

MIL-C-24368B(NAVY)  
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 SUPERSEDING  
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 1 March 1972  
 (See 6.6)

## MILITARY SPECIFICATION

### CONNECTOR ASSEMBLIES; PLUGS AND RECEPTACLES, ELECTRIC POWER TRANSFER, SHORE TO SHIP AND SHIP TO SHIP, GENERAL SPECIFICATION FOR

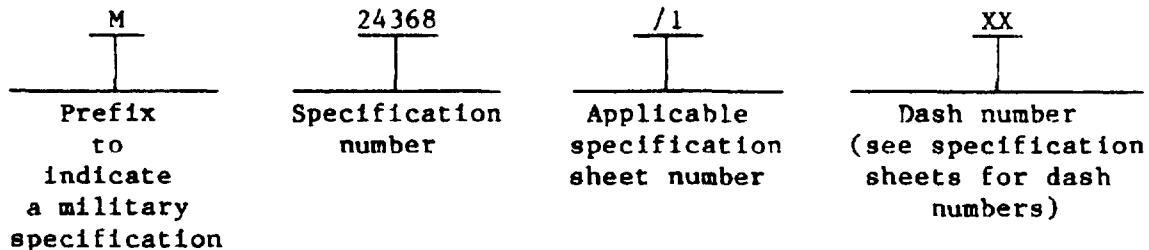
This specification is approved for use within the Department of the Navy and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers the requirements for the construction, performance, and testing of connector assemblies for electric power transfer from shore to ship and ship to ship.

1.2 Part number. The part number shall consist of the letter "M" followed by the basic specification sheet number, and a sequentially assigned dash number (see 3.1 and 6.2.1).

Example:



Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

## SPECIFICATIONS

## FEDERAL

- I-C-30 - Cable and Wire, Electrical Power, Fixed Installation.
- QQ-B-626 - Brass, Leaded and Nonleaded: Rod, Shapes, Forgings, and Flat Products with Finished Edges (Bar and Strip).
- QQ-C-390 - Copper Alloy Castings (Including Cast Bar).
- QQ-S-365 - Silver Plating, Electrodeposited; General Requirements for.
- QQ-S-763 - Steel Bars, Wire, Shapes, and Forgings, Corrosion Resisting.
- QQ-S-766 - Steel Plates, Sheets, and Strip - Corrosion Resisting.
- WW-T-791 - Tube, Brass, Seamless.

## MILITARY

- MIL-S-901 - Shock Test, H.I. (High-Impact): Shipboard Machinery, Equipment and Systems, Requirements for.
- MIL-C-915 - Cable and Cord, Electrical, for Shipboard Use, General Specification for.
- MIL-C-915/6 - Cable, Electrical, 600 Volts, Type THOF.
- MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
- MIL-R-3065 - Rubber, Fabricated Products.
- MIL-T-5624 - Turbine Fuel, Aviation, Grades JP-4 and JP-5.
- MIL-R-6855 - Rubber, Synthetic, Sheets, Strips, Molded or Extruded Shapes.
- MIL-S-8660 - Silicone Compound, NATO Code Number S-736.
- MIL-S-8805 - Switches and Switch Assemblies, Sensitive and Push (Snap Action), General Specification for.
- MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-F-16884 - Fuel Oil, Diesel, Marine.
- MIL-E-17555 - Electronic and Electrical Equipment, Accessories, and Repair Parts, Packaging of.
- MIL-M-24041 - Molding and Potting Compound, Chemically Cured, Polyurethane.

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## MILITARY (Continued)

- MIL-C-24643 - Cable and Cord, Electrical, Low Smoke, for Shipboard Use, General Specification for.
- MIL-C-24643/3 - Cable, Electrical, 600 Volts, Types LSSHOF, LSDHOF, LSTHOF, and LSFHOF.
- MIL-C-24643/16 - Cable, Electrical, 1000 Volts, Type LSTSGU (Including Variation LSTSGA).

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

## STANDARDS

## FEDERAL

- FED-STD-H28/2 - Screw Thread Standards for Federal Services, Section 2, Unified Thread Form and Thread Series for Bolts, Screws, Nuts, Tapped Holes and General Applications.

