

A Summary of Connector Specifications for RF and Other Applications

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This article provides a listing of major technical standards for RF and RFI/EMI shielded connectors, drawn from various standards organizations and industry reference sources

When selecting a connector for a new product, the first step is to decide which connector style provides the proper form and function. The second step is to make sure that the connector's perfor-

mance meets both your requirements and those specified by your customer. This is especially important with products intended for military and aerospace, automotive, and other high reliability applications.

Many other applications also have specific electrical requirements, such as passive intermodulation distortion in wireless base station systems, non-magnetic properties in magnetic resonance imaging (MRI) systems, plus safety requirements, electrostatic discharge (ESD) protection and electromagnetic interference (EMI) filtering. These specifications may be referenced to national or international standards, or may be proprietary requirements for a specific customer, such as wireless carrier in the case of a passive IMD specification.

Environmental performance may also be specified by a standard or customer requirement. Resistance to moisture, corrosion, electrolytic effects and temperature extremes may be required. Mechanical properties may be specified as well, including mating/unmating force, axial and radial forces, and vibration.

Also, the actual physical construction should not be overlooked. Specific connector types are well-defined in their interface dimensions, but customers may require tight manufacturing tolerances, or may have special mounting requirements.

Standards Listing

Beginning on the following page is a list of many published standards and specifications for RF connectors, and for a number of RFI/EMI shielded electrical connectors. It is not intended to be a complete listing of all standards, but provides an initial set of standards to begin your research.

Among the most important of these are the IEC 169-xx standards, including IEC 60169-2 through -28 (not all numbers are presently in use). Of equal importance in defense applications is MIL-STD-348A and the additional documents it references. These standards cover all major RF connectors.

Various industry groups—broadcasting, CATV, RF heating, and others—may have additional standards information specific to their requirements. Readers are encouraged to search out additional information from professional societies or other standards organizations serving their industry.

References

Many references were used to prepare the accompanying list of connector standards and specifications. Some key sources include:

1. http://en.wikipedia.org/wiki/Military_connector_specifications
2. International Electrotechnical Commission (IEC): www.iec.ch
3. Defense Supply Center Columbus, Document Standardization Division: www.dscc.dla.mil
4. "RF Connector Guide," available at www.hubersuhner.com
5. "Glossary of active military specifications for connectors," *Connector Specifier*, July 2009.

Military, Commercial, Automotive and Other Specifications for Connectors

This list is not intended to be comprehensive; it represents information collected using various references for RF connector and RFI/EMI shielded electrical connectors. Readers are encouraged to research additional standards as necessary

