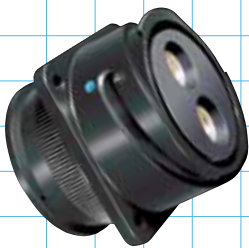


ENVIRONMENTAL CONNECTOR REFERENCE GUIDE



Answers to your most



frequently asked questions



Welcome Interconnect Professionals!

High performance MS type electrical connectors have been around since the late '30s. As military and aerospace electronics became more prevalent and sophisticated, so did the requirements for interconnection devices. As you may know, Glenair is the largest connector accessory supplier in the world building the widest range of backshells, dustcaps, and other accessories for connectors past and present. But Glenair also produces a wide range of QPL and commercial environmental connectors. In this Environmental Connector Reference Guide, we are happy to provide you with some of the most essential reference materials for use in identifying and specifying both connector and accessory types and styles. Remember, in addition to the backshell, in most cases Glenair can now provide all your connector requirements as well, from MIL-DTL-38999 to various forms of MIL-DTL-5015 and other high-performance connector solutions.

Environmental Connector Types

Free Cable Plugs and Mounted Receptacles

Environmental cable plugs and receptacles are the “bread and butter” products in the high-reliability I/O connector industry. Regardless of product series, Glenair is able to supply both military standard, VG qualified as well as custom designed special purpose plug-and-receptacle connectors. The products are typically produced from either aluminum alloy, composite plastic, stainless steel, and occasionally titanium. Insert arrangements include standard signal as well as power and RF layouts. Coupling styles run the complete range from bayonet to push-pull lanyard release or standard threaded designs.



Bulkhead Feed-Throughs

Bulkhead feed-thrus eliminate the need to permanently fix cable harnesses to panels—affording increased system flexibility, superior mechanical integrity, and greater serviceability. Glenair hermetic and environmental bulkhead feed-thru connectors are available in MIL-DTL-38999 Series I, II and III configurations. Hermetic Versions are ideally suited for high-pressure/low-leakage applications in air, sea and space environments, meeting a leak rate of 1×10^{-7} cm³ per second. Environmental versions offer IP67 level sealing.



Sav-Con® Connector Savers

Glenair Sav-Con® Connector Savers are designed to protect connectors that are subject to repeated mating and unmating cycles. Sav-Con® Connector Savers prevent costly repair or replacement of expensive connectors and cables while preserving the quality and integrity of connector performance. Sav-Con® Connector Savers take the abuse of repeated connection cycles instead of “black box” or other equipment connectors. Equipment connectors that are mated and unmated frequently during manufacturing, check-out phases and environmental test programs can be protected by Glenair Sav-Con® Connector Savers at considerable savings in time and money.



Overview of Circular MS Type Environmental Connector Families

Series 80 “Mighty Mouse” Connectors

The Series 80 “Mighty Mouse” Connector is currently available with 33 high density insert arrangements from 1 to 130 contacts on 0.076” spacing, in bayonet, triple-start threaded and push-pull coupling styles. The connector series is broadly applied in ground soldier ensembles—including Land Warrior—and offers virtually equal performance to MIL-DTL-38999 interconnects with up to 71% weight and 52% size savings. The Series 80 “Mighty Mouse” supports a flexible range of contact types, including #23 and #20 signal contacts, #16 and #12 power contacts, size #16 and #12 coaxial contacts, as well as #12 pneumatic contacts.



MIL-DTL-38999 Type Environmental Connectors

Environmental class plugs and receptacles are offered in high-density insert arrangements (up to 128 contacts) with crimp removable contacts, PC tails, and solder cups—in Series I, II and III configurations. Glenair manufactures a wide range of environmental class MIL-DTL-38999 type connectors including lanyard-release products, composites, specialty metal cable plugs and receptacles, and Coax contact equipped products. Both MIL-qualified and one-off “specials” are available to meet the requirements of every application.



Series ITS Reverse Bayonet MIL-DTL-5015 Type

The Glenair ITS connector series is based on the MIL-DTL-5015 standard, but in lieu of threads features an improved reverse bayonet coupling that provides positive mating and excellent shock and vibration resistance. These rugged connectors are available in hundreds of power and signal insert arrangements, and offer exceptional environmental protection.



MIL-DTL-83723

The MIL-DTL 83723 Series III Type connector is ideally suited for use on commercial, military, and aerospace interconnect systems that demand high vibration resistance and reliability in a medium-density cylindrical connector. Glenair can supply over 30 insert arrangements, from 2 to 61 contacts. The MIL-DTL-83723 utilizes Mil-Standard AS39029 crimp contacts as well as solder cups and PC Tail terminations in sizes 12, 16, and 20



Series IPT and IPT-SE (MIL-DTL-26482 Type)

The Glenair Series IPT SE Bayonet-Lock Signal Connector is ideally suited for all general and environmental applications that require a high-performance military type cylindrical connector with crimp-removable contacts. Qualified to VG95328, the bayonet mechanism provides fast and easy coupling, especially when the connector is situated in an awkward or hard to reach location. Glenair also supplies a selection of higher performance hermetic and environmental MIL-DTL-26482 Type connectors under our 230 series product code



MIL-DTL-28840

The standard connector and backshell series for shipboard use, MIL-DTL-28840 offers high-density insert arrangement and high-shock performance. The MIL-DTL-28840 features RFI/EMI shielding, scoop-proof shells and corrosion resistant materials and finishes. Glenair’s qualified product line is fully tooled and highly available.



Cylindrical Connector

❧ TERMS AND DEFINITIONS ❧

Back-Mounted: A connector design used in panel or box applications in which the mounting flange is located inside the equipment enclosure.

Bayonet Coupling: A mating design utilizing pins on the receptacle and ramps on the plug for quick-connect and disconnect coupling. "Reverse" bayonet puts the pins on the plug and ramps on the receptacle.

Circular Connector: Any of a thousand flavors of multipin interconnects with cylindrical contact housings and circular contact interface geometries. Circular connectors are selected for ease of engagement and disengagement, their ability to conveniently house different types of contacts, their wide range of allowable contact voltages and currents, their ease of environmental sealing and their rugged mechanical performance. In military and other high-rel applications, the MIL-C-5015 and D38999 are the most commonly specified types. Note: A disadvantage of the circular design is loss of panel space when used in arrays.

Closed Entry: A contact cavity design in which the entry diameter of the socket insulator is smaller than the O.D. of the socket contact. Closed entry limits the size or position of the mating contact to a maximum dimension.

Connector Body: The metal or plastic shell of a connector. Its main purpose is to house the contacts, maintain their position and shield them from dust, dirt, moisture, and electrical interference.

Coaxial Contacts (and Cable): A contact with inner and outer conductive elements separated by a center dielectric element. Coaxial contacts terminate coaxial cable, and are employed in high bandwidth, high-frequency applications such as video and audio. The cable offers a closed, controlled impedance medium for the transmission of RF energy. It also provides high frequency performance and RFI shielding.

Contact: The conductive element in a connector. Contacts mate mechanically and electrically to transmit signals and/or power across a connector interface.

Crimp style contacts are the most common type found in high-reliability cylindrical connectors. Male contacts are sometimes referred to as leads, posts or pins. Female contacts are universally known as sockets.

Contact Arrangement or Pattern: The gauge, number, spacing and arrangement of contacts in a connector. Contact arrangement selections are based on the current and voltage requirements of the application, and the space available for the connector package.

Contact Engaging and Separating Force: Tensile force required to engage or separate mating contacts. Measured in ounces, the force increases with the number of contacts and with contact size.

Contact (or Circuit) Identifier: Wiring schematics identify and label each and every circuit with numbers, letters or special codes. On the connector, this process is maintained by marking small numbers or letters next to each contact cavity on the connector.

Contact Resistance: The measure of electrical resistance across a pair of fully mated contacts. Measured in ohms or millivolt drop at a specified current, contact resistance is affected by normal force (the static force on the contact interface), plating quality and the physical geometry of the contact.

Contact Retainer: A locking clip or tang used to secure a crimp contact in place within the connector insert. Contact retention specifications define the force required to remove a properly seated contact for each class of connector.

Contact Retention: The pressure a contact can withstand, in either direction, without being dislodged from the retaining clip which holds it within the connector.

Contact Size: An assigned number denoting the outside diameter of the engaging end of the pin contact. The larger the number, the smaller the size.

Contact Spacing: Also referred to as pitch, the distance, center-to-center, between adjacent contacts.

Coupling Ring: An accessory feature of the connector plug which aids in mating and unmating plugs and receptacles and prevents decoupling of the connector. Self-locking coupling rings are used for high-vibration applications.

Crimp: The physical compression (deformation) of a contact barrel around a conductor in order to make an electrical connection.

Crimp Contact: A connector pin or socket, shipped loose with the connector body, and designed to be crimped onto the end of the wire conductor with a special tool. Often referred to as “crimp and poke” contacts, the terminated contact is poked into the connector body either by hand, or in the case of small gauge wires, with the aid of a hand-held tool. The ease of assembly and maintenance afforded by crimp contacts is preferred for aerospace and other high reliability applications not requiring a hermetic seal.

Dielectric: A material having electrical insulating properties, such as the contact insulator in a connector or the jacketing on a wire.

Electrical Connector: A separable device which provides mechanical and electrical contact between two elements of an electronic system without unacceptable signal distortion or power loss.

Electromagnetic interference (EMI) is conducted, radiated or magnetically induced voltage that degrades, obstructs, or repeatedly interrupts performance of electronic equipment.

Environmentally Sealed: Connectors and backshells designed to prevent fluids, moisture, air or dust from degrading the performance of electrical contacts and conductors. “Environmental” components typically use gaskets, grommets, potting materials or interfacial and O-ring seals to prevent the penetration of foreign substances into the body of the part.

Filter Contact or Filter Connector: Contact design which provides EMI suppression in addition to its normal function of transmitting electrical energy. Filtered connectors are typically specified for highspeed signal paths. Filtering is accomplished through the integration of capacitors into the contact to separate high-frequency noise from low-frequency signals.

Firewall Connector: A class of high-reliability, feedthrough connectors designed to prevent fire or sparks from penetrating through a sealed bulkhead.

Firewall connectors must continue to function for a specific period of time when exposed to fire, and are typically specified in military applications such as fighter jets and Navy ships.

Flange: The integral mounting plate on some bulkhead and feed-through connectors used to attach the connector to the chassis or panel. The connector flange is typically square, and is mounted to the panel with threaded screws.

Front Mounted: A connector design used in panel or box applications in which the mounting flange is located on the inside or outside of the equipment enclosure.

Front Release: “Crimp and poke” style contacts may be removed from the connector for maintenance using a special hand-held tool. The proper insertion and removal tool must be used at all times. In front release designs, the tool is inserted into the mating face of the connector to disengage the contact from its retaining clip. The disengaged contact is then removed from the back (cable-side) of the connector by lightly pulling on the attached wire.

Grommet: An elastomeric seal used on the back side of a connector to seal out fluids, moisture, air and dust. **Grounding (or EMI) Fingers:** A set of spring fingers in certain connectors, used to facilitate shell to shell grounding and enhance EMI performance. The grounding fingers engage before contact mating and remain engaged until after contact separation.

Guide Pins: Metal posts with a rounded or pointed tip which projects beyond the contact interface, used to assist in the correct alignment and mating of connector shells and contacts. The post mates with a corresponding cavity on the mating connector before contacts are allowed to engage. Guide pins are typically used in rack and panel packaging and in other “blind-mate” applications. Guide pins can also be used to insure correct polarization.

Hermetic Connector: A class of connectors equipped with a pressure seal for use in maintaining pressurized application environments. The hermetic element of the connector is typically fabricated from vitreous glass.

Insert: A molded piece of dielectric material that fits inside the connector shell and supports the connector contacts. Inserts are tooled for each shell size, and contact arrangement. Inserts made from resilient materials also contribute to environmental properties.

Insulation Displacement: Forcing an insulated wire into a terminal slot smaller than the conductor diameter, displacing the insulation to make electrical contact.

Interfacial Seal: An elastomeric seal providing overall sealing of the mated connectors and their individual contacts. “Cork & bottle” style seals feature a raised shoulder around each pin contact that compresses into a corresponding hole on the socket contact insulator.

Key: A short pin (sometimes referred to as a “dog” by crusty old machinists) which slides into a corresponding slot or keyway to guide the plug and receptacle together during mating. The principal function of the key is to insure polarization of the mating contacts.

Levels of Interconnection: A classification system for connectors defining connector types in terms of interconnect system function. The levels of most use include Level 4 (subassembly to subassembly), Level 5 (subassembly to I/O) and Level 6 (system to system). The lower levels (1, 2 and 3) all concern interconnection inside the microscopic world of printed circuit boards.

Mating and Unmating Force: The force required to join and separate two halves of a connector. This is the sum of contact engaging forces plus any additional force necessary to overcome minor misalignment of connector halves and any dimensional variations in the connector shells.

Normal Force: A measure of the spring pressure applied perpendicularly to contacts in mated connectors. The force of this spring pressure creates the gas-tight interface between contact surfaces which prevents corrosive contaminants from penetrating or forming between the contacts. High normal force reduces resistance across the contacts, but contributes to contact wear and may overstress the connector housing and even damage the spring properties of contact sockets. However, maintaining a constant normal force is an essential requirement for electrical integrity in the connector.

Package Size: The length, width and height of the connector; or alternatively the dimensions of the entire interconnect system. Package size is an issue in many applications where system miniaturization, faster operating speeds, higher operating temperatures and other application requirements place new demands on the envelope of space the connector and its accessories may occupy.

Plug: The half of a connector pair which is designed to attach to a wire or cable; as opposed to the receptacle half which is typically mounted to a bulkhead, panel or box. Even though we usually picture plugs as having male (pin) contacts, they can in fact house any type of contact—pins, sockets or even both. Thus it is the design and location of the connector which makes it a plug, not the gender of its contacts.

Polarize: Design features on mating connectors—such as keyways or shell geometries—that insure connectors can be mated in only one possible orientation. The shape of a D-Sub connector shell, for example, assures that the two halves of the connector can be mated in only one way.

Potting: The permanent sealing of the cable end of a connector with a compound or material to exclude moisture or to provide a strain relief. Glenair typically uses epoxy compounds for this purpose because of their dimensional stability and high-temperature resistance.

Radio frequency interference (RFI) is a type of EMI that occurs between the audio and infrared frequencies in the electromagnetic spectrum. Many natural RF signals exist in nature, but typically RFI is a man-made electromagnetic wave such as might originate in unfiltered electronic circuitry.

Rear Release: “Crimp and poke” style contacts (see Crimp Contacts above) may be removed from the connector for maintenance using a special hand-held tool. The proper insertion and removal tool must be used to install and remove wires from such crimp and poke connectors. In rear release designs, the tool is inserted into the rear (cable side) of the connector to disengage the contact from its retaining clip. The disengaged contact is then removed from the connector by lightly pulling on the attached wire.

Receptacle: The other half of the connector pair, designed to be mounted—with jam nut fittings or other fastener hardware—to a bulkhead, panel or box.

Inline receptacles are also available for cable-to-cable connections. As with the plug, it is the design and location of the receptacle in the system, not the gender of its contacts, which makes it a receptacle.

Rectangular Connector: Any of the thousands of multipin interconnects with rectangular shell housings and rectangular insert interface geometries. Rectangular connectors are typically mounted in rack and panel configurations in which large arrays of fixed receptacle connectors are mated with plugs attached to a movable rack for efficient utilization of space. D-Subminiatures are the world's most common rectangular connectors.

Scoop-proof: Scoop-proof connectors feature a nice, long shell on the receptacle which prevents damage to the exposed contact pins during mating. No matter how hard that swabbie tries, it is impossible to cock the mating plug so as to damage the pins or electrically short the contacts.

Service Rating: Also called Current Rating, the maximum voltage or current load a connector is designed to carry during continuous, long-term use. Good engineering practice usually entails preliminary testing of connectors which will be operated with most or all contacts at the maximum rated load. Designers will often maximize contact and wire size in such situations.

Solder Cup: A connector design that typically uses potting material to permanently affix the contacts inside the connector shell. Termination of contact to wire is then accomplished by soldering the wire into the cup-like barrel on the back of the contact. In the United Kingdom it is important to pronounce the "i" in solder. Brits also prefer to say "bucket" rather than "cup" when specifying solder contacts.

Standoff Part of a connector shell, a standoff provides additional working room between the connector shell, and, for example, a printed circuit board

Surface Mount: A termination method in which solder "tails" or leads on the connector are soldered directly to a printed circuit board. In high-reliability commercial and military applications, surface mount receptacle connectors are typically limited to rectangular designs such as D-Subminiatures and Micro-D's. But some surface-mount applications do use a cylindrical connector mounted to the box with ribbon cable or flying leads soldered directly to the

PCB. The reason here is to provide a low-resistance pathway to ground of the shielded cable. In severe EMI applications, it is less satisfactory to bring the shielded cable directly to the printed circuit board because of the difficulty in shielding out interference conducted along the cable.

Termination: Termination is the physical act of attaching a wire conductor to a contact. Effective termination contributes to electrical performance and to the durability and reliability of the interconnect system. Common termination methods include crimp, insulation displacement, surface mount, and soldering. Termination can also refer to the mechanical attachment of EMI shielding to the connector backshell.

Threaded Coupling: An interconnect mating design which utilizes a threaded nut on the plug, and a corresponding set of threads on the receptacle, to mate the pair of components. The coupling nut is usually equipped with flats or knurling for easy assembly. Different thread types, profiles and geometries provide different functionality. "Buttress" threads, for example, are often specified on plastic connectors due to their enhanced tensile strength. The MIL-DTL-38999 Series III connector incorporates a triple-start threaded coupling mechanism for greater vibration protection and faster mating and unmating.

Wall Mount A square-flanged receptacle connector in which the mounting flange is located on the outside of the equipment enclosure.

Wiping Effectiveness: Maintaining a clean, metallic path is essential if contacts are to perform with low and stable contact resistance. Surface films and contaminants are removed from the surface of plated contacts each time mating occurs. This displacement of surface contaminants during mating is called contact wiping. Wiping effectiveness depends on the contact geometry, engagement length and normal force. Interestingly, oxide film does not form on gold plated contacts, so wiping pressure can be lighter to displace only the occasional surface contaminant.

Wire Pull-Out Force: This defines the force required to separate a wire from a contact. In properly terminated crimp contacts, the wire will generally break before it pulls away from the contact.

Introduction to **MILITARY STANDARD CYLINDRICAL CONNECTORS**

The purpose of a connector is easy to describe: connectors bridge gaps between individual pieces of electronic equipment to make assembly, repair and upgrades easier to accomplish. Instead of struggling with a gordian knot of soldered circuits and spliced wiring, connectors enable technicians to make interconnections with ease and convenience.

Connectors bridge the gap between individual wires to provide contact between two conductive elements of an electronic system. The connection they make enables electrical current (or light waves in the case of fiber optics) to flow from one conductor to the next. Edward's Publishing's indispensable Encyclopedia of Connectors defines the connector thus: *"An electromechanical device which permits two or more circuit elements to be electrically and mechanically separated and reconnected at will without disturbing any other elements of the circuit. A connector performs no circuit function and should have no effect on the electrical performance of the device to which it is attached. If the connectors of a device were eliminated and the corresponding wires joined together, the circuit would not be affected."*

When connectors are used to connect one set



Connector testing is designed to simulate a lifetime of use over a short period of time. Environmental, mechanical and electrical tests are conducted to measure both the reliability of the connector and the system. The number-one criterion of reliability is a change in contact resistance.

of wires to another, they are called wire-to-wire connectors. Wire-to-board connectors connect a wire to a Printed Circuit Board (PCB). And board-to-board connectors directly interconnect PCB's.