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-130 - Identification Marking of U.S. Military Property.
- MIL-STD-107-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-810 - Environmental Test Methods and Engineering Guidelines.
- DOD-STD-1399, Section 300 - Interface Standard for Shipboard Systems Electric Power, Alternating Current. (Metric)

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

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

## AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

- B18.1.1 - Small Solid Rivets. (DoD adopted)
- B46.1 - Surface Texture (Surface Roughness, Waviness and Lay). (DoD adopted)

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018.)

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## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 228 - Standard Specification for Steel Wire, Music Spring Quality. (DoD adopted)
- A 313 - Standard Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire. (DoD adopted)
- A 582 - Standard Specification for Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished. (DoD adopted)
- B 301 - Standard Specification for Free-Cutting Copper Rod and Bar.

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

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also may be available in or through libraries or other informational services.)

**2.3 Order of precedence.** In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede 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 requirements of this specification and the specification sheets, the latter shall govern.

**3.2 Qualification.** Connector assemblies furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.3 and 6.3).

**3.3 Materials.** Materials shall conform to the applicable specifications and as specified herein. Unless protected against electrolytic corrosion, dissimilar metals shall not be employed in intimate contact with each other in plugs or receptacles or in any mated pair of plug and receptacle conforming to this specification. Dissimilar metals are defined in MIL-E-917. Nonmetallic materials shall not support fungus growth.

**3.3.1 Hardware.** External hardware shall be of corrosion-resistant material or of a material that is protected to resist corrosion.

**3.3.2 Recovered materials.** Unless otherwise specified herein, all materials and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

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3.3.3 Prohibited materials. Asbestos and cadmium shall not be used in the manufacture of the connector assemblies.

3.4 Configuration and construction. Configuration and construction shall be as specified herein and in the applicable specification sheets (see 3.1).

3.4.1 Cables. The cables used in plugs and receptacles shall be in accordance with MIL-C-24643 or J-C-30, as specified (see 3.1). Type and size shall be as specified. When plugs and receptacles are furnished complete with cables, they are referred to herein as cabled connectors; otherwise, they are referred to as uncabled connectors.

3.4.2 Bus lugs. Bus lugs and reducer sleeves, where applicable, shall accommodate cable conductor sizes as specified in the applicable specification sheets.

3.4.3 Attachment of cable conductors to bus lugs. When specified (see 3.1), cable conductors shall be attached to the bus lugs. The method shall be by crimping. The electrical characteristics shall not exceed the contact resistance values specified (see 3.5.9.3). Pull-out strength shall be not less than 1325 pounds for 400-thousand circular mil (MCM) cable or 1500 pounds for 500-MCM cable when tested as specified in 4.6.15.

3.4.4 Phase polarizing. Phase polarization shall be accomplished by keying the plugs into their respective receptacles in such a manner that cross phasing cannot be accomplished.

3.4.5 Phase identification. Phase identification shall be accomplished by engraved, molded, or raised letters as specified (see 3.1) and shall be color coded: A-Black; B-White; and C-Red. The phase rotation and the relative position of the phase with respect to a reference point shall be as shown on the applicable specification sheets.

3.4.6 Engaging and disengaging forces. The forces for engaging and disengaging plugs and receptacles shall be such that no auxiliary tools or lubricants shall be required when tested as specified in 4.6.16.

3.4.7 Seals. Seals shall be made of elastomeric compound. Seals shall be furnished to seal between phases and to the external environments. When seals come in contact with uninsulated current-carrying members, they shall have good electrical characteristics to pass all electrical tests specified herein.

3.4.8 Current carrying parts. Unless otherwise specified (see 3.1), current carrying parts (bus lugs, socket and pin contacts, reducer inserts, and sleeves), shall be made of copper conforming to ASTM B 301, alloy no. C14500 or C18700. Current carry parts shall be silver plated in accordance with type II or III, grade A of QQ-S-365.

3.4.9 Surface finishes. Surface finishes shown on the specification sheets shall be in accordance ANSI B46.1.

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3.4.10 Threaded parts. Threads shall be right hand, unified national coarse or unified national fine in accordance with FED-STD-H2/2. Where threads are not specified (see 3.1), they shall be right hand, fine-thread series, unified form, class 2A or 2B.

