

MIL-STD-1498B

14 May 1985

SUPERSEDING

MIL-STD-1498A

18 OCTOBER 1979

MILITARY STANDARD

CIRCUIT BREAKERS, SELECTION AND USE OF



FSC 5925

MIL-STD-1498B

DEPARTMENT OF DEFENSE
Washington, D.C. 20301

Circuit Breakers, Selection and Use of

MIL-STD-1498B

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to Commander, US Army Electronics Research and Development Command, ATTN: DELET-R-S, Fort Monmouth, NJ 07703 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-STD-1498B

FOREWORD

This standard provides a listing of circuit breakers that are covered by Federal and Military specifications and standards and are intended for use in the design of military equipment.

MIL-STD-1498B

CONTENTS

		PAGE
Paragraph 1.	SCOPE - - - - -	1
1.1	General - - - - -	1
1.2	Standard circuit breakers not listed herein - - -	1
1.3	Purpose - - - - -	1
2.	REFERENCE DOCUMENTS - - - - -	2
2.1	Government documents- - - - -	2
2.2	Other publications- - - - -	2
3.	DEFINITIONS - - - - -	4
4.	GENERAL REQUIREMENTS- - - - -	5
4.1	Criteria for inclusion in this standard - - - - -	5
4.2	Lists of standard circuit breakers- - - - -	5
4.3	Outline configurations- - - - -	5
4.4	Conflict of requirements- - - - -	5
4.5	Selection of circuit breakers - - - - -	5
4.6	Trip-free versus non trip-free and automatic reset operation- - - - -	6
4.7	Circuit application- - - - -	6
4.8	Effect of altitude on calibration (thermal breakers) - - - - -	6
4.9	Additional guidelines- - - - -	6
5.	DETAILED REQUIREMENTS- - - - -	8
5.1	Standard items offered for selection - - - - -	8
6.	NOTES- - - - -	9
6.1	Qualified products list- - - - -	9
6.2	Procedure for inquiring about circuit breakers not listed herein- - - - -	9
FIGURES		
Figure 1	Outline configurations - - - - -	10
TABLE		
Table I	Circuit breaker selection guide- - - - -	33

MIL-STD-1498B

1. SCOPE

1.1 General. This standard establishes requirements for selection of circuit breakers shown in detail in table I and referenced in 1.2 for use in military equipment.

1.2 Standard circuit breakers not listed herein.

- a. Circuit breakers covered by W-C-375 have not been included in this standard because that specification includes devices too numerous to cover by specification sheets; therefore, a listing in this standard would be somewhat incomplete and misleading. However, the specification sheets of W-C-375 should be considered first when making a choice of a branch and entry type circuit breaker.
- b. The large shipboard type circuit breakers (900 through 6400 ampere frames) under MIL-C-17587 have been removed from the selection guide in this standard due to their limited usage and numerous variations. For coverage of these circuit breakers, see MIL-C-17587.

1.3 Purpose. The purpose of this standard is as follows:

- a. To provide equipment designers and manufacturers with lists of circuit breakers considered to be preferred for design of military equipment.
- b. To control and minimize the variety of circuit breakers used by military activities in order to facilitate effective logistic support of equipment in the field; to maximize economic support of, and to concentrate improvement on, production of the circuit breakers listed in this standard.

MIL-STD-1498B

2. REFERENCED DOCUMENTS

2.1 Government documents.

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 standard to the extent specified herein.

SPECIFICATIONS

FEDERAL

W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service.

MILITARY

MIL-E-5272 - Environmental Testing, Aeronautical and Associated Equipment.
 MIL-C-5809 - Circuit Breakers, Trip-Free, Aircraft, General Specification For.
 MIL-C-7079 - Circuit Breakers, Non Trip-Free, General Specification For.
 MIL-C-8379 - Circuit Breaker, Electrically Operated, 3-Pole, Type A-1.
 MIL-C-13516 - Circuit Breakers; Manual and Automatic (28-Volt).
 MIL-C-17361 - Circuit Breakers, Air, Electric, Insulated Enclosure (Shipboard Use).
 MIL-C-17587 - Circuit Breakers, Air, Electric, Open Frame Removable Assembly (Shipboard use)
 MIL-C-17588 - Circuit Breakers (Automatic-ALB) and Switch, Toggle (Circuit Breaker, Non-Automatic-NLB), Air, Insulated Housing, 125 Volts and Below, AC or DC, (Naval Shipboard Use).
 MIL-C-27715 - Circuit Breakers, Trip-Free, High Temperature, Aircraft, General Specification For.
 MIL-C-39019 - Circuit Breakers; Magnetic, Low-Power, Sealed, Trip-Free, General Specification For.
 MIL-C-55629 - Circuit Breakers, Magnetic, Unsealed, Trip-Free, General Specification For.
 MIL-C-83383 - Circuit Breakers, Remote Control, Thermal, Trip-Free, General Specification For.

STANDARDS

MILITARY

MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
 MS3320 - Circuit Breaker-Aircraft, Trip-Free, Push Pull, 1/2 Thru 20 AMPS, Type I -55 Thru +121°C.
 MS14105 - Circuit Breaker-Aircraft, Trip-Free, Push Pull, 25 Thru 35 AMPS, Type I -55 to +121°C.
 MS14153 - Circuit Breaker-Aircraft, Trip-Free, Push-Pull 3 Phase, 1 Thru 35 AMP, Type I.
 MS14154 - Circuit Breaker-Aircraft, Trip-Free, Push-Pull 3 Phase, 1 thru 20 AMP, Type I.
 MS21984 - Circuit Breaker-Aircraft, Trip-Free, Push-Pull, 3-Phase, 5 Thru 60 AMP., Type I.
 MS22073 - Circuit Breaker, Trip-Free, Push-Pull, 1/2 Thru 20 AMP, Type I.
 MS24506 - Circuit Breaker-Aircraft, Non Trip-Free, Push Pull, 5 to 50 AMP, Type I.
 MS24509 - Circuit Breaker, Trip-Free, Toggle, 3 Thru 35 AMPS, Type I.
 MS24510 - Circuit Breaker, Trip-Free, Push-Pull, 3 Thru 35 AMPS, Type I.
 MS24571 - Circuit Breaker, Aircraft, Trip Free, 2 1/2 to 50 Amperes, 121.1°C Ambient.

MIL-STD-1498B

- MS25244 - Circuit Breaker, Trip-Free, Push-Pull, 5 thru 35 Ampere, Type I.
- MS25361 - Circuit Breaker-Aircraft, Trip-Free, Push-Pull, 50 Thru 100 AMPS, Type I.
- MS26574 - Circuit Breaker, Trip-Free, Push-Pull, 1/2 Thru 20 AMP, Type I.

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

2.2 Other publications. The following document forms a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

Society of Automotive Engineers, Inc..

ARP 1199 - Aerospace Recommended Practice, Selection, Application, and Inspection of Electric Overcurrent Protective Devices.

Department of Defense activities should order ARP 1199 from the Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. All other organizations should order from the Society of Automotive Engineers, Inc. 400 Commonwealth Dr. Warrendale, PA 15096. Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.

MIL-STD-1498B

3. DEFINITIONS: SEE 4.9b

MIL-STD-14983

4. GENERAL REQUIREMENTS

4.1 Criteria for inclusion in this standard.

- a. The circuit breaker shall be considered by the military departments as the best presently available type for the function.
- b. The circuit breaker shall be in production and continued availability shall be reasonably certain (see table I, note 6 for possible exceptions).

4.2 Lists of standard circuit breakers. Table I included herein lists the applicable specification number for all circuit breakers approved as standard for use in the design and manufacture of military equipment. (Complete detailed requirements for circuit breakers listed in this standard are covered in the applicable specification, specification sheet, or MS drawing, see 1.2 for standard circuit breakers not listed in table I).

4.3 Outline configurations. Outline configurations on figure 1 are given in maximum dimensions.

4.4 Conflict of requirements. Selection of a circuit breaker from this standard should be tentative. The design engineer should refer to the applicable specification, specification sheet, or MS drawing for confirmation of his selection. In the event of conflict between the technical description of circuit breakers described in this standard and the applicable specification, specification sheet, or MS drawing, the latter shall govern.

4.5 Selection of circuit breakers. Circuit breaker types shall be selected from the types listed in this standard. The variety of circuit breakers used in any military equipment shall be the minimum necessary to provide satisfactory performance, and the contractor (or hardware designer/builder) shall exercise all reasonable design choices to achieve this objective. The following are some considerations in choosing the correct circuit breaker for a particular application.

Proper selection requires that the device will:

- a. Carry load current continuously: Breakers should continuously carry normal load current; however, the value chosen should be the lowest rating that will not open inadvertently. A few of the considerations in selecting the proper current rating and time delay curve of a circuit breaker follows:
 1. What are the average (steady state) conditions of the load
 2. What is the initial start-up current of the equipment and what is its duration
 3. What are the transient overloads and their durations
 4. The time delay characteristics of the circuit breaker should be compared to the time current characteristics (including starting or overload surges) of the equipment, component or wire.
- b. Be suitable for operation in the intended environment: Due consideration should be given to ambient temperature extremes, altitude (atmospheric pressure), relative humidity, contaminants in the atmosphere such as sand, dust, explosive gases, corrosive substances, etc., and to mechanical shock and vibration. These environmental conditions should be related to demonstrated characteristics of the circuit breaker.
- c. Have sufficient interrupting capacity to interrupt fault currents of any magnitude up to the value available in the circuit being protected: (For aid in computing power system fault currents, and methods of protecting circuits with available short circuit current higher than the circuit breaker interrupt ratings, see ARP 1199).

MIL-STD-1498B

- d. Not produce an excessive voltage drop (resistance or impedance): In some circuits the voltage drop across the circuit breaker may become critical and should be considered in computing the total power loop voltage drop (exclusive of the load). This condition becomes prominent in low amperage breakers and is compounded when used in low voltage circuits.
- e. Withstand normal operating voltages and transients:
 - 1. The rated voltage of the breaker should not be exceeded by the normal system working voltage.
 - 2. System transients should not exceed proven dielectric withstanding voltages of the breaker.
- f. Coordinate with other breakers: When required circuit breakers should coordinate with other breakers in the system.
- g. Permit restoration of service after fault has been corrected: The ability of a breaker to be returned to the "on state" (recycle time) should be within the time allowed for the application. Normally a magnetic circuit breaker will have a shorter recycle time than a thermal or thermal magnetic breaker.
- h. Provide the required electrical and mechanical endurance: The demonstrated life/endurance capabilities for switching rated loads shall exceed the expected application needs. The use of circuit breakers as a switch is not recommended unless they are designed and tested specifically for such use. Repeated cycling under load will disturb contact surfaces and platings and may degrade general performance characteristics. To ensure that circuit breakers provide the desired circuit protection, their use as a switch should be restricted to circuits with minimal cycling requirements, such as for maintenance only. Where repeated cycling of loads is required, a switch should be installed in line with the circuit breaker.

4.6 Trip-free versus non trip-free and automatic reset operation. The preponderance of circuit breaker applications requires the use of trip-free breakers however, applications do exist that require a breaker that can be overridden even to its own destruction to complete a mission. Such missions may include such things as propeller feathering and control circuits, escape hatch releases, etc. Automatic reset circuit breakers have been used in such military applications as jeeps, tanks, personnel carriers, lighting circuits, turret stabilizers, wiring harnesses, etc.

4.7 Circuit application. The equipment shall be designed so that it will meet the specified equipment performance and reliability requirements when using any circuit breaker meeting the applicable specification requirements. The use of the standard circuit breaker or the satisfactory equipment performance shall not depend on characteristics or parameters which are not controlled by the applicable specification, specification sheet, or MS drawing.

4.8 Effect of altitude on calibration (thermal breakers). The effect of altitude is a paramount consideration in heat dissipation with the lower rated thermal breakers. For example, a thermal breaker having a maximum ultimate-trip point of 138 percent at sea level would be derated to 130 percent at 50,000 feet and to 120 percent at 100,000 feet simply because of the loss of a heat conductive atmosphere. Under the complete vacuum conditions of space, serious degradation might occur.

4.9 Additional guidelines. For additional guidelines in the selection, application and inspection of circuit breakers, see ARP 1199, Aerospace Recommended Practices. The following subjects are discussed in that document.