Connectors facilitate the fabrication and assembly of electronic products by enabling designers to treat each subassembly as a unique, modular unit. Interconnection can then be accomplished at the most convenient time and place in the production process. Connectors also facilitate the equipment repair process by allowing technicians to quickly and easily replace suspect components. Without opening black box cabinets and without introducing contaminants like solder and flux into the system, technicians can swap out suspect equipment and have a system back on line in a matter of minutes. Connectors also permit upgrades to electronic equipment without major disruptions to the overall system. Connectors give engineers the flexibility to integrate new products and components into existing systems simply by maintaining a consistent connector specification.

While there is great variety in the makeup and design of each type of connector, as a family they generally share a common set of design elements and component parts. In fact, in order to function as a separable interconnect device, a connector must house the following elements:

- **Contact Interface:** a mechanical means of joining the conductive contacts together under normal force
- **Contact Spring Members:** a means of generating the normal force required to maintain the electrical path between conductive contact elements
- **Contact Finish:** a means of protecting the contacts from corrosion, and for optimizing the lubricity and durability of the contact interface
- **Contact Housing:** a means of holding the contacts and spring members in place and maintaining their exact position and alignment. The contact housing also shields the contacts from the operating environment.

Connectors are selected with consideration to electrical, mechanical and environmental requirements. Electrical requirements include wire type and size, contact resistance, transfer impedance and current rating. Mechanical specifications, such as thermal shock, vibration and durability indicate how well a connector will perform under critical stress factors. Environmental requirements include moisture absorption, temperature resistance, corrosion and resistance to electromagnetic interference. Environmentally resistant connectors are required for interconnect systems which are subjected to fluids in combination with vibration, shock, thermal extremes and corrosion.

While the same basic connector design may be used for both signal and/or power distribution, power connectors use contacts designed specifically for the unique requirements of power distribution. This is due to the relatively higher current/voltage requirements of power applications and the temperature rise experienced by power connectors. A disk drive in a personal computer, for example, uses both signal and power connectors. The power connector bridges the circuit that drives the unit. The signal connector carries the digital data. While the signal and power contacts may be combined into a single connector housing, each contact type is uniquely suited for its role in transmitting either signal or power electrical energy.

The Military Standard Connector

The multi-contact electrical connector used in Air Force, Navy and other high-reliability applications is a critical subassembly within the wiring system. Military connectors find many diversified applications due to severe environments, mobility, and field repairability. The key attribute of such connectors is better reliability when compared to less expensive commercial connectors. The reliability of a system is essentially a measure of the failure rate of its components. Connectors can fail due to plug dependent mechanisms, wear mechanisms or corrosion mechanisms. Total system life, power on-hours (POH) and system on/off cycles (number of times that a product powers on and off) are

important factors determining system reliability. Military standard connectors (and their commercial equivalents) are chosen for their performance and reliability even in the most severe interconnect applications.

* * * * *

***“Power” connectors carry contacts
from size 4/0 to 16***

“Miniature” connectors from size 12 to 20

“High-density” connectors from size 20 to 22

“Microminiature” size 24.

* * * * *

The military standard connector is made up of two separate component assemblies known as the “plug and receptacle” which intermate to connect wires with pin and socket contacts. Connector families are defined in this high-reliability world by the military detail specifications which spell out the exact requirements for every aspect of the connector’s design and performance. Connector families are distinguished by their coupling mechanisms, physical shape, contact types, environmental classes and termination methodologies.

Plug and receptacle connector pairs are available in various mounting configurations to accommodate different levels of interconnection and different application requirements. The most common configurations are for in-line (wire-to-wire) applications, or for various bulkhead, chassis and enclosure mountings. In general, connectors are available to accommodate any fixed mounting or in-line requirement.

Circular connectors are selected because of their compact, rugged design and their ability to effectively seal the connector from environmental hazards. Circular connectors may incorporate bayonet couplings, threaded couplings, ball detent couplings (push/pull), and/or breech lock couplings as their mechanism for locking the mated pairs together.

Rectangular connectors are selected to maximize the number of contacts possible in a restricted space. However, rectangulars are not as easily sealed against fluid damage and other environmental hazards. Spring style rack/panel couplings as well as standard jackscrew fasteners are both common coupling styles in rectangular connectors.

Both circulars and rectangulars can accommodate multiple contact types including power or high-voltage contacts, signal contacts, coaxial and triaxial contacts, or fiber-optic termini. High reliability contacts are usually made from gold plated, copper alloy material. Large diameter power contacts and solder type contacts may be either gold or silver plated copper alloy.

Crimp style contacts are preferred for all aerospace and other high-reliability applications (except those requiring a hermetic seal) due to their relative ease of assembly and maintenance. Solder type contacts are usually selected when cost is the primary consideration and repairability secondary. Solder type contacts are also used in hermetic connectors.

Installation of both crimp and solder type contact connectors requires unobstructed working room behind the connector. Rear release crimp contacts require additional working room to install the extraction tool to remove the contact. Another important design feature of crimp type contact connectors is the connector insert wire sealing grommet. The grommet provides moisture sealing around each individual wire.

The shell of a circular connector is a cylinder available in incremental sizes starting as small as .375" diameter up to 3.25" diameter and larger. The most common shell sizes are available in .0625" increments starting at shell size 8 (.50") to shell size 36 (2.25"). Shell size may be determined by multiplying the shell size number by .0625. Shell size 24, for example, has a 1.50" outside diameter (24 x .0625" = 1.50"). This nomenclature becomes significant, as backshells (accessories which attach onto the connector shell) must inter mate with the connector shell rear-end geometry. Connector and accessory manufacturers both use the term "shell size" to designate the size of their respective products.

Making Sense of Connector Part Numbers

Military standard connectors are organized under specification series numbers: MIL-C-5015, MIL-DTL-38999 and so on. The specification series number identifies the master document which explains everything about the particular connector family. The actual part numbers of connector components are designed to call out the physical connector type and its dimensional attributes. For example, a MIL-C-5015 receptacle connector designed to be mounted on a box would have a part number such as MS3402DS28-21PY. The number can be dissected as follows:

The first 4 digits after the MS (Military Standard) designate the physical connector type, like so:

- 3400 - Wall mounted receptacle
- 3401 - In line receptacle
- 3402 - Box mount receptacle
- 3404 - Jam nut receptacle
- 3406 - Straight plug
- 3408 - 90° plug
- 3409 - 45° plug
- 3412 - Box mount receptacle with rear threads

The single character which follows indicates the connector service class:

- D - High Shock
- K - Firewall
- L - High Temperature
- W - General Purpose

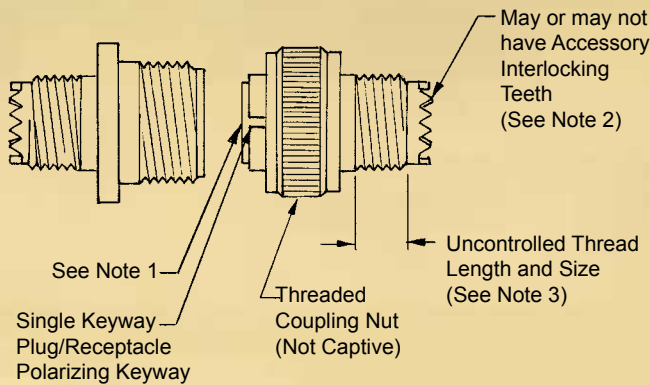
The next character, S in our example, indicates the shell material; in this case stainless steel. The next two characters, 28 in our example, identify the shell size. The following pair of numbers, 21 in our example, identifies the contact arrangement. If this pair of characters is followed by an "S", it indicates female-style (socket) contacts. If they are followed by a "P", it indicates male contacts (Pin). The final character, Y in our example, indicates the choice of polarization keying.

That's all there is to it. While there are many part number complexities and nuances throughout the various MS connector families, they all follow the same basic approach to part number development.

DESIGN ELEMENTS OF COMMON MILITARY STANDARD CONNECTORS

The following pages recap standard circular military connector design features including illustrations of the individual design characteristics important to the accessory manufacturer when selecting or designing backshells.

MIL-C-5015 Connectors, Circular, MS3100 Series, Solder Types; Glenair Designator Code B



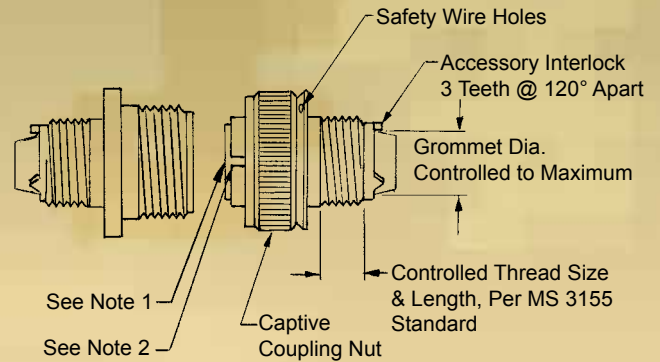
Design Features:

- Threaded coupling design.
- Fifteen shell sizes—Range 8 thru 48 (.500" to 3.000" diameter).
- Wide variety of contact sizes, standard density; 1 to 100 contacts.
- Conductive finish—Cadmium/Olive drab, 96-hour corrosion protection.

Notes:

1. Contacts may mate prior to connector shell mating.
2. Single keying may not always ensure shell polarizing.
3. Uncontrolled accessory interface.
4. Plug or receptacle may have pin or socket contacts.
5. Connector shell may strike pin contacts, thus power should always be on socket contacts.

MIL-C-5015 Connectors, Circular MS3400 (Front Release Contact) and MS3450 (Rear Release Contact) Series Crimp Type Contacts; Glenair Designator Code A



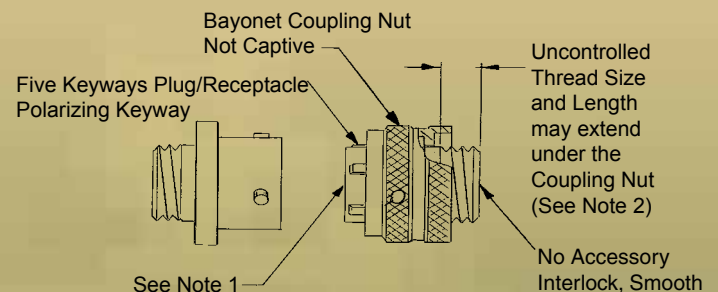
Design Features:

- Threaded coupling design, captive.
- Fifteen shell sizes—Range 8 thru 48 (.500" to 3.000" diameter).
- Wide variety of contact sizes, standard density; 1 to 100 contacts.
- Cadmium/Olive drab conductive finish, 500 hour salt spray; electroless-nickel options.

Notes:

1. Same interface features as MS3100 and MS3106; intermateable.
2. Single keying may not always ensure shell polarizing.

MIL-C-26482 Connectors, Circular MS3110 and MS3116 Series 1, Solder Contacts Glenair Designator Code D



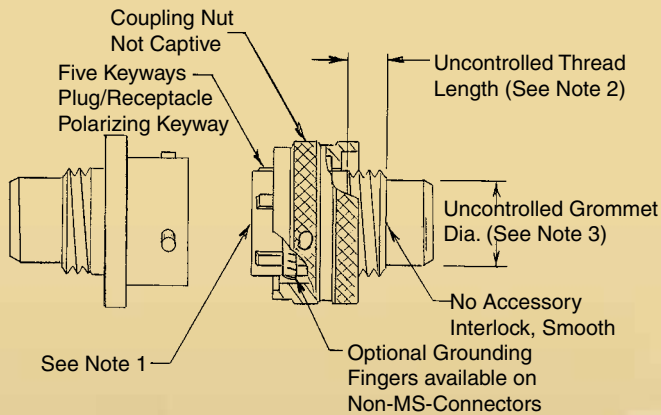
Design Features:

- Bayonet coupling design, quick disconnect.
- Ten shell sizes—Range 6 through 24 (.3750" to 1.500" diameter).
- 12, 16, and 20 gauge contacts, standard density, 3 to 61 contacts.
- Conductive and non-conductive finishes; Cadmium/Olive drab and anodic.

Notes:

1. Contacts may mate prior to connector shell mating.
2. Plug may have less than three threads.

MIL-C-26482 Connectors, Circular, MS3120 and MS3126 Series 1, Crimp Contacts, Front Release; Glenair Designator Code D



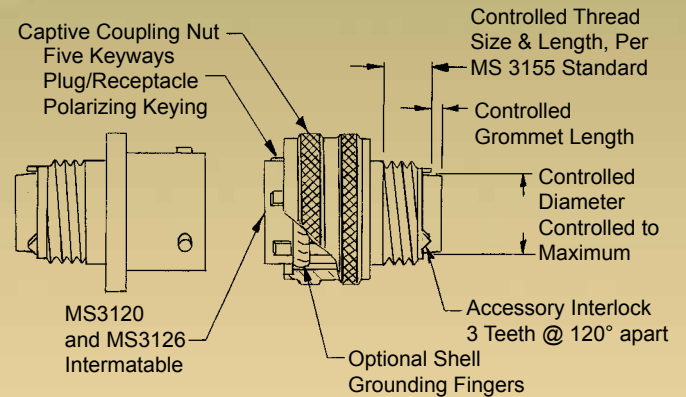
Design Features:

- Bayonet coupling design, quick disconnect.
- Eight shell sizes—Range 8 thru 24 (.500" to 1.500" diameter).
- 12, 16, 20, and 22 gauge contacts, standard density, 3 to 61 contacts.

Notes:

1. Contacts may mate prior to connector shell mating when grounding fingers not supplied.
2. Same limitations as MS3110 and MS3116 solder type connectors.
3. Uncontrolled wire seal grommet geometry; accessories properly mate.

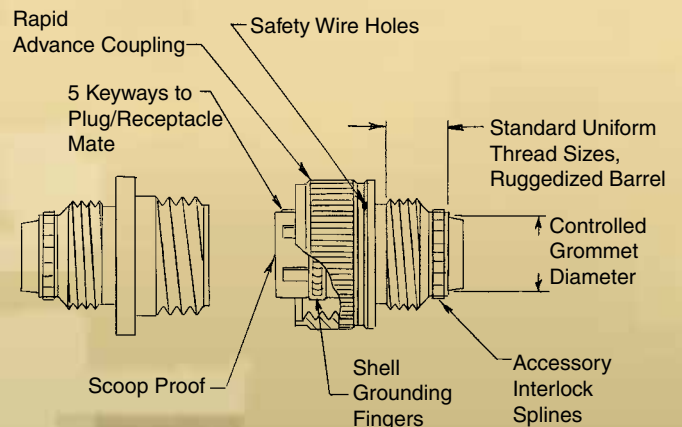
MIL-C-26482 Connectors, Circular, MS3470 Series 2, Crimp Contacts, Rear Release; Glenair Designator Code A



Design Features:

- Bayonet coupling design, quick disconnect.
- Nine shell sizes—8 through 24 (.500" to 1.500" dia)
- 12, 16, 20, and 22 gauge contacts, standard density, 3 to 61 contacts.

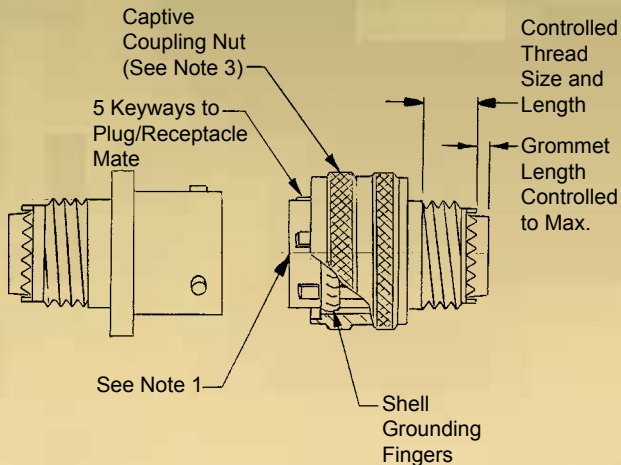
MIL-DTL-28840 Connectors, Circular, Front Release, Crimp Contacts Glenair Designator Code G



Design Features:

- Threaded coupling design, rapid advance, captive, scoop proof.
- Nine shell sizes—Range 11 through 33 (.500 to 2.000 diameter).
- 20 gauge high density contacts, 7 to 155.

MIL-DTL-38999 Connectors, Series I
Crimp Contacts, Rear Release;
Glenair Designator Code F



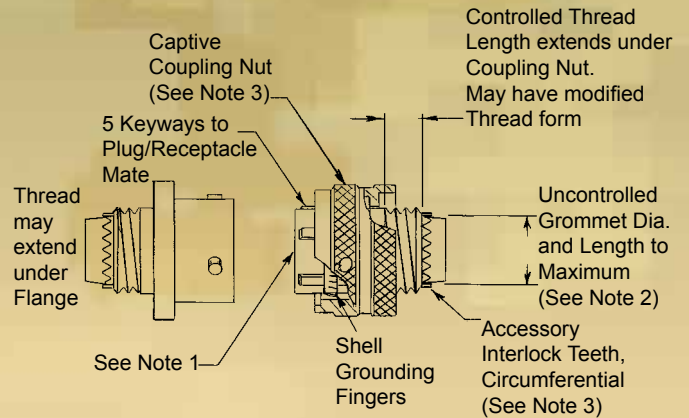
Design Features:

- Bayonet coupling design, quick disconnect.
- Nine shell sizes—Range 8 through 24 (.500" to 1.500" diameter).
- 12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- Scoop-proof shell design to prevent shell to contact problem.
- Controlled accessory interface per MIL-DTL-38999, figure 11.
- Cork and bottle primary insert interface seal and shell environmental seal, fuel resistant silicone elastomers.
- Conductive and non-conductive finishes; electroless nickel, Cadmium/Olive drab 500 hour salt spray, and anodic.

Notes:

1. Long barrel design to prevent shell striking contacts.
2. Serrated accessory interlocking tooth design may prevent reliable moisture seal or EMI bond to accessories.
3. Bayonet coupling may not perform under severe conditions with large diameter cable and backshell.

MIL-DTL-38999 Connectors, Series II
Crimp Type Contacts, Rear Release; Glenair
Designator Code F



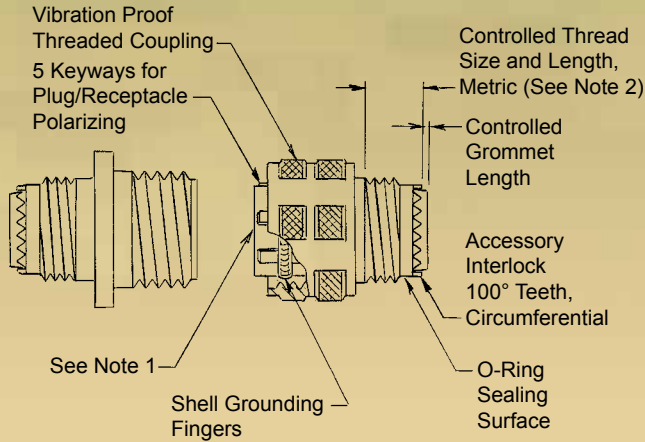
Design Features:

- Bayonet coupling design, quick disconnect, captive.
- Nine shell sizes—Range 8 through 24 (.500" to 1.500" diameter).
- 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- Shell ground available on MS and commercial part numbers.
- Controlled accessory interface per MIL-DTL-38999 figure II.
- Cork and bottle primary interface and shell environmental seals, fluid resistant silicone elastomers.
- Conductive and non-conductive finishes; electroless nickel, Cadmium/Olive drab, 500-hour salt spray, and anodic.
- Short barrel construction for minimum envelope.