3.5 Performance. Unless otherwise specified herein, all performance requirements shall apply to the plugs and receptacles assembled as specified on the applicable specification sheet.

3.5.1 Ambient temperature extremes. The plug and receptacles shall withstand ambient temperature extremes from minus 55 degrees Celsius ( $^{\circ}$ C) to plus 85 $^{\circ}$ C when tested as specified in 4.6.5.

3.5.2 Fluid immersion. The plugs, after having been immersed in fluids for the time periods specified, shall properly mate with their respective receptacles when tested as specified in 4.6.6.

3.5.3 Moisture resistance. Mated plugs and receptacles shall withstand the moisture resistance test specified (see 4.6.17). Following the moisture resistance test, the mated plugs and receptacles shall conform to the insulation resistance requirement (see 3.5.9.6) and the dielectric withstanding voltage requirement (see 3.5.9.4).

3.5.4 Impact. Connector assemblies shall not fracture or crack when subjected to a 3 foot-pound blow on the main body of the plug when tested as specified in 4.6.8.

3.5.5 High-impact shock. Connector assemblies, with covers or caps installed, shall conform to the type A, grade A, class 1 shock requirements for lightweight equipment as specified in MIL-S-901. Following the shock test (see 4.6.12), there shall be no evidence of damage or loosening of parts and the connector assemblies shall conform to the dielectric withstanding voltage requirement (see 3.5.9.4).

3.5.6 Water deluge. The plugs and receptacles shall withstand a water deluge of 400 gallons per minute at 100 pounds nozzle pressure at a distance of 50 feet for a minimum period of 5 minutes. Following the test of 4.6.7, the plugs and receptacle shall conform to the insulation resistance requirement (see 3.5.9.6).

3.5.7 Mechanical vibration. Connector assemblies with covers or caps installed shall conform to the type I vibration requirement of MIL-STD-167-1. Following the vibration test (see 4.6.13), there shall be no evidence of damage or loosening of parts and the connector assemblies shall conform to the dielectric withstanding voltage requirement (see 3.5.9.4).

3.5.8 Physical shock. Cabled connector assemblies shall withstand the physical shock test (see 4.6.14) without cracking, fracture, deformation, or physical damage which would interfere with electrical or mechanical operation.

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**3.5.9 Electrical requirements.**

3.5.9.1 Power source. The connector assemblies shall operate from electrical power having characteristics as specified for type I of section 300 of DOD-STD-1399. The voltage and frequency rating shall be as specified (see 3.1).

3.5.9.2 Electrical creepage and clearance distances. Electrical creepage and clearance distances shall conform to MIL-E-917.

3.5.9.3 Contact resistance. Plugs and receptacles shall show no contact resistance above the limits shown in table I.

TABLE I. Contact resistance.

	A	B	C
Test current per phase (ampere)	Contact millivolt drop (max) (see 4.6.3.1)	Millivolt drop after salt spray and durability (max) (see 4.6.10 and 4.6.4)	Contact and cable crimp millivolt drop (max) (see 4.6.3.2)
300	8	11	11

3.5.9.4 Dielectric withstanding voltage. There shall be no evidence of breakdown, arcing, corona (audible or visible), or punctured insulation when mated plugs and receptacles are subjected to the test as specified in 4.6.9 for 1 minute.

3.5.9.5 Current overload. When mated plugs and receptacles are subjected to the current overload rating as shown in table II (see 4.6.11), there shall be no shorting, loss of continuity, rupture, or contact welding.

TABLE II. Current overload.

Conductor size per phase	Continuous duty (2 hours) current (A)	Overload current (A)		
		5 min. (Min)	2 sec (Min)	1/2 cycle (Max)
400 MCM	400	800	20,000	30,000
500 MCM	500	800	20,000	30,000

3.5.9.6 Insulation resistance. With plugs and receptacles unmated and unterminated, the insulation resistance between phases and between any phase and any metal part shall be not less than 500 megohms with a potential of 500 volts direct current (Vdc) when tested as specified in 4.6.2.

