



**DEFENSE LOGISTICS AGENCY
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August 27, 2026

MEMORANDUM FOR MILITARY/INDUSTRY DISTRIBUTION

SUBJECT: Initial Draft of: MIL-DTL-32689 Amd 4
Project Number: 5935-2026-039

The initial draft for the subject document, is now available for viewing and downloading from the DLA Weapons Support (Columbus)-VA Web site:

<https://weaponssupportapps.dla.mil/programs/milspec/default.aspx>

Major changes to this document include: Multiple dimensional, tolerance, and testing requirement changes per manufacture requests.

Concurrence or comments are required at this Center within 30 days from the date of this letter. Late comments will be held for the next coordination of the document. Comments from military departments must be identified as either "Essential" or "Suggested". Essential comments must be justified with supporting data. Military review activities should forward comments to their custodians of this office, as applicable, in sufficient time to allow for consolidating the department reply. Lack of response to this draft will be construed as concurrence.

If this document is of interest to you, please provide your comments or suggested changes. The point of contact for this document is Mr. Ed Pfeifer, phone number 614-693-3034, e-mail Eddie.Pfeifer@dlamail, or may be mailed via the US Postal Service to DLA Weapons Support, ATTN: VAI (Attention: Ed Pfeifer), P.O. Box 3990, Columbus, OH 43218-3990.

Sincerely,

-/Signed/-

MUHAMMAD AKBAR
Acting Chief,
Interconnection Branch

cc:
Mr. Eddie Shen, VQ

NOTE: This draft, dated 27 August 2026 prepared by DLA-CC, has not been approved and is subject to modification. DO NOT USE PRIOR TO APPROVAL. (Project 5935-2026-039)

INCH-POUND

MIL-DTL-32689
w/AMENDMENT 4
DRAFT
SUPERSEDING
MIL-DTL-32689
w/AMENDMENT 3
14 March 2024

DETAIL SPECIFICATION

CONNECTORS, ELECTRICAL, CIRCULAR, MINIATURE, LIGHTWEIGHT, HIGH DENSITY, QUICK DISCONNECT, TRI-START THREADED COUPLING, ENVIRONMENT RESISTANT WITH REMOVABLE CRIMP CONTACTS, GENERAL SPECIFICATION FOR

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

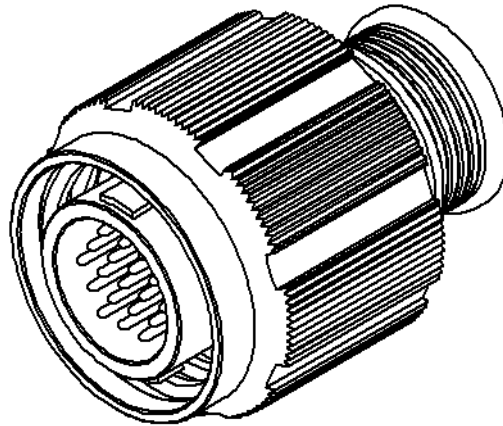


FIGURE 1. Isometric view of typical plug connector

1. SCOPE

1.1 Scope. This specification covers the general requirements for environment resisting, electromagnetic/radiofrequency interference (EMI/RFI) shielded connectors. Connectors achieve full mating with one 360° turn using a triple-start threaded coupling system. Plug connectors include a ratcheting, anti-decoupling mechanism. Plugs and receptacles have keyed shells and removable, rear release crimp contacts. Shell style options include shells with integrated banding platforms and shells with rear accessory threads. Contact mating end sizes include sizes 23, 20, 20HD, 16 and 12. Connectors support applications with contacts at sea level, DWV tested up to 1800 Vac (rms) and are capable of operating within a temperature range of -65°C to +200°C, depending on class (see [table II](#)). Connectors are tested to withstand 37 g's random vibration and 300 g's shock. See [6.1](#) for intended use and applications.

Comments, suggestions, or questions on this document should be addressed to DLA ~~Land and Maritime~~ **Weapons Support** - VAI, P.O. Box 3990, Columbus OH 43218-3990 or emailed to CircularConnector@dlam.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

AMSC N/A

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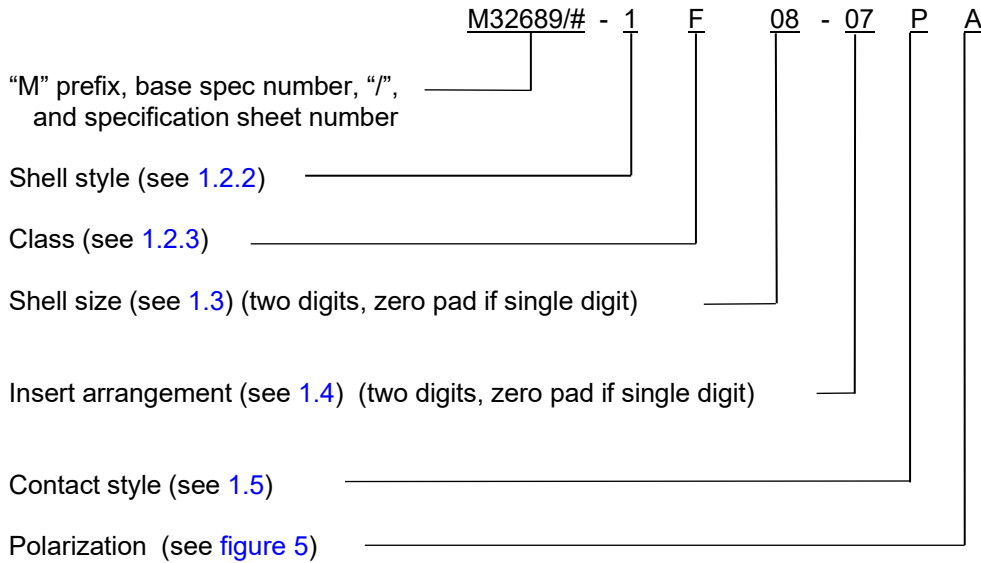
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1.2 Classification.

1.2.1 Military Part or Identifying Number (PIN).



Unless otherwise specified in the specification sheet (see 3.1), the connector PIN configuration for qualified products acquired to this specification is formatted as shown in the preceding example, and includes the letter "M", the basic part number with the applicable specification sheet, followed by the applicable alphanumeric letter designators as formatted in the preceding example

1.2.2 Shell style. Shell styles and description are provided in [table I](#).

TABLE I. <u>Shell style.</u>		
Shell style	Description	
1	banding platform	Connector shells feature banding platform integrated into the shell body for direct termination of shield to shell.
2	accessory threads	Connector shells feature rear accessory threads to attach backshells and other accessories.

1.2.3 Classes. The connector classes, which indicate shell material and the electrically conductive surface finish, are identified with the letter designators listed below. See [table II](#) for additional information.

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TABLE II. Classes – shell materials and finishes.

Class	Shell material	Finish (see 3.3.6.1)	Temperature limit		Features
			Lower	Upper 2/	
F	aluminum	nickel (electroless)	-65°C	+200°C	conductive plating, EMI applications
G 1/					F plus space grade
K					firewall, conductive
S	K with conductive plating				
V	stainless steel	electro-deposited nickel		+175°C	non-reflective, conductive plating 5/
T					conductive plating, alternative to cadmium
W	aluminum	cadmium olive drab			high corrosion resistance, conductive plating
Z		zinc-nickel			conductive plating
AA		tri-nickel alloy			conductive plating 5/
AB		tin-zinc (SnZn)		+200°C	conductive plating 5/
				+175°C	higher performance variant of class V 5/

Class	Shell-to-shell conduct. (mV, max)	Shield braid-to-shell conduct. (mV)	Salt spray (hours, test 3/)	Hex. chromium detection	Thermal vacuum outgassing	Fire wall	
F	2.5	3.5	48 Std.	x	x	x	
G 1/					✓		
K	10.0	15.0	500 Dyn.		✓	x	✓
S	2.5						
V	2.5	5.0		x	x		
T	5.0						
W	2.5						
Z	5.0						
AA	2.5		1000 Dyn.	✓			
AB							

1/ Class G: Same shell as F, but the class G requires compliance with outgassing requirements for suitability for use in space applications.

2/ The upper temperature limit is the maximum internal hotspot temperature resulting from any combination of electrical load and ambient conditions.

3/ Salt spray testing: S= standard, D = dynamic. See section 4.

4/ ✓ denotes required (applicable), x denotes not required (not applicable)

5/ Not approved for NAVAIR use.

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1.3 Shell size. Shell sizes are as specified on [table III](#).

TABLE III. Shell sizes.

Shell size		
08	11	18
09	12	19
10	15	23

1.4 Insert arrangement. Insert arrangements, or contact arrangement layouts, are specified in MIL-STD-3067.

1.5 Contact styles. The following contact letter designators are for use with connectors populated with contact arrangements herein:

TABLE IV. Contact styles.

Contact Style	Description	Details	
P	Standard pin contact	Typical, contacts supplied with connector	
S	Standard socket contact		
P (w/ note)	Same as P with no contacts	Connector is meant to have only P contacts installed	Procurement note specifying less contacts (only the connector, no contacts, sealing plugs, and tools supplied with connector),
S (w/ note)	Same as S with no contacts	Connector is meant to have only S contacts installed	
A	Non-defined pin contacts	Contacts not supplied with connector, connector to be populated with contacts not otherwise defined in this specification	
B	Non-defined socket contacts		

For size 23 contacts with 26-30 wire gauge barrel (smaller), use contact style A or B and procure contacts separately.

The A and B contact styles are for non-defined contacts (not defined by this specification, i.e. fiber, quadax, thermocouple, or coaxial) unless otherwise specified. They are part of the connector PIN and should be marked on the connectors. When A and B designators are used, contacts should not be supplied with the connectors. The contacts that will be used with the connectors procured separately. A and B designators should not be used for ordering connectors less contacts if the user intends to put the standard (P, S) complement of contacts in the connectors. These contact style designators are specified to allow flexibility in the use of the connector with non-defined contacts. The connector (the supplied part with these designators) is of a quality to meet the requirements of this specification if it were to be tested with standard contacts. Since standard contacts are not supplied with A and B contact styles and non-standard contacts (outside the scope of this specification) are used, the quality of the connector with non-standard contact is not controlled and may not meet the requirements of this specification.

If the user orders standardized contacts and connectors separately, but still intends to populate the connectors with the full complement of standard crimp removable contacts, as specified in MIL-STD-3067, then connectors may be ordered without standard contacts (less contacts) by adding the appropriate note

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on the contract order. However, the connector PIN and the marking requirements remain unchanged. Unless otherwise stated (i.e. specifically stated in the procurement note), ordering without contacts (less contacts) only includes the connector and does not include other pieces that may typically come with the standard connector configuration (i.e. sealing plugs, tools, contacts). Ordering connectors in this fashion is used for ordering bare boned, unpopulated connectors (typically for bulk/wholesale procurement).

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 of documents cited in sections 3 and 4 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 (see 6.2).

FEDERAL STANDARD

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

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-S-7742 - Screw Threads, Standard, Optimum Selected Series, General Specification for.
MIL-A-46146 - Adhesive Sealants, Silicone, RTV, Non-corrosive (for use with Sensitive Metals and Equipment).
MS27488 - Plug, End Seal, Electrical Connector.

(See supplement 1 for list of specification sheets.)

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-202-110 - Method 110, Sand and Dust.
MIL-STD-790 - Established Reliability and High Reliability Qualified Products List (QPL) Systems for Electrical, Electronic, and Fiber Optic Parts Specifications.
MIL-STD-810 - Test Method Standard for Environmental Engineering Considerations and Laboratory Tests.

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- | | | |
|--------------|---|---|
| MIL-STD-889 | - | Galvanic Compatibility of Electrically Conductive Materials |
| MIL-STD-1285 | - | Marking of Electrical and Electronic Parts. |
| MIL-STD-3067 | - | Insert Arrangements for MIL-DTL-32689 Circular Electrical Connectors. |

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation or contract.

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 (see 6.2).

ASME INTERNATIONAL

- | | | |
|------------|---|---|
| ASME B1.1 | - | Unified Inch Screw Threads (UN and UNR Thread Form) |
| ASME Y14.5 | - | Dimensioning and Tolerancing. |

(Copies of these documents are available online at <https://www.asme.org/>.)

ASTM INTERNATIONAL

- | | | |
|-----------|---|---|
| ASTM B733 | - | Standard Specification for Autocatalytic (Electroless) Nickel Phosphorus Coatings on Metal. |
| ASTM B841 | - | Standard Specification for Electrodeposited Coatings of Zinc Nickel Alloy Deposits. |

(Copies of these documents are available at <https://www.astm.org>.)

ELECTRONIC COMPONENTS INDUSTRY ASSOCIATION (ECIA)

- | | | |
|------------|---|--|
| EIA-359 | - | EIA Standard Colors for Color Identification and Coding. |
| EIA-364 | - | Electrical Connector/Socket Test Procedures including Environmental Classifications. |
| EIA-364-03 | - | Altitude Immersion Test Procedure for Electrical Connectors |
| EIA-364-10 | - | Fluid Immersion Test Procedure for Electrical Connectors. |
| EIA-364-14 | - | Ozone Exposure Test Procedure for Electrical Connectors. |
| EIA-364-20 | - | Withstanding Voltage Test Procedure for Electrical Connectors, Sockets and Coaxial Contacts. |
| EIA-364-21 | - | Insulation Resistance Test Procedure for Electrical Connectors, Sockets, and Coaxial Contacts. |
| EIA-364-23 | - | Low Level Contact Resistance Test Procedure for Electrical Connectors and Sockets. |
| EIA-364-24 | - | Maintenance Aging Test Procedure for Electrical Connectors. |
| EIA-364-26 | - | Salt Spray Test Procedure for Electrical Connectors, Contacts and Sockets. |
| EIA-364-28 | - | Vibration Test Procedure for Electrical Connectors and Sockets. |
| EIA-364-29 | - | Contact Retention Test Procedure for Electrical Connectors. |
| EIA-364-31 | - | Humidity Test Procedure for Electrical Connectors and Sockets. |

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|-------------|---|
| EIA-364-32 | - Thermal Shock (Temperature Cycling) Test Procedure for Electrical Connectors and Sockets. |
| EIA-364-35 | - Insert Retention Test Procedure for Electrical Connectors. |
| EIA-364-45 | - Firewall Flame Test Procedure for Electrical Connectors. |
| EIA-364-54 | - Magnetic Permeability Test Procedure for Electrical Connectors, Contacts, and Sockets. |
| EIA-364-66 | - EMI Shielding Effectiveness Test Procedure for Electrical Connectors. |
| EIA-364-75 | - Lightning Strike Test Procedure for Electrical Connectors |
| EIA-364-79 | - Insert Bond Strength Test Procedure for Electrical Connectors. |
| EIA-364-83 | - Shell-To-Shell and Shell-To-Bulkhead Resistance Test Procedure for Electrical Connectors. |
| EIA-364-105 | - Low Temperature Test Procedure for Electrical Connectors. |
| EIA-364-114 | - Coupling and Uncoupling Force Test Procedure for Electrical Connectors, Sockets and Applicable Accessories. |

(Copies of these documents are available online at <https://www.ecianow.org>.)

INTERNATIONAL ELECTROTECHNICAL COMMISSION

- | | |
|---------------|--|
| IEC 62321-7-1 | - Determination of certain substances in electrotechnical products - Part 7-1: Hexavalent chromium - Presence of hexavalent chromium (Cr(VI)) in colourless and coloured corrosion-protected coatings on metals by the colorimetric method |
|---------------|--|

(Copies of these documents are available at <https://www.iec.ch/>.)

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION

- | | |
|---------------|---|
| ISO/IEC 17025 | - General requirements for the competence of testing and calibration laboratories |
|---------------|---|

(Copies of these documents are available at <https://www.iso.org>.)

SAE INTERNATIONAL

- | | |
|------------------|--|
| SAE AIR1329 | - Electrical Connectors and Wiring, Compatibility of |
| SAE AIR1351 | - Manufacturers' Identification of Aerospace Electrical and Electronic Wiring Devices and Accessories. |
| SAE AMS-2700 | - Passivation Treatments for Corrosion-Resistant Steel. |
| SAE AMS-QQ-P-416 | - Plating, Cadmium (Electrodeposited). |
| SAE AMS-QQ-N-290 | - Nickel Plating (Electrodeposited). |
| SAE AMS 2404 | - Plating, Electroless Nickel |
| SAE-AMS 2434 | - Plating, Tin-Zinc Alloy |
| SAE AMS 2454 | - Plating, Electroless Nickel, Codeposited with Polytetrafluoroethylene (PTFE). |
| SAE AS22759 | - Wire, Electrical, Fluoropolymer-Insulated, Copper or Copper Alloy. |
| SAE AS39029 | - Contacts, Electrical Connector, General Specification for. |
| SAE AS39029/57 | - Contacts, Electrical Connector, Socket Crimp Removable (for MIL-DTL-24308, MIL-DTL-38999 SERIES II, MIL-DTL--55302/68, /71, /72, /75 AND MIL-DTL-83733 Connectors) |

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SAE AS39029/58	-	Contacts, Electrical Connector, Pin, Crimp Removable (for MIL-DTL-24308, MIL-DTL-38999 SERIES I, II, III, AND IV, AND MIL-DTL-55302/69 AND MIL-DTL-83733 Connectors)
SAE AS85049/128	-	Connector Accessories, Electrical General Specification For
SAE EIA-557	-	Statistical Process Control Systems.

(Copies of these documents are available at <https://www.sae.org/>.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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. The connectors and accessories furnished under this specification shall be products that are authorized by the qualifying activity for listing on the applicable qualified products list before contract award (see 4.4 and 6.3). Once product is qualified, if the manufacturer seeks to make design changes or process changes, or if the manufacturer seeks to use alternate / substitute materials, then the manufacturer shall be required to coordinate with and obtain approval from the qualifying activity.

3.2.1 Qualified Products List (QPL) system. The manufacturer shall establish and maintain a quality system that allows its parts that are covered by this specification to be listed on the QPL. Requirements for this system are specified in MIL-STD-790. In addition, the manufacturer shall implement and use statistical process control (SPC) techniques in the manufacturing process for parts covered by this specification. The SPC program shall be developed and maintained in accordance with SAE EIA-557. The SPC program shall be documented and maintained as part of the overall reliability assurance program as specified in MIL-STD-790. All commercial part numbers referenced in this specification shall be subject to the quality system requirements specified in Mil-STD-790.

3.3 Materials.

3.3.1 Critical interface materials. Materials shall be as specified herein. When a definite material is not specified, a material shall be used which will enable the connector to meet the performance requirements of this specification.

3.3.1.1 Metals. Metals shall be corrosion-resistant or shall be plated or treated to resist corrosion, and as specified herein (see [table V](#)).

3.3.1.2 Dissimilar metals. When dissimilar metals are used in intimate contact with each other, protection against galvanic corrosion shall be provided. The use of dissimilar metals in contact, which tend toward active galvanic corrosion (particularly brass, copper, or steel used in contact with aluminum or aluminum alloy) is not acceptable. However, metal plating 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. Dissimilar metals and compatible couples are specified in MIL-STD-889.

3.3.1.3 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of connectors, their components and solder shall not exceed 97 percent, by mass.

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Tin shall be alloyed with a minimum of 3 percent lead, by mass (see 6.3.4).

3.3.1.3.1 Exception. (Class V) The pure tin requirements (including 3 percent lead by mass) do not apply. Metallurgy set by finish's controlling specification.

3.3.2 Components. Unless otherwise specified (see 3.1), materials for specific connector components shall be as specified in table V.

TABLE V. Connector components, materials and finish codes.

Components	Materials and finishes
Shell housing (including coupling ring) and jam-nut (i.e., spanner nut and hex nut), base material	Impact extruded or machined aluminum alloy 6061 T6, T651, T6510, or T6511 or stainless steel of 300 series. Finish as specified (see finish code details, para. 3.3.6.1)
Rigid dielectric of insert (i.e., insulator)	Suitable rigid dielectric material
Interfacial seal, wire-sealing grommet and O-ring	Fluorosilicone or silicone/fluorosilicone blend elastomer (100% silicone not permitted)
EMI grounding spring	Heat treated beryllium copper with nickel plating or corrosion resistant steel with plating as specified
Contact retention clip	Beryllium copper, heat treated
Filler compound	Room temperature vulcanizing (RTV) silicone in accordance with MIL-A-46146.
Contacts (pins and sockets)	Qualified in accordance with QPL-39029.

3.3.3 Recycled, recovered, or environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased 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.

3.3.4 Fungus resistance. Materials used in the construction of these connectors shall be fungus inert (see 4.6.30).

3.3.5 Magnetic permeability.

3.3.5.1 Magnetic permeability, mated connectors. The relative permeability of the wired, fully populated, and fully mated connector assembly shall be less than 2.0 μ (see 4.6.29).

3.3.6 Plating and surface finishes.

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3.3.6.1 Shells hardware. Unless otherwise specified, the finish on shells hardware shall be as specified in [table VI](#).

TABLE VI. Plating and surface finish – Shell

Class	Requirement
G, F	Electrically conductive electroless nickel plating conforming to ASTM-B733, service category SC2 .0005 inches minimum thickness. Specified dimensions apply after plating. Use of a suitable underplate is permissible. Finish shall be capable of meeting salt spray (corrosion) testing in accordance with EIA-364-26 test condition B (48 hours).
K	Electrically conductive, non-magnetic, corrosion resistant steel, with passivate surface finish.
S	Electrodeposited nickel in accordance with SAE AMS-QQ-N-290, class 2, .0001 inch minimum thickness. Specified dimensions apply after plating.
T	Nickel with fluorocarbon polymer additives conforming to SAE AMS2454 over a suitable underplate. Color shall be nonreflective.
V	Tin-zinc in accordance with SAE-AMS2434, type 2, grade A, B, or equivalent non-chromium conversion, with a composition of 65-90 percent tin and 10-35 percent zinc, .0005 in thick minimum, over electroless nickel per SAE AMS 2404, 0.0010 inch (25 µm) minimum or 0.0005 inch (13 µm) minimum or other suitable underplate. Color shall be gold to bronze, pale green to olive, brown, black, or gray. Color shall be non-reflective (some iridescence permitted but is not preferred).
W	Olive drab cadmium plate in accordance with SAE AMS-QQ-P-416 over a suitable underplate. Final finish shall be electrically conductive.
Z	Zinc nickel in accordance with ASTM-B841, type D (black), over a suitable underplate, with the following exception: Zinc may be alloyed with a maximum of 20% nickel, by mass. Color shall be nonreflective.
AA	Tri-Nickel Alloy plate - Electrically conductive electroless nickel plating conforming to ASTM B733, Service Category SC3 .001 inches (0.023 mm) minimum thickness. Use of a suitable underplate is permissible.
AB	Same as class V above.

3.3.6.2 Shell EMI grounding springs. Shell EMI grounding spring (in industry may also be referred to as EMI bands, grounding fingers, spring fingers, or grounding straps), shall be suitably protected to meet salt spray (corrosion) requirements and shall be galvanically compatible with connector shell.

3.4 Design and construction. Connectors shall be configured to withstand normal handling incident to installation and maintenance in service. Connector intermateability control dimensions shall be as specified on [figure 2](#) and [figure 3](#). Connector accessory interface dimensions shall be as specified on [figure 6](#).

3.4.1 Dimensioning. Unless otherwise specified, dimensioning and tolerancing shall be in accordance with ASME Y14.5. Unless otherwise specified, dimensions apply after plating

3.4.2 Interchangeability and intermateability. All connectors having the same military specification (MS) Part or Identifying Number (PIN) shall be completely interchangeable with each other with respect to installation (physical form and fit) and performance (function) as specified herein.

