INCH-POUND
MIL-PRF-24308D
15 July 1996
SUPERSEDING
MIL-C-24308C
26 January 1989

PERFORMANCE SPECIFICATION

CONNECTORS, ELECTRIC, RECTANGULAR, NONENVIRONMENTAL, MINIATURE, POLARIZED SHELL, RACK AND PANEL, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the performance requirements for nonenvironmental, polarized shell, miniature, rack and panel connectors having pin and socket, crimp (removable), solder (nonremovable), or insulation displacement (nonremovable) contacts with rigid or float mounting, designed for -55°C to +125°C operating temperature.

1.2 Classification

1.2.1 Classes. Connectors covered by this specification are of the following classes.

G - General purpose connectors, see 3.3.6.1. 1/
N - Nonmagnetic connectors, see 3.3.6.1. 1/
H - Hermetic connectors.
M - Same as N except see 2/.
D - Same as G except see 2/.
K - Same as H except see 2/.

1.2.2 Style of termination. Connectors covered by this specification are of the following terminal types:

Crimp
Solder
Insulation displacement contact (IDC)
Printed wiring board (PWB)

1.2.3 Types. Connectors covered by this specification are of the following types:
I - Standard density (size 20 contacts).
II - High density (size 22D contacts).
III- Standard density (size 20 IDC contacts).

1/ Classes G and N, zinc-plated parts are not to be used on aerospace or missile applications (see 3.3.1) .

2/ Classes D, K, and M are intended for space missions where high reliability is required.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Defense Electronics Supply Center, ATTN: DESC-ELDI, 1507 Wilmington Pike, Dayton, OH 45444-5765 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 5935
DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this standard. This section does not include documents cited in other sections of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this standard, 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

QQ-N-290 - Nickel Plating (Electrodeposited).
QQ-P-35 - Passivation Treatments for Corrosion-Resisting Steel.
QQ-P-416 - Plating, Cadmium (Electrodeposited).

STANDARDS

MILITARY

MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
MIL-STD-1285 - Marking of Electrical and Electronic Part.
MIL-STD-1344 - Test Methods for Electrical Connectors.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Printing Service Detachment Office, Blgd. 4D (Customer Service), 700 Robbins Avenue, Philadelphia, PA 19111-5094.

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 issue are those cited in the solicitation.

SP-R-0022 - Vacuum Stability Requirements of Polymeric Material for Spacecraft Applications.

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 the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

American Society for Testing and Materials (ASTM)

ASTM A342 - Test method for permeability of feebly magnetic materials.
ASTM B633 - Zinc on Iron and Steel, Electrodeposited Coatings of.
ASTM B733 - Autocatalytic Nickel-Phosphorus Coatings on Metal.
ASTM E595 - Material from Outgassing in a Vacuum Environment, Total Mass Loss and Collected Volatile Condensable, Standard Test Method for.

(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

American National Standards Institute Inc.

ANSI/NCSL Z540-1 - Calibration Laboratories and Measuring and Test equipment, General requirements
J-STD-004 - Requirements for Solder Fluxes
J-STD-005 - Requirements for Solder Paste
J-STD-006 - Requirements for Electronic Grade Solder Alloys, Fluxed and Non Fluxed Solid Solders for Electronic soldering applications.

(Application for copies should be addressed to the American National Standards Institute, Inc 1430 Broadway, New York 10017.)

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

INTERNATIONAL ORGANIZATION FOR STANDARDS (ISO)

ISO 10012-1 - Quality Assurance Requirements for Measuring Equipment , Part 1: Meteorological Confirmation System for Measuring Equipment.

(Application for copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), 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. Connector assemblies 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 4.5 and 6.3).

3.2.2 Quality

3.2.2.1 Statistical process control (SPC). The contractor shall implement and use statistical process control techniques in the manufacturing process for parts covered by this specification. The SPC program shall be developed and maintained in accordance with ANSI/EIA-557. Where SPC cannot be utilized because of non-continuous production requirements, a lot sampling plan for inspection in accordance with table XI with c = 0 can be utilized. The SPC and c = 0 programs shall be documented and maintained as part of the overall reliability assurance program as specified in ANSI/EIA-557 or other equivalent industry overall reliability program. Evidence of such compliance shall be verified by the qualifying activity of this specification as a prerequisite for qualification effective 24 months after the date of this document.

3.3 Materials. Materials shall be as identified herein or as approved by the qualifying activity. However, when a definite material is not specified, a material shall be used which will enable the connectors to meet the performance requirements of this specification. Acceptance or approval of any constituent material shall not be construed as a guarantee for acceptance of the finished product.

3.3.1 Reference critical interface, materials, platings and processes. The identified reference critical interface, materials, platings, and processes have been established to provide assurances that connectors manufactured to this specification will properly interface to similar industry standard or government specified connector systems without problems of electrochemical contamination of critical electrical or mechanical interfaces or generation of incompatible mechanical interface surface wear products. The manufacturer of connectors supplied to this specification are allowed to use alternate recognized industry standard materials, platings, and processes from those identified in paragraphs 3.3 of this specification. Alternate materials, platings and processes used must be coordinated with the qualifying activity as part of the qualification process. Use of alternates to those referenced guidance items by the supplier must not result in inferior short or long term performance or reliability of supplied connectors as compared with connectors manufactured using the referenced materials, platings, or processes. Short or long term failures or reliability problems due to use of these alternates shall be the responsibility of the supplier. Previously required military specified materials, platings and processes are listed in section 6.8 and 6.9 for reference and guidance.

3.3.2 Dissimilar metals. When dissimilar metals are employed in intimate contact with each other, protection against electrolytic corrosion shall be provided (see 3.3.1).

3.3.3 Nonmagnetic materials (classes M and N connectors). All parts used in classes M and N connectors shall be made from materials which are classed as nonmagnetic (see 3.6.1).

3.3.4 Contact materials. Classes D, G, M, and N contact bodies shall be made of suitably conductive copper based alloys. Classes H and K contacts may be ferrous alloy material. All contacts shall be suitably protected from corrosion. When contacts are in-process plated in strip form, the absence of plating in the separation area is acceptable, provided the area is nonfunctional and any corrosion products formed as a result of salt spray testing (4.7.18) does not appear in contact mating or termination area.

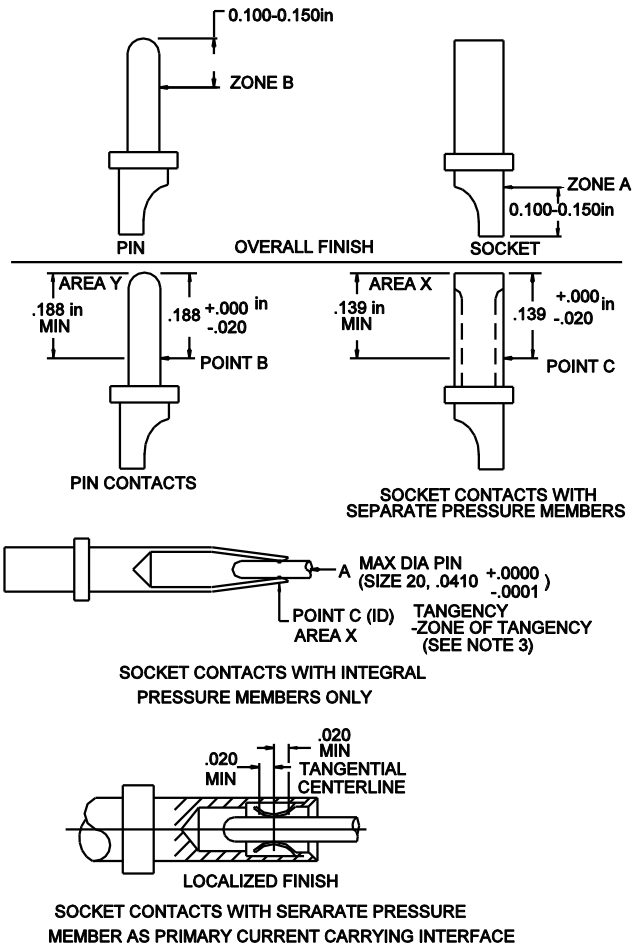
3.3.4.1 Accessory members. Contact accessory members such as hoods, pressure members and retaining devices shall be made of corrosion resistant material or shall be suitably treated to resist corrosion.

3.3.4.2 Contact finish (solder contact). The finish on contact bodies shall be gold (see 3.3.1)or an equivalent or better finish applied either overall or localized for class G (see 6.5). The finish on contact bodies for classes D, K, and M shall be gold or an equivalent or better finish applied overall. The finish on contact bodies for class H shall be tin or an equivalent or better finish applied overall.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

3.3.4.2.1 Overall finish. Contact bodies shall have an equivalent or better finish than contacts which are overall gold-plated (see 3.3), over a suitable underplate (see 6.5). Silver shall not be used as an underplate. Nickel shall not be used as an underplate on classes M and N. The finish on contact bodies of class H connectors shall be electro-tin (see 3.3.1) or an equivalent or better finish (no organic brighteners). Preliminary plating of another metal is permissible.

3.3.4.2.2 Localized finish. Contact bodies shall be overall nickel plated in accordance with QQ-N-290 or an equivalent industry standard when available, except plating thickness shall be 30 to 150 microinches thick (see 6.5). Mechanical operations may be performed after application of plating.



NOTES:
1. Overall finish: Measure gold thickness in zone A or B, as applicable.
2. Localized finish: Apply gold to the inside and outside diameter of the contact in area X or Y. Measure gold thickness on outside diameter of the contact at point B or C, as applicable
3. On socket contacts with integral pressure members area X (zone of tangency) extends from the tip of the contact to .020 inch beyond the point of tangency, point C on the inside and outside diameter of the contact.

FIGURE 1. Gold thickness areas.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

3.3.4.2.2.1 Contact mating area. The contact mating area as shown on figure 1 shall have an equivalent or better finish than contacts which are gold plated (see 3.3.1) over nickel plating (see 3.3.4.2.2).