3.5.10 Durability. Plugs and receptacles shall withstand the engagement/disengagement cycles specified and shall show no contact resistance above the limits shown in column B of table I when tested as specified in 4.6.4.

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3.5.11 Salt spray. After being subjected to the salt spray test as specified (see 4.6.10), plugs and receptacles shall show no contact resistance above the limits shown in column B of table I and shall show no evidence of excessive corrosion. Excessive corrosion shall be defined as that which interferes with electrical or mechanical performance, or in the case of plated metals, corrosion which has migrated through the plating and attacked the base metal.

3.5.12 Hydrostatic pressure (housing inserts). Housing inserts shall withstand a hydrostatic pressure of 1000 pounds per square inch (lb/in<sup>2</sup>) for a period of 2 hours when tested as specified in 4.6.18.

3.6 Interchangeability. In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance and strength.

3.7 Identification marking. The plugs and receptacles shall be clearly and permanently marked for identification in accordance with MIL-STD-130 with the following information:

- (a) Military part number.
- (b) Symbol number (as shown on applicable specification sheet).
- (c) National stock number.
- (d) Manufacturer's identification.
- (e) Contract number.
- (f) Serial number (alpha-numeric sequence at option of contractor).
- (g) Additional information as shown on the applicable specification sheet.

3.7.1 Marking method. Marking method shall be as specified in MIL-STD-130. Marking shall be on identification/information plates or directly on the item at the option of the manufacturer.

3.7.2 Identification and information plates. Unless otherwise specified (see 3.1), identification and information plates shall be severe service plates in accordance with MIL-P-15024 and MIL-P-15024/5, except that warning information shall be the color and format specified on the applicable specification sheet.

3.8 Dimensions and tolerances. Dimensions shall be as shown on the applicable specification sheet. Unless otherwise specified on the applicable specification sheet (see 3.1), the following tolerances shall apply:

- (a) Decimal dimensions - Plus or minus 0.005 inch.
- (b) Angular dimensions - Plus or minus 0 degree 15 minutes.

Unless otherwise specified in the applicable specification sheet, a tolerance of plus or minus 0.031 inch is acceptable on fractional dimensions that are controlled by welding, casting, or brazing. This wider tolerance shall not interfere with the interchangeability of assemblies or parts.



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3.9 Workmanship. The plugs and receptacles shall be free from burrs, sharp edges and foreign material. Molded parts shall be free from flash, blow holes, cracks or other imperfections. Surfaces in contact with O-rings and shaft seals shall be free of defects that may cause leakage or damage to the O-ring.

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Material certification. When specified in the contract or order, a material certification report shall be prepared (see 6.2.2).

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

- (a) Qualification inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

4.3 Qualification inspection. Qualification inspection shall be conducted at a laboratory satisfactory to the Naval Sea Systems Command (see 6.3). Qualification inspection shall consist of the examination and tests shown in table III.

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TABLE III. Qualification and quality conformance inspection.

Examination or test	Requirement	Test method	Qualification	Quality conformance
Examination of product	3.3, 3.4, 3.7, 3.8, 3.9 and specification sheets	4.6.1	X	
Insulation resistance	3.5.9.6	4.6.2	X	X
Contact resistance	3.5.9.3	4.6.3	X	X
Durability	3.5.10	4.6.4	X	
Ambient temperature extremes	3.5.1	4.6.5	X	
Fluid immersion	3.5.2	4.6.6	X	
Water deluge	3.5.6	4.6.7	X	
Impact	3.5.4	4.6.8	X	
Dielectric withstanding voltage	3.5.9.4	4.6.9	X	X
Salt spray	3.5.11	4.6.10	X	
Current overload	3.5.9.5	4.6.11	X	
High-impact shock	3.5.5	4.6.12	X	
Mechanical vibration	3.5.7	4.6.13	X	
Physical shock	3.5.8	4.6.14	X	
Pull-out strength	3.4.3	4.6.15	X	
Engaging and disengaging forces	3.4.6	4.6.16	X	X
Moisture resistance	3.5.3	4.6.17	X	
Hydrostatic pressure <sup>1/</sup> (housing inserts)	3.5.12	4.6.18	X	X
Packaging	5.1	4.7		

<sup>1/</sup> Each housing insert in the contract quantity shall be subjected to the hydrostatic pressure test.

