of broken, loose, deformed, or displaced parts (see [4.7.3](#)).

3.6.4 High-impact shock. Switches shall remain mechanically and electrically operative and there shall be no opening of closed contacts in excess of 20 milliseconds, or closure of open contacts, or evidence of broken, loose, deformed, or displaced parts (see [4.7.4](#)).

3.6.5 Dielectric withstanding voltage. Switches shall withstand the application of the specified voltages without arcing, breakdown of insulation, or damage, and there shall be no leakage current greater than 100 microamperes (see [4.7.5](#)).

3.6.6 Overload. The switches shall remain mechanically and electrically operative when subjected to the overload test specified (see [4.7.6](#)) (applicable to 1SR and 3SR only).

3.6.7 Contact resistance. The contact resistance shall not exceed the following values for the class of switch indicated (see [4.7.7](#)).

Class	Maximum allowable contact resistance (ohms)
1SR and 1SRN	0.02
3SR	0.01
6SR	0.005
20SR	0.0015

3.6.8 Temperature rise. The temperature rise at the switch stationary contact shall not exceed 50 degrees Celsius (°C) when measured as specified (see [4.7.8](#)).

3.6.9 Endurance. The switch shall remain mechanically and electrically operative during and following the endurance test as specified (see [4.7.9.1](#) or [4.7.9.2](#), as applicable).

3.6.10 Insulation resistance. The insulation resistance shall be not less than 200 megohms (see [4.7.10](#)).

3.7 Marking. Except as indicated herein (see [6.2](#)), marking shall be in accordance with [MIL-STD-1285](#).

3.7.1 Identification of product. Switches shall be marked with the information required in [3.7.3](#) or [3.7.4](#) as applicable. Electrical ratings shall be marked on the switch caps. Other required marking shall be located on the terminal boards of back-connected switches and, except for terminal markings, on the base plates of side-connected switches. Terminal boards shall be marked by silk screening, hot stamping, or engraving. Base plates and caps shall be marked by die stamping or engraving.

3.7.2 Terminal marking. Terminal marking on back-connected switches shall be located on the terminal boards, adjacent to the terminals designated. Terminal marking on side-connected switches shall be die stamped on the terminals, clear of the screw heads, and shall be visible from the rear of front mounted switches and from the front of base mounted switches.

3.7.3 Switches covered by specification sheets. Switches covered by specification sheets shall be identified by:

- Electrical rating
- Part or identifying number (PIN) (for example M15291/1-001)
- Type designation, where assigned (for example 1SR2A1) (see [1.3](#) and [6.7](#))
- Manufacturer's name, symbol, or CAGE
- Date code
- Terminal identification as specified in the applicable specification sheet.

3.7.4 Switches not covered by specification sheets. Switches not covered by specification sheets shall be identified by:

- Electrical rating
- Manufacturer's part number
- Government drawing number
- Manufacturer's name, symbol, or CAGE
- Date code
- Terminal identification.

3.8 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

4. VERIFICATION

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

- Qualification inspection (see [4.3](#)).
- Conformance inspection (see [4.4](#)).

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

4.3 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government on sample units produced with equipment and procedures normally used in production. Qualification shall consist of the examination and tests specified in [tables II](#) and [III](#)

4.3.1 Samples for qualification. Sample switches of each class for which qualification is sought shall be subjected to the tests specified in [tables II](#) and [III](#), in the order shown. The SRN class is considered a distinct class, however when qualifying both the class 1SR and class 1SRN reduced testing of the 1SRN is permitted (see [table III](#)).

4.3.2 Verification of qualification. Every 12 months, the manufacturer shall provide verification of qualification to the qualifying activity. Continuation is based on meeting the following requirements:

- Design of switch has not been modified (every 12 months).
- Verification of group A lot acceptance (every 12 months) (see [4.5.3](#)).
- Periodic group B inspection (every 24 months) (see [4.5.4](#)).

4.3.3 Qualification inspection requirements for switches not covered by specification sheets. Qualification inspection requirements for switches not covered by specification sheets shall be performed by the contractor after award of contract and prior to production. Unless otherwise specified (see [6.2](#)), inspection shall be as specified in [4.3](#).

