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MIL-DTL-38999 Cylindrical Connectors

Hermetics, Filters, Environmentals, Feed-Thrus, Lanyards, Sav-Cons® and More!

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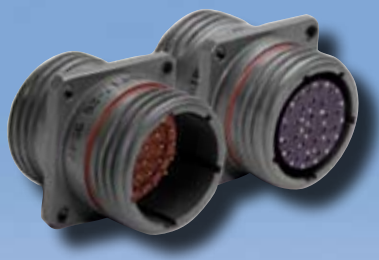
1st Edition • September, 2008

1000 Hour Grey™

The Advanced Formula Ni-PTFE Plating Process for EMC Applications



New Cadmium Free RoHS Compliant Plating Process Breaks 1000 Hour Corrosion Protection Barrier!

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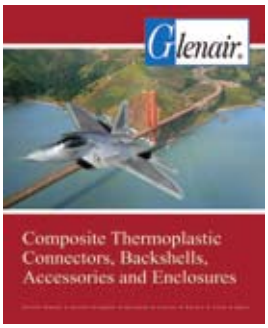

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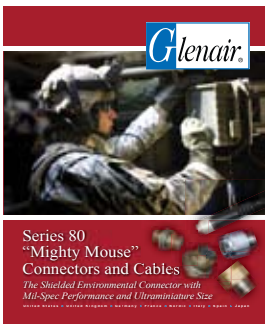

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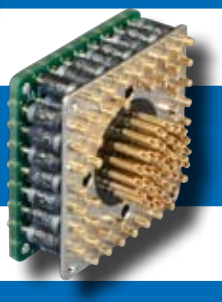
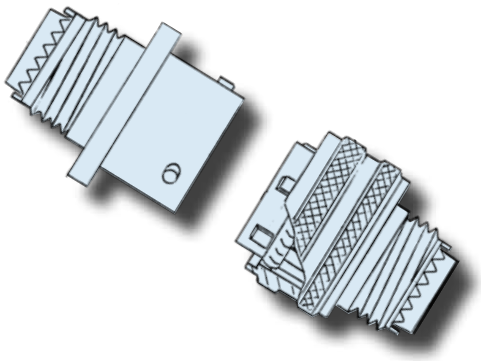
MIL-DTL-38999
Qualified Connectors and Derivatives



Turn to Individual Sections for Detailed Table of Contents

MIL-DTL-38999 Environmental Class Connector Overview

Series I



MIL-DTL-38999 is a high-performance connector family designed for cable-to-panel I/O applications in military aerospace and other demanding situations. Environmental class plugs and receptacles—with high-density insert arrangements (up to 128 contacts)—are available with crimp removable contacts, PC tails, and solder cups. Glenair manufactures a wide range of environmental class MIL-DTL-38999 type connectors including lanyard-release products, composite and specialty metal cable plugs and receptacles, and Coax contact equipped products. This table describes the most basic attributes for the environmental class products supplied by Glenair.

Series Description	Scoop-Proof 3-Point Bayonet Coupling
Supported Contact Types and Gauges	12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts. Crimp, solder and PCB tails.
Coupling/Mating Design	Bayonet coupling; quick disconnect; positive locking, keyed.
EMI Shielding	Conductive plating and thick shell wall cross-sections provide effective EMI shielding to 40 dB minimum at 10 GHz.
Vibration and Shock	Excellent resistance to vibration and shock with no electrical discontinuity and no disengagement of the mated connectors per MIL-DTL-38999 (paragraph 3.26)
Mating Speed	120 ° or 1/3 turn to full mate
Materials	Aluminum, Composite or Stainless Shells, Silicone Seals per ZZ-R-765, Beryllium Copper Alloy, Gold Plated Contacts

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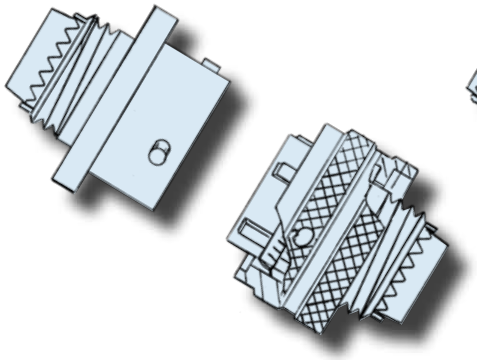
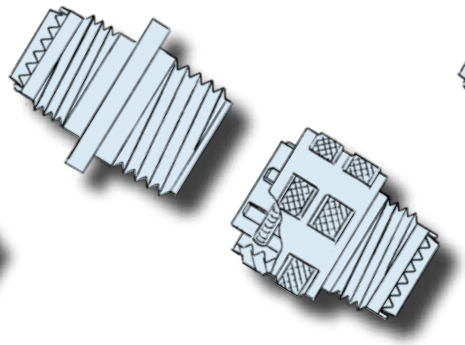
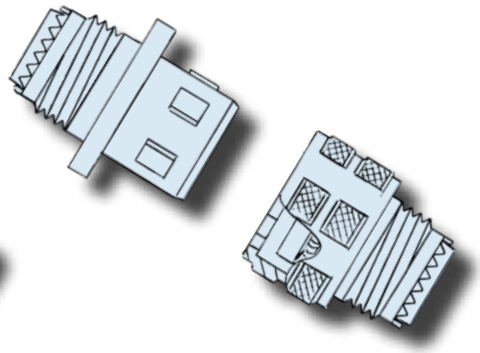
MIL-DTL-38999
Environmental Class Connectors
Overview

Series II	Series III	Series IV
		
Low-Profile 3-Point Bayonet Coupling	Scoop-Proof, Triple Start, Self-Locking	Scoop-Proof, Breech Lock
12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts. Crimp, solder and PCB tails.	12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts. Crimp, solder and PCB tails.	12, 16, 20, and 22 gauge contacts, standard density and 22 gauge high density arrangements; 3 to 128 contacts. Crimp, solder and PCB tails.
Bayonet coupling design, quick disconnect, captive, keyed.	Triple-start threaded coupling design, rapid advance, self-locking and full-mate indicator, keyed.	Breech lock coupling design, rapid advance, self-locking, keyed.
Conductive plating and thick shell wall cross-sections provide effective EMI shielding to 40 dB minimum at 10 GHz.	Shell to shell bottoming, grounding fingers, conductive plating and thick shell wall cross-sections provide effective EMI shielding to 65 dB minimum at 10 GHz	Shell to shell bottoming, grounding fingers, conductive plating and thick shell wall cross-sections provide effective EMI shielding to 65 dB minimum at 10 GHz. Grounding before engagement of contacts.
Excellent resistance to vibration and shock with no electrical discontinuity and no disengagement of the mated connectors per MIL-DTL-38999 (paragraph 3.26)	Excellent resistance to vibration and shock with no electrical discontinuity and no disengagement of the mated connectors per MIL-DTL-38999 (paragraph 3.26)	Excellent resistance to vibration and shock with no electrical discontinuity and no disengagement of the mated connectors per MIL-DTL-38999 (paragraph 3.26)
120 ° or 1/3 turn to full mate	360 ° or one full turn to full mate	90° or 1/4 turn to full mate
Aluminum or Stainless Steel Shells, Silicone Seals per ZZ-R-765, Beryllium Copper Alloy, Gold Plated Contacts	Aluminum, CRES and Composite Shells, Silicone Seals per ZZ-R-765, Beryllium Copper Alloy, Gold Plated Contacts	Aluminum Shells, Silicone Seals per ZZ-R-765, Beryllium Copper Alloy, Gold Plated Contacts

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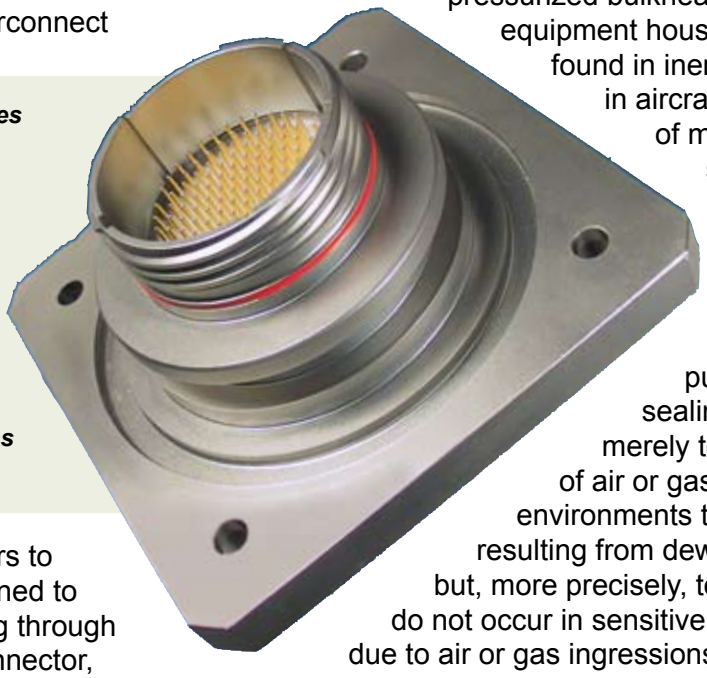
MIL-DTL-38999 Hermetic Connectors

Hermetic connectors, such as the qualified MIL-DTL-38999 Series I, II, III and IV supplied by Glenair, are designed for use in pressurized or severe environmental applications. Typical environments include geophysical, medical and military aerospace—in fact, the requirement for connector hermeticity was originally driven by military electronic applications. Hermeticity is generally defined as the state or condition of being air or gas tight. In interconnect applications, "hermetic" refers to packaging technology designed to prevent gasses from passing through pressure barriers via the connector, as it is important to prevent any moisture in the leaked gas from condensing inside the pressurized enclosure. The point at which moisture will condense is called the "dew point"—or the precise moment when humidity, pressure, and temperature allows condensation to form.

Glenair typically specifies stainless steel, carbon steel, titanium or Kovar for its hermetic products to provide an effective barrier against gas ingress and corrosion caused by dew point condensation. The hermetic sealing helps insure against damage to sensitive electronic systems and components.



When an electric current must pass through a high-pressure differential barrier, the potential exists for gases, and, in some rare cases, particulate matter, to penetrate the barrier and, as described above, to form condensation in the equipment enclosure. In the receptacle cabling on the vacuum side of the barrier this may result in dielectric breakdown, corrosion, and loss of insulation resistance between conductors (a properly built plug assembly on the non-vacuum side is adequately sealed with conventional environmental protections and so is impervious to moisture ingress).

The classic hermetic application is a receptacle feed-through penetrating a pressurized bulkhead, or a pressurized equipment housing—such as is found in inertial navigation units in aircraft. The introduction of moisture-laden air into such an enclosure may be enough to produce false readings and other malfunctions in the device. The ultimate purpose of hermetic sealing then is not merely to avert the ingress of air or gas into pressurized environments to prevent corrosion resulting from dew point condensation, but, more precisely, to insure malfunctions do not occur in sensitive electronic systems due to air or gas ingressions.

Connector hermeticity may be negatively affected both by the permeability of shell materials and the quality of the sealing technology. Metal materials are typically chosen due to their relative impermeability to gas, although certain plastics may also be used. Glenair typically specifies stainless steel, carbon steel, titanium or Kovar for its hermetic products, as all these base materials provide an effective barrier against gas ingress.