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3.5 Connector subcomponents and construction.

3.5.1 Contacts. Contacts shall be removable with crimp terminations, as specified in [table VII](#).

TABLE VII. Crimp contact size and specification.

Contact size	Pin or socket	Wire size	Controlling document or commercial entity	Part number
12	Pin	12-14	SAE AS39029	M39029/58-365
	Socket			M39029/57-359
16	Pin	16-20		M39029/58-364
	Socket			M39029/57-358
20	Pin	20-24		M39029/58-363
	Socket			M39029/57-357
20HD	Pin	20-24	Glenair	809-517
			Amphenol	2M809-204
			ITT	030-9661-000
	Socket	20-24	Glenair	809-518
			Amphenol	2M809-205
			ITT	031-9766-000
23	Pin	22-28	Glenair	809-515
			Amphenol	2M809-001
			ITT	030-9649-000
			QA Technology	ICM230PAC5000
	Socket		Glenair	809-516
			Amphenol	2M809-002
			ITT	031-9750-040
			QA Technology	ICM230S0C5000
	Pin	26-30 (non-standard, small)	Glenair	809-519
			Amphenol	2M809-042
			ITT	030-9649-100
	Socket		Glenair	809-520
			Amphenol	2M809-043
			ITT	031-9750-100

3.5.1.1 Connectors with contacts. The quantity of crimp contacts to be supplied with each connector unit package shall consist of a full complement of contacts plus one spare contact for each contact size used in insert arrangements utilizing 26 contacts or less. For insert arrangements utilizing more than 26 contacts, 2 spare contacts of each contact size used in the arrangement shall be supplied.

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3.5.2 Insert arrangement. Electrical connector inserts, or insulators, shall provide an insulating element to position and support the contacts within the connector.

3.5.3 Insert construction and insert retention. The entire insert, consisting of the rigid dielectric, fluorosilicone wire sealing/supporting grommet, and interfacial seals (when specified), shall be one integral assembly, configured to provide suitable sealing and support around the wires and cables. Inserts shall in be positioned in the shell accordance with figure 5. Inserts shall be retained in the directions and by the methods listed below:

Direction of insert motion to be prevented	Method used to prevent motion
Rotation about axial direction	• Mechanical required • Supplemental method permissible including but not limited to adhesive
Axial motion in the direction of insert installation	
Axial motion in the direction of insert removal	• No specific method required • Sufficient to meet performance requirements

The rigid dielectric shall be one molded piece or no more than two pieces bonded so as to form one integral piece. Interfacial seals, when specified, shall be bonded to the hard insert. The rigid dielectric shall be voidless to eliminate any air paths between contact cavities. The insert shall also be designed to permit the removal and replacement of individual crimp type pin or crimp type socket contacts into the rear, wired side of the connector insert contact cavities using installing/removal tools. Positive locking of the contacts within the insert shall be accomplished with contact retention clips permanently installed within each contact cavity in the rigid dielectric insert. The insert shall meet the contact retention requirements of this specification.

3.5.3.1 Insert arrangement, contact location. The engaging end of the pin contact in assembled connectors shall be located within .024 inch diameter of true position and the engaging end of the socket contact in assembled connectors shall be located within .015 inch diameter of true position.

3.5.3.2 Contact alignment and float. Inserts for crimp socket contacts shall provide an overall side-play ("float") of the socket contacts of .0025 to .0075 inch from the true alignment position to facilitate alignment with mating pin contacts. The alignment of crimp pin contacts assembled into either plug or receptacle shall be in accordance with the applicable specification sheet when measured at the engaging end of the contacts.

3.5.3.3 Insert front interface. Mated connector pairs shall include environmental sealing features so that engaged connectors comply with the requirements specified herein. All pin contact inserts shall have resilient interfacial seals bonded to the front face of the connector insert. Chamfered socket "lead-in" entry holes and raised pin seal barriers, shall conform to the requirements on figures 1 through 3. The insert engaging faces shall be designed and constructed to eliminate air paths between the connector mating interfaces.

3.5.3.4 Grommet-to-wire sealing. Environment resisting assemblies shall be designed to meet the environmental requirements of this specification. The grommet shall be permanently bonded to the insert. The grommet shall provide sealing for a full complement of wire or cable sizes and finished wire outside diameters. See [table VIII](#) for minimum and maximum wire and cable outside diameters.

3.5.4 Grommet sealing plugs. Except when otherwise specified (see [3.1](#)), the grommets of environment resisting connectors shall be designed to accept sealing plugs/dummy contacts in

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accordance with MS27488. Grommet sealing plugs shall be used in lieu of wire in all unwired, unpopulated contact cavities. The quantity of sealing plugs to be enclosed in the unit pack shall be ten percent of the number of contacts, but not less than one, for each contact size. For indirect shipments, connectors may be specified without grommet sealing plugs (see 6.2).

3.5.5 Connector shell. Connector shell bodies, including receptacle mounting flanges, shall be a one-piece construction and shall be designed to retain their inserts in one position, both axially and with respect to rotation.

3.5.5.1 Color bands. A solid red band (stripe), uniform in color, shall be located on the connector shell in accordance with [figure 1](#) to indicate a fully mated condition. Color bands shall be in accordance with EIA-359 and shall remain permanent after exposure to all tests specified in [table XX](#).

3.5.5.1.1 Blue band. Connectors shall have at least one blue color band, indicating a rear release contact retention system. The blue color band shall be located so that it is readily visible to any person servicing a mounted connector.

3.5.5.1.2 Red band. A solid red band (stripe), uniform in color, shall be located on the connector shell in accordance with [figure 2](#) to indicate a fully mated condition.

3.5.6 Cavity fill compound between shell and rear grommet. If the rear grommet design does not allow for intimate contact between it and the complete inner perimeter of the shell, any resulting cavity between the insert and the shell shall be filled with RTV silicone in accordance with MIL-A-46146. The silicone shall adhere to both the shell and the grommet.

3.5.7 EMI grounding spring (plugs only) and minimum electrical engagement. All plugs shall include EMI grounding springs. Grounding springs shall be designed to make electrical contact with the mating shell without interfering with mechanical coupling and engagement. The EMI grounding spring shall be retained about the shell body periphery. Minimum engagement of EMI grounding springs shall be .040 prior to contact engagement.

3.5.8 Mechanical Coupling Interface.

3.5.8.1 Banding platform. Integral banding platform shall be as depicted in [figure 7](#). The banding surface shall be circumferentially ribbed.

3.5.8.1.1 Banding Termination. The connector shall meet the requirements for the band termination test (configuration 6 and 8) of SAE AS85049/128 for the following tests.

3.5.8.1.1.1 Banding - Braid Retention. When tested as specified in [4.6.2.1](#), the requirements shall be met.

3.5.8.1.1.2 Banding - Thermal Aging. When tested as specified in [4.6.2.2](#), the requirements shall be met.

3.5.8.2 Threaded Interface Threads shall be checked using ring or plug gauges. Slight out-of-roundness beyond the specified tolerances is acceptable if threads can accept the gauges without forcing.

3.5.8.2.1 Coupling Ring. Coupling threads shall be as specified in [figure 2](#) and [figure 3](#), and shall conform to FED-STD-H28 and MIL-S-7742 as applicable. Coupling ring surface shall be as depicted in [figure 6](#). The coupling ring surface shall be straight axial ribbed or diamond knurled.

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3.5.8.2.2 Accessory Threads. Connector accessory threads shall be as specified in [figure 6](#). Threads shall be in accordance with ASME B1.1.

3.5.8.3 Lubrication. During connector manufacturing process, internal coupling threads of triple-start connectors may be coated with a lubricant that shall be non-flaking and galvanically compatible and shall not migrate into other threaded areas.

3.6 Connector coupling and locking. Connector mating shall be accomplished with triple-start mating threads. Complete coupling shall be accomplished by rotating the coupling ring clock-wise until the coupling ring covers the red mating indicator band (stripe) and the connector shells bottom against each other. Complete coupling and uncoupling shall be accomplished by rotating the coupling ring approximately 360°. Fully coupled connectors shall maintain shell-to-shell “bottoming”, in which mechanical contact is maintained between the receptacle and plug housing. Mated connectors shall not exhibit any shifts in resonance points during testing in accordance with [4.6.11.2](#). Mated connectors, when vibrated, shall not display any resonance at frequencies less than 300 Hz. An anti-decoupling device shall be provided to maintain complete coupling. A solid red indicator band, uniform in color, shall be located on the receptacle so as to be visible when unmated and to be fully covered when completely mated. The red band (stripe) shall remain permanent after exposure to all tests specified in [table XX](#) herein. Counterpart connectors of any arrangement shall be capable of being fully coupled and uncoupled in a normal and accessible location without the use of tools.

3.6.1 Shell keying and polarization. Polarization of connectors shall be accomplished by matched integral key(s) and keyway(s) of counterpart plugs and receptacles. Polarization shall be accomplished prior to initial engagement of the plug coupling ring. During axial engagement, pins shall not touch sockets or the insert face until polarization has been achieved. The receptacle shall include three keyways which engage with corresponding keys in the plug. Connectors shall include a major, “master” key/keyway with a fixed location, which is wider than the two minor keys/keyways. The position of the insert shall be fixed relative to the master key. Different polarizations shall be obtained by altering the locations of the minor keys.

3.6.2 Alternate keying/polarization positions. Alternate rotation positions shall be as specified in [figure 5](#). For alternate polarization positions, the master key always stays fixed, while the position of the two minor keys/keyways rotate in relation to the master key.

3.7 Contact installation/removal method, and installing / removal tools. Crimp contact installation and removal shall be accomplished from the rear, wired side of the connector. Tools as specified in the contact specifications shall be used to install and lock pin and socket contacts in place, and release and remove pin and socket contacts from their respective contact cavities. One all plastic as specified in the contact specification (contact sizes 12, 16, and 20) installing/removal tool for each contact size, as applicable, shall be enclosed in the unit package. Installation and removal tools shall not be included for contact sizes 20HD and 23.

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TABLE VIII. Wire sealing diameter ^{1/}

Contact mating end size	Wire barrel size	Wire sizes (AWG)			Finished outside wire diameter (OD)	
		List	Max, nominal	Min	min	max
23	26	26, 28, 30 ²	26	30	.030	.054
	22	28, 26, 24, 22	22	28		
20HD	20	24, 22, 20	20	24	.040	.083
20	20	24, 22, 20	20	24	.040	.083
16	16	18, 16	16	18	.065	.109
12	12	14, 12	12	14	.097	.142

¹ SAE AIR1329 provides general information on wire selection and O.D. of finished wire.

² The use of smaller wire (i.e. 30 AWG wire) is possible with contacts used in this specification. Smaller wires may not meet the grommet-to-wire sealing requirements of this specification and should be checked during design.

3.8 Dust caps. Protective plastic dust caps shall be furnished in place on the mating end of each connector for shipment in the unit package for protection during shipping and storage. For plugs dust caps shall be assembled externally over the mating end of the coupling nut.

3.9 Mechanical requirements.

3.9.1 Maintenance aging. After being tested as specified in 4.6.3, crimp contact installing and removal forces shall not exceed the requirements specified in table IX. Contact retention (see 4.6.5), shall be performed on contacts subjected to the maintenance aging conditioning test.

TABLE IX. Maintenance aging – installing and removal forces.

Contact mating end size	Installing and removal forces (maximum, lbs)
23	10
20 and 20HD	20
16	20
12	30

3.9.2 Durability. See 4.6.4.

3.9.2.1 Durability, connector mating and unmating. When tested as specified in 4.6.4, counterpart connectors populated with the specified complement of contacts, shall withstand 500 cycles of mating and unmating without mechanical or electrical degradation. Connectors shall meet all subsequent test requirements.

3.9.3 Contact retention. When tested as specified in 4.6.5, crimp contacts shall be retained in their inserts at the axial loads specified in table X without damage to the contacts or insert. The axial displacement of contacts with respect to the shell shall not exceed .012 inch while under load. The axial displacement of contacts with respect to the shell shall not exceed .012 inch within one minute after the load has been removed.

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TABLE X. Axial loads for contact retention.

Crimp contact mating end size	Axial load minimum (pounds) +10% / -0%
23	10
20HD	10
20	15
16	25
12	25

3.9.4 Pin contact stability. When tested as specified in 4.6.6, the total displacement of a reference point on the contact tip end shall not exceed the amount shown in [table XI](#).

TABLE XI. Pin contact stability.

Crimp contact size (mating end)	Total displacement	Force $\pm$ 10% Pounds (lbf)
23	.025	.25
20HD	.054	.55
20	.054	.55
16	.075	1.1
12	.075	1.1

3.9.5 Contact retention system effectiveness (contact walk-out). When tested as specified in 4.6.7, contacts shall not become dislodged from their normal position.

3.9.6 Shell EMI grounding spring engagement and separation forces. When tested as specified in 4.6.8, the minimum force required to engage and separate plugs with EMI grounding springs for mating receptacles shall be within the values specified in [table XII](#).

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TABLE XII. Shell EMI grounding spring engagement and separation forces.

Shell size	Axial force (lbs.)	
	Min	Max
8	0.5	25
9		25
10		25
11		30
12		30
15		35
18		35
19		35
23		35

3.9.7 Accessory (backshell) thread strength. When tested as specified in 4.6.9, the accessory threads and portion of the connector that accepts cable clamps and "J" adapters shall be capable of withstanding the proof torque listed in table XIII.

TABLE XIII. Accessory thread strength.

Shell size	Accessory thread torque (inch-pounds)
	Proof (testing) torque, min
8	44
9	80
10	
11	90
12	
15	
18	
19	
23	

3.9.8 Insert retention. When tested as specified in 4.6.10, and subjected a specified maximum pressure in both directions, inserts shall not be dislocated from their original positions, and there shall be no evidence of cracking, breaking or separation from the shell, or loosening of parts.

3.9.9 Vibration.

3.9.9.1 Vibration, mated connectors. When tested as specified in 4.6.11, there shall be no electrical discontinuities greater than 1 microsecond. There shall be no physical disengagement or backing off of the coupling mechanism between wired, mated connectors, and there shall be no evidence of cracking, breaking or loosening of parts.

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3.9.10 Shock. When tested as specified in 4.6.12, wired, mated connectors shall not be damaged and there shall be no interruption of electrical continuity greater than 1 microsecond. There shall be no physical disengagement or backing off of the coupling mechanism between wired, mated connectors, and there shall be no evidence of cracking, breaking or loosening of parts

3.9.11 Insert bond strength. When tested as specified in 4.6.39 there shall be no visible separation or cracks at the bond joint while an axial load is applied.

3.9.12 Coupling and uncoupling torque. When tested as specified in 4.6.37, the coupling torque for mating and the uncoupling torque for unmating of counterpart plugs and receptacles shall meet the requirements in table XIV.

TABLE XIV. Coupling and uncoupling torque.

Shell size	Torque (in.-lbs.)	
	Disengagement Minimum	Engagement Maximum, Disengagement Maximum
8	2	8
9	2	8
10	2	12
11	2	12
12	2	16
15	3	20
18	5	28
19	3	28
23	5	36

3.9.13 External bending moment. Connectors shall be tested as specified in 4.6.28, using the applicable bending moment shown in table XV, connectors shall show no evidence of damage detrimental to their normal operation, nor shall there be any interruption of connector electrical continuity.

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TABLE XV. External bending moment.

Shell size	Bending moment torque, in-lbs (± 5 in-lb)
	Connector
8	55
9	61
10	115
11	134
12	154
15	199
18	245
19	270
23	328

Note:

1. Jam-nut receptacles are typically the weakest type of receptacle for strength (i.e. external bending moment). Typically spanner nuts are weaker than hex nuts due to less thickness and material.

3.10 Electrical requirements.

3.10.1 Insulation resistance (IR),

3.10.1.1 IR at ambient temperature. When tested as specified in [4.6.13.1](#), the insulation resistance between any pair of contacts and between any contact and the shell shall be 5000 megohms, minimum.

3.10.1.2 IR at ambient temperature, after humidity. When tested as specified in [4.6.13.1](#), insulation resistance after humidity shall be 100 megohms minimum.

3.10.1.3 IR at ambient temperature, after altitude immersion. When tested as specified in [4.6.13.1](#), insulation resistance after altitude immersion shall be 1000 megohms minimum.

3.10.1.4 IR at elevated temperature. When tested as specified in [4.6.13.2](#), the insulation resistance between any pair of contacts and between any contact and the shell shall be 1000 megohms minimum.

3.10.2 Dielectric withstanding voltage (DWV) at sea level and at altitude. When tested as specified in [4.6.14](#), connectors shall be capable of withstanding the applicable voltages specified in [table XVI](#) with no evidence of flashover or breakdown. The leakage current shall be 2 milliamperes maximum. For combo/mixed contact layouts refer to the test voltages related to the smallest contact in the arrangement.

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TABLE XVI. Test voltages, Vac (rms), 60 Hz.

Contact size	12, 16		20HD		23	
Altitude	Mated	Unmated	Mated	Unmated	Mated	Unmated
Sea level	1800	1800	1000	1000	750	750
40,000 ft	850	550	750	450	400	250
70,000 ft	450	250	550	300	400	150

3.10.3 Electrical engagement. When tested as specified in 4.6.15, the wired, mated connectors shall provide an minimum electrical engagement of one (1) pin diameter, at maximum specified diameter for each contact size, measured from the pin tip.

3.10.4 Shell-to-shell conductivity.

3.10.4.1 Shell-to-shell conductivity, initial. When tested as specified in 4.6.16, the maximum measured voltage drop across a mated pair of connectors shall be in accordance with table II.

3.10.4.2 Shell-to-shell conductivity, after conditioning. After conditioning (salt spray and / or mating force testing) and when tested as specified in 4.6.16, the voltage drop may increase 100 percent, maximum. Test probes shall not puncture or otherwise damage connector finish.

3.10.5 EMI/RFI shielding

3.10.5.1 EMI/RFI shielding, low frequencies, 100 to 1,000 MHz. When tested as specified in 4.6.17, the EMI shielding capabilities of mated shells with EMI grounding springs shall not be less than that specified in table XVII at the specified frequencies.

3.10.5.2 EMI/RFI shielding, high frequencies, 1,000 to 10,000 MHz. When tested as specified in 4.6.17, the EMI shielding capabilities of mated shell with EMI ground springs shall not be less than that specified in table XVII using the mode-stirred technique.

TABLE XVII. EMI/RFI shielding, frequencies.

EMI/RFI shielding low frequencies		EMI/RFI shielding high frequencies	
Frequency MHz	dB minimum (leakage attenuation)	Frequency GHz	dB minimum (leakage attenuation)
100	75	1	85
200	70	3	69
300	65	5	66
400	63	10	65
800	58		
1000	55		

3.10.6 Contact resistance testing

3.10.6.1 Low level contact resistance (LLRC). When tested as specified in 4.6.18.1, connectors in the mated condition shall meet the low level contact resistance requirements specified in SAE AS39029.

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3.10.6.2 Contact resistance. When tested as specified in 4.6.18.2, connectors in the mated condition shall meet the contact resistance requirements specified in SAE AS39029.

3.10.7 Shield braid-to-shell conductivity. When tested as specified in 4.6.38, probes shall not puncture or otherwise damage the connector finish. In addition, the initial maximum measured voltage drop across mated assemblies shall be as specified in table II.

After conditioning, the maximum measured braid-to-shell voltage drop shall be twice the initial voltage drop.

3.11 Environmental requirements.

3.11.1 Thermal shock (temperature cycling). When mated connectors are subjected to testing as specified in 4.6.19, there shall be no blistering, peeling, separation of plating or other damage detrimental to the operation of connectors, and connectors shall meet the requirements of all subsequent testing.

3.11.2 Salt spray (corrosion).

3.11.2.1 Salt spray (corrosion) unmated connectors and unmated contacts. When tested as specified in 4.6.20, unmated connectors and unmated contacts shall show no corrosion sites or defects such as lifting of plated coating or exposure of base metal under three power (3X) magnification which adversely affects performance.

3.11.3 Fluid immersion. After being tested as specified in 4.6.21, connectors shall show no visible damage from immersion in fluids, shall meet the coupling and uncoupling torque requirements (3.9.12), dielectric withstanding voltage at sea level (3.10.2), and contact retention (3.9.3) and shall meet the requirements of all subsequent testing.

3.11.4 Fluid immersion: general and retention system. When tested as specified 4.6.22, connectors shall show no visible damage from immersion in fluids. Connectors shall meet the coupling and uncoupling torque requirements (3.9.12), dielectric withstanding voltage at sea level (3.10.2), and contact retention (3.9.3), and shall meet the requirements of all subsequent testing. Effects of the fluids on resilient sealing members shall not be a consideration of this test.

3.11.5 Humidity. When tested as specified in 4.6.23, wired, mated connectors shall maintain an insulation resistance of 100 megohms or greater at 25°C. Connectors shall show no deterioration which adversely impacts performance during subsequent testing

3.11.6 High temperature exposure with contact loading (contacts installed in connectors). When tested for 1,000 hours as specified in 4.6.24, the contacts shall maintain their specified locations as shown on figure 2 to figure 5, and there shall be no electrical discontinuity in excess of 1 microsecond.

3.11.7 Ozone exposure. When connectors are tested as specified in 4.6.25, there shall be no evidence of cracking of dielectric material or other damage that will adversely affect the subsequent performance of the connectors in the applicable test sequence.

3.11.8 Sand and dust. When tested as specified in 4.6.27, connectors shall pass succeeding tests in the qualification table (table XX). When tested as specified in 4.6.37, uncoupling and recoupling torque shall not exceed the values specified in table XIV by more than 25 percent.

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3.11.9 Ice resistance. When tested as specified in 4.6.26, connectors shall pass succeeding tests in the qualification table. When tested as specified in 4.6.37, uncoupling and recoupling torque shall not exceed the values specified in table XIV by more than 25 percent.

3.11.10 Thermal vacuum outgassing. Applicable as specified in table II. When tested as specified in 4.5.47, all nonmetallic materials used in the finished connector shall not release greater than 1.0 percent total mass loss (TML) and 0.1 percent total collected volatile condensable material (CVCM).

3.11.11 Resistance to indirect lightning strike. When tested as specified in 4.6.34, wired and mated connectors shall meet braid shield braid-to-shell conductivity as specified in 4.6.38, coupling and uncoupling torque as specified in 4.6.37, insulation resistance at ambient temperature as specified in 4.6.13.1, and dielectric withstanding voltage at sea level as specified in 4.6.14. Connectors shall show no damage or degradation in the finish or base material that would affect subsequent use. Damage or hardening of elastomeric sealing members affecting sealing shall be considered a failure.

3.11.12 Altitude immersion. When tested as specified in 4.6.31, the insulation resistance of the mated pair shall be 1,000 Megohms minimum. Connector insert interfaces and contact mating ends shall show no evidence of moisture.

3.11.13 Altitude-low temperature. When tested as specified in 4.6.32, the connectors shall meet the requirements of dielectric withstanding voltage at sea level specified in 4.6.14, and insulation resistance at ambient temperature specified in 4.6.13.1.

3.11.14 Retention system fluid immersion. When tested as specified 4.6.22, insert assemblies shall meet requirements of contact retention as specified in 3.9.3. Effects of the fluids on resilient sealing members shall not be a consideration of this test.

3.11.15 Electrolytic erosion. When tested as specified in 4.6.35, pin contacts shall show no exposure of base metal due to electrolytic erosion. Corrosion deposits shall not be considered as defects.