Notes:

1. Very short barrel, shell may strike pin contacts.
2. Wire seal grommet controlled to maximum condition only, over compression will cause contact splaying.
3. Same limitations as D38999 Series I.

MIL-DTL-38999 Connectors, Series III
Circular, Crimp Contacts
Rear Release; Glenair Code H



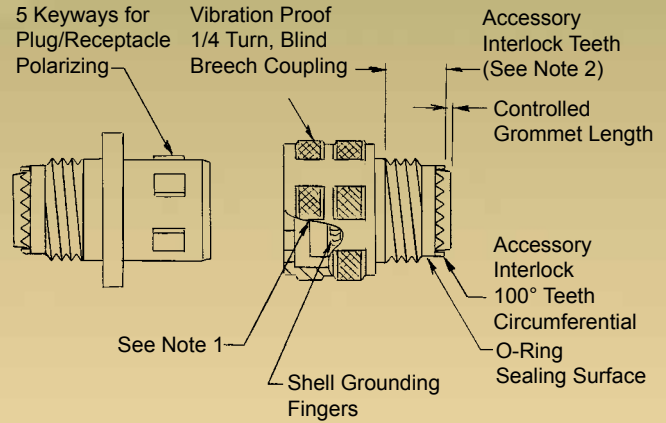
Design Features:

- Threaded coupling design, rapid advance, self-locking.
- Nine shell sizes—Range 9 through 25 (.500" to 1.500" diameter).
- 12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- 16 gauge fiber-optic insert arrangement.
- Scoop-proof shell design to prevent shell to contact problem.
- Controlled accessory interface with metric threads.
- Diaphragm contact seal interface and shell environmental seal, fluid resistant fluorosilicone elastomers.
- Conductive and non-conductive finishes; Cadmium/Olive drab 500 hour salt spray, electroless nickel, anodic and stainless steel.
- Conductive composite shell, cadmium/olive drab over electroless nickel, and electroless nickel, 2000 hour salt spray.

Notes:

1. Same barrel features as MIL-DTL-38999 Series I, except metric threads.
2. 100 percent scoop proof, positive shell mating.

MIL-DTL-38999 Connectors, Series IV
Circular, Crimp Contacts
Rear Release; Glenair Code H



Design Features:

- Breech lock coupling design, rapid advance, self-locking.
- Eight shell sizes—Range 11 through 25 (.500" to 1.500" diameter).
- 12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts.
- 16 gauge fiber-optic insert arrangements.
- Scoop proof shell design to prevent shell to contact problems.
- Controlled accessory interface with metric threads.
- Ruggedized construction for shipboard service.
- Cork and bottle primary interface and shell environmental seals, fluid resistant fluorosilicone elastomers.
- Conductive and non-conductive finishes; Cadmium/Olive drab 500 hour salt spray, electroless nickel, anodic, and stainless steel.

Notes:

1. 100 percent scoop proof, positive shell mating.
2. Same accessory interlock teeth as MIL-DTL-38999, Series III.
3. Same O-ring seal features as MIL-DTL-38999, Series III.

MILITARY STANDARD CONNECTOR INDEX

The following is a listing of circular connectors defined by US Military Specifications, cross-referenced to the applicable active or inactive part

number series. The symbols in the Connector Designator column are an essential element in Glenair's backshell part number developments.

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS3100	B	MIL-C-5015	MS3100	Receptacle Wall Mtg (Solder)
MS3101	B	MIL-C-5015	MS3100	Receptacle
MS3102	**	MIL-C-5015	MS3100	Receptacle Box Mtg (Solder)
MS3103	**	MIL-C-5015	MS3100	Receptacle Potting (Solder)
MS3105	**	MIL-C-5015	MS3100	Dummy Receptacle
MS3106	B	MIL-C-5015	MS3100	Plug Straight (Solder)
MS3107	B	MIL-C-5015	MS3100	Plug Quick Disconnect (Solder)
MS3108	B	MIL-C-5015	MS3100	Plug 90° (Solder)
MS3110	D-729	MIL-DTL-26482	1	Receptacle Wall Mtg
MS3111	D	MIL-DTL-26482	1	Plug Cable Connecting
MS3112	**	MIL-DTL-26482	1	Receptacle Box Mtg
MS3113	**	MIL-DTL-26482	1	Receptacle Solder Mtg
MS3114	D-717	MIL-DTL-26482	1	Receptacle Jam Nut
MS3115	**	MIL-DTL-26482	1-2	Dummy Receptacle
MS3116	D	MIL-DTL-26482	1	Plug Straight
MS3119	**	MIL-DTL-26482	1	Receptacle Thru-Bulkhead
MS3120	D	MIL-DTL-26482	1	Receptacle Wall Mtg (Crimp)
MS3121	D	MIL-DTL-26482	1	Plug Straight (Crimp)
MS3122	**	MIL-DTL-26482	1	Receptacle Box Mtg (Crimp)
MS3124	D-717	MIL-DTL-26482	1	Receptacle Rear Mtg Jam Nut (Crimp)
MS3126	D	MIL-DTL-26482	1	Plug Straight (Crimp)
MS3127	**	MIL-DTL-26482	1	Receptacle Box Mtg (Crimp)
MS3128	D	MIL-DTL-26482	1	Receptacle Wall Mtg (Crimp)
MS3130	*	QPL-81703	1	Receptacle Push Pull Wide Flange
MS3132	X-706	QPL-81703	1	Receptacle Push Pull Box Mtg
MS3134	X-706	QPL-81703	1	Receptacle Push Pull Jam Nut
MS3135	**	QPL-81703	1	Dummy Receptacle
MS3137	X-706	QPL-81703	1	Plug Straight Push Pull
MS3138	X-706	QPL-81703	1	Plug Lanyard Push Pull
MS3139	**	QPL-81703	1	Receptacle Thru-Bulkhead
MS3140	X-706B	QPL-81703	2	Receptacle Push Pull Wall Mtg
MS3142	**	MIL-C-5015	MS3100	Receptacle Hermetic Box Mtg
MS3143	**	MIL-C-5015	MS3100	Receptacle Hermetic Solder Mtg
MS3144	X-706B	QPL-81703	2	Receptacle Push Pull Jam Nut
MS3145	**	QPL-81703	3	Receptacle Hermetic Push Pull Box Mtg
MS3146	**	QPL-81703	3	Receptacle Push Pull Hermetic Solder Mtg
MS3147	X-706B	QPL-81703	2	Plug Push Pull (Crimp)
MS3148	X-706B	QPL-81703	2	Plug Push Pull Lanyard (Crimp)
MS3149	**	QPL-81703	3	Receptacle Push Pull Hermetic
MS3400	A	MIL-C-5015	MS3400	Receptacle Wall Mtg

* Consult Factory

** Connector does not accommodate rear accessories

Military Standard Connector Index

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS3401	A	MIL-C-5015	MS3400	Receptacle Cable Connecting
MS3402	**	MIL-C-5015	MS3400	Receptacle,Box Mtg
MS3404	A	MIL-C-5015	MS3400	Receptacle Jam Nut
MS3406	A	MIL-C-5015	MS3400	Plug
MS3408	A	MIL-C-5015	MS3400	Plug 90°
MS3409	A	MIL-C-5015	MS3400	Plug 45°
MS3412	A	MIL-C-5015	MS3400	Receptacle Wall Mtg
MS3424	A	QPL-81703	3	Receptacle Push Pull Wall Mtg
MS3440	**	MIL-DTL-26482	2	Receptacle Narrow Flange Mtg (was M83723/9/10)
MS3442	**	MIL-DTL-26482	2	Receptacle Wide Flange Mtg
MS3443	**	MIL-DTL-26482	2	Receptacle Solder Flange Mtg
MS3445	*	QPL-81703	2	Plug Push Pull Rack & Panel Mtg
MS3446	A	QPL-81703	3	Plug Rack & Panel
MS3449	**	MIL-DTL-26482	2	Receptacle Single Hole Mtg
MS3450	A	MIL-C-5015	MS3450	Receptacle Wall Mtg (was M83723/19/20)
MS3451	A	MIL-C-5015	MS3450	Receptacle Cable Connecting (was M83723/17/18)
MS3452	**	MIL-C-5015	MS3450	Receptacle Box Mtg (was M83723/21/22)
MS3454	A	MIL-C-5015	MS3450	Receptacle Jam Nut
MS3456	A	MIL-C-5015	MS3450	Plug Straight (was M83723/23/24)
MS3459	A	MIL-C-5015	MS3450	Plug Straight Self Locking (was M83723/52/53)
MS3463	**	QPL-81703	3	Receptacle Push Pull
MS3464	A	QPL-81703	3	Receptacle Push Pull Jam Nut
MS3466	**	QPL-81703	3	Receptacle Push Pull Hermetic
MS3467	A	QPL-81703	3	Plug Push Pull
MS3468	A	QPL-81703	3	Plug Push Pull Lanyard
MS3469	**	QPL-81703	3	Receptacle Push Pull Hermetic Jam Nut
MS3470	A	MIL-DTL-26482	2	Receptacle Narrow Flange Mtg (was M83723/1/2)
MS3471	A	MIL-DTL-26482	2	Receptacle Cable Connecting (was M83723/7/8)
MS3472	A	MIL-DTL-26482	2	Receptacle Wide Flange Mtg (was M83723/3/4)
MS3473	**	MIL-DTL-26482	2	Receptacle Solder Mtg Hermetic
MS3474	A	MIL-DTL-26482	2	Receptacle Rear Mtg Jam Nut (was M83723/5/6)
MS3475	A	MIL-DTL-26482	2	Plug RFI Shielded (was M83723/42/43)
MS3476	A	MIL-DTL-26482	2	Plug Straight (was M83723/13/14)
MS3477	**	MIL-DTL-26482	2	Receptacle Hermetic Box Mtg
MS3479	**	MIL-DTL-26482	2	Receptacle Hermetic Rear Mtg Jam Nut
MS17343	C	MIL-DTL-22992	R	Receptacle Wall Mtg
MS17344	C	MIL-DTL-22992	R	Plug Straight
MS17345	C	MIL-DTL-22992	R	Plug Cable Connecting
MS17346	C	MIL-DTL-22992	R	Receptacle Box Mtg
MS17347	C	MIL-DTL-22992	R	Receptacle Jam Nut
MS17348	**	MIL-DTL-22992	R	Receptacle Jam Nut Box Mtg
MS18062	**	MIL-DTL-22992	R	Dummy Receptacle
MS20026	*	MIL-C-27599		Receptacle Wall Mtg Solder
MS20027	*	MIL-C-27599		Receptacle Line
MS20028	*	MIL-C-27599		Plug Straight
MS20029	**	MIL-C-27599		Receptacle Jam Nut Mtg
MS20030	*	MIL-C-27599		Receptacle Box Mtg Hermetic

* Consult Factory

** Connector does not accommodate rear accessories

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS20031	**	MIL-C-27599		Receptacle Jam Nut Hermetic
MS20032	**	MIL-C-27599		Receptacle Solder Mtg Hermetic
MS20034	*	MIL-C-27599		Receptacle Wall Mtg
MS20035	*	MIL-C-27599		Receptacle Box Mtg
MS24264	E	MIL-C-26500	F G & R	Receptacle Flange Mtg
MS24265	E	MIL-C-26500	F G & R	Receptacle Single Hole Mtg
MS24266	E	MIL-C-26500	F G & R	Plug Straight
MS25183	**	MIL-C-5015	MS3100	Plug PottingSeal
MS27034	**	MIL-C-26500		Receptacle Hermetic Solder Mtg
MS27334	*	MIL-C-27599		Receptacle Wall Mtg
MS27335	**	MIL-C-27599		Receptacle Box Mtg
MS27336	*	MIL-C-27599		Plug Straight
MS27337	*	MIL-C-27599		Receptacle Jam Nut
MS27338	*	MIL-C-27599		Receptacle Wall Mtg Hermetic
MS27339	**	MIL-C-27599		Receptacle Box Mtg Hermetic
MS27340	**	MIL-C-27599		Receptacle Jam Nut Mtg Hermetic
MS27341	**	MIL-C-27599		Receptacle Solder Mtg Hermetic
MS27466	F	MIL-DTL-38999	I	Receptacle Wall Mtg
MS27467	F	MIL-DTL-38999	I	Plug Straight
MS27468	F	MIL-DTL-38999	I	Receptacle Jam Nut
MS27469	**	MIL-DTL-38999	I	Receptacle Wall Mtg Hermetic
MS27470	**	MIL-DTL-38999	I	Receptacle Jam Nut Hermetic
MS27471	**	MIL-DTL-38999	I	Receptacle Solder Mtg Hermetic
MS27472	F	MIL-DTL-38999	II	Receptacle Wall Mtg
MS27473	F	MIL-DTL-38999	II	Plug Straight
MS27474	F	MIL-DTL-38999	II	Receptacle Jam Nut
MS27475	F	MIL-DTL-38999	II	Receptacle Wall Mtg
MS27476	**	MIL-DTL-38999	II	Receptacle Box Mtg Hermetic
MS27477	**	MIL-DTL-38999	II	Receptacle Jam Nut Hermetic
MS27478	**	MIL-DTL-38999	II	Receptacle Solder Mtg Hermetic
MS27479	F	MIL-DTL-38999	II	Inactive Use MS27472
MS27480	F	MIL-DTL-38999	II	Inactive Use MS27473
MS27481	F	MIL-DTL-38999	II	Inactive Use MS27474
MS27482	F	MIL-DTL-38999	II	Inactive Use MS27475
MS27483	**	MIL-DTL-38999	II	Inactive Use MS27477
MS27484P	**	MIL-DTL-38999	II	Plug Straight
MS27484T	F	MIL-DTL-38999	II	Plug Straight
MS27496	**	MIL-DTL-38999	I	Receptacle Box Mtg
MS27497	F	MIL-DTL-38999	II	Receptacle Back Panel Wall Mtg
MS27498	F	MIL-DTL-38999	I	Plug 90°
MS27499	**	MIL-DTL-38999	II	Receptacle Box Mtg
MS27500	F	MIL-DTL-38999	II	Inactive See MS27473
MS27503	**	MIL-DTL-38999	II	Inactive See MS27478
MS27504	**	MIL-DTL-38999	II	Inactive See MS27499
MS27505	**	MIL-DTL-38999	I	Receptacle Back Panel Box Mtg
MS27508	**	MIL-DTL-38999	II	Receptacle Back Panel Box Mtg
MS27513	**	MIL-DTL-38999	II	Receptacle Box Mtg

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** Connector does not accommodate rear accessories

Military Standard Connector Index

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
MS27515	F	MIL-DTL-38999	I	Inactive Use MS27656
MS27613	E-710	MIL-C-26500K		Receptacle Panel Mtg
MS27614	E-710	MIL-C-26500K		Receptacle D-Hole Mtg
MS27615	E-710	MIL-C-26500K		Plug Straight
MS27652	F	MIL-DTL-38999	I	Inactive Use MS27466
MS27653	F	MIL-DTL-38999	I	Inactive Use MS27467
MS27654	F	MIL-DTL-38999	I	Inactive Use MS27656
MS27656	F	MIL-DTL-38999	I	Receptacle Back Panel Wall Mtg
MS27661	F-752	MIL-DTL-38999	I	Plug Lanyard Release
MS27662	**	MIL-DTL-38999	I	Receptacle Thru-Bulkhead
MS27664	**	MIL-DTL-38999	II	Receptacle Back-Panel Wall Mtg
MS27665	F	MIL-DTL-38999	I	Plug Rack & Panel Mtg
MS27667	**	MIL-DTL-38999	II	Receptacle Thru-Bulkhead
MS90555	*	MIL-DTL-22992	L	Receptacle Wall Mtg
MS90556	*	MIL-DTL-22992	L	Plug Straight
MS90557	*	MIL-DTL-22992	L	Plug Cable Connecting
MS90558	*	MIL-DTL-22992	L	Receptacle W/Coupling Ring Wall Mtg
M28840/10	G	MIL-DTL-28840		Receptacle Wall Mtg
M28840/11	G	MIL-DTL-28840		Receptacle Cable Connecting
M28840/12	**	MIL-DTL-28840		Receptacle Box Mtg
M28840/14	G	MIL-DTL-28840		Receptacle Jam Nut
M28840/16	G	MIL-DTL-28840		Plug Straight
D38999/20	H	MIL-DTL-38999	III	Receptacle Wall Mtg
D38999/21	**	MIL-DTL-38999	III	Receptacle Hermetic
D38999/23	**	MIL-DTL-38999	III	Receptacle Hermetic Jam Nut
D38999/24	H	MIL-DTL-38999	III	Receptacle Jam Nut
D38999/25	**	MIL-DTL-38999	III	Receptacle Hermetic Solder Mtg
D38999/26	H	MIL-DTL-38999	III	Plug Straight
D38999/27	**	MIL-DTL-38999	III	Receptacle Hermetic Weld Mtg
D38999/29	H-701	MIL-DTL-38999	III	Plug Lanyard Release
D38999/30	H-701	MIL-DTL-38999	III	Plug Lanyard Release
D38999/40	H	MIL-DTL-38999	IV	Receptacle Wall Mtg
D38999/42	H	MIL-DTL-38999	IV	Receptacle Box Mtg
D38999/44	H-715	MIL-DTL-38999	IV	Receptacle Jam Nut
D38999/46	H	MIL-DTL-38999	IV	Plug Straight EMI
D38999/47	H	MIL-DTL-38999	IV	Plug Straight
M81511/1	J	MIL-C-81511	2	Receptacle Flange Mtg
M81511/2	**	MIL-C-81511	2	Receptacle Solder Flange
M81511/3	J	MIL-C-81511	2	Receptacle Jam Nut
M81511/4	**	MIL-C-81511	2	Receptacle Jam Nut
M81511/5	J	MIL-C-81511	2	Plug Cable Connecting
M81511/6	J	MIL-C-81511	2	Plug
M81511/21	J	MIL-C-81511	1	Receptacle Flange Mtg
M81511/22	**	MIL-C-81511	1	Receptacle Solder Flange Mtg
M81511/23	J	MIL-C-81511	1	Receptacle Jam Nut
M81511/24	**	MIL-C-81511	1	Receptacle Jam Nut
M81511/25	J	MIL-C-81511	1	Receptacle Cable Connecting