3.3.4.2.2.2 Terminations. Terminations shall be plated as follows:

a. Solder cups: 100 microinches minimum tin-lead plated (see 3.3.1), 50 to 95 percent tin.

b. Insulation displacement: 100 microinches minimum tin-lead plated (see 3.3.1) , 50 to 95 percent tin.

c. Printed wiring tails: (See 3.3.1), 100 microinches minimum tin-lead plated (see 3.3.1).

3.3.5 Dielectric materials.

3.3.5.1 Insert. Insert materials shall conform to diallyl phathalate resin (see 3.3.1) or thermoplastic polyester (see 3.3.1), for classes D, G, M, and N connectors. Insert dielectric material for classes H and K shall be glass.

3.3.6 Metal components. Metal components shall be of high grade corrosion resistant material or a material treated to resist corrosion which will allow the complete connector assembly to meet the requirements of this specification.

3.3.6.1 Finish (classes G and N) 3/. Shells shall be cadmium plated in accordance with type II, class 2 of QQ-P-416 or an equivalent industry standard when available or zinc plated in accordance with ASTM B633. A preliminary plating of another metal is permissible. The resulting finish shall be electrically conductive, and shall be of a golden color to ensure that the chromate finish has been properly applied. Corrosion-resistant steel parts including shells shall be passivated in accordance with QQ-P-35 or an equivalent industry standard when available and need not be overplated.

3.3.6.2 Finish for class H connectors. Unless otherwise specified, all metal parts for class H connectors shall be tin plated (see 3.3.1). Preliminary plating of another metal is permissible.

3.3.6.3 Finish for classes D, K, and M connectors. All metal parts for classes D and K connectors shall be electrically conductive nickel-phosporus conforming to ASTM B733, class 1 or 2, type III, .0005 inch minimum thickness, or an equivalent industry standard when available, class 1 or 2, grade B, finish shall be dull. Use of a suitable underplate is permissible. For class M, the finish shall be gold (see 3.3.1) over a suitable underplate (see 6.5). A silver underplate shall not be used.

3.4 Interface and physical dimensions. Connectors shall be of the physical dimensions specified (see 3.1). Connectors shall be so designed that neither the pins nor the sockets will be damaged during normal mating of counterpart connectors.

3.4.1 Contact interface design. Contacts interface design shall be as specified on individual standards or military specification sheets (see 3.1).

3.4.1.1 Solder contacts. Solder contacts shall be nonremovable from the insert, shall have eyelet or solder cup terminals as specified (see 3.1 and 3.3.1). Solder cups shall be so designed such that during soldering, no components will be damaged and no liquid solder shall escape.

3.4.1.2 Crimp contacts. Crimp contacts (see 3.3.1) shall be as follows:

Connector density	Contact size
High	22D socket
High	22D pin
Standard	20 pin
Standard	20 socket

3.4.1.2.1 Contact insertion and removal tools. Crimp removable connectors shall be designed for contact insertion and removal with the applicable tools (see 3.3.1).

3.4.1.3 Classes H and K contacts. Classes H and K contacts shall be permanently fused in place and shall have eyelet or solder cup terminals, as specified (see 3.1 and 3.3.1).

3.4.1.4 Insulation displacement contacts. Insulation displacement contacts shall be nonremovable from the insert and shall be as specified (see 3.1).

3/ Cadmium finished parts (F suffix PIN's) can be used interchangeably for non suffix parts.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

3.4.2 Insert design and construction. Inserts shall be designed with suitable sections and radii such that they will not readily chip, crack, or break in assembly or in normal service. Inserts shall be molded or bonded with a bond barrier between all adjacent contacts and outside edge, one-piece construction, except for IDC. Pin entry openings on socket insert faces shall be as small as practicable. Socket inserts shall provide adequate protection against a pin contacting a socket before the mating pair of connectors has been polarized. The inserts shall be so designed that the inserts cannot be removed from the shells. The contact retaining system shall be free of foreign material, adhesive, or any obstruction that would prevent smooth contact insertion and positive retention. The contact retention system for removable crimp contact connectors shall be a metal retention clip.

3.4.2.1 Insert arrangement. The insert arrangement shall be as specified by the connector part number (see 3.1).

3.4.2.2 Contact alignment and stability. With all contacts in place, the alignment of pin and socket contacts shall always permit engagement irrespective of buildup of allowable tolerances on hole locations, distortion of contacts due to crimping, and insert location in the shell.

3.4.3 Shell design. The shell shall be designed to positively retain the insert and shall be so constructed that the insert cannot be removed.

3.4.3.1 Shell polarization. Polarization shall be accomplished by a keystone shape shell design with polarization accomplished before engagement of the pins and sockets.

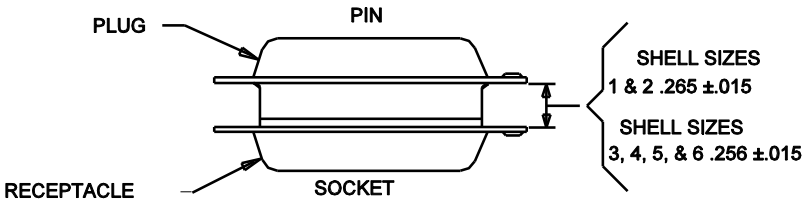
3.4.3.2 Mounting. Connectors shall be provided with means to fasten the shell securely to a mounting surface. Classes H and K connectors shall be provided with solder mounting provisions, or with provisions for external mounting hardware (see 3.1).

3.4.4 Interchangeability and intermatability.

3.4.4.1 Intermatability. Plug and receptacle connectors having the same shell size, keying and contact arrangement shall be intermatable. Materials and processes used shall be completely and totally compatible with materials and processes used to supply components supplied to MIL-C-24308C. This compatibility shall not be subject to any precautionary, installation or maintenance procedures not in place as of 26 January 1989.

3.4.4.2 Interchangeability. All connectors and accessories having the same military PIN shall be completely interchangeable with each other and MIL-C-24308C having the same military PIN with respect to installation (physical), performance (function) and intermatability, as specified herein. Solder and crimp contact connectors shall be intermatable (see 3.1).

3.4.5 Mated spacing. Connectors shall meet applicable performance requirements when mated within the spacing shown below.



3.5 Performance. Connectors shall be designed to meet the performance requirements specified herein.

3.5.1 Magnetic permeability (classes M and N). The relative permeability of classes M and N connectors shall not exceed 2 mμ when measured as specified in 4.7.3.

3.5.2 Maintenance aging (crimp type). All crimp-contact connectors shall be capable of conforming to the requirements of 3.5.3 and 3.5.4 after maintenance aging of 4.7.4.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

3.5.3 Contact insertion and removal forces. The axial forces required to insert and remove removable contacts shall conform with the applicable requirements of table I when tested in accordance with 4.7.5.

TABLE I. Contact insertion and removal forces (pounds maximum).

	Contact size	
	20	22D
Insertion	4	4
Removal	4	4

3.5.4 Mating and unmating force. The force for mating and unmating of counterpart connectors shall meet the requirements of table II. The connectors used in this test shall have the complete complement of contacts. Testing shall be as specified in 4.7.6.

TABLE II. Mating and unmating forces (pounds)

Shell size	Unmating				Mating	
	Minimum		Maximum		Maximum	
	Class		Class		Class	
	G, D, M, N	H, K	G, D, M, N	H, K	G, D, M, N	H, K
1	0.75	1.50	6.0	7.00	10.0	7.25
2	1.00	2.00	10.0	13.00	17.0	13.00
3	1.75	3.25	17.0	21.25	28.0	21.25
4	2.50	4.50	24.0	31.25	39.0	31.25
5	3.25	5.50	30.0	42.25	49.0	42.25
6	4.50	----	39.0	-----	65.0	-----

3.5.5 Contact retention. Contacts for classes G, D, M, and N connectors shall be retained in their inserts by a 9-pound (minimum) force. The axial displacement of contacts shall not exceed 0.012 inch (0.30 mm) while under load (see 4.7.7).

3.5.6 Dielectric withstanding voltage. Unmated connectors shall show no evidence of breakdown or flashover when subjected to the test voltages and altitude of tables III and IV. Corona shall not be considered as breakdown. Testing shall be as specified in 4.7.8.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

TABLE III. Type I and II test voltage (rms 60 hertz ac volts). 1/

Altitude	Humidity conditioned (see 4.7.14)		All other conditions	
	Class G, D, M, N	Class H, K	Class G, D, M, N	Class H, K
Sea level	600	400	1,000	750
70,000 feet	---	---	325	175

1/ These are not working voltages.

TABLE IV. Type III test voltage (rms 60 hertz ac volts). 1/

Altitude	Humidity conditioned (see 4.7.14)	All other conditions
	Class G	
Sea level	500	500
70,000 feet	---	200

1/ These are not working voltages.

3.5.7 Cable retention (flat cable only). When connectors are tested as specified in 4.7.9, they shall withstand the minimum applied force without mechanical damage.

3.5.8 Insulation resistance at ambient temperature. The insulation resistance of unmated connectors shall conform with the applicable requirements of table V when tested in accordance with 4.7.10.

TABLE V. Insulation resistance.

Humidity conditioned (see 4.7.14)		All other conditions
After step 6 of method 1002 of MIL-STD-1344 or an equivalent industry standard when available	After 24 hours of conditioning (method 1002 of MIL-STD-1344 or an equivalent industry standard when available)	
Megohms (min)	Megohms (min)	Megohms (min)
1	1.000	5,000

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

3.5.9 Contact resistance. Contact resistance for mated pairs of pin and socket contacts shall be as required by table VI when tested in accordance with 4.7.11.

TABLE VI. Contact resistance (millivolts maximum).

Contacts						
Contact size or type	AWG wire size	Test current (amperes)	Class			
			G, D, M, N		H, K	
			After salt spray	All others conditions	After salt spray	All others conditions
20	24	3.0	55	45	---	---
	20	7.5	65	55	---	---
	24	2.0	---	---	ind 165	ind 165
	20	5.0	---	---	avg 90	avg 70
IDC	28	1.0	75	65	---	---

3.5.10 Contact engagement and separation forces. Socket contacts shall conform with the forces specified in table VII when tested in accordance with 4.7.12.