4.3.3.1 Samples. Unless otherwise specified (see [6.2](#)), the samples and test routine shall be as specified in [4.3.1](#) and [table II](#) or [III](#). This acceptance is valid only on the contract under which it is granted unless extended by the Government to another contract. Samples subjected to this inspection shall not be delivered on the contract or order.

4.3.3.2 Failures. One or more failures will be cause for refusal to grant inspection acceptance.

TABLE II. Qualification inspection for SR classes.

Inspection	Requirement	Test method	Sample number ¹						
			1	2	3	4	5	6	7
General Examination	3.5 and 3.7	4.6	1	1	1	1	1	1	1
Operation	3.6.1	4.7.1	2	2	2	2	2	2	2
Momentary position return	3.6.1.1	4.7.1.1		3					
Stop strength	3.6.1.2	4.7.1.2		4					
Transfer time	3.6.1.3	4.7.1.3	3		3	3	3	3	3
Salt spray	3.6.2	4.7.3						4	4
Vibration	3.6.3	4.7.4				4	4		
Shock	3.6.4	4.7.5				5	5		
Dielectric with- standing voltage	3.6.5	4.7.6	4	5		6	6	5	
Overload	3.6.6	4.7.7				7			
Contact resistance	3.6.7	4.7.8	5	6	4		7	6	5
Endurance, ac	3.6.9	4.7.10.1	6	7	5				
Endurance, dc	3.6.9	4.7.10.2	7	8					
Temperature rise	3.6.8	4.7.9			6				
Insulation resistance	3.6.10	4.7.11	8	9	7	8			6
Operation	3.6.1	4.7.1	9	10	8	9	8	7	7
Transfer time	3.6.1.3	4.7.1.3	10	11	9	10	9	8	8
General Examination	3.5	4.6	11	12	10	11	10	6	9

¹For classes 1SR, 3SR, 6SR, or 20SR the test sample shall be of the following types for each class:

Sample:

1. Type SR3B2 - Front mounted, side connected
2. Type SR3B2 - With stop and spring return
3. Type SR3A2 - Front mounted, side connected
4. Type SR3B1 - Front mounted, back connected
5. Type - Longest front mounted switch not requiring rear support listed for each class.
6. Type SR3A3 - Base mounted, side connected
7. Type SR3B3 - Base mounted, side connected

4.4 Quality conformance inspection.

4.4.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspection (see [6.3](#)).

4.4.2 Inspection lot. All rotary switches of the same class presented for delivery at one time shall be considered a lot. The lot may include the entire contract quantity or it may be the production of any convenient time period.

4.4.3 Group A inspection. Group A inspection shall consist of the inspections specified in [table IV](#) and shall be conducted in the order listed. Defective switches shall not be offered for delivery until the defects have been corrected and the rotary switches re-examined and retested.

4.4.3.1 Sampling plan. As a minimum, the contractor shall inspect a sample quantity in accordance with the sampling plan specified herein. Sample size depends on classification of the characteristic as shown in [table V](#). The sample size for each characteristic is shown in [table V](#) below. If one or more defects is found in any sample, the entire lot shall be rejected. The contractor has the option of screening 100 percent of the rejected lot for all specified attributes, or providing a new lot, which shall be inspected in accordance with the sampling plan.

TABLE III. Qualification inspection for SRN classes.

Inspection	Requirement	Test method	Sample Number ^{1,2}						
			1	2	3	4	5	6	7
General Examination	3.5 and 3.7	4.6	1	1	1	1	1	1	1
Operation	3.6.1	4.7.1	2	2	2	2	2	2	2
Momentary position return	3.6.1.1	4.7.1.1		3			3		3
Stop strength	3.6.1.2	4.7.1.2		4			4		4
Salt spray	3.6.2	4.7.3					5		
Vibration	3.6.3	4.7.4		5	3				
Shock	3.6.4	4.7.5		6	4				
Dielectric with-standing voltage	3.6.5	4.7.6	3	7	5			3	5
Overload	3.6.6	4.7.7			6				
Contact resistance	3.6.7	4.7.8	4	8	7			4	6
Endurance, ac	3.6.9	4.7.10.1	5						7
Temperature rise	3.6.8	4.7.9	6						8
Insulation resistance	3.6.10	4.7.11	7	9	8			5	9
Operation	3.6.1	4.7.1	8	10	9	3	6	6	10
General Examination	3.5	4.6	9	11	10	4	7	7	11