But even metal materials are permeable to gas leakage to some degree, and the minimal permeability of metal materials can be worsened when weld and solder joints are formed between

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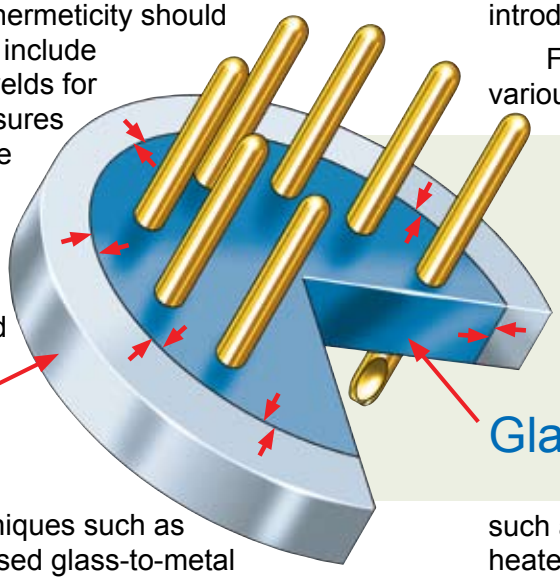
connector shell materials and the base material of the bulkhead. Electrode coatings used in welding readily attract moisture in the work causing micro cracks and fissures. If other stresses are present, such as vibration and shock, micro-cracking can progress to larger fissures visible to the human eye. Optimizing hermeticity should therefore always include examination of welds for any cracks or fissures that could provide a leakage path. Although moderately effective sealing may be produced with simple techniques such as epoxy potting, fused glass-to-metal seals are usually specified in high-reliability applications.



In Matched Seal hermetics, thermal expansion of the glass and metal materials are nearly the same. The stress in the glass is therefore relatively small–an important factor in the design of Micro-D hermetic connectors, due to varying degrees of stress on the glass caused by the rectangular shape.

In hermetic connector manufacturing, the glass material is introduced either as separate glass beads or as a pre-formed glass seal insulator tooled to precise dimensions. The glass must be exactingly selected for each application according to its ability to form a strong bond with the metal materials.

Glass is an excellent insulator, bonds well to metallic surfaces and is extremely corrosion resistant. And because of its robust mechanical strength and resistance to radical changes in temperature and pressure, glass seals are extremely resistant to any cracking which may introduce leaks into the hermetic package.

Fused glass seals may be produced from various recipes of ground, non-crystalline solids such as silicates, borates and phosphates. When heated to high temperature and then cooled, these materials fuse into an amorphous solid called glass.

In hermetic connector manufacturing, the glass material is introduced either as separate glass beads or as a pre-formed glass seal insulator tooled to precise dimensions. The glass must be exactingly selected for each application according to its ability to form a strong bond with the chosen metal materials. Electrical properties, such as high withstanding voltage and dielectric strength are also considered as is thermal and shock stability.

Depending on the style of connector being produced (rectangular versus circular, for example) two distinct categories of glass-seal hermetics may be specified. These are known as Matched and Mismatched (or Compression) Seals.

In Matched Seal hermetics, the thermal expansion and contraction of the glass and metal materials are relatively close, usually within 10% of each other, resulting in a product in which the stress in the glass is relatively small.

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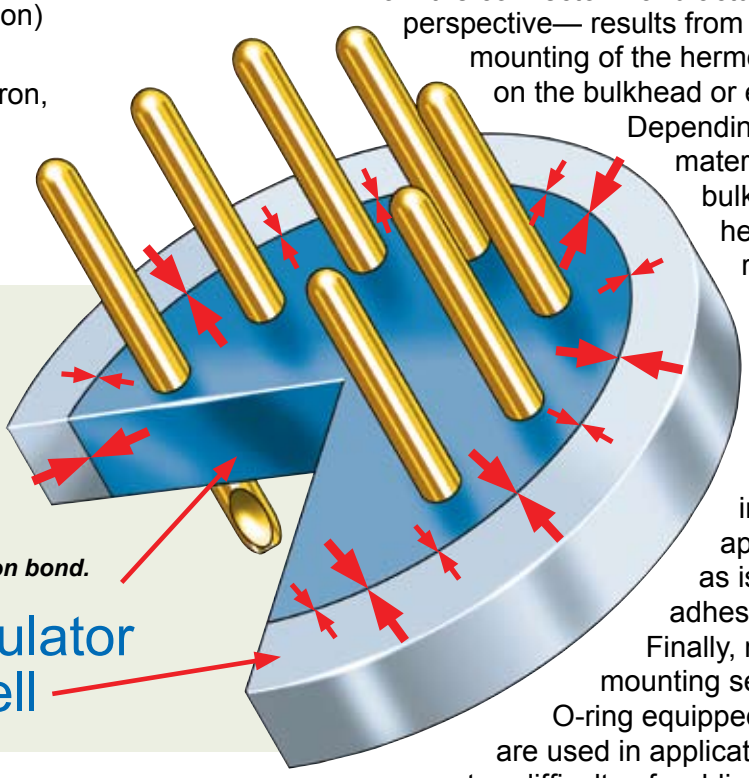
MIL-DTL-38999
Hermetic Connectors
Overview

Matched Seals are extremely important in glass hermetic connectors such as the Micro-D, since the rectangular shape of the connector shell can exert varying degrees of stress on the glass. At ambient temperatures, the glass is well wetted (bonded) to the metal shell and contacts, but under little or no pressure or stress. Matched Seals can withstand high thermal and mechanical shocks, and are generally easier to manufacture than Mismatched (Compression) Hermetic Seals.

Kovar, a combination of iron, nickel and cobalt, is the material of choice for Match Seal hermetic receptacles—both shells and contacts.

In Mismatched (Compression) Seals, the thermal expansion/ contraction of the metal exceeds that of the glass. During cooling, the metal contracts into the already solidifying glass to form an extremely robust compression bond.



Kovar is a low-expansion metal with a coefficient of expansion rating matched to the glass material that forms the hermetic seal.

In Mismatched (Compression) Seals, the thermal expansion/contraction of the metal exceeds that of the glass. During the firing process, the metal materials, usually stainless steel, expand at a greater rate than the glass. During cooling, the metals contract back into the already solidifying glass to form an extremely robust compression bond. This type of seal is consequently the most frequently specified for connectors used in extreme, high-pressure applications since the seal produced is reliable to pressures as high as 14,000 psi (1000 bars). The MIL-DTL-38999 connector falls into this category.

The total potential for leakage in a hermetic connector is the sum of any permeation which may occur via the metal materials themselves through cracks or open pores, and any leakage that may result from a defective seal. An additional source of leakage—uncontrolled from the connector manufacturer's perspective— results from sub-standard mounting of the hermetic package on the bulkhead or enclosure. Depending on the surface material of the bulkhead, hermetic receptacles may be welded or soldered in place. Low temperature brazing is also possible in certain applications as is the use of adhesive sealants. Finally, mechanical mounting seals such as O-ring equipped jam-nut mounts are used in applications where the cost or difficulty of welding or soldering is impractical.

Regardless of the choice of mounting technology, care must be given to ensure inadvertent leakage paths are not introduced. It is also important to note that vapor condensation in vacuum enclosures may be affected by the material makeup of component parts inside the enclosure. Materials such as silicones, adhesives, lubricants and Teflon insulation can all outgas water vapor, and so contribute to the total vapor pressure inside the enclosure. Vapor pressure directly impacts the condensation dew point of the protected environment.

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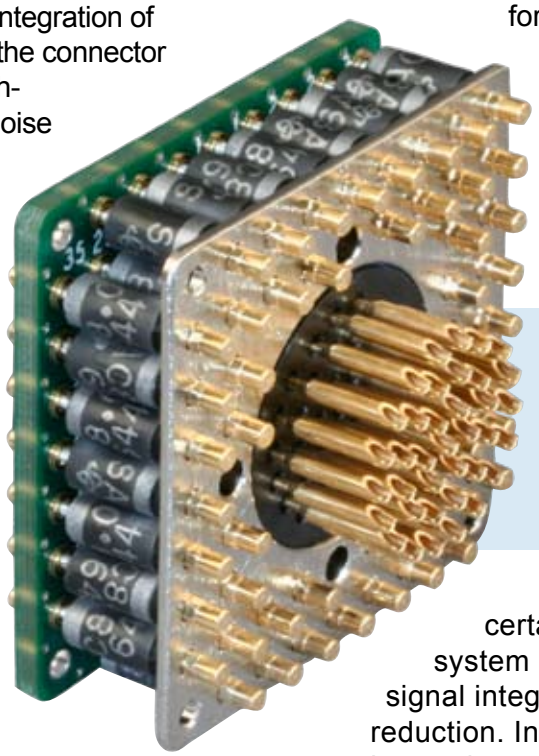
Hermetic seals are qualified via various methodologies including helium testing and dye penetrant. The purpose of both types of tests is to detect and measure leakage under pressure. The dye penetrant method has the advantage of revealing the exact location of a leak, while Helium testing measures overall leakage within the hermetic device. In both types of tests, a pressure differential between the internal volume of the package and the external environment is created.

The resultant pressure gradient causes the helium or liquid dye to diffuse through the connector shell, contacts and/or glass seals. Quantitative and qualitative measurements are then taken using appropriate sensing instruments. Glenair MIL-DTL-38999 qualified hermetic connectors are rated to 1 X 10^{-6} cc/second maximum helium leakage rate.

As with other connector classes, customers may specify the connector coupling style (threaded, bayonet, solder mount, etc.) pin or socket count and layout, contact termination type (solder cup, flat eyelet or PCB termination), conductive or non-conductive finish, polarization and so on.

EMI/EMP Filter Connectors

"Filtering" or suppression of electromagnetic noise within the connector package is reliably accomplished through the integration of capacitors and diodes into the connector to segregate interfering high-frequency or high voltage noise from the desired lower frequency signals. The capacitors strip off the interfering noise from the signal as it passes through the filter device. While various types of capacitor filters are available, perhaps the most widely applied is the Planar Array type.



Planar Arrays are extremely effective at filtering high-frequency interference. Planar Array designs utilize ceramic capacitor arrays and ferrite inductors which externally surround each contact, and may be supplied in a single monolithic block to fit into any connector size or shape. Planar arrays may be fabricated with different capacitive values on individual pins for additional flexibility in achieving the desired level of EMC. Diodes are used to clamp the voltage below a certain value, thereby protecting the electronic circuity. They are typically integrated into the connector using a small printed circuit board.

Ferrite elements and capacitors can be integrated into any connector package envelope.

Using filter technology has certain advantages to the electrical system engineer, including improved signal integrity as well as size and weight reduction. In addition, filters can be incorporated into an interconnect system late in the research and development process—for example after an unforeseen emission problem has been detected.

In every filter application the signal levels

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MIL-DTL-38999 Type Filter Connectors
Overview

and frequency bands must be well understood in order to select the appropriate mode or type of filter technology.

For example, electronic equipment used by avionic systems typically spans the electromagnetic spectrum from a few kilohertz to several gigahertz. At the low end, Omega Navigation, which is used to fix aircraft position within a network of ground based transmitters, operates in the frequency range of 10 to 14 KHz. VHF Omnidirectional Range Finders (VOR) are radio beacons used in point-to-point navigation. They operate from 108 to 118 MHz. Glideslope Systems used during landings operate in the 328 to 335 MHz range. Distance-Measuring Equipment (DME), which gauges the space between the aircraft in the sky and ground-based transponders operate at frequencies of just over 1 GHz.