4.3.1 Qualification samples. The samples for qualification inspection shall consist of two plugs and mating receptacles representative of standard production units.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the tests as specified in table III.

4.4.1 Inspection lot. An inspection lot shall consist of all the plugs, receptacles, and associated fittings of the same military part number, produced under essentially the same conditions and offered for delivery at one time.

4.4.1.1 Quality conformance inspection report. When specified in the contract or order, a quality conformance inspection report shall be prepared (see 6.2.2).

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4.4.2 Sampling for examination of product. Sample plugs and receptacles shall be selected from each lot in accordance with MIL-STD-105 at inspection level II for the examination (see 4.6.1). Defects shall be classified as shown in table IV. The Acceptance Quality Level (AQL) shall be 1.0 percent for major defects and 4.0 percent for minor defects. If the number of defective plugs and receptacles in the sample exceeds the acceptance number, the lot represented by the sample shall be rejected.

TABLE IV. Classification of defects.

Critical:	None defined
Major:	
101	Inability to mate with counterpart.
102	Incorrect contact construction.
103	Contact finish not as specified.
104	Incorrect dimensions which affect mating, engagement, or mounting.
105	Burrs capable of cutting personnel.
106	Incorrect marking.
107	Contact missing.
108	Missing socket spring.
109	Piece part missing.
110	Sharp edges capable of cutting personnel.
111	Material incorrect.
112	Other design and construction not listed as minor.
Minor:	
201	Poor exterior finish.
202	Foreign material not removed after final assembly.
203	Molding flash.
204	Incorrect dimensions not affecting mating, engagement, or mounting.
205	Incorrect exterior on outline.

4.4.3 Sampling for quality conformance inspection. Completely assembled plugs and receptacles shall be selected from each lot in accordance with inspection level II of MIL-STD-105 for quality conformance inspection (see 4.4.4). The AQL shall be 2.5 percent defective. If any sample plug or receptacle fails one or more of the tests, it shall be rejected and if the rejection number exceeds the acceptance number, the lot represented by the sample shall be rejected.

4.4.4 Quality conformance inspection. The sample plugs and receptacles selected (see 4.4.3) shall be subjected to the quality conformance inspection shown in table III, except examination of product (see 4.4.2).

4.5 Test conditions. Unless otherwise specified herein, examination and tests shall be conducted under any combination of conditions within the ranges specified hereinafter. Any specified condition shall not affect the other two ambient ranges.

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- (a) Temperature 20 to 30°C.
- (b) Relative humidity: 30 to 80 percent.
- (c) Barometric pressure: 24 to 31 inches or mercury (Hg).

#### 4.6 Test methods.

4.6.1 Examination of product. Plugs and receptacles shall be examined to determine conformance to all requirements not covered by performance requirements (see 3.5). Examination shall be performed to assure conformance to the following requirements:

- (a) Materials (see 3.3).
- (b) Configuration and construction (see 3.4).
- (c) Identification of product (see 3.7).
- (d) Dimensions (see 3.8).
- (e) Workmanship (see 3.9).

4.6.2 Insulation resistance. The insulation resistance of unmated plugs and receptacles shall be measured in accordance with method 302, condition B of MIL-STD-202. The insulation resistance shall conform to the requirements specified (see 3.5.9.6).

4.6.3 Contact resistance. The contact resistance test shall be conducted on mated plugs and receptacles in accordance with method 307 of MIL-STD-202. The following details shall apply:

- (a) Test current: 300A through each bus lug.
- (b) Method of connection: As specified in 4.6.3.1 and 4.6.3.2.
- (c) Number of measurements: Three (minimum) to determine average millivolt drop.

4.6.3.1 Contact resistance (unterminated connector assemblies). The millivolt drop shall be measured from the rear end of the bus lug on the receptacle to the rear end of the bus lug on the plug. The average millivolt drop shall not exceed the value shown in column A of table I.