TABLE VII. Contact engagement and separation forces (ounces).

Initial			
Solder contact size	Maximum individual engagement force (ounces) using maximum diameter test pin	Maximum average engagement force (ounces) using maximum diameter test pin	Minimum separation force (ounces) using minimum diameter test pin
22D	12.0	9.5	0.7
20	18.0	12.0	0.7
IDC	18.0	12.0	0.7
After conditioning			
22D	14	11.4	0.6
20	22	14	0.6

3.5.11 Temperature cycling. There shall be no damage detrimental to the operation of the connector after being subjected to the temperature extremes of table VIII in accordance with 4.7.13.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

TABLE VIII. Temperature extremes.

Extremes	°C
Low	-55 +0
High	+125 +3 -0

3.5.11.1 Temperature cycling (classes D, K, and M). There shall be no damage detrimental to the connectors operation after being subjected to testing in accordance with 4.7.13.1. Following the test, the connectors shall withstand the sea level dielectric withstanding voltage specified in table III.

3.5.12 Air leakage (classes H and K connectors). When tested as specified in 4.7.14, the air leakage rate of classes H and K connectors shall be no greater than one micron cubic foot per hour at a differential of one atmosphere (1.04×10^{-5} atmospheres cm^3/s). The specified leakage rate shall apply only through the connector and not through the flange to the mounting surface joint.

3.5.13 Humidity. Connectors shall meet the applicable dielectric withstanding voltage and insulation resistance requirements (see 3.5.6 and 3.5.8) when tested as specified in 4.7.15.

3.5.14 Vibration. Mated connectors shall not be damaged and there shall be no loosening of parts due to vibration. Counterpart connectors shall be retained in engagement and there shall be no interruption of electrical continuity or current flow longer than 1 microsecond when tested as specified in 4.7.16.

3.5.15 Shock. Mated connectors shall not be damaged and there shall be no loosening of parts, nor shall there be an interruption of electrical continuity or current flow longer than 1 microsecond during the exposure to mechanical shock, as specified in 4.7.17.

3.5.16 Durability. Counterpart connectors shall show no mechanical or electrical defects detrimental to the operation of the connector as specified in 3.5.4 and 3.5.10 after 500 cycles of mating and unmating as specified in 4.7.18.

3.5.17 Salt spray (corrosion). Mated connectors shall show no exposure of base metal due to corrosion which will affect performance as specified in accordance with 3.5.4 and 3.5.8, when tested as specified in 4.7.19.

3.5.18 Oversize pin exclusion. Socket contacts shall exclude the entry of the test pin indicated in table IX when tested as specified in 4.7.20. After testing, the contacts shall meet the contact resistance requirements of 3.5.9.

TABLE IX. Oversize pin exclusion.

Contact	Pin diameter
20	.046

3.5.19 Resistance to test probe damage. Socket contacts shall meet the engaging and separating force requirements of 3.5.10 and shall show no evidence of visible damage when tested as specified in 4.7.21.

3.5.20 Fluid immersion. Connectors shall mate within the forces specified in 3.5.4 after being subjected to the fluid immersion test of 4.7.22.

3.5.21 Insert retention.

3.5.21.1 Insert retention (classes D, G, M, and N). Inserts shall not be dislocated from their original positions with an axial load of 60 lb/in^2 applied as specified in 4.7.23.

3.5.21.2 Insert retention (classes H and K). Classes H and K inserts shall not be dislocated from their original positions or damaged when an effective pressure differential of 200 lb/in^2 is applied as specified in 4.7.23.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

3.5.22 Contact pin strength. Contact pin strength shall be such that a force of 2 pounds ± ounce will not produce a permanent set in excess of .005 inch (0.13 mm) when tested as specified in 4.7.25.

3.5.23 Solderability. Solderable, nonremovable contact terminations shall withstand the test specified in 4.7.24. Printed wiring tails shall meet the solderability requirements of MIL-STD-202, method 208 or an equivalent industry standard when available when available.

3.5.24 Thermal vacuum outgassing (classes D, K, and M). The entire connector assembly, when tested in accordance with 4.7.26, shall have maximum total mass los (TML) of 1.0 percent of the original specimen mass and shall have a maximum volatile condensable material (VCM) content of 0.1 percent of the original specimen mass.

3.5.25 Resistance to soldering heat. Solderable, nonremovable contact connectors shall withstand the tests specified in 4.7.27.

3.6 Marking. Connectors shall be marked in accordance with method I of MIL-STD-1285 or an equivalent industry standard, and shall include the military PIN (see 3.1), the manufacturer's name or code symbol, and date code.

3.6.1 Insert marking. Raised or depressed characters may be used. Markings are shown on the applicable military specification sheet or standard. Socket face and pin face are the opposite. Contact position markings shall appear on both sides of the insert. On insulation displacement connectors, the first and last pin number of each row shall be marked clearly on the housing.

3.6.1.1 Contact designations. All contact locations shall be designated by identifiable characters on the front and rear faces of the insert or insert assembly. Positioning and arrangement of the characters shall be such that the corresponding contact location may be readily identifiable. Connector shell marking and insert marking shall remain legible after completion of the tests specified in 4.5.

3.6.2 Connector kit package. Each connector kit package shall contain a removable contact connector (marked with the complete connector part number), a full complement of contacts for the connector, and an applicable insertion/removal tool as required by the detail specification sheet (see 3.1).

3.7 Workmanship. Connectors shall be processed in such a manner as to be uniform in quality and shall be free from burrs, crazing, cracks, voids, pimples, chips, blisters, pin holes, sharp cutting edges, and other defects that will adversely affect life, serviceability, or appearance. Sharp cutting edges are acceptable on the terminations of IDC connectors.

3.8 Part or identification number (PIN). The PIN shall consist of the letter "M", the basic number of the specification sheet, an assigned dash number (see 3.1), and as

M	24308/1	-1	F
Military designation	Specification sheet number	Dash number	Finish

For class N:
F = Cadmium 4/.
P = Passivated stainless steel.
No suffix = Cadmium or zinc 4/, 5/
For classes G and H:
F = Cadmium 4/
No suffix = Cadmium or zinc 4/, 5/
For classes D and K:
Class D and class K connectors have a nickel finish, no suffix is required.
For class M:
Class M connectors have a gold finish, no suffix is required.

4/ F suffix PIN are to be used for cadmium finished parts after 1 July 1987.
5/ Zinc finish is inactive for new design effective as of the date of MIL-C-24308C.

4. VERIFICATION

4.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment (i.e. ANSI/NCSL Z540-1, ISO 10012-1 part 1 or comparable standards) shall be required.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

4.1.1 Assembly plants. Assembly plants must be listed on or approved for listing on the applicable Qualified Products List. The qualified connector manufacturer shall certify that the assembly plant is approved for the distribution of the manufacturer's parts. The assembly plant shall use only piece parts supplied by the qualified connector manufacturer. No testing other than visual examination is required of certified piece parts obtained from the qualified connector manufacturer, except when there is cause for rejection. All assemblies produced at the assembly plant shall be subjected to examination of product to assure that the assembly process conforms with that established at the qualified manufacturing plant. Quality control requirements shall be the same as required for the qualified connector manufacturer.

4.1.2 Established Reliability and high reliability practice . An established reliability and a high reliability practice shall be established and maintained. Evidence of such compliance shall be verified by the qualifying activity of this specification as a prerequisite for qualifications and continued qualifications effective 24 months after the date of this document.

4.2 Classification of inspections. The inspections specified herein are classified as follows:

a. Materials inspection (see 4.3).
b. Qualification inspection (see 4.5).
c. Verification of qualification (see 4.6).

4.3 Materials inspection. Materials inspection shall consist of certification supported by verifying data that the materials, as specified herein and on the specification sheet (see 3.1), used in fabricating the connectors, are in accordance with the applicable referenced inspections or requirements prior to such fabrication.

4.4 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-1344 and MIL-STD-202 or an equivalent industry standard when available when available .

4.5 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government (see 6.3) on sample units produced with equipment and procedures normally used in production.
Use of alternate materials, platings, and processes (see 3.3.1) shall be identified for inclusion in the product test documentation.

4.5.1 Sample size.

4.5.1.1 Connectors. A minimum of six completely assembled plugs and receptacles of the class (1.2.1) with the insert arrangement of the largest size connector of the type (1.2.3) with the same style of termination (1.2.2) for which qualification is desired, shall be subjected to the examinations and tests, except for thermal vacuum outgassing, in the sequence shown in table XII. For classes D, K, and M, all the nonmetallic materials, including lubricants, of two additional connectors shall be subjected to the thermal vacuum outgassing test. If classes G and N or M and D are being qualified at the same time, a minimum of three completely assembled plugs and receptacles with the insert arrangement of the largest size connector of the type (1.2.3) with the same style of termination (1.2.2) of each class (classes G and N, 3 class G, 3 class N; classes D and M, 3 class M, 3 class D) shall be subjected to the examinations and tests, except for thermal vacuum outgassing, in the sequence shown in table XII. For classes D and M, all the nonmetallic materials, including lubricants, of one additional connector of each class shall be subjected to the thermal vacuum outgassing test. The connectors shall have a full complement of contacts. Half of the class H and class K contacts shall have solder cups and the remainder shall have eyelets. The samples subjected to qualification testing shall be provided with counterpart connectors for those tests requiring mating assemblies. The counterpart connectors provided for this purpose shall be new, previously qualified connectors or new connectors submitted for qualification testing. Suppliers not producing mating connectors shall submit substantiating, certification data that tests were performed with qualified counterpart connectors. The samples shall be taken from a production run and shall be produced with equipment and procedures normally used in production.

4.5.1.1.1 Printed wiring board connectors. When qualifying plugs and receptacles of printed wiring boards termination types, both the plug and receptacle shall be mounted to printed wiring boards and test as mated connectors.