Clearly, potential EMI in the application environment described above covers a broad range of frequencies. Filter modes and types are consequently specified according to the EMI frequency ranges which are the source of the actual signal degradation and the operating frequency of the affected device. Certain electrical circuit criteria are also germane to filter selection, including:

- Capacitance Value
- Working Voltage
- Surge Voltage
- Dielectric Withstand Voltage
- Insulation Resistance
- Transient Protection

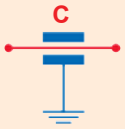
Filter connectors appropriate for use in applications such as those referenced above are broadly identified as 'low-pass' filters (i.e. they let low frequency signals pass through and attenuate higher frequencies). The attenuation curve can

COMMON FILTER CONNECTOR TYPES

Glenair supplies filter connectors in the following electrical configurations: C, L-C, C-L, and Pi. The following general values may be used in type selection: Single element filter connectors sporting either a single capacitor or inductor yield an insertion loss characteristic of 20dB per decade, dual element filters (capacitor plus an inductor) 40dB per decade, and triple element filters 60dB per decade. Selection is based primarily on source and load impedances but may also be influenced by the level of attenuation required at various frequencies. Please consult the factory for assistance in evaluating insertion loss values.

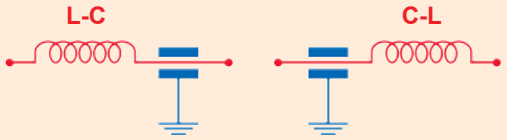
C Filter

Single capacitor with low self inductance. This configuration is generally used to attenuate high frequency signals. The simple design allows high-frequency EMI to discharge to ground via the surrounding electromagnetic field.



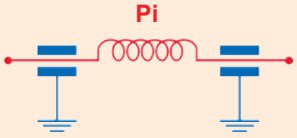
L-C or C-L Filter

Single capacitor combined with an inductive element. It is commonly used in a circuit with a both a low impedance source and a high impedance load or a low impedance load and a high impedance source. The inductive element should face the low impedance.



Pi Filter

Dual capacitors with a single inductive element positioned between them. The Pi filter provides exceptional high-frequency performance due to its sharper rolloff and is typically used when both source and load impedances are high.



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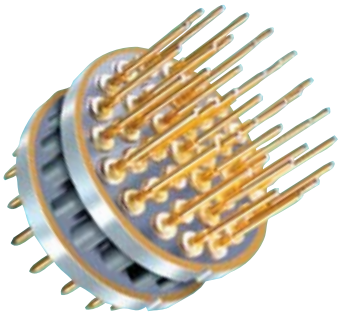
be shaped using different filter types (different configurations of capacitors and inductors). These types include: Pi Filter, L-C or C-L Filter, and C Filter. These filter connector types are characterized by their relative abilities to filter noise according to capacitance, voltage values and load impedances. The simplest design is the "C", which consists of a single capacitor inserted between the signal line and ground.

While most EMI filter connectors can be used in a working temperature environment from -55° to 125° C, selected designs are optimized for higher operating temperatures. Hermetic filter connectors provide the ultimate protection. The hermetic glass fused design protects the filter assembly while maintaining very low leakage rates.



A multiway planar array filter device, assembled with its ferrite elements and connector contacts, ready for insertion into the connector shell. The flexible design allows for different capacitive values on individual pins as well as the integration of hybrid contacts such as optical termini.

Prior to shipping a filtered connector, Glenair offers extensive testing, qualification and burn-in options. Tests range from a simple capacitance (C), insulation resistance (IR), and dielectric withstanding voltage (DWV), to more elaborate options such as RF insertion loss, dissipation factor, Zener/TVS diode test, ground resistance, voltage conditioning and thermal shock.

The Glenair factory, provided with the system attenuation and frequency values, relevant electrical specifications, and connector configuration details, can design an effective filter device for every application (to get started, use the checklist found in the filter connector section of this catalog). In addition to the MIL-DTL-38999 type filter products cataloged in this book, Glenair is able to supply filter technology in virtually any connector package including our own Series 80 "Mighty Mouse," Mil-C-24308, and MIL-DTL-83513 products. Hybrid electrical/optical filter connectors and hermetic filter designs are a specialty.

Multilayer Ceramic Planar Capacitor Arrays

Planar, multi-layer ceramic capacitive filters offer reduced size and improved performance compared to discrete discoidal or tubular capacitors. Planar array filter devices have the advantage, especially when compared to capacitive filters integrated at the circuit board level, of being bidirectionally effective at attenuating unwanted noise travelling into and out of equipment enclosures.

As mentioned, the planar array can be designed with different capacitive values on individual pins, and pin groupings, and can also be selectively equipped with surge protection diodes. The ability to accommodate such Transient Voltage Suppressions (TVS) diodes to protect against voltage spikes from transient sources such as EMP, lightning or Electrostatic Discharge (ESD) is an additional strength of the planar array design.

The planar array package can also easily accommodate ferrite elements to add inductance to the filter device. For these reasons and more, the planar array is the most common filter type specified in military aerospace and other high-performance applications. The planar array consists of multiple layers of ceramic dielectric separated by individual sheets of a ceramic tape material screen-printed with a pattern of metal electrodes. The exact configuration of the electrodes—their combined capacitance values, positions vis-a-vis individual contacts, selective grounding to the connector shell, etc.—determines the EMI attenuation properties of the filter device. After the layer-cake of dielectric materials and conductive elements is assembled, it is fired at high temperature to create a unified, monolithic structure. The planar array is fabricated such that the capacitor positions align exactly to the pin layout positions of the connector. When combined with inductive

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ferrite elements, TVS diodes or other special circuitry, the final assembly is ready for insertion into the connector shell. The incorporation of filter elements into a standard cylindrical or rectangular connector will necessarily increase the overall length of the package. The extra real estate is usually added to the inside-the-box (non-mating) side of the connector receptacle. Another approach is to attach a connector adapter, or go-between, outfitted with the filter device, to the connector plug. This approach has the advantage of not requiring any dimensional changes in box design or receptacle connector package.

Often, custom-configured planar arrays, with unique capacitive elements and values, are required to effectively address complex EMI problems such as might be encountered in an avionics bay or in the body of a missile. But many EMI problems can be satisfactorily addressed with standard catalog product designs. As critical EMI problems are often discovered late in the development process—perhaps only after equipment has been installed for use—it is critical that both standard catalog products as well as non-standard designs are delivered with the fastest possible turnaround. Glenair is committed to meeting the most aggressive delivery requirements for planar array type filter connectors.

Glenair can apply a broad range of custom shell configurations, filter values, TVS technologies—even hybrid fiber optic contacts—into any MIL-DTL-38999 type connector package, including bulkhead feed-thrus and connector savers.

Insertion Loss Evaluation

Insertion loss is an important specification to consider in the selection of filter connectors. Insertion loss is a measure of the degradation experienced by a signal when a device, such as a connector, is inserted into the transmission path.

When a filter element performs its job of stripping signal noise from a transmission line, it may attenuate a portion of the desired signal as well. Measured in decibels (dB), insertion loss should be minimized in sensitive electronic systems which may operate at extremely low current levels. Typically, some amount of insertion loss is considered acceptable to accomplish the necessary signal selectivity, since the signal can always be re-amplified post-filtering. However, in many applications, too large a loss may ultimately result in the unacceptable degradation of system performance.

The evaluation of insertion loss is performed over a specific frequency range—i.e., a spectrum that extends from one limiting frequency to another. The intent being to measure signal degradation for each filter type across the actual operating frequencies of the equipment under consideration. Note that each filter type may yield different (theoretical and actual) insertion loss values depending on the specific capacitance and inductance [pF] ratings of the filter elements. Effective EMI/EMP filtering is, therefore, a balance between the purposeful attenuation of signal noise and the unfortunate degradation of signal strength—both conditions directly attributable to the insertion of the filter device into the system.

Sensible EMC design should, as a consequence, always incorporate conventional grounding and shielding of interconnect cabling and equipment housings in anticipation of unexpected EMI problems. The tables on the opposite page explain predictable insertion loss [dB] for each filter type (C, L, and Pi), at the available capacitance ratings [pF] across a common frequency range [MHz].

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C

INSERTION LOSS

Insertion Loss, dB Minimum, 25°C

Frequency	A	B	C	D	E	F	G
1 MHz	6	5	3	–	–	–	–
10 MHz	24	23	16	8	4	–	–
100 MHz	41	39	35	28	21	10	5
500 -1000 MHz	50	49	46	41	34	23	17

CAPACITANCE

Filter Class	Capacitance
X	80000 – 120000 [pF]
Y	40000 – 60000 [pF]
Z	30000 – 45000 [pF]
A	19000 – 28000 [pF]
B	16000 – 22500 [pF]
C	9000 – 16500 [pF]
D	4000 – 6000 [pF]
E	1650 – 2500 [pF]
F	400 – 650 [pF]
G	200 – 300 [pF]

Pi

INSERTION LOSS

Insertion Loss, dB Minimum, 25°C

Frequency	A	B	C	D	E	F	G
1 MHz	10	8	5	1	–	–	–
10 MHz	40	35	25	14	8	2	0.8
100 MHz	62	60	57	50	40	15	13
500 - 1000 MHz	66	62	60	58	52	32	22

CAPACITANCE

Filter Class	Capacitance
X	1600000 – 240000 [pF]
Y	80000 – 120000 [pF]
Z	60000 – 90000 [pF]
A	38000 – 56000 [pF]
B	32000 – 45000 [pF]
C	18000 – 33000 [pF]
D	8000 – 12000 [pF]
E	3300 – 5000 [pF]
F	800 – 1300 [pF]
G	400 – 600 [pF]

APPLICATION NOTES

1. Standard voltage rating is 500 V DWV.
2. Insertion loss values quoted are for 50Ω impedance and no load condition.
3. Classes X, Y and Z are 250 V DWV. Consult factory for additional information.
4. Some shell configurations may require extra length for classes X, Y and Z.

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MIL-DTL-38999 Type Filter Connectors
Overview

Custom Options in Filtered Connectors

Glenair MIL-DTL-38999 type filter connector designs may be optimized for use in a wide range of application environments including avionic systems, down-hole drilling and logging devices, network-centric ground warfare systems, and missile and satellite/space applications. Common electrical customizations include unique capacitance values on individual lines, electrostatic discharge designs, transient voltage suppression diodes, grounded holes and feed-throughs, as well as the incorporation of customer-specified filter architectures including Pi, C, L-C, C-L and T configurations.

Non-standard packaging options in EMI/EMP filter connectors include:

- Hybrid Fiber Optic/Electrical Contacts
- Dual-Flange PCB Mount Designs
- Composite Thermoplastic Shell Materials
- Variable Length PCB Tails
- Piggy-Back Crimp Contacts
- EMI Grounding Fingers and Gaskets
- In-Line, Feed-Through, Plug and Other Shell Styles

EMP and Transient Voltage Suppression

Electromagnetic Pulse (EMP) refers to intense radio frequency pulses produced by nuclear explosions at high altitudes. Other names for this phenomenon are Nuclear EMP (NEMP), and High-Altitude EMP (HEMP). Like other forms of electromagnetic interference, EMP can have a destructive effect on sensitive electronic devices, if the EMP grounds to an unshielded cable and passes into the electronic device.

EMP hardened equipment is designed to protect vital communications at a time when unhardened devices are likely to fail. Thus it is standard for many military applications to proactively protect certain devices from EMP. This is accomplished, in part, by the integration of Transient Voltage Suppression technologies into the connectors that service the device.

