MIL-STD-1549
19 July 1974

MILITARY STANDARD

COMMON TERMINATION SYSTEM FOR ELECTRICAL AND ELECTRONIC PARTS

FSC 59GP

MIL-STD-1549
NOTICE-1
15 June 1975

MILITARY STANDARD

COMMON TERMINATION SYSTEM FOR

ELECTRICAL AND ELECTRONIC

PARTS

TO ALL HOLDERS OF MIL-STD-1549.

1. THE FOLLOWING PAGES OF MIL-STD-1549 HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
3	15 June 1975	3	19 July 1974
4	15 June 1975	4	Reprinted with no change except dated added

2. RETAIN THIS NOTICE PAGE AND INSERT BEFORE THE TABLE OF CONTENTS.

3. Holders of MIL-STD-1549 will verify that page changes and additions indicated above have been entered. The notice page will be retained as a check sheet. This insurance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the Military Standard is completely revised or cancelled.

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Army - AV
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Army - MI, MU
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FSC 59GP

DEPARTMENT OF DEFENSE
WASHINGTON, D.C. 20301

Common Termination System for Electrical and Electronic Parts
MIL-STD-1549

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

2. Recommended corrections, additions, or deletions should be addressed to the Commander, Air Force Logistics Command, ATTN: MMGE, Wright-Patterson AFB, OH 45433.

CONTENTS

FIGURE

TABLES

1. SCOPE

1.1 Purpose. This standard establishes the additional design, technical, and performance requirements necessary for implementing the Common Termination System (CTS) on any electrical or electronic part or terminal junction system (modules and splices).

2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

SPECIFICATIONS

MILITARY

MIL-G-3056	-Gasoline, Automotive, Combat.
MIL-H-5606	-Hydraulic Fluid, Petroleum Base, Aircraft and Ordnance.
MIL-T-5624	-JP4 and JP5 Aircraft Fuels.
MIL-L-7808	-Lubricating Oil, Aircraft Turbine Engine Synthetic Base.
MIL-A-8243	-Anti-icing - Defrosting Fluid.
MIL-C-22520	-Crimping Tools, Contact, Electric, Hand, General Specification for.
MIL-L-23699	-Lubricating Oil, Turbine Engine Synthetic Oil.
MIL-C-25769	-Cleaning Compound, Aircraft Surface, Alkaline Water Base.
MIL-C-39029/1	-Contacts, Electric, Pin, Crimp Type, Terminal Junction Systems.
MIL-C-39029/22	-Contact, Electric, Socket, Crimp Type, Common Termination System (CTS).
MIL-W-81381	-Wire, Electric, Polyimide-Insulated, Copper or Copper Alloy.
MIL-T-81714	-Terminal Junction Systems, General Specification for.
MIL-C-83723/28	-Connector, Electric, Plug, Grommet Sealing, Size 0 - 20.

STANDARDS

MILITARY

MIL-STD-202	-Test Methods for Electronic and Electrical Component Parts.
MIL-STD-1344	-Test Methods for Electrical Connectors.
MS27488	-Plug, Sealing, Electric Connector.
MS27491	-Contact, Electric, Socket, Crimp, Removable, Series II.
MS27534	-Tool, Contact Insertion-Extraction, Electrical Connector.

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

3. DEFINITIONS

3.1 Not applicable.

4. GENERAL REQUIREMENTS

4.1 Not applicable.

5. DETAIL REQUIREMENTS

5.1 Mechanical design and performance requirements.

5.1.1 CTS configuration. The CTS configuration shall be as shown in figure 1. The openings in the grommets for the entrance of the contacts shall not be covered or closed by a solid membrane. Separate cavities shall be provided for all contacts and contact interconnections which are not electrically interconnected. Wire sealing grommets shall be bonded or molded to the housing. There shall be no air paths through the walls of the housing, either to the outside or between any contacts which are not electrically interconnected. The design of the module shall permit the insertion and extraction of individual contacts without damage to the sealing members. CTS configurations using MIL-C-39029/1 pins shall provide for internal closed entry to preclude probe damage.