4.5.1.2 Qualification of additional connectors. For all other connector sizes of the same type, class, and style of termination for which qualification is desired, two each of the completely assembled plugs and receptacles shall be subjected to the examinations and tests in the sequence shown in table XII. Mating plugs and receptacles shall be furnished.

4.5.1.3 Preparation of samples. Connectors shall be wired with approximately 2 feet of wire (see 3.3.1) and table X. Half of the connectors of each type shall be wired with the maximum wire size and the remainder shall be wired with the minimum wire size specified in table X. Termination of wires to contacts shall be accomplished as follows: A crimping tool (see 3.1 and 3.3.1), shall be used for removable contacts. Soldering shall be used (see 3.3.1) for nonremovable contacts. Insulation displacement connectors shall use flexible, flat, unshielded, round conductor cable (see 3.3.1).

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

TABLE X. Test wire sizes.

Contact size	Maximum	Minimum
20	20	24
22D	22	28
IDC	28 stranded	28 stranded

4.5.2 Inspection routine. The sample shall be subjected to the inspections specified in table XI, in the order shown. All sample units shall be subjected to visual and mechanical inspection before wiring (see 4.5.1.2 and 4.7.1).

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

4.5.4 Verification of qualification. To verify qualification, the contractor shall make available a report at 12 month intervals to the qualifying activity. The qualifying activity shall establish the initial reporting availability. The report shall consist of:

a. A summary of the results of the tests performed for inspection of product for delivery (group A), indicating as a minimum the number of lots that have passed and the number that have failed. The results of tests of all reworked lots shall be identified and accounted for.

b. The results of tests performed for periodic inspection (group B), including the number and mode of failures. The test report shall include results of all periodic inspection tests performed and completed during the 36-month period. If the test results indicate nonconformance with specification requirements, and corrective action acceptable to the qualifying activity has not been taken, action may be taken to remove the failing product from the qualified products list.

The contractor shall immediately notify the qualifying activity at any time during the 36-month period that the inspection data indicates failure of the qualified product to meet the requirements of this specification.

4.6 Conformance inspection.

4.6.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A inspection.

4.6.1.1 Inspection lot. An inspection lot shall consist of all connectors or removable crimp contacts, as applicable, covered by one specification sheet, produced under essentially the same conditions, and offered for inspection at one time.

4.6.1.2 Group A inspection. Group A inspection shall consist of the inspections specified in table XIII, in the order shown.

4.6.1.2.1 Sampling plan (group A). Table XIII tests shall be performed on a production lot basis. Samples shall be selected in accordance with table XI. If one or more defects are found, the lot shall be screened for that particular defect and defects removed. A new sample of parts shall be selected in accordance with table XI and all group A tests again performed. If one or more defects are found in the second sample, the lot be rejected and shall not be supplied to this specification.

TABLE XI. Lot and sample size.

Lot size	Sample size
1 to 50	5
51 to 90	7
91 to 150	11
151 to 280	13
281 to 500	16
501 to 1200	19
1201 to 3200	23
3201 to 10000	29
10001 to	35

4.6.2 Retention of qualification. Retention of qualification inspection on connectors shall consist of the examinations and tests shown in table XII. Shipment shall not be held up pending the results of this inspection.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

TABLE XII. Qualification inspection. 1/

Inspection	Requirement paragraph	Test method paragraph	Connector class 2/				
			1	2	3	4	5
Group I							
Visual and mechanical inspection	3.1, 3.3, 3.4, 3.5, and 3.6	4.7.2	X	X	X	X	X
Magnetic permeability (classes N and M) 3/	3.5.1	4.7.3			X	X	
Maintenance aging (crimp type)	3.5.2	4.7.4	X		X		
Contact insertion and removal forces	3.5.3	4.7.5	X		X		
Mating and unmating force	3.5.4	4.7.6	X		X		
Contact retention	3.5.5	4.7.7	X	X	X	X	
Dielectric withstanding voltage: 3/							
At sea level	3.5.6	4.7.8.1	X	X	X	X	X
At altitude	3.5.6	4.7.8.2	X	X	X	X	X
Contact retention (flat cable only)	3.5.7	4.7.9	X	X	X	X	X
Insulation resistance at ambient temperature 3/	3.5.8	4.7.10	X	X	X	X	X
Contact resistance	3.5.9	4.7.11		X		X	X
Contact engagement and separation forces	3.5.10	4.7.12		X		X	X
Mating and unmating force	3.5.4	4.7.6	X	X	X	X	X
Temperature cycling (classes G, H, and N)	3.5.11	4.7.13	X	X	X	X	X
Temperature cycling (classes D, K, and M)	3.5.11.1	4.7.13.1	X	X	X	X	X
Air leakage (classes H and K)	3.5.12	4.7.14					X
Humidity	3.5.13	4.7.15	X	X	X	X	X
Dielectric withstanding voltage	3.5.6	4.7.8	X	X	X	X	X
Insulation resistance	3.5.8	4.7.10	X	X	X	X	X
Vibration	3.5.14	4.7.16	X	X	X	X	X
Shock	3.5.15	4.7.17	X	X	X	X	X
Durability	3.5.16	4.7.18	X	X	X	X	X
Contact engagement and separation forces	3.5.10	4.7.12		X		X	X
Mating and unmating force	3.5.4	4.7.6	X	X	X	X	X
Salt spray (corrosion)	3.5.17	4.7.19	X	X	X	X	X
Contact resistance	3.5.9	4.7.11		X		X	X
Resistance to test probe damage	3.5.19	4.7.21		X		X	
Contact engagement and separation forces	3.5.10	4.7.12		X		X	
Fluid immersion 3/	3.5.20	4.7.22	X	X	X	X	X
Mating and unmating force 3/	3.5.4	4.7.6	X	X	X	X	X
Insert retention	3.5.21	4.7.23	X	X	X	X	X
Contact pin strength	3.5.22	4.7.25		X		X	X
Visual and mechanical inspection	3.1, 3.3, 3.4, 3.5, and 3.5	4.7.2	X	X	X	X	X
Thermal vacum outgassing (classes D, K, and M) 4/	3.5.24	4.7.26	X	X	X	X	X
Group II							
Resistance to solder heat	3.5.25	4.7.27		X		X	X
Group III							
Solderability 5/	3.5.23	4.7.24		X		X	X
Contact pin strength	3.5.22	4.7.25		X		X	X

See footnotes on next page.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

1/ IDC Connectors shall meet the test requirements specified for classes G and D nonremovable contact connectors.
2/ Connector class:

a. Classes D and G - Removable contact connectors.
b. Classes D and G - Nonremovable contact connectors.
c. Classes M and N - Removable contact connectors.
d. Classes M and N - Nonremovable contact connectors.
e. Classes H and K - Nonremovable contact connectors.

3/ Not applicable for periodic inspection.

4/ See 4.5.1.1 (nonmetallic materials of two connector assemblies).

5/ Not applicable for crimp, wrappost, and IDC contacts.

TABLE XIII. Group A inspection.

Inspection	Requirement paragraph	Test method paragraph
Visual and mechanical inspection	3.1, 3.3, 3.4, 3.5, and 3.6	4.7.2
Contact engagement and separation forces (nonremovable contacts)	3.5.10	4.7.12
Insulation resistance at ambient	3.5.8	4.7.10
Dielectric withstanding voltage	3.5.6	4.7.8

4.6.3 Periodic inspection. Periodic inspection shall consist of group B inspection. Except where the results of this inspection show noncompliance with the applicable requirements (4.6.3.1.4), delivery of products which have passed group A shall not be delayed pending the results of this periodic inspections.

4.6.3.1 Group B inspection. Group B inspection shall consist of the inspections specified in table XII, in the order shown. Group B inspection shall be made on sample units which have been randomly selected from inspection lots which have passed the group A inspection.

4.6.3.1.1 Sampling plan.

Group I: Sample connectors consisting of two mated pairs of each class, of each type, of each style of termination of each size and all the nonmetallic materials, including lubricants, of one connector of class D, K, and M for which retention of qualification is desired shall be selected every 24 months. Upon passing this inspection two consecutive times, the contractor may select sample connectors every 36 months. If production of a particular part number is not current, the group B tests must take place at the time production is resumed. The testing shall revert to the original schedule which is applied to a newly qualified product. If group B testing on classes G and N, D and M, or G, N, D, M is desired, one completely assembled plug and receptacle of each class shall be subjected to the examinations and tests in lieu of two of a single class.

Group II: One each of plug and receptacle with the largest insert arrangement being tested shall be submitted.

Group III: Twenty contacts each, pin and socket solder type termination being tested shall be submitted for solderability requirements and eight pin contacts of each type being tested shall be submitted for contact and pin strength requirements.

4.6.3.1.2 Failures. If any sample units fail to pass group B inspection, the entire sample shall be considered to have failed.

4.6.3.1.3 Disposition of sample units. Sample units which have been subjected to group B inspection shall not be delivered on the contract.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

4.6.3.1.4 Noncompliance. If a sample fails to pass group B inspection, the manufacturer shall notify the qualifying activity and the cognizant inspection activity of such failure and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be corrected and which were manufactured under 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 B 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). Group A inspection may be reinstituted; however, final acceptance and shipment shall be withheld until the group B inspection has shown that the corrective action was successful. In the event of failure after inspection, information concerning the failure shall be made available to the cognizant inspection activity and the qualifying activity.

4.7 Methods of inspection.

4.7.1 Test methods. The following identified tests and test methods assure connector integrity within typical operating conditions and applications. Alternate commercial industry standard test methods are allowed, however when and alternate method is used, the qualifying activity must be notified prior to performance of the test. The test methods described herein are proven methods and shall be the referee method in cases of dispute.

4.7.2 Visual and mechanical inspection. Connectors and contacts shall be examined to verify that the dimensions, materials, design, construction, marking, and workmanship are in accordance with the applicable requirements (see 3.1, 3.3, 3.4, 3.5, and 3.6).

4.7.3 Magnetic permeability (classes M and N) (see 3.5.1). Permeability shall be measured on classes M and N connectors with an instrument conforming to ASTM A342 or an equivalent industry standard when available when available . The connectors may be wired or unwired, but shall not be carrying current. Requirements shall be as specified in 3.5.1.