3.11.16 Firewall. Applicable only to firewall classes as specified in table II. Mated connectors shall prevent passing of a flame through the connector for at least 20 minutes when tested as specified in 4.6.36. During this period there shall be no flame from outgassing or other causes on the end of the connector protected by the firewall. When the specified dc current is applied, there shall be no break in electrical continuity for the first 5 minutes of the test. When AC current is applied during the sixth minute of the test, there shall be no leakage current equal to or greater than 2 amperes.

3.11.17 Hexavalent chromium detection. Applicable only as specified in table II when hexavalent chromium is used in manufacturing process. When tested as specified in 4.6.41, finish shall be negative for hexavalent chromium (Cr(VI)). Detection is done to validate the absence or acceptably low level of hexavalent chromium. It is preformed because some manufacturers may use hexavalent chromium in processing. They use a post process to convert the hexavalent chromium to trivalent chromium. This test is to validate that the hexavalent chromium conversion was successful in bringing the hexavalent chromium levels below an acceptable amount.

3.12 Marking.

3.12.1 Connector shell marking. Connectors shall be legibly and permanently marked on the shell or coupling ring with the PIN, date code, manufacturer's identification marking, and also with the assembly plant identification, when applicable (see 1.2.1 and 3.1). The above-referenced date code, or lot number (also called "lot/date code") shall be marked in accordance with MIL-STD-1285. In addition, the part shall

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be marked with the "JAN" or "J" certification (see 3.12.4). The manufacturer and assembly plants may be identified by the use of Commercial or Government Entity Number (CAGE code), name, trademark, symbol, or identification letters, and shall be as specified in SAE AIR1351. The manufacturer's name, if used, may be abbreviated. If the connectors are assembled by a qualified assembly plant, then the identification marking shall also include the assembly plant's identification marking. The trademark shall be as specified in SAE AIR1351 or shall be that which has been provided to the qualifying activity. Stamping shall be in accordance with MIL-STD-1285 where space permits, in the location specified (see 3.1). Metal stamping shall be accomplished before plating. Marking shall be nonfading and shall remain legible following completion of all inspections.

3.12.2 Contact location identification. Contact locations as specified on MIL-STD-3067 shall be identified. Molded (raised or recessed) characters shall not be used on insert mating faces for any markings of crimp contact connectors, but are permitted on the rear face of the grommet. Supplier's identification is permitted on face of insert. Contact cavity designators specified by MIL-STD-3067 shall be marked on the front insert face and rear grommet face, except where space limitations make this impracticable. Location of contact identifying characters shall be in close proximity to the contact cavities, but need not be placed exactly where specified in the standard. A contrasting color against the background shall be used to easily distinguish the identifying character.

3.12.3 JAN and J marking. The United States Government has adopted and is exercising legitimate control over the certification marks "JAN" and "J", respectively, to indicate that items so marked or identified are manufactured to, and meet all the requirements of specifications. Accordingly, items acquired to, and meeting all of the criteria specified herein and in applicable specifications shall bear the certification mark "JAN" except that items too small to bear the certification mark "JAN" shall bear the letter "J". The "JAN" or "J" shall be placed immediately before the part number except that if such location would place a hardship on the manufacturer in connection with such marking, the "JAN" or "J" may be located on the first line above or below the part number. Items furnished under contracts or orders which either permit or require deviation from the conditions or requirements specified herein or in applicable specifications shall not bear "JAN" or "J". In the event an item fails to meet the requirements of this specification or the applicable specification sheets, the manufacturer shall remove completely the military part number and the "JAN" or the "J" from the sample tested and also from all items represented by the sample. The "JAN" or "J" certification mark shall not be used on products acquired to contractor drawings or specifications. The United States Government has obtained Certificate of Registration Number 6,069,576 for the certification mark "JAN" and Registration Number 2,577,735 for the certification mark "J".

Note: The "JAN" or "J" is not part of the PIN but indicates a certification.

3.13 Workmanship. Connectors shall meet all design dimensions and intermateability and interchangeable requirements of this specification. Loose contacts, poor molding fabrication, loose materials, defective bonding, damaged or improperly assembled contact, peeling, or chipping of plating or finish, galling of mating parts and post molding warpage will be considered adequate basis for rejection of items of quality inferior for the purpose intended. The connector shall be fabricated in a manner such that the criteria for appearance, fit and adherence to specified tolerances are observed. Particular attention shall be given to neatness and thoroughness of marking parts, plating, welding, soldering, riveting, staking, and bonding. The visual examination under three power (3X) magnification shall include examination of each retention cavity for molding discrepancies, retention features, and excessive adhesive. The connectors shall be free from crazing, cracks, voids, pimples, chips, blisters, pinholes, sharp cutting edges, nicks, burrs, and other defects that will adversely affect life, serviceability, or appearance. Contacts shall be processed in such a manner as to be uniform in quality. Contacts shall be free from foreign material and burrs or sharp corners that might damage the connector or affect mating of the contacts.

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4. VERIFICATION

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

- a. Qualification inspection (see 4.4).
- b. Conformance inspection (see 4.5).

4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in the "General Requirements" of EIA-364.

4.2.1 Application torque. Unless otherwise specified and where applicable, all inspection and testing shall be done using the application torques given below. Application torques are values that are intended to be used in the field. They differ from the proof and testing torques specified elsewhere. Proof torques are intentionally high values the parts are exposed/subjected to in order to "prove" they are capable of withstanding the torque without failure. Jam nuts are indirectly proof tested by the external bending moment test. Testing torques is a general term for a torque used for a specific test but not necessarily in the field (i.e. coupling engage/disengage torques to make sure coupling is not too difficult to put together and not so easily that the connectors would vibrate apart). Application torques shall be targeted to the nominal torque given (i.e. torque wrench shall be set to the nominal torque). The tolerance allowance is only for tool error/tolerance, user variation, and other such uncontrolled variations that lead to a deviation from nominal. The tolerance shall not be used to try to intentionally tighten over or under the nominal value.

TABLE XVIII. Application torques.

Shell size	Coupling application torque (in-lbs)		Jam nut application torque (in-lbs)		Accessory (backshell) application torque (in-lbs)	
	Nominal	Tolerance	Nominal	Tolerance	Nominal	Tolerance
8	20	±10%	23	±10%	14	±10%
9	22		23		16	
10	24		23		20	
11	26		23		22	
12	28		28		24	
15	34		28		30	
18	40		28		30	
19	42		28		30	
23	50		28		30	

4.3 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 manufacturer. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ISO/IEC 17025.

4.3.1.1 QPL system, manufacturing facilities and value-added distributors. The manufacturer shall establish and maintain a system to meet the requirements of MIL-STD-790 and the requirements herein (see 3.2.1). Evidence of such compliance shall be verified by the qualifying activity as a prerequisite for

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qualification and retention of qualification. Manufacturer changes to process control inspections, quality conformance inspections, manufacturing control drawings that affect fit, form, or function or manufacturing locations (except within the same facility) without express approval by the qualifying activity may result in loss of qualification for that product. Value-added distributors and/or assembly plants that assemble QPL connectors shall be approved by the qualifying activity and listed on the applicable Qualified Products List. Assemblies produced at the assembly plant shall be subjected to inspection to ensure that the assembly process conforms with that established at the qualified manufacturing plant. Quality control requirements, including Government inspection surveillance, shall be the same as required for the qualified connector manufacturer.

4.3.1.2 Assembly plants. The qualified connector manufacturer shall certify that the value-added distributor's assembly plant is approved for the distribution of the manufacturer's parts. Assembly plants shall use only piece parts (i.e. subcomponents such as connector shells and inserts) produced by the qualified manufacturer, and the assembly plant shall assemble the manufacturer's product in accordance with the manufacturer's assembly procedures.. No incoming inspection or testing other than visual examination is required of certified piece parts obtained from the qualified manufacturer, except when there is cause for rejection. Assemblies produced at the assembly plant shall be subjected to inspection to assure that the assembly process conforms with that established at the qualified manufacturing plant.

4.4 Qualification inspection. The qualifying activity (see 6.3) maintains the associated QPL, and requests for qualification are reviewed and authorized by the qualifying activity prior to the start of qualification testing. Qualification inspection shall be performed at a laboratory acceptable to the qualifying activity (see 6.3) on sample units produced with equipment and procedures normally used in production. Qualification approval may be granted upon successful completion of the inspections and tests of 4.4.2 conducted on samples of 4.4.1; such approval to include classes, finishes, connector shell configurations, and insert arrangements other than those actually tested, providing that the capability to manufacture these parts is demonstrated by providing exhibit samples or equivalent listing.

4.4.1 Qualification samples and preparation. Samples of each class for which qualification is desired shall be tested in the sequence specified in table XX, as applicable. Each connector subjected to qualification testing shall be provided with a counterpart connector for those tests requiring mating assemblies. Manufacturers not producing mating connectors shall submit data substantiating that tests were performed with new, qualified counterpart connectors.

Crimp terminations shall be accomplished using tools specified in the contact specifications. The wire or cable shall be stripped so that as a minimum, the stripped length shall reach the bottom of the crimp barrel. When the conductor is installed so that the end touches the bottom of the crimp barrel, no more than .031 inch of the stripped conductor shall be exposed beyond the end of the barrel. Connectors samples shall be coupled together with the maximum engagement/disengagement coupling torque value specified in table XIV unless otherwise stated. An alternate sample preparation may be used with the approval of the qualifying activity. Samples and preparations for connectors and accessories, shall be as follows:

all groups: The follow criteria shall apply for qualification testing:

- All plugs shall be shell style 2 unless otherwise stated
 - All receptacles shall be shell style 1 unless otherwise stated
- a. group 1 (general) and group 2 (general): For all class, mated pairs meeting all of the follow criteria shall be provided for qualification testing.
- For each shell size, a minimum of one mating pairs of each of the following:

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- a straight plug and a wall mounting receptacles
- a straight plug and a jam-nut receptacle using a spanner nut (note: Jam-nut receptacle is used as a worst case scenario being the typically weakest receptacle for strength (i.e. external bending moment). Spanner nut is the typically weakest nut.)
- Half the samples of each shell size shall have pin contacts in the receptacle and socket contacts in the plug. The other samples shall have socket contacts in the receptacle and pin contacts in the plug.
- For the 9 shell sizes, a specific number of the shell sizes shall have an insert arrangement with contact size as specified in [table XIX](#).

TABLE XIX. Group 1. Number of shell sizes to be used with a given contact size.

Insert arrangement contact size (All or predominant)	Number of shell size
12	1
16	2
20HD	3
23	3

- Connectors shall be supplied with an insert arrangement of maximum contact density as defined by MIL-STD-3067 for a given shell size
- Samples shall be wired with wire having a smooth extruded outer jacket of waterproof construction
- Two samples of each shell size shall utilize maximum diameter wire ([table VIII](#)) and the remaining samples shall utilize minimum diameter wire.
- Two cavities of each sample provided shall contain unwired contacts and sealing plugs in accordance with MS27488. Connectors with less than four contacts of a given contact size will not have sealing plugs installed for that contact size.

Note: For limited qualification, the manufacturer shall coordinate with the qualifying activity to determine the sample quantities required to fully represent that manufacturer's qualified product. A minimum of nine mated pairs shall be supplied for limited qualification of arrangement layouts.

- b. [group 3 \(general\)](#): For all classes, mating pairs meeting all of the follow criteria shall be provided for qualification testing.
- A pair consists of a straight plug shell with EMI grounding springs (coupling nuts and inserts not required) and a wall mounting receptacle
 - Receptacles may be shells only
 - Small, medium, and large shell size
 - Applicable EMI backshells for shell style 2
- c. [group 4 \(dielectric, ozone, fluid immersion\)](#): Mating pairs meeting all of the follow criteria shall be provided for qualification testing.
- A pair consists of a straight plug and a wall mounting receptacle
 - Ten mated pairs in a medium shell size

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- Any insert arrangement
 - One sample of each shell size shall be wired with nominal gauge wire ([table VIII](#))
- d. [group 5 \(retention system, additional\)](#): Mating pairs meeting all of the follow criteria shall be provided for qualification testing.
- A pair consists of a straight plug and a wall mounting receptacle
 - Representative shell sizes
 - Smallest shell size shall be used and smallest contact size (should be the worst case scenario for insert retention, surface area of between shell and insert for adhesion compared to force applied should be low, some manufactures may choose to use short inserts with the small contacts reducing insert/shell surface area)
- e. [group 6 \(environmental/corrosion testing\)](#): Mating pairs meeting all of the follow criteria shall be provided for qualification testing.
- A pair consists of a straight plug and a wall mounting receptacle
 - For shell style 2, each connector supplied with environmental backshell. The backshell shall be qualified. If a qualified backshell is not available, a commercial equivalent backshell shall be used.
 - Pin contacts installed in the receptacles
 - One mating pair for each class and shell size
 - Connectors shall be supplied with an insert arrangement of maximum contact density as defined by MIL-STD-3067 for a given shell size
 - Connectors shall have pin contacts installed in the receptacles
- f. [group 7 \(ice, sand, and dust\)](#): Mating pairs meeting all of the follow criteria shall be provided for qualification testing.
- One mating pair in each shell size for each class
 - Connectors shall be supplied with an insert arrangement of maximum contact density as defined by MIL-STD-3067 for a given shell size
 - Each contact gage shall be represented in a minimum of 2 arrangements of different shell sizes
- g. [group 8 \(insert bonding/outgassing\)](#): Assemblies meeting all of the following criteria shall be provided for qualification testing.
- An assembly consists of a insert grommet and insert interface seal bonded together
 - 2 assemblies provided
 - Assemblies shall be of the size and contact arrangement for which qualification is to be conducted (Sample size required for thermal vacuum outgassing test shall be as specified in ASTM E595).
- h. [group 9 \(lightning strike\)](#): Mating pairs meeting all of the following criteria shall be provided for qualification testing.
- A pair consists of a straight plug and a receptacle
 - Three mating pairs in shell sizes 8, 15 and 23 (nine mating pairs total) in each class for which qualification is desired shall be tested

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- Each mating pair of connectors shall be provided with an SAE AS85049 braidsock strain relief as specified in EIA-364-75. (Note: An SAE AS85049/103 strain relief is recommended)
- i. [group 10 \(rear threaded accessories\)](#): One accessory (backshell) of each shell size shall be provided for qualification testing. The backshell shall be qualified. If a qualified backshell is not available, a commercial equivalent backshell shall be used. Each accessory sample shall be assembled to a counterpart shell style 2 connector plug and counterpart shell style 2 flange mount receptacle. The backshell shall be assembled with 10 feet of wire. 7 feet of conduit shall be used if applicable to the backshell used
- j. [group 11 \(banding platform\)](#): Connectors as specified in [4.6.2.](#), shall be provided for qualification testing.
- k. [group 12 \(firewall\)](#): Mating pairs meeting all of the follow criteria shall be provided for qualification testing.
 - A pair consists of a straight plug and a receptacle
 - One mating pair for each class and shell size
 - Connectors shall be supplied with an insert arrangement of maximum contact density as defined by MIL-STD-3067 for a given shell size
 - Shell style 2 (rear accessory threads) threads shall be provided with applicable straight strain relief clamp backshell. The backshell shall be qualified. If a qualified backshell is not available, a commercial equivalent backshell shall be used.
- l. [group 13 \(hexavalent chromium detection\)](#): Mating pairs meeting all of the following criteria shall be provided for qualification testing.
 - A pair consists of a straight plug and a wall mounting receptacle
 - For shell style 2, each connector supplied with environmental backshell. The backshell shall be qualified. If a qualified backshell is not available, a commercial equivalent backshell shall be used.
 - Pin contacts installed in the receptacles
 - One mating pair of the smallest shell size for each class
 - Connectors shall have pin contacts installed in the receptacles

Minimum, nominal, and maximum wires diameters (gauges) are shown in [table VIII](#). SAE AS22759 wire is typically used.

4.4.1.1 [Sample size \(limited qualification\)](#). Manufacturers that do not intend to qualify all nine (9) shell sizes in all series or all contact sizes shall provide the following test samples instead of those specified in [4.4.1a](#) and [4.4.1b](#): Four mating pairs of each shell for each series or contact size to be qualified. The maximum number of mated pairs that will be tested is forty-four (44). Future qualification of additional shell or contact sizes will require qualification as determined by the qualifying activity.

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4.4.2 Qualification tests.

- a. Samples provided under 4.4.1a shall be divided into two similar groups. One group shall be subjected to the tests of group 1, table XX, in the sequence specified. The other group shall be subjected to the tests of group 2, table XX, in the sequence specified.
- b. Samples provided under 4.4.1b shall be subjected to the tests of group 3, table XX, in the sequence specified.
- c. Samples provided under 4.4.1c shall be subjected to the test of group 4, table XX, in the sequence specified.
- d. Samples provided under 4.4.1d shall be subjected to the tests of group 5, table XX, in the sequence specified.
- e. Samples provided under 4.4.1e shall be subjected to the tests of group 6, table XX, in the sequence specified.
- f. Samples provided under 4.4.1f shall be subjected to the tests of group 7, table XX, in the sequence specified.
- g. Samples provided under 4.4.1g shall be subjected to the tests of group 8, table XX, in the sequence specified.
- h. Samples provided under 4.4.1h shall be subjected to the tests of group 9, table XX, in the sequence specified.
- i. Samples provided under 4.4.1i shall be subjected to the tests of group 10, table XX, in the sequence specified.
- j. Samples provided under 4.4.1j shall be subjected to the tests of group 11, table XX, in the sequence specified.
- k. Samples provided under 4.4.1k shall be subjected to the tests of group 12, table XX, in the sequence specified.
- l. Samples provided under 4.4.1l shall be subjected to the tests of, group 13, table XX, in the sequence specified.

4.4.2.1 Failures. One or more failures shall be cause for refusal to grant qualification.

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TABLE XX. Qualification and group C periodic tests.

Inspection	Requirement paragraph	Test paragraph
<u>Group 1 (general)</u> <u>(all classes and finishes)</u>		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Magnetic permeability	3.3.5	4.6.29
Maintenance aging	3.9.1	4.6.3
Thermal shock (temperature cycling)	3.11.1	4.6.19
Coupling and uncoupling torque	3.9.12	4.6.37
Durability	3.9.2	4.6.4
Attitude immersion <u>1/</u>	3.11.12	4.6.31
Insulation resistance at ambient temperature	3.10.1.1	4.6.13.1
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Insert retention	3.9.8	4.6.10
Shell-to-shell conductivity (initial)	3.10.4.1	4.6.16
Salt spray (corrosion)	3.11.2.1	4.6.20
Coupling and uncoupling torque	3.9.12	4.6.37
Shell-to-shell conductivity (after conditioning)	3.10.4.2	4.6.16
Contact resistance (initial)	3.10.6.2	4.6.18.2
Electrical engagement	3.10.3	4.6.15
External bending moment	3.9.13	4.6.28
Post test examination	3.12 and 3.13	4.6.40

See footnotes at end of table.

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TABLE XX. Qualification and group C periodic tests. – Continued.

Inspection	Requirement paragraph	Test paragraph
<u>Group 2 (general)</u> (all classes)		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Maintenance aging	3.9.1	4.6.3
Contact retention	3.9.3	4.6.5
Altitude-low temperature	3.11.13	4.6.32
Insulation resistance at ambient temperature	3.10.1.1	4.6.13.1
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Thermal shock (temperature cycling)	3.11.1	4.6.19
Coupling and uncoupling torque	3.9.12	4.6.37
Insulation resistance at elevated temperature	3.10.1.4	4.6.13.2
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Dielectric withstanding voltage at altitude <u>1</u> /	3.10.2	4.6.14
Durability	3.9.2.1	4.6.4
Low level contact resistance (initial)	3.10.6.1	4.6.18.1
Contact resistance (initial)	3.10.6.2	4.6.18.2
Vibration <u>4</u> /	3.9.9	4.6.11
Low level contact resistance (after conditioning)	3.10.6.1	4.6.18.1
Contact resistance (after conditioning)	3.10.6.2	4.6.18.2
Shock <u>4</u> /	3.9.10	4.6.12
Shell-to-shell conductivity (after conditioning)	3.10.4.2	4.6.16
High temperature exposure with contact loading <u>1</u> /	3.11.6	4.6.24
Humidity	~~3.11.4~~ 3.11.5	~~4.6.22~~ 4.6.23
Insulation resistance at ambient temperature	3.10.1.1	4.6.13.1
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Contact retention	3.9.3	4.6.5
Post test examination	3.12 and 3.13	4.6.40

See footnotes at end of table.

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TABLE XX. Qualification and group C periodic tests. – Continued.

Inspection	Requirement paragraph	Test paragraph
<u>Group 3</u> (general)		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Durability	3.9.2	4.6.4
Shell to EMI grounding spring forces	3.9.6	4.6.8
Shell-to-shell conductivity	3.10.4.1	4.6.16
EMI/RFI shielding	3.10.5	4.6.17
Post test examination	3.12 and 3.13	4.6.40
<u>Group 4</u> (dielectric, ozone, fluid immersion)		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Ozone exposure	3.11.7	4.6.25
Insulation resistance at ambient temperature	3.10.1.1	4.6.13.1
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Fluid immersion	3.11.4	4.6.22
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Coupling and uncoupling torque	3.9.12	4.6.37
Contact retention	3.9.3	4.6.5
Post test examination	3.12 and 3.13	4.6.40
<u>Group 5</u> (retention system, additional)		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Pin contact stability	3.9.4	4.6.6
Contact retention system effectiveness (contact walk-out)	3.9.5	4.6.7
High temperature exposure with contact loading	3.11.6	4.6.24
Insert retention	3.9.8	4.6.10
Post test examination	3.12 and 3.13	4.6.40

See footnotes at end of table.

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TABLE XX. Qualification and group C periodic tests. – Continued.

Inspection	Requirement paragraph	Test paragraph
<u>Group 6</u> (environmental/corrosion testing)		
Visual and mechanical examination	3.1 , 3.3 , 3.4 , 3.5 , 3.12 , 3.13	4.6.1
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Electrolytic erosion	3.11.15	4.6.35
Shell-to-shell conductivity (initial)	3.10.4.1	4.6.16
Thermal shock (temperature cycling)	3.11.1	4.6.19
Salt spray (corrosion)	3.11.2.1	4.6.20
Coupling and uncoupling torque	3.9.12	4.6.37
Shell-to-shell conductivity (after conditioning)	3.10.4.2	4.6.16
Post test examination	3.12 and 3.13	4.6.40
<u>Group 7</u> (ice, sand, and dust)		
Visual and mechanical examination	3.1 , 3.3 , 3.4 , 3.5 , 3.12 , 3.13	4.6.1
Ice resistance	3.11.9	4.6.26
Sand and dust	3.11.8	4.6.27
Post test examination	3.12 and 3.13	4.6.40
<u>Group 8</u> (insert bonding/outgassing)		
Visual and mechanical examination	3.1 , 3.3 , 3.4 , 3.5 , 3.12 , 3.13	4.6.1
Insert bond strength <u>2/</u>	3.9.11	4.6.39
Thermal vacuum outgassing <u>1/</u> <u>2/</u>	3.11.10	4.5.47
Post test examination	3.12 and 3.13	4.6.40

See footnotes at end of table.

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TABLE XX. Qualification and group C periodic tests. – Continued.