¹ Samples for qualification of class 1SRN switches shall be of the following types:

Samples 1,2 and 4 - M15291/4-001

Samples 3 and 5 - M15291/4-006

Samples 6 - M15291/4-004

Samples 7 - M15291/4-002

² When qualifying both class 1SR and 1SRN only, samples 1,2,and 7 for 1SRN are required to be tested in addition to samples in [Table II](#).

TABLE IV. Group A inspection.

Inspection	Requirement	Test method
General examination	3.5 and 3.7	4.6
Operation	3.6.1	4.7.1
Momentary position return (where applicable)	3.6.1.1	4.7.1.1
Dielectric withstanding voltage	3.6.5	4.7.5

4.4.4 Group B inspection. Group B tests and examination shall be as specified in [table VI](#). Whenever the manufacturer has had no production for the switch class in the 12- or 24-month period, the samples shall be selected from the first production run following this period.

4.5 Acceptance - groups B. The results of each test shall be compared with the specification requirements. In the event of failure to conform to this specification for any of the applicable tests, the contractor shall correct the cause of failure on future production units and shall repair the deficiency on all undelivered switches produced on the contract or order. Quality conformance inspection shall be discontinued until corrective action has been taken. After the corrective action, sample units shall be subjected to the necessary group B inspection (all tests or the failed tests, at the option of the inspector). Group A inspection, may be reinstated; however, final acceptance shall be withheld until the group B, as applicable, has shown that the corrective action was successful.

TABLE V. Sampling.

Lot size	Minimum number of switches to be tested
1 to 50	All
51 to 90	All
91 to 150	90
151 to 280	125
281 to 500	125
501 to 1,200	125
1,201 to 3,200	125
3,201 to 10,000	192
10,001 to 35,000	294
35,001 to 150,000	294

TABLE VI. Group B inspection.

Inspection	Requirement	Test method
Stop strength	3.6.1.2	4.7.1.2
Dielectric withstanding voltage	3.6.5	4.7.5
Contact resistance	3.6.7	4.7.7
Temperature rise	3.6.8	4.7.8
Endurance, ac	3.6.9	4.7.9.1
Insulation resistance	3.6.10	4.7.10

4.6 General examination. Switches shall be examined to verify that the materials, design, construction, physical dimensions, and marking are in accordance with this specification

4.7 Test procedures.

4.7.1 Operation. The operation test shall consist of the minimum number of electrical operations to ascertain that the switching action is in accordance with [3.6.1](#). The switch shall be energized at any convenient voltage and current within the switch rating. A suitable audible or visual device shall be used to indicate the opening and closing of the circuits at each position and/or each deck for multideck switches. Suitable measuring devices shall be used to determine whether transfer action is as specified.

4.7.1.1 Momentary position return. The switch shall be mounted by its normal mounting means. The switch operating shaft shall be rotated 75 ± 5 degrees from an adjacent rest position toward a momentary position and released. This test shall be made for each momentary position of the switch blades. Normally closed circuits shall be tested for continuity and handle shaft displacement and float shall be measured.

4.7.1.2 Stop strength. The switch shall be mounted by its normal mounting means. The switch shaft shall be rotated to the clockwise and counterclockwise extremes and a torque in accordance with table VII shall be applied to the switch shaft and maintained for 10 seconds. Switch contacts shall be monitored for open or closed conditions in the stop positions.

4.7.1.3 Transfer time (see [3.6.1.3](#)). The time between the opening of an initially closed contact and the closing of the initially open contact shall be measured using an oscilloscope capable of measuring to 500 microseconds. The contacts being used for measurement shall be of the break before make style and shall be 90 degrees a part. Three clockwise measurements and three counterclockwise measurements shall be taken and the average transfer time shall comply with [3.6.1.3](#).