4.6.3.2 Contact and cable crimp resistance (cabled connector assemblies). The millivolt drop shall be measured by piercing the insulation with a pin. The pin shall be inserted in that part of the insulation that is in the area to be potted. The average millivolt drop shall not exceed the value shown in column C of table I.

4.6.4 Durability. Plugs shall be subjected to 1000 engagement and disengagement cycles with mating receptacles. The rate shall be approximately two to five engagements and disengagements per minute. To prevent galling of contacts during this test, a very small amount of lubrication such as graphite may be applied to the contact. The millivolt drop shall be measured as specified in 4.6.3.1 or 4.6.3.2, as applicable, to determine conformance to column B of table I.

4.6.5 Ambient temperature extremes. The plug and receptacle shall be subjected to a high and low temperature test in accordance with procedure II of method 501.1, and method 502.1, respectively, of MIL-STD-810, except that the high temperature shall be plus 85°C and the low temperature shall be minus 55°C.

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4.6.6 Fluid immersion. The plugs, with covers and caps not installed, shall be immersed in the following fluids, one plug in each fluid, for the specified time period:

- (a) Aviation turbine (wide cut gasoline type) fuel (grade JP-4), of MIL-T-5624: 20 hours.
- (b) Fuel oil, diesel, marine, MIL-F-16884: 20 hours.

The plugs shall then be wiped free of the fluids and engaged to receptacles to determine that they mate properly and shall be subjected to the engaging and disengaging test of 4.6.16.

4.6.7 Water deluge. The receptacle and plug shall be subjected to a water deluge test. The test temperature of the water shall be as it comes from the cold water tap. The test shall be as follows:

- (a) The receptacle mated with the plug shall be subjected to a water deluge of 400 gallons per minute at 100 pounds nozzle pressure at a distance of 50 feet for a minimum period of 5 minutes. Following the test, the mated plugs and receptacles shall be subjected to the insulation resistance test (see 4.6.2).
- (b) The receptacle and the plug with covers or caps securely installed shall be subjected to water deluge specified in item (a). Following the test, the plug and receptacle shall be subjected to the insulation resistance test (see 4.6.2).

4.6.8 Impact. Connector assemblies with covers or caps securely installed, shall be placed in a cold chamber and conditioned at minus  $55 \pm 2^\circ\text{C}$  for 24 hours. Upon completion of the conditioning period and while still at minus  $55 \pm 2^\circ\text{C}$ , samples shall be placed on an anvil consisting of a 3/8-inch steel plate, and shall be subjected to impact by dropping a weight having a ball-shaped end with a 1/2-inch radius through a tube at right angles to the sample. Following the test, the samples shall be examined for fractures and cracks (see 3.5.4).

4.6.9 Dielectric withstanding voltage. Mated plugs and receptacles shall be tested in accordance with method 301 of MIL-STD-202 to determine conformance to the requirements of 3.5.9.4. The following details shall apply.

- (a) Nature of potential - alternating current (ac).
- (b) Magnitude of test voltage - 2500V root mean square (rms).
- (c) Points of application - The potential shall be applied between each phase and metal part and between each phase and all adjacent phases.

During the test, there shall be no evidence of breakdown, arcing, corona (audible or visible), and following the test, the samples shall exhibit no signs of punctured insulation.

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4.6.10 Salt spray. Unmated plugs and receptacles with covers or caps not installed, shall be subjected to the salt spray test, method 101, condition A of MIL-STD-202. The samples shall be examined for evidence of excessive corrosion (see 3.5.11). Following the test, the plug and receptacle shall be mated and shall be subjected to the contact resistance test (see 4.6.3). The test current shall be applied after the first mating action of the connectors under test and the millivolt drop shall not exceed the value shown in column B of table I.

4.6.11 Current overload. Mated plugs and receptacles shall be connected to a power supply as necessary to pass the specified currents (see 3.5.9.5 and table II) through all mated phases in the plugs and receptacles simultaneously. As a result of application of the overload current, there shall be no shorting, loss of continuity, rupture, or contact of receptacles.