<u>Group 9 (lightning strike) 1/ 3/</u>		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Coupling and uncoupling torque	3.9.12	4.6.37
Shield braid-to-shell conductivity (initial)	3.10.7	4.6.38
Resistance to indirect lightning strike	3.11.11	4.6.34
Shield braid-to-shell conductivity (after conditioning)	3.10.7	4.6.38
Coupling and uncoupling torque	3.9.12	4.6.37
Insulation resistance at ambient temperature	3.10.1.1	4.6.13.1
Dielectric withstanding voltage at sea level	3.10.2	4.6.14
Post test examination	3.12 and 3.13	4.6.40
<u>Group 10 (rear threaded accessories)</u>		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Magnetic permeability	3.3.5	4.6.29
Accessory thread strength	3.9.7	4.6.9
Shell conductivity, before conditioning	3.10.4.1	4.6.16
Vibration	3.9.9	4.6.11
Shock	3.9.10	4.6.12
Salt spray (corrosion)	3.11.2	4.6.20
Shell conductivity, after conditioning	3.10.4.2	4.6.16
External bending moment	3.9.13	4.6.28
Post test examination	3.12 and 3.13	4.6.40
<u>Group 11 (banding platform)</u>		
Braid Retention	3.5.8.1.1.1	4.6.2.1
Thermal Aging	3.5.8.1.1.2	4.6.2.2
<u>Group 12 (firewall)</u>		
Visual and mechanical examination	3.1, 3.3, 3.4, 3.5, 3.12, 3.13	4.6.1
Firewall	3.11.16	4.6.36
Post test examination	3.12 and 3.13	4.6.40

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TABLE XX. Qualification and group C periodic tests. – Continued.

Group 13 (hexavalent chromium detection)		
Hexavalent chromium detection.	3.11.17	4.6.41

- 1/ Unless otherwise specified, initial qualification only (for exceptions, see 4.5.2.1.1).
- 2/ Additional parts may be used.
- 3/ If the supplier's plating system changes (e.g., change to method of plating, or change in plating thicknesses of underplates and finishes), then the manufacturer shall notify the qualifying activity and submit a requalification test plan for approval.
- 4/ Vibration and shock testing are required for all classes during initial qualification. For periodic requalification, random vibration testing at elevated temperature (see 4.6.11.2) is required.

4.4.3 Retention of qualification. To retain qualification, the qualified manufacturer shall periodically forward reports to the Qualifying Activity (see 6.3) as follows:

- a. At 24 month intervals, unless otherwise specified by the Qualifying Activity, the qualified manufacturer shall forward a report with a summary of the results of groups A and B testing (see 4.5.1.1 and 4.5.1.2). The results of tests of all reworked lots shall be identified and accounted for.
- b. At 24 month intervals, unless otherwise specified by the Qualifying Activity, the qualified manufacturer shall submit requalification, group C test reports (see 4.5.2.1), including the number and mode of failures. The summary shall include results of all qualification verification inspection testing performed during that period.

Reports shall include certification that the qualified source continues to produce qualified product under the same conditions as originally qualified (i.e., same processes, materials, design, construction, etc., including manufacturing locations), unless such changes have been authorized by the Qualifying Activity.

Note: The qualified source shall immediately notify the Qualifying Activity at any time during the reporting period when inspection data indicates failure of the qualified product to meet the requirements of the specification. If the summary of test results indicates nonconformance with the specification requirements, and corrective action acceptable to the Qualifying Activity has not been taken, then action may be taken to remove failing product from the QPL. In addition, failure to submit the report within thirty days after the end of each reporting period may result in loss of qualification for that product. In the event that no production occurred during the reporting period, the qualified manufacturer shall submit a report certifying that the company still has the capability and facilities required to produce the qualified product. If there has been no production during two consecutive reporting periods, the Qualifying Activity, at their discretion, may require the manufacturer submit a representative product of each type, class, etc., to retention testing in accordance with qualification inspection requirements.

4.5 Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A and B inspections. The documentation requirements of the applicable military or industry test procedures do not apply.

4.5.1.1 Group A inspection. Group A inspection shall consist of the inspections specified in table XXI.

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4.5.1.1.1 Visual examination (group A inspection). Each connector shall be visually examined for completeness, workmanship, and identification requirements. For those assemblies that require a gasket and/or O-ring, the condition of the gasket and/or O-ring shall be visually examined. Gaskets which are missing, twisted, buckled, kinked, or damaged in any way shall be cause for rejection. O-rings which are damaged or missing shall be caused for rejection.

4.5.1.1.2 Critical examination (group A inspection). The following dimensions and features shown on the pertinent military standard are considered critical.

- a. Mating diameter H shall be as specified on [figure 2](#) and [figure 3](#) (max shell outside dia. on plugs, min shell inside dia. on receptacles).
- b. Key or keyway positions.
- c. Registration of grommet and insert markings (hole pattern between the grommet and the front face of the insert).
- d. Red band dimension as specified in [3.5.5](#).

TABLE XXI. Group A inspection. 1/

Inspection	Requirement paragraph	Test paragraph
Visual inspection <u>1/</u> <u>2/</u>	3.1 , 3.3 , 3.4 , 3.5 , 3.12 , 3.13	4.5.1.1.1
Critical examination <u>1/</u> <u>2/</u>	3.1	4.5.1.1.2
Insulation resistance at ambient temperature <u>1/</u> <u>2/</u> <u>3/</u>	3.10.1.1	4.6.13.1
Dielectric withstanding voltage at sea level <u>1/</u> <u>2/</u> <u>3/</u>	3.10.2	4.6.14

1/ 100 percent inspection.

2/ The contractor may use in-process controls for this requirement.

3/ Test 100 percent of contacts. Points of measurement and application of voltage shall be between circuits consisting of each contact and its closest adjacent contact and between connector shell and closest contacts adjacent to the shell. Multiple circuits may be tested concurrently.

4.5.1.2 Group B inspection. Group B inspection shall consist of the inspections specified in [table XXII](#) in the order shown and shall be made on sample units which have been subjected to and have passed the group A inspection.

TABLE XXII. Group B inspection.

Inspection	Requirement paragraph	Test paragraph
Shell EMI ground spring forces (plugs with EMI ground spring only) <u>1/</u> <u>2/</u> <u>3/</u>	3.9.6	4.6.8

1/ The contractor may use in-process controls for this requirement.

2/ No failures permitted.

3/ Test 5 pieces.

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4.5.1.2.1 Sampling plan (group B inspection). A sample size shall be randomly selected as specified in [table XXIII](#), except sampling for shell EMI ground spring forces shall be as specified [table XXII](#), footnote 3/. If one or more defects are found, then the lot shall be rescreened and defects removed. A new sample as specified in [table XXIII](#), shall then be randomly selected. If one or more defects are found in the second sample, then the lot shall not be supplied to this specification.

TABLE XXIII. Sampling plan.

Lot size	Sample size
1 to 13	100 percent
14 to 150	13 units
151 to 280	20 units
281 to 500	29 units
501 to 1,200	34 units
1,201 to 3,200	42 units

4.5.1.2.2 Lot definition (group B inspection). The production lot, as defined in MIL-STD-790, is further specified as follows:

- a. A production lot consists of all connectors covered under one military specification or standard, manufactured from the specified raw materials, processed under the same specification and procedures, produced by the same type of equipment, and submitted for inspection at one time. Each production lot of assembled connectors shall be a group identified by a common manufacturing record through all significant assembly operations.
- b. Common manufacturing records and traceability shall begin with machining and molding and shall include connector assembly. Traceability of connectors to specific physical/chemical test reports of incoming raw material is not required.

4.5.1.2.3 Disposition of sample units. Sample units which have completely passed group B inspection may be delivered on the contract or purchase order if the lot is accepted and the sample units are still within specified tolerances.

4.5.2 Periodic inspection. Periodic inspection shall consist of group C inspection. Except where the results of this inspection show noncompliance with the applicable requirements (see [4.5.2.1.4](#)), delivery of products which have passed groups A and B inspections shall not be delayed pending the results of this periodic inspection.

4.5.2.1 Group C inspection (periodic tests). Periodic tests shall be performed on a 24-month basis. Random vibration at temperature shall be performed during 24-month periodic testing, beginning with the first 24-month periodic test. Following the initial 24-month testing period, vibration testing shall only be required during every alternate 24-month time period (i.e., random vibration shall be required during the first group C inspection after initial qualification, and then it shall be required every 48 months thereafter, unless otherwise required by the qualifying activity). Samples submitted to periodic tests shall have passed groups A and B inspections.

4.5.2.1.1 Twenty-four month periodic tests. Every 24 months, mated connector pair sample units shall be selected, configured and tested as specified below (Note: At the discretion of the qualifying activity,

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an alternate test sequence may be performed):

- a. [group 1](#) and [group 2](#) (all classes and finishes), test sample quantity and configuration: Two mating plugs and receptacles from each shell size range and contact gage shall be provided. The three shell size ranges are small (sizes 8 through 10), medium (sizes 11 through 15), and large (sizes 18 through 23). One mating pair from each shell size range shall be fully wired with maximum diameter wire ([table VIII](#)) and subjected to the applicable tests in [table XX](#), group 1. The remaining samples shall be fully wired with minimum diameter wire ([table VIII](#)) and subjected to the applicable tests in [table XX](#), group 2. Random vibration at temperature (see [4.6.11.2](#)) shall be included in group 2 during every alternate 24-month periodic testing time period.
- b. [group 8](#) (all series), test sample quantity and configuration: Two bonded insert grommet subassemblies and two bonded insert interfacial seal subassemblies with the highest density insert arrangement for each shell size (small, medium and large, see [4.5.2.1.1a](#)) shall be provided. One set of each type of insert assembly shall be installed in the connector shell. Assemblies shall be subjected to the tests in [table XX](#), [group 8](#), with the exception of thermal vacuum outgassing. The set of inserts provided without shells shall be subjected to insert bond strength as specified in [table XX](#), [group 8](#).
- c. High temperature: One mating pair of connectors, of any representative shell size and insert arrangement for each contact size qualified, shall be subjected to high temperature exposure with contact loading in accordance with [4.6.24](#), except that the time period shall be 250 hours.

4.5.2.1.2 Failures. If one or more sample units fail to pass group C inspection, the sample shall be considered to have failed and corrective action shall be taken in accordance with [4.5.3](#).

4.5.2.1.3 Disposition of sample units. Sample units which have been subjected to group C inspection shall not be delivered on the contract or purchase order.

4.5.2.1.4 Noncompliance. If a sample fails to pass group C inspection, the manufacturer shall take corrective action on the materials or processes or both, as warranted, and on all units of product which are to be corrected and which were manufactured with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action acceptable to the qualifying activity has been taken. After the corrective action has been taken, group C inspection shall be repeated on additional sample units (all inspections, or the inspection which the original sample failed, at the option of the qualifying activity). Groups A and B inspections may be reinstituted; however, final acceptance shall be withheld until the group C reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the cognizant inspection activity and the qualifying activity.

4.5.3 Failures of groups A, B or C. Lots which fail group A, B or C and either fail retesting or are not submitted for retesting, shall not be shipped. Additionally the PIN and "JAN" marking shall be removed within 30 days from product produced to these lots (see [3.12](#)).

4.6 Methods of inspection.

4.6.1 Visual and mechanical examination.

4.6.1.1 Connectors and piece parts. The connectors and piece parts covered by this specification shall be visually and mechanically examined to ensure conformance with the specification and the applicable

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military standards (see [3.1](#), [3.3](#), [3.4](#), [3.12](#) and [3.13](#)). The contractor may use in-process controls to satisfy these requirements.

4.6.1.2 Test methods. The following identified tests and methods assure connector integrity within typical operating conditions and applications. Alternate commercial industry standard test methods are allowed when determined to provide equivalent results; however when an alternate method is proposed, the manufacturer shall submit details of the alternate method to the qualifying activity for their review and approval prior to the performance of the test. The test methods described herein are proven methods and shall be the referee methods in the event of a dispute.

4.6.2 Banding Termination. See [3.5.8.1.1](#). A braid shall be banded to the connector into an assembly. The assembly shall be tested in accordance the band termination test (configuration 6 and 8) of SAE AS85049/128 for the following tests.

4.6.2.1 Banding - Braid Retention. See [3.5.8.1.1.1](#). The assembly shall be subjected to the braid retention test.

4.6.2.2 Banding - Thermal Aging. See [3.5.8.1.1.2](#). The assembly shall be subjected to the thermal aging test.

4.6.3 Maintenance aging. See [3.9.1](#). Connectors shall be tested in accordance with test procedure EIA-364-24. The following details shall apply:

- a. Installing/removal tools shall be in accordance with contact specification.
- b. A minimum of twenty (20) percent, but not less than three contacts of each connector shall be tested.
- c. Fifty (50) percent of maintenance aging shall be performed with all plastic tools and fifty percent with metal tools, except for connectors with size 23 contacts, which shall use fifty percent metal tipped plastic tools and fifty percent metal tools.
- d. Contact installing and removal force measurements may be made with the appropriate installing and removal tips adapted to measure installing and removal forces on the initial and final cycle of maintenance aging.
- e. No lubricant shall be used during this test for all contact sizes except contact size 20HD and 23.
- f. For contact size 20HD and 23 contacts only 3 cycles shall be required.

4.6.4 Durability. See [3.9.2](#).

Durability, connectors. The wired, assembled plugs and receptacles shall be mated and unmated 500 cycles, at a rate of 300 cycles per hour, maximum. The mating and unmating shall be accomplished so that the plug and receptacle are completely separated during each cycle.

4.6.5 Contact retention. See [3.9.3](#).

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4.6.5.1 Axial displacement from front to rear. Contact retention shall be tested in accordance with test procedure EIA-364-29, test to specific force with displacement measurement. The following details and exceptions shall apply:

- a. Number of samples - The test shall be performed on 20 percent of the contact complement; but not less than three contacts in each connector half.
- b. Applied axial load - Preload to 3 pounds maximum.
- c. Special requirements - Where the test sequence required maintenance aging prior to contact retention, the contacts which were subjected to maintenance aging shall also be selected for contact retention.
- d. Axial direction - The applicable forces shall be applied along the longitudinal axis of individual contacts in the direction tending to displace the contacts to the rear.
- e. Only the contacts to be tested need be installed in the connector.

4.6.6 Pin contact stability. See 3.9.4. Gauge pins conforming dimensionally to the requirements on figure 15 shall be used. The connector shall be held in a holding device and the gauge pin inserted. The forces specified in table XI shall be applied to the groove on the rear end of the gauge pin (figure 15). The force shall be perpendicular to the gauge pin axis on the exposed portion of the gauge pin as shown on figure 9. The load shall be applied gradually at a rate not exceeding 1 inch per minute. The total pin tip displacement shall be measured as shown on figure 9. Testing shall meet all of the follow criteria:

- Minimum number of contacts per connector of (using the smallest contact size for connectors with multiple contact sizes):
 - 20 for contact size 20HD or smaller
 - 7 for contact size 16 or larger
 - If for a given shell size, no insert arrangement meets the minimums above, the insert arrangement of the highest pin count shall be used.

4.6.7 Contact retention system effectiveness (contact walk-out). See 3.9.5. Two contacts in each plug and receptacle shall be tested. The contacts shall be crimped to stranded steel cable of an appropriate size and installed in the connector. The unmated connector shall be mounted in a test fixture as shown on figure 13. A 3 pound load shall be applied to the cable. One 360° rotation of the fixture with the connector mounted shall constitute one cycle. The connector shall be subjected to 100 cycles at a rate of 10 to 20 cycles per minute.

4.6.8 Shell EMI grounding spring engagement and separation forces. See 3.9.6. Plugs shall be completely mated and unmated 10 times with counterpart receptacles less inserts. On the mating of the first cycle, the forces necessary to engage the connectors shall be within the values specified in table XII. On the unmating of the last cycle, the forces necessary to separate the connectors shall be within the value specified in table XII. When measuring the engagement and separation forces, the axial loads shall be applied at a displacement rate of 0.5 inches per minute.

4.6.9 Accessory thread strength. See 3.9.7. The mated connector shall be mounted as in normal service to a rigid panel. The torque wrench shall be attached as shown on figure 14. After mating the plug and receptacle connectors, a torque shall be applied to the accessory end of the plug at a rate of approximately 10 pounds-inches per second until the required torque is achieved. The applied load shall be held for 1 minute, then the load shall be released. The test shall then be repeated on the accessory end of the receptacle.

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4.6.10 Insert retention. See 3.9.8. Unmated connectors shall be tested in accordance with test procedure EIA-364-35 with the following details and exceptions:

- a. Force to be applied: 100 ± 5 pounds per square inch with a 25 pounds minimum force.
- b. Connectors may be wired.

4.6.11 Vibration. See 3.9.9. Wired and mated connectors shall be subjected to the applicable test(s) specified. Connectors shall be mounted on the vibration table by normal means. All contacts shall carry a test current of 100 milliamperes maximum and shall be continuously monitored for discontinuities throughout the test. A detector capable of detecting any discontinuities in excess of 1 microsecond shall be used. All plugs shall have an accessory load fixture specified on figure 17 attached during vibration; applicable to shell style 2. Shell style 1 is tested as is.

4.6.11.1 Sine vibration. Connector samples shall be subjected to a simple harmonic motion from 10 to 2,000 Hz in each of three mutually perpendicular axes. The level of vibration shall be a velocity of 10 in./sec from 10-50 Hz; 0.0591 in. double amplitude from 50-140 Hz, and 60 G from 140-2,000 Hz. The entire frequency range from 10-2,000 Hz and back shall be traversed in 20 minutes. The vibration shall be applied for a duration of 12 hours in each of the three mutually perpendicular axes for a total of 36 hours. Each axis of vibration shall be accomplished by vibrating for 4 hours at ambient room temperature, 4 hours at $-55^{\circ}\text{C} \pm 5^{\circ}\text{C}$, and 4 hours at the temperature listed in "Upper temperature limit" column in table II.

4.6.11.2 Random vibration (elevated temperature). Connectors shall be subjected to the test specified in test procedure EIA-364-28. The following details shall apply:

- a. Test condition VI - Letter "J". All classes shall be tested at elevated temperature and testing shall include verification of metal-to-metal shell bottoming (see 3.6). The verification of plug to receptacle metal-to-metal shell bottoming (or composite-to-composite shell bottoming) shall be accomplished by demonstrating that the connector meets a minimum rigidity requirement of 300 Hz (i.e. no resonances at frequencies less than 300 Hz). Two accelerometers, one for the perpendicular axis and one for the longitudinal axis (see figure 17), shall be placed on the backshell for shell style 2 or on the banding platform for shell style 1 of the plug connector in the location as specified on figure 17 (dimension LL). Additionally, an input or control accelerometer shall be placed on a non-resonant point of the fixture to control the input vibration. If the accelerometers on the backshell/banding platform indicate a resonance at a frequency below 300 Hz during any part of the vibration test procedures, the connector shall be considered to have failed (see 3.6). Verification of resonance shall be accomplished by monitoring the accelerometers placed on the backshell assembly. Prior to the random vibration test, a 2 g sinusoidal resonance search shall be performed to verify system response. During the random vibration test, the accelerometers data shall be recorded at 1 hour intervals. Following the random vibration test, the sinusoidal resonance search shall be performed again to verify any change in system resonance. In the case of the sinusoidal tests, resonance shall be defined as a response greater than twice the input vibration level. In the case of the random vibration test, resonance shall be defined as a response greater than four times the input vibration level ($1g^2$ vs $4g^2$). Note: Lightweight accelerometers and mounting features shall be selected so that the total mass of the backshell/cable assembly shall be as specified on figure 17. Vibration testing shall be conducted at the temperature listed in "Upper temperature limit" column in table II ($\pm 5^{\circ}\text{C}$). Duration shall be 8 hours in the longitudinal direction and 8 hours in a perpendicular direction for a total of 16 hours for all classes.

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4.6.11.3 Random vibration (room temperature). Connectors shall be tested in accordance with test procedure EIA-364-28. The following details shall apply:

- a. Test condition V - Using the vibration envelope shown on [figure 16](#).
- b. Vibration to be conducted at ambient temperature.
- c. Duration shall be 8 hours in the longitudinal direction and 8 hours in a perpendicular direction for a total of 16 hours.
- d. The test accessory specified on [figure 17](#) is not required.

4.6.12 Shock. See [3.9.10](#). Wired and mated connectors shall be subjected to the applicable test specified. Connectors shall be mounted by normal means and held together by normal coupling means. All contacts shall be wired in a series circuit with 100 milliamperes maximum current flow through the series circuit during shock. Connectors shall be monitored for any discontinuities. A detector capable of detecting all discontinuities of 1.0 microsecond or longer shall be used.

4.6.12.1 Standard shock. Connectors shall be tested in accordance with test procedure EIA-364-27. The following details shall apply:

- a. The pulse shall be an approximate half sine wave of $300\text{ G} \pm 15$ percent magnitude with a duration of 3 ± 1 milliseconds.
- b. The wire bundle shall be clamped to fixed points at least 8 inches (203.2 mm) from the rear of the connector.

4.6.12.2 High-impact shock. Wired and mated connectors shall be tested in accordance with MIL-S-901, grade A with the following modifications and additions. Mounting fixture shall be in accordance with MIL-S-901, light weight. The wire bundle shall be supported on a stationary frame in such a manner to provide a free flexing length between the frame and fixture of not less than 36 inches (914.4 mm). Each plug shall be terminated with at least 80 percent of wired contacts. The wire bundle shall be provided with a straight, environmental, backshell, the longest length available per shell size. The backshell shall be qualified. If a qualified backshell is not available, a commercial equivalent backshell shall be used. Discontinuity monitoring shall be performed in accordance with EIA-364-46.

4.6.13 Insulation resistance (IR).

4.6.13.1 IR at ambient temperature. See [3.10.1](#). Unmated connectors shall be tested in accordance with test procedure EIA-364-21. The following details and exceptions apply:

- a. For lot acceptance testing, where it is undesirable to install actual contacts in connectors, simulated contacts and special techniques may be used in performing this test.
- b. The tolerance on the applied voltage shall be ± 10 percent.
- c. Connectors shall be mated when testing after altitude immersion, humidity and altitude-low temperature.

4.6.13.2 IR at elevated temperature. See [3.10.1.4](#). Unmated connectors shall be tested in accordance with test procedure EIA-364-21. The following details and exceptions shall apply:

- a. The tolerance on the applied voltage shall be ± 10 percent.
- b. 30 minutes at an elevated temperature specified by the "Upper temperature limit" column in [table II](#) for the applicable class.
- c. Measurements shall be made while the connectors are still in the chamber at the specified temperature.

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4.6.14 Dielectric withstanding voltage at sea level and altitude. See 3.10.2.

4.6.14.1 Dielectric withstanding voltage at sea level. Wired, unmated connectors shall be tested in accordance with test procedure EIA-364-20, method A. Connectors shall be mated when testing after altitude immersion, humidity, and altitude-low temperature. The following details and exceptions apply:

- a. The magnitude of the test voltage shall be as specified in table XVI.
- b. All contacts shall be tested. The test voltage shall be applied between each wired contact and each adjacent contact and the shell.
- c. The test voltage shall be maintained at the specified value for 2 seconds minimum.
- d. For conformance inspection (see 4.5), simulated contacts and special techniques may be used in performing this test.

4.6.14.2 Dielectric withstanding voltage at altitude. Mated connectors and unmated connector halves with pin contacts shall be tested in accordance with test procedure EIA-364-20, method A, with the following details and exceptions:

- a. The magnitude of the test voltage shall be as specified in table XVI.
- b. All contacts shall be tested. The test voltage shall be applied between each wired contact and each adjacent contact and the shell.
- c. The test voltage shall be maintained at the specified value for 2 seconds minimum.
- d. The leads of all test circuits shall be brought out through the walls of the chamber. There shall be no wire splices inside the chamber. The wire ends of all leads shall be unsealed.
- e. The chamber shall be evacuated to each of the specified altitude pressure equivalents listed below.