- a. Types of overcurrent protective devices
- b. Definitions

- c. Philosophy of aircraft circuit protection
 - 1. Practical overcurrent protective concepts
 - 2. Protector selection
 - Extent of protection
 - Equipment protection
 - System protection
- d. Circuit breakers
 - 1. General
 - 2. Magnetic circuit breakers
 - Magnetic time-delay (typical)
 - Instantaneous trip
 - 3. Thermal circuit breaker types
 - Thermal
 - Thermal-magnetic assist
 - Temperature compensated-thermal
 - Hot wire breaker
 - 4. Remote control circuit breakers (RCCB)
 - 5. Application considerations and problem areas
 - Explosion-proof aeronautical equipment
 - Temperature effect on calibration
 - Temperature compensation
 - Coordination of cascaded protectors
 - Interrupting capacity (rupture capacity)
 - Contamination
 - Circuit breaker endurance
 - Change in circuit breaker trip characteristics
 - Multipole breakers
 - Application analysis
 - 6. Maintenance procedures
 - 7. Military specifications related to circuit breakers

MIL-STD-1498B

5. DETAILED REQUIREMENTS

5.1 Standard items offered for selection. The basic style, three dimensional drawings, maximum dimensions and many important characteristics for selecting the most appropriate circuit breaker for the application are given in table I and figure 1, (also see 1.2). Final selection should be made from the applicable specification, specification sheet, or MS drawing.

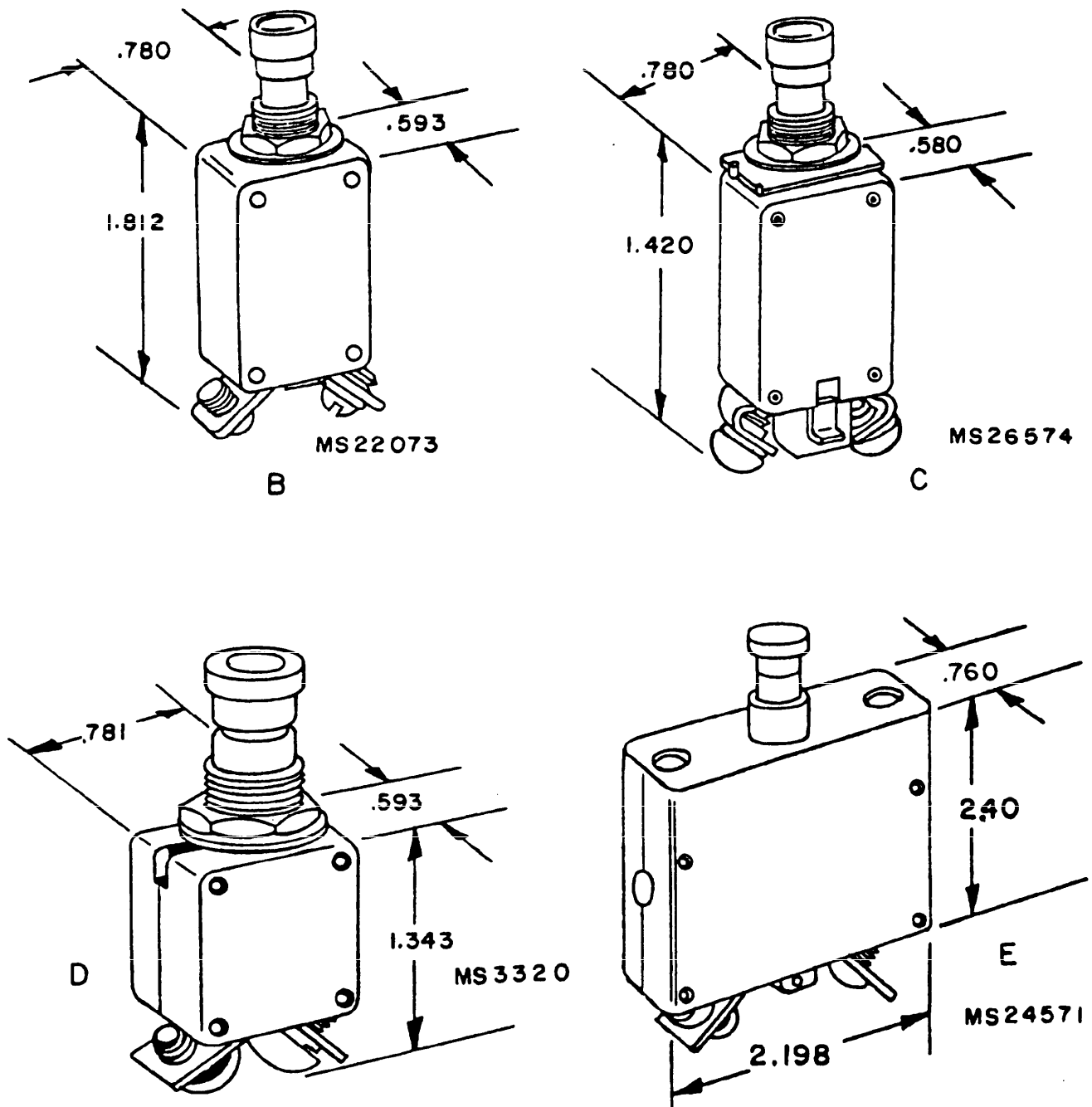
MIL-STD-14988

6. NOTES

6.1 Qualified products list. Some of the devices listed in this standard may not be listed on the applicable QPL as indicated by note 6 of table 1. The qualifying activity should be contacted to determine if approval has been granted for a device in this category subsequent to the publication of this document, or if the previous qualification status of the device has changed.

6.2 Procedure for inquiring about circuit breakers not listed herein. When a contractor has determined that equipment or system requirements cannot be met by devices listed herein, he is encouraged to contact the Military Parts Control Advisory Group (MPCAG) at the Defense Electronics Supply Center (telephone 513-296-6131) for advice on the use of any circuit breaker not identified herein or if standardization action is underway to cover a circuit breaker having the required characteristics. Such contact may provide a recommendation for use of an alternate item which is less objectionable from the DOD viewpoint.

MIL-STD-1498B

FIGURE 1. Outline configurations (codes B through E).

MIL-STD-1493B

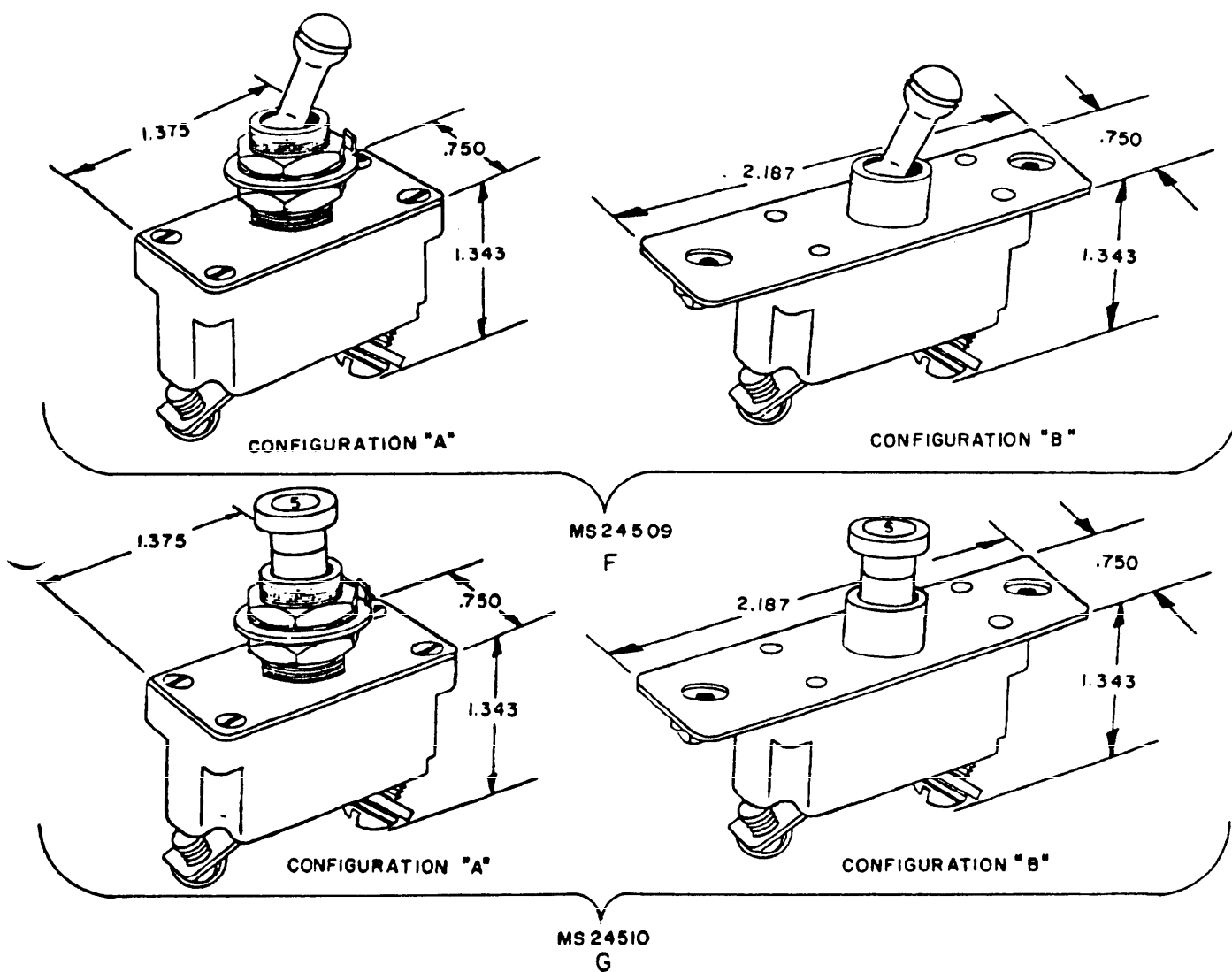


FIGURE 1. Outline configurations (codes F and G) - Continued.

MIL-STD-149B

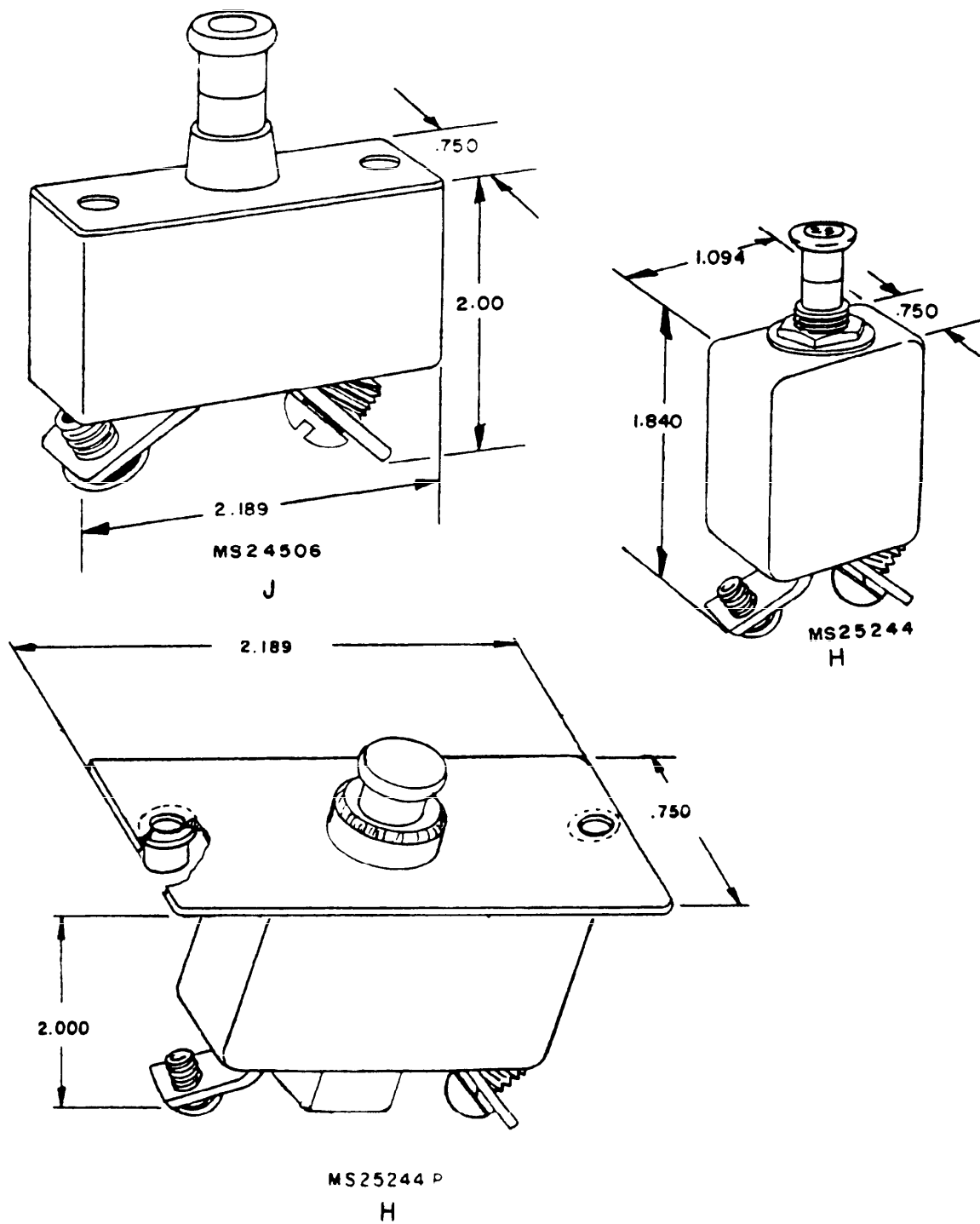


FIGURE 1. Outline configurations (H and J) - Continued.

