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MILITARY STANDARD

COMMON TERMINATION SYSTEM FOR ELECTRICAL AND ELECTRONIC PARTS

AMSC N/A

FSC 59GP

DEPARTMENT OF DEFENSE
WASHINGTON, DC 20301

Common Termination System for Electrical and Electronic Parts

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: Electronic Support Division AFLC, 2750 ABW/ESP, Gentile AFS, OH 45444-4500, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

CONTENTS

1. SCOPE

1.1 Purpose. This standard establishes the 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 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards 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

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-T-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-I-81969	-	Installing and Removal Tools, Connector Electrical Contact, General Specification for.

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.

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

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

3. DEFINITIONS (Not applicable)

4. GENERAL REQUIREMENTS (Not applicable)

5. DETAILED REQUIREMENTS

5.1 Mechanical design and performance requirements.

5.1.1 CTS configuration. The CTS configuration shall be as shown on 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 wired contacts without damage to sealing member. CTS configurations using MIL-C-39029/1 contacts 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 and MIL-C-39029/22, and shall be selected from table I herein. The contact crimp barrel is designed to function with wire sizes specified in table I, when crimped with tool specified in table I.

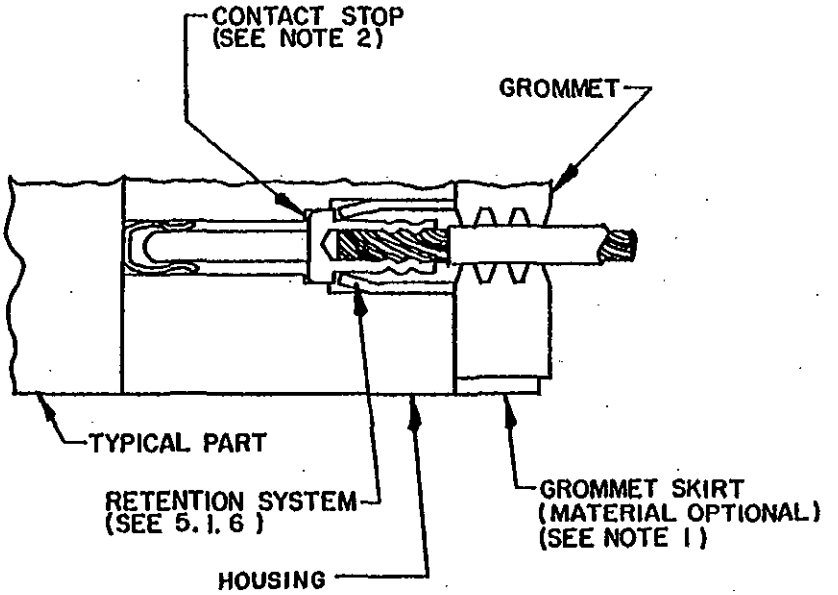
TABLE I. Contact and wire data.

Contact part number	Wire sizes accommodated (AWG)	Crimping tool part numbers per MIL-C-22520	
		Basic tool	Positioner or turret
M39029/1-507	22, 24, 26, 28	M22520/2-01	M22520/2-32
M39029/1-100	22, 24, 26	M22520/2-01	M22520/2-11
M39029/1-101	20, 22, 24	M22520/1-01 or M22520/2-01	M22520/1-02 or M22520/2-11
M39029/1-102	16, 18, 20	M22520/1-01	M22520/1-02
M39029/1-103	12, 14	M22520/1-01	M22520/1-02
M39029/22-190	28, 30, 32	M22520/7-01	M22520/7-11
M39029/22-191	22, 24, 26	M22520/7-01	M22520/7-11
M39029/22-192	20, 22, 24	M22520/7-01	M22520/7-12
M39029/22-193	16, 18, 20	M22520/7-01	M22520/7-13
M39029/22-605	12, 14	M22520/1-01	M22520/1-04