TABLE VII. Stop strength.

Switch class	Torque (inch-pounds)
1SR	30
1SRN	50
3SR	100
6SR	100
20SR	100

4.7.2 Salt spray (corrosion) (see 3.6.2). Switches with their mounting hardware, assembled with their mounting means, shall be tested in accordance with [method 101 of MIL-STD-202](#). The following details shall apply:

- a. Test condition - B
- b. Measurements after exposure - Not applicable.

After the test, switches shall be examined for evidence of excessive corrosion. Mounting and terminal hardware shall be removable at the end of the test.

4.7.3 Vibration. Switches shall be tested in accordance with [MIL-STD-167-1](#), type I. The following details and exceptions shall apply:

- a. Test and measurements prior to vibration - Not applicable
- b. Method of mounting - Switches shall be rigidly mounted by their normal mounting means. The mounting fixture shall be free from resonance over the test frequency range. Rear support shall be provided with switches having 10 or more decks, including blank decks.
- c. Direction of motion - One of the directions of vibration shall be in a plane perpendicular to the longitudinal axis of the switch.
- d. Electrical test conditions - The test circuit shall be in accordance with [method 310 of MIL-STD-202](#), and shall consist of all closed mated contacts in an ON switch position. At the option of the manufacturer, contacts may be wired in series.
- e. Test measurements during vibration - Contacts shall be monitored for opening.
- f. Measurements after vibration - Not applicable.
- g. Examination after test - Switches shall be examined for change in shaft position, and evidence of broken, loose, deformed, or displaced parts.

4.7.4 High-impact shock. High-impact shock tests shall be conducted in accordance with [MIL-S-901](#) for grade A, class I equipment (see 3.6.4). Rear support shall be provided with switches having 10 or more decks, including blank decks. The switch shall be energized in an operating position at rated voltage. The coil of a relay calibrated for the rated voltage of the switch being tested and having a drop-out time of 0.02 second, shall be connected in series with the energized contacts of the switch to determine conformance with 3.6.4. An alternate monitoring method using a calibrated timing device and a supervisory test current similar to [method 310 of MIL-STD-202](#) may be substituted for the calibrated relay method. A latching type circuit shall be connected to an energized normally open contact during the [MIL-S-901](#) testing. The latching of this circuit will indicate that the contact is momentarily closed.

4.7.5 Dielectric withstanding voltage (see 3.6.5 and 6.2). The switch shall be tested in accordance with [method 301 of MIL-STD-202](#). The following details shall apply:

- a. For switches rated at 125 volts ac (V ac), the test voltage shall be 1250 volts root means square (rms). For switches rated at 500 V ac the test voltage shall be 2000 volts rms.
- b. For group A inspection, the test voltage shall be applied for 5 seconds. For qualification and groups B and C inspections, the test voltage shall be applied for 1 minute.
- c. In each switch position, the test voltage shall be applied between open circuits contacts, and between closed contacts and noncurrent carrying parts.

4.7.6 Overload. The switches shall be operated for 50 operations to interrupt 600 percent of the rated alternating current at the rated voltage. The circuit shall provide for ON-OFF switching and one operation shall consist of throwing the switch from the OFF to the ON position and returning to the OFF position. The test rate shall be 2 operations per minute and the duty cycle shall be 50 percent ON and 50 percent OFF (applicable to 1SR and 3SR only).

4.7.7 Contact resistance. Contact resistance between the stationary contacts which have been energized for the endurance tests (see 4.7.9), shall be determined in accordance with [method 307 of MIL-STD-202](#), and the exceptions listed herein. The following details shall apply:

- Test leads shall be connected by a method suitable for the switch terminals.
- Test current and voltage shall be the rated current and voltage energizing the switch during the endurance tests (see [tables VIII](#) and [IX](#)).
- Prior to each measurement, the switch shall be operated once.
- Five separate measurements shall be taken at each interval and the average value calculated.
- The contact resistance shall be determined prior to the endurance tests, and during the endurance tests at intervals of: 5000 operations for classes 1SR and 1SRN, 4000 operations for class 3SR and at 1000 operations for classes 6SR and 20SR.