<u>Altitude</u>	<u>Equivalent pressure</u>
40,000 feet	141 torr
70,000 feet	34 torr

4.6.15 Electrical engagement. See 3.10.3. Counterpart plugs and receptacles shall be wired to provide a complete series circuit through all contacts of the mated connector. A suitable power source and indicator shall be provided such that the earliest point at which the circuit is completed, during normal connector mating, can be established. Connector halves shall be slowly mated by the normal mating means until first indication of a completed circuit is observed. Means shall be provided to assure that electrical contact is made between the pin and the spring of the socket contact, rather than the hood of the socket contact. The mating operation shall be held at this point and the overall connector length shall be measured from solid reference points on the connector halves. The mating operation shall then be continued until the connector halves are in the completely mated position. A second overall length measurement shall then be taken from the same reference points. The difference of these two measurements shall be not less than specified in 3.10.3. Both the outer shield and inner conductor circuits shall be included in the test of shielded contacts.

4.6.16 Shell-to-shell conductivity, before and after conditioning. See 3.10.4. Mated connectors shall be tested in accordance with test procedure EIA-364-83.

4.6.17 EMI/RFI shielding. Applicable to all classes. See 3.10.5.

4.6.17.1 EMI/RFI shielding, low frequencies. Applicable frequency range is 100 to 1,000 MHz only. The EMI shielding effectiveness of mated connectors with accessory threaded EMI backshells (backshells may be soldered to the connector) or banding platform shells shall be measured in a triaxial radio frequency leakage fixture as shown on figure 11, and test system schematic shown on figure 10. The EMI leakage from the conductor inside the connector in the same inner coaxial line into the outer coaxial

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line shall be measured at the frequencies specified in [table XVII](#) within a frequency accuracy of ± 5 percent. The level of detected signal power shall be specified by a tunable radio frequency field intensity meter isolated from the test circuit by a 3 to 10 dB pad. Care shall be taken to ensure that the signal is a result of EMI leakage from within the mated connector and not due to a faulty termination inside the fixture. All terminations inside the fixture, whether to the EMI backshells or between internal conductors, shall have a leakage at least 10 dB less than the test requirements. The signal source shall be set to the desired frequency. The signal shall be fed through a 3 to 10 dB isolation pad to a parallel circuit consisting of a coaxial switch (DPDT) so connected that the signal can be manually or electronically fed alternately to the fixture and to a variable 100 dB reference attenuator. The attenuator shall be adjustable in 1 dB steps and calibrated to ± 3 dB.

- a. The inserts may be removed from the connectors under test or the contacts removed and a hole drilled through the inserts to accommodate a center conductor of suitable geometry to provide a good 50-ohms impedance match with the inside diameter of the mated connector shells and any EMI backshells. Tapered transition may be used to provide a means of changing diameters without introducing significant discontinuities in the line. The maximum voltage standing wave ratio (VSWR) in the inner coaxial line shall be 1.5. The outer shell of the test fixture shall be so constructed as to provide a good 50-ohms impedance match with the outside diameter of the mated connector shells, coupling ring, and EMI backshells (applicable to shell style 2 only). The maximum VSWR of the outer coaxial line shall be 1.5.
- b. A sliding circumferential short shall be positioned behind the connector on the signal input end of the fixture to provide for tuning the outer coaxial line for maximum output at each test frequency. The allowable travel of this short shall be greater than $1/2$ wave length at the lowest test frequency of 1.5 meters minimum for 100 MHz. The inner coaxial line shall be terminated in a fixed 50-ohms load impedance behind the connector at the output end of the fixture.
- c. The connectors used to couple together the various elements of the test system shall be of a low-leakage type which have a nominal impedance of 50 ohms, a VSWR of less than 1.5, and a minimum leakage attenuation of 100 dB. The output impedance of the signal source and the input impedance of the detector shall be nominally 50 ohms with a maximum VSWR of 1.5. The input and output VSWR of the standard attenuator shall be less than 1.5 in the 20 to 100 dB range.
- d. The relative signal level in the variable attenuator shall be equaled to the signal level through the leakage fixture by adjusting the attenuator. The signal loss in the fixture can then be read from the setting on the variable attenuator.

4.6.17.2 EMI/RFI shielding, high frequencies. Applicable frequency range is 1,000 to 10,000 MHz only. The EMI shielding effectiveness of mated connectors shall be measured using the mode-stirred technique in accordance with test procedure EIA-364-66.

4.6.18 Contact resistance testing. The following details shall also apply:

- 10% of contacts or a minimum of 3 (whichever is greater) shall be tested. When a requirement for number of contacts results in a fractional number of contacts, the number shall be rounded up to the next integer number of contacts (for example, 10% of 49 contact = 4.9, round up to 5 contacts). Of the 10%:
 - $1/3$ of the contacts shall be selected from the center of the insert arrangement
 - $1/3$ of the contacts shall be selected from those located nearest to the connector shell
 - The remaining contacts shall be selected from random locations
 - If contact size is not covered by a specific test in SAE AS39029, contacts of that size are

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not included for the specific test. They shall not be included in the count for the 10% sample.

4.6.18.1 Low level contact resistance. See 3.10.6.1. Mated connectors shall be tested in accordance SAE AS39029. The following details shall apply:

Contact resistance testing condition	SAE AS39029 conditions, mV requirement conditions
Initial	ICV - Initial condition values
After conditioning	TCV - After conditioning values

4.6.18.2 Contact resistance (standard). See 3.10.6.2. Mated connectors shall be tested in accordance SAE AS39029. The following details shall apply:

Contact resistance testing condition	SAE AS39029 conditions, mV requirement conditions
Initial	Ambient temperature (25° C)
After conditioning	Ambient temperature (25° C) "After Conditioning" condition

4.6.19 Thermal shock (temperature cycling). See 3.11.1. Mated connectors shall be tested in accordance with test procedure EIA-364-32, with specifications:

- Test method A
- Test duration A (except that the duration of steps 2 and 4 shall be 2 minutes)
- Test condition:
 - V for class's temperature upper limit < +200°C
 - VI for class's temperature upper limit >= +200°C

4.6.20 Salt spray (corrosion). See 3.11.2. Applicable as specified in table II.

4.6.20.1 Salt spray (corrosion), standard test. Unmated connectors shall be tested in accordance with test procedure EIA-364-26. The following details and exceptions shall apply:

- a. Test condition B (48 hours).
- b. The samples shall not be mounted but shall be suspended from the top of the chamber using waxed twine or string, glass rods, or glass cord.
- c. Wire ends must be protected to prevent salt migration.

4.6.20.2 Salt spray (corrosion), dynamic test. The wired, assembled plugs and receptacles shall be mated and unmated 50 cycles at a rate of 300 cycles per hour maximum. The mating and unmating shall be accomplished so that the plug and receptacle are completely separated during each cycle. The connectors shall then be subjected to the salt spray test in accordance with test procedure EIA-364-26. The following details and exceptions apply:

- a. The connectors shall be tested for 452 hours mated followed by 48 hours unmated.
- b. The connectors shall not be mounted but shall be suspended from the top of the chamber using waxed twine or string, glass rods, or glass cord.
- c. Wire ends shall be protected to prevent salt migration.

After salt spray exposure, the remaining number of durability cycles specified in 3.5.8 shall be completed.

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4.6.21 Fluid immersion. Applicable to initial qualification only, see 3.11.3. Connector samples shall be tested in accordance with test procedure EIA-364-10 (one sample per fluid). Following the fluid immersion cycles, the connectors shall be tested coupling torque in accordance with 4.6.37 and dielectric withstanding voltage at sea level in accordance with 4.6.14 within 3 hours.

4.6.22 Retention system Fluid immersion. See 3.11.4. Unmated connectors with contacts removed shall be immersed in the fluids in accordance with test procedure EIA-364-10 (one sample per fluid) for 2 hours at room temperature. After removal, excess fluid shall drain from the connectors for 4 hours and the contacts reinstalled. Within 3 hours of the end of the fluid draining period, the connectors shall be tested for coupling torque in accordance with 4.6.37, dielectric withstanding voltage at sea level in accordance with 4.6.14, and contact retention as specified in 4.6.5.

4.6.23 Humidity. See 3.11.5. Wired, mated connectors shall be tested in accordance with test procedure EIA-364-31. The following details and exceptions shall apply:

- a. Test method IV, test duration B (10 24-hr cycles, 240 hrs total), including “cold shock” sub-cycle (step 7a).
- b. The mated connectors shall be mounted in a vertical position.
- c. For qualification testing, insulation resistance readings shall be made on a minimum number of circuits as specified below:

<u>Circuit count</u>	<u>Minimum IR readings</u>
1 to 4	All circuits
4 to 8	4 circuits
9 or more	50% of circuits

4.6.24 High temperature exposure with contact loading. See 3.11.6. Connectors shall have one mating pair of contacts removed from an untested contact cavity, if applicable, and replaced with contacts crimped or otherwise attached to steel cable or steel-cored copper wire (copper-weld, or equivalent) of an appropriate size. The axial location of these contacts shall be measured for conformance to the applicable dimensions on figure 2 to figure 5 with a load of approximately 2 pounds applied to seat the contact back against the retention device. The connector shall then be mounted in a fixture equivalent as shown on figure 12. A weight equal to 50 percent of the axial load specified in table X for the applicable contact size shall be suspended freely from each steel wire.

A current of 100 milliamperes maximum shall be applied to the test contacts and a suitable instrument shall be used to monitor the circuit for discontinuities in excess of 1 microsecond. The mounted connector shall then be exposed to the temperature based on class listed in the “Upper temperature limit” column in table II (+ 3°C/- 0°C) for 1,000 hours minimum. After the connectors return to ambient temperature, they shall be unmated and the contact locations shall be remeasured with approximately 2 pounds axial load applied to seat the contact back against the retention device.

4.6.25 Ozone exposure. See 3.11.7. Wired, mated connectors shall be tested in accordance with test procedure EIA-364-14.

4.6.26 Ice resistance. See 3.11.9. Mated connectors shall be immersed in tap water for 1 minute and then placed in an ambience of - 65° C +0°C/- 5°C for 1 hour. A minimum of three such cycles shall be performed until the connector surfaces are completely iced over. Immediately after removal from the last cycle, the frozen connectors shall be uncoupled and then recoupled. The connectors shall be uncoupled and recoupled a second time with the uncoupling and coupling torque measured in accordance with 4.6.37. The uncoupling and coupling torque shall not be measured on the first uncoupling and

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recoupling.

4.6.27 Sand and dust. See 3.11.8. Mated connectors shall be tested in accordance with MIL-STD-202-110.

4.6.28 External bending moment. See 3.9.13.

4.6.28.1 External bending moment. The receptacle connector shall be mounted as in normal service to a rigid panel as shown on figure 19. Before mating the plug connector to the receptacle, an adapter or test torque arm shall be attached as shown on figure 8. The torque shall be applied at a rate of approximately 10 in.-lbs. per second until the required torque is achieved. The applied load shall be held for 1 minute, then the torque shall be released. Continuity of the contacts shall be monitored during the test. The test circuit used to monitor the circuit shall be capable of detecting a discontinuity in excess of 1 microsecond.

4.6.29 Magnetic permeability. See 3.3.5. Connectors (all classes) shall be tested in accordance with test procedure EIA-364-54.

4.6.30 Fungus resistance. See 3.3.4. Certification to method 508 of MIL-STD-810 is required.

4.6.31 Altitude immersion. See 3.11.12. Mated connectors shall be tested in accordance with test procedure EIA-364-03. The following details shall apply:

- a. All wire ends shall be located within the chamber and exposed to the chamber atmosphere but not submerged or sealed.
- b. At the end of the third cycle, while the connectors are still submerged in the solution, the insulation resistance at ambient temperature shall be measured as specified in 4.6.13.1, and the dielectric withstanding voltage test shall be performed as specified in 4.6.14.1.

4.6.32 Altitude-low temperature. See 3.11.13. Wired, mated, assembled connectors shall be tested in accordance with test procedure EIA-364-105. The following details and exceptions apply:

- a. No wire ends or splices inside the chamber.
- b. Chamber pressure shall be reduced to simulate an altitude of 70,000 feet. The chamber internal temperature shall be reduced to -65 °C, +0 °C, -4 °C. Temperature shall be maintained until the mated pair stabilizes.
- c. Insulation resistance test to be performed at 70,000 feet at -65 °C, +0 °C, -4 °C, and shall be in accordance with 4.5.24.1.
- d. Dielectric withstanding voltage test to be performed after return to ambient conditions and shall be in accordance with 4.5.25.1.

4.6.33 Thermal vacuum outgassing. See 3.11.9. All materials used in the finished connector shall be tested in accordance with ASTM E595. Samples to be tested shall have been processed in the same manner as that used in production of the qualification lot.

4.6.34 Resistance to indirect lightning strike. see 3.11.11. Mated connectors as specified in test procedure EIA-364-75 shall be tested in accordance with test procedure EIA-364-75 with the following details and exceptions:

- a. Test sequence shall be as specified in table XX, group 9
- b. Each specimen shall be subjected to three current pulses in each polarity (a total of six pulses).

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After each current pulse, the connectors shall be unscrewed $\frac{1}{2}$ turn counter-clockwise without removing or unmating in order to break any weld points that may have occurred. Connectors shall then be re-tightened $\frac{1}{2}$ turn, back to the fully mated position.

- c. Visual examination shall be conducted under three-five power (3-5X) magnification in accordance with test procedure EIA-364-75.
- d. Coupling torque shall be in accordance with 4.6.37.
- e. Shell-to-shell conductivity testing shall be in accordance with 4.6.16.
- f. The peak current, I_{pk} , shall be 10,000 amperes.
- g. Insulation resistance at ambient temperature shall be in accordance with 4.6.13.1, followed by dielectric withstanding voltage at sea level in accordance with 4.6.14.1.
- h. The waveform for indirect lightning strike effects, as specified figure 20, shall be utilized. Indirect lightning strike test setup, as specified on figure 21, shall be utilized.

4.6.35 Electrolytic erosion. See 3.11.15. The wired receptacle half of the connector containing the pin contacts shall be firmly mounted in a vertical position with pins facing up. A salt-water solution (5 percent salt by weight) shall be poured onto the pin interface until the solution level just reaches the pin tips. The solution shall remain in the connector for a minimum of 30 seconds and then poured out, lightly shaking excesses from the connector. The counterpart plug shall immediately be mated with the receptacle. One cell pattern, with all contacts adjacent to a central contact at a positive polarity and the center contact at a negative polarity, shall be set up at a location giving the most uniform distribution of contacts adjacent to the center contact. A potential of 60 volts dc shall be applied between the contacts adjacent to the center contact. The contacts shall be energized for 40 hours. Following this, with the voltage disconnected, the connectors shall be unmated and the pin contacts removed. The contacts shall exhibit no erosion to base metal when examined under three power (3X) magnification.

4.6.36 Firewall. See 3.11.16. The mated, torqued, and wired connectors shall be tested in accordance with test procedure EIA-364-45. The following details shall apply: Wire bundles to be clamped to fixed points at least 8 inches behind the connector. The DC current shall be applied for the first 5 minutes without break in electrical continuity. After the fifth minute a test potential of 220 - 260 V AC (rms), 50 - 60 Hz, shall be applied for 1 minute between each of the circuits, and a test potential of 110 - 130 V AC (rms) between each circuit and the connector shells. There shall be no leakage current equal to or greater than 2 amperes during the sixth minute of the test.

4.6.37 Coupling and uncoupling torque. See 3.9.12. Mated connectors shall be tested in accordance with test procedure EIA-364-114, except mated pairs shall be fully coupled within 5 seconds minimum, and shall be fully uncoupled within 5 seconds minimum. For qualification testing, mated connectors shall be coupled and uncoupled; the torque which must be applied to facilitate full coupling and uncoupling shall be measured and recorded. The following detail applies:

- a. Full coupling: Full coupling is achieved when the red band is covered by the plug coupling ring.

4.6.38 Backshell shield braid-to-shell conductivity. See 3.10.7. Mated connectors shall be tested in accordance with test procedure EIA-364-83, except that measurement shall be made between the plug shield braid (shell style 1) or the backshell's shield braid (shell style 2) and one of the following: the accessory threads (shell style 2), banding platform (shell style 1) or mounting flange of the receptacle (see figure 22 for test setup). A backshell in accordance with a specification sheet or SAE AS85049 shall be utilized.

4.6.39 Insert bond strength. See 3.9.11. The connector's bonded insert assembly shall be tested in accordance with test procedure EIA-364-79.

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4.6.40 Post test examination. The tested connectors and contacts shall be examined for compliance with 3.12 and 3.13 to determine the effects of previous testing. Any evidence of cracking, loosening of parts, carbon tracking, excess wear, or missing parts shall be recorded.

4.6.41 Hexavalent chromium detection. See 3.11.17. Sample shall be tested in accordance with IEC 62321-7-1 using the boiling water extraction procedure.

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 or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data 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. This electrical connector is military and aerospace unique. It is a miniature, high density, threaded, environment resisting, high shock, high vibration, high corrosion resistant connector that utilizes crimp removable electrical contacts. It is capable of operating at temperatures up to 200°C. It is designed to withstand up to 500 hours of salt spray. Where weight and size is a critical consideration for military and aerospace applications, this circular electrical connector may be preferred over other military circular connector specifications. Depending on the insert arrangement and shell size, the mated connector pair may be up to 20-30 % lighter than a similar triple-start MIL-DTL-38999 mated pair. When installed with appropriate connector accessories, some classes of this connector family are suitable for severe wind and moisture problem (SWAMP) areas.

6.1.1 Application guidance and restrictions. When evaluating connectors for use in new design, including new systems and support equipment, users are advised to carefully evaluate the connector characteristics herein versus their requirements:

- a. Intermateability/interchangeability: See 3.4.2. Performance (function) may vary when different finishes or shell material are mated together.
- b. Connectors are vulnerable to pin contact bending from scooping, with contact size 23 being the most vulnerable. Scoop proof sensitive applications connectors with a size 23 pin contact should have pins loaded in the receptacle.
- c. Receptacles must be located so as to minimize the amount of required cable bending. When using size 16 and 12 contacts connectors with large cables which must be bent at right angles, the cables must have the right angle bend permanently established. A permanent bend would be utilizing an angled backshell or other acceptable wire strain relief based on the end application.
- d. Connector should not be used with heavy jacketed cable and excessive overhang moments, because of possible shell damage.

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- e. Connector rear sealing grommet has thinner walls due to its high density contact population. Bending or gathering/bundling of wires can elongate the rear sealing hole which may allow and introduce fluids into the grommet seal. It is recommended to have all wire bundle ties be no closer than 2 inches from the rear of the connector, less any backshell. Care should be taken using a metal insertion/extraction contact tool as to not tear the internal sealing surfaces. Tears could degrade some of sealing properties against the jacketed wire.
- f. Recommended panel cutout dimensions are shown in applicable connector slash sheet.
- g. Compatibility of connectors should be addressed when intermating different classes and finishes. Galvanically incompatible classes and finishes should not be intermated together. When intermating classes with different performance requirements, the lower performance requirements of the two classes apply.
- h. Flange mount (Box Mount) connectors are not intended to be used on environmentally sealed boxes without any additional sealing aid. If an environmentally sealed box capability is needed, a jam-nut mount connector should be used.
- i. Class T is required to be nonreflective. Class W is required to be an olive drab color in accordance with SAE AMS-QQ-P-416. Class Z is required to be black in accordance with ASTM B841. These nonreflective finishes and colors may vary in color depending on the method of manufacture. This variance in color does not alter the performance capabilities of the finish.
- j. Storage, cadmium plated connectors: See SAE AMS-QQ-P-416 for packaging limitations for cadmium plated products. Users are advised that cadmium plated parts should not be packed in non-ventilated containers or in direct contact with wood or cardboard, especially under conditions of high humidity or moisture, due to a corrosive reaction that often occurs between the cadmium plating and organic acids (i.e. formic acid, butyric acid, etc.) which form under these conditions.
- k. Isopropyl alcohol (i.e. TT-I-735) can be used as a lubricant aiding in insertion and removal of contacts and minimizing risk of grommet tear.
- l. Sealing grommet is thinner than other connectors such as MIL-DTL-38999. Some grommet cavities have 3 ripples (like MIL-DTL-38999). Some grommet cavities only have 2 ripples for sealing against the contact. 2 ripples are more prone fluid leakage especially when wire is torqued (wire bundle bending, zip tie bundling close (approximately less than 2") to connector which pushes on contacts in the center of the insert arrangement and pulls on the outer contacts).
- m. Pin-to-pin mating prevention. Pin-to-pin contact is possible if a plug with pin contacts is inadvertently mated with a receptacle with pin contacts. Although an end user should not try to mate such a configuration, best practice should use keyways, relative position of connectors to each other, harness design, and other methods to provide redundant prevention of mis-mating.

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6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of the specification.
- b. Title, number, and date of the applicable MS standard and the complete PIN.
- c. For indirect shipment, these connectors may be furnished without contacts, or grommet sealing plugs (see 3.5.1 and 3.5.4).
- d. Special finish.
- e. Shielded contacts.

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 Product List QPL No. 32689 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 from the qualifying activity, Defense Supply Center Columbus, DLA Land and Maritime Weapons Support-VQ, 3990 East Broad Street, Columbus, Ohio 43218-3990. An online listing of products qualified to this specification may be found in the Qualified Products Database (QPD) at <https://assist.dla.mil>.

6.3.1 Qualifying Activity program information and points of contact. Additional information is available on the DLA L&M website at <https://landandmaritimeapps.dla.mil/programs/QMLQPL/default.aspx>
<https://weaponssupportapps.dla.mil/programs/QMLQPL/default.aspx>.

6.3.2 Copies of "Provisions Governing Qualification SD-6". Copies of "Provisions Governing Qualification SD-6" are available on the DLA Document Services' website at <https://assist.dla.mil>.

6.3.3 Subject term (keyword) listing.

Beryllium	Copper	Metal	Plug	Silver
Cadmium	Lead	Nickel	Receptacle	Space grade

6.3.4 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) (see 3.3.1.3).

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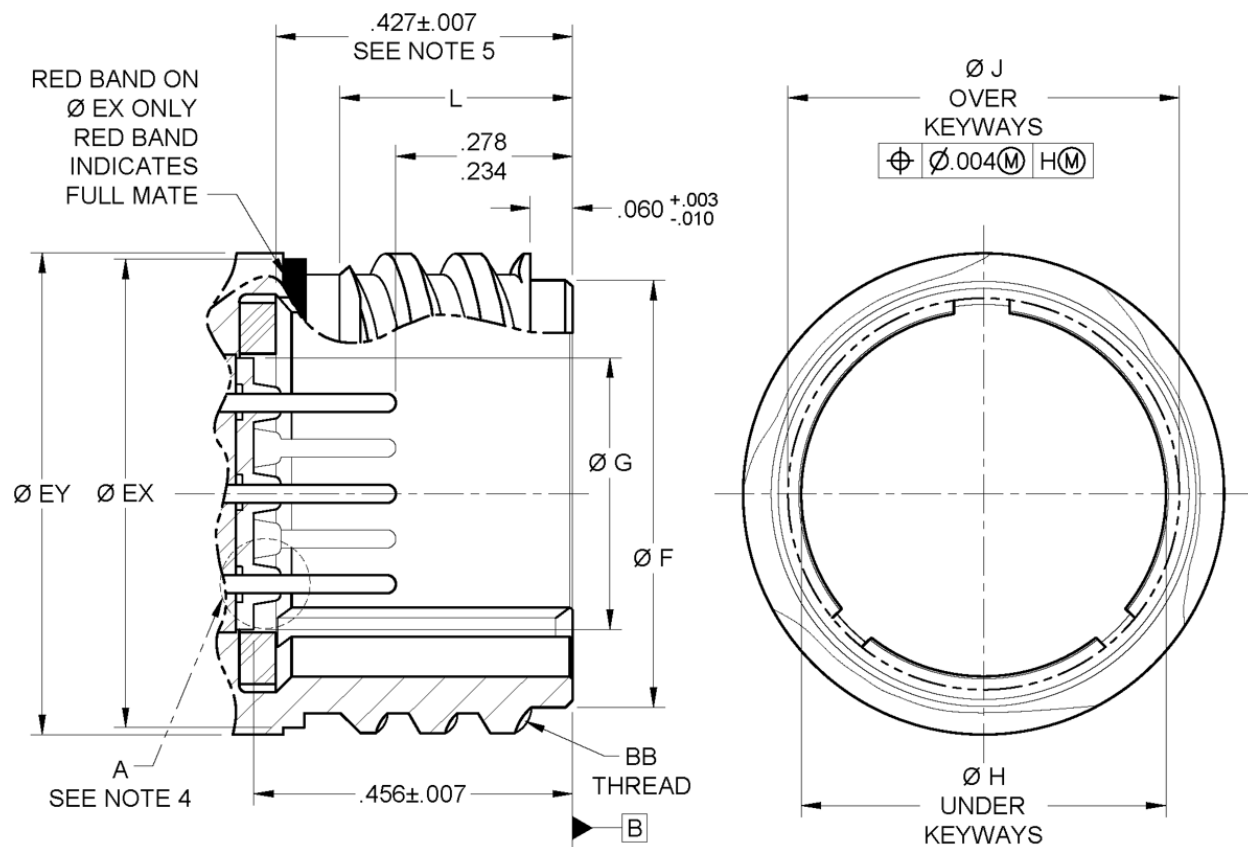
6.4 Definitions. The terms used in this standard are generally accepted by the electrical and electronics industries and commonly used in electrical connector engineering practice.