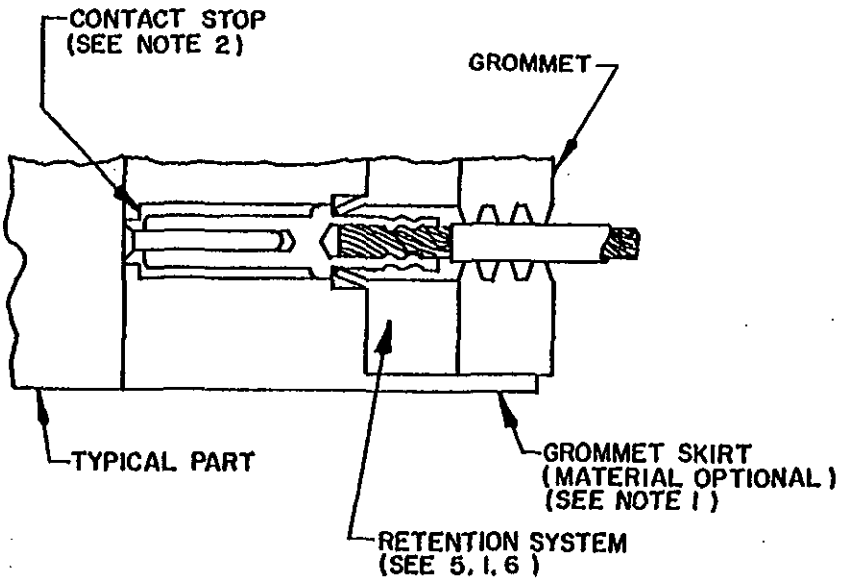
5.1.4 Wired contact insertion and extraction forces. When using the appropriate insertion/extraction tool, the contact insertion and extraction forces shall not exceed the values specified in table II.

TABLE II. Contact insertion and extraction forces.

Contact	Contact insertion/ extraction tool	Force, maximum (pounds)	
		Insertion	Extraction
M39029/1-507	M81969/14-01	10	10
M39029/1-100	M81969/14-04	10	10
M39029/1-101	M81969/14-02	10	10
M39029/1-102	M81969/14-03	15	10
M39029/1-103	M81969/14-04	15	15
M39029/22-190	M81969/16-04	9	6
M39029/22-191	M81969/16-04	9	6
M39029/22-192	M81969/16-01	15	10
M39029/22-193	M81969/16-02	15	12
M39029/22-605	M81969/14-04	15	15



MIL-C-39029/1 pin contact



MIL-C-39029/22 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.

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 0.012 inch from its preloaded position.

TABLE III. Contact retention.

Contact	Load in pounds (minimum)
M39029/1-507	10
M39029/1-100	12
M39029/1-101	20
M39029/1-102	25
M39029/1-103	30
M39029/22-190	9
M39029/22-191	9
M39029/22-192	13
M39029/22-193	22
M39029/22-605	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. The retention system shall be designed to meet the requirements of 5.1.5. The applicable insertion/extraction tool (see table II) shall facilitate insertion and positive locking of wired contacts, and unlock the retention system for removal of wired contacts.

5.1.7 Grommet. The grommet 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	
M39029/1-507	0.030	0.054	MS27488-22
M39029/1-100	0.030	0.060	MS27488-20
M39029/1-101	0.040	0.083	MS27488-20
M39029/1-102	0.065	0.109	MS27488-16
M39029/1-103	0.097	0.142	MS27488-12
M39029/22-190	0.030	0.060	MS27488-22
M39029/22-191	0.030	0.060	MS27488-22
M39029/22-192	0.040	0.083	MS27488-20
M39029/22-193	0.065	0.109	MS27488-16
M39029/22-605	0.097	0.142	MS27488-12

5.1.8 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).

5.1.9 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°C ±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 125°C ±3°C in an air circulating oven for six 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°C ±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°C ±3°C in an air circulating oven for six 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°C ±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°C ±3°C in an air circulating oven for six 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 20 hours minimum. Remove CTS configuration and allow to drain for one hour minimum at room temperature. Fluid shall be drained from all recesses.

See footnotes 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 preconditioned at 175°C ±3°C for 30 minutes minimum. Immerse CTS configuration fully in room temperature fluid for one 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)	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°C ±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, plastics, or electrical discontinuity.

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 two hours minimum at room temperature. After removal, the excess fluid shall be allowed to drain from the CTS configuration for four hours minimum. The components shall then be subjected to contact retention as specified in 5.1.5. Effects of the fluids on the resilient sealing members shall not be a consideration of the test. There shall be no electrical discontinuity with tensile force applied.

5.2.6 Contact walkout. 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 on figure 2. A three 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 three 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.