4.7.8 Temperature rise. The temperature rise of the switch stationary contacts energized during the electrical endurance tests shall be determined by means of thermocouples of small wire gauge (28-32 AWG). The temperature sensitive elements shall be placed on the contacts where they first emerge from the switch body. Temperature measurements shall be taken immediately following the electrical endurance test. The contacts shall be energized at rated current at any convenient voltage within the switch rating. Temperature measurements shall be taken at half-hour intervals until three successive measurements are within plus or minus 1 °C.

4.7.9 Endurance.

4.7.9.1 Alternating current. Referring to the columnar headings of [table VIII](#), the switch shall make, break, and carry (a) amperes at (b) volts at unity power factor for a total of (c) operations (see 6.2). The rate of testing shall not exceed (d) operations per minute. An operation is defined as one make and one break, of the same switch contact and the number of operations is determined by the contact either movable or stationary which is subjected to the largest number of makes and breaks. Following this, the switch shall be de-energized and operated for additional (e) operations. The duty cycle shall be 50 percent ON and 50 percent OFF.

TABLE VIII. AC endurance.

Switch class	(a) Current (amperes rms)	(b) Voltage (volts rms)	(c) Electrical operations (number of operations)	(d) Test rate (operations per minute)	(e) De-energized operations (number of operations)
1SR	10	125	30,000	30	20,000
1SRN	10	125	20,000	30	10,000
3SR	30	500	20,000	30	10,000
6SR	60	500	6,000	10	4,000
20SR	200	500	6,000	8	4,000

4.7.9.1.1 Test wiring. The test wiring for qualification testing shall be in accordance with [figure 1](#) (see [6.2](#)). For tests involving type designations other than the SR3B, the wiring for qualification testing shall simulate an intended switch application.

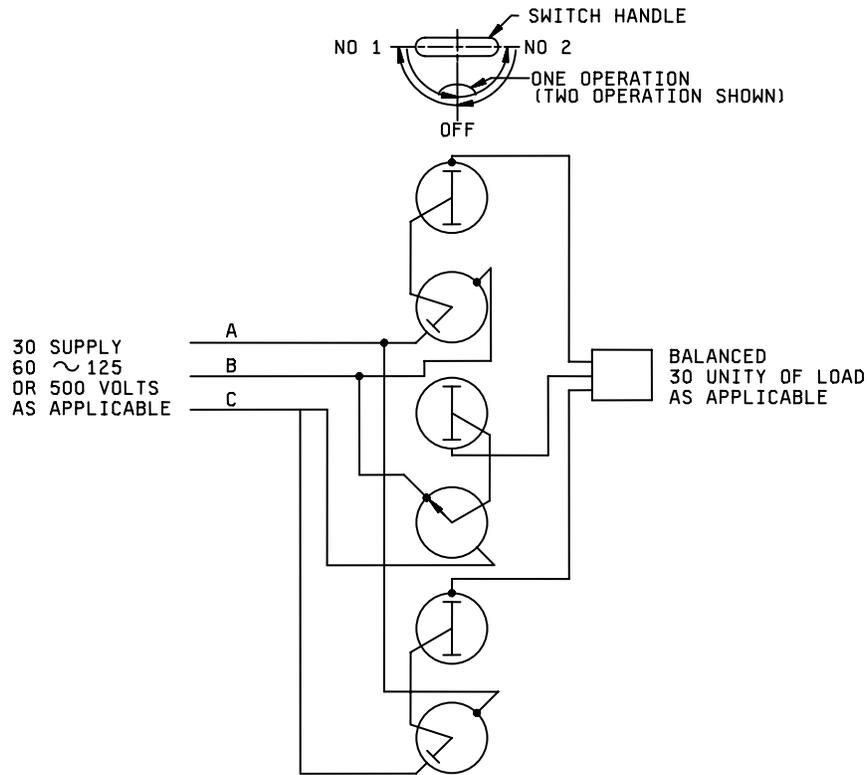


Figure 1. Test wiring for ac endurance testing of switches, type designation SR3B.