MIL-STD-1498B

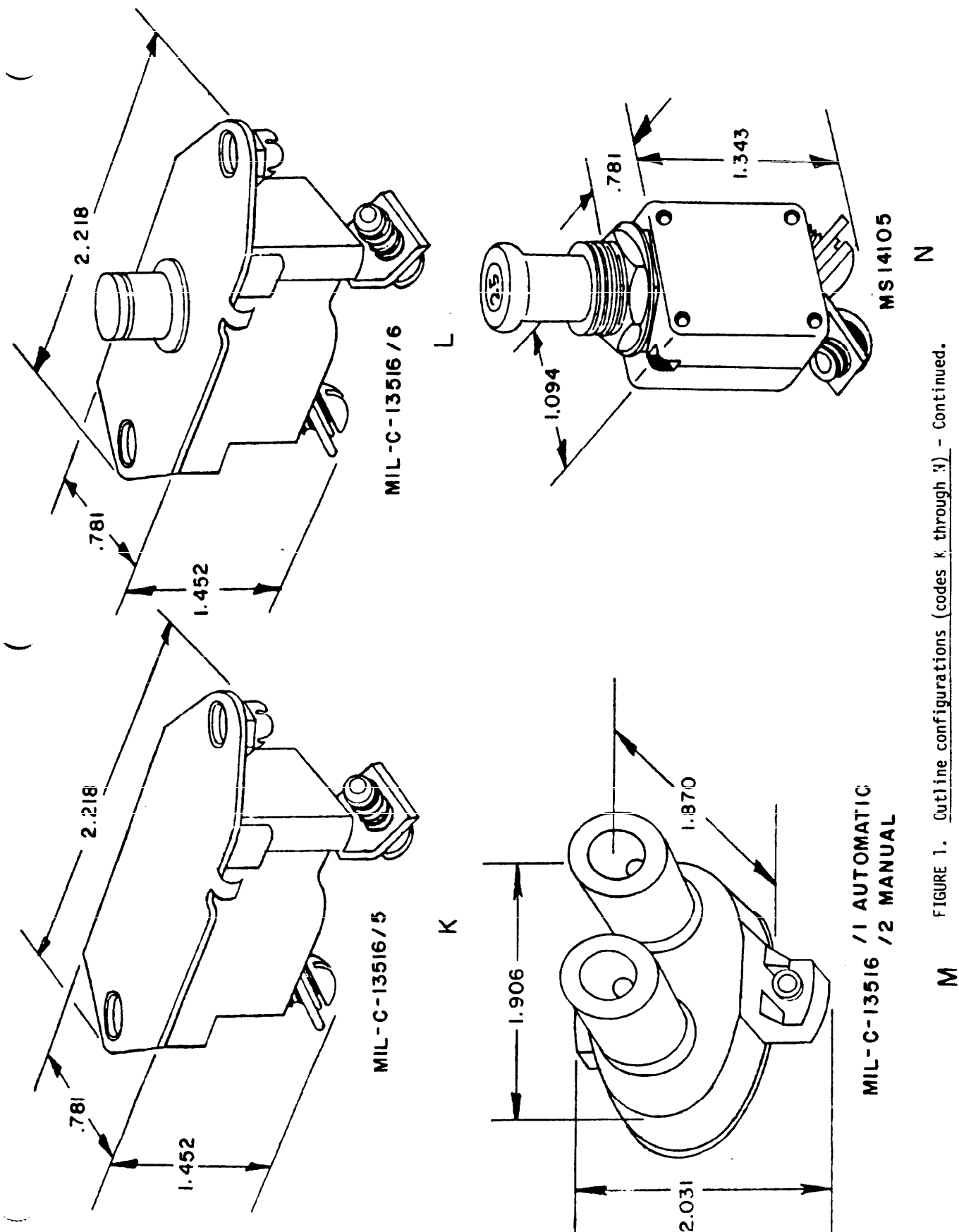
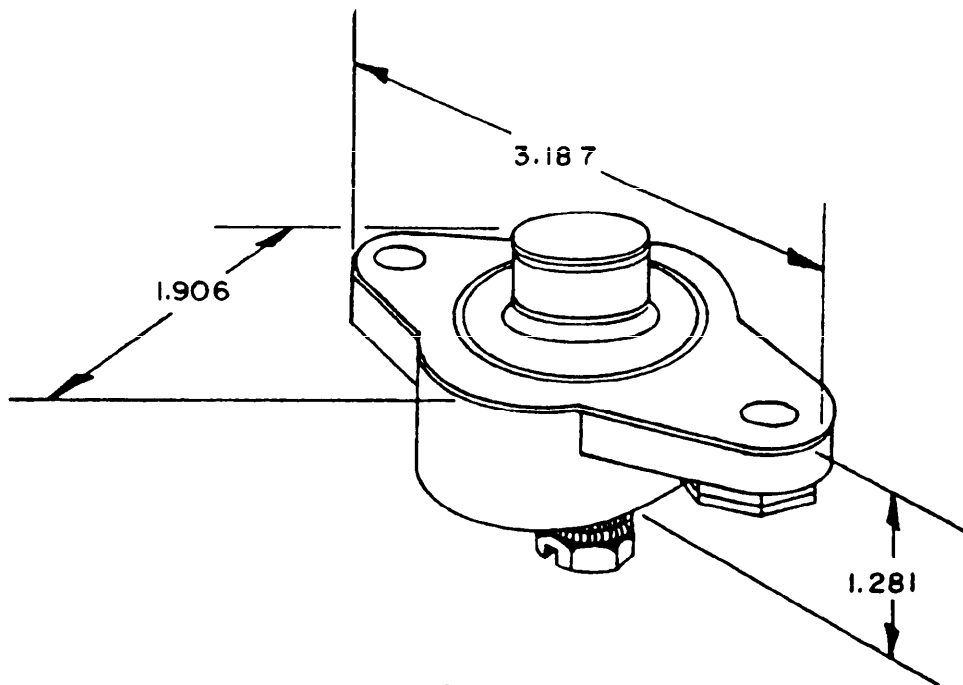


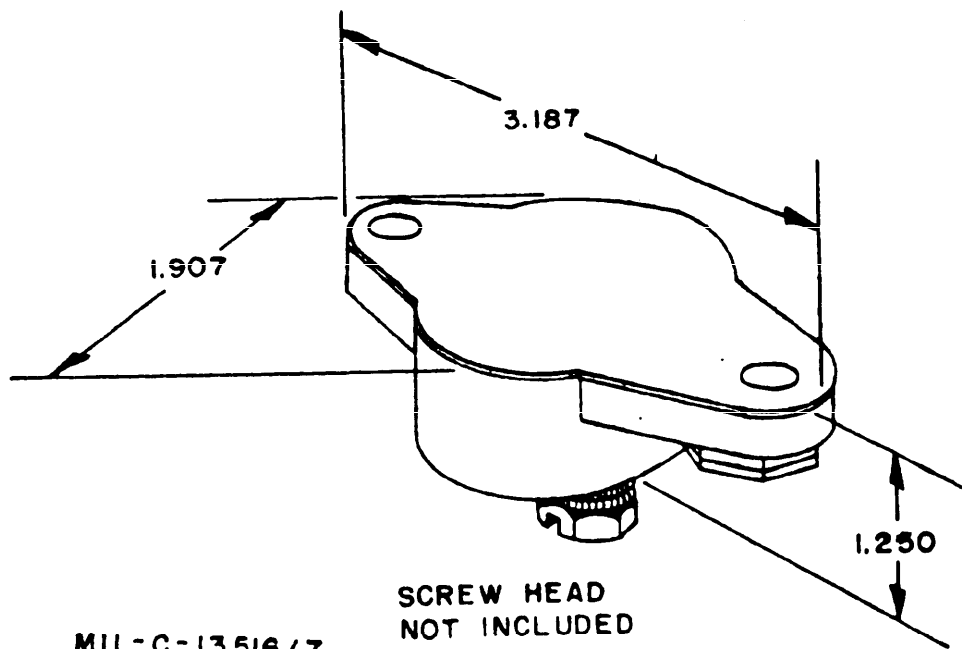
FIGURE 1. Outline configurations (codes K through N) - Continued.

MIL-STD-1498B



MIL-C- 13516/4

0



MIL-C-13516/7

P

FIGURE 1. Outline configurations (codes 0 and P) - Continued.

MIL-STD-1498B

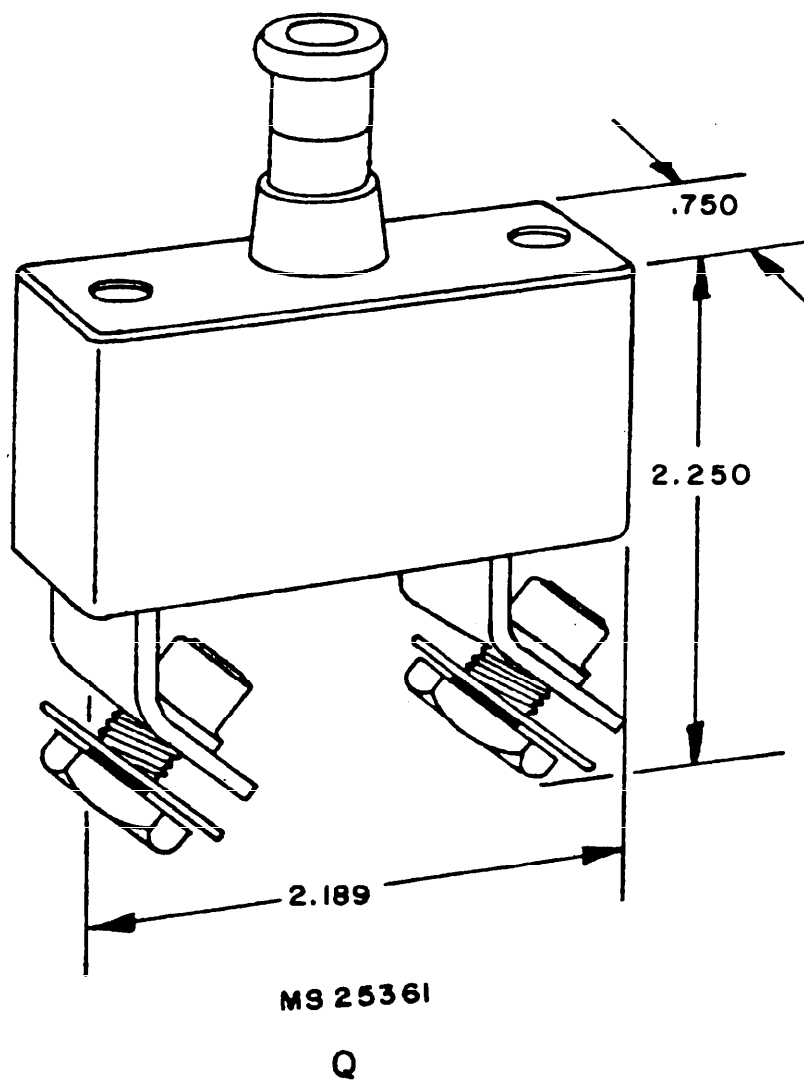
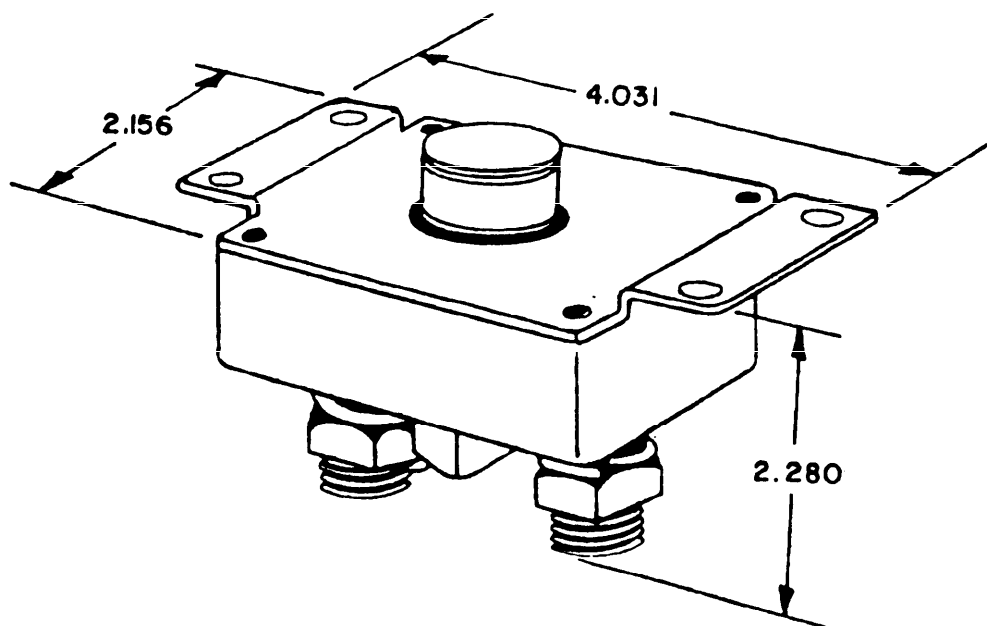