Transient Voltage Suppression (TVS) technologies are designed to shunt voltage transients directly to ground before such surges can damage sensitive electronic equipment. Individual TVS diodes as well as diode modules may be incorporated directly into the filter connector package to provide optimal protection for either individual contacts or groups of contacts without significant increases in connector size or weight. Individual circuit protection diodes and diode modules are available for all connector types and are routinely stocked by Glenair to reduce lead-times. Individual diodes and modules may be screened and tested prior to assembly to ensure reliable performance. Field maintenance and repair of damaged diodes is also possible as both individual diodes and diode modules are easily removed from the connector package. RTCA DO-160 and other electrical performance standards now define acceptable benchmarks for withstanding electromagnetic pulse, lightning strike, or other induced voltage surges in high-reliability systems. Glenair designs all TVS equipped filter connectors to conform to the RTCA DO-160 standard.

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Composite Connectors and Lightning Strike

Composite thermoplastic materials, such as the 30% glass filled polyetherimide (PEI) used in Glenair's MIL-DTL-38999 Series II Wall Mount Receptacle Connector have been tested for mechanical and electrical survivability to direct and indirect lightning strike. At issue is the ability of the composite connector shell to maintain its electrical continuity in the event of an intense voltage surge resulting from lightning strike.

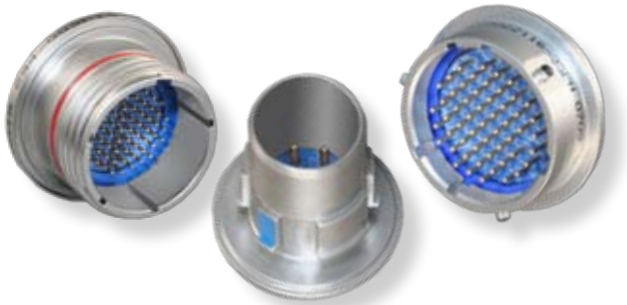
In testing in accordance with MIL-STD-1344, items are subjected to waveform 1 and 5B using a high current generator. Items must remain functional without degradation of the unit's electrical performance, including filtering elements and TVS diodes and modules. Waveform 1 and 5B are applied starting at 3Ka increasing to 20Ka checking continuity measurements at set intervals. Waveform 1 is additionally subjected to an oscillatory wave starting at 30Ka and increasing in 10Ka steps until failure in continuity is measured.

While larger composite connector shell sizes (12 to 24) conform to MIL-STD-1344, smaller sizes (8 and 10) fail the test. Customers should select alternative materials, aluminum or stainless steel, when specifying small connector shell sizes in applications subject to lightning strike.

Glenair composite connectors and backshell are tested IAW MIL-STD-1344 lightning strike.

Soldering

Our filter connector engineers are frequently asked about any special handling procedures that are required when soldering PC Tail and Solder-cup contacts. At issue is the potential to damage filter elements due to the high heat of the soldering process. The short answer is that any trained and qualified operator can complete the operation without any special precautions. While it certainly can't hurt to take some basic precautions such as preheating the connector or utilizing a heat sink on individual contacts, our tests have revealed that, under normal conditions, the temperature of the ceramic filter array is not radically raised during solder termination of the contacts. Even in tests where we used a solder iron temperature of 350°C and an extremely long 'touch time' of 90 seconds, no adverse effects were observed. In fact, temperature at the ceramic remained well below 100°C at all times.



Hermetic Filter Connectors

Hermetic class EMI/EMP filter connectors are available throughout our complete range of MIL-DTL-38999 type filter connector products in both Pi and C from 400 pF to 56000 pF. Select either class H2 (stainless steel, electroless nickel), or class XM (composite, electroless nickel).

Hermetic connectors with EMI/EMP filtering are specified for applications as divergent as submarines, orbiting satellites, oil-patch logging equipment or medical devices that require both filtering elements and hermeticity. In addition to their EMI management function, the connectors are deployed to resist moisture ingress in

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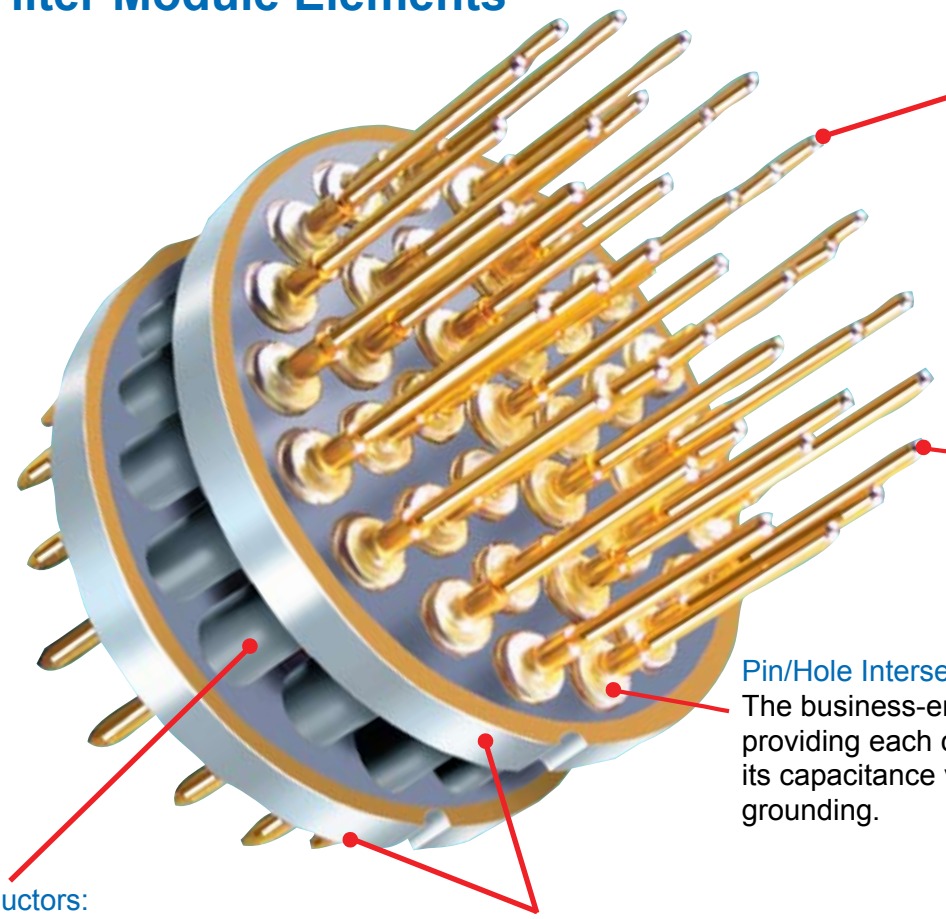
MIL-DTL-38999 Type Filter Connectors
Overview

underground applications and to withstand pressure differentials in vacuum chambers, laboratory equipment and commercial and military aircraft. Hermetic filter connectors are constructed from a core component-set that includes the connector shell, the planar array filtering device, a vitreous glass insert and the necessary interfacial sealing.

Shells may be machined from stainless steel or Kovar®, an iron-nickel-cobalt alloy with a coefficient of expansion closely balanced to the glass inserts. Contacts used in hermetic connectors must be fabricated from high-grade materials that can withstand high-heat, and bond effectively to the vitreous glass seal.

Glenair offers both standard hermetic/filter products compatible with standard MIL-DTL-38999 plugs as well as non-standard designs with unique filter values or voltage suppression technologies. Our goal is to always provide the fastest turnaround in the industry. Please consult the factory for unique packaging requirements.

Filter Module Elements



Contact Types: Choose from Solder Cup, PC Tail or Piggy-Back Crimp (Consult Factory for PC Tail Length Options).

Contact Material: Gold Plated Beryllium Copper Alloy.

Pin/Hole Intersection: The business-end of the filter, providing each contact with its capacitance value and grounding.

Inductors: Ferrite Beads to provide inductance and increase insertion loss.

Multilayer Ceramic Planar Array: Containing a network of capacitors, feedthrus and ground lines.

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MIL-DTL-38999 Connectors for Space Flight

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 MIL-DTL-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 flight 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 flourosilicone/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

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MIL-DTL-38999 Connectors for Space Flight

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

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MIL-DTL-38999
Connector Performance Specifications

<table>
<tr><th>Test</th><th>Performance Specifications</th></tr>
<tr><td>Dielectric Withstanding Voltage</td><td>(meets MIL-C-38999, paragraph 3.14)
Test voltage at sea level — 1300 Volts AC (rms).
Wired, assembled, unmated connectors withstand the following:
<table>
<tr><td>550 VAC (rms) @ 50,000 ft.</td></tr>
<tr><td>350 VAC (rms) @ 70,000 ft.</td></tr>
<tr><td>200 VAC (rms) @ 100,000 ft.</td></tr>
</table></td></tr>
<tr><td>Insulation Resistance</td><td>(meets MIL-C-38999, paragraph 3.13)
Unmated connectors shall be tested as specified in test method EIA-364-21
5000 megohms min. at 25° C</td></tr>
<tr><td>Supported Wire Size</td><td>(meets MIL-DTL-38999, paragraph 3.4.3.1)
<table>
<tr><th>Contact Size</th><th>Wire Gauge</th></tr>
<tr><td>22D</td><td>#22 - #28</td></tr>
<tr><td>20</td><td>#20 - #24</td></tr>
<tr><td>16</td><td>#16 - #20</td></tr>
<tr><td>12</td><td>#12 - #14</td></tr>
<tr><td>10</td><td>#10 - #12</td></tr>
</table></td></tr>
<tr><td>EMI Shielding</td><td>(meets MIL-DTL-38999, paragraph 3.31)
Effective over a range of 100 MHz to 10 GHz with a minimum 50dB effectiveness at 10GHz, in accordance with test method EIA-364-10
<table>
<tr><th rowspan="2">Frequency MHz</th><th colspan="3">Attenuation Minimum dB</th></tr>
<tr><th>Series I</th><th>Series II</th><th>Series III and IV</th></tr>
<tr><td>100</td><td>90</td><td>65</td><td>90</td></tr>
<tr><td>200</td><td>88</td><td>60</td><td>88</td></tr>
<tr><td>300</td><td>88</td><td>55</td><td>88</td></tr>
<tr><td>400</td><td>87</td><td>55</td><td>87</td></tr>
<tr><td>800</td><td>85</td><td>45</td><td>85</td></tr>
<tr><td>1,000</td><td>85</td><td>45</td><td>85</td></tr>
<tr><td>1,500</td><td>69</td><td>—</td><td>76</td></tr>
<tr><td>2,000</td><td>65</td><td>—</td><td>70</td></tr>
<tr><td>3,000</td><td>61</td><td>—</td><td>69</td></tr>
<tr><td>4,000</td><td>58</td><td>—</td><td>68</td></tr>
<tr><td>6,000</td><td>55</td><td>—</td><td>66</td></tr>
<tr><td>10,000</td><td>50</td><td>—</td><td>65</td></tr>
</table></td></tr>
<tr><td>Thermal Shock</td><td>(meets MIL-C-38999, paragraph 3.7)
After cycling the connector between -65° C and +175° C, it will meet all applicable electrical and mechanical requirements.</td></tr>
</table>

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MIL-DTL-38999
Connector Performance Specifications

Test	Performance Specifications
Physical Shock	*(meets MIL-C-38999, paragraph 3.27)* No loosening of parts, cracking or other deleterious results hindering further part operation after 300 G's in each of 3 mutually perpendicular planes.
Fluid Compatibility	*(meets MIL-DTL-38999, paragraph 3.33)* Designed to function in all fluids encountered in any modern military or aerospace environment
Fluid Immersion	*(meets MIL-DTL-38999, paragraph 3.31)*

Frequency (MHz)	50Leakage Attenuation Minimum (dB)
100	90
200	88
300	87
400	85
800	85
1,000	85
1,500	69
2,000	65
3,000	61
4,000	58
6,000	55
10,000	50

High Impact Shock	*(meets MIL-C-38999, paragraph 3.27)* Mated connectors, wired with MIL-C-915/60 or /63 cable and equipped with straight environmentally sealed backshells, withstand high impact shock per MIL-S-901.
Vibration	*(meets MIL-C-38999, paragraph 3.26)* There shall be no electrical discontinuity and there shall be no disengagement of the mated connectors, backing off of the coupling mechanism, evidence of cracking, breaking, or loosening of parts.
Fungus	*(meets MIL-C-38999, paragraph 4.2.2)* Materials used in the construction of these connectors shall be fungus inert per certification of method 508.4 of MIL-STD-810
Corrosion	*(meets MIL-C-38999, paragraph 3.16)* When tested in accordance with EIA-364-26, meets appropriate electrical and mechanical requirements and shows no exposure of base metal after 500 hours of salt spray
Mating / Unmating Forces	*(meets MIL-C-38999, paragraph 3.10)* The coupling torque for mating and unmating of the counterpart connectors and protective covers shall meet the requirements of the table shown below.