4.7.4 Maintenance aging (crimp contact connectors only (see 3.5.2)). Connectors shall be tested in accordance with method 2002 of MIL-STD-1344 or an equivalent industry standard when available when available . Installing/removal tool shall be in accordance with the applicable specification sheet (see 3.1). Four contacts or twenty percent of the contacts, whichever is greater, shall be tested.

4.7.5 Contact insertion and removal forces (see 3.5.3). Contacts shall be inserted and removed in accordance with method 2012 of MIL-STD-1344 or an equivalent industry standard when available when available . Installing/removal tools shall be in accordance with the applicable specification sheet (see 3.1).

4.7.6 Mating and unmating force (see 3.5.4). Mated connectors shall be tested in accordance with method 2013 of MIL-STD-1344 or an equivalent industry standard when available when available . The rate of mating and unmating shall be 1 to 10 inches per minute.

4.7.7 Contact retention (see 3.5.5). Connectors shall be tested in accordance with method 2007 of MIL-STD-1344 or an equivalent industry standard when available when available . The following details shall apply:

a. Axial direction: Shall be applied in both directions.
b. Axial load: As specified.

4.7.8 Dielectric withstanding voltage (see 3.5.6).

4.7.8.1 Sea level. Unmated connectors shall be tested in accordance with method 3001, condition I, of MIL-STD-1344 or an equivalent industry standard when available when available . The applicable test voltages specified in 3.5.6 shall be applied between all adjacent contacts and between the shell and each peripheral contact. Requirements shall be as specified in 3.5.6. For group A inspection testing, voltage may be applied for a minimum of 10 seconds.

4.7.8.2 Altitude. The connectors shall be tested in accordance with method 3001, condition IV, of MIL-STD-1344 or an equivalent industry standard when available when available . After 5 minutes at the simulated altitude, the connectors shall be tested as specified in 4.7.8.1.

4.7.9 Cable retention (flat cable only) (see 3.5.7). The unmated wired connector with strain relief, when applicable, shall be mounted by normal mounting means and aligned with the test fixture. An axial force of 8 ounces per contact shall be applied. The force shall be applied 6 inches from the mating face of the connector to the cable and shall pull away from the connector in a direction that will put the maximum stress on the contact-cable interface.

4.7.10 Insulation resistance at ambient temperature (see 3.5.8). Unmated connectors shall be tested in accordance with method 3003, test condition B, of MIL-STD-1344 or an equivalent industry standard when available when available . The resistance shall be measured between 50 percent, but not less than four pairs of adjacent contacts and between 50 percent, but not less than six contacts adjacent to the shell and the shell. The contacts selected shall be those having the closest spacing between measurement points and the measured resistance shall be as required by 3.5.8.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

4.7.11 Contact resistance (see 3.5.9). Contacts shall be tested in accordance with method 3004 of MIL-STD-1344 or an equivalent industry standard when available when available . A minimum of four mated contacts or 20 percent of the mated contacts, whichever is greater, shall be measured in each connector being tested. The following details apply:

a. Wire size: As specified (see 3.1).
b. Preparation: Connectors mated.
c. Test current: Maximum contact current rating (see 3.5.9).
d. Test circuit for nonremovable and classes H and K connectors shall be as shown in method 3004. Test circuit for IDC connectors shall be as shown on figure 2.

4.7.11.1 Classes H and K pin contacts. Classes H and K pin contacts shall be mated with counterpart copper based alloy socket contacts for the test of 4.7.10.

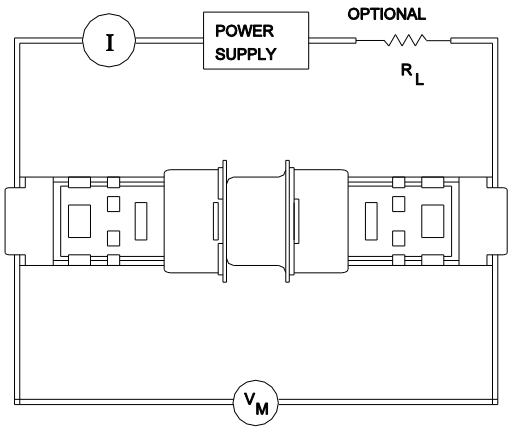


FIGURE 2. Contact resistance test circuit for IDC connectors.

4.7.12 Contact engagement and separation forces (see 3.5.10). Contact engagement and separation forces shall be tested in accordance with method 2014 of MIL-STD-1344 or an equivalent industry standard when available when available . Four contacts or 20 percent of the contacts, whichever is greater, shall be measured in each connector being tested. The following details apply:

a. Insert and separate a maximum diameter pin in and from each socket contact, then insert and remove a minimum diameter pin in the same sockets. During separation of the minimum diameter test pin, the minimum separation force shall conform to 3.5.10.

b. Insert and separate a maximum diameter pin in and from each socket contact three times. During the third cycle, the engagement force shall conform to 3.5.10.

4.7.13 Temperature cycling (classes G, H, and N) (see 3.5.11). Unmated connectors shall be tested in accordance with method 1003, test condition A, of MIL-STD-1344 or an equivalent industry standard when available when available , except that the minimum temperature shall be as specified in table VIII. At the completion of the last cycle, the connectors shall be returned to room temperature for further examination and shall meet the requirements of 3.5.11.

4.7.14.1 Temperature cycling (classes D, K, and M) (see 3.5.11.1). Mated connectors shall be tested in accordance with method 1003, test condition A of MIL-STD-1344 or an equivalent industry standard when available when available , except that the minimum temperature shall be as specified in table VIII. At the completion of the last cycle, the connectors shall be returned to room temperature for further examination and shall meet the requirements of 3.5.11.1.

4.7.14 Air leakage (classes H and K connectors) (see 3.5.12). Classes H and K connectors shall be mounted in a manner suitable for application of one atmosphere pressure differential across the connectors, and tested in accordance with method 1008, test condition C, of MIL-STD-1344 or an equivalent industry standard when available when available . The leakage rate shall be determined while pressurized air or gas, containing not less than 10 percent helium by volume, is applied to the connector. Requirements shall be as specified in 3.5.12.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

4.7.15 Humidity (see 3.5.13). The connectors shall be fully wired. The unmated and wired connectors shall be subjected to a humidity test in accordance with method 1002, test condition II, of MIL-STD-1344 or an equivalent industry standard when available when available and with the following exceptions and details as required by 3.5.13.

a. Step 7B, vibration, is not required.

b. Upon completion of step 6 of the final cycle, connectors shall be removed from the chamber and surface moisture removed from the insulators. Immediately following removal of surface moisture, the insulation resistance test (see 4.7.9) and the sea level dielectric withstanding voltage test (see 4.7.7.1) shall be conducted.

c. After the 24 hour conditioning period, the insulation resistance shall again be measured.

4.7.16 Vibration (see 3.5.14). The connector assembly shall be mounted, as specified herein and vibrated in accordance with method 2005, test condition 4, of MIL-STD-1344 or an equivalent industry standard when available when available . All contacts shall be wired in series with at least 100 milliamperes of current allowed to flow. A suitable instrument shall be employed to monitor the current flow and to indicate any discontinuity of contact or interruption of current flow. Requirements shall be as specified in 3.5.14.

4.7.16.1 Connector mounting. Each receptacle shall be mounted on a suitable fixture, which in turn shall be attached to a vibration table. A suitable sensor shall monitor the receptacles at a point on or near the receptacle. A counterpart plug shall be engaged with the receptacle and shall not be held by any locking means. The wire bundles or cables attached to the receptacle shall be clamped to nonvibrating points at least 8 inches from the rear of the receptacle. The wire bundles or cables attached to the plug shall be clamped to a vibrating point 4 ±1/2 inches from the rear of the plug. The clamping length shall be chosen to avoid resonance of the wire bundles or cables. To eliminate possible wire breakage when testing connectors wired with number 28 AWG wire, a strain relief clamp that mounts directly to the connector and reduces the clamping length of the wire bundle to a minimum is permitted.

4.7.16.2 Printed wiring board connector mounting. Right angle connectors shall have the receptacle mounted on an epoxy glass printed wiring board, 1/16 inch minimum (plus added tolerances) thick and clamped to a suitable fixture which in turn shall be firmly mounted on the vibration table. Each plug shall be mounted in the normal manner at one end of the rectangular epoxy glass laminate board. The board shall be 1/16 inch minimum thick.

4.7.17 Shock (see 3.5.15). Mated connectors shall be subjected to test condition E, method 2004 of MIL-STD-1344 or an equivalent industry standard when available when available . One shock shall be applied in each direction of the three major axes of the connectors. Receptacles shall be mounted similar to the mounting of 4.7.15.1. Plugs shall be engaged with the receptacles and shall not be held by any locking means. All contacts shall be wired in series with a minimum of 100 milliamperes of current allowed to flow. The wire bundles or cables shall be clamped to structures that move. A minimum of 8 inches of wire or cable shall be unsupported behind the rear of the receptacle and 4 ±1/2 inches of wire or cable shall be unsupported behind the rear of the plug. A suitable instrument shall be employed to indicate any discontinuity or interruption of current flow. Requirement shall be as specified in 3.5.15.

4.7.17.1 Printed wiring board connector mounting. Mounting method in accordance with 4.7.15.2.

4.7.18 Durability (see 3.5.16). Connectors shall be tested in accordance with method 2016 of MIL-STD-1344 or an equivalent industry standard when available when available . The following details apply:

a. Mated and unmated 500 times at a rate of 200 ±100 cycles per hour.

b. After 500 cycles mated connectors shall be subjected to salt spray.

4.7.19 Salt spray (corrosion) (see 3.5.17). Mated connectors shall be subjected to a salt spray test in accordance with method 1001, condition B, of MIL-STD-1344 or an equivalent industry standard when available when available . After exposure, connectors shall be thoroughly washed with tap water to remove all salt deposits and then shall be dried in a circulating air oven at temperature of 38°C ±3°C for a period of 12 hours. They shall then be visually examined for evidence of corrosion and subjected to the contact resistance test of 4.7.10 and the mating and unmating force test of 4.7.5. After completion of test, connectors shall conform to the requirements of 3.5.4, 3.5.5, and 3.5.9.