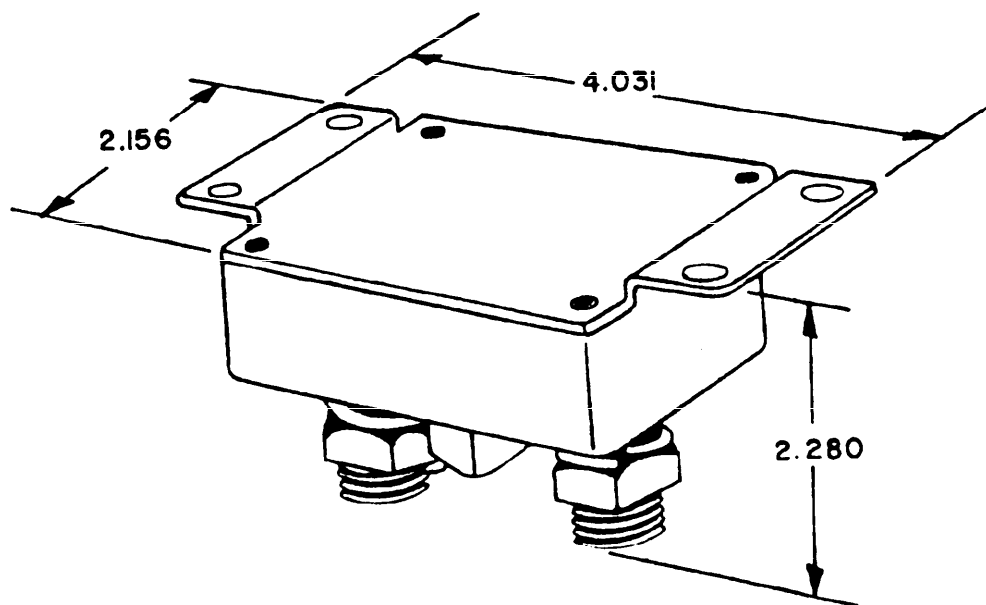
FIGURE 1. Outline configurations (code Q) - Continued.

MIL-STD-1498B



MIL-C - 13516 / 3

S

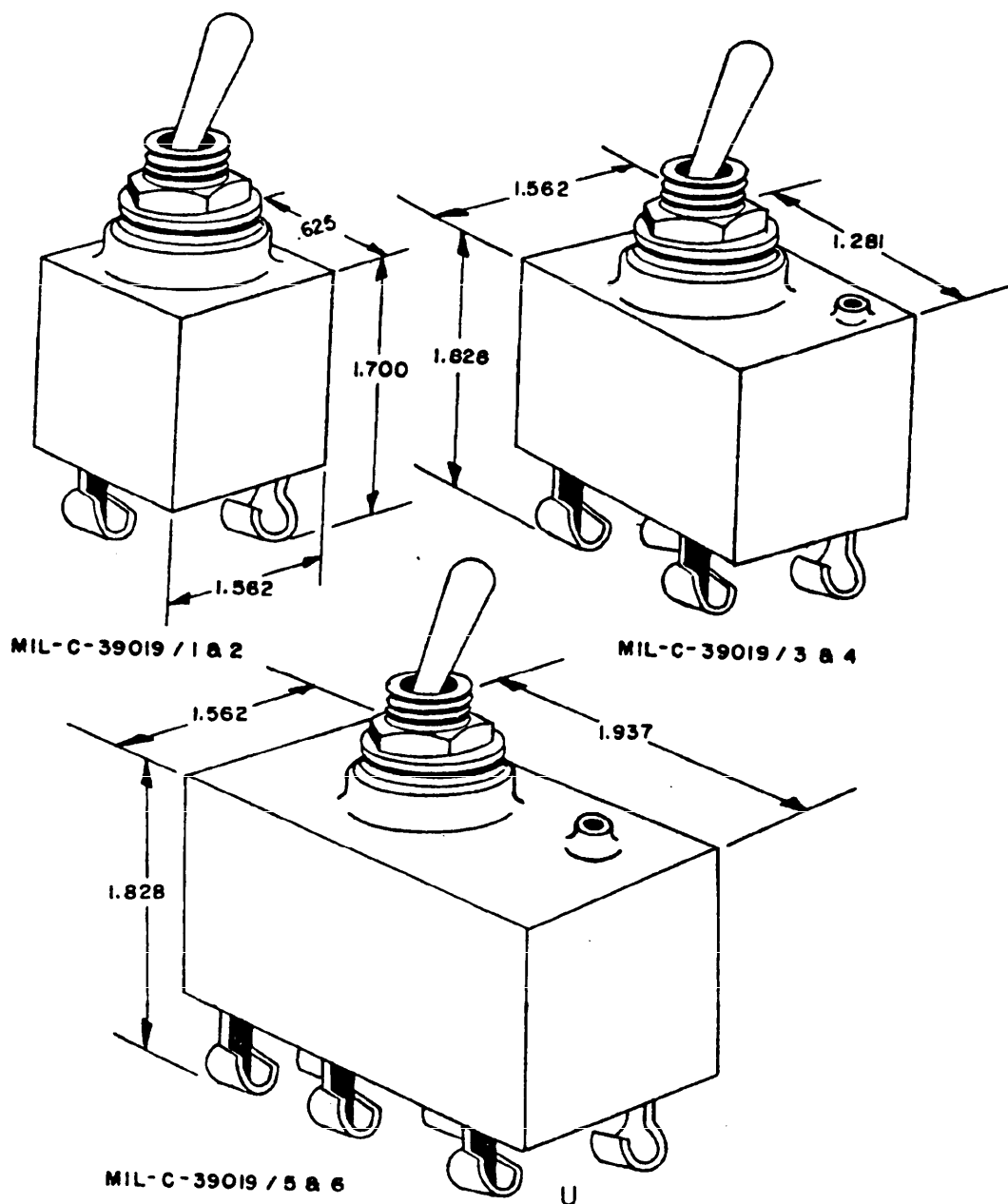


MIL-C-13516 / 8

T

FIGURE 1. Outline configurations (codes S and T) - Continued.

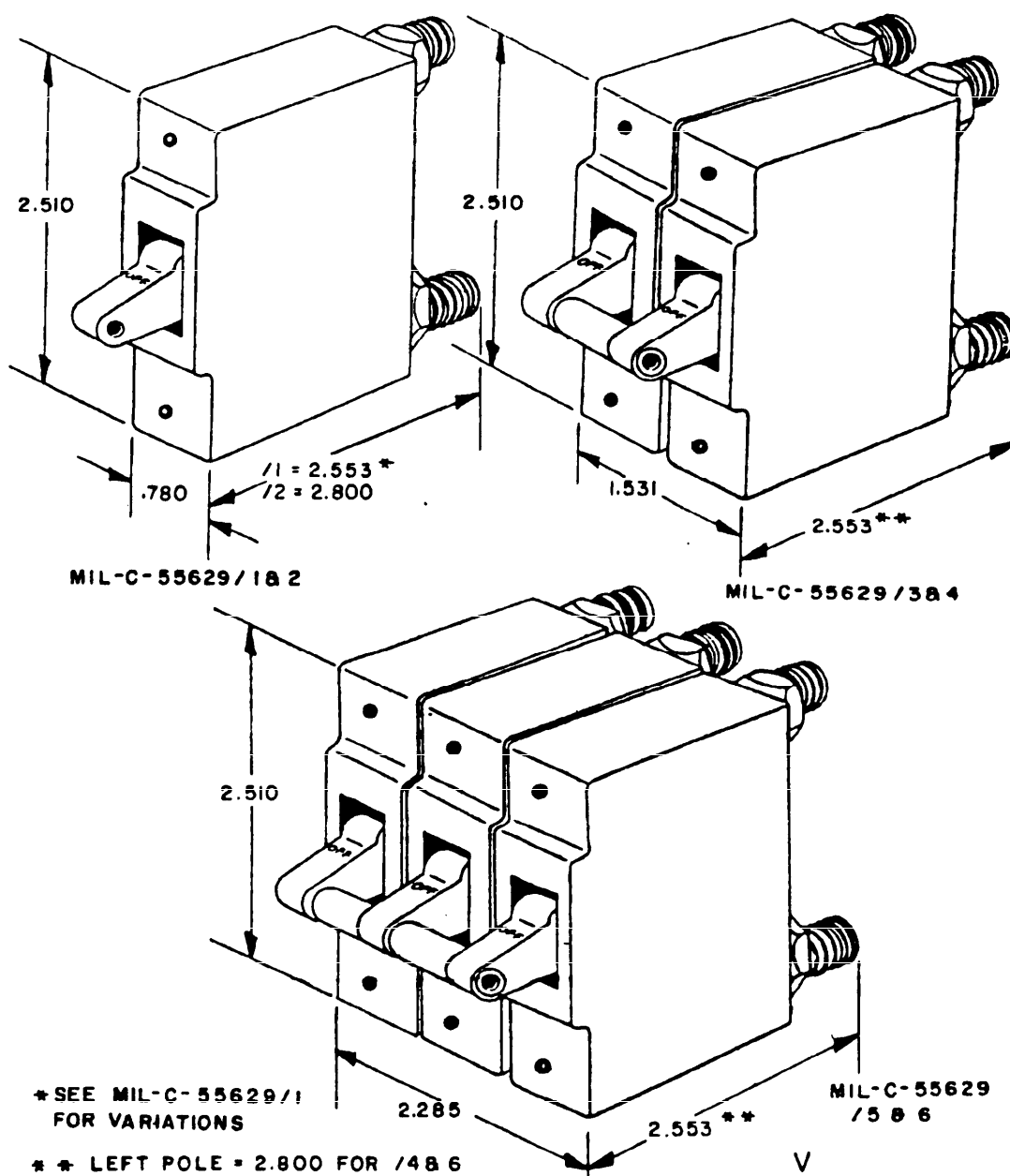
MIL-STD-1498B



NOTE: /2, /4 and /6 includes auxiliary switch terminals not shown.

FIGURE 1. Outline configurations (code U) - Continued.