* Consult Factory

** Connector does not accommodate rear accessories

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
M81511/26	J	MIL-C-81511	1	Plug
M81511/27	**	MIL-C-81511	1	Receptacle Thru-Bulkhead Jam Nut
M81511/28	**	MIL-C-81511	2	Receptacle Thru-Bulkhead Single Hole Mtg
M81511/31	J	MIL-C-81511	2	Receptacle Flange Mtg
M81511/32	J	MIL-C-81511	2	Receptacle Jam Nut Mtg
M81511/33	J	MIL-C-81511	2	Receptacle, Cable Connecting
M81511/34	J	MIL-C-81511	2	Plug
M81511/35	J	MIL-C-81511	1	Receptacle Flange Mtg
M81511/36	J	MIL-C-81511	1	Receptacle Jam Nut
M81511/37	J	MIL-C-81511	1	Receptacle Cable Connecting
M81511/38	J	MIL-C-81511	1	Plug
M81511/41	J	MIL-C-81511	3	Receptacle Flange Mtg
M81511/42	**	MIL-C-81511	3	Receptacle Solder Flange Mtg
M81511/44	**	MIL-C-81511	3	Receptacle Jam Nut
M81511/45	J	MIL-C-81511	3	Receptacle Cable Connecting
M81511/46	J	MIL-C-81511	3	Plug
M81511/47	**	MIL-C-81511	3	Receptacle Solder Flange Mtg
M81511/48	**	MIL-C-81511	3	Receptacle Jam Nut
M81511/49	J	MIL-C-81511	3	Receptacle Jam Nut
M81511/50	**	MIL-C-81511	4	Receptacle Jam Nut
M81511/51	J	MIL-C-81511	4	Receptacle Flange Mtg
M81511/52	**	MIL-C-81511	4	Receptacle Solder Flange Mtg
M81511/53	J	MIL-C-81511	4	Receptacle Jam Nut
M81511/54	**	MIL-C-81511	4	Receptacle Jam Nut
M81511/55	J	MIL-C-81511	4	Receptacle Cable Connecting
M81511/56	J	MIL-C-81511	4	Plug
M81511/57	**	MIL-C-81511	4	Receptacle Solder Flange Mtg
M81582/1	*	MIL-C-81582		Receptacle Single Hole Mtg
M81582/2	*	MIL-C-81582		Plug Lanyard Release
M83723/1	A	MIL-DTL-83723	I	Superseded by MS3470
M83723/2	A	MIL-DTL-83723	I	Superseded by MS3470
M83723/3	A	MIL-DTL-83723	I	Superseded by MS3472
M83723/4	A	MIL-DTL-83723	I	Superseded by MS3472
M83723/5	A	MIL-DTL-83723	I	Superseded by MS3474
M83723/6	A	MIL-DTL-83723	I	Superseded by MS3474
M83723/7	A	MIL-DTL-83723	I	Superseded by MS3471
M83723/8	A	MIL-DTL-83723	I	Superseded by MS3471
M83723/9	**	MIL-DTL-83723	I	Superseded by MS3440
M83723/10	**	MIL-DTL-83723	I	Superseded by MS3442
M83723/11	**	MIL-DTL-83723	I	Superseded by MS3443
M83723/12	**	MIL-DTL-83723	I	Superseded by MS3443
M83723/13	A	MIL-DTL-83723	I	Superseded by MS3476
M83723/14	A	MIL-DTL-83723	I	Superseded by MS3476
M83723/17	K	MIL-DTL-83723	II	Superseded by MS3451
M83723/18	K	MIL-DTL-83723	II	Superseded by MS3451
M83723/19	K	MIL-DTL-83723	II	Superseded by MS3450
M83723/20	K	MIL-DTL-83723	II	Superseded by MS3450

* Consult Factory

** Connector does not accommodate rear accessories

Military Standard Connector Index

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
M83723/21	**	MIL-DTL-83723	II	Superseded by MS3452
M83723/22	**	MIL-DTL-83723	II	Superseded by MS3452
M83723/23	K	MIL-DTL-83723	II	Superseded by MS3456
M83723/24	K	MIL-DTL-83723	II	Superseded by MS3456
M83723/25	**	MIL-DTL-83723	II	Superseded by MS3142
M83723/26	**	MIL-DTL-83723	II	Superseded by MS3143
M83723/36	A	MIL-DTL-83723	I	Inactive For New Design
M83723/37	A	MIL-DTL-83723	I	Inactive For New Design
M83723/38	A	MIL-DTL-83723	I	Inactive For New Design
M83723/39	A	MIL-DTL-83723	I	Inactive For New Design
M83723/40	A	MIL-DTL-83723	I	Inactive For New Design
M83723/41	A	MIL-DTL-83723	I	Inactive For New Design
M83723/42	A	MIL-DTL-83723	I	Superseded by MS3475
M83723/43	A	MIL-DTL-83723	I	Superseded by MS3475
M83723/45	**	MIL-DTL-83723	I	Superseded by MS3115
M83723/48	A	MIL-DTL-83723	I	Inactive For New Design
M83723/49	A	MIL-DTL-83723	I	Inactive For New Design
M83723/52	K	MIL-DTL-83723	II	Superseded by MS3459
M83723/53	K	MIL-DTL-83723	II	Superseded by MS3459
M83723/66	A	MIL-DTL-83723	III	Plug Push Pull (Pin Contacts)
M83723/67	A	MIL-DTL-83723	III	Plug Push Pull (Socket Contacts)
M83723/68	A	MIL-DTL-83723	III	Plug Push Pull Lanyard (Pin Contacts)
M83723/69	A	MIL-DTL-83723	III	Plug Push Pull Lanyard (Socket Contacts)
M83723/71	A	MIL-DTL-83723	III	Receptacle Bayonet Flange Mtg (Socket Contact)
M83723/72	A	MIL-DTL-83723	III	Receptacle Bayonet Flange Mtg (Pin Contact)
M83723/73	A	MIL-DTL-83723	III	Receptacle Bayonet Single Hole Mtg (Socket Contact)
M83723/74	A	MIL-DTL-83723	III	Receptacle Bayonet Single Mtg (Pin Contact)
M83723/75	A	MIL-DTL-83723	III	Plug Bayonet (Socket Contact)
M83723/76	A	MIL-DTL-83723	III	Plug Bayonet (Pin Contact)
M83723/77	A	MIL-DTL-83723	III	Plug Bayonet RFI (Socket Contact)
M83723/78	A	MIL-DTL-83723	III	Plug Bayonet RFI (Pin Contact)
M83723/79	**	MIL-DTL-83723	III	Receptacle Bayonet Flange Mtg Hermetic
M83723/80	**	MIL-DTL-83723	III	Receptacle Bayonet Solder Flange Mtg Hermetic
M83723/81	**	MIL-DTL-83723	III	Receptacle Bayonet Single Hole Mtg Hermetic
M83723/82	A	MIL-DTL-83723	III	Receptacle Threaded Flange Mtg (Socket Contact)
M83723/83	A	MIL-DTL-83723	III	Receptacle Threaded Flange Mtg (Pin Contact)
M83723/84	A	MIL-DTL-83723	III	Receptacle Threaded Single Hole Mtg (Socket Contact)
M83723/85	A	MIL-DTL-83723	III	Receptacle Threaded Single Hole Mtg (Pin Contact)
M83723/86	A	MIL-DTL-83723	III	Plug Threaded (Socket Contact)
M83723/87	A	MIL-DTL-83723	III	Plug Threaded (Pin Contact)
M83723/88	**	MIL-DTL-83723	III	Receptacle Threaded Flange Mtg (Pin Contact)
M83723/89	**	MIL-DTL-83723	III	Receptacle Threaded Single Hole Mtg Hermetic
M83723/90	**	MIL-DTL-83723	III	Receptacle Threaded Solder Flange Mtg Hermetic
M83723/91	A	MIL-DTL-83723	III	Plug Threaded RFI (Socket Contact)
M83723/92	A	MIL-DTL-83723	III	Plug Threaded RFI (Pin Contact)
M83723/93	**	MIL-DTL-83723	III	Receptacle Bayonet Solder Flange Mtg Hermetic
M83723/94	**	MIL-DTL-83723	III	Receptacle Bayonet Single Hole Mtg Hermetic

* Consult Factory

** Connector does not accommodate rear accessories

PART NO.	CONN. DESIGN.	SPECIFICATION	SERIES	DESCRIPTION
M83723/95	A	MIL-DTL-83723	III	Plug Threaded (Socket Contact) Self Locking
M83723/96	A	MIL-DTL-83723	III	Plug Threaded (Pin Contact) Self Locking
M83723/97	A	MIL-DTL-83723	III	Plug Threaded RFI (Socket Contact) Self Locking
M83723/98	A	MIL-DTL-83723	III	Plug Threaded RFI (Pin Contact) Self Locking
NATC00	H*	SSQ21635		Receptacle Flange
NATC06	H*	SSQ21635		Plug
NATC07	H*	SSQ21635		Receptacle Jam Nut
NATC09	***	SSQ21635		Receptacle Weld Mtg
NATC77	***	SSQ21635		Receptacle Jam Nut
NATC99	***	SSQ21635		Receptacle Weld Mtg
NBO	A	40M39569		Receptacle Flange Mtg
NBOH	**	40M39569		Receptacle Hermetic
NB3H	**	40M39569		Receptacle Hermetic
NB4	A	40M39569		Receptacle Flange Mtg
NB5H	**	40M39569		Thru-Bulkhead Hermetic
NB6	A	40M39569		Plug Straight
NB6G	A	40M39569		Plug Straight,EMI
NB7	A	40M39569		Receptacle Jam Nut
NB7H	**	40M39569		Receptacle Hermetic
NB8H	**	40M39569		Receptacle Hermetic
NLSO	F	40M38277		Receptacle Flange Mtg
NLS3H	**	40M38277		Receptacle Hermetic
NLS6	F	40M38277		Plug Straight
NLS6G	F	40M38277		Plug Straight EMI
NLS7	F	40M38277		Receptacle Jam Nut
NLS7H	**	40M38277		Receptacle Jam Nut
NZGL00	H**	SSQ21635		Receptacle Flange
NZGL03	***	SSQ21635		Receptacle Lever
NZGL06	H**	SSQ21635		Plug
NZGL07	H**	SSQ21635		Receptacle Weld Mtg
NZGL09	***	SSQ21635		Receptacle Weld Mtg
NZGL66	H**	SSQ21635		Plug
NZGL77	***	SSQ21635		Receptacle Jam Nut
NZGL99	***	SSQ21635		Receptacle Weld Mtg

* Consult Factory

** Connector does not accommodate rear accessories



Military Specification Comparison Tables

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE		
		DESCRIPTION	FLUID RESISTANCE	RESILIENT MATERIAL
MIL-C-5015 Solder Section 1B	A	Non-Environmental Solid Shell	Moisture-proof	–
	B	Non-Environmental Split Shell	Moisture-proof	–
	C	Pressurized	Moisture-proof	–
	E	Environmental Grommet Seal	Moisture-proof	Neoprene
	F	Environmental Grommet Seal with Clamp	Moisture-proof	Neoprene
	HS	Hermetic	Submersible	Silicone
	HT	Hermetic	Submersible	Complete
	K	Non-Environmental Firewall	Moisture-proof	–
MIL-C 5015 Crimp Front Release Per MIL-STD-242 MIL-STD-1353 MIL-STD-1683 Section 1C	R	Environmental Grommet Seal with 'O' Ring	Moisture-proof	Neoprene
	D	Environmental High Shock	Splash-proof	Silicone
	DJ	Environmental High Shock	Splash-proof	Silicone
	DJS	Environmental High Shock	Splash-proof	Silicone
	DS	Environmental High Shock	Splash-proof	Silicone
	K	Environmental Firewall	Submersible	Silicone
	KS	Environmental Firewall	Submersible	Silicone
	KT	Environmental Firewall	Submersible	Silicone
	L	Environmental High Temperature	Submersible	Silicone
	LS	Environmental High Temperature	Submersible	Silicone
	U	Environmental High Temperature	Splash-proof	Silicone
	US	Environmental High Temperature	Splash-proof	Silicone
MIL-C-5015 Crimp Rear Release Per MIL-STD-242 MIL-STD-975 MIL-STD-1353 MIL-STD-1547 (8, 4 & 0 Contacts Only) Section 1D	W	Environmental General Purpose	Splash-proof	Silicone
	K	Environmental Firewall	Submersible	Silicone
	KS	Environmental Firewall	Submersible	Silicone
	KT	Environmental Firewall	Submersible	Silicone
	L	Environmental High Temperature	Submersible	Silicone
	LS	Environmental High Temperature	Submersible	Silicone
	U	Environmental High Temperature	Splash-proof	Silicone
MIL-C-10544 Section 2	US	Environmental High Temperature	Splash-proof	Silicone
	W	Environmental General Purpose	Splash-proof	Silicone
MIL-C-12520 Section 3	ALL	Environmental Signal Corps Audio U Series	Moisture-proof	Neoprene
MIL-C-22249 Section 4	ALL	Environmental Signal Corps Power UW Series	Moisture-proof	Neoprene
MIL-C-22539 Section 5	ALL	Environmental High Pressure Bulkhead	Submersible	Silicone
	ALL	Environmental High Pressure Bulkhead	Submersible	Dially Phthalate

		CONTACT TYPE			SHELL			
	OPERATING TEMP	SOLDER	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
			FRONT	REAR				
	125°C	•	–	–	16 12 8 4 1/0	Aluminum	96 hr. Cad O.D.	Threaded
	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	125°C	•	–	–		Aluminum	96 hr. Cad O.D.	
	125°C	•	–	–		Stainless Steel	96 hr. Cad O.D.	
	125°C	•	–	–		Carbon Steel	TInned	
	125°C	Non-Removable Crimp				Carbon Steel	96 hr. Cad O.D.	
	125°C	•	–	–	Aluminum	96 hr. Cad O.D.	Threaded	
	175°C	–	•	–	Aluminum	500 hr. Cad O.D.		
	175°C	–	•	–	Aluminum	500 hr. Cad O.D.		
	175°C	–	•	–	Stainless Steel	Black Cad		
	175°C	–	•	–	Stainless Steel	Black Cad		
	175°C	–	•	–	Carbon Steel	Electroless Nickel		
	175°C	–	•	–	Stainless Steel	Passivated		
	175°C	–	•	–	Carbon Steel	96 hr. Cad O.D.		
	200°C	–	•	–	Aluminum	Electroless Nickel		
	200°C	–	•	–	Stainless Steel	Passivated		
	200°C	–	•	–	Aluminum	Electroless Nickel		
	200°C	–	•	–	Stainless Steel	Passivated		
	175°C	–	•	–	Aluminum	96 hr. Cad O.D.		
	175°C	–	–	•	Carbon Steel	Electroless Nickel		Threaded
	175°C	–	–	•	Stainless	Passivated		
	175°C	–	–	•	Carbon Steel	96 hr. Cad O.D.		
	200°C	–	–	•	Aluminum	Electroless Nickel		
	200°C	–	–	•	Stainless Steel	Passivated		
	200°C	–	–	•	Aluminum	Electroless Nickel		
	200°C	–	–	•	Stainless Steel	Passivated		
	175°C	–	–	•	Aluminum	96 hr. Cad O.D.		
	125°C	Solder & Taper Pin Terminations			16	Stainless Steel	Passivated	Reverse Bayonet
	125°C	•	–	–	20 16 12 8	Aluminum	Cad O.D.	Center Lock Screw
	73°C	•	–	–	20 16	Stainless Steel	Passivated	Threaded
	73°C	•	–	–	16 12	Stainless Steel	Passivated	Threaded

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE		
		DESCRIPTION	FLUID RESISTANCE	RESILIENT MATERIAL
MIL-DTL-22992 Class C, J & R Section 6B	C*C*	Environmental Pressurized	Moisture-proof	Neoprene
	C*N*	Environmental Pressurized	Moisture-proof	Neoprene
	J*C*	Environmental Pressurized, with Grommet	Moisture-proof	Neoprene
	J*N*	Environmental Pressurized, with Grommet	Moisture-proof	Neoprene
	R*C*	Environmental	Moisture-proof	Neoprene
	R*N*	Environmental	Moisture-proof	Neoprene
MIL-DTL-22992 Class L Section 6D	L (C)	Environmental, Gland Seal Backshell	Moisture-proof	Neoprene
	L (N)	Environmental, Gland Seal Backshell	Moisture-proof	Neoprene
MIL-C-24217 Section 7	ALL	High Pressure Bulkhead	Submersible	Silicone
MIL-C-25955 Section 8	–	Environmental	Moisture-proof	Neoprene
	–	Hermetic	Moisture-proof	Neoprene
MIL-DTL-26482 Series 1 Solder Section 9B	A	Non-Environmental Solid Shell	Moisture-proof	Neoprene
	B	Non-Environmental with Strain Relief	Moisture-proof	Neoprene
	E	Environmental with Grommet Nut	Moisture-proof	Neoprene
	F	Environmental with Strain Relief	Moisture-proof	Neoprene
	H*A*	Hermetic	Moisture-proof	
	H*B*	Hermetic	Moisture-proof	
	H*C*	Hermetic	Moisture-proof	
	H*Y*	Hermetic	Moisture-proof	
	J	Environmental Gland Seal	Moisture-proof	Neoprene
P	Environmental Potting Seal	Moisture-proof	Neoprene	
MIL-DTL-26482 Series 1 Crimp Section 9C	E	Environmental with Grommet Nut	Moisture-proof	Neoprene
	F	Environmental with Strain Relief	Moisture-proof	Neoprene
	P	Environmental Potting Seal	Moisture-proof	Neoprene
MIL-DTL-26482 Series 2	A	Environmental	Submersible	Silicone
	E	Environmental	Submersible	Silicone
	H*A*	Hermetic	Submersible	Silicone
	H*B*	Hermetic	Submersible	Silicone
	H*C*	Hermetic	Submersible	Silicone
	H*Y*	Hermetic	Submersible	Silicone
	L	Environmental	Submersible	Silicone
	N	Hermetic	Submersible	Silicone
	S	Environmental	Submersible	Silicone
W	Environmental	Submersible	Silicone	

		CONTACT TYPE			SHELL		
OPERATING TEMP	SOLDER	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
		FRONT	REAR				
125°C	•	–	–	16 12 8 4 1/0	Aluminum	500 hr Cad O.D	Threaded Double Start
125°C	–	–	–		Aluminum	Black Anodize	
125°C	–	–	–		Aluminum	500 hr Cad O.D.	
125°C	–	–	–		Aluminum	Black Anodize	
125°C	–	–	–		Aluminum	500 hr Cad O.D.	
125°C	–	–	–		Aluminum	Black Anodize	
125°C	•				6 4 2	Aluminum	
125°C	•			1/0 4/0	Aluminum	Black Anodize	
75C	•	–	–	16 12 8 4 1/0	Stainless Steel	Passivated	Coupling
125°C	–	•	–	20	Aluminum	Cadmium	Threaded Double Start
125°C	•	–	–		Carbon Steel	Tinned	
125°C	•	–	–	20 16 12	Aluminum	96 hr Cad O.D.	Bayonet
125°C	•	–	–		Aluminum	96 hr Cad O.D.	
125°C	•	–	–		Aluminum	96 hr Cad O.D.	
125°C	•	–	–		Aluminum	96 hr Cad O.D.	
125°C	•				Stainless Steel	Passivate	
125°C	•				Stainless Steel	Passivate	
125°C	•				Carbon Steel	Tinned	
125°C	•				Carbon Steel	Tinned	
125°C	•				Aluminum	96 hr Cad O.D.	
125°C	•				Aluminum	96 hr Cad O.D.	
125°C	–	•	–	20	Aluminum	96 hr Cad O.D.	Bayonet
125°C	–	•	–	16	Aluminum	96 hr Cad O.D.	
125°C	–	•	–	12	Aluminum	96 hr Cad O.D.	
175°C	–	–	•	20 16 12	Aluminum	Black Anodize	Bayonet
175°C					Aluminum	Electroless Nickel	
200°C	•	–	–		Stainless Steel	Passivate	
200°C	•	–	–		Stainless Steel	Passivate	
175°C	•	–	–		Carbon Steel	Tinned	
175°C	•	–	–		Carbon Steel	Tinned	
200°C	–	–	•		Aluminum	Electroless Nickel	
175°C	–	–	•		Carbon Steel	Tinned	
200°C	–	–	•		Stainless Steel	Electroless Nickel	
175°C	–	–	•		Aluminum	500 hr Cad O.D.	