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MIL-DTL-38999
Connector Performance Specifications

<table>
<tr><th>Test</th><th>Performance Specifications</th></tr>
<tr><td>Durability</td><td>(meets MIL-C-38999, paragraph 3.11)
No electrical or mechanical defects after 500 cycles of engagement and disengagement</td></tr>
<tr><td>Insert Retention</td><td>(meets MIL-C-38999, paragraph 3.15)
Unmated connectors shall retain their inserts in their proper location in the shell and there shall be no evidence of cracking, breaking, separation from the shell, or loosening of parts.</td></tr>
<tr><td>Contact Retention</td><td>(meets MIL-C-38999, paragraph 3.23)
The axial displacement of the contact shall not exceed .012 inch (0.30 mm).
No damage to contacts or inserts shall result.</td></tr>
<tr><td>Coupling Pin Strength</td><td>(meets MIL-C-38999, paragraph 3.20) Applicable to series I and II only
Bayonet coupling pins shall withstand a load of 50 +5, -0 pounds without displacement or perceptible loosening of coupling pins.</td></tr>
<tr><td>Contact Engagement and Disengagement Forces</td><td>(meets MIL-C-38999, paragraph 3.16) Applicable to hermetic connectors with sockets only
Contact engagement and separating forces shall be within the limits specified in SAE-AS39029.</td></tr>
<tr><td>Resistance to Probe Damage</td><td>(meets MIL-C-38999, paragraph 3.42) Applicable to hermetic connectors with sockets only
Contacts shall withstand the bending moment and depth of test probe insertion without evidence of damage that would interfere with the mechanical or electrical performance.</td></tr>
<tr><td>EMI Ground Spring Forces</td><td>(meets MIL-C-38999, paragraph 3.30)
The forces necessary to engage and separate EMI plugs with receptacle shells shall be within the values specified in the table shown below:
<table>
<tr><th rowspan="2">Shell size</th><th colspan="4">Axial force for Series I, II, and III</th><th colspan="4">Axial force for Series IV</th></tr>
<tr><th>Maximum Pounds</th><th>Minimum Newtons</th><th>Maximum Pounds</th><th>Minimum Newton</th><th>Pounds</th><th>Newtons</th><th>Pounds</th><th>Newtons</th></tr>
<tr><td>8/9</td><td>25</td><td>111</td><td>0.5</td><td>2</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>10/11</td><td>25</td><td>111</td><td>0.5</td><td>2</td><td>5</td><td>22.3</td><td>0.3</td><td>1.3</td></tr>
<tr><td>12/13</td><td>30</td><td>133</td><td>0.5</td><td>2</td><td>5</td><td>22.3</td><td>0.3</td><td>1.3</td></tr>
<tr><td>14/15</td><td>30</td><td>133</td><td>0.5</td><td>2</td><td>6</td><td>26.7</td><td>0.4</td><td>1.8</td></tr>
<tr><td>16/17</td><td>35</td><td>156</td><td>0.5</td><td>2</td><td>7</td><td>31.1</td><td>0.4</td><td>1.8</td></tr>
<tr><td>18/19</td><td>35</td><td>156</td><td>0.5</td><td>2</td><td>8</td><td>35.6</td><td>0.5</td><td>2.2</td></tr>
<tr><td>20/21</td><td>35</td><td>156</td><td>0.5</td><td>2</td><td>9</td><td>40</td><td>0.5</td><td>2.2</td></tr>
<tr><td>22/23</td><td>35</td><td>156</td><td>0.5</td><td>2</td><td>10</td><td>44.5</td><td>0.5</td><td>2.2</td></tr>
<tr><td>24/25</td><td>35</td><td>156</td><td>0.5</td><td>2</td><td>10</td><td>44.5</td><td>0.5</td><td>2.2</td></tr>
</table></td></tr>
</table>

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MIL-DTL-38999
Contact Performance Specifications

<table>
<tr><th>Test</th><th>Performance Specifications</th></tr>
<tr><td>Current Rating</td><td>(meets MIL-C-39029, paragraph 1.3.1)
<table>
<tr><th rowspan="2">Contact Size</th><th colspan="2">Maximum Amps</th></tr>
<tr><th>Crimp</th><th>Hermetic</th></tr>
<tr><td>22D</td><td>5</td><td>3</td></tr>
<tr><td>20</td><td>7.5</td><td>5</td></tr>
<tr><td>16</td><td>13</td><td>10</td></tr>
<tr><td>12</td><td>23</td><td>17</td></tr>
<tr><td>10</td><td>33</td><td>24</td></tr>
</table></td></tr>
<tr><td>Contact Millivolt Drop</td><td>
<table>
<tr><th rowspan="2">Contact Size</th><th colspan="2">Maximum Millivolt Drop</th></tr>
<tr><th>Crimp</th><th>Hermetic</th></tr>
<tr><td>22D</td><td>73</td><td>85</td></tr>
<tr><td>20</td><td>55</td><td>60</td></tr>
<tr><td>16</td><td>49</td><td>85</td></tr>
<tr><td>12</td><td>42</td><td>82</td></tr>
<tr><td>10</td><td>33</td><td>72</td></tr>
</table></td></tr>
<tr><td>Contact Resistance at 25° C</td><td>(meets MIL-C-38999, paragraph 3.17)
Contacts in the mated condition shall meet the contact resistance requirements of the table shown below. Appropriate compensation may be made for resistance in the measured value which is due to an additional length of wire included in the measurement.
<table>
<tr><th rowspan="2">Class</th><th rowspan="2">Contact Size</th><th rowspan="2">Wire Size</th><th rowspan="2">Test Amperes</th><th colspan="2">Millivolt Drop Maximum</th></tr>
<tr><th>Initial</th><th>After Conditioning</th></tr>
<tr><td rowspan="4">H, N and Y</td><td>12</td><td>12</td><td>17</td><td>85</td><td>100</td></tr>
<tr><td>16</td><td>16</td><td>10</td><td>85</td><td>100</td></tr>
<tr><td>20</td><td>20</td><td>5</td><td>60</td><td>75</td></tr>
<tr><td>22D</td><td>22</td><td>3</td><td>85</td><td>95</td></tr>
</table></td></tr>
</table>

MIL-DTL-38999 CONTACT MATERIALS AND SPECIFICATIONS

Component	Material	Notes
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

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RoHS Compliant Plating Options for MIL-DTL-38999 Type Connectors and Accessories

The 30 May 2008 MIL-DTL-38999 Rev L specif cation provides guidance on the use of alternative parts with less hazardous or nonhazardous materials. In this regard, the specif cation provides for a number of alternative plating materials. Users are directed to select the least hazardous plating material that meets the form, f t and function requirements of their application.

Glenair would like to draw our customer's attention to two f nish materials that conform to this guidance from our extensive list of commercial-equivalent (non-QPL) plating options:

AL – Pure electrodeposit aluminum IAW MIL-DTL-83488 (1,000-Hour Salt Spray) and MIL-38999 Rev L.

MT – Environment resisting Nickel f uorocarbon polymer. Conductive Nickel with f uorocarbon polymer additives over a suitable underplate to withstand 500 hours of dynamic salt spray testing.

Like the AL f nish, the Glenair commercial MT plating solution is both cadmium and hexavalent chromium free, which allows it to be def ned as RoHS compliant. Here are some additional details on this surface f nish:

Temperature Resistance: Class MT - Nickel f uorocarbon polymer (Ni-PTFE ***1,000 Hour Grey™*** f nish) is rated from -65°C to +175°C.

Plating adhesion: When tested as specif ed in 4.5.5, there shall be no blistering, peeling, f aking or separation of plating or other damage detrimental to the operation of the connector.

Dissimilar metals and compatible couples: The ***1,000-Hour Grey™*** f nish satisf es prohibitions against dissimilar metal coupling as specif ed in MIL-STD-889.

Shell-to-shell conductivity (millivolts): The "MT" f nish is rated at 2.5 millivolt drop potential.

Glenair Nickel-PTFE 1,000 Hour Grey™ RoHS Compliant Plating is Now Available. This commercial-equivalent plating option is designed IAW MIL-DTL-38999 Rev L.

Sulfur Dioxide Resistance: The Glenair MT f nish passes the requisite 336 hours resistance to Sulfur Dioxide.

Glenair is pleased to make these environmentally-friendly plating f nishes available to our connector and accessory customers. Both surface f nishes provide outstanding mechanical, electrical and environmental performance. ***1,000-Hour Grey™*** may be applied to both aluminum alloy, stainless steel as well as composite thermoplastic versions of our products, including connectors and accessories. Glenair is a leader in the advancement of alternative plating solutions and offers as broad a selection as any manufacturer in our industry.

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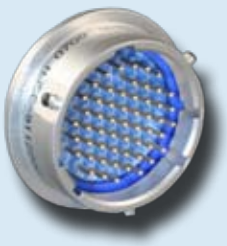
MIL-DTL-38999 Series I, II, III and IV Qualified Hermetic Connectors

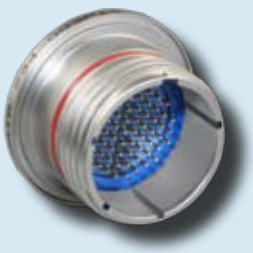
SECTION B TABLE OF CONTENTS

GLENAIR MIL-DTL-38999 SERIES I, II, III AND IV QUALIFIED HERMETIC CONNECTORS:

Series I



Series II



Series III

Series IV

The Full Range of MIL-DTL-38999 Series I, II, III and IV Hermetic Receptacles—*Plus Glenair Commercial Equivalents*

Product Applications

The MIL-DTL-38999 Series I, II, III and IV family of hermetic connectors are ideal for high-pressure/low-leakage applications in air, sea and space environments. Glenair is on the Qualified Product List (QPL) for all configurations of MIL-DTL-38999 Series I through IV pin and socket hermetic connectors. We also offer our D38999 type commercial part numbers for applications that do not require MS qualified products.

Materials

Glenair MIL-DTL-38999 Series I, II, III and IV Hermetic Connectors are made of stainless (CRES) or carbon steel (CRS), with glass insulators fused to the connector shell, and contacts meeting a leak rate of 1 X 10^{-6} cc/Helium per second. Maximum design flexibility is built into the Series I, II, III and IV Military Standard Hermetic Connectors – with a minimum of 2 to a maximum of 128 circuits per connector in a wide variety of contact arrangements IAW MIL-STD-1560. Fluorosilicone rubber interfacial and peripheral seals ensure positive sealing with plug connectors.