5.2.7.2 Insertion tool rotation. The contact shall first be removed. With the applicable contact insertion tool, the contact shall be reinserted with an axial load of three 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 reinserted 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.

6. NOTES

6.1 Subject term (key word listing).

Junction block
Junction board
Terminal
Terminal block
Terminal board

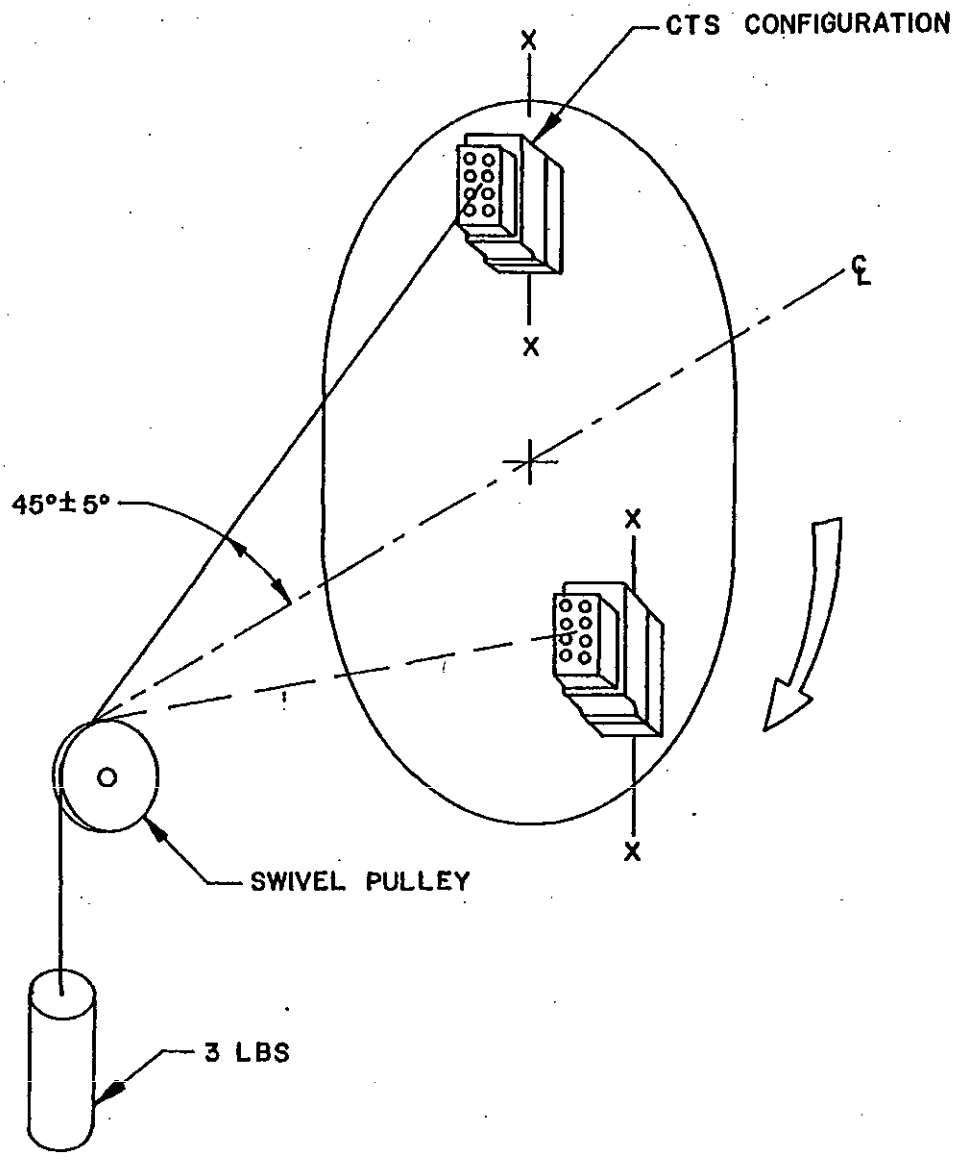


FIGURE 2. Contact walkout test setup.

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

Custodians:
Army - CR
Navy - AS
Air Force - 85

Review activities:
Army - AV
Navy - EC, OS
Air Force - 10, 11, 17, 80, 99
DLA - ES

User activities:
Army - MI, MU
Navy - SH

Preparing activity:
Air Force - 85

Agent:
DLA - ES

(Project 59GP-0055)