4.7.9.2 Direct current. Referring to the columnar headings of [table IX](#), the switch shall make, break, and carry (a) amperes at (b) volts for a total of (c) operations (see [6.2](#)). An operation is specified in [4.7.9.1](#). The rate of testing shall not exceed (d) operations per minute. The test loading shall be nominally resistive. The duty cycle shall be 50 percent ON and 50 percent OFF. The test wiring for qualification testing for other than switching characteristic A, shall be in accordance with [figure 2](#). Test wiring for other switching characteristics shall simulate intended switch applications (see [3.1](#)). Direct current endurance tests are required for class SR (snap action) switches only.

TABLE IX. DC endurance.

Switch class	(a) Current (amperes)	(b) Voltage (volts)	(c) Electrical operations (number of operations)	(d) Test rate (operations per minute)
1SR	10	120	20,000	15
3SR	30	250	15,000	15
6SR	60	250	4,000	5
20SR	200	250	4,000	3

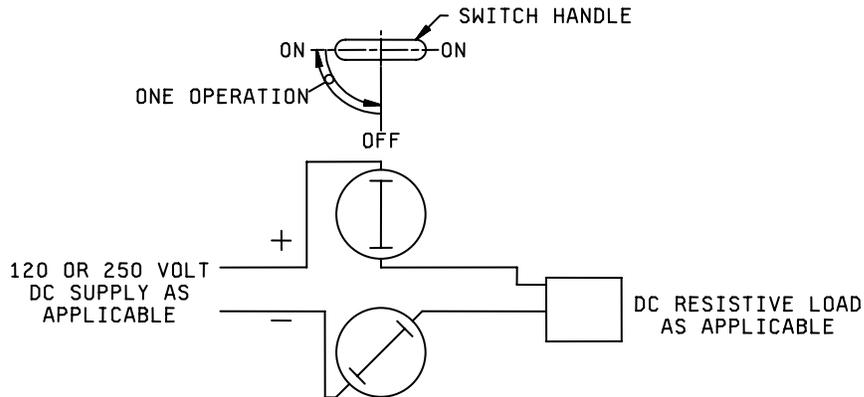


FIGURE 2. Test wiring for dc endurance testing of switches, type designation SR3A, characteristic A.

4.7.10 Insulation resistance. The switch shall be tested in accordance with [method 302 of MIL-STD-202](#). The following details shall apply:

- a. Test condition B shall be used.
- b. In each switch position, the test voltage shall be applied between open circuit contacts, and between closed contacts and noncurrent carrying parts.
- c. Test potential shall be applied for one minute.
- d. The test shall be conducted at a room temperature of approximately 75°F, and at a relative humidity of approximately 50 percent.

5. PACKAGING

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

6. NOTES

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

6.1 Intended use. The switches covered by this specification are intended for use in power and control equipment where reliability and ruggedness are required.

6.1.1 Voltage and current ratings. The voltage and current ratings specified in [table I](#) are applicable for the number of operations indicated in [tables VIII](#) and [IX](#). Other current and voltage ratings are possible where the switch will be subjected to fewer operations. Such ratings based on test data are listed as extended ratings in the specification sheets (see [3.1](#)). The extended ratings are applicable to snap action switches only.