5.1.2 Terminal junction systems. Terminal junction systems shall be in accordance with MIL-T-81714.

5.1.3 Contact and wire data. Contacts shall be in accordance with MIL-C-39029/1, MIL-C-39029/22, or MS27491 and shall be selected from table I. The contact crimp barrel is designed to function with wire sizes specified in table I, when crimped with tool specified in table I.

TABLE I. Contact and wire data.

Contact part number	Wire sizes accomodated (AWG)	Crimping tool part numbers per MIL-C-22520	
		Basic tool	Positioner or turret
M39029/1-16-22	22,24,26	M22520/2-01	M22520/2-02
M39029/1-16-20	20,22,24	M22520/1-01 or M22520/2-01	M22520/1-02 or M22520/2-02
M39029/1-14-16	16,18,20	M22520/1-01	M22520/1-02
M39029/1-12-12	12,14	M22520/1-01	M22520/1-02
M39029/22-22-28	28,30,32	M22520/7-01	M22520/7-11
M39029/22-22-22	22,24,26	M22520/7-01	M22520/7-11
M39029/22-20-20	20,22,24	M22520/7-01	M22520/7-12
M39029/22-16-16	16,18,20	M22520/7-01	M22520/7-13
MS27491-12	12,14	M22520/1-01	M22520/1-04

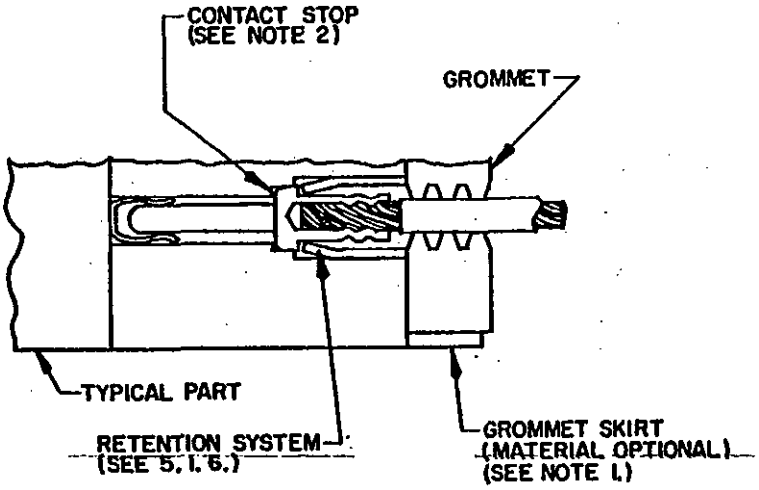

Figure 1a. MIL-C-39029/1 pin contact

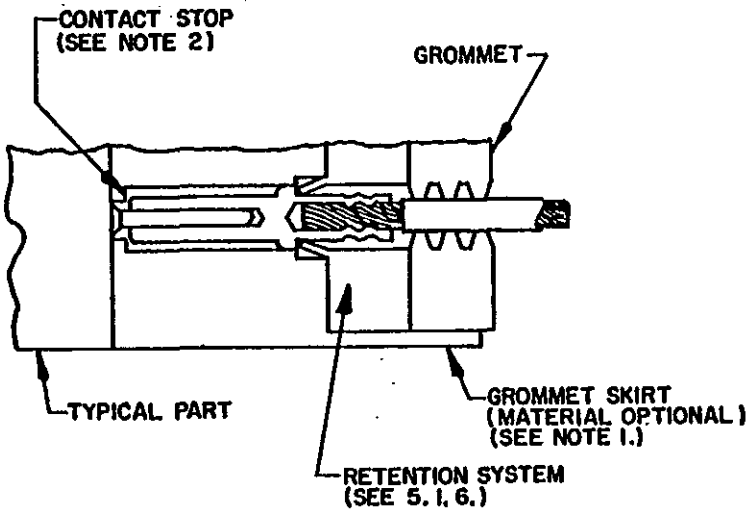

Figure 1b. MIL-C-39029/22 or MS27491-12 socket contact.