Nickel-iron alloy 52 gold-plated contacts, available in sizes 8, 10, 12, 16, 20 and 22D, depending on the layout chosen, offer a wide selection of insert arrangement options. Solder cup, feed through (PCB Flexprint) and eyelet contact styles are also available.

Same-Day Inventory

Because Glenair makes all its hermetic connectors in-house, including the machining of shells, molding of interfacial seals and firing of hermetic components, we can offer you outstanding availability on stock products and fast turnaround on special orders.

Same-Day Delivery on Most Common Shell Styles and Layouts

Full Range of D38999 Series I thru IV Pin and Socket Insert Arrangements

DSCC Approved QPL Hermetics

1 x 10^{-6} cc/Helium per Second Leakage Rate

CRES and CRS Shells with Vitreous Glass Sealing with All Standard Material Options

Jam Nut, Solder Mount, Wall Mount and Box Mount Options

Catalog contents—including part numbers, materials and dimensions—are accurate to the best of our ability when we go to print. Even so, customers are advised to consult the factory for the latest specifications, particularly to confirm critical dimensions such as connector lengths, threads, and so on. When errors or mistakes are brought to our attention, corrected content is posted immediately to www.glenair.com.

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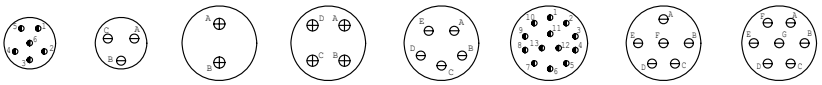
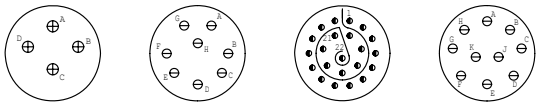
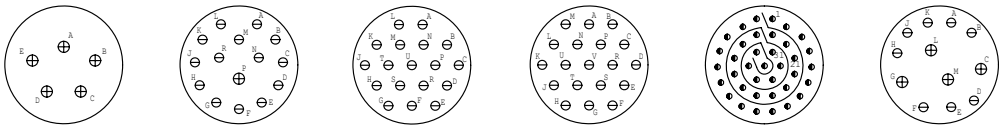
MIL-DTL-38999 Series I, II, III, and IV Hermetic Class Connectors Insert Arrangements (IAW MIL-STD-1560)



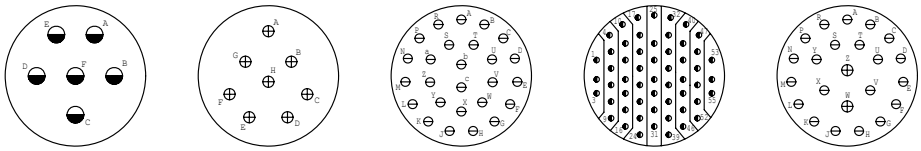
Series I	9-35	9-98	11-2	11-4	11-5	11-35	11-98	11-99
Series II	8-35	8-98	10-2	10-4	10-5	10-35	10-98	10-99
Series III	A35	A98	B2	B4	B5	B35	B98	B99
Series IV	---	---	---	---	B5	B35	B98	B99



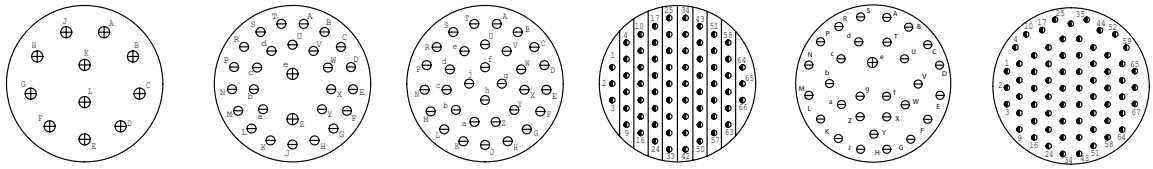
Series I	13-4	13-8	13-35	13-98
Series II	12-4	12-8	12-35	12-98
Series III	C4	C8	C35	C98
Series IV	C4	---	C35	C98



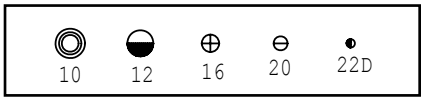
Series I	15-5	15-15	15-18	15-19	15-35	15-97
Series II	14-5	14-15	14-18	14-19	14-35	14-97
Series III	D5	D15	D18	D19	D35	D97
Series IV	D5	---	D18	D19	D35	D97



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	---	---



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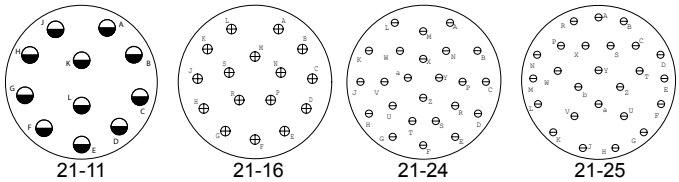
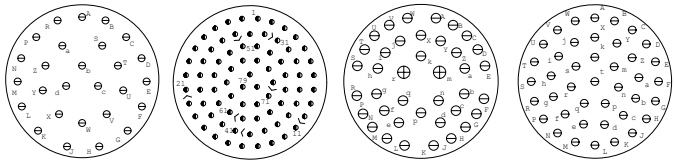
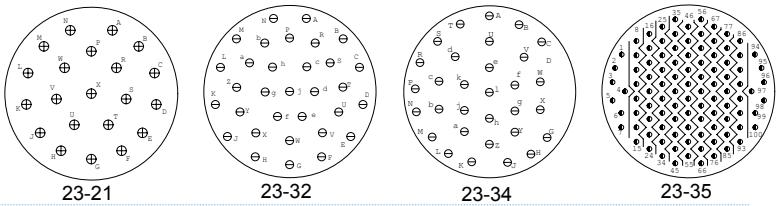


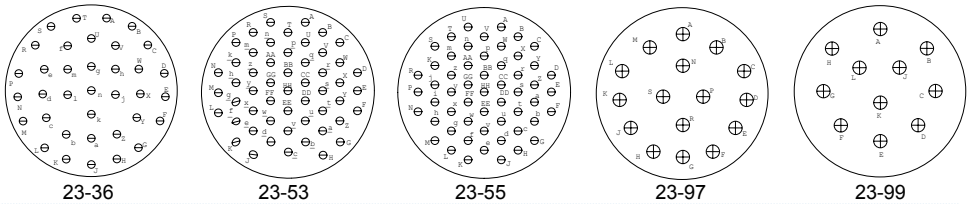
Series I	21-11	21-16	21-24	21-25
Series II	20-11	20-16	20-24	20-25
Series III, IV	G11, G11	G16, G16	G24, G24	G25, ---



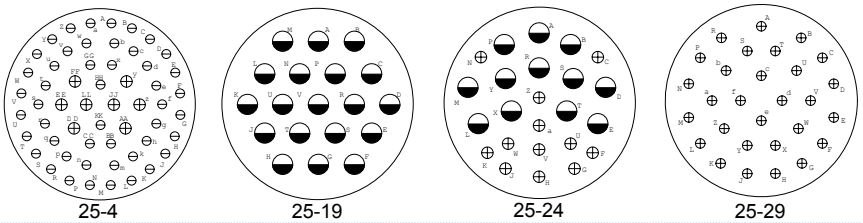
Series I	21-27	21-35	21-39	21-41
Series II	20-27	20-35	20-39	20-41
Series III, IV	G27, ---	H35, H35	G39, ---	G41, G41



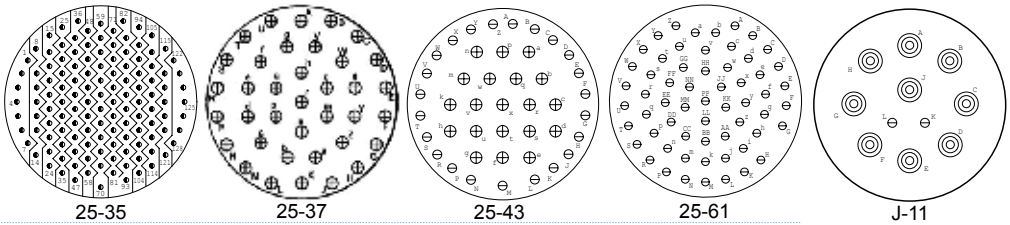
Series I	23-21	23-32	23-34	23-35
Series II	22-21	22-32	22-34	22-35
Series III, IV	H21, H21	H32, ---	H34, ---	H35, H35



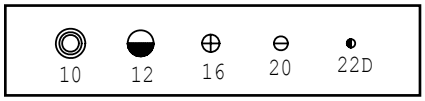
Series I	23-36	23-53	23-55	23-97	23-99
Series II	22-36	22-53	22-55	22-97	22-99
Series III, IV	H36, ---	H53, ---	H55, H55	H97, ---	H99, ---



Series I	25-4	25-19	25-24	25-29
Series II	24-4	24-19	24-24	24-29
Series III, IV	J4, J4	J19, J19	J24, J24	J29, J29



Series I	25-35	25-37	25-43	25-61	J-11



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

Shell Size and Insert Arrangements			Number of Pins			
MS Series I	MS Series II	D38999 Series III	22D	20	16	12
9-35	8-35	A35	6			
9-98	8-98	A98		3		
11-2	10-2	B2			2	
11-4	10-4	B4		4		
11-5	10-5	B5		5		
11-35	10-35	B35	13			
11-98	10-98	B98		6		
11-99	10-99	B99		7		
13-4	12-4	C4			4	
13-8	12-8	C8		8		
13-35	12-35	C35	22			
13-98	12-98	C98		10		
15-5	14-5	D5			5	
15-15	14-15	D15		14	1	
15-18	14-18	D18		18		
15-19	14-19	D19		19		
15-35	14-35	D35	37			
15-97	14-97	D97		8	4	
17-6	16-6	E6				6
17-8	16-8	E8			8	
17-26	16-26	E26		26		
17-35	16-35	E35	55			
17-99	16-99	E99		21	2	
19-11	18-11	F11			11	
19-28	18-28	F28		26	2	
19-30	18-30	F30		29	1	
19-32	18-32	F32		32		
19-35	18-35	F35	66			
19-45	18-45	F45	67			
21-11	20-11	G11				11
21-16	20-16	G16			16	
21-24	20-24	G24		24		
21-25	20-25	G25		25		
21-27	20-27	G27		27		
21-35	20-35	G35	79			
21-39	20-39	G39		37	2	
21-41	20-41	G41		41		
23-21	22-21	H21			21	
23-32	22-32	H32		32		
23-34	22-34	H34		34		
23-35	22-35	H35	100			
23-36	22-36	H36		36		
23-53	22-53	H53		53		
23-55	22-55	H55		55		
23-97	22-97	H97			16	
23-99	22-99	H99			11	
25-4	24-4	J4		48	8	
25-19	24-19	J19				19
25-24	24-24	J24			12	12
25-29	24-29	J29			29	
25-35	24-35	J35	128			
25-37	N/A	J37	37		37	16
25-43	24-43	J43		23	20	
25-61	24-61	J61		61		

Shell Size / Insert Arrangements	Number of Pins				
D38999 Series IV	22D	20	16	12	10
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		
F32		32			
F35	66				
G11				11	
G16			16		
G35	79				
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			
J37			37		

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MIL-DTL-38999 Series I, II, III and IV
Hermetic Class Connectors
Material Specifications

TABLE I: HERMETIC CLASS MATERIALS

Shell, Barrel Coupling and Jam Nut (Hermetic)	Stainless steel per AMS-QQ-S-763
Shell, Barrel, Coupling Nut and Jam Nut (Hermetic)	Carbon Steel per ASTM-B545 or ASTM-B339
Front and Rear Insulators	Glass-filled liquid crystal polymer (LCP) in accordance with MIL-M-24519, Type GLP-30F
Grommet, Peripheral Seal and Interfacial Seal	Blended elastomer, 30% silicone per ZZ-R-765, 70% fluorosilicone per MIL-R-25988
Hermetic Insert	Vitreous glass
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
Socket Contact (Hermetic)	Copper Alloy, Gold Plated IAW ASTM B488, Type 3, Code C
Adhesives	Silicone and epoxy
Potting Compound, PCB and Solder Cup Versions	Environmental and Hermetic Connectors: High-strength epoxy, Hysol EE4215. Filter Connectors: Stycast 2850FT/Catalyst 11 thermally conductive epoxy encapsulant.