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE		
		DESCRIPTION	FLUID RESISTANCE	RESILIENT MATERIAL
MIL-C-26500	E	Environmental, High Temperature	Splash-proof	Silicone
	F	Environmental, Fluid Resistant	Submersible	Silicone
	G	Environmental, Grounding	Splash-proof	Silicone
	H*C	Hermetic	Splash-proof	Silicone
	H*E	Hermetic	Splash-proof	Silicone
	K	Environmental, Firewall	Splash-proof	Silicone
	R	Environmental	Splash-proof	Silicone
MIL-C-27599 Series I	P*A	Potting Seal	–	None
	P*B	Potting Seal	–	None
	T*A	Non-Environmental	–	None
	T*B	Non-Environmental	–	None
MIL-C-27599 Series II	P*A	Potting Seal	–	None
	P*B	Potting Seal	–	None
	T*A	Non-Environmental	–	None
	T*B	Non-Environmental	–	None
MIL-DTL-28840	D	Environmental	Splash-proof	Silicone
	DJ	Environmental with Backshell	Splash-proof	Silicone
	DJS	Environmental with Backshell	Splash-proof	Silicone
	DS	Environmental	Splash-proof	Silicone
MIL-C-28876 Section 13	ALL	Environmental	Submersible	Fluorosilicone
MIL-C-29600 Series A MIL-DTL-38999 Insert Section 14B	E	Environmental	Submersible	Silicone
	G	Environmental, Space Grade	Submersible	Silicone
	R	Environmental	Submersible	Silicone
MIL-C-29600 Series B MIL-C-81511 Insert Section 14B	E	Environmental	Submersible	Silicone
	G	Environmental, Space Grade	Submersible	Silicone
	R	Environmental	Submersible	Silicone
MIL-DTL-38999 Series 1 Scoop Proof Section 16B	E*A*	Environmental (Superseded by Class T)	Submersible	Silicone
	E*B*	Environmental (Superseded by Class T)	Submersible	Silicone
	E*C*	Environmental (Superseded by Class T)	Submersible	Silicone
	E*F*	Environmental (Superseded by Class T)	Submersible	Silicone
	P*A*	Environmental, Potting Seal	Submersible	Silicone
	P*B*	Environmental, Potting Seal	Submersible	Silicone
	P*C*	Environmental, Potting Seal	Submersible	Silicone
	P*F*	Environmental, Potting Seal	Submersible	Silicone
	T*A*	Environmental	Submersible	Silicone
	T*B*	Environmental	Submersible	Silicone
	T*C*	Environmental	Submersible	Silicone
	T*F*	Environmental	Submersible	Silicone
	Y*D*	Hermetic	Submersible	Silicone
	Y*E*	Hermetic	Submersible	Silicone
Y*N*	Hermetic	Submersible	Silicone	

		CONTACT TYPE			SHELL				
	OPERATING TEMP	SOLDER	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE	
			FRONT	REAR					
	200°C	–	•	–	20	Stainless Steel	Passivate	Bayonet or Threaded	
	175°C	–	•	–		Aluminum	Anodic Coating		
	200°C	–	•	–		Aluminum	Electroless Nickel		
	200°C	•	–	–		16	Carbon Steel		Tinned
	200°C	•	–	–		12	Carbon Steel		Tinned
	200°C	–	•	–			Stainless Steel		Passivate
	175°C	–	•	–			Aluminum		Black Anodize
	150°C	•			22M	Aluminum	Bright/Gold Cad over Nickel	Bayonet	
	150°C	•			22D	Aluminum	Bright/Gold Cad over Nickel		
	175°C	•			20	Aluminum	500 hr Cad O.D.		
	175°C	•			16	Aluminum	500 hr Cad O.D.		
	175°C	•			12	Aluminum	500 hr Cad O.D.		
	150°C	•			22M	Aluminum	Bright/Gold Cad over Nickel	Bayonet	
	150°C	•			22D	Aluminum	Bright/Gold Cad over Nickel		
	175°C	•			20	Aluminum	500 hr Cad O.D.		
	175°C	•			16	Aluminum	500 hr Cad O.D.		
	175°C		•		20	Aluminum	500 hr Cad O.D.	Threaded Double Start	
	175°C		•			Aluminum	500 hr Cad O.D.		
	175°C		•			Stainless Steel	Black Cadmium		
	175°C		•			Stainless Steel	Black Cadmium		
	65C	Fiber Optic			–	Aluminum	500 hr Cad O.D.	Threaded	
	175°C	•			22D	Composite	None	Threaded Triple Start	
	175°C	•			22	Composite	Tin		
	175°C	•			20	Composite	Tin		
	175°C			•	23	Composite	None	Threaded Triple Start	
	175°C			•	20	Composite	Tin		
	175°C			•	16	Composite	Tin		
	175°C			•	12	Composite	Tin		
	150°C			•	22M	Aluminum	Bright/Gold Cad over Nickel	Bayonet	
	175°C			•		22D	Aluminum		500 hr Cad O.D.
	200°C			•		22	Aluminum		Black Anodize
	200°C			•		20	Aluminum		Electroless Nickel
	150°C			•		22D	Aluminum		Bright/Gold Cad over Nickel
	175°C			•		22	Aluminum		500 hr Cad O.D.
	200°C			•		20	Aluminum		Black Anodize
	200°C			•		16	Aluminum		Electroless Nickel
	150°C			•		12	Aluminum		Bright/Gold Cad over Nickel
	175°C			•		10	Aluminum		500 hr Cad O.D.
	200°C			•		8	Aluminum		Black Anodize
	200°C			•			Aluminum		Electroless Nickel
	150°C	Solder cup or Eyelet					Carbon Steel		Fused Tin
	200°C						Stainless Steel		Passivated
	200°C						Stainless Steel		Electro deposited Nickel
	200°C								

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE		
		DESCRIPTION	FLUID RESISTANCE	RESILIENT MATERIAL
MIL-DTL-38999 Series II Low Profile Section 16C	E*A*	Environmental, with Gland Nut	Submersible	Silicone
	E*B*	Environmental, with Gland Nut	Submersible	Silicone
	E*C*	Environmental, with Gland Nut	Submersible	Silicone
	E*F*	Environmental, with Gland Nut	Submersible	Silicone
	P*A*	Environmental, Potting Seal	Submersible	Silicone
	P*B*	Environmental, Potting Seal	Submersible	Silicone
	P*C*	Environmental, Potting Seal	Submersible	Silicone
	P*F*	Environmental, Potting Seal	Submersible	Silicone
	T*A*	Environmental	Submersible	Silicone
	T*B*	Environmental	Submersible	Silicone
	T*C*	Environmental	Submersible	Silicone
	T*F*	Environmental	Submersible	Silicone
	Y*D*	Hermetic	Submersible	Silicone
	Y*E*	Hermetic	Submersible	Silicone
	Y*N*	Hermetic	Submersible	Silicone
MIL-DTL-38999 Series III Scoop Proof Section 16D	C	Environmental	Submersible	Silicone
	F	Environmental	Submersible	Silicone
	G	Environmental, Space Grade	Submersible	Silicone
	H	Hermetic, Space Grade	Submersible	Silicone
	J	Environmental	Submersible	Silicone
	K	Environmental, Firewall	Submersible	Silicone
	M	Environmental	Submersible	Silicone
	N	Hermetic	Submersible	Silicone
	S	Environmental	Submersible	Silicone
	W	Environmental	Submersible	Silicone
Y	Hermetic	Submersible	Silicone	
MIL-C-55116 Section 17	–	Environmental, Cable Seal	Splash-proof	Neoprene
MIL-C-55181 Section 18	–	Environmental, Cable Seal	Splash-proof	Neoprene
MIL-C-55243 Section 19	–	Environmental, Cable Seal	Splash-proof	Neoprene
MIL-C-81511 Series1 Gang Release* Superseded by Series 3 Section 20B	A	Environmental	Submersible	Silicone
	B	Hermetic	Submersible	Silicone
	C	Environmental, Potting Seal	Submersible	Silicone
	D	Hermetic	Submersible	Silicone
	E	Environmental	Splash-proof	Silicone
	F	Environmental	Submersible	Silicone
	G	Hermetic	Submersible	Silicone
	H	Hermetic	Submersible	Silicone
	P	Environmental, Potting Seal	Splash-proof	Silicone
	T	Environmental, Potting Seal	Submersible	Silicone

		CONTACT TYPE			SHELL			
	OPERATING TEMP	SOLDER	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
			FRONT	REAR				
	150°C	•			22M 22D 22 20 16 12	Aluminum	Bright/Gold Cad over Nickel	Bayonet
	175°C	•				Aluminum	500 hr Cad O.D.	
	200°C	•				Aluminum	Black Anodize	
	200°C	•				Aluminum	Electroless Nickel	
	150°C	•				Aluminum	Bright/Gold Cad over Nickel	
	175°C	•				Aluminum	500 hr Cad OD	
	200°C	•				Aluminum	Black Anodize	
	200°C	•				Aluminum	Electroless Nickel	
	150°C	•				Aluminum	Bright/Gold Cad over Nickel	
	175°C	•				Aluminum	500 hr Cad O.D.	
	200°C	•				Aluminum	Black Anodize	
	200°C	•				Aluminum	Electroless Nickel	
	150°C					Carbon Steel	Fused Tin	
	200°C	Solder cup				Stainless Steel	Passivated	
	200°C	or Eyelet				Stainless Steel	Electro deposited Nickel	
	200°C			•	22M 22D 22 20 16 12 10 8	Aluminum	Black Anodize	Threaded Triple Start
	200°C			•		Aluminum	Electroless Nickel	
	200°C			•		Aluminum	Electroless Nickel	
	200°C	•				Stainless Steel	Electroless Nickel	
	175°C			•		Composite	2000 hr Salt Spray	
	200°C			•		Stainless Steel	Passivated	
	200°C			•		Composite	Electroless Nickel	
	200°C	•				Stainless Steel	Electro deposited Nickel	
	200°C			•		Stainless Steel	Electro deposited Nickel	
	175°C			•		Aluminum	500 hr Cad O.D.	
	200°C	•				Stainless Steel	Electroless Nickel	
	125°C	•			20	Stainless Steel	Passivated	Reverse Bayonet
	125°C	•				Carbon Steel	96 hr Cad O.D.	Center Lock Screw
	125°C	•				Aluminum	96 hr Cad O.D.	Reverse Bayonet
	200°C			•	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	200°C	*				Stainless Steel	Passivated	
	200°C			•		Aluminum	Electroless Nickel	
	175°C	*				Stainless Steel	Passivated	
	150°C			*		Aluminum	96 hr Cad O.D.	
	175°C			•		Aluminum	Electroless Nickel	
	175°C	•				Stainless Steel	Passivated	
	150°C	*				Carbon Steel	Tinned	
	150°C			•		Aluminum	96 hr Cad O.D.	
	175°C			*		Aluminum	Electroless Nickel	

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE		
		DESCRIPTION	FLUID RESISTANCE	RESILIENT MATERIAL
MIL-C-81511 Series 2 Gang Release* Superseded by Series 4	A	Environmental	Submersible	Silicone
	B	Hermetic	Submersible	Silicone
	C	Environmental, Potting Seal	Submersible	Silicone
	D	Hermetic	Submersible	Silicone
	E	Environmental	Splash-proof	Silicone
	F	Environmental	Submersible	Silicone
	G	Hermetic	Submersible	Silicone
	H	Hermetic	Submersible	Silicone
	P	Environmental, Potting Seal	Splash-proof	Silicone
	T	Environmental, Potting Seal	Submersible	Silicone
Section 20C	A	Environmental	Submersible	Silicone
	D	Hermetic	Submersible	Silicone
	F	Environmental	Submersible	Silicone
	L	Hermetic	Submersible	Silicone
	W	Environmental	Submersible	Silicone
MIL-C-81511 Series 3	A	Environmental	Submersible	Silicone
	D	Hermetic	Submersible	Silicone
	F	Environmental	Submersible	Silicone
	L	Hermetic	Submersible	Silicone
	W	Environmental	Submersible	Silicone
Section 20D	A	Environmental	Submersible	Silicone
	D	Hermetic	Submersible	Silicone
	F	Environmental	Submersible	Silicone
	L	Hermetic	Submersible	Silicone
	W	Environmental	Submersible	Silicone
MIL-C-81511 Series 4	A	Environmental	Submersible	Silicone
	D	Hermetic	Submersible	Silicone
	F	Environmental	Submersible	Silicone
	L	Hermetic	Submersible	Silicone
	W	Environmental	Submersible	Silicone
Section 20E	E	Environmental	Splash-proof	Neoprene
	H	Hermetic	Splash-proof	Neoprene
	J	Gland Seal	Splash-proof	Neoprene
	P	Environmental, Potting Seal	Splash-proof	Neoprene
	E	Environmental	Splash-proof	Neoprene
QPL-81703 Series 1 Section 21B	J	Gland Seal	Splash-proof	Neoprene
	E	Environmental	Splash-proof	Neoprene
QPL-81703 Series 2 Section 21C	J	Gland Seal	Splash-proof	Neoprene
	E	Environmental	Splash-proof	Neoprene
QPL-81703 Series 3 Section 21D	E	Environmental	Submersible	Silicone
	H	Hermetic	Submersible	Silicone
	L	Environmental	Submersible	Silicone
	N	Hermetic	Submersible	Silicone
QPL-81703 Series 1 Section 21B	E	Environmental	Splash-proof	Neoprene
	H	Hermetic	Splash-proof	Neoprene
	J	Gland Seal	Splash-proof	Neoprene
	P	Environmental, Potting Seal	Splash-proof	Neoprene
QPL-81703 Series 2 Section 21C	E	Environmental	Splash-proof	Neoprene
	J	Gland Seal	Splash-proof	Neoprene
QPL-81703 Series 3 Section 21D	E	Environmental	Submersible	Silicone
	H	Hermetic	Submersible	Silicone
	L	Environmental	Submersible	Silicone
	N	Hermetic	Submersible	Silicone
MIL-C-83526 Fiber Optic Section 22	ALL	Environmental	Submersible	Aluminum

		CONTACT TYPE			SHELL			
	OPERATING TEMP	SOLDER	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE
			FRONT	REAR				
	200°C			*	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	200°C	•				Stainless Steel	Passivated	
	200°C			*		Aluminum	Electroless Nickel	
	175°C	•				Stainless Steel	Passivated	
	150°C			*		Aluminum	96 hr Cad O.D.	
	175°C			*		Aluminum	Electroless Nickel	
	175°C	•				Stainless Steel	Passivated	
	150°C	•				Carbon Steel	Tinned	
	150°C			*		Aluminum	96 hr Cad O.D.	
	175°C			*		Aluminum	Electroless Nickel	
	200°C			•	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	175°C	•				Stainless	Passivated	
	175°C			•		Aluminum	Electroless Nickel	
	175°C			•		Steel	Tinned	
	175°C			•		Aluminum	500 hr Cad O.D.	
	200°C			•	23 20 16 12	Aluminum	Electroless Nickel	Bayonet
	175°C	•				Carbon Steel	Passivated	
	175°C			•		Aluminum	Electroless Nickel	
	175°C			•		Carbon Steel	Tinned	
	175°C			•		Aluminum	500 hr Cad O.D.	
	125°C	•			20 16 12	Aluminum	96 hr Cad O.D.	Push Pull
	125°C	•				Carbon Steel	Tinned	
	125°C	•				Aluminum	96 hr Cad O.D.	
	125°C	•				Aluminum	96 hr Cad O.D.	
	175°C		•		20 16 12	Aluminum	96 hr Cad O.D.	Push Pull
	175°C		•			Aluminum	96 hr Cad O.D.	
	200°C			•	20 16 12	Aluminum	500 hr Cad O.D.	Push Pull
	200°C	•				Stainless Steel	Passivated	
	175°C			•		Aluminum	500 hr Cad O.D.	
	200°C			•		Stainless Steel	Passivated	
	125°C	•			20 18 12	Aluminum	96 hr Cad O.D.	Push Pull
	125°C	•				Carbon Steel	Tinned	
	125°C	•				Aluminum	96 hr Cad O.D.	
	125°C	•			Aluminum	96 hr Cad O.D.		
	175°C		•		20 18 12	Aluminum	96 hr Cad O.D.	Push Pull
	175°C		•			Aluminum	96 hr Cad O.D.	
	200°C			•	20 18 12	Aluminum	500 hr Cad O.D.	Push Pull
	200°C	•				Stainless Steel	Passivated	
	175°C			•		Aluminum	500 hr Cad O.D.	
	200°C			•		Stainless Steel	Passivated	
	65C	Fiber Optic			–	Aluminum	Grey Anodize	Threaded

Military Specification Comparison Tables (continued)

MILITARY SPECIFICATION	ENVIRONMENTAL AND MATERIAL CLASS	PERFORMANCE		
		DESCRIPTION	FLUID RESISTANCE	RESILIENT MATERIAL
MIL-DTL-83723 Series I Section 9E	A	Environmental	Submersible	Silicone
	G	Environmental	Submersible	Silicone
	H	Hermetic	Splash-proof	Silicone
	R	Environmental	Submersible	Silicone
	Y	Hermetic	Submersible	Silicone
MIL-DTL-83723 Series II Section 1E	A	Environmental	Submersible	Silicone
	F	Environmental, Superseded by Class R	Submersible	Silicone
	G	Environmental	Submersible	Silicone
	H	Hermetic	Splash-proof	Silicone
	K	Environmental, Firewall	Submersible	Silicone
	R	Environmental	Submersible	Silicone
	Y	Hermetic	Submersible	Silicone
MIL-DTL-83723 Series III Bayonet Section 10D	A	Environmental	Submersible	Silicone
	G	Environmental	Submersible	Silicone
	H	Hermetic	Splash-proof	Silicone
	K	Environmental, Firewall	Submersible	Silicone
	N	Environmental	Submersible	Silicone
	R	Environmental	Submersible	Silicone
	W	Environmental	Submersible	Silicone
	Y	Hermetic	Submersible	Silicone
MIL-DTL-83723 Series III Threaded Section 10D	A	Environmental	Submersible	Silicone
	G	Environmental	Submersible	Silicone
	H	Hermetic	Splash-proof	Silicone
	K	Environmental Firewall	Submersible	Silicone
	N	Environmental	Submersible	Silicone
	R	Environmental	Submersible	Silicone
	S	Environmental, EMI Self Locking Firewall	Submersible	Silicone
	W	Environmental	Submersible	Silicone
NAS1599 Bayonet Section 24	G	Environmental	Submersible	Silicone
	H	Hermetic	Submersible	Silicone
	R	Environmental	Submersible	Silicone
NAS1599 Threaded Section 24	G	Environmental	Submersible	Silicone
	H	Hermetic	Submersible	Silicone
	R	Environmental	Submersible	Silicone

		CONTACT TYPE			SHELL				
	OPERATING TEMP	SOLDER	CRIMP		SIZE	SHELL MATERIAL	FINISH DESCRIPTION	COUPLING TYPE	
			FRONT	REAR					
	200°C			•	20	Aluminum	Black Anodize	Bayonet	
	200°C			•		Stainless Steel	Passivated		
	150°C	•				16	Carbon Steel		Tinned
	200°C			•		12	Aluminum		Electroless Nickel
	200°C	•					Stainless Steel		Passivated
	200°C			•	16	Aluminum	Black Anodized	Threaded	
	200°C			•		Aluminum	Electroless Nickel		
	200°C			•		12	Stainless Steel		Passivated
	150°C	•				8	Carbon Steel		Tinned
	200°C			•		4	Stainless Steel		Passivated
	200°C			•	1/0	Aluminum	Electroless Nickel	Threaded	
	200°C	•				Stainless Steel	Passivated		
	200°C			•		Aluminum	Black Anodized		
	200°C			•		Stainless Steel	Passivated		
	150°C	•				20	Carbon Steel		Tinned
	200°C			•	16	Stainless Steel	Passivated	Bayonet	
	200°C			•		12	Stainless Steel		Electroless Nickel
	200°C			•		Aluminum	Electroless Nickel		
	175°C			•		Aluminum	500 hr Cad O.D.		
	200°C	•				Stainless Steel	Passivated		
	200°C			•	20	Aluminum	Black Anodize	Threaded	
	200°C			•		Stainless Steel	Passivated		
	150°C	•				Carbon Steel	Tinned		
	200°C			•		16	Stainless Steel		Electroless Nickel
	200°C			•		12	Aluminum		Electroless Nickel
	200°C			•	20	Stainless Steel	Passivated	Threaded	
	200°C			•		Stainless Steel	Passivated		
	175°C			•		Aluminum	500 hr Cad O.D.		
	200°C	•				Stainless Steel	Passivated		
	200°C			•		Aluminum	Chrome Plated		
	200°C	•			20	Stainless Steel	Passivated	Bayonet	
	200°C			•		16	Aluminum		Black Anodize
	200°C			•	20	Aluminum	Chrome Plated	Threaded	
	200°C	•				16	Stainless Steel		Passivated
	200°C			•		12	Aluminum		Black Anodize

Connector Manufacturers Index for Backshell and Accessory Specifications

This index of US and international connector manufacturers provides a cross-reference of manufacturers' proprietary series designations to applicable specifications. This information does

not imply qualification status but serves to indicate that the manufacturers' series is "in conformance with" the noted specifications or documents. The symbols in the Connector Designator column are an essential element in Glenair's accessory part number developments. For connector manufacturers' part number series not shown in these listings, please consult factory for applicable accessory part numbers.