NOTES:
1. Design of the skirt around the grommet is optional provided the skirt does not extend beyond the top surface of the grommet, but does support a minimum of 50 percent of the grommet thickness. Where integral wire support members are specified, means of preventing moisture entrapment shall be provided.
2. Location and design of the contact stop is optional provided the contact does not bottom on the glass bead (part hermetic seal), socket, or pin.

FIGURE 1. CTS configuration.

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5.1.4 Contact insertion and extraction forces. When using the appropriate insertion/extraction tool, the contact insertion and extraction forces shall not exceed the values specified in table II.

TABLE II. Contact insertion and extraction forces.

Contact	Contact insertion/ extraction tool	Force, maximum (pounds)	
		Insertion	Extraction
M39029/1-16-22	MS27534-22D	10	10
M39029/1-16-20	MS27534-20	10	10
M39029/1-14-16	MS27534-16	15	10
M39029/1-12-12	MS27534-12	15	15
M39029/22-22-28	MS27534-22D	9	6
M39029/22-22-22	MS27534-22D	9	6
M39029/22-20-20	MS27534-20	15	10
M39029/22-16-16	MS27534-16	15	12
MS27491-12	MS27534-12	15	15

5.1.5. Contact retention. When using the appropriate tools (see tables I and II), the crimped wired contact shall be inserted and extracted from the part 10 times. The crimped wired contact shall again be inserted and tested to the contact retention values specified in table III. After preloading of the crimped wired contact to 2 pounds minimum, the tensile force shall be applied at the rate of 1 pound per second (approximately) until the specified load is reached. The specified load shall be maintained for a minimum of 10 seconds and the contact shall not move more than 0.010 inch from its preloaded position.

TABLE III. Contact retention.

Contact	Load in pounds (minimum)
M39029/1-16-22	12
M39029/1-16-20	20
M39029/1-14-16	25
M39029/1-12-12	30
M39029/22-22-28	9
M39029/22-22-22	9
M39029/22-20-20	13
M39029/22-16-16	22
MS27491-12	22

5.1.6. Contact retention system. The contact retention system shall be designed to provide positive locking of the contacts and may be made of metal or plastic. A minimum of two locking tines per contact shall be provided. The applicable insertion/extraction tool (see table II) shall unlock the retention system for removal of the contact.

5.1.7 Grommet. The grommet shall be designed with a minimum of two sealing glands per wire and shall be capable of sealing on insulated wires (including MIL-W-81381) and sealing plugs (in lieu of wire in unused contact openings) as specified in table IV.

TABLE IV. Grommet sealing.

Contact	Insulation outside diameter range (inch)		Sealing plug part number
	Min	Max	
M39029/1-16-22	0.030	0.060	MS27488/22
M39029/1-16-20	0.040	0.083	M83723/28-20
M39029/1-14-16	0.065	0.109	M83723/28-16
M39029/1-12-12	0.097	0.142	M83723/28-12
M39029/22-22-28	0.030	0.060	MS27488-22
M39029/22-22-22	0.030	0.060	MS27488-22
M39029/22-22-20	0.040	0.083	M83723/28-20
M39029/22-16-16	0.065	0.109	M83723/28-16
MS27491-12	0.097	0.142	M83723/28-12

5.1.8 Dielectric wall thickness. The minimum solid dielectric wall thickness between electrically conductive members shall be 0.012 inch for size 16 contacts and 0.018 inch for size 14 and size 12 contacts.

5.1.9. Bonding. All seals shall be bonded such that, after 100 hours in a circulating air oven at the maximum temperature specified in the part specification, attempts to pull apart the seal(s) shall result in cohesive failure of the seal(s) or material(s) rather than adhesive failure of the bond(s).