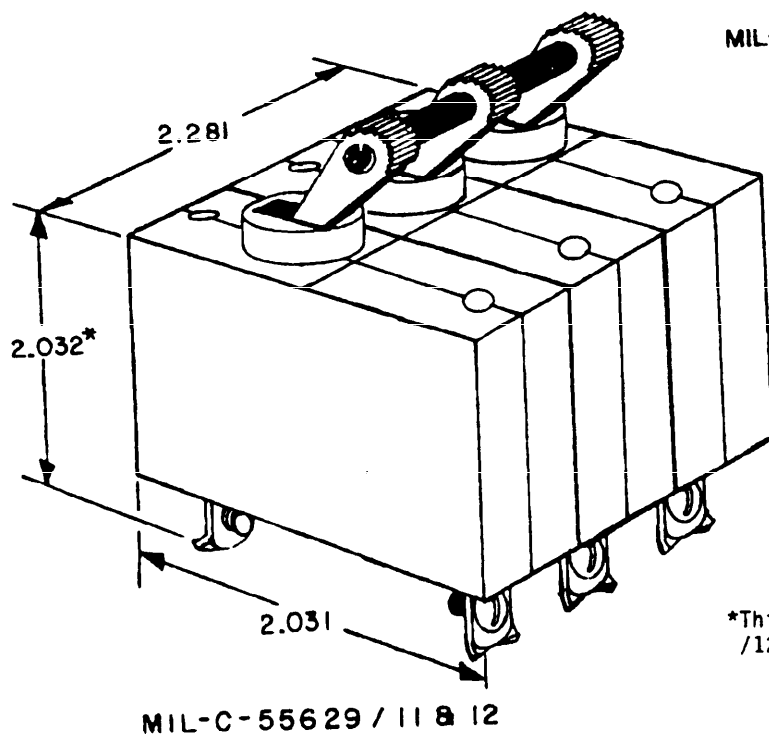
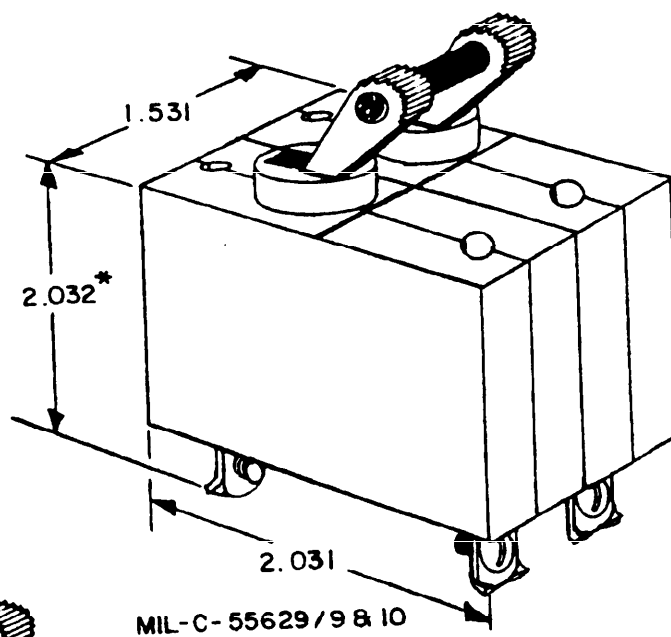
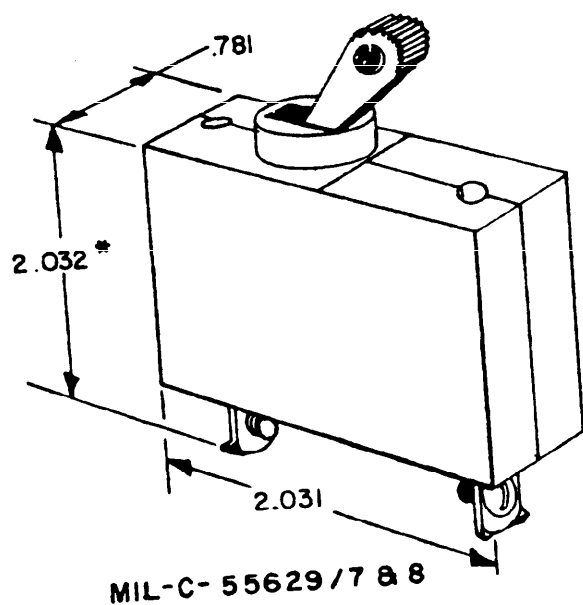
MIL-STD-1498B



NOTE: /2, /4 and /6 includes auxiliary switch terminals not shown.

FIGURE 1. Outline configurations (code V) - Continued.

MIL-STD-14988

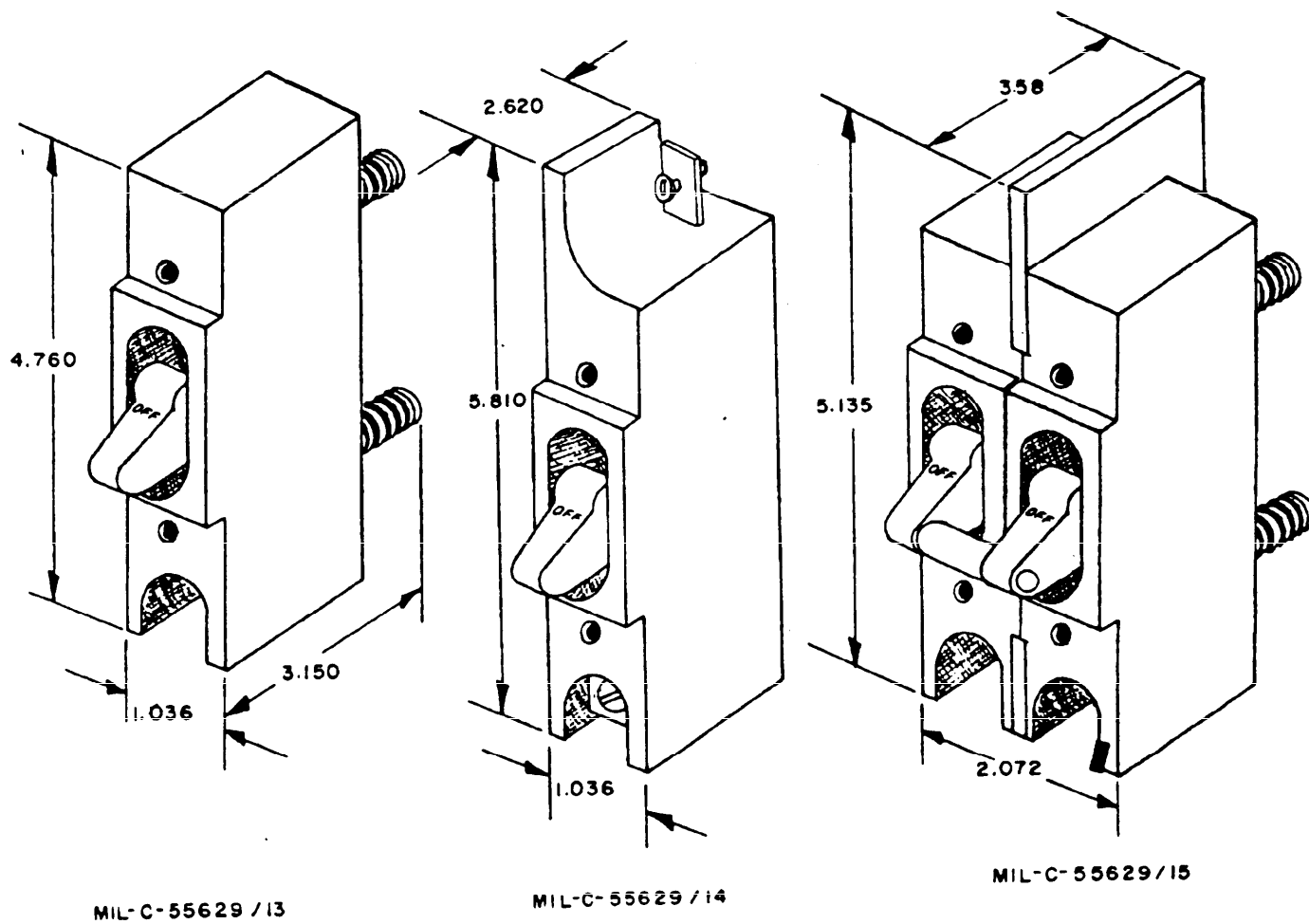


*This dimension becomes 2.10 for /8, /10 and /12 to cover auxiliary contacts.

NOTE: /8, /10 and /12 includes auxiliary switch terminals not shown.

FIGURE 1. Outline configurations (code V) - Continued.

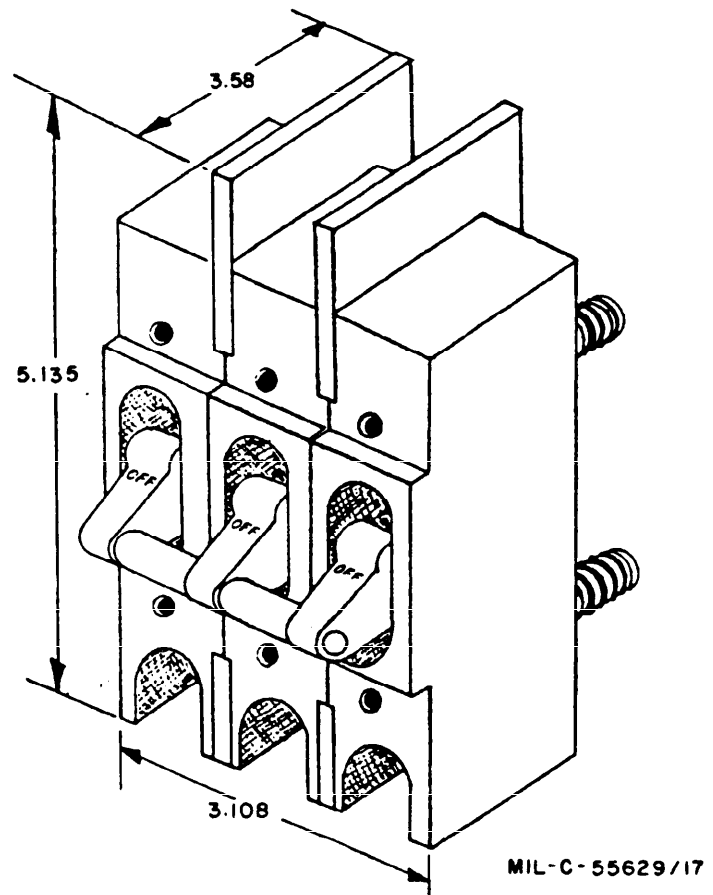
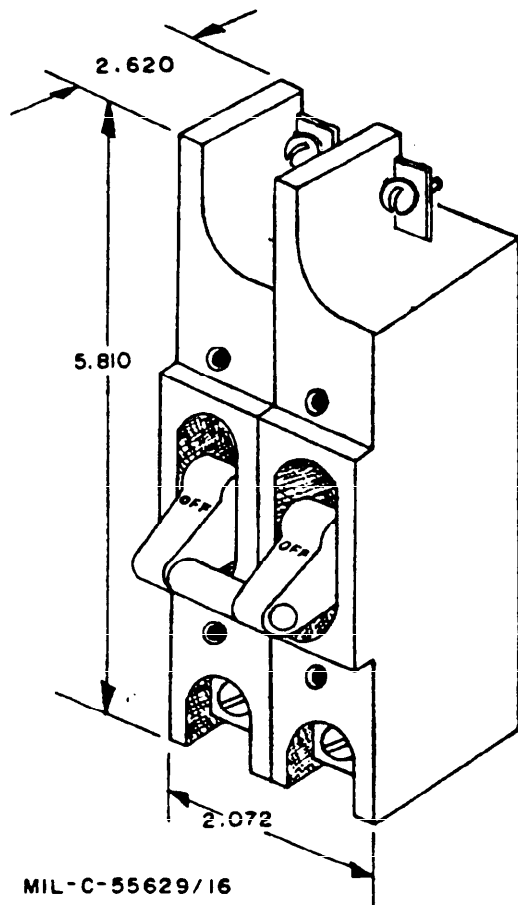
MIL-STD-1498B



NOTE: /13 and /15 includes auxiliary switch terminals not shown.