Contact	Individual electrical connection terminating a wire within a connector and interfacing with a corresponding contact in another connector when mated.
Contact size	Assigned numbers denoting the size of the contact mating end and the size of the contact wire barrel end.
Crimp contacts	A contact where a stripped wire is insert into the contact's barrel and the barrel is crimped (mechanically deformed) to mechanically and electrically join the wire and contact
Insert	A piece which mechanically positions the contacts (and retention clips) into an arrangement pattern. With the retention clips, the insert holds the contacts in the axial direction. Insert provide electrical insulation to prevent electrical arcing between pins and from pins to the shell. Inserts are generally a cylinder (O.D. to fit in the shell) with a pattern of holes to hold the contacts. Inserts are inserted and fixed or retained in the shell body of the connector during assembly.
Insert arrangement	A specific, standardized arrangement (pattern) of contacts for different shell sizes. The same insert arrangement in connectors allow them to be used with each other. Different insert arrangements can't be used with each but design flexibility with factors such as number of contacts, contact sizes, ampacity, voltages, contact spacing (density), and shell sizes.
Key	Protrusion ("male") which aligns with corresponding keyway for keying.
Keying	One or more sets of key and matching keyway which rotationally orientate two connectors during mating and prevents connectors with different keying from mating. Rotational orientation correctly positions pins and sockets engagement.
Keyway	Recessed slot ("female") which aligns with corresponding key for keying.
Pin (contact)	A contact having a mating end that enters the socket contact.
Socket (contact)	A contact having a mating end that will accept entry of a pin contact.

6.5 Amendment notations. The margins of this specification are marked with vertical lines to indicate modifications generated by this amendment. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations.

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The default tolerance is $\pm .005$ " and shall be used when another tolerance is not given.



RECEPTACLE PIN INSERT
FOR DETAIL A – SEE FIGURE 4

FIGURE 2. Receptacle intermateability dimensions.

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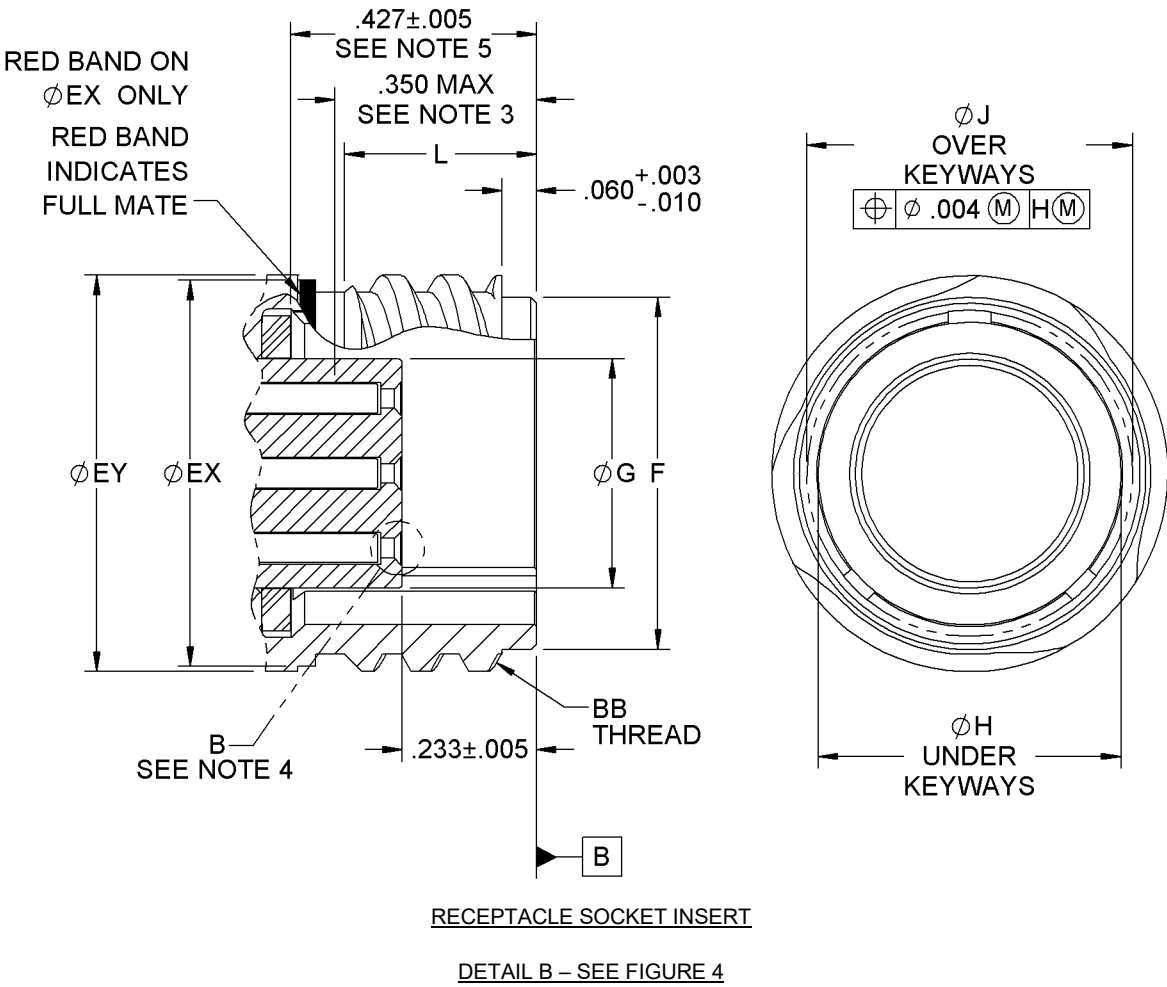
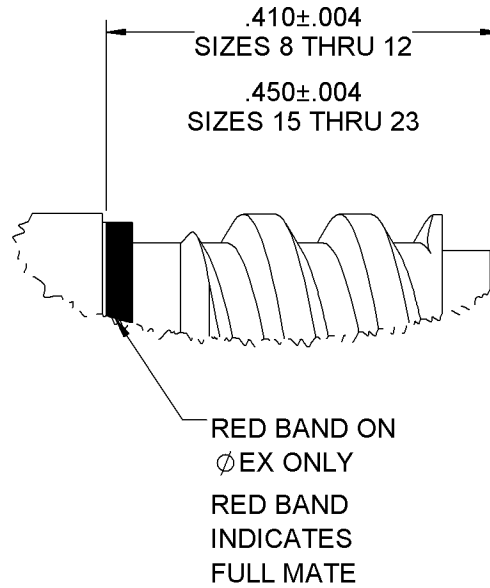


FIGURE 2. Receptacle intermateability dimensions. – Continued.

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Red band detail.

Shell size	F dia max receptacle thread lead-in	G dia max	H dia $\pm .002$, between keyways, receptacle shell ID	J dia $\pm .002$ over keyways	L min max	EX dia max receptacle thread clean-out	EY dia max receptacle shell
8	.410	.225	.328	.370	.308 .374	.450	.492
9	.498	.296	.406	.453		.513	.556
10	.559	.343	.475	.513		.575	.624
11	.617	.399	.526	.565		.638	.690
12	.681	.475	.599	.645		.700	.750
15	.799	.552	.690	.732	.345 .411	.888	.936
18	.974	.713	.845	.898		1.061	1.121
19	.995	.767	.915	.958		1.123	1.175
23	1.254	1.003	1.162	1.212		1.373	1.448

FIGURE 2. Receptacle intermateability dimensions. – Continued.

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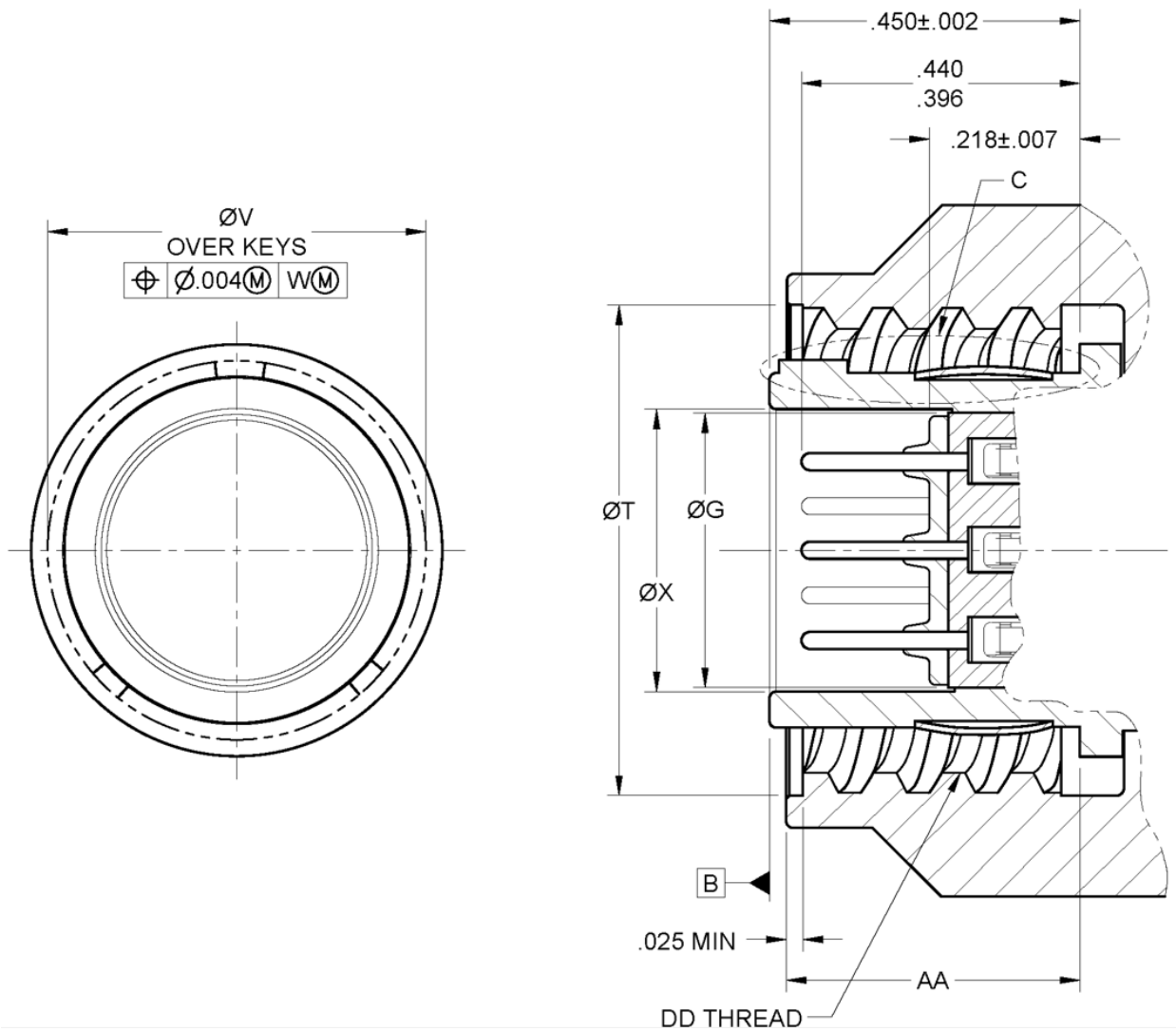
Receptacle BB-Thread (Triple 60° ACME Stub Modified Screw-Thread)									
Shell size	Designation a Class 2A thread (TS-2A)			External Threading Class 2A					
	Thread size (in)	Pitch	Lead	Major Diameter		Minor Diameter		Pitch Diameter	
				Max	Min	Max	Min	Max	Min
8	.5000	.1	.3	.499	.491	.443	.436	.473	.469
9	.5625			.561	.553	.505	.498	.535	.531
10	.6250			.624	.616	.568	.561	.598	.594
11	.6875			.686	.678	.630	.623	.660	.656
12	.7500			.749	.741	.693	.686	.723	.719
15	.9375			.936	.928	.880	.875	.910	.906
18	1.1250			1.123	1.111	1.051	1.044	1.089	1.085
19	1.1875			1.186	1.174	1.114	1.107	1.152	1.148
23	1.4375			1.436	1.434	1.364	1.357	1.402	1.398
Notes									
a. Threads are modified 60° stub configuration									
b. Gauges for plated threads: Maximum gauging limits of class 2A threads which are plated, are increased by the allowance .0015. Unplated threads, for example class Y, may be checked with standard after plate gauges.									

NOTES:

1. Dimensions are in inches.
2. For shell size used for part numbering, see [table I](#).
3. A point at which a gauge pin, having the same basic diameter as the mating contact and a square face, touches socket contact spring.
4. Details "A" (socket entry) and "B" (pin barrier) on [figure 4](#) apply to both plugs and receptacles.
5. Initial contact with static seal.
6. Insert front surface shall be flat within .005 in. TIR.
7. Diameters "H" and "G" shall be concentric within .005 in TIR at MMC.
8. Thread approach modified to eliminate cross-threading.
9. Red band location is critical. Dimensional verification of red band location is performed in Group A Inspection.
10. Gauges for plated threads: Maximum gauging limits of class 2A threads which are plated, are increased by the allowance. Unplated threads, for example class K, may be checked with standard after plate gauges.
11. When the receptacle is mated to the plug, the radius or chamfer shall neither damage the plug's EMI band nor impede EMI sealing.

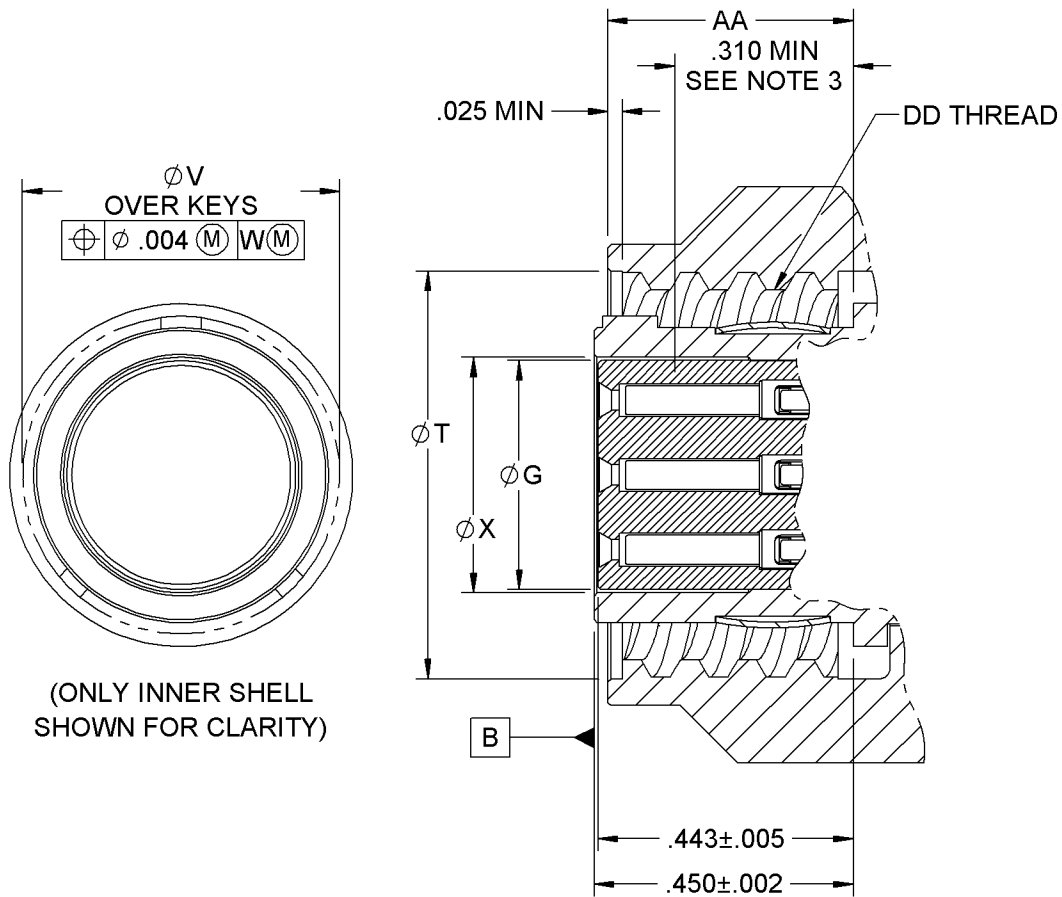
FIGURE 2. Receptacle intermateability dimensions. – Continued.

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PLUG PIN INSERT

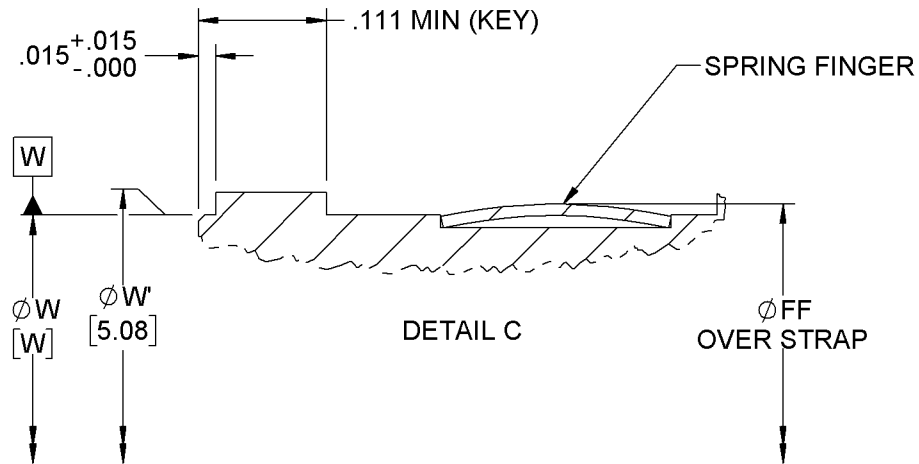
FIGURE 3. Plug intermateability control dimensions.



PLUG SOCKET INSERT

FIGURE 3. Plug intermateability control dimensions. – Continued.

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PLUG PIN INSERT

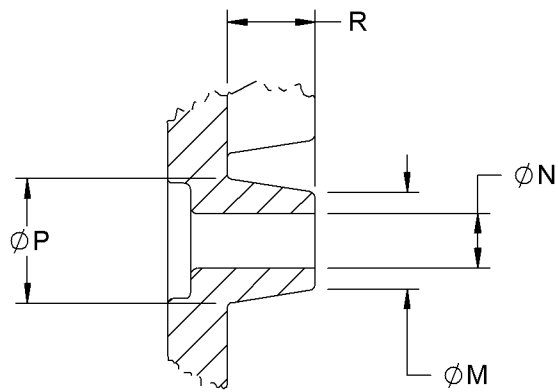
Shell size	W dia ± .002	W' dia Max between keys	T dia min coupling nut entrance dia	V dia ± .002 plug shell dia over keys	X dia min plug shell ID	AA to ensure red band coverage, min/max	FF dia, min Plug ESD Strap
8	.311	.317	.504	.349	.231	.419 .449	.331
9	.390	.396	.566	.433	.301		.409
10	.460	.464	.634	.495	.348		.478
11	.510	.518	.702	.546	.403		.529
12	.586	.592	.762	.629	.480		.602
15	.676	.682	.953	.715	.558	.459 .489	.693
18	.833	.8365	1.132	.879	.718		.848
19	.903	.8885	1.191	.943	.771		.918
23	1.150	1.1155	1.458	1.193	1.009		1.165
G dimension: see figure 2 .							

FIGURE 3. Plug intermateability control dimensions. – Continued.

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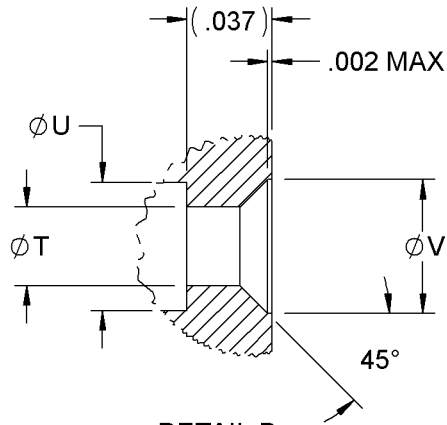
Plug Coupling Nut - DD-Thread (Triple 60° ACME Stub Modified Screw-Thread)									
Shell size	Designation ^a Class 2B thread (TS-2B)			Internal Threading Class 2B					
	Thread size	Pitch	Lead	Major Diameter		Minor Diameter		Pitch Diameter	
				Max	Min	Max	Min	Max	Min
8	.5000	.100	.300	.520	.504	.464	.454	.480	.474
9	.5625			.583	.567	.527	.517	.543	.537
10	.6250			.645	.629	.589	.579	.605	.599
11	.6875			.708	.692	.652	.642	.668	.662
12	.7500			.770	.754	.714	.704	.730	.724
15	.9375			.958	.942	.902	.892	.918	.912
18	1.1250			1.149	1.129	1.077	1.065	1.097	1.091
19	1.1875			1.212	1.192	1.139	1.127	1.160	1.154
23	1.4375			1.462	1.442	1.390	1.378	1.410	1.404
^a Threads are modified 60° stub configuration									

FIGURE 3. Plug intermateability control dimensions. – Continued.



DETAIL A

PIN CONTACT RAISED SEAL BARRIER



DETAIL B

SOCKET CONTACT CAVITY

FIGURE 4. Interface design.

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Contact size	Interface design - socket contact cavity, dia. (Detail B - socket entry)			Interface design - pin contact cavity, dia. (Detail A – pin barrier)			
	T	U	V	M	N max	P	R
23	.035 .033	~~.058~~ .057 ~~.055~~ .054	.060 .056	.042 .038	.025	.048 .054 .044 .050	.038+/- .005 .033+/- .005
20HD	~~.052~~ .050 ~~.050~~ .048	~~.086~~ .082 ~~.082~~ .079	.087.088 .085.084	.082 ~~.060~~ .078 .056	.038 .041	.098 .082 .094 .078	
20	.050 .047	.086 .082	.080 .076	.045 .042	.040	.070 .065	.055/.050
16	.074 .071	.121 .118	.114.112 .110.108	.098 .095	.060	.119 .114	.050+.005/- .000
12	~~.106~~ .105 ~~.104~~ .102	~~.169~~ .157 ~~.166~~ .155	.142.112 .140.108	.136 ~~.130~~ .132 .127	.093	.153 .146 .149 .141	

NOTES:

1. Dimensions are in inches.

FIGURE 4. Interface design. - Continued.