- IEC 60169-1: Radio-frequency connectors. Part 1: General requirements and measuring methods, with amendments and follow-on documents for reflection factor measurements and shielding effectiveness.
- IEC 60169-(2 - 28): Detail specifications for various specific connector types
- IEC 60966-2-3: Detail specification for flexible coaxial cable assemblies using IEC 61169-8 connectors
- IEC 61169-8: Sectional specification - 50 ohm BNC RF coaxial connectors
- IEEE STD 287: 7 mm Amphenol APC-7[®], 2.92 mm Anritsu K Connector[®], 2.4 mm & 1.8 mm Anritsu V Connector[®], 1.0 mm Anritsu W1 Connector[®]
- MIL-STD-348A: Military Standard, Radio Frequency Connector Interfaces for MIL-C-3643, MIL-C-3650, MIL-C-3655, MIL-C-25516, MIL-C-26637, MIL-PRF-31031, MIL-PRF-39012, MIL-PRF-39030, MIL-PRF-49142, MIL-PRF-55339, and MIL-C-83517
- MIL-C-3643: Connectors, Coaxial, Radio Frequency, Series HN, and Associated Fittings
- MIL-C-3650: Connectors, Coaxial, Radio Frequency, Series LC
- MIL-C-3655: Connectors, Plug and Receptacle, Electrical (Coaxial, Series Twin), and Associated Fittings
- MIL-C-25516: Connectors, Electrical, Miniature, Coaxial, Environment Resistant Type
- MIL-C-26637:
- MIL-PRF-31031: Connectors, Electrical, Plugs and Receptacles, Coaxial, Radio Frequency, High Reliability, For Flexible and Semirigid Cables,
- MIL-PRF-39012: General Specifications for Connectors, Coaxial, Radio Frequency
- MIL-PRF-49142: Connector, Triaxial, Radio Frequency
- MIL-PRF-55339: Adapters, Connectors, Coaxial, Radio Frequency, (Between Series and Within Series)
- MIL-DTL-83517: Connector, Coaxial, Radio Frequency For Coaxial, Strip or Microstrip Transmission Line
- MIL-DTL-83723: Connectors, Electrical (Circular, Environment Resisting)
- MIL-DTL-83723F(1) SUP1A: Connectors, electrical (Circular, environment resisting), receptacles and plugs, general specification
- MIL-DTL-83723/61E: Connectors, electrical (Circular, environment resisting), dummy connector, receptacles (for MIL-C-26500 and MIL-C-83723, Series III, Classes A, R, and W)
- MIL-DTL-83723/65E: Connector, electric (Circular, environment resisting), receptacle, (Single-hole mount, bayonet coupling, pin contact), (Series III, Class H)
- MIL-DTL-83723/72D: Connector, electric (Circular, environment resisting), receptacle, (Single-hole mount, bayonet coupling, pin contact), (Series III, Class H)
- MIL-DTL-83723/73E: Connector, electric (Circular, environment resisting), receptacle, (Single-hole mount, bayonet coupling, crimp socket contact), (Series III, Class A, G, R, and W)
- MIL-DTL-83723/74E(1): Connectors, electric (Circular, environment resisting), receptacle, (Single-hole mount, bayonet coupling, crimp pin contact), (Series III, Classes A, G, R, and W)
- MIL-DTL-83723/75D: Connectors, electrical (Circular, environment resisting), plug, (bayonet coupling, crimp socket contact), (Series III, Classes A, G, K, R, and W)
- MIL-DTL-83723-76D: Connectors, electrical (Circular, environment resisting), Plug, (bayonet coupling, crimp pin contact), (Series III, Classes A, G, R, and W)
- MIL-DTL-83723/77C(1): Connectors, electrical (Circular, environment resisting), Plug, (RFI, bayonet coupling, crimp socket contact), (Series III, Classes G, R, and W)
- MIL-DTL-83723/78D: Connectors, electrical (Circular, environment resisting), Plug, (RFI, bayonet coupling, crimp pin contact), (Series III, Classes G, R, and W)
- MIL-DTL-83723/79D: Connectors, electrical (Circular, environment resisting), receptacle, (flange-mount, bayonet coupling, solder pin contact), (Series III, Classes H and Y)
- MIL-DTL-83723/80C: Connectors, electrical (Circular, environment resisting), receptacle (solder flange-mount, bayonet coupling, solder pin contact), (Series III, Classes H and Y)
- MIL-DTL-83723/81E: Connectors, electrical (Circular, environment resisting), receptacle (single hole-mount, bayonet coupling, solder pin contact), (Series III, Classes H and Y)
- MIL-DTL-83723/85F: Connectors, electrical (Circular, environment resisting), receptacle (single hole-mount, threaded coupling, crimp pin contact), (Series III, Classes A, G, K, N, R, S, and W)
- MIL-DTL-83723/88D: Connectors, electrical, (Circular, environment resisting), receptacle (flange-mount, threaded coupling, solder pin contact), (Series III, Classes H, N, and Y)
- MIL-DTL-83723/89E: Connectors, electrical, (Circular, environment resisting), receptacle (single hole-mount, threaded coupling, solder pin contact), (Series III, Classes H, N, and Y)
- MIL-DTL-83723/90E: Connectors, electrical (Circular, environment resisting), receptacle, (solder flange-mount, threaded coupling, solder pin contact), (Series III < Classes H, N, and Y)
- MIL-DTL-83723/93C: Connectors, electrical (Circular, environment resisting), receptacle (solder flange-mount, bayonet coupling, straight pin contact), (Series III, Class H and Y)
- MIL-DTL-83723/94E: Connectors, electrical (Circular, environment resisting), receptacle (single hole-mount, bayonet coupling, straight pin contact), (Series III, Classes H and Y)
- MIL-DTL-83723/95F: Connectors, electrical (Circular, environment resisting), plug (threaded coupling, self-locking, crimp socket contact), (Series III, Classes A, G, K, R, and W)
- MIL-DTL-83723/96F: Connectors, electrical (Circular, environment resisting), plug (threaded coupling, self-locking, crimp pin contact), (Series III, Classes A, G, K, R, and W)
- MIL-DTL-28731/38A: Connector, electrical, rectangular shield, for use with MIL-C-28731/32