4.7.20 Oversize pin exclusion (see 3.5.18). A hardened steel oversize pin, as specified in 3.5.18, shall be placed in a position centered and parallel to the axis of the socket contact. A 12-ounce axial force shall then be applied tending to force the test pin into the socket contact. After completion of the test, the contacts shall be subjected to the contact resistance test in accordance with 4.7.10. This test shall be performed on 20 percent or a minimum of four, of the socket contacts in each connector.

4.7.21 Resistance to test probe damage (see 3.5.19). Socket contacts shall be tested in accordance with method 2006 of MIL-STD-1344 or an equivalent industry standard when available when available . The following details shall apply:

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

a. The test shall be performed on 20 percent of the contacts, or a minimum of four contacts.

b. After testing, the contacts shall meet the requirements of 3.5.19 (contact engagement and separation).

c. Type 1 or type 2 contact holding device.

d. Probe damage tool shall be inserted into the contact to the following depths:

Contact size	Holding fixture	
	Type 1	Type 2
20	.202 ±.005, .077 ±.005	.250 ±.005, .125 ±.007
IDC 20	.202 ±.005, .077 ±.005	.250 ±.005, .125 ±.007

Note: Dimensions are inches.

e. The diameter of the handle (.190) is not applicable.

4.7.22 Fluid immersion (see 3.5.20). Connectors shall be tested in accordance with method 1016 of MIL-STD-1344 or an equivalent industry standard when available when available . The following details apply:

a. Test fluid (a) .

b. Test fluid (e).

4.7.23 Insert retention (see 3.5.21). Unmated connectors shall be tested in accordance with method 2010 of MIL-STD-1344 or an equivalent industry standard when available when available :

a. Force to be applied: 10 lbf/in^2 per second until pressure specified in 3.5.21 is reached.

b. For classes D, G, M, and N connectors, the wired contacts may be removed for convenience of testing.

4.7.24 Solderability (see 3.5.23). Solderability, nonremovable contact terminations, except wrappost, IDC, and crimp, shall be tested in accordance with method 208 of MIL-STD-202 or an equivalent industry standard when available when available (type R or RMA flux may be used). Solder cup terminations shall be tested in the following manner:

a. Test samples shall not be cleaned prior to soldering.

b. Test sample connectors shall have the solder cups dipped in, or brushed with, flux type RMA just prior to the application of solder.

c. A pencil type soldering iron shall be used, with temperature regulated to 360°C ±10°C to heat the test solder cups.

d. After healing the test solder cups to a solder melt temperature, 63/37 tin-lead type solder shall be applied to fill the solder cup to a solder capacity which will result in solder wetting the entire cup surface and forming a solder fill meniscus across the open portion of the solder cup.

e. The finished solder fill shall be smooth and slightly concave with clear wetting and adhesion to all internal surfaces of the solder cup. Inspection shall be aided by a 10X optical aid.

f. Twenty percent but not less than seven contacts of test specimen shall be tested.

4.7.25 Contact pin strength (nonremovable contacts) (see 3.5.22). Contacts shall be mounted in a suitable fixture and a gradual force as shown in the table shall be applied to pin as shown on figure 3. The maximum rate of travel of the head of the testing machine shall not exceed 1 inch per minute. Maximum loading time shall not exceed 1 minute. The permanent set shall be the difference between the initial and final position of the extreme pin tip, immediately after load removal and shall not exceed the limits specified in 3.5.22.

4.7.26 Thermal vacuum outgassing (classes D, K, and M). All nonmetallic materials, including lubricants, used in the manufacture of these connectors shall be tested in accordance with SP-R-0022 or ASTM-E595 to determine the maximum TML of the original specimen mass and the VCM content of the original specimen mass. For the purpose of determining TML and VCM of connectors, the original specimen mass shall be the assembled connector mass excluding metallic parts. The TMC and VCM for the connectors may be determined by testing the specific materials of the connector and calculating the loss for the connector.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

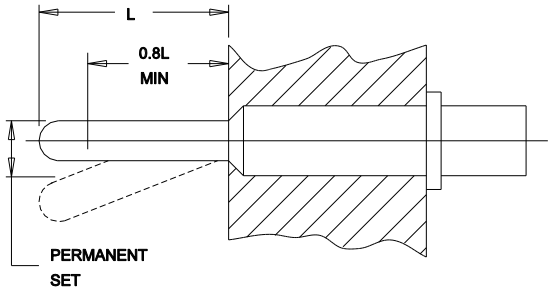


FIGURE 3. Contact pin strength.

Mating end size	moment (lb-in.) (unless otherwise specified (see 3.1)
20	.53
22	.22
23	.16

4.7.27 Resistance to solder heat (solderable, nonremovable contacts only) (see 3.5.25). All solder cup and printed circuit board termination type connectors shall be tested.

a. Where applicable (not for printed circuit board type connector) the appropriate copper wire size, 2 to 4 inches in length, properly prepared for the applicable solder cup size shall be inserted into the contact termination. Seven contacts or twenty percent of the contacts, whichever is greater, shall be tested.

b. The test specimens shall be fluxed accordingly with flux liquid or other techniques (see 3.3.1).

c. Unless otherwise specified, a pencil type solder iron rated for 25 watts shall be used.

d. The solder iron shall be heated to a temperature of 360° C ±10° C. It shall be applied to the termination for a period necessary to hold the solder in a liquid state for a time duration of 4 to 5 seconds. Solder type to be used is SN-63 in accordance with J-STD-006 or an equivalent industry standard when available when available .

e. After application, the soldering iron shall be removed and a visual and mechanical inspection performed, the visual inspection shall be at 10X.

f. The connector shall show no evidence of distortion or damage to any area of the connector housing. The contact shall meet the contact retention requirement (see 3.5.5).

5. PACKAGING

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

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

6. NOTES

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

6.1 Intended use. These connectors are intended for general military use. The class and types of connectors are intended for application as follows. Connector installations should be designed to assure that connectors are mated within the limits prescribed by 3.4.5.

a. Classes G and N connectors are intended for use in nonenvironment-resisting applications where the operating temperature range of -55° to +125°C is experienced. Crimp contact connectors have the additional advantage of possessing removable crimp-type contacts.

b. Class N connectors are intended for use in applications wherein presence of residual magnetism must be held to very low levels to avoid interference with nearby sensitive instrumentation.

c. Class H receptacles are intended for use in applications wherein atmospheric pressures must be contained by the connectors across the wall or panels on which they are mounted. If air leakage requirements are critical, a class H connector should be used.

d. Crimp contact connectors shall have contacts present in all positions when the connector is installed.

e. Classes D, K, and M connectors are for high reliability space applications.

f. Connector installations should be designed to assure that connectors are mated within the limits prescribed by 3.4.5.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of the specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

c. Packaging requirement (see 5.1)

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time of award of contract, qualified for inclusion in the applicable qualified products list, 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 purchase orders for the products covered by this specification. Information pertaining to qualification of products may be obtained from the Defense Electronics Supply Center (DESC-E), Engineering Standardization Directorate, Dayton, OH 45444.

6.4 Copyright notice. All information disclosed in this specification and related specification sheets and military standard which is or may be copyrighted by IT Cannon Electric is reproduced herein with the express permission of the copyright owner.

6.5 Definitions.

6.5.1 Overall finish. A finish having a specified minimum thickness applied over the entire surface area (such as, barrel plating technique or other nonselective plating technique, and so forth).

6.5.2 Localized finish. A finish having a specified minimum thickness applied to a definite area, (such as, clad, inlay, welded dot, selective plating
technique, and so forth).

6.5.3 Gold finish. A finish having an unspecified thickness of gold not requiring a measurement of thickness.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

6.6 Steps in selecting MIL-C-24308 type connector - PIN's.

Step 1. Determine the desired connector features.

A. Use Class (G, D, M, N, H, K, or G-PCB mount).
B. Termination type (harness solder, harness crimp, flat cable IDC, PC board solder).
C. Size of contacts and contact density (#20 or #22).
D. contact gender (pin or socket).
E. Member of contacts (9, 15, 25, 26, 37, 44, 50, 62, 78, 104).
F. Mounting method (no float, dual float, PC board vertical, PC board right angle).

Step 2. Using chart 'A', select the appropriate specification sheet to be used.