5.1.10. Cavity and contact gender identification. Cavity identification shall be as specified in the part specification. The contact gender (socket or pin) shall be clearly marked on the contact entry portion of the part. Marking shall be legible after all tests specified in the part specification.

5.2 Environmental performance (applicable to CTS configuration only).

5.2.1. Fluid immersion. Unless otherwise specified in the part specification, the grommet shall be visually (no magnification) inspected for cracks and tears and shall function as a sealing member after exposure to the fluids specified in table V.

TABLE V. Fluid immersion.

Sample No.	Test fluid	Test procedure
1	MIL-L-7808	Immerse wired CTS configuration in fluid at 120° ±3°C for five minutes minimum. Remove CTS configuration and allow to drain for one hour minimum at room temperature. Fluid shall be drained from all recesses. Expose CTS configuration

TABLE V. Fluid immersion -Continued

Sample No.	Test fluid	Test procedure
		to 125° ±3°C in an air circulating oven for 6 hours minimum. Remove CTS configuration and allow to stabilize at room temperature for one hour minimum. Repeat procedure for a total of seven cycles.
2	MIL-L-23699	Identical procedure to sample 1.
3	MIL-H-5606	Immerse wired CTS configuration in fluid at 85° ±3°C for five minutes minimum. Remove CTS configuration and allow to drain for one hour minimum at room temperature. Fluid shall be drained from all recesses. Expose CTS configuration to 100° ±3°C in an air circulating oven for 6 hours minimum. Repeat procedure for a total of seven cycles.
4	Hydraulic fluid 1/	Identical procedure to sample 3.
5	MIL-A-8243	Immerse wired CTS configuration in fluid at 65° ±3°C for five minutes minimum. Remove CTS configuration and allow to drain for one hour minimum at room temperature. Fluid shall be drained from all recesses. Expose CTS configuration to 100° ±3°C in an air circulating oven for 6 hours minimum. Repeat procedure for a total of seven cycles.
6	MIL-C-25769 (diluted for cleaning)	Identical procedure to sample 5.
7	MIL-T-5624 Grade JP-5	Immerse wired CTS configuration in fluid at room temperature for twenty hours minimum. Remove CTS configuration and allow to drain for one hour minimum at room temperature. Fluid shall be drained from all recesses.

See footnote at end of table

TABLE V. Fluid immersion - Continued

Sample No.	Test fluid	Test procedure
8	Coolant-dielectric fluid synthetic silicate ester base 2/	Wired CTS configuration shall be pre-conditioned at 175° ±3°C for thirty minutes minimum. Immerse CTS configuration fully in room temperature fluid for 1 minute minimum. Remove CTS configuration and allow to stabilize at room temperature for one hour minimum. Fluid shall be drained from all recesses.
9	MIL-G-3056(type 1)	The wired CTS configuration shall be immersed in the fluid for five minutes minimum, removed from the fluid and exposed to free air for 24 ± 2 hours. This conditioning cycle shall be repeated until the CTS configuration has been subjected to 5 complete cycles; for a maximum of 2 cycles the exposure to free air may be extended to 50 hours minimum.
10	Solvent (a) specified in method 215 of MIL-STD-202	Identical procedure to sample 9.
11	Solvent (b) specified in method 215 of MIL-STD-202	Identical procedure to sample 9.
12	Solvent (c) specified in method 215 of MIL-STD-202	Identical procedure to sample 9.
13	MIL-H-5606	Identical procedure to sample 7.

1/ M2-V Chevron oil or equivalent.
2/ Coolanol 25 or equivalent.

5.2.2 Temperature life. Unless otherwise specified in the part specification, the grommet shall function as a sealing member and the contact retention forces shall be as specified in 5.1.5 after conditioning for 1,000 hours minimum at the maximum temperature specified in the part specification.