6.2 Acquisition requirements. Acquisition documents must specify the following:

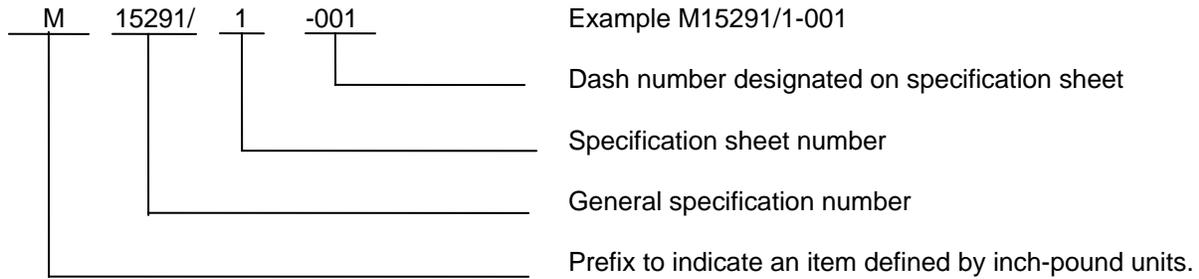
- a. Title, number, and date of this specification
- b. ASSIST Online database at <http://www.assist.daps.dla.mil/> to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see [2.1](#) and [2.2](#))
- c. Packaging requirements (see [5.1](#))
- d. Kit for panel seal mounting (see [3.1](#))
- e. PINs of switches to be acquired (see [3.3.1](#))
- f. Applicable complimentary documents (see [3.3.2](#))
- g. Inspection requirements if other than as specified (see [3.3.2](#))
- h. Materials, if other than as specified (see [3.4](#))
- i. Insulation, if other than as specified (see [3.4.2.1](#))
- j. Design, class and construction (see [3.5](#))
- k. Threaded parts, if other than as specified (see [3.5.4](#))
- l. Terminal hardware (see [3.5.6](#))
- m. Handles (see [3.5.10](#))
- n. Whether stops are required and their positions (see [3.6.1.2](#))
- o. Marking (see [3.7](#))
- p. Inspection for switches not covered by inspection sheets:
 - (1) The laboratory at which inspection is to be performed (see [4.4.3](#))
 - (2) Samples, submission of data, and test routine, if other than as specified (see [4.4.3.1](#))
- q. Dielectric withstanding voltage: Test voltage, if other than as specified (see [4.7.5](#))
- r. Circuit configuration and diagrams to be used for specifying the circuit configuration for each switch section (see [4.7.9.1.1](#))
- s. Endurance, if other than as specified (see [4.7.9.1](#) and [4.7.9.2](#))
- t. Level of preservation, level of packing, and other packaging options required (see [5.1](#))
- u. When fire retardant lumber and plywood is not required (see [5.1](#)).
- v. Class of fire retardant fiberboard required (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 Qualified Products List (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 orders for the products covered by this specification. Information pertaining to qualification of products may be obtained via email to vqp.chief@dla.mil or from the Defense Supply Center Columbus, Attn: DSCC-VQP, 3990 East Broad Street, Columbus, OH 43213-1199.

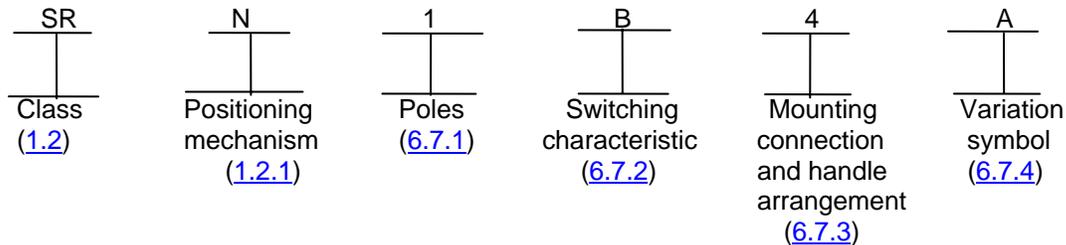
6.4 Switch wiring. Wiring connected to switch terminals should be formed to the switches and secured as necessary to minimize strain exerted on the terminals and to provide flexibility suitable for the shock and vibration conditions of the installation. Excessive strain may cause displacement of the contacting tips of the terminals, resulting in poor contact and excessive heating.

6.5 Switch exercising. Switches that are operated infrequently in normal service should be exercised periodically or when opportunity permits in order to retard drying of the contact lubricant and consequent increase in contact resistance.

6.6 Part or Identifying Number (PIN). The PIN to be used for switches acquired to this specification is created as follows:



6.7 Type designations. Type designations assigned in previous issues of this specification are cross referenced to superseding PINs in the specification sheets (see [3.1](#) and [6.7](#)). The type designations are in the following form and have the significance indicated.