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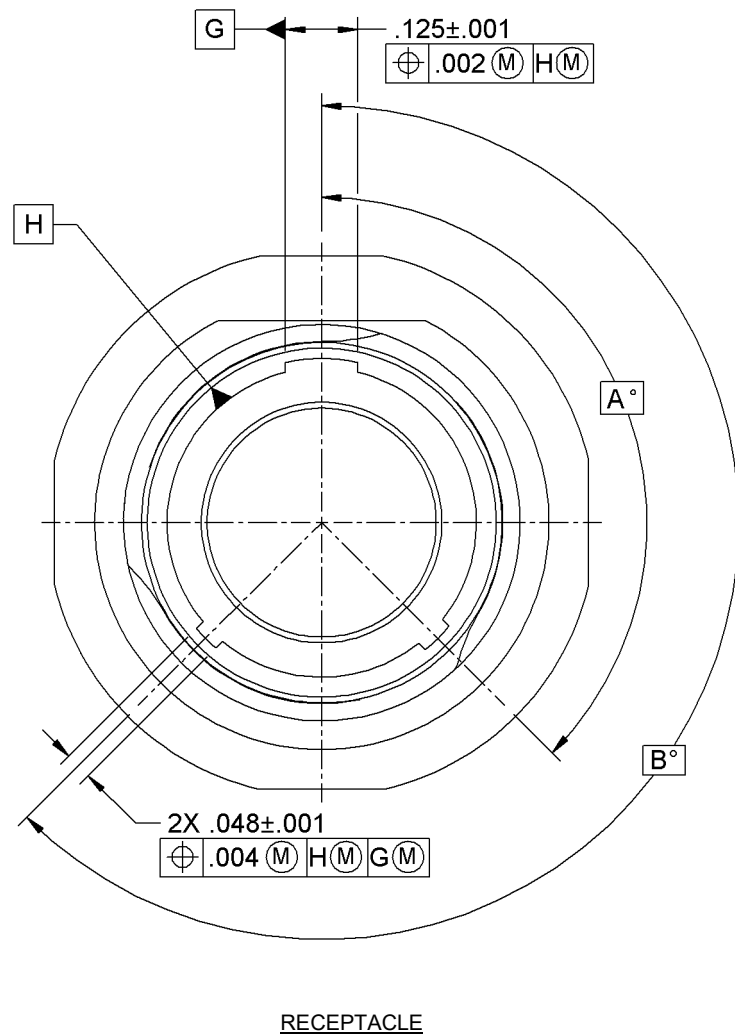


FIGURE 5. Connector intermateability dimensions. Main key / keyway polarization.

Polarization	A (degrees)	B (degrees)
A (normal /standard)	150	210
B	75	210
C	95	230
D	140	275
E	75	275
F	95	210

1. Dimensions are in inches.
2. All angles are BSC.
3. The insert arrangement does not rotate with main key/keyway.
4. For alternate rotations (other than normal (A)), the main key stays fixed, and the minor keys rotate.

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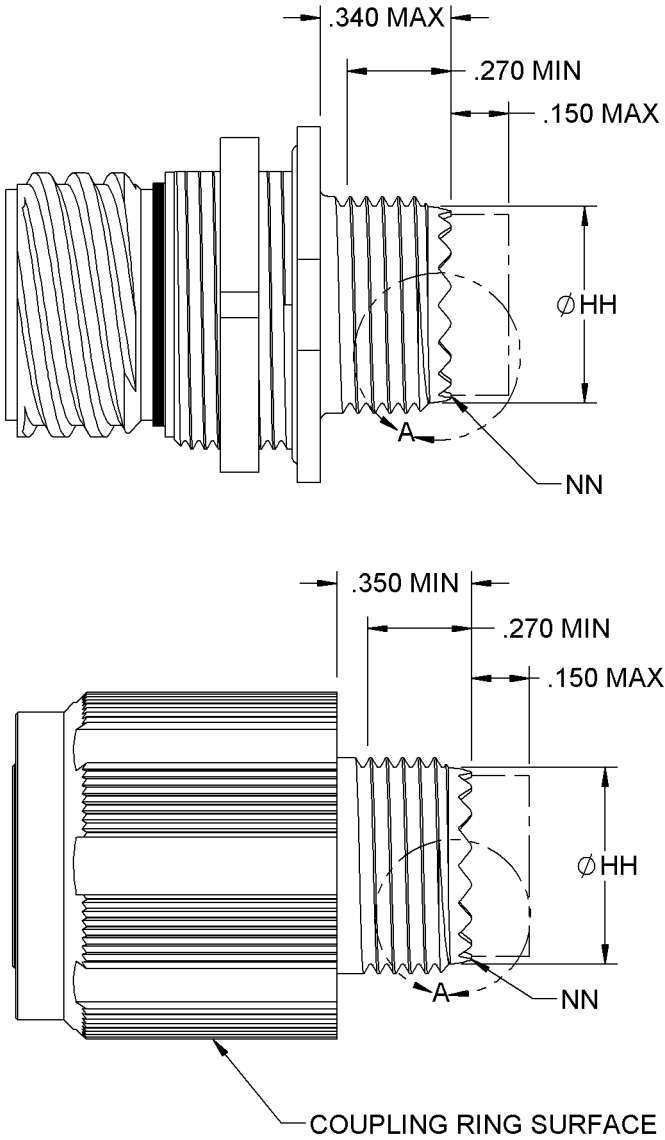
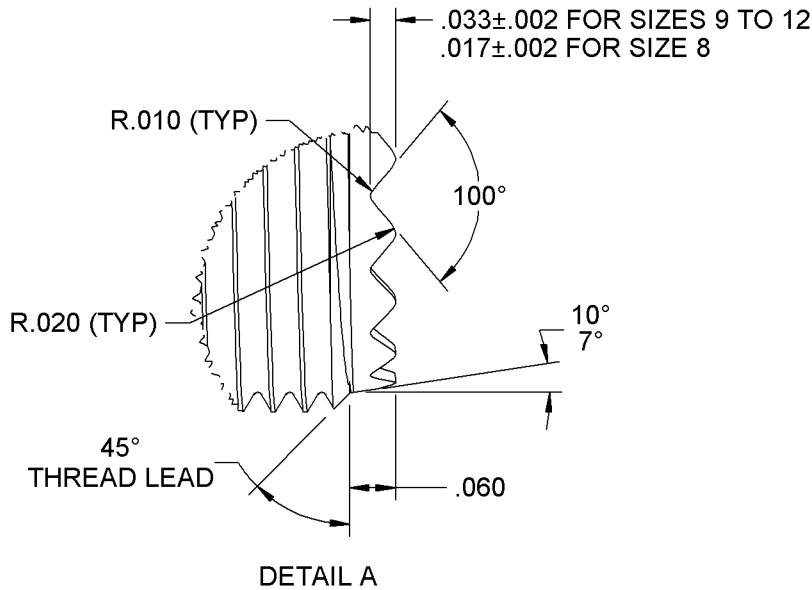


FIGURE 6. Connector accessory interface dimensions.

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Shell size	Ø HH +/- .005	NN No of Teeth	Accessory Threads (Inch)
8	.324	20	.3750-32 UNEF-2A
9	.392	12	.4375-28 UNEF-2A
10	.453	13	.5000-28 UNEF-2A
11	.513	16	.5625-24 UNEF-2A
12	.565	17	.6250-24 UNEF-2A
15	.695	23	.7500-20 UNEF-2A
18	.873	28	.9375-20 UNEF-2A
19	.873	28	.9375-20 UNEF-2A
23	1.128	35	1.1875-18 UNEF-2A

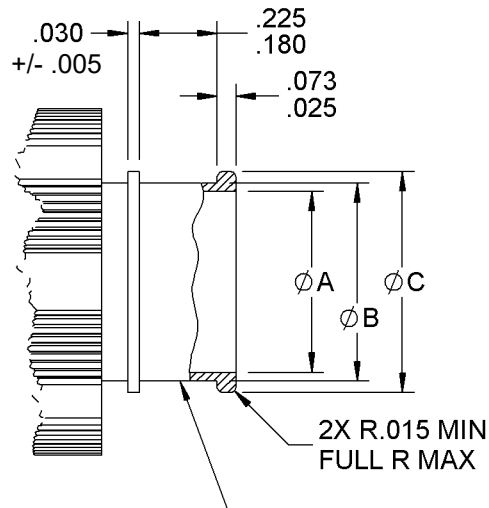
The axis of a tooth shall be in the medial plane of the main key or keyway.
Alignment tolerance of axis ± 1 degree.

NOTES:

1. Dimensions are in inches.
2. The centerline of specified projection must be located on vertical centerline within 2° of -G- (see [figure 5](#), key/keyway polarization).
3. Grommet may taper to shell inner diameter.

FIGURE 6. Connector accessory interface dimensions.— Continued.

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BANDING PLATFORM - DEPICITED GENERICALLY IN FIGURE AS A SMOOTH SURFACE WITHOUT ANY FEATURES, SURFACE DETAILS (ADDITIONAL REQUIREMENTS) DEFINED IN SECTION 3, BANDING PLATFORM

Shell size	A dia, min (ID shell – back end)	B dia, +/- .005 (OD over pattern)	C dia, +/- .005 (rear shoulder)
8	0.241	0.318	0.375
9	0.326	0.398	0.457
10	0.390	0.473	0.531
11	0.446	0.517	0.562
12	0.517	0.588	0.647
15	0.598	0.688	0.749
18	0.759	0.881	0.937
19	0.808	0.881	0.937
23	1.054	1.129	1.188

FIGURE 7. Connector with banding platform shell, interface dimensions.

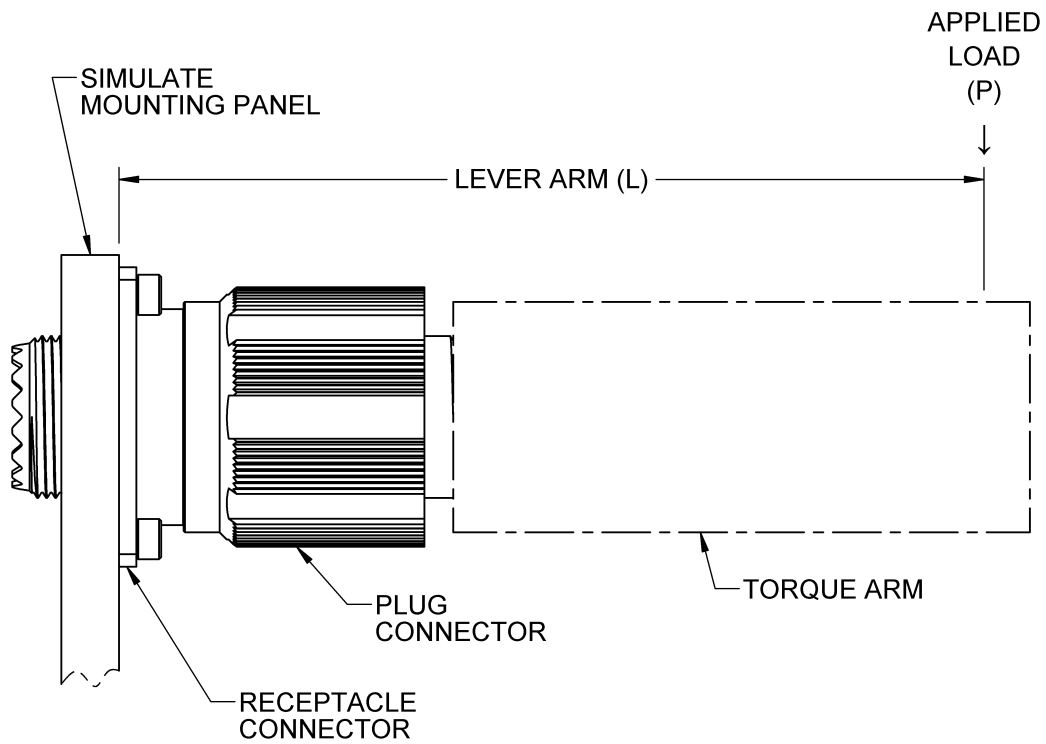
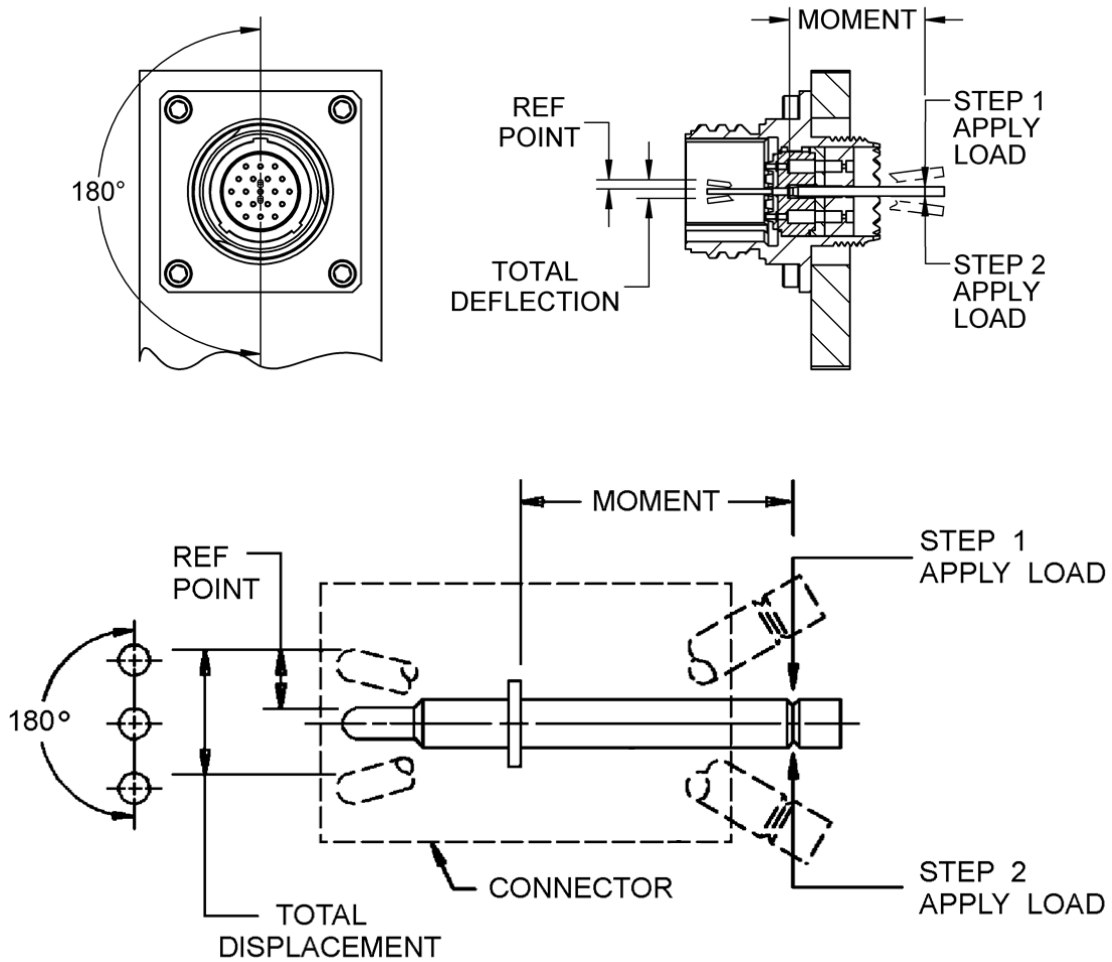


FIGURE 8. External bending moment test setup.

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Step 1 – Apply load to determine reference point.
Step 2 – Apply load in opposite direction (180°) and measure total deflection.

NOTES:
Dimensions are in inches.

FIGURE 9. Pin contact stability test.

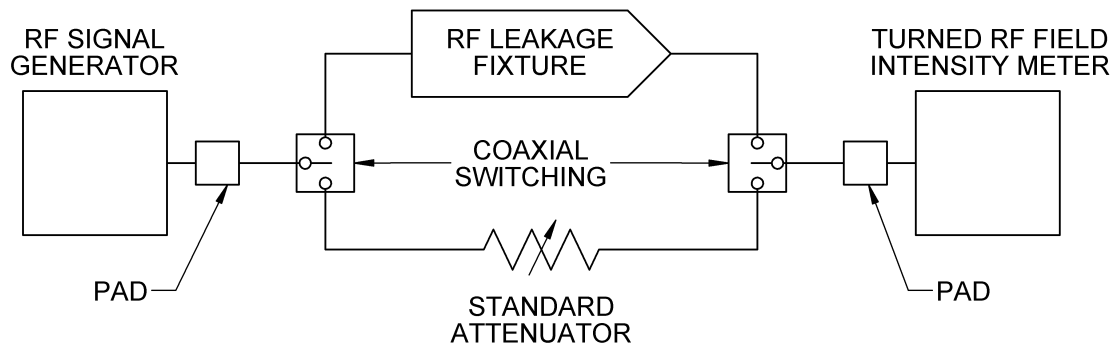


FIGURE 10. Test system schematic for RFI leakage test.

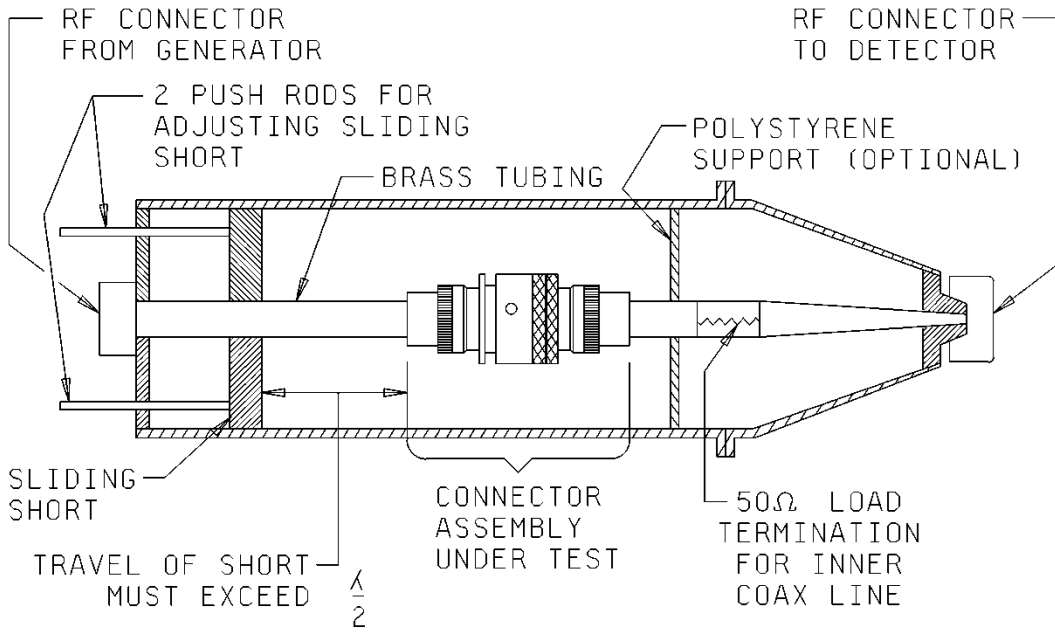


FIGURE 11. EMI/RFI leakage test fixture.

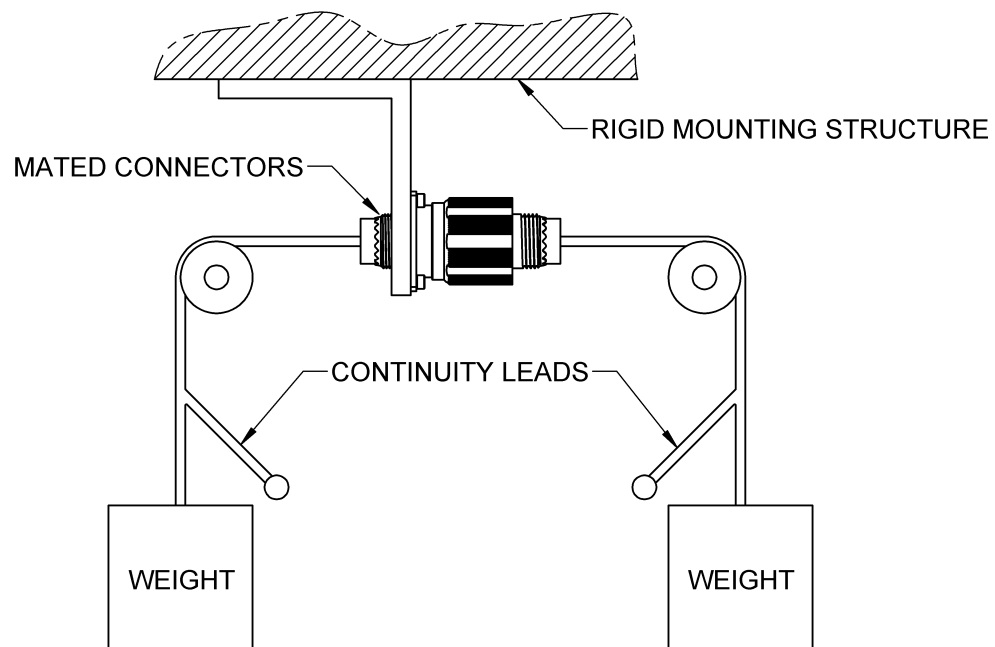
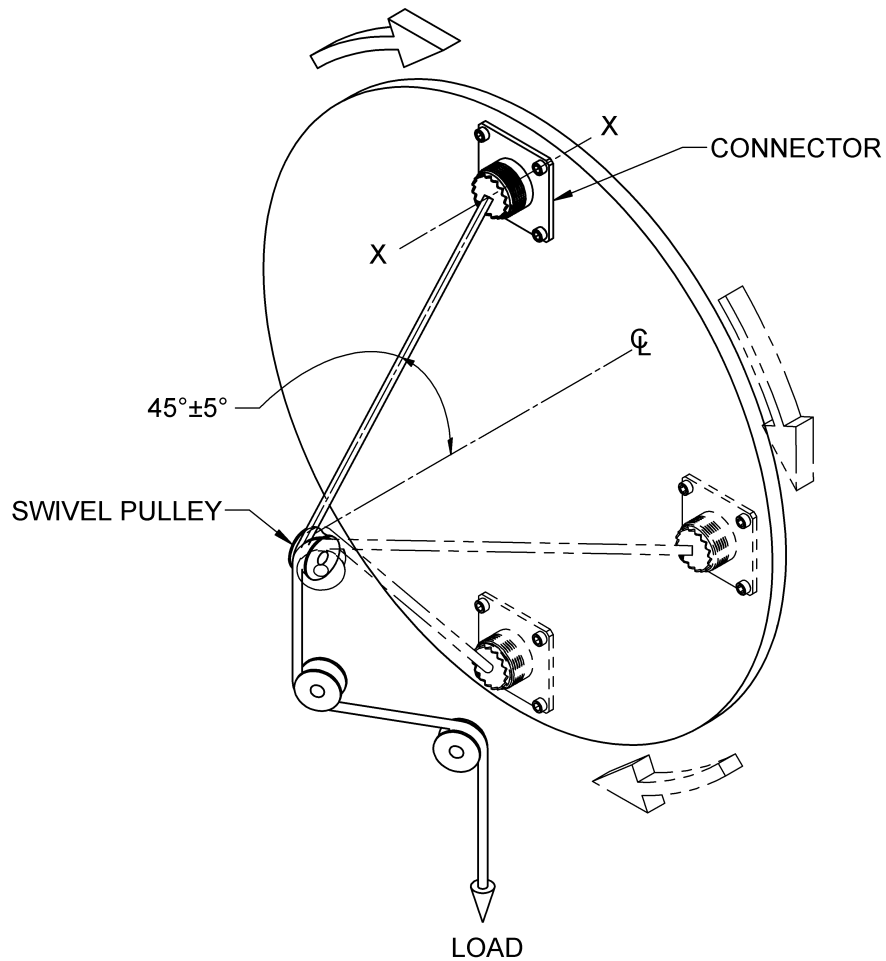


FIGURE 12. Typical fixturing for high temperature exposure with contact loading (orientation optional).