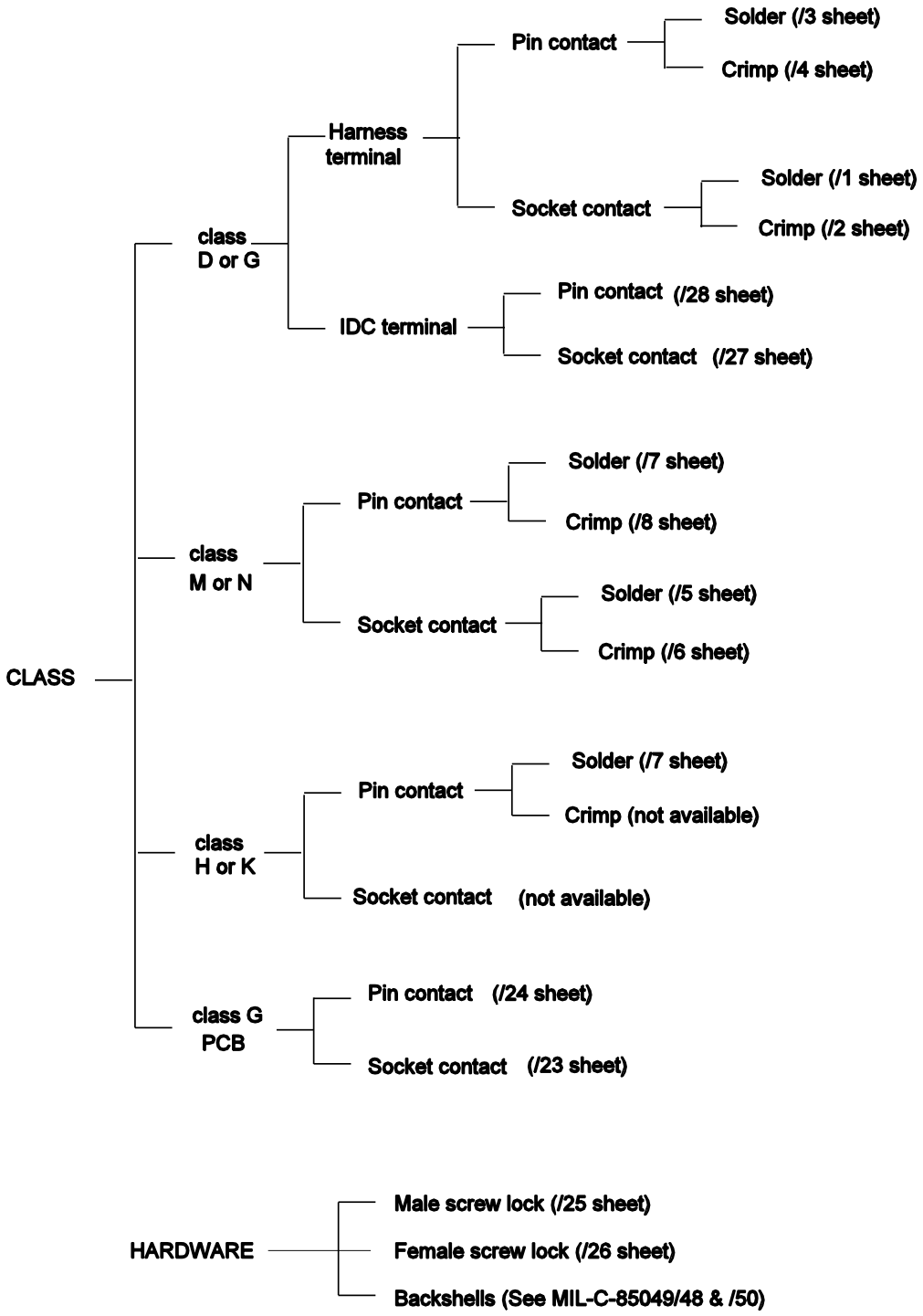
Step 3. Using chart 'B', determine the appropriate Insert MS sheet, MS sheet dash number, and shell size for reference in the PIN selection.

Step 4. Using chart 'C', determine the appropriate Shell MS sheet dash number for reference in the PIN selection.

Step 5. Using the shell size, Insert MS sheet number and dash number, and Shell MS sheet number and dash number, determined from steps #3 and #4 above, refer to the charts on the slash sheet selected in step #2 above and determine the appropriate slash sheet dash number (PIN) for the desired connector.

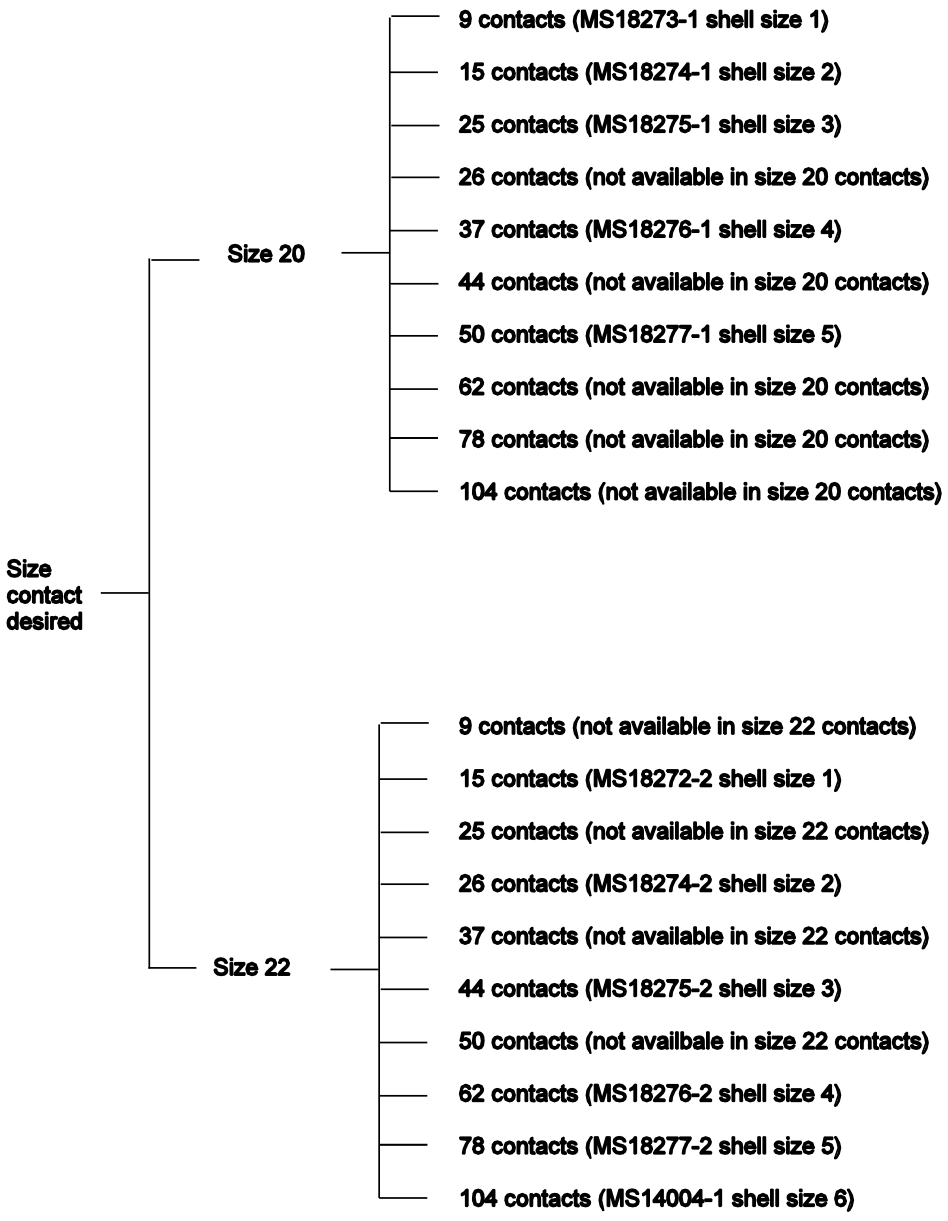
Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

CHART "A" SLASH SHEET SELECTION



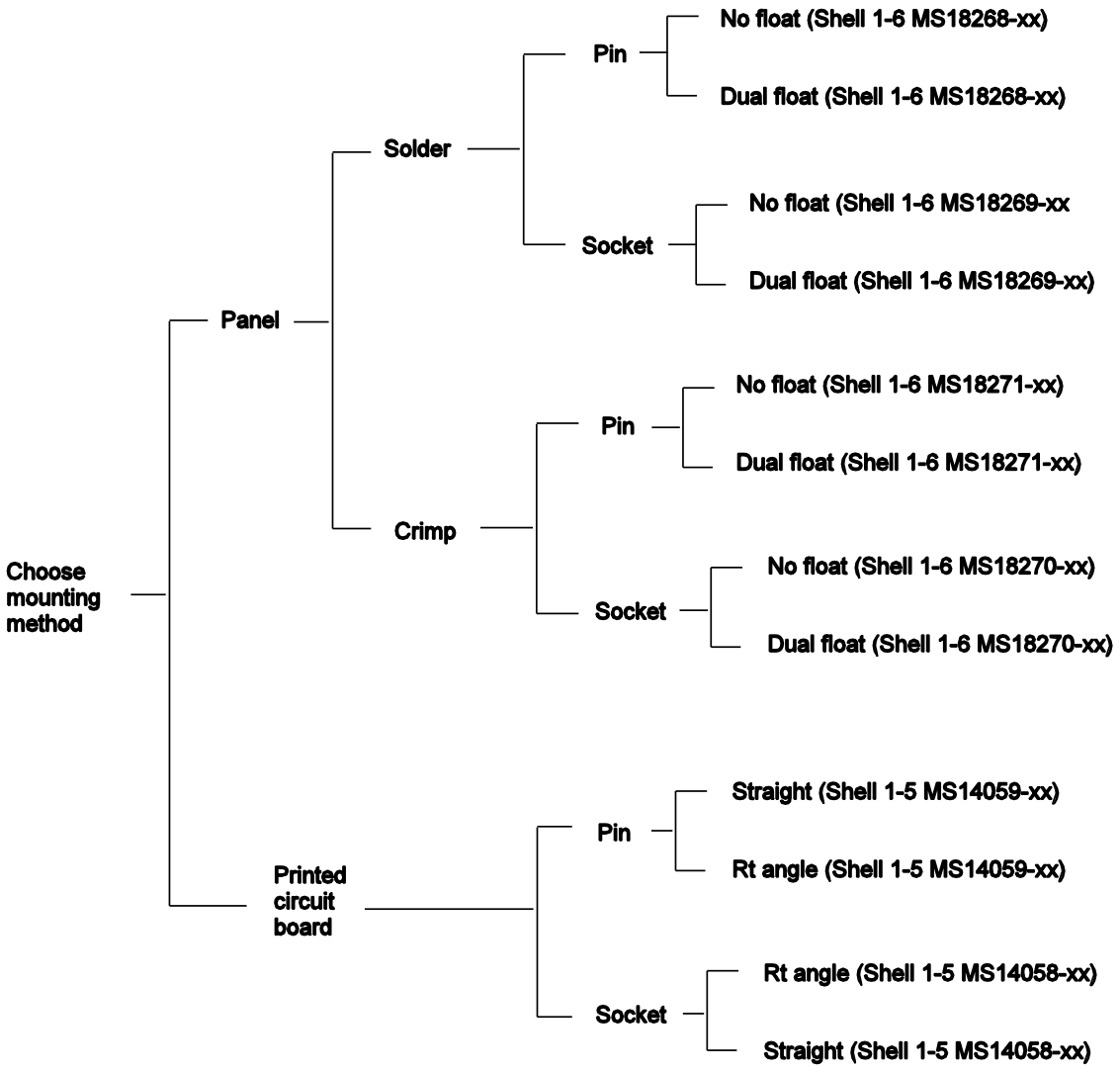
Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