6.7.1 Poles. The number of poles are identified by a number equal to the number of single circuits simultaneously controlled by the switch. The symbol "S" should be substituted for the digit when the switch has a special switching characteristic (see [6.7.2](#)).

6.7.2 Switching characteristic. The switching characteristics are identified by a one-letter symbol describing the electrical changing characteristic for a typical pole of the switch in accordance with [table X](#).

6.7.3 Mounting, connection, and handle arrangement. The type of mounting, the method of wiring stationary contacts, and the handle or shaft arrangement should be identified by a one-digit symbol in accordance with the following:

1. Front mounted-back connected-handle supplied with switch.
2. Front mounted-side connected-handle supplied with switch.
3. Base mounted-side connected-shaft designed for handle, handle not supplied.
4. Base mounted-side connected-shaft designed for coupling to external shaft.

6.7.4 Variation symbol. The variation symbol should start with the letter A and continue alphabetically. It should be used to differentiate switches having the same type designation but varying in either mechanical or electrical characteristics.

TABLE X. Switching characteristics

CHARACTERISTIC SYMBOL	OPERATION (C INDICATES COMMON)	HANDLE POSITION (SEE 3.1) TYPICAL SCHEMATIC SEE NOTE 1
A	OFF-ON-OFF-ON (SINGLE THROW)	
B	OFF-ON 1 OFF-ON 2 (DOUBLE THROW)	
C	ON 1-ON 2-ON 1-ON 2 (DOUBLE THROW)	
D	ON 1-ON 2-OFF-OFF (DOUBLE THROW)	
E	OFF-ON 1-ON 2-ON 3 (TRIPLE THROW)	
F	OFF-ON 1-ON AND 2-OFF 2 (TRIPLE THROW)	
G	ON 1-ON 2-ON 3-ON 4 (FOUR THROW)	
H	ON 1-OFF-ON 2 (DOUBLE THROW)	
J	ON 1-ON 2-ON 1-ON 2 (DOUBLE THROW)	
S	SPECIAL (OTHER THAN THE ABOVE OR COMBINATIONS)	

1/ Terminal numbers shown do not necessarily correspond to actual configurations.

6.8 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. Table XI lists the Environmental Protection Agency (EPA) top seventeen hazardous materials targeted for major usage reduction. Use of these materials should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

TABLE XI. EPA top seventeen hazardous materials.

Benzene	Dichloromethane	Tetrachloroethylene
Cadmium and Compounds	Lead and Compounds	Toluene
Carbon Tetrachloride	Mercury and Compounds	1,1,1 - Trichloroethane
Chloroform	Methyl Ethyl Ketone	Trichloroethylene
Chromium and Compounds	Methyl Isobutyl Ketone	Xylenes
Cyanide and Compounds	Nickel and Compounds	

6.9 Sub-contracted material and parts. The packaging or preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.10 Lubricating Compounds. It is recommended that MIL-PRF-23827 be considered for meeting the lubricating compound requirements of this specification.

6.11 Plastic laminates. It is recommended that MIL-I-24768, type FBE be considered for the plastic laminates material.

6.12 Plastic molding. It is recommended that ASTM D5948, type MAI-60 or MAI-30 be considered for the plastic molding material.

6.13 Moving contact material. It is recommended that phosphor bronze in accordance with ASTM-B139 be considered for the moving contact material.

6.14 Stationary contact material. It is recommended that copper in accordance with ASTM-B152 be considered for the stationary material.

6.15 Contact studs. It is recommended that copper in accordance with ASTM-B133 and ASTM-B272 be considered for the contact studs material.

6.16 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to ASTM-B545 (Standard Specification for Electrodeposited Coatings of Tin).

6.17 Subject term (key word) listing.

Sea water
Corrosion resistant
Fungus resistant
Salt Water
High Shock

6.18 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians:

Navy - SH
DLA - CC

Preparing activity:

DLA - CC

(Project (5930-1896))

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil/>.