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Aero-Electric Connector Company			
AE22	H	MIL-DTL-38999	III
AE46	F	MIL-DTL-38999	I
AE47	F	MIL-DTL-38999	II
AE48	F	MIL-DTL-38999	II
AE49	F	MIL-DTL-38999	I
AE55	A	MIL-C-5015	MS3400
AE66	E	MIL-DTL-26500	Aluminum
AE77	A	MIL-DTL-26482	II
AE83	A	MIL-DTL-83723	III
AB Electronics			
CT-R	F	MIL-DTL-38999	II
MK	8	S	PATT 105
MK	12	S	PATT 603
MK	18	S	PATT 608
Amphenol Limited			
JT	F	PAN	6433-1
SJT	L	JN	1003
SJT	L	LN29729	
SJT	L	PAN	6433-2
118	A	LN	29504
162GB	S	PATT	603
348	J	VG	95329
418-1	F	PATT	616
418-2	F	PATT	614
418-5	L	NFC 93422	HE 306
418-5	L	PATT	615
602GB	A	PAN	6432-1
602GB	A	PATT	602
62GB	S	PATT	105
652	A	LN	29504
Amphenol Products			
BG	D	MIL-DTL-26482	I
JT	*	MIL-C-27599	
JT-R	F	MIL-DTL-38999	II

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Amphenol Products (Continued)			
JT-R	F	40M38277	
LJT	*	MIL-C-27599	
LJT-R	F	MIL-DTL-38999	I
MF-S	D	MIL-DTL-26482	I
PT	D	MIL-DTL-26482	I
PT-SE	D	MIL-DTL-26482	I
PTS-DR	A	MIL-DTL-26482	II
PTS-DR	A	MIL-DTL-83723	I
QWLD	C	MIL-DTL-22992	R
SC	B	MIL-C-5015	MS3100
SJT	L	LN	29729
SM	B	MIL-C-5015	MS3100
TV	H	MIL-DTL-38999	III
TVRB	H	CECC 75201.002	III
TVS	H	MIL-DTL-38999	III
10-72	B	MIL-C-5015	MS3100
10-214	B	MIL-C-5015	MS3100
10-475	F	40M38277	
48	E	MIL-DTL-26500	Aluminum
69	B	MIL-C-5015	MS3100
97	B	MIL-C-5015	MS3100
118	A	MIL-DTL-26482	II
118	A	MIL-DTL-83723	I
246	*	MIL-C-5015	
348	J	MIL-C-81511	I-II
418-1	F	MIL-DTL-38999	I
418-2	F	MIL-DTL-38999	II
518	A	MIL-DTL-83723	III
71	B	MIL-C-5015	MS3100
91-483	A	MIL-DTL-26482	II
91-483	A	MIL-DTL-83723	I
Amphenol/Pyle National			
B	A	MIL-DTL-83723	III
T3	H	MIL-DTL-38999	III

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Amphenol/Pyle National (Continued)			
ZZW	E	MIL-DTL-26500	Aluminum
ZZY	E	MIL-DTL-26500	Aluminum
	A	ESC 10, ESC 11	
Amphenol/Tuchel Electronics GmbH			
118	A	LN	29504
162GB	*	VG	95328
348	J	VG	95329
602GB	A	DEF	5326-3
602GB	A	PAN	6432-1
602GB	A	PATT	602
62GB	*	DEF	5326-3
652	A	LN	29504
Cie Deutsch & Compagnie Deutsch GmbH			
AFD	A	LN	29504
AFD	A	MIL-DTL-26482	I
AFD	A	PAN	6432-1
DBAS	A	QPL-81703	III
DBAS	A	PAN	6432-2
DFE	A	LN	29504
DVG	A	VG	95328
FDBA	A	LN	29504
951	A	PRL	53125
9.815	J	MIL-C-81511	III & IV
991	A	PAN	6432-4
999.1	F	MIL-DTL-38999	I
	A	ESC 10	
	A	ESC 11	
Deutsch Engineered Connecting Devices			
AFD5	A	MIL-DTL-26482	II
AFD	A	MIL-DTL-83723	I
A815	J	MIL-C-81511	III
B815	J	MIL-C-81511	IV
BMS	E	MIL-C-26500	
BTK	D	MIL-DTL-26482	I
DBA	A	40M39569	
DBA7	A	QPL-81703	III
DTS	H	MIL-DTL-38999	III
DIV4	H	MIL-DTL-38999	IV
DL6	A	MIL-DTL-83723	III
D817	A	QPL-81703	III
LPT	D	MIL-DTL-26482	I
381	A	40M39569	
450	D	MIL-DTL-26482	I
460	D	MIL-DTL-26482	I

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Deutsch Engineered Connecting Devices (Continued)			
837	A	MIL-DTL-83723	III
Deutsch Limited			
LL	J	MIL-C-81511	III-IV
DBAS	A	PAN	6432-2
DTS	H	MIL-DTL-38999	III
HDJ	L	JN	1003
RR	A	PAN	6432-1
RR	A	PATT	602
RR70	A	QPL-81703	III
SLPT	*	MIL-DTL-26482	I
Glenair			
90	G	MIL-DTL-28840	
80	M	Mighty Mouse	800 Thru 805
22	W	Geo-Marine®	
ITS, IT	R	MIL-C-5015	
231	F	MIL-DTL-38999	1
232	F	MIL-DTL-38999	2
233	H	MIL-DTL-38999	3
Souriau			
BT	D	MIL-DTL-26482	I
G	D	MIL-DTL-26482	I
L	D	MIL-DTL-26482	I
L-T	D	MIL-DTL-26482	I
M-T	D	MIL-DTL-26482	I
JVS	H	CECC 75201.002	
8LT	F	MIL-DTL-38999	I
8LT	F	NFC 93422	HE 308
8ST	L	JN 1003	8ST-034
8ST	L	LN 29729	
8ST	L	NFC 93422	HE 306
8ST	L	PAN 6433-2	
8ST	L	PATT 615	
8ST	L	VG 96912	
8T	F	MIL-DTL-38999	II
8T	F	NFC 93422	HE 309
85	D	MIL-DTL-26482	I
851	S	PATT 603	
851-50	*	NFL53125	
851-50	*	VG 95328	
8525	A	NFC 93422	HE 302
8525.1	A	LN 29504	
8526	A	MIL-DTL-26482	II
8526	A	PAN 6432-1	
8526	A	PATT 602	


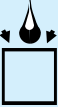
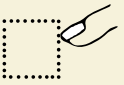

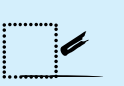





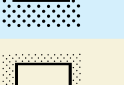



Connector Manufacturers Index for Backshell and Accessory Specifications (continued)

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
Souriau (continued)			
8533	A	EN 2992	
8533	A	ESC 10	
8534	A	ESC 11	8534
Flight Connector Corporation			
FC	*	MIL-C-5015	
FF	A	MIL-C-5015	MS3400
FH	*	MIL-C-5015	
FHA	K	MIL-DTL-83723	II
PL	H	MIL-DTL-38999	IV
G & H Technologies			
BL	H	MIL-DTL-38999	IV
NC	G	MIL-DTL-28840	
ITT Cannon			
CA3106B	*	VG95234	
CA-E / R	B	MIL-C-5015	MS3100
CA-RX	B	MIL-C-5015	MS3100
CVA	K	MIL-DTL-83723	II
CV340	A	MIL-C-5015	MS3400
CV345	A	MIL-C-5015	MS3450
KFS	G	MIL-DTL-28840	
KJ	F	MIL-DTL-38999	II
KJ	F	40M38277	
KJA	H	MIL-DTL-38999	III
KJL	F	MIL-DTL-38999	I
KPSE	D	MIL-DTL-26482	I
KPT	D	MIL-DTL-26482	I
MF	A	MIL-DTL-83723	III
PV-G	A	40M39569	
PVA	A	MIL-DTL-83723	I
PV7	A	MIL-DTL-26482	II
A	ESC 10	KE, SE	
ITT Cannon Electric France SA			
KJ	F	MIL-DTL-38999	II
KJ	F	PAN	6433-1
KJL	F	MIL-DTL-38999	I
251	*	MIL-DTL-26482	I
ITT Cannon UK Ltd.			
KJ	F	PATT	614
KPSE	D	MIL-DTL-26482	I
PV-S	A	MIL-DTL-83723	I
PVW	A	LN29504	
PVX	A	PAN	6432-1
PVX	A	PATT	602
A	ESC 10	KE, SE	

MFG SERIES	GLENAIR CONNECTOR DESIGNATOR	SPECIFICATION REFERENCE	SERIES
ITT Cannon Electric GmbH			
CA3106B	*	VG 95234	
CGK	L	LN 29729	
CWLD	C	MIL-DTL-22992	R
KJ	F	PAN 6433-1	
KPSE	*	VG 95328	
KPT	*	VG 95328	
PVW	A	LN 29504	
PVX	A	PAN 6432-1	
J-Tech			
JT 3400	A	MIL-C-5015	MS3400
JT 3450	A	MIL-C-5015	MS3450
JTVG95234	A	VG95234	
Labinal/Cinch			
CNO930	A	MIL-DTL-83723	III
48	E	MIL-DTL-26500	Aluminum
RMS			
RO		MIL-DTL-26500	Aluminum
Schaltbau GmbH			
650	J	VG 95329	
674	*	VG 95328	
675	*	VG 95328	
679	J	VG 95329	
SICEM			
SCB	*	VG 95234	
Sunbank			
JSC		MIL-DTL-28840	
ITT Cannon			
TT	F	PAN 6433-1	
PT	S	PATT 105	
PT-SE	S	PATT 603	
STT	L	LN 29729	
STT	L	PAN 6433-2	
STT	L	PATT 615	
STT	L	VG 96912	
ITT VEAM			
CIR	*	VG 95234	
VPT	D	MIL-DTL-26482	I
VPT-SE	*	MIL-DTL-26482	I
VPT-SE	*	VG 95328	

International Standards IP Protection Classification

IEC Publication 60529 Classification of Degrees of Protection by Enclosures provides a system for specifying enclosures of electrical equipment on the basis of the degree of protection required. IEC 60529 does not specify degrees of protection against risk of explosions or conditions such as moisture (produced, for example, by condensation), corrosive vapors, fungus, or vermin. NEMA Standards Publication 250 does test for environmental conditions such as corrosion, rust, icing, oil, and coolants. For this reason, and because the tests and evaluations for other characteristics are not identical, the IEC enclosure classification designations cannot be exactly equated with NEMA enclosure Type numbers.

First Numeral			Second Numeral	
IP	Protection of Persons	Protection of Equipment	IP	Protection of Equipment
0	No Protection	No Protection	0	No Protection
1	 Protected against contact with large areas of the body (back of hand)	Protected against objects over 50 mm in diameter	1	 Protected against vertically falling drops of water, e.g. condensation
2	 Protected against contact with fingers	Protected against solid objects over 12 mm in diameter	2	 Protected against direct sprays of water up to 15° from vertical
3	 Protected against tools and wires over 2.5 mm in diameter	Protected against solid objects over 2.5 mm in diameter	3	 Protected against sprays to 60° from vertical
4	 Protected against tools and wires over 1 mm in diameter	Protected against objects over 1 mm in diameter	4	 Protected against water sprayed from all directions (limited ingress permitted)
5	 Protected against tools and wires over 1 mm in diameter	Protected against dust (limited ingress, no harmful deposit)	5	 Protected against low pressure jets of water from all directions (limited ingress permitted)
6	 Protected against tools and wires over 1 mm in diameter	Totally protected against dust	6	 Protected against strong jets of water
			7	 Protected against the effects of immersion between 15 cm and 1 m
			8	 Protected against long periods of immersion under pressure

Example Rating

If the 1st IP number is...	and the 2nd IP number is...	Then the IP rating is
2 (protection against solid objects)	3 (protection against liquids)	IP 2 3 (An enclosure with this designation provides protection against touch with a finger and penetration of solid objects greater than 12 mm and against spraying water.)

Levels of Sealing

Connector Type	Seal Rating	Sealing Method	Typical Shell Material	Contact Material
Dust Tight	IP 65	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Environmental	IP 66	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Environmental	IP 67	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Environmental	IP 68	Elastomer and/or epoxy	Aluminum or Plastic	BeCu/Brass/others
Semi-Hermetic (-491 Mod Code)	1 X 10 -4 Epoxy Special	Aluminum	Special	
Hermetic	1 X 10 -4	Glass (soft) to Metal	Aluminum	BeCu/other
Hermetic	1 X 10 -6	Glass to Metal	Cold Rolled Steel or Titanium	Alloy 52 or Kovar
Hermetic	1 X 10 -8	Glass to Metal	Stainless Steel or Kovar	Alloy 52 or Kovar
Hermetic	1 X 10 -10	Glass to Metal	Inconel or Stainless Steel	Inconel or Stainless Steel

Kovar shell and contact are optimum for rectangular hermetic connectors

Hermetic leak rate = CC He/Sec

Mod 429 Space Grade Processing Information

Save Time and Trouble with...

Mod 429 SPACE GRADE Connectors

Virtually any environmental connector package supplied by Glenair can be processed for DSCC approved space programs. NASA EEE-INST-002 provides guidance on additional screening for connectors. Glenair Mod 429 upgrades inspection and screening to NASA requirements without the need for a customer Statement of Work or Specification Control Drawing. This section of the *Environmental Connector Reference Guide* explains Glenair Mod 429 ordering, and provides valuable information on outgassing and other space flight topics.

This section will provide answers for the following frequently asked questions regarding:

Connectors used in space grade applications

- 1. OUTGASSING:** What is outgassing, why is it important, and how does it affect connector selection? Is special processing required to meet outgassing requirements?
- 2. SCREENING:** What is NASA screening and what level of screening is required?
- 3. MAGNETIC PERMEABILITY:** Are nonmagnetic connectors required?
- 4. CRYOGENIC EXPOSURE:** Are Nano connectors suitable for -200° C. exposure?
- 5. MATERIALS:** Nano connectors offer a variety of materials and plating finishes. Which ones are recommended for space flight?
- 6. WIRE CORROSION:** M22759/33 irradiated Tefzel® wire is preferred for space applications. What about corrosion problems caused by this wire?

Quick Reference Guide: Specifying Space Grade Connectors

STEP 1

Select suitable shell materials and plating

Titanium shells, nickel-plated aluminum shells and stainless steel shells are suitable for use in vacuum environments. Cadmium plating is prohibited for space flight.

STEP 2

Select a NASA Screening Level

The term "Screening Level" refers to the final inspection procedure.
Level 1 for mission-critical highest reliability
Level 2 for high reliability
Level 3 for standard reliability

STEP 3

Outgassing Processing

Most Glenair connectors are certified to meet NASA outgassing requirements without special processing. However, if additional outgassing processing is required, choose the appropriate suffix code from the table below.

STEP 4

Select the Mod 429 Code that Matches the Desired Level of Screening and Outgassing

Use the following table to choose the right modification code. Add the mod code to the connector part number.
Example: 233-105-07-M11-21SN-429

NASA Screening Level	Special Screening Only	Special Screening Plus Outgassing Processing	
		8 Hour Oven Bake 400° F.	Thermal Vacuum Outgassing 24 hrs. 125° C.
Level 1 Highest Reliability	Mod 429B	Mod 429J	Mod 429C
Level 2 High Reliability	Mod 429	Mod 429K	Mod 429A
Level 3 Standard Reliability	(Use standard part number)	Mod 186	Mod 186M

Mod 429 Space Grade Processing Information

1. OUTGASSING: *What is outgassing and how does it affect connector selection? Is special processing required to meet outgassing requirements?*

What is Outgassing?

Plastic and rubber materials give off gaseous molecules. For example, the smell inside a new car is caused by polymer outgassing. Heat and vacuum increase the rate of diffusion. In a spacecraft the gases coming off polymers can contaminate optical surfaces and instruments. The result is degraded performance.

How is Outgassing Measured?

The space industry has adopted a standardized test procedure, **ASTM E 595**, to evaluate out-gassing properties of polymers. Small samples of material are heated to 125° C. at a vacuum of 5×10^{-5} torr for 24 hours. Then the sample is weighed to calculate the **Total Mass Loss** (TML). The TML cannot exceed 1.00% of the total initial mass. During the test, outgassed matter condenses on a cooled collector plate. The quantity of outgassed matter is calculated to determine the **Collected Volatile Condensable Material** (CVCM). The CVCM cannot exceed 0.10% of the original specimen mass.

Do All Connectors Require Special Outgassing Processing?

No. Most connectors meet NASA outgassing requirements without special processing.

2. SCREENING: *What is NASA screening and what level of screening is required?*

What is NASA Screening?

NASA specification EEE-INST-002 provides instructions on selecting, screening and qualifying parts for use on NASA GSFC space flight projects. Table 2J in the NASA spec contains specific

inspection instructions for Nanominiature connectors. These screening requirements exceed the standard mil spec inspection levels.

What Screening Level is Required for Space Applications?

NASA defines three levels of screening: level 1 for highest reliability, level 2 for high reliability, and level 3 for standard reliability.

Is Glenair NASA Certified?

Yes. Meeting NASA requirements means not only inspecting per EEE-INST-002, but also building parts in accordance with NASA Technical Standard NASA-STD-8739.4 "Crimping, Interconnecting Cables, Harnesses, and Wiring". Glenair fully meets these requirements and has obtained NASA certification. Our extra inspection steps reflect the fact that pre-wired connectors not only require best practices on the assembly floor, but also require thorough final electrical and mechanical testing.