4.6.12 High-impact shock. When specified (see 3.1), connector assemblies, with covers or caps securely installed, and mounted to simulate the installed condition, shall be subjected to the type A, grade A, class I shock test for lightweight equipment in accordance with MIL-S-901. The samples shall be examined for damage or loosening of parts (see 3.5.5), and shall be subjected to the dielectric withstanding voltage test (see 4.6.9).

4.6.13 Mechanical vibration. Connector assemblies with covers and caps securely installed, and mounted to simulate the installed conditions shall be subjected to the type I vibration test in accordance with MIL-STD-167-1. The sample shall be examined for damage or loosening of parts (see 3.5.7) and shall be then subjected to the dielectric withstanding voltage test (see 4.6.9).

4.6.14 Physical shock. Cabled connector assemblies with covers or caps securely installed shall be dropped from a height of 3 feet to a steel plate for 50 drops. The plug shall be randomly positioned for drop testing. The impact surface shall be flat. The sample shall be examined for cracking, fracture, deformation, or physical damage which would interfere with mechanical or electrical operation. Damage which may be restored by minor repairs shall not be cause for rejection.

4.6.15 Pull-out strength. Individual bus lugs crimped to cable connectors shall have sufficient force applied to pull the cable out of the bus lug. The force, in pounds, required to pull out shall be not less than the values specified (see 3.4.3).

4.6.16 Engaging and disengaging forces. Plugs and their respective receptacles shall be engaged (mated) and disengaged five times to determine conformance to 3.4.6.

4.6.17 Moisture resistance. The mated plugs and receptacles shall be subjected to the moisture resistance test, method 106 of MIL-STD-202. After the tenth and final cycle, the chamber shall be maintained at the end-of-cycle conditions for the time required to conduct the insulation resistance test (see 4.6.2), dielectric withstanding voltage test (see 4.6.9), and to make final measurements.

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4.6.18 Hydrostatic pressure (housing inserts). Housing inserts properly assembled in the housing or a test jig having the same dimensions as the housing shown on the applicable specification sheet, shall be subjected to a hydrostatic pressure of 1000 lb/in<sup>2</sup> for a period of 2 hours. The pressure shall be applied to the outboard side, without caps. The inserts shall meet the requirements specified in 3.5.12.

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

## 5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.4.)

5.1 Packaging. The plugs and receptacles shall be preserved and packaged, packed, and marked in accordance with MIL-E-17555. The level shall be as specified (see 6.2.1).

## 6. NOTES

6.1 Intended use. Plugs and receptacles are intended to provide electric interface connections for power transfer at 440 to 480 volt, three-phase, ungrounded, 400 to 500 A per phase between shore to ship or ship to ship.

### 6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Title, number, and date of the applicable specification sheet and part number (see 1.2).
- (c) Level of preservation and packaging, packing, and marking required (see 5.1).

6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DoD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification are cited in the following paragraphs.

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<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
4.1.2	Certificate of compliance	DI-E-2121	----
4.4.1.1	Test report	DI-T-2072	----

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5010.12-L., AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time set for opening of bids, qualified for inclusion in Qualified Products List QPL-24368 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. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.5 Subject term (key word) listing.

Connector assemblies  
Plugs, electric power transfer  
Receptacles, electric power transfer



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

Review activity:

Navy - YD

Preparing activity.

Navy - SH

(Project 5935-N193)

User activity:

Navy - EC

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### STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

<b>1 DOCUMENT NUMBER</b> MIL-C-24368B(NAVY)	<b>2 DOCUMENT TITLE</b> Connector Assemblies; Plugs And Receptacles, Electric Power Transfer, Shore To Ship & Ship To Ship
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**3a. NAME OF SUBMITTING ORGANIZATION**

**4 TYPE OF ORGANIZATION (Mark one)**

VENDOR

USER

MANUFACTURER

OTHER (Specify) \_\_\_\_\_

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

**5 PROBLEM AREAS**

**a. Paragraph Number and Wording**

**b. Recommended Wording**

**c. Reason/Rationale for Recommendation**

**6 REMARKS**

**7a NAME OF SUBMITTER (Last, First, MI) - Optional**

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

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

**8 DATE OF SUBMISSION (YYMMDD)**

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