FIGURE 1. Outline configurations (code W) - Continued

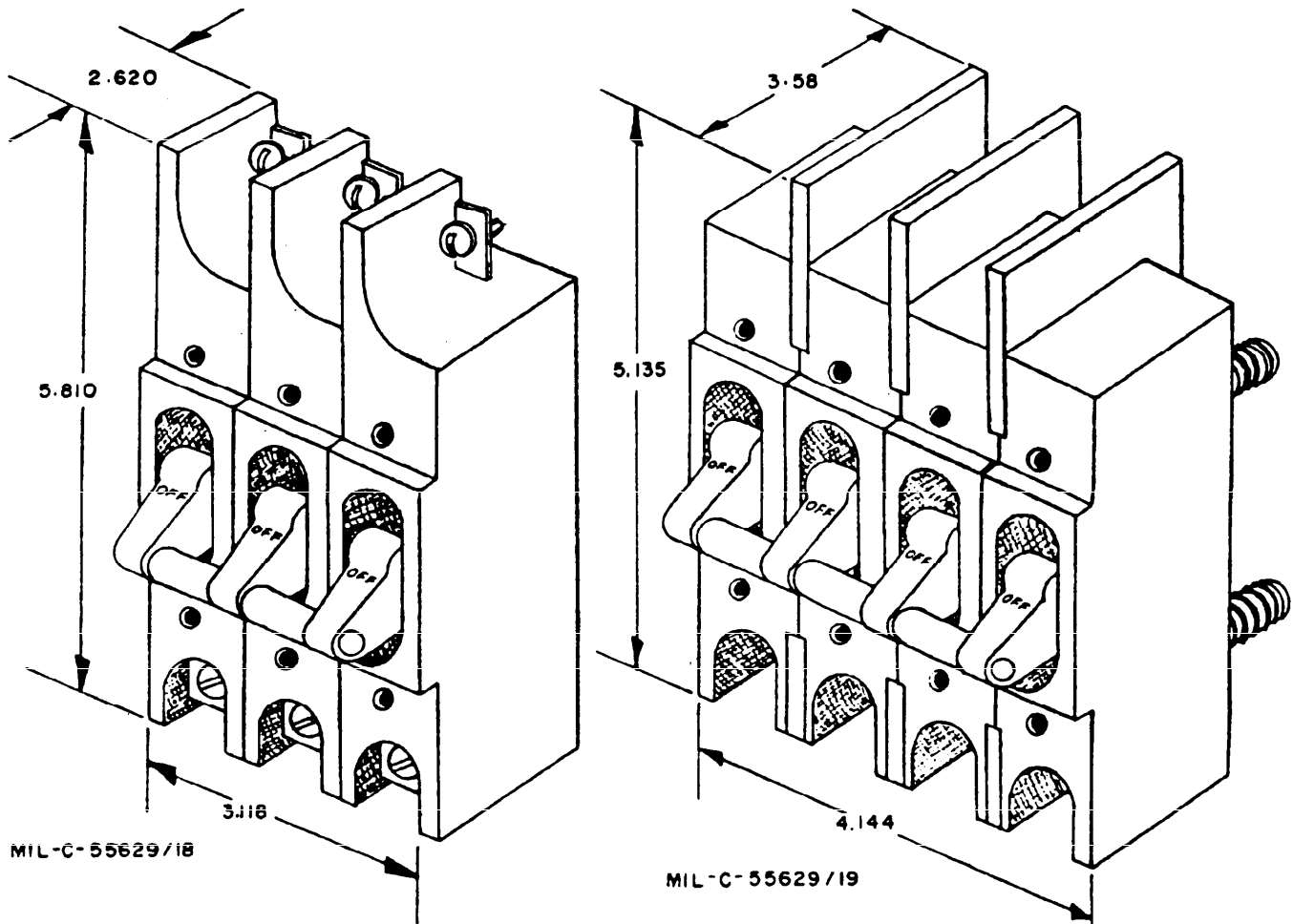
MIL-STD-1498B



NOTE: /17 includes auxiliary switch terminals not shown.

FIGURE 1. Outline configurations (code W) - Continued.

MIL-STD-1498B



NOTE: /19 includes auxiliary switch terminals not shown,
pole 4 is voltage sensitive.

FIGURE 1. Outline configurations (code W) - Continued.

MIL-STD-1498B

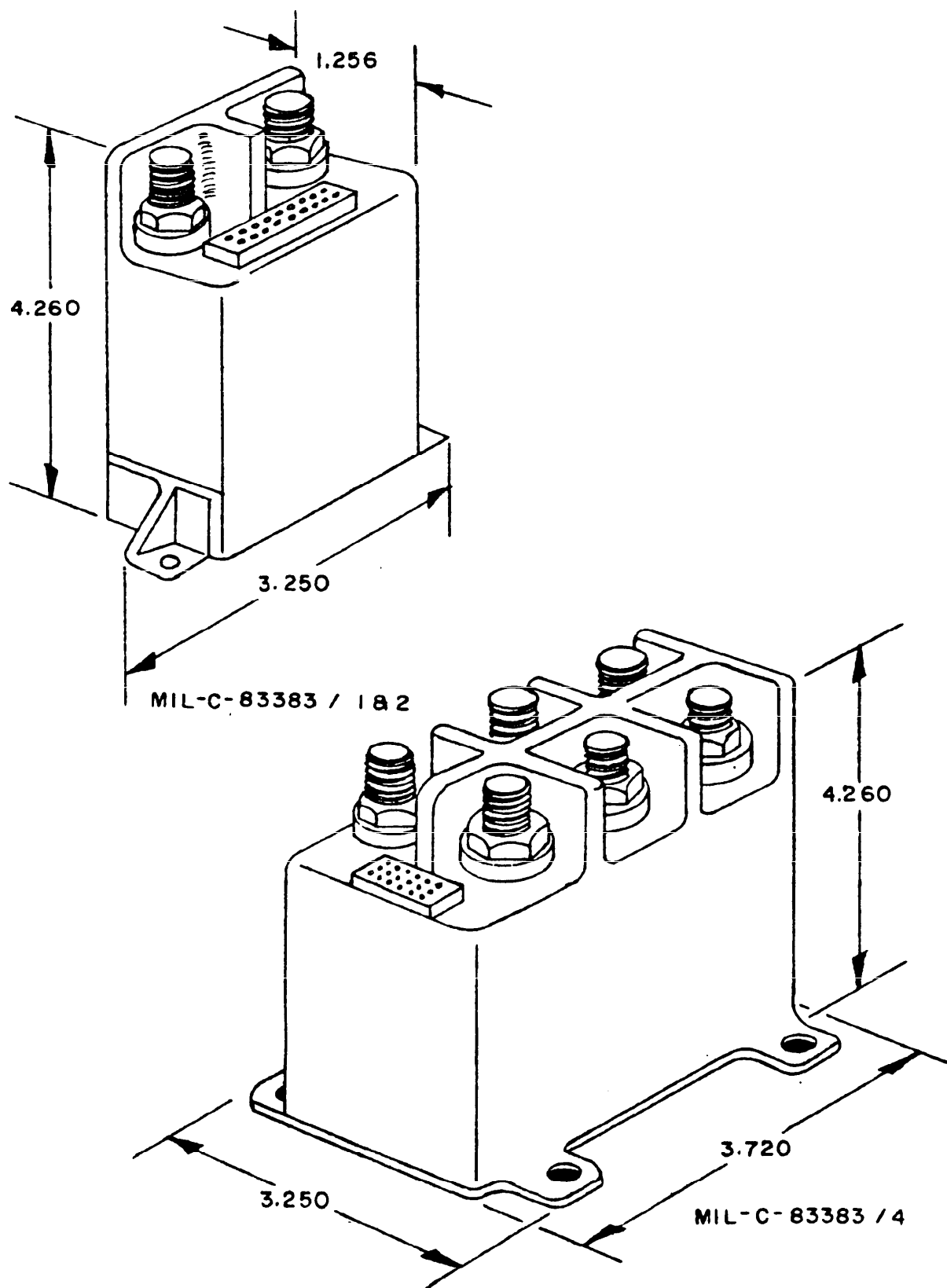


FIGURE 1. Outline configurations (code X) - Continued.

MIL-STD-1498B

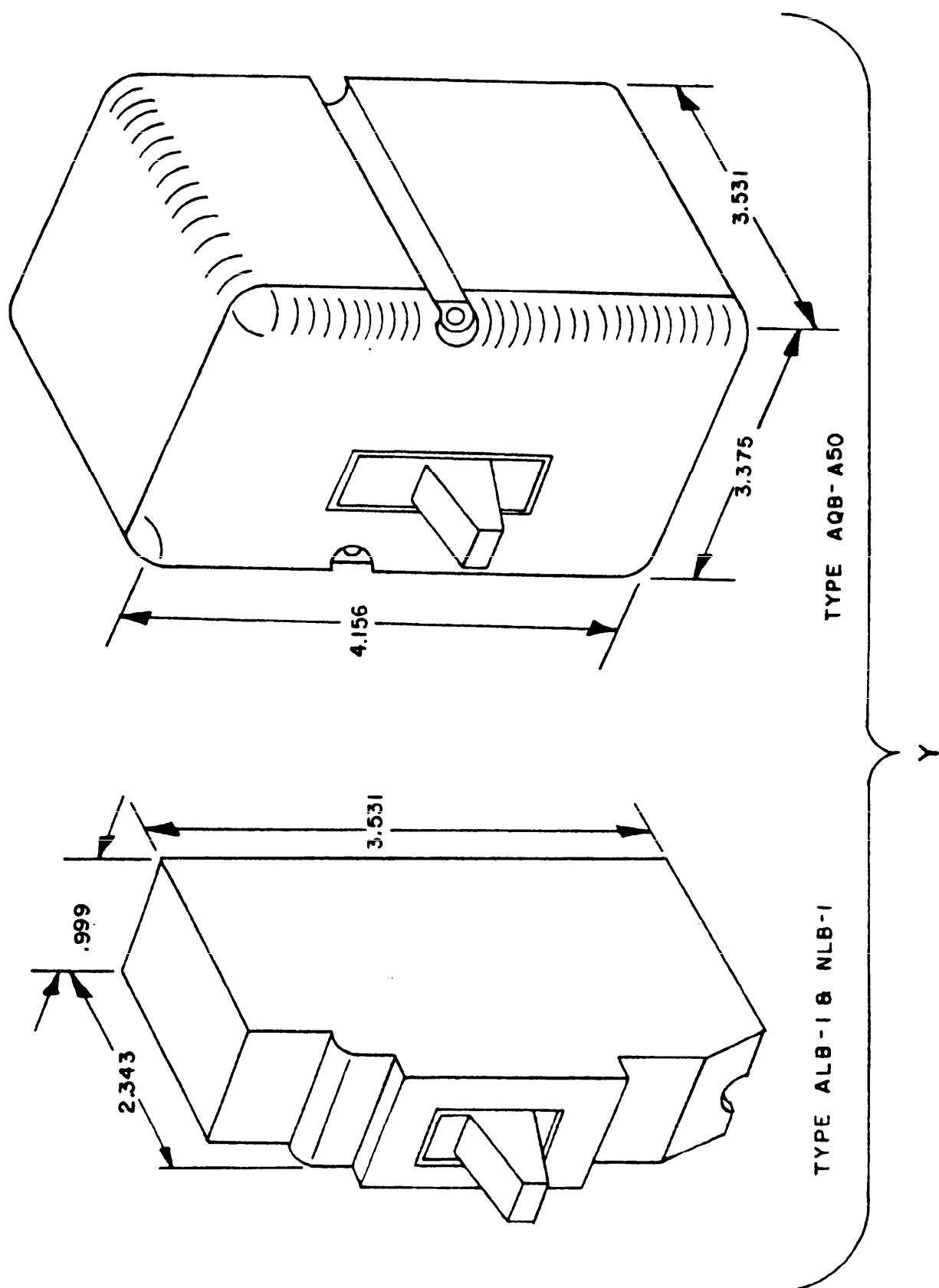


FIGURE 1. Outline configurations (code Y) - Continued.