5.2.3 Altitude immersion. Unless otherwise specified in the part specification, the grommet shall function as a sealing member when the wired CTS configuration is subjected to the altitude immersion test in accordance with method 1004 of MIL-STD-1344.

5.2.4 Hydrolytic stability. Unless otherwise specified in the part specification, materials used in the CTS configuration, including elastomers, adhesives, plastics, and metals, shall not fail when subjected to 20 days minimum of continuous conditioning at 160° ±2°C and 95 ± 4 percent relative humidity. Failure consists of corrosion on metal parts or a 10 percent or more reduction in hardness of the elastomers, adhesives, and plastics.

5.2.5 Retention system fluid exposure. CTS configuration shall have all contacts and seal plugs removed. The CTS configuration shall be immersed in the fluids listed in table V (one sample per fluid) for 20 hours minimum at room temperature. After removal the excess fluid shall be allowed to drain from the CTS configuration for 4 hours minimum. Crimped wired contacts shall be installed and tested to the contact retention values specified in table III. After preloading of the crimped wired contacts to 2 pounds minimum, the tensile force shall be applied at the rate of 1 pound per second (approximately) until the specified load is reached. The specified load shall be maintained for a minimum of 10 seconds and the contact shall not move more than 0.010 inch from its preloaded position. Effects of the fluids on the resilient sealing members shall not be a consideration of the test.

5.2.6 Contact walk out. Two contacts in each CTS configuration shall be tested. The contacts shall be crimped to stranded steel cable of an appropriate size and installed in a CTS configuration. The CTS configuration shall be mounted in a test fixture as shown in figure 2. A 3 pound minimum load shall be applied to the cable. One 360° minimum rotation of the fixture with the CTS configuration mounted shall constitute one cycle. The CTS configuration shall be subjected to 100 cycles at a rate of 10 to 20 cycles per minute. During this test the contacts shall not become dislodged from their normal position. Contact cavities used in this test shall be excluded from further testing.

5.2.7 Insertion removal tool abuse. Four contact cavities in each CTS configuration shall be subjected to each of the tests listed below. Different contact cavities shall be used for each test. Should a tool become damaged during any of the testing it shall be replaced. Failure of a tool shall not constitute a test failure. There shall be no evidence of damage to the contacts, inserts or the contact retention at the completion of these tests. Contact cavities used in this test shall not be subjected to further testing.

5.2.7.1 Removal tool rotation. The applicable contact removal tool shall be inserted as if to remove a contact and an axial load of 3 pounds minimum shall be applied. With the force applied, the tool shall be rotated 180° minimum and then removed, also removing the contact. The contact shall be reinserted. These steps shall be repeated three times on each of the four contacts selected.