TABLE II: HERMETIC CLASS FINISHES

Plating Code	Material	Finish	Specification
Glenair Commercial Equivalent Plating Codes			
Z1	Stainless Steel	Passivate	AMS-QQ-P-35
FT	Carbon Steel	Fused Tin Plate	ASTM-B545 or ASTM-B339
ZL	Stainless Steel	Electrodeposited Nickel	SAE-AMS-QQ-N-290, Class 2
MIL-DTL-38999 Plating Codes			
D	Carbon Steel	Fused Tin Plate	ASTM-B545 or ASTM-B339
E	Stainless Steel	Passivate	AMS-QQ-P-35
N	Stainless Steel	Electrodeposited Nickel	SAE-AMS-QQ-N-290, Class 2

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MS27469
Wall Mount Hermetic Receptacle
MIL-DTL-38999 Series I

How To Order: *MS*

Shell Style
MS27469 - *Wall Mount, Series I*

Connector Material / Finish
D - Carbon Steel - Fused Tin Finish
E - Stainless Steel - Passivate Finish
N - Stainless Steel - Nickel Finish

Contact Termination
P - Pin, Solder Cup
X - Pin, Eyelet
C - Pin, PCB Flex Feedthrough
S - Socket, Solder Cup
Z - Socket, Eyelet
D - Socket, PCB Flex Feedthrough

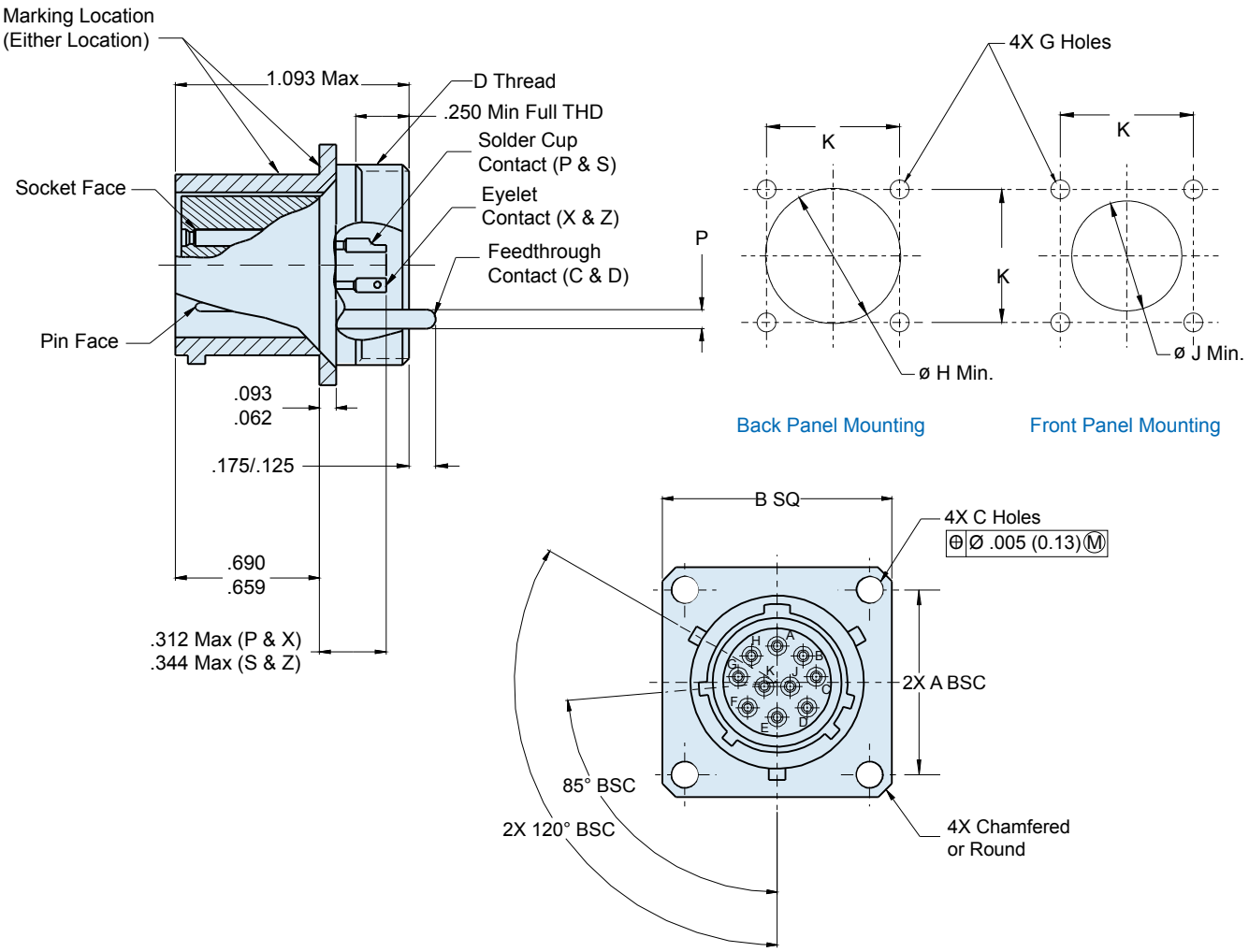
MS27469	Y	11	N	35	P	A

Class
Y- Hermetic

Shell Size
9,11,13,15,17,19,21,23,25

Insert Arrangement
MIL-DTL-38999 Series I Hermetic Inserts Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D
(Omit for Normal)



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MS27469
Wall Mount Hermetic Receptacle
MIL-DTL-38999 Series I

How To Order: *Commercial*

Connector Series
231 - Series I Type

Shell Style
H0 - Hermetic Wall Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

231 - 100 - H0 Z1 11 - 35 P N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated
FT - Carbon Steel, Fused Tin

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D,
(*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

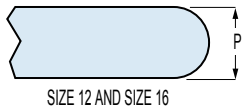
SHELL SIZE	A BSC	B SQ ±.016(0.4)	ø C HOLES	D THREADS
9/09	.719(18.3)	.938(23.8)	.133(3.4) .123(3.1)	.6875-24 UNEF-2A
11	.812(20.6)	1.031(26.2)	.133(3.4) .123(3.1)	.8125-20 UNEF-2A
13	.906(23.0)	1.125(28.6)	.133(3.4) .123(3.1)	.9375-20 UNEF-2A
15	.969(24.6)	1.219(31.0)	.133(3.4) .123(3.1)	1.0625-18 UNEF-2A
17	1.062(27.0)	1.312(33.3)	.133(3.4) .123(3.1)	1.1875-18 UNEF-2A
19	1.156(29.4)	1.438(36.5)	.133(3.4) .123(3.1)	1.3125-18 UNEF-2A
21	1.250(31.8)	1.562(39.7)	.133(3.4) .123(3.1)	1.4375-10 UNEF-2A
23	1.375(34.9)	1.688(42.9)	.157(4.0) .142(3.6)	1.5625-18 UNEF-2A
25	1.500(38.1)	1.812(46.0)	.157(4.0) .142(3.6)	1.6875-18 UNEF-2A

TABLE I (CONTINUED): CONNECTOR DIMENSIONS

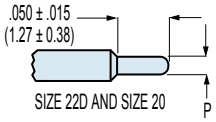
SHELL SIZE	ø G HOLES ±.005(0.1)	ø H MIN	ø J MIN	K ±.005(0.1)
9/09	.128(3.3)	.656(16.7)	.516(13.1)	.719(18.3)
11	.128(3.3)	.781(19.8)	.625(15.9)	.812(20.6)
13	.128(3.3)	.921(23.4)	.750(19.1)	.906(23.0)
15	.128(3.3)	1.047(26.6)	.906(23.0)	.968(24.6)
17	.128(3.3)	1.218(30.9)	1.016(25.8)	1.062(27.0)
19	.128(3.3)	1.296(32.9)	1.142(29.0)	1.156(29.4)
21	.128(3.3)	1.421(36.1)	1.266(32.2)	1.250(31.8)
23	.154(3.9)	1.546(39.3)	1.375(34.9)	1.375(34.9)
25	.154(3.9)	1.672(42.5)	1.484(37.7)	1.500(38.1)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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MS27470
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series I

How To Order: *MS*

Shell Style
MS27470 - *Jam Nut Mount, Series I*

Connector Material / Finish
D - *Carbon Steel - Fused Tin Finish*
E - *Stainless Steel - Passivate Finish*
N - *Stainless Steel - Nickel Finish*

Contact Termination
P - *Pin, Solder Cup*
X - *Pin, Eyelet*
C - *Pin, PCB Flex Feedthrough*
S - *Socket, Solder Cup*
Z - *Socket, Eyelet*
D - *Socket, PCB Flex Feedthrough*