MIL-STD-1498B

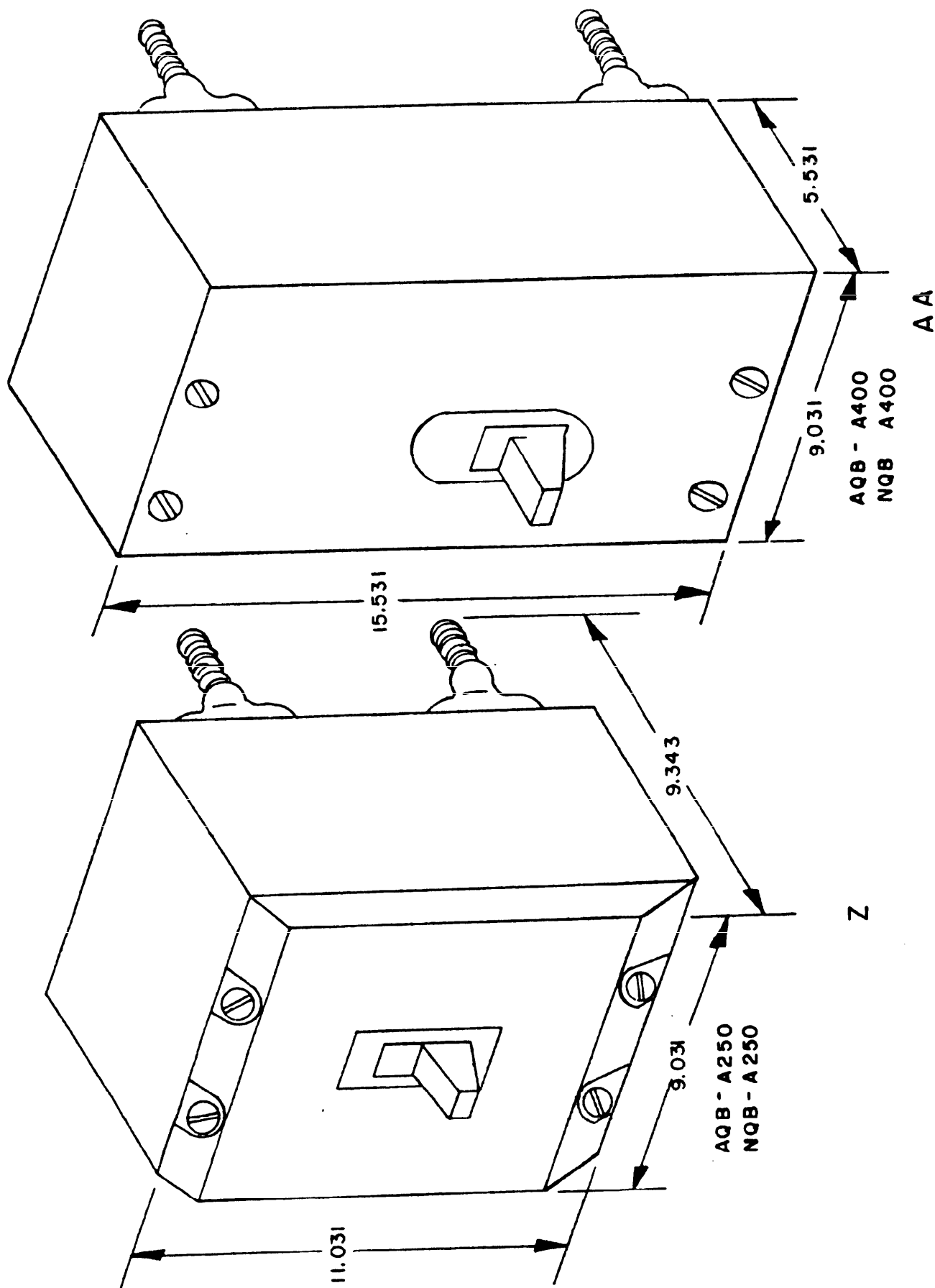
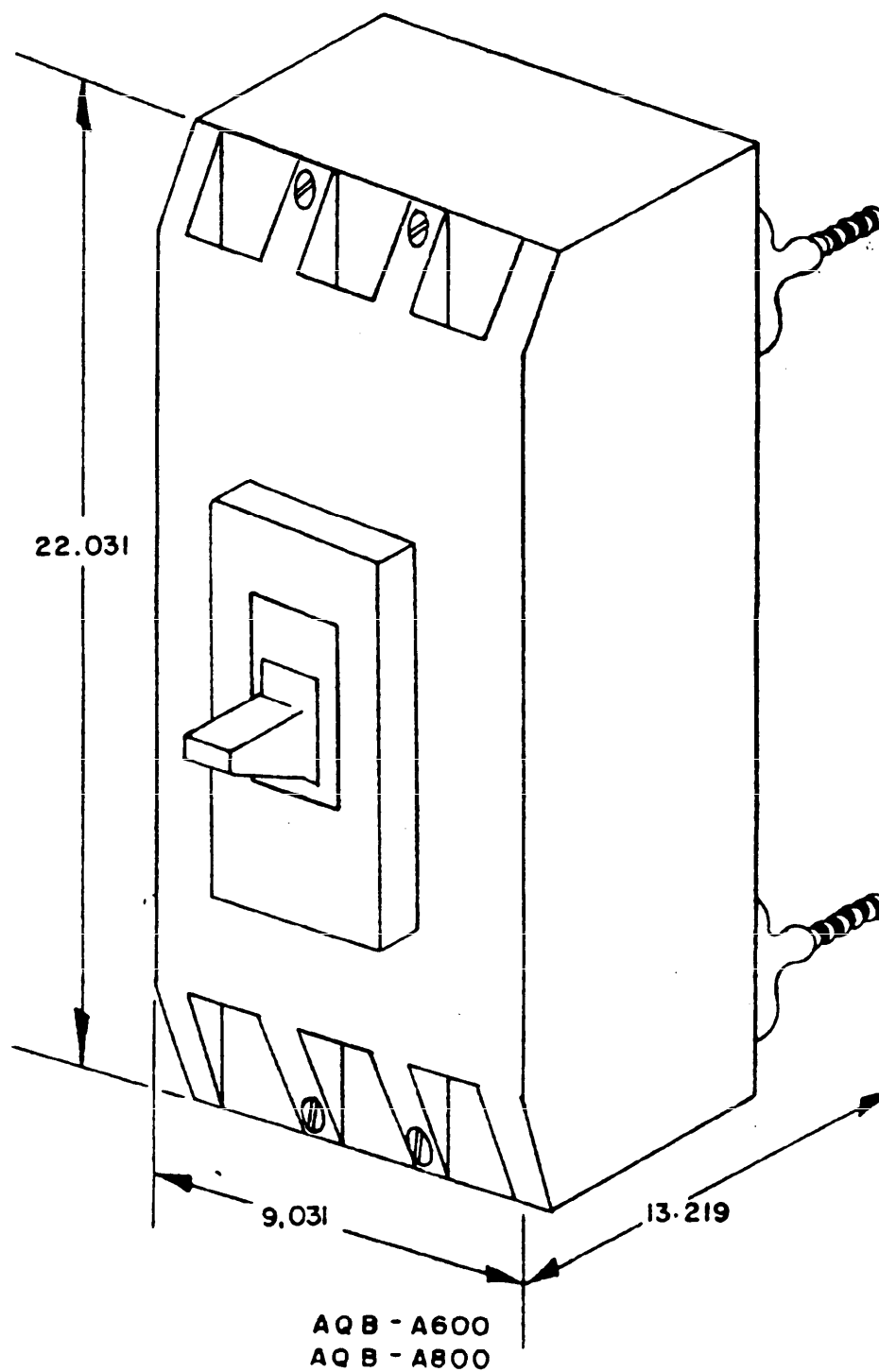


FIGURE 1. Outline configurations (codes Z and AA) - Continued.

MIL-STD-1498B



AB

FIGURE 1. Outline configurations (code AB) - Continued.

MIL-STD-1498B

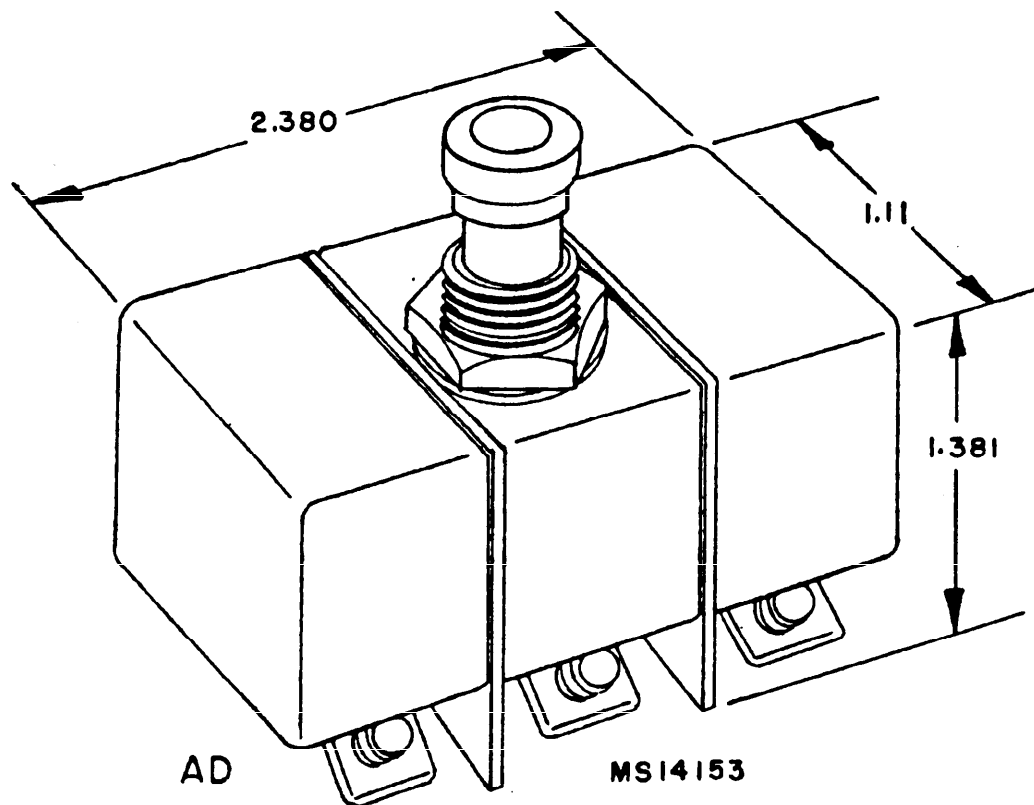


FIGURE 1. Outline configurations (code AD) - Continued.