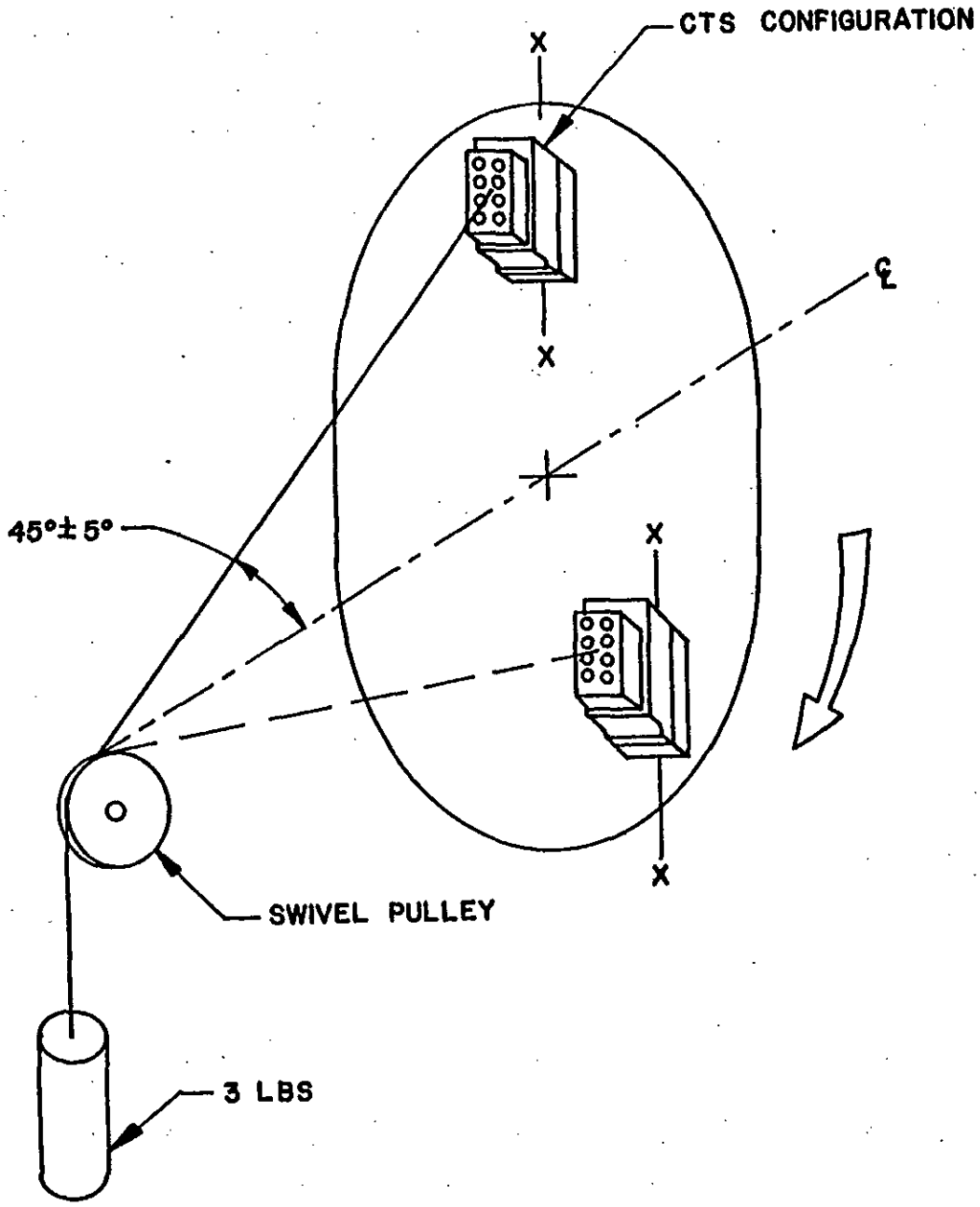

FIGURE 2. Contact walk-out test setup.

5.2.7.2 Insertion tool rotation. The contact shall first be removed. With the applicable contact insertion tool, the contact shall be reinserted and an axial load of 3 pounds minimum applied to the tool. With the force applied, the tool shall be rotated 180° minimum and then removed. These steps shall be repeated three times on each of the four contacts selected.

5.2.7.3 Insertion tool thrust. The contact shall first be removed. With the applicable contact insertion tool, the contact shall be reinstated and an axial load of 10 pounds minimum applied. These steps shall be performed only once on each of the four contacts selected. A new tool shall be used for each contact.

5.2.7.4 Removal tool thrust. The applicable contact removal tool shall be inserted as if to remove the contact and an axial load of 10 pounds minimum shall be applied to the tool. The tool shall then be removed, also removing the contact. These steps shall be performed only once on each of the four contacts selected. A new tool shall be used for each contact.

Custodian:
Army - EL
Navy - AS
Air Force - 85

Review activities:
Army - EL, AV
Navy - EC, OS
Air Force - 10, 11, 17, 80
DSA - ES

User activities:
Army - MI, MU
Navy - SH
Air Force - 11, 17, 80

Preparing activity:
Air Force - 85

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