MIL-DTL-38999/91 NOT 1: Connectors, electrical, circular, receptacle, dummy stowage, bayonet coupling (MIL-C-27599 Series I and MIL-DTL-38999 Series I)	Straight, Non-Self Locking and Self Locking, Pre-Attached Shield Termination (RFI/EMI), Boot Accommodation, Category 3B (for MIL-DTL-83723 Series III, MIL-DTL-5015 [Series I and II], AS81703 Series III, and MIL-C-26482 Series II Connectors)
MIL-DTL-38999/10A NOT 1: Connectors, electrical, circular, receptacle, dummy stowage, bayonet coupling (MIL-C-27599 Series II and MIL-DTL-38999 Series II)	SAE-AS85049/111: Connector Accessories, Electrical Backshell, 90 Degree, Self-Locking and Non-Self-Locking, Pre-Attached Shield Termination (RFI/EMI), Boot Accommodation, Category 3B (for MIL-DTL-83723 Series III, MIL-DTL-5015 [Series I and II], AS81703 Series III, and MIL-C-26482 Series II Connectors)
MIL-C-83723/59C NOT 1: Connectors, electrical (Circular, environment resisting), protective covers, plug (for MIL-C-26500 and MIL-C-83723, Series III, Classes A, R, and W)	SAE-AS85049/112: Connector Accessories, Electrical Backshell, Straight, Self-Locking and Non-Self-Locking, Pre-Attached Shield Termination (RFI/EMI), Boot Accommodation, Category 3B (for MIL-DTL-38999 Series I and II Connectors)
MIL-C-83723/60D NOT 1: Connectors, electrical (Circular, environment resisting), protective covers, receptacles (for MIL-C-26500 and MIL-C-83723, Series III, Class A, R, and W)	SAE-AS85049/114: Connector Accessories, Electrical Backshell, 90 Degree, Self-Locking and Non-Self-Locking, Pre-Attached Shield Termination (RFI/EMI), Boot Accommodation, Category 3B (For MIL-DTL-38999 Series I and II Connectors)
MIL-DTL-83723/61E: Connectors, electrical (Circular, environment resisting), dummy connector, receptacles (for MIL-C-26500 and Mil-C-83723, Series III, Classes A, R, and W)	SAE-AS85049/115: Connector Accessories, Electrical Backshell, Straight Self-Locking and Non-Self-Locking, Pre-Attached Shield Termination (RFI/EMI), Boot Accommodation, Category 3B (for MIL-DTL-38999 Series III and IV Connectors)
SAE-AS854049/103: Connectors, Accessories, Composite, RFI/EMI, Electrical, Strain Relief, Straight, Self-Locking, Category RELIEF, 3C (for MIL-DTL-38999 Series III and IV Connectors)	SAE-AS85049/117: Connector Accessories, Electrical Backshell, 90 Degree, Self-Locking, Pre-Attached Shield Termination (RFI/EMI), Booth Accommodation, Category 3B (for MIL-DTL-38999 Series III and IV Connectors)
SAE-AS854049/104: Connectors, Accessories, Composite, RFI/EMI, Electrical Strain Relief, 45, Self-Locking, Category 3C (for MIL-DTL-38999 Series III and IV Connectors)	
SAE-AS85049/105: Connectors, Accessories, Composite, RFI/EMI, Electrical Strain Relief, 90, Self-Locking, Category 3C (for MIL-DTL-38999 Series III an IV Connectors)	
SAE-AS85049/109: Connector Accessories, Electrical Backshell,	