NOTE: Connector axis (ref X-X) to remain constant during rotation.

FIGURE 13. Contact retention system effectiveness (contact walk-out).

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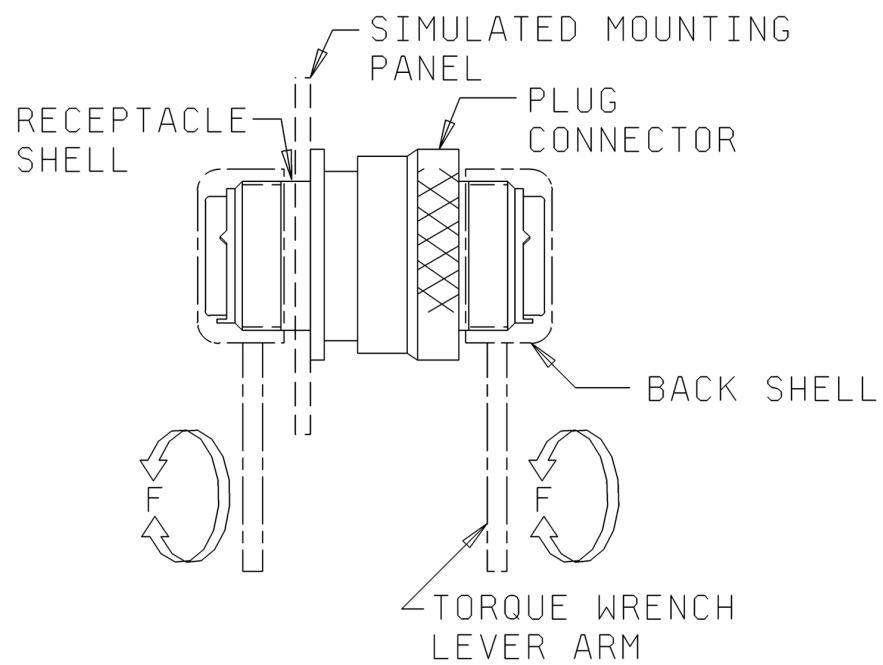


FIGURE 14. Rear accessory thread torque test setup.

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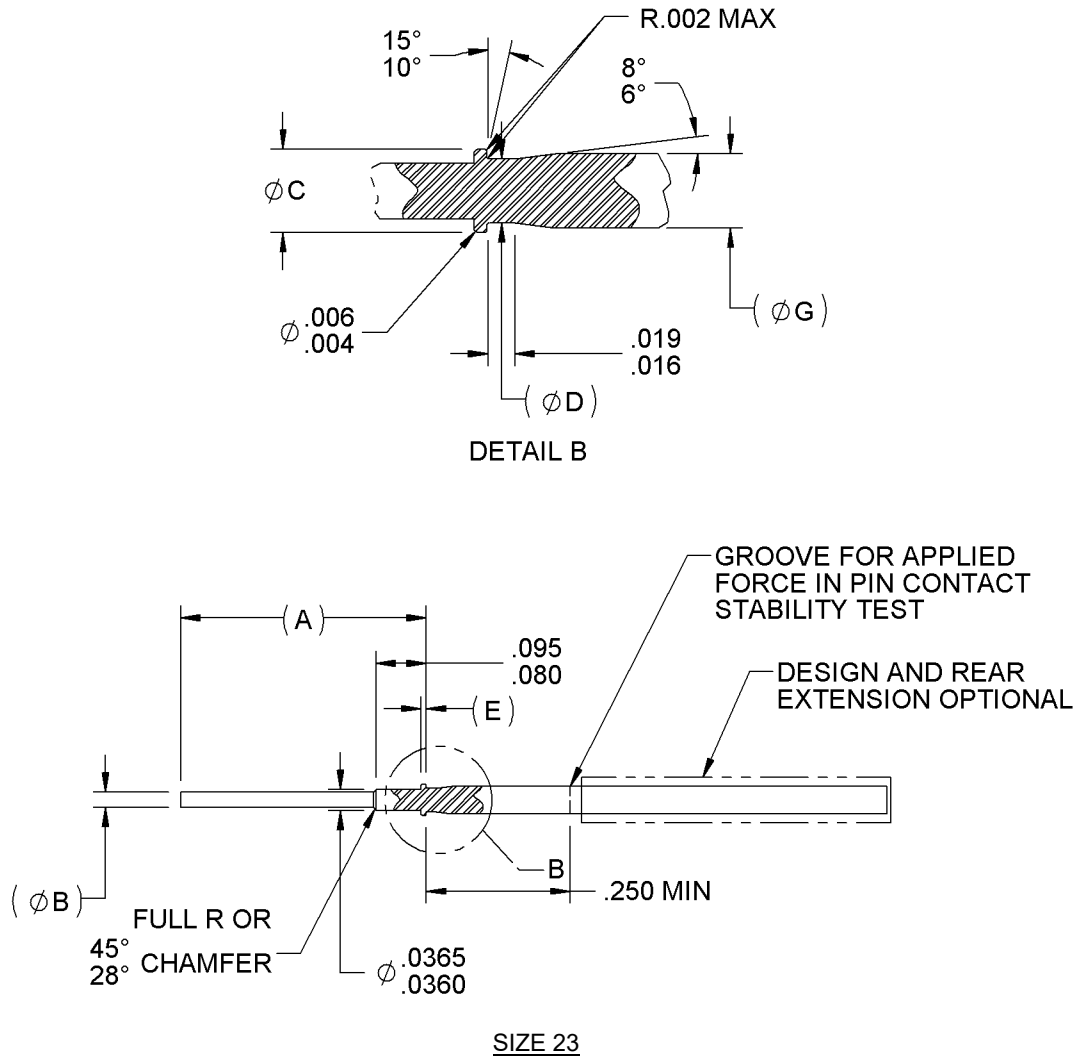


FIGURE 15. Test pin gauge, gauge location and gauge retention. - Continued.

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Contact size	A +.0005 -.0000	B dia +.0002 -.0000	C dia +.0002 -.0000	D dia +.0000 -.0002	E +.0000 -.0002	G dia +.0000 -.0002
23	.4200	.0265	.0540	.0415	.0120	.0480
20 and 20HD		.0390	.0910	.0410	.0330	.0700
16		.0615	.1270	---		.1030
12		.0930	.1790	---		.1510

NOTES:

1. Dimensions are in inches.
2. Design of rear extension is optional, but must have a groove provided as specified.
3. Material: Hardened tool steel.
4. Finish: 32 microinches polished.

FIGURE 15. Test pin gauge, gauge location and gauge retention. - Continued.

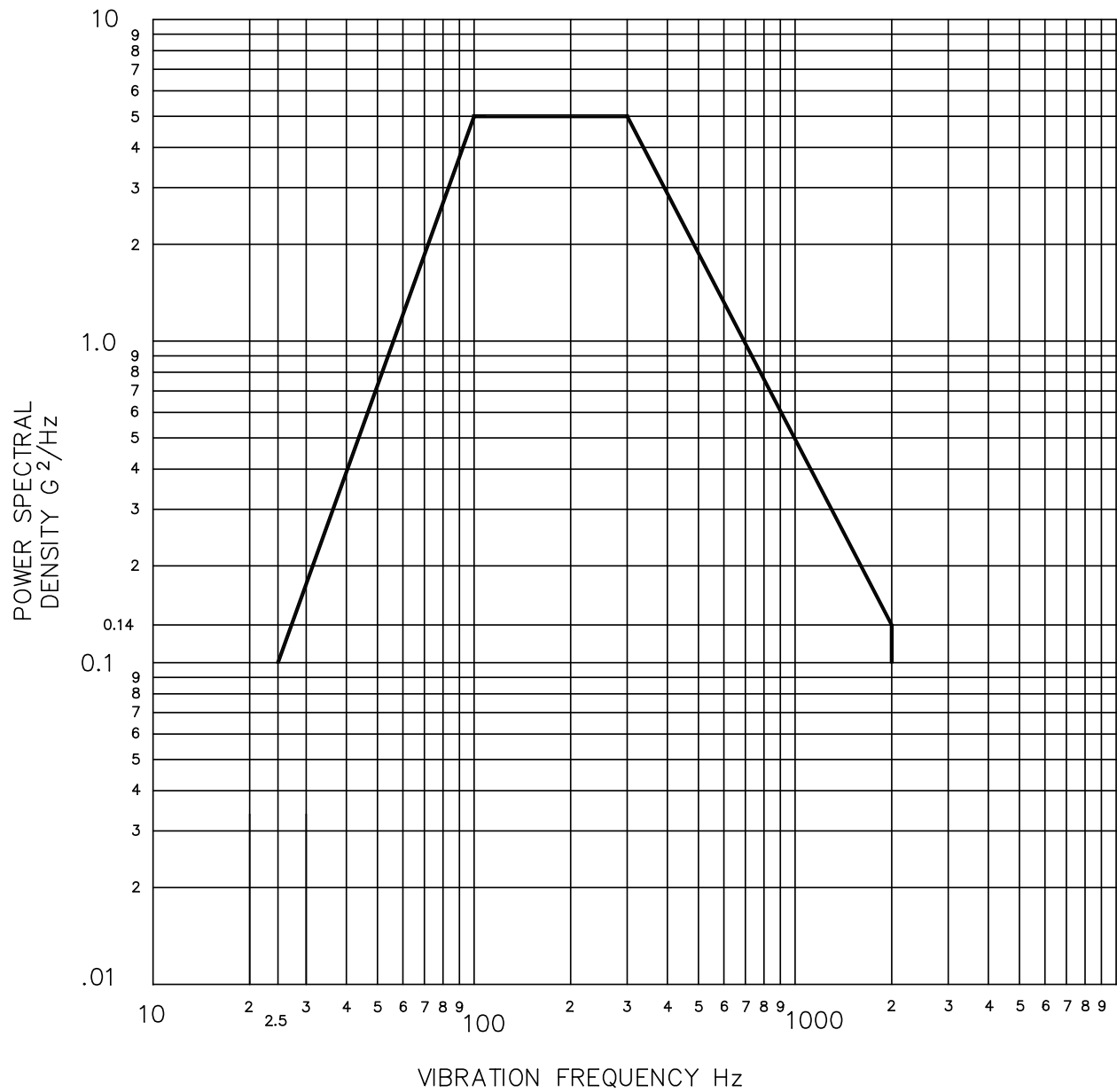
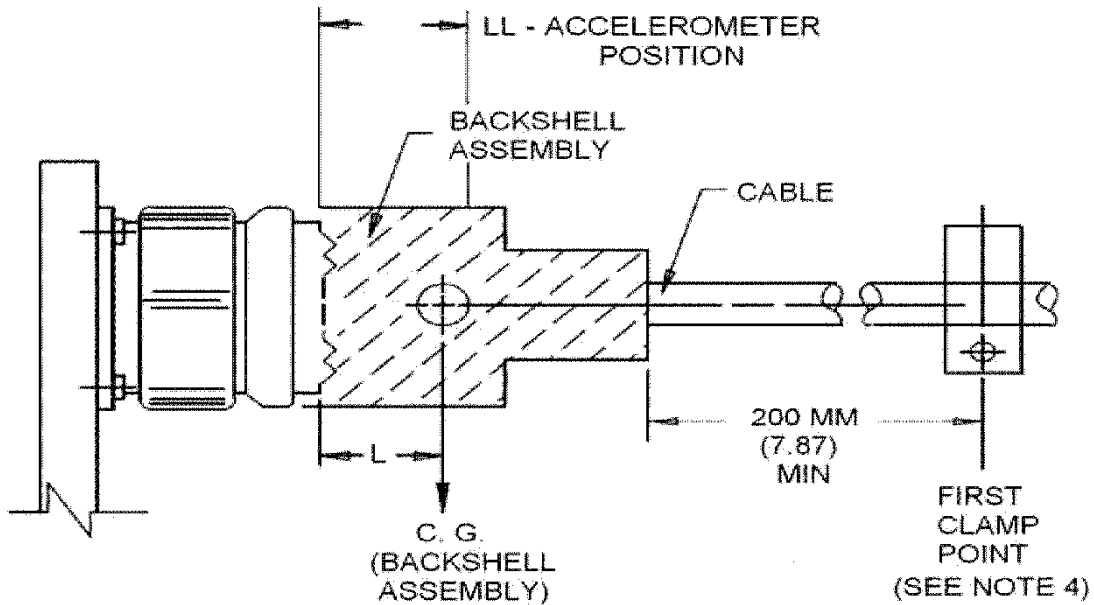


FIGURE 16. Random vibration.

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Shell size	L (mm) root to C.G. + 10% - 0%	Weight (kg) backshell assembly + 10% - 0%	LL (mm) ± 1
8	15.24	.05	10.2
9	17.78	.06	10.2
10	19.05	.07	17.8
11	19.05	.09	25.4
12	19.05	.11	25.4
15	22.86	.18	30.5
18	22.86	.22	30.5
19	23.37	.25	35.6
23	23.37	.31	35.6

NOTES:

1. Dimensions are in millimeters.
2. Shape of test accessory is optional.
3. The test accessory may include a strain relief clamp.
4. Clamp point to be located on vibration table, and cable weight between rear of grommet and tie down clamp point to be considered a portion of the backshell assembly weight.

FIGURE 17. Vibration test accessory load fixture.

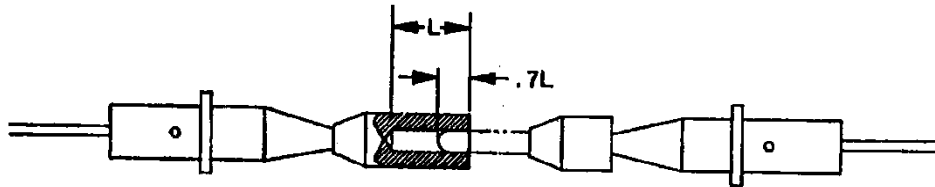


FIGURE 18. Depth of contact engagement for verification testing.

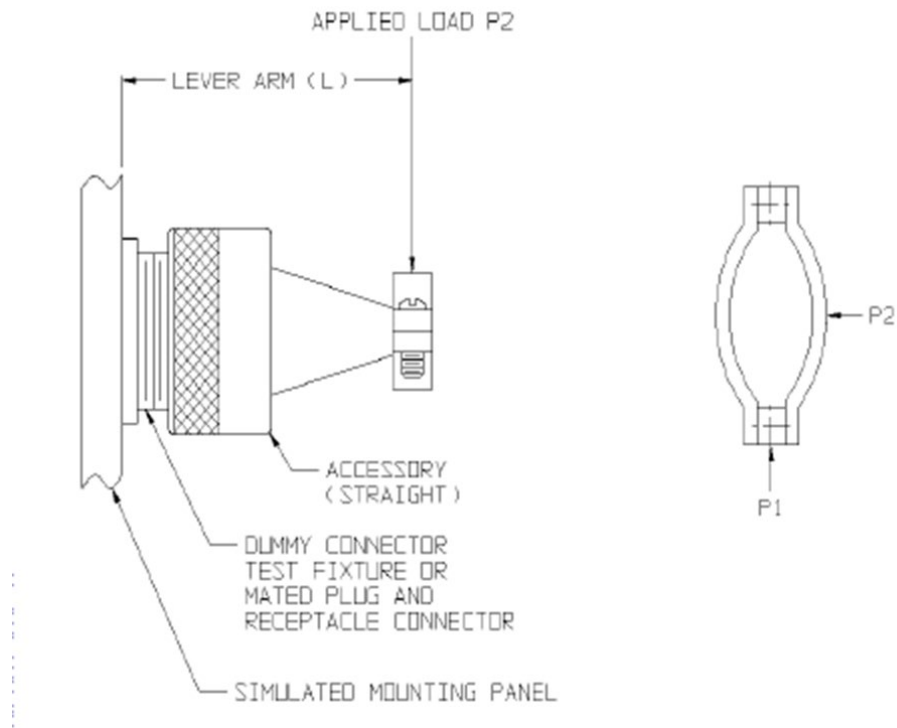


FIGURE 19. External bending moment, accessories, test setup.

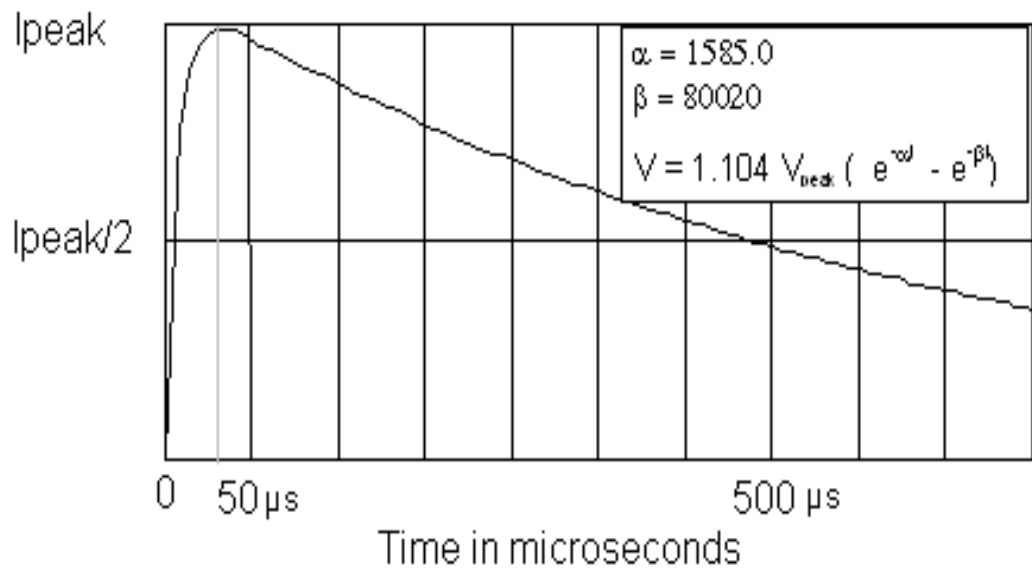


FIGURE 20. Waveform for indirect lightning strike effects.

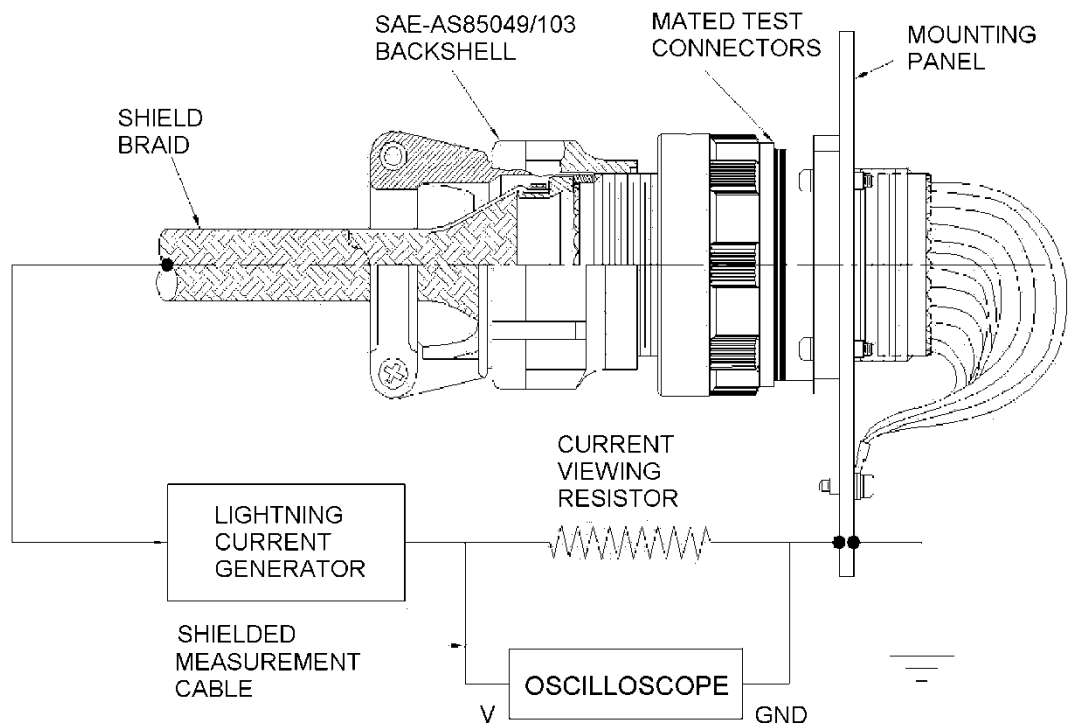


FIGURE 21. Indirect lightning strike test setup.

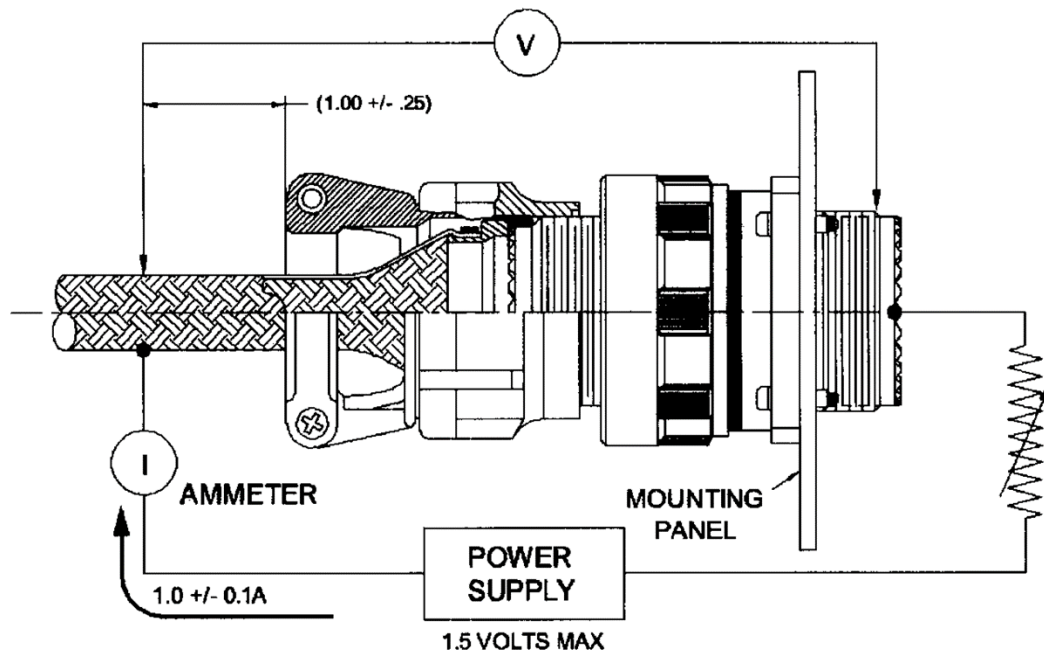


FIGURE 22. Shield braid-to-shell conductivity.

CONCLUDING MATERIAL

Custodians:

Army - CR
Navy - AS
Air Force - 85
DLA - CC

Preparing activity:

DLA - CC

(Project 5935-2026-039)

Review activities:

Navy - EC, SH

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 <https://assist.dla.mil>.