CHART "B" INSERT MS SHEET INFORMATION SELECTION



Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

CHART "C" SHELL MS SHEET INFORMATION SELECTION



Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

6.7 Subject term (key word) listing.

Contacts
Crimp
Current
Dielectric
Finish
Heat
Humidity
Inspection
Insulation displacement
Magnetic permeability
Materials
Mating force
Military standards
Plug
Pin
Printed wiring board
Qualification
Receptacle
Sampling
Socket
Solder
Solderability
Temperature
Voltage

6.8 MILITARY SPECIFICATION ALTERNATIVE

		Requirement paragraph	Military reference
MIL-M-14 -	Molding Plastics and Molded Plastic Parts, Thermosetting.	3.3.5.1,	6.9.3.1
MIL-S-5002 -	Surface Treatments and Inorganic Coatings for Metal Surfaces of Weapon Systems.	1.2.1, 3.3.5.1	6.9.4.1
MIL-T-10727 -	Tin Plating; Electrodeposited or Hot-Dipped, for Ferrous and Nonferrous Metals.	3.3.4.2.1, 3.3.6.2	6.9.2.1
MIL-F-14256 -	Flux, Soldering, Liquid (Rosin Base).	4.7.27b	
MIL-W-16878/4 -	Wire, Electrical, Polytetrafluoroethylene (PTFE) Insulated, 200° C, 600 Volts, Extruded Insulation.	4.5.1.3	6.9.8
MIL-C-22520 -	Crimping Tools, Terminal, Hand or Power Actuated, Wire Termination, and Tool Kits, General Specification for.	4.5.1.3	6.9.8
MIL-M-24519 -	Molding Plastics, Polyester, and Polyarylether Thermoplastic.	3.3.5.1	6.9.3.1
MIL-C-39029 -	Contacts, Electrical Connector, General Specification for.	3.4.1.2	6.9.5.2
MIL-G-45204 -	Gold Plating, Electrodeposited.	3.3.4.2.1, 3.3.4.2.2.1, 3.3.6.3	6.9.2.1, 6.9.2.2.1, 6.9.4.3
MIL-C-49055 -	Cables, Power, Electrical, (Flexible, Flat, Unshielded), Round Conductor, General Specification for.	4.5.1.3	6.9.8
MIL-P-81728 -	Plating, Tin Lead (Electrodeposited).	3.3.4.2.2.2a, b, c	6.9.2.2.2a, b, c
MIL-I-81969 -	Installing and Removal Tools, Connector Electrical Contact, General Specification for.	3.4.1.2.1	6.9.5.2.1

STANDARDS

MIL-STD-790 -	Standard Practice for Established Reliability and High reliability Qualified Products List (QPL) Systems for Electrical, Electronic, and Fiber Optic Parts Specifications.	4.1.2	6.9.7
MS14058 -	Connector, Electric, Rectangular, Miniature, Polarized Shell, Rack and Panel, Shell, Receptacle, Socket Contacts Straight, Printed Circuit Board Terminal Types.	3.3.4.2.2.2c	6.9.2.2.2c
MS14059 -	Connectors, Electric, Rectangular, Miniature, Polarized Shell, Rack and Panel, Shell, Plug, Pin Contacts, Printed Circuit Board Termination Types.	3.3.4.2.2.2c	6.9.2.2.2c
MS18281 -	Contacts, Pin and Socket, Classes G, N, and H, Solder Type, Non-removable.	3.4.1.1, 3.4.1.3	6.9.5.1, 6.9.5.3

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

HANDBOOKS

MILITARY

MIL-HDBK-454 - Standard General Guideline for Electronic Equipment.	3.3.2, 4.5.1.3	6.9.8

(See supplement 1 for list of associated specification sheets and military standards).

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Defense Printing Service Detachment Office, Blgd. 4D (Customer Service), 700 Robbins Avenue, Philadelphia, PA 19111-5094.

6.9 FORMER MILITARY REQUIREMENTS

6.9.1 Dissimilar metals. When dissimilar metals are employed in intimate contact with each other, protection against electrolytic corrosion is to be provided as specified in guideline 16 of MIL-HDBK-454.

6.9.2 Contact finish (solder contact). The finish on contact bodies are to be gold applied either overall or localized for class G (see 6.5). The finish on contact bodies for classes D, K, and M are to be gold applied overall. The finish on contact bodies for class H are to be tin applied overall.

6.9.2.1 Overall finish. Contact bodies are to be overall gold-plated 50 microinches thick minimum in accordance with MIL-G-45204, type II, grade C, class 1, over a suitable underplate (see 6.5). Silver is not be used as an underplate. Nickel is not be used as an underplate on classes M and N. The finish on contact bodies of class H connectors are to be 50 microinches minimum of electro-tin (no organic brighteners) in accordance with MIL-T-10727. Preliminary plating of another metal is permissible.

6.9.2.2 Localized finish. Contact bodies are to be overall nickel plated in accordance with QQ-N-290, except plating thickness are to be 30 to 150 microinches thick (see 6.5). Mechanical operations may be performed after application of plating.

6.9.2.2.1 Contact mating area. The contact mating area as shown on figure 1 are to be gold plated 50 microinches thick minimum in accordance with MIL-G-45204, type II, grade C, class 1 or an equivalent industry standard over nickel plating (see 3.3.3.2.2).

6.9.2.2.2 Terminations. Terminations are to be plated as follows:

a. Solder cups: 100 microinches minimum tin-lead plated in accordance with MIL-P-81728, 50 to 95 percent tin.

b. Insulation displacement: 100 microinches minimum tin-lead plated in accordance with MIL-P-81728, 50 to 95 percent tin.

c. Printed wiring tails: Dimension M as shown on MS14058 and MS14059, 100 microinches minimum tin-lead plated in accordance with MIL-P-81728.

6.9.3 Dielectric materials.

6.9.3.1 Insert. Insert materials are to conform to type SDG-F of MIL-M-14 or type GPT-30F or GET-30F in accordance with MIL-M-24519, for classes D, G, M, and N connectors. Insert dielectric material for classes H and K are to be glass.

6.9 .4 Metal components. Metal components are to be of high grade corrosion resistant material or a material treated to resist corrosion which will allow the complete connector assembly to meet the requirements of this specification.

6.9.4.1 Finish (classes G and N) 3/. Shells are to be cadmium plated in accordance with type II, class 2 of QQ-P-416 or zinc plated in accordance with ASTM B633. A preliminary plating of another metal is permissible. The resulting finishare to be electrically conductive, and are to be of a golden color to ensure that the chromate finish has been properly applied. Corrosion-resistant steel parts including shells are to be passivated in accordance with QQ-P-35 and need not be overplated. (See MIL-STD-5002 for aerospace and missile application restrictions which restricts the use of zinc for aerospace applications.)

6.9.4.2 Finish for class H connectors. Unless otherwise specified, all metal parts for class H connectors are to be tin plated in accordance with MIL-T-10727. Preliminary plating of another metal is permissible.

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.

6.9.4.3 Finish for classes D, K, and M connectors. All metal parts for classes D and K connectors are to be electrically conductive nickel-phosphorus conforming to ASTM B733, class 1 or 2, type III, .0005 inch minimum thickness, class 1 or 2, grade B, finish is to be dull. Use of a suitable underplate is permissible. For class M, the finish is to be gold in accordance with MIL-G-45204, grade C, class 1 over a suitable underplate (see 6.5). A silver underplate is not be used.

6.9.5 Interface and physical dimensions.

6.9.5.1 Solder contacts. Solder contacts are to be nonremovable from the insert, are to have eyelet or solder cup terminals as specified (see 3.1)and are to be in accordance with MS18281. Solder cups are to be so designed such that during soldering, no components will be damaged and no liquid solder is to escape.

6.9.5.2 Crimp contacts. Crimp contacts are to be as follows:

Connector density	Contact size	Contact Part or Identyfying Number (PIN)
High	22D socket	M39029/57-354
High	22D pin	M39029/58-360
Standard	20 pin	M39029/64-369
Standard	20 socket	M39029/63-368

6.9.5.2.1 Contact insertion and removal tools. Crimp removable connectors are to be designed for contact insertion and removal with the applicable military tools as follows.:

Contact size	Tool PIN
22D	M81969/14-01 with plastic tips
	M81969/1-04 with metal tips
20	M81969/39-01 with plastic tips
	M81969/1-02 with metal tips

6.9.5.3 Classes H and K contacts. Classes H and K contacts are to be permanently fused in place and are to have eyelet or solder cup terminals, as specified (see 3.1), in accordance with MS18281.

6.9.7 Established Reliability and high reliability practice . An established reliability and a high reliability practice are to be established and maintained in accordance with MIL-STD-790. Evidence of such compliance is to be verified by the qualifying activity of this specification as a prerequisite for qualifications and continued qualifications effective 24 months after the date of this document.

6.9.8 Preparation of samples. Connectors are to be wired with approximately 2 feet of wire conforming to MIL-W-16878/4 and table X. Half of the connectors of each type are to be wired with the maximum wire size and the remainder are to be wired with the minimum wire size specified in table X. Termination of wires to contacts are to be accomplished as follows: A MIL-C-22520/2 crimping tool (see 3.1), is to be used for removable contacts. Soldering is to be in accordance with guideline 5 of MIL-HDBK-454 for nonremovable contacts. Insulation displacement connectors are to use cable in accordance with MIL-C-49055.

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

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - EC
Air Force - 85
NASA - NA

Preparing activity:
DLA - ES

Review activities:
Army - AR, AV, MI, AT, ME
Navy - AS, CG, MC, OS
Air Force - 11, 99

(Project 5935-4007)

Source: https://assist.dla.mil -- Downloaded: 2016-11-16T03:49Z
Check the source to verify that this is the current version before use.