SCREENING REQUIREMENTS		
Inspection/ Test	Glenair Level 1 (Mod 429B)	Glenair Level 2 (Mod 429)
Visual Inspection	100% (10X)	100%
Mechanical	100%	2 pcs.
Voltage (DWV)	100%	100%
Insulation Resistance	100%	100%
Low Level Contact Resistance	100% (Read and Record)	2 pcs. (Read and Record)
Mating Force	2 pcs.	N/A
Contact/Wire Retention	2 pcs.	N/A
Solderability/Resistance to Soldering Heat	2 pcs.	N/A

3. MAGNETIC PERMEABILITY: *Are nonmagnetic connectors required?*

Spacecraft designers generally avoid the use of ferromagnetic materials, which can become magnetized and can interfere with sensitive instruments. Nano connectors have a maximum permeability of 2 mu.

4. CRYOGENIC EXPOSURE: *Are Glenair connectors suitable for use at temperatures approaching -200° C. ?*

Most Glenair environmental connectors are rated to -55° C. Glenair has not performed testing below this temperature. EEE-INST-002 states "...experience has proven it is possible for (non-certified) connector types to be used successfully at cryogenic temperatures. It is recommended that connector samples should be subjected to five cycles of cryogenic temperature...(followed by examination for cracks and DWV)".

5. MATERIALS: *Which materials are recommended for space flight?*

Cadmium plated shells are prohibited from space programs. Other plating materials are acceptable.

6. WIRE CORROSION: *M22759/33 irradiated Tefzel® wire is preferred for space applications. What about corrosion problems caused by this wire?*

Does M22759/33 Wire Have an Outgassing Problem?

Irradiated Tefzel® wire is known to cause tarnishing and corrosion of metal parts in close proximity, usually in sealed bags. Both MIL-DTL-32139 and NASA EEE-INST-002 contain cautionary notes regarding this problem. Wire manufacturers have not been able to eliminate this problem. This corrosion problem is referred to as "wire outgassing", which has led to confusion over the term outgassing. This problem has nothing to do with the ability of the wire to meet the TML and CVCM outgassing requirements of ASTM E595. M22759/33 irradiated Tefzel wire continues to be the wire of choice for spacecraft. This wire complies with outgassing requirements.

Connectors with M22759/33 wire should not be stored in sealed bags for extended periods.

New Unit Pack Minimizes Corrosion

Glenair has adopted an inovative new packaging system to protect connectors from performance hindering corrosion. Metal shell connectors supplied with M22759/33 wire are now packaged as follows: the connector is wrapped in Teflon® tape and placed in a ventilated sulpher-free paper envelope to ensure that your mission-critical component arrives in perfect order.

OUTGASSING PROPERTIES OF NANO CONNECTORS

Component	Material	Brand Name	% Total Mass Loss	% Collected Volatile Condensable Material	Test Report
Thermoplastic Insulators and PCB Trays	Liquid Crystal Polymer	Vectra® C-130	0.03	0.00	NASA Test #GSC17478
Potting Compound	Epoxy	Hysol C9-4215	0.48	0.01	Glenair Test
Wire	Tefzel®	Tefzel®	0.22	0.01	NASA Test #GSC19998

Outgassing Properties and Processing

Nonmetallic materials such as rubber, plastic, adhesives and potting compounds can give off gasses when subjected to a vacuum or high heat. The space industry has adopted a standardized test procedure, ASTM E 595, to evaluate outgassing properties of products that contain polymer materials. In the ASTM test, material samples are heated to 125° C at a vacuum of 5 X 10⁻⁵ torr for 24 hours. The test sample is then weighed to calculate the Total Mass Loss (TML), which may not exceed 1.00% of the total initial mass. Likewise the quantity of outgassed matter is weighed to determine the Collected Volatile Condensable Material (CVCM), which may not exceed 0.10% of the original specimen mass.

For space grade applications, Glenair is able to offer both an 8 hour 400° bakeout process as well as a 24 hour 125° thermal vacuum outgassing process on connector products that must conform

to NASA screening or other outgassing standards. Our experience has been that the simpler bakeout process is more than adequate to meet the ASTM E 595 benchmark of 1.00% TML and 0.10% CVCM.

Glenair is well versed in supplying connector products that are optimized for use in space grade applications, and we supply MILDTL-38999 type compliant to EEE-INST-002, Table 2G, the recognized standard for space grade connectors. Section C2 “Connectors and Contacts” of NASA EEE-INST-002 provides guidelines for materials used in connectors for space .ight applications: Aluminum is a preferred material for connector components, and electroless nickel is the preferred finish. Beryllium copper is a preferred material for contacts. 50 microinch minimum gold plating is the preferred contact finish. LCP is a preferred material for dielectric insulating materials. Specify “M” for aluminum shells with electroless nickel finish.

OUTGASSING PROPERTIES OF MATERIALS USED IN MIL-DTL-38999 CONNECTORS

Component	Material	TML %	TCVML %	Test Reference
Front and Rear Insulator	Liquid Crystal Polymer Vectra C130	0.03	0.0	NASA Test # GSC17478
Rear Grommet Interfacial Seal Peripheral Seal	Blended fluorosilicone/silicone elastomer, 30% silicone per ZZ-R-765, 70% flourosilicone per MIL-R-25988	0.48	0.14	Glenair testing conducted at NuSil Technology 02/27/2001
Front-To-Rear Insulator Bonding Material	Eccobond 104 A/B	0.52	0.08	Emerson & Cuming Data Sheet
Insulator-to-Rubber Bonding Material	DC3145 RTV, per MIL-A-46146	1.74	0.90	NASA Test GSFC0191
Coupling Nut Retainer	Torlon® 4203L	1.88	0.01	Glenair Test at NuSil Technology 03-12-2003
Coupling Nut Epoxy	Hysol C9-4215	0.48	0.01	Glenair Test
White Epoxy Ink for Silk-screening	Markem 7224 White	0.49	0.03	NASA Test #GSC19899
Potting Compound, Solder Cup and PC Tail Connectors	Hysol C9-4215	0.48	0.01	Glenair Test
Potting Compound, Filter Receptacles	Stycast epoxy, 2850FT/Catalyst 11	0.29	0.02	Mfgr Data Sheet

1. Fluorosilicone rubber components such as O-rings and grommets exceed NASA outgassing limits.
2. NASA recommends outgassing processing to reduce outgassing to acceptable levels.
3. An inexpensive oven bakeout has better results than the more costly thermal vacuum outgassing. The higher temperature of the oven bakeout is more effective at removing volatile materials. However, both methods assure compliance with outgassing limits.
4. Glenair Mod 429 codes provide an easy ordering solution, whatever the outgassing option. Spacecraft designers generally avoid the use of ferromagnetic materials, which can become magnetized and can interfere with sensitive instruments. Aluminum shell connectors have a maximum permeability of 2 mu. Hermetic connector pins are iron alloy, a highly magnetic material.
5. Space programs sometimes need cryogenic connectors capable of withstanding temperatures as low as -270° C. D38999 connectors are rated to -65° C. Glenair does not have data to validate these connectors for cryogenic applications. EEE-INST-002 states "...experience has proven it is possible for (non-certified) connector types to be used successfully at cryogenic temperatures. It is recommended that connector samples should be subjected to five cycles of cryogenic temperature...(followed by examination for cracks and DWV)".


MIL-DTL-38999 CONNECTOR MATERIALS APPROVED FOR SPACE FLIGHT

Component	Material	Notes
Shells, Coupling Nuts, Jam Nuts	Aluminum alloy 6061 per ASTM B211, electroless nickel plated	Approved for Space Flight
Rigid Insulators	Glass-filled liquid crystal polymer (LCP) in accordance with MIL-M-24519, Type GLP-30F	Approved for Space Flight
Contact Retention Clip	Beryllium copper, heat-treated, unplated	Approved for Space Flight
Grommet, Peripheral Seal, Interfacial Seal, O-ring	Blended fluorosilicone/silicone elastomer, 30% silicone per ZZ-R-765, 70% fluorosilicone per MIL-R-25988	Requires outgassing processing
Hermetic Insert	Vitreous glass	Approved for Space Flight
Pin Contact	Beryllium copper alloy per ASTM B197, 50 microinches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches	Approved for Space Flight
Pin Contact, Hermetic	Nickel-iron alloy per ASTM F30 (Alloy 52),50 microinches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches	Ferromagnetic material.
Socket Contact	Beryllium copper alloy per ASTM B197, 50 microinches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches.	Approved for Space Flight
Socket Contact Hood	Stainless steel, passivated per AMS-QQ-P-35	Approved for Space Flight
Adhesives	RTV and epoxies (see following table for outgassing info)	Requires outgassing processing
Potting Compound, PCB and Solder Cup Versions	Environmental and Hermetic Connectors: Stycast 2651/Catalyst 9 epoxy encapsulant. Filter Connectors: Stycast 2850FT/Catalyst 11 thermally conductive epoxy encapsulant.	Approved for Space Flight
Filter Element	Multilayer Ceramic Planar Array, ferrite inductors	Approved for Space Flight

Glenair Material and Finish Options

Code	Material	Finish	Finish Specification
A	Aluminum	Cadmium, No Chromate	SAE-AMS-QQ-P-416 Type I Class 3
AB	Marine Bronze	Unplated	
AL	Aluminum	AlumiPlate, Clear Chromate	MIL-DTL-83488, Class 2, Type II over electroless nickel
B	Aluminum	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 3
C	Aluminum	Anodize, Black	AMS-A-8625 Type II Class 2
E	Aluminum	Chem Film	MIL-DTL-5541 Type 1 Class 3
G	Aluminum	Anodize, Hardcoat	AMS-A-8625 Type III, Class 1, .001" thick
G2	Aluminum	Anodize, Hardcoat	AMS-A-8625, Type III, Class 1, .002" thick
J	Aluminum	Cadmium, Gold	SAE-AMS-QQ-P-416 Type II, Class 2 over electroless nickel
JF	Aluminum	Cadmium, Gold	SAE-AMS-QQ-P-416 Type II, Class 2 over electroless nickel
LF	Aluminum	Cadmium, Clear	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel
M	Aluminum	Electroless Nickel	AMS-C-26074 Class 4 Grade B; ASTM-B-733, SC 2, Type IV
MT	Aluminum	Nickel-PTFE	GMF-002 Type II Class 1
N	Aluminum	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 3 over electroless nickel
NC	Aluminum	Zinc-Cobalt, Olive Drab	ASTM B 840 Grade 6 Type D over electroless nickel
NF	Aluminum	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel
P	Stainless Steel	Electrodeposited Nickel	SAE-AMS-QQ-N-290 Class 1 Grade F
T	Aluminum	Cadmium, No Chromate	SAE-AMS-QQ-P-416 Type I Class 3
TP2	Titanium	Electrodeposited Nickel	SAE-AMS-QQ-N-290 Class 1 Grade F
U	Aluminum	Cadmium, Black	SAE-AMS-QQ-P-416 Type I Class 3
UC	Aluminum	Zinc-Cobalt, Black	ASTM B 840 Grade 6 Type D over electroless nickel
UCR	Aluminum	Zinc-Cobalt, Black	ASTM B 840 Grade 6 Type D over electroless nickel
UF	Aluminum	Cadmium, Black	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel
XAL	Composite	AlumiPlate	MIL-DTL-86448, Class 2, Type II over electroless nickel
XB	Composite	Unplated Black	
XM	Composite	Electroless Nickel	AMS-C-26074
XMT	Composite	Nickel-PTFE	GMS-002 Class 2 Type II
XO	Composite	Unplated Light Brown	
XW	Composite	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 3 over electroless nickel
XZN	Composite	Zinc-Nickel, Black	ASTM B841 Grade 5 over electroless nickel
Z1	Stainless Steel	Passivate	SAE-AMS-SAE-AMS-QQ-P-35 Type VI
Z2	Aluminum	Gold	MIL-DTL-45204 Class 1 over electroless nickel
ZC	Stainless Steel	Zinc-Cobalt, Black	ASTM-B840, Grade 6
ZCR	Stainless Steel	Zinc-Cobalt, Black	ASTM-B840, Grade 6
ZL	Stainless Steel	Electrodeposited Nickel	SAE-AMS-QQ-N-290 Class 1 Grade F
ZM	Stainless Steel	Electroless Nickel	AMS-C-26074 Class 1 Grade A
ZMT	Stainless Steel	Nickel-PTFE	GMF-002 Type II Class 3
ZN	Aluminum	Zinc-Nickel, Olive Drab	ASTM B841 Grade 5 over electroless nickel
ZNU	Aluminum	Zinc-Nickel, Black	ASTM B841 Grade 5 over electroless nickel
ZU	Stainless Steel	Cadmium, Black	SAE-AMS-QQ-P-416 Type II Class 3
ZW	Stainless Steel	Cadmium, Olive Drab	SAE-AMS-QQ-P-416 Type II Class 2 over electroless nickel

This chart presents a selection of the broad range of base materials and plating options available from Glenair. Innovation and qualification of material and finish types is a major Glenair strength.

Hrs. Salt Spray	Electrical Conductivity	Operating Temp. Range		Notes
48	Conductive	-65 to +175°C		Not recommended for new projects. LF is preferred.
1000	Conductive	-65 to +200°C	✓	Marine and geophysical applications.
1000	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L and MIL-DTL-83513G.
96	Conductive	-65 to +175°C		Not recommended for new projects. NF is preferred.
336	Non-Conductive	-65 to +175°C	✓	Glenair's standard black anodize finish.
168	Conductive	-65 to +175°C		Glenair's standard chem film finish.
336	Non-Conductive	-65 to +200°C	✓	Not recommended for new projects. G2 is preferred.
336	Non-Conductive	-65 to +200°C	✓	Dark olive grey color. Glenair's preferred hardcoat finish.
500	Conductive	-65 to +175°C		Not recommended for new projects. JF is preferred.
1000	Conductive	-65 to +175°C		Glenair's preferred gold cadmium finish.
1000	Conductive	-65 to +175°C		Glenair's preferred clear cadmium finish.
48	Conductive	-65 to +200°C	✓	Glenair's standard electroless nickel finish.
1000	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L and MIL-DTL-83513G.
500	Conductive	-65 to +175°C		Not recommended for new projects. NF is preferred.
350	Conductive	-65 to +175°C		Glenair's standard olive drab zinc-cobalt finish.
1000	Conductive	-65 to +175°C		Glenair's standard olive drab cadmium finish.
500	Conductive	-65 to +200°C	✓	Not recommended for new projects. ZM is preferred.
48	Conductive	-65 to +175°C		Not recommended for new projects. LF is preferred.
96	Conductive	-65 to +200°C	✓	Glenair's preferred finish for titanium connectors.
48	Conductive	-65 to +175°C		Not recommended for new projects. UF is preferred.
350	Conductive	-65 to +175°C		Glenair's standard black zinc-cobalt finish.
350	Conductive	-65 to +175°C	✓	RoHS version of UC.
1000	Conductive	-65 to +175°C		Glenair's preferred black cadmium finish.
2000	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L.
2000	Non-Conductive	-65 to +175°C	✓	Glenair's standard unplated composite.
2000	Conductive	-65 to +175°C	✓	Glenair's standard electroless nickel finish over composite.
2000	Conductive	-65 to +175°C	✓	Approved for MIL-DTL-38999L.
2000	Non-Conductive	-65 to +175°C	✓	Not recommended for new projects. Use XB.
2000	Conductive	-65 to +175°C		Glenair's standard olive drab cadmium finish over composite.
2000	Conductive	-65 to +175°C		Glenair's standard black zinc-nickel finish over composite.
1000	Conductive	-65 to +200°C	✓	Glenair's standard passivated stainless steel.
48	Conductive	-65 to +200°C	✓	Glenair's standard gold plating for space programs.
	Conductive	-65 to +175°C		Glenair's standard zinc-cobalt over stainless steel.
	Conductive	-65 to +175°C	✓	RoHS version of ZC.
1000	Conductive	-65 to +200°C	✓	Used on hermetic connectors. Use ZM for other applications.
	Conductive	-65 to +200°C	✓	Glenair's preferred nickel-plated stainless steel.
1000	Conductive	-65 to +175°C	✓	Glenair's new 1000 Hour Grey over stainless steel.
1000	Conductive	-65 to +175°C		Glenair's standard olive drab zinc-nickel finish.
1000	Conductive	-65 to +175°C		Glenair's standard black zinc-nickel finish.
1000	Conductive	-65 to +175°C		Glenair's standard black cadmium over stainless steel.
2000	Conductive	-65 to +175°C		Glenair's standard olive drab cadmium over stainless steel.

Glenair Backshell Plating Code and Mil-Spec Connector Finish Code Cross-Reference

MIL-DTL-38999 Series I and II		Recommended Glenair Accessory Code
Finish Code	Material, Finish	
A	Aluminum, Cadmium Plated, Clear Chromate	LF
B	Aluminum, Cadmium Plated, Olive Drab	NF
C	Aluminum, Anodize, Hardcoat	G2
E	Stainless Steel, Passivated	Z1
F	Aluminum, Electroless Nickel Plated	M
N	Stainless Steel, Electrodeposited Nickel (Hermetic)	P
P	Aluminum, Pure Dense Aluminum (AlumiPlate SM)	AL
R	Aluminum, Electroless Nickel	M
T	Aluminum, Nickel-PTFE	MT
U	Aluminum, Cadmium Plated, Clear Chromate	LF
X	Aluminum, Cadmium Plated, Olive Drab	NF
Z	Aluminum, Black Zinc-Nickel	ZR

MIL-DTL-38999 Series III and IV Class Code		Recommended Glenair Accessory Code
Finish Code	Material, Finish	
C	Aluminum, Anodize, Hardcoat	G2
F	Aluminum, Electroless Nickel	M
G	Aluminum, Electroless Nickel	M
H	Stainless Steel, Passivated	Z1
J	Composite, Cadmium Plated, Olive Drab	XW
K	Stainless Steel, Passivated	Z1
L	Stainless Steel, Electrodeposited Nickel	P
M	Composite, Electroless Nickel Plated	XM
P	Aluminum, Pure Dense Aluminum (AlumiPlate SM)	AL
R	Aluminum, Electroless Nickel	M
S	Stainless Steel, Electrodeposited Nickel	P
T	Aluminum, Nickel-PTFE	MT
W	Aluminum, Cadmium Plated, Olive Drab	NF
X	Aluminum, Cadmium Plated, Olive Drab	NF
Z	Aluminum, Black Zinc-Nickel	ZR

MIL-DTL-83513		Recommended Glenair Accessory Code
Finish Code	Material, Finish	
A	Aluminum, Pure Dense Aluminum (AlumiPlate SM)	AL
C	Aluminum, Cadmium Plated, Gold Chromate	JF
K	Aluminum, Zinc-Nickel, Olive Drab	ZN
N	Electroless Nickel	M
P	Stainless Steel, Passivated	Z1
T	Aluminum, Nickel-PTFE	MT

MIL-C-5015		Recommended Glenair Accessory Code
Class Code	Material, Finish	
A, B, C, E, F, P, R, W	Aluminum, Cadmium Plated, Olive Drab	NF

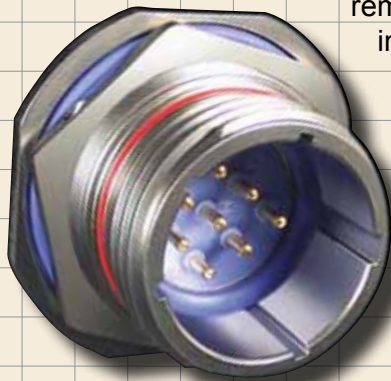
MIL-DTL-26482		Recommended Glenair Accessory Code
	Material, Finish	
Series I	Aluminum, Cadmium Plated, Olive Drab	NF
Series 2 Class L	Electroless Nickel	M
Series 2 Class W	Aluminum, Cadmium Plated, Olive Drab	NF

AS85049		Recommended Glenair Accessory Code
Finish Code	Material, Finish	
A	Aluminum, Black Anodize	C
B	Stainless Steel, Cadmium Plated, Black	ZU
G	Aluminum, Electroless Nickel Plated (Space)	M
J	Composite, Cadmium Plated, Olive Drab	XW
L	Composite, Cadmium Plated, Olive Drab ⁽¹⁾	XX
M	Composite, Electroless Nickel Plated	XM
N	Aluminum, Electroless Nickel Plated	M
P	Aluminum, Cadmium Plated, Olive Drab ⁽¹⁾	NFP
W	Aluminum, Cadmium Plated, Olive Drab	NF
T	Composite, Unplated	XO

(1) Selective plated with polysulfide barrier

MIL-DTL-38999 Type Environmental Connectors

The connector of choice for high-density and high-reliability applications



Environmental class plugs and receptacles are offered in high-density insert arrangements (up to 128 contacts) with crimp removable contacts, PC tails, and solder cups—in Series I, II and III configurations. Glenair manufactures a wide range of environmental class MIL-DTL-38999 type connectors including lanyard-release products, composites, specialty metal cable plugs and receptacles, as well as high-speed RF configurations utilizing coaxial and other shielded contact types. Glenair excels in the design and delivery of special purpose connectors based on the MIL-DTL-38999 standard.