MIT-5TD-14986

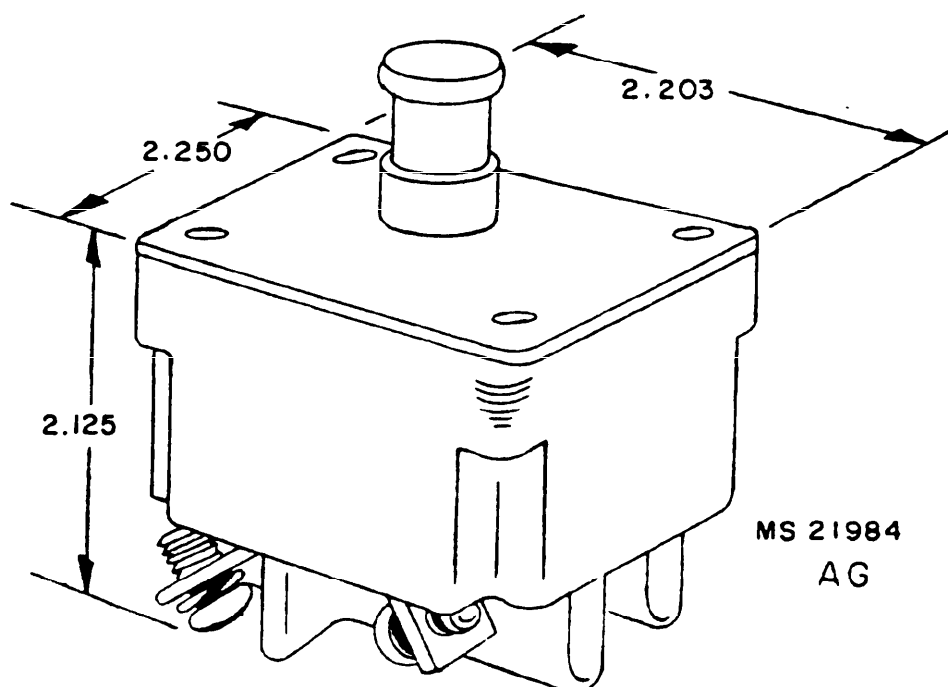
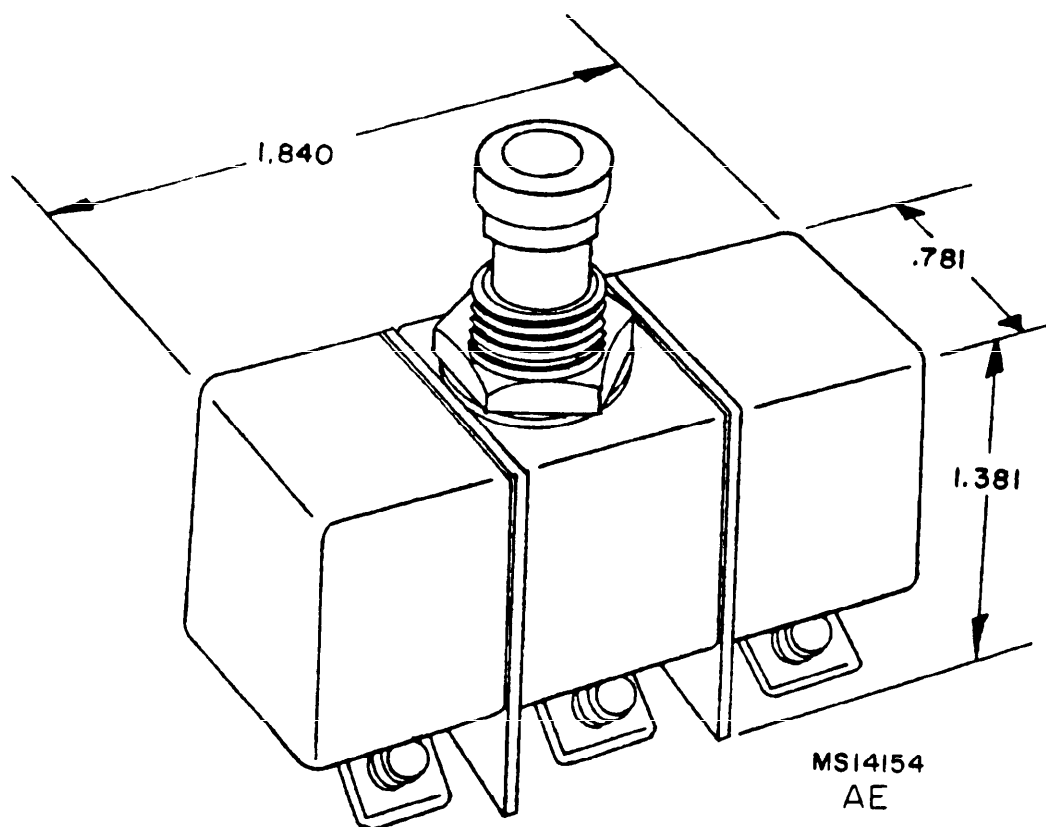
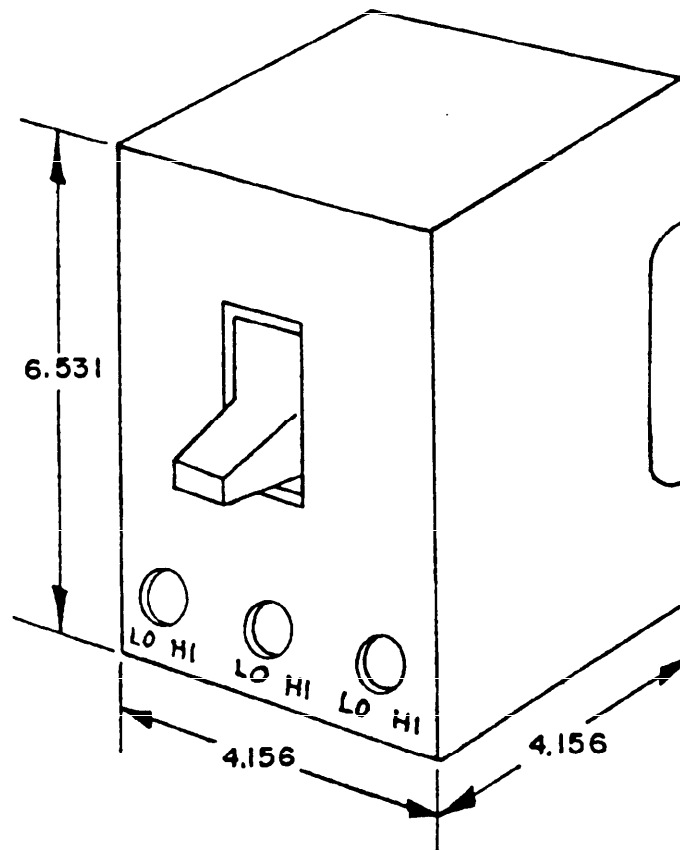


FIGURE 1. Outline configurations (codes AE and AG) - Continued.

MIL-STD-1498B



AQB - AIOI
NQB - AIOI

A H

FIGURE 1. Outline configurations (code AH) - Continued.

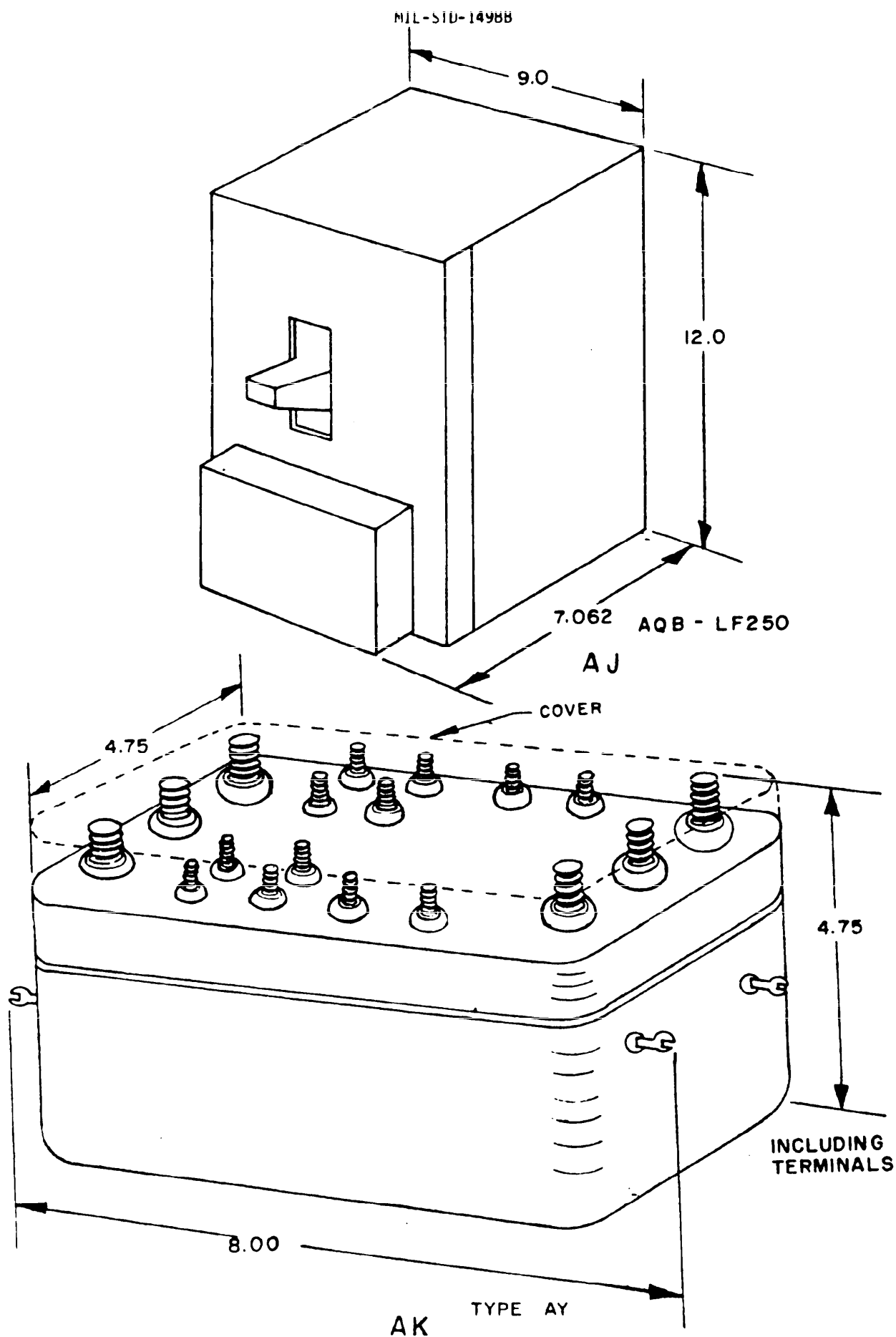


FIGURE 1. Outline configurations (codes AJ and AK) - Continued.

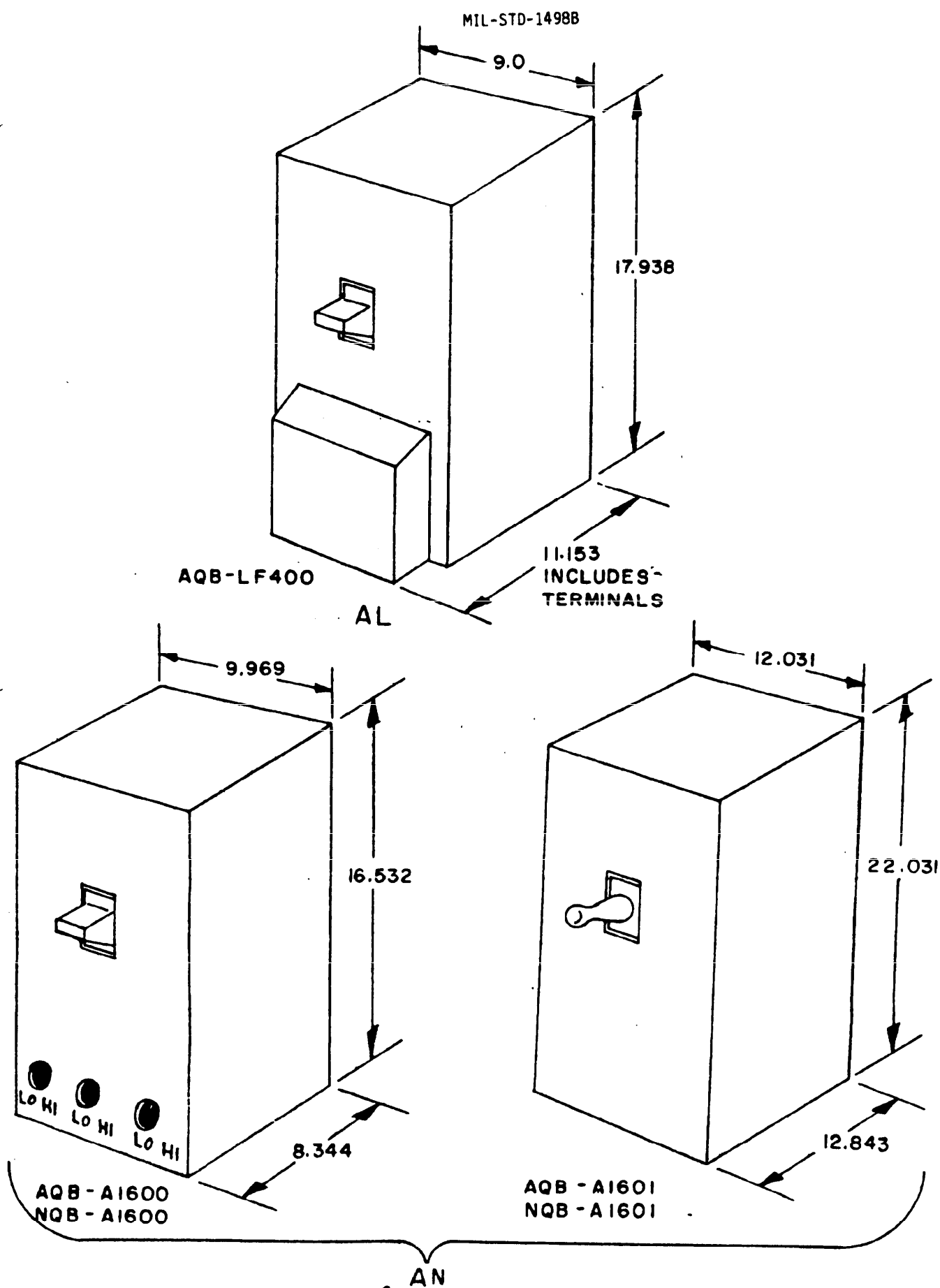


FIGURE 1. Outline configurations (codes AL and AN) - Continued.

08671-625-71m

TABLE 1. Circuit breaker selection guide. 1/

[illegible][illegible]

WIL-51-14908

[illegible]

See footnotes at end of table.

MIL-STD-1498B

Custodians:

Army - ER
Navy - EC
Air Force - 85

Preparing activity:

Army - ER

(Project 5925-0155)

Review activities:

Army - MI, ME, AT, AV, AM
Navy - AS
Air Force - 17
DLA - ES

User activities:

Navy - MC, YD
Air Force - 19

Agent:

DLA - ES

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER
MIL-STD-1498B2. DOCUMENT TITLE
MILITARY STANDARD, CIRCUIT BREAKERS, SELECTION AND USE OF

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐ VENDOR☐ USER☐ MANUFACTURER☐ OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

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

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional

8. DATE OF SUBMISSION (YYMMDD)