Contacts, Layouts and Terminations

Signal Contacts: Copper alloy / Gold plate, available in sizes 8, 10, 12, 16, 20 and 22D.

Shielded Contacts: Gold plated. Coax, twinax, triax, quadax in sizes 8, 12, and 16.

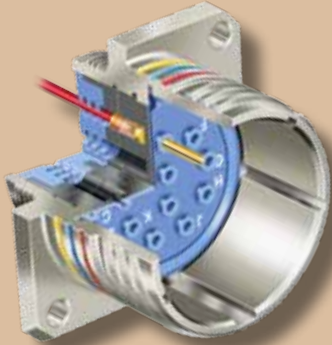
Layouts: Available with 2 to 128 contacts. Insert arrangements IAW MIL-STD-1560

Terminations: Solder cups, eyelets, straight- and right-angle PCB, crimp, thermocouple.

Environmental Connector Materials and Specifications

Component	Material
Shells, Coupling Nuts, Jam Nuts	Aluminum alloy 6061 per ASTM B211; Engineering grade thermoplastic; CRES passivated stainless steel
Rigid Insulators	Glass-filled liquid crystal polymer (LCP) in accordance with MIL-M-24519, Type GLP-30F
Contact Retention Clip	Highly conductive copper alloy, heat-treated, unplated
Grommet, Peripheral Seal, Interfacial Seal, O-ring	Blended fluorosilicone/silicone elastomer, 30% silicone per ZZ-R-765, 70% fluorosilicone per MIL-R-25988
Pin Contact	Copper alloy per ASTM B197, 50 micro inches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 micro inches
Socket Contact	Copper alloy per ASTM B197, 50 micro inches gold plated per ASTM B488 Type 3 Code C Class 1,27 over nickel plate per QQ-N-290 Class 2, 50-100 microinches.
Socket Contact Hood	Stainless steel, passivated per AMS-QQ-P-35
Adhesives	Silicone and Epoxy
Potting Compound: PCB and Solder Cup Versions	High-strength epoxy, Hysol EE4215

MIL-DTL-38999 Series III



Available Mounting Styles

Mounting Style	Part Number
Wall Mount	233-105-00, D0 & T0
Jam Nut	233-105-07
In-Line Receptacle	233-105-05
Plug Connector	233-105-G6
Box Mount with PC Tails	257-455

Supported Wire Sizes

Contact Size	Wire Gauge
22D	#22 - #28
20	#20 - #24
16	#16 - #20
12	#12 - #14
10	#10 - #12

Performance Ratings

Shock and Vibration	300 G's Shock; 37 G's Random Vibration
Thermal Shock	-65° C to +175° C per EIA-364-32 test
Operating Temperature	-55° C to +200° C
Mating Cycles	500 Mating Cycles
Corrosion Resistance	1000 Hours on Stainless Steel Shells
Shielding Effectiveness	Effective over a range of 100MHz to 10GHz with a minimum 50dB effectiveness at 10GHz, IAW test method EIA-364-10
Shell-to-Shell Resistance	2 Millivolt drop maximum, per EIA-364-83

Service Rating

Test voltage, Volts AC (rms). Wired, assembled, unmated connectors:

Service Rating	Sea Level	70,000 ft..
M	1300 VRMS	350 VRMS
N	1000 VRMS	260 VRMS
I	1800 VRMS	400 VRMS
II	2300 VRMS	500 VRMS

Materials and Finishes

Plating Code	Material	Finish	Specification
M*	Aluminum	Electroless Nickel	AMS-C-26074
NF	Aluminum	Cadmium Plate Olive Drab over Electroless Nickel	AMS-QQ-P-416, over AMS-C-26074 (1000 Hour Salt Spray)
ZN	Aluminum	Olive Drab Zinc-Nickel	Zinc alloy per ASTM B841-91, Class 1 Type E Grade 3 over Electroless nickel per ASTM B733-90 SC2, Type 1 Class 5
MT*	Aluminum	Ni-PTFE 1,000 Hour Grey™ (Nickel Fluorocarbon Polymer)	MIL-DTL-38999L (500 Hour Salt Spray)
XM*	Composite	Electroless Nickel	AMS-C-26074
XMT*	Composite	Ni-PTFE 1,000 Hour Grey™ (Nickel Fluorocarbon Polymer)	MIL-DTL-38999L (2000 Hour Salt Spray)
XW	Composite	Cadmium Olive Drab over Electroless Nickel	AMS-QQ-P-416, over AMS-C-26074 (1000 Hour Salt Spray)
Z1*	Stainless Steel	Passivate	AMS-QQ-P-35
ZL*	Stainless Steel	Electrodeposited Nickel	SAE-AMS-QQ-N-290, Class 2

* = RoHS Compliant

MIL-DTL-38999 Series I, II, III, and IV Connectors Insert Arrangements (IAW MIL-STD-1560)

Series I	9-35	9-98	11-2	11-4	11-5	11-35	11-98	11-99
Series II	8-35	8-98	10-2	10-4	10-5	10-35	10-98	10-99
Series III	A35	A98	B2	B4	B5	B35	B98	B99
Series IV	---	---	---	---	B5	B35	B98	B99

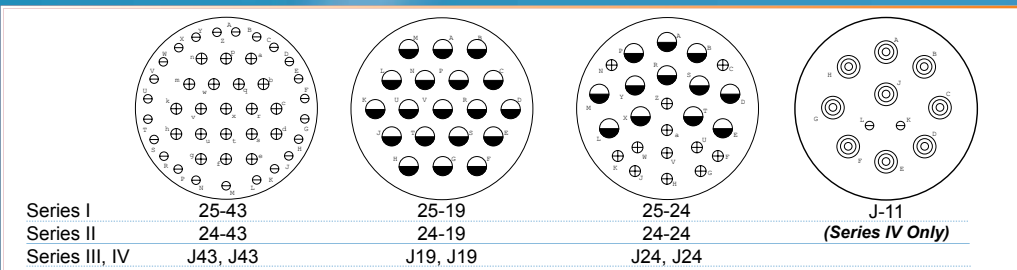
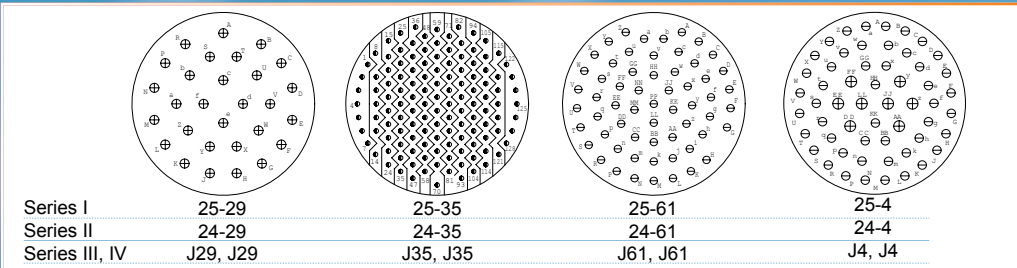
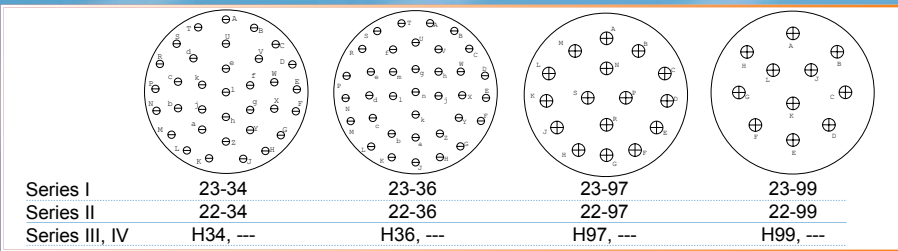
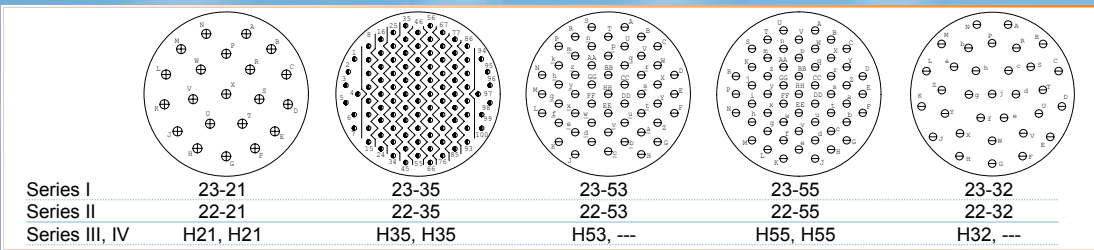
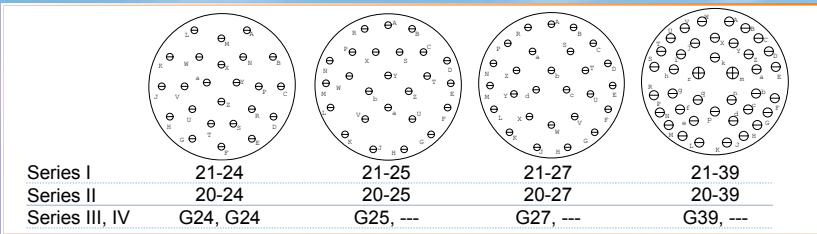
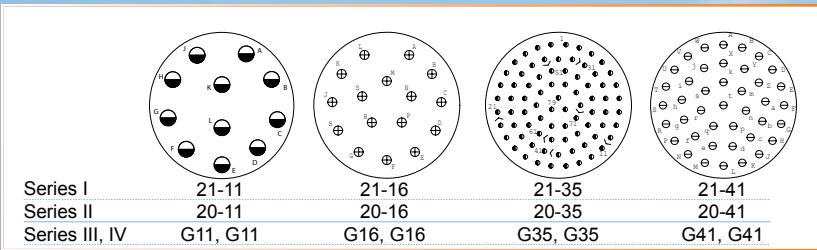
Series I	13-4	13-8	13-35	13-98
Series II	12-4	12-8	12-35	12-98
Series III	C4	C8	C35	C98
Series IV	C4	---	C35	C98

Series I	15-5	15-15	15-18	15-19	15-35	15-97
Series II	14-5	14-15	14-18	14-19	14-35	14-97
Series III	D5	D15	D18	D19	D35	D97
Series IV	D5	---	D18	D19	D35	D97

Series I	17-6	17-8	17-26	17-35	17-99
Series II	16-6	16-8	16-26	16-35	16-99
Series III	E6	E8	E26	E35	E99
Series IV	E6	E8	E26	E35	---

Series I	19-11	19-28	19-32	19-35	19-30	19-45
Series II	18-11	18-28	18-32	18-35	18-30	18-45
Series III	F11	F28	F32	F35	F30	F45
Series IV	F11	---	F32	F35	---	---





MIL-DTL-38999 Series I, II, III, and IV Connectors Layouts and Pin Counts

Shell Size and Insert Arrangements					Number of Pins			
MS Series I	MS Series II	D38999 Series III	Service Rating	22D	20	16	12	
9-35	8-35	A35	M	6				
9-98	8-98	A98	I		3			
11-2	10-2	B2	I			2		
11-4	10-4	B4	I		4			
11-5	10-5	B5	I		5			
11-35	10-35	B35	M	13				
11-98	10-98	B98	I		6			
11-99	10-99	B99	I		7			
13-4	12-4	C4	I			4		
13-8	12-8	C8	I		8			
13-35	12-35	C35	M	22				
13-98	12-98	C98	I		10			
15-5	14-5	D5	II			5		
15-15	14-15	D15	I		14	1		
15-18	14-18	D18	I		18			
15-19	14-19	D19	I		19			
15-35	14-35	D35	M	37				
15-97	14-97	D97	I		8	4		
17-6	16-6	E6	I				6	
17-8	16-8	E8	II			8		
17-26	16-26	E26	I		26			
17-35	16-35	E35	M	55				
17-99	16-99	E99	I		21	2		
19-11	18-11	F11	II			11		
19-28	18-28	F28	I		26	2		
19-30	18-30	F30	I		29	1		
19-32	18-32	F32	I		32			
19-35	18-35	F35	M	66				
19-45	18-45	F45	M	67				
21-11	20-11	G11	I				11	
21-16	20-16	G16	II			16		
21-24	20-24	G24	I		24			
21-25	20-25	G25	I		25			
21-27	20-27	G27	I		27			
21-35	20-35	G35	M	79				
21-39	20-39	G39	I		37	2		
21-41	20-41	G41	I		41			
23-21	22-21	H21	II			21		
23-32	22-32	H32	I		32			
23-34	22-34	H34	I		34			
23-35	22-35	H35	M	100				
23-36	22-36	H36	I		36			

23-53	22-53	H53	I	53	
23-55	22-55	H55	I	55	
23-97	22-97	H97	I		16
23-99	22-99	H99	II		11
25-4	24-4	J4	I	48	8
25-19	24-19	J19	I		19
25-24	24-24	J24	I		12 12
25-29	24-29	J29	I		29
25-35	24-35	J35	M	128	
25-43	24-43	J43	I	23	20
25-61	24-61	J61	I	61	

Shell Size / Insert Arrangements	Number of Pins				
	22D	20	16	12	10
D38999 Series IV					
B5		5			
B35	13				
B98		6			
B99		7			
C4			4		
C35	22				
C98		10			
D5			5		
D18		18			
D19	37	19			
D35					
D97		8	4		
E6				6	
E8			8		
E26		26			
E35	55				
F11			11		

Shell Size / Insert Arrangements	Number of Pins				
	22D	20	16	12	10
D38999 Series IV					
G41		41			
H21			21		
H35	100				
H55		55			
J4		48	8		
J11		2			9
J19				19	
J24			12	12	
J29			29		
J35	128				
J43		23	20		
J61		61			
F32		32			
F35	66				
G11				11	
G16			16		
G35	79				

The **Smart Solution** for Preventing Contact Damage and Extending the Service Life of Cable and Box Assemblies



Product Applications

Glenair Sav-Con® Connector Savers are designed to protect connectors that are subject to repeated mating and unmating cycles. Sav-Con® Connector Savers prevent costly repair or replacement of expensive connectors and cables while preserving the quality and integrity of connector performance. Sav-Con® Connector Savers take the abuse of repeated connection cycles instead of “black box” or other equipment connectors. Equipment connectors that are mated and unmated frequently during manufacturing,

check-out phases and environmental test programs can be protected by Glenair Sav-Con® Connector Savers at considerable savings in time and money.

Glenair Sav-Con® Connector Savers feature one-piece, non-removable pin/socket contacts for maximum reliability and minimum effect on circuit resistance. Each Glenair Sav-Con® Connector Saver series meets the same durability requirements as the Military Specification series with which it mates. The mating portions of the pin-and-socket contacts are in strict compliance with the applicable Military Specification contacts used in each connector series.

Sav-Con® Connector Index		
Connector Specification	Series	Part Number
MIL-STD-1533		
MIL-STD-1760		94*-021
MIL-C-5015		94*-011
MIL-DTL-26482	I-II	94*-001
MIL-C-28840		94*-002
MIL-DTL-38999	I	94*-003
MIL-DTL-38999	II	94*-004
MIL-DTL-38999	III	94*-005
MIL-DTL-83723	I	
MIL-DTL-83723	IIIB	94*-006
MIL-DTL-83723	IIIT	94*-007
MIL-DTL-83723		
40M38277		
40M38298		94*-010
40M39569		
LN29504		
LN 29729 (SJT)		94*-001
PAN6432-1		
PAN6433-1		
PATT 105 - 602		94*-009
PATT 616		
NFC C93-422	HE 301B	
NFC C93-422	HE 302	
NFC C93-422	HE 308	
NFC C93-422	HE 309	
NFC C93-422	HE 312	
VG 95328		

* 0 = General Duty
 1 = Environmental
 2 = High Reliability

The one-piece design adds resistance to a circuit equal to a mated pin and socket contact, thus it has little or no effect on sensitive circuits.

When a Sav-Con® Connector Saver is installed between a receptacle and a plug, the effective additional length is less than the length of an equivalent mated plug and receptacle. When using bayonet coupled Sav-Con® Connector Savers, Glenair recommends our Lock Ring design feature in applications where large cable bundles may induce unwanted stress to the coupling mechanism and potential unwanted contact displacement.

- For MIL-DTL-26482, MIL-DTL-83723, MIL-C-5015, MIL-DTL-38999 Series I, II and III Connectors
- All Standard Materials and Finish Platings
- Environmental and Hermetic Designs Available
- Gender Changers
- Optional Locking Mechanism
- Keyed Polarization
- Fully Repairable

High Speed Connector Application Worksheet

Glenair excels in the design and fabrication of high-speed (RF) connectors equipped with coax, twinax, quadrax, and other matched-impedance, shielded cartridge contacts. This connector specification worksheet is designed to capture essential high-speed connector application details at the onset of the specification and design process.

Cable Type

M17 _____

RG _____

Raychem _____

Gore _____

Tensolite _____

Other _____

Ethernet Protocol

10BaseT_____

100BaseT_____

1000BaseT_____

10GBaseT_____

Ground Plane

Yes_____ No_____

Connector Series

38999_____ I, II, III, IV_____

26482_____

Other _____

Arrangement _____

Impedance (ohm)

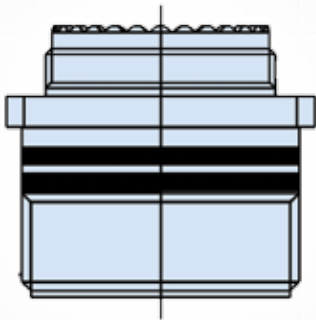
50 _____

75 _____

100 _____

150 _____

Other _____



Contact Size

12 _____

16 _____

20 _____

22 _____

Mating Contact

AS39029/ _____ - _____

Contact Type

Coax_____

Twinax_____

Concentric Twinax_____

Quadrax_____

Other Information



Contact Name _____

Phone _____

Email _____

Program _____

Application Environment _____