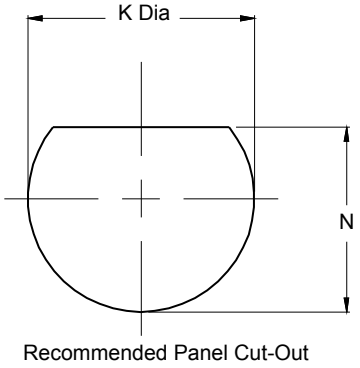
MS27470	Y	11	N	35	P	A

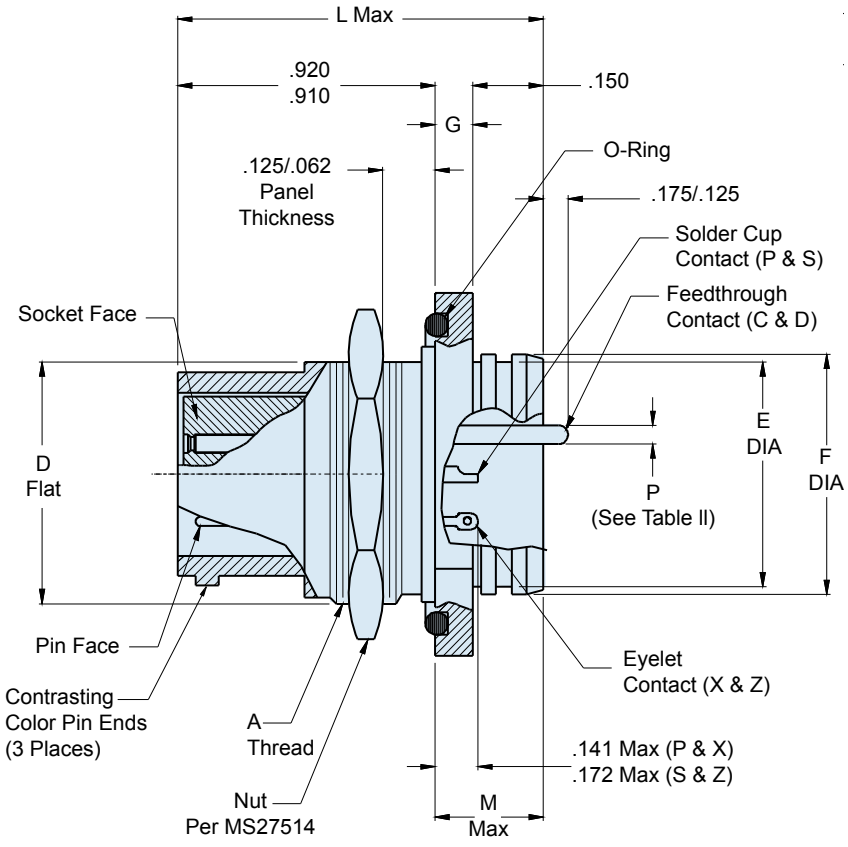
Class
Y- Hermetic

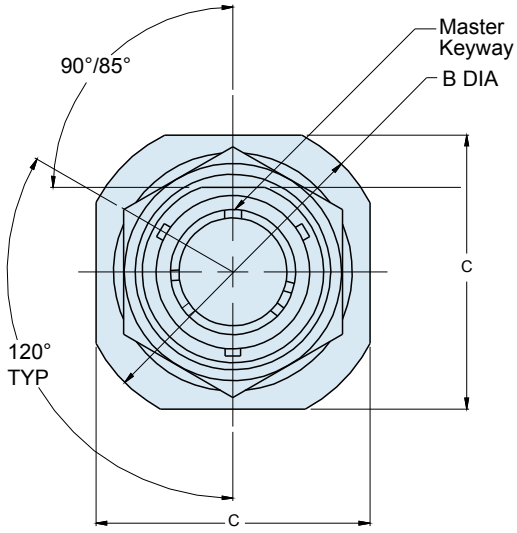
Shell Size
9,11,13,15,17,19,21,23,25

Insert Arrangement
MIL-DTL-38999 Series I Hermetic Inserts Per MIL-STD-1560; See Pages B-2 - B-4

Alternate Key Position
A, B, C, D
(Omit for Normal)







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MS27470
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series I

How To Order: *Commercial*

Connector Series
231 - Series I Type

Shell Style
H7 - Hermetic Jam Nut Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

231 - 100 - H7 Z1 11 - 35 P N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated
FT - Carbon Steel, Fused Tin

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D,
(*N* = Normal)

B

TABLE I: CONNECTOR DIMENSIONS

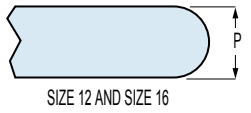
SHELL SIZE	A THREAD CLASS 2A	B DIA ±.016(0.4)	C ±.016(0.4)	D FLAT ±.005(0.1)	E DIA ±.011(0.3)	F DIA ±.005(0.1)
9/09	.6875-24 UNEF	1.188(30.2)	1.062(27.0)	.65(16.5)	.602(15.3)	.648(16.5)
11	.8125-20 UNEF	1.375(34.9)	1.25(31.8)	.75(19.1)	.726(18.4)	.772(19.6)
13	1.000-20 UNEF	1.5(38.1)	1.375(34.9)	.937(23.8)	.852(21.6)	.898(22.8)
15	1.125-18 UNEF	1.625(41.3)	1.5(38.1)	1.061(26.9)	.978(24.8)	1.024(26.0)
17	1.250-18 UNEF	1.75(44.5)	1.625(41.3)	1.186(30.1)	1.102(28.0)	1.148(29.2)
19	1.375-18 UNEF	1.938(49.2)	1.812(46.0)	1.311(33.3)	1.228(31.2)	1.274(32.4)
21	1.500-18 UNEF	2.062(52.4)	1.938(49.2)	1.436(36.5)	1.352(34.3)	1.398(35.5)
23	1.625-18 UNEF	2.188(55.6)	2.062(52.4)	1.561(39.6)	1.478(37.5)	1.524(38.7)
25	1.750-18 UNS	2.312(58.7)	2.188(55.6)	1.686(42.8)	1.602(40.7)	1.648(41.9)

TABLE I (CONTINUED): CONNECTOR DIMENSIONS

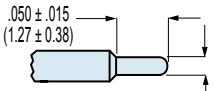
SHELL SIZE	G ±.016 (0.4)	K DIA ±.005 (0.1)	L MAX	M MAX	N +.000 -.002 (.05)
9/09	.109 (2.8)	.698 (17.7)	1.200 (30.5)	.280 (7.1)	.698 (17.7)
11	.109 (2.8)	.830 (21.1)	1.200 (30.5)	.280 (7.1)	.830 (21.1)
13	.109 (2.8)	1.015 (25.8)	1.200 (30.5)	.280 (7.1)	1.015 (25.8)
15	.109 (2.8)	1.140 (29.0)	1.200 (30.5)	.280 (7.1)	1.140 (29.0)
17	.109 (2.8)	1.265 (32.1)	1.200 (30.5)	.280 (7.1)	1.265 (32.1)
19	.140 (3.6)	1.390 (35.3)	1.231 (31.3)	.311 (7.9)	1.390 (35.3)
21	.140 (3.6)	1.515 (38.5)	1.231 (31.3)	.311 (7.9)	1.515 (38.5)
23	.140 (3.6)	1.640 (41.7)	1.231 (31.3)	.311 (7.9)	1.640 (41.7)
25	.140 (3.6)	1.765 (44.8)	1.231 (31.3)	.311 (7.9)	1.765 (44.8)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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MS27471
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series I

How To Order: *MS*

Shell Style	**Connector Material / Finish**		**Contact Termination**			
MS27471 *- Solder Mount, Series I*	***D*** *- Carbon Steel - Fused Tin Finish*		***P*** *- Pin, Solder Cup*		***S*** *- Socket, Solder Cup*	
	E *- Stainless Steel - Passivate Finish*		***X*** *- Pin, Eyelet*		***Z*** *- Socket, Eyelet*	
	N *- Stainless Steel - Nickel Finish*		***C*** *- Pin, PCB Flex Feedthrough*		***D*** *- Socket, PCB Flex Feedthrough*	

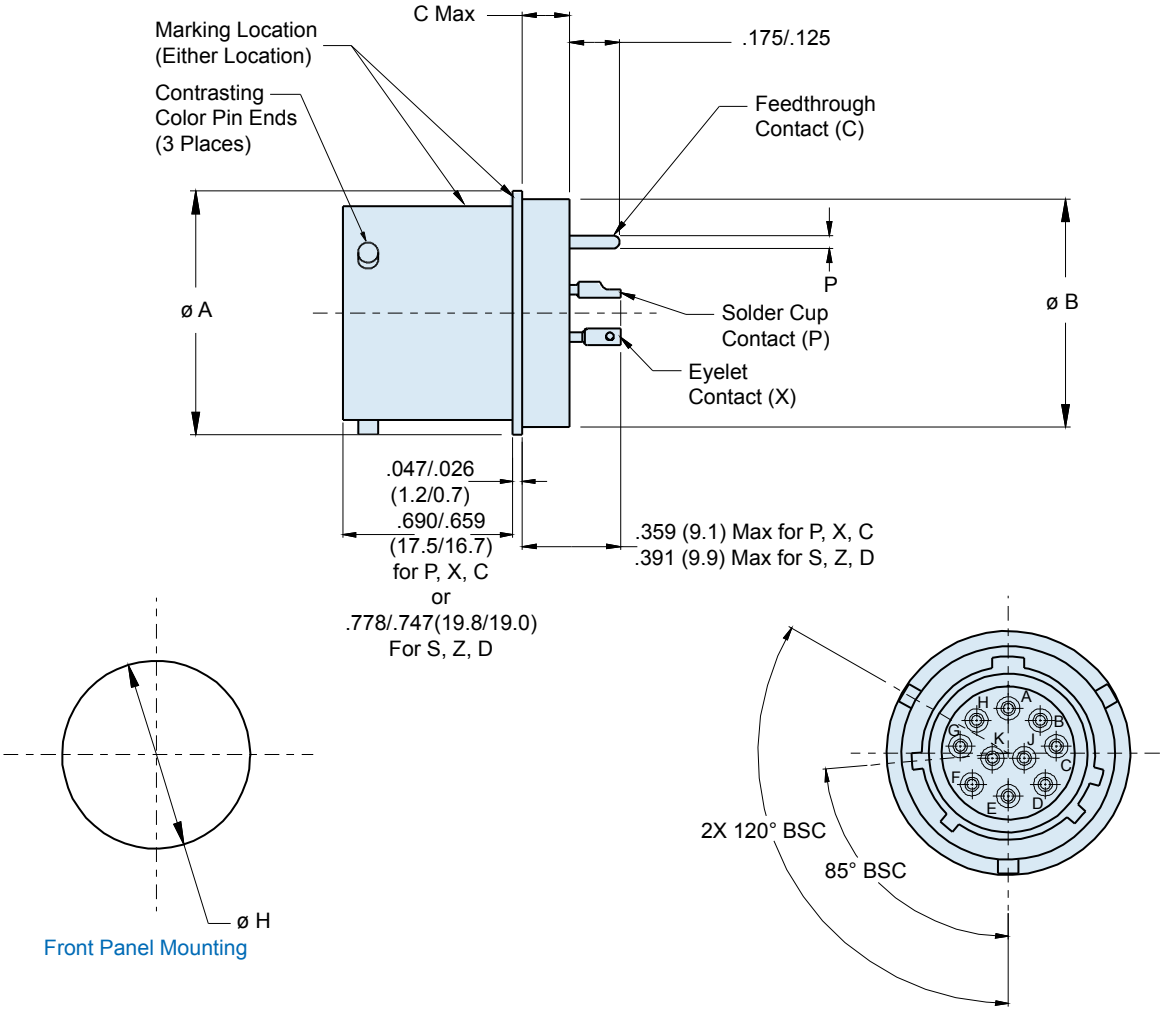
MS27471	Y	11	N	35	P	A

Class
Y- Hermetic

Shell Size
9,11,13,15,17,19,21,23,25

Insert Arrangement
MIL-DTL-38999 Series I
Hermetic Inserts Per
MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D
(Omit for Normal)



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MS27471
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series I

How To Order: *Commercial*

Connector Series
231 - Series I Type

Shell Style
H5 - Hermetic Solder Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

231	-	100	-	H5	Z1	11	-	35	P	N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated
FT - Carbon Steel, Fused Tin

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

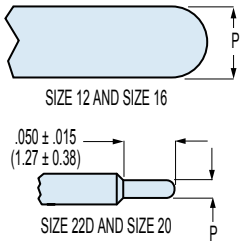
Alternate Key Position
A, B, C, D,
(*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE	ø A ±.016(0.4)	ø B	C MAX	ø H ±.005(0.1)
9/09	.750(19.1)	.673(17.1) .667(16.9)	.187(4.7)	.680(17.3)
11	.844(21.4)	.782(19.9) .776(19.7)		.789(20.0)
13	.969(24.6)	.907(23.0) .901(22.9)		.914(23.2)
15	1.094(27.8)	1.032(26.2) 1.027(26.1)		1.038(26.4)
17	1.218(30.9)	1.157(29.4) 1.151(29.2)		1.164(29.6)
19	1.312(33.3)	1.251(31.8) 1.245(31.6)		1.258(32.0)
21	1.438(36.5)	1.376(35.0) 1.370(34.8)		1.383(35.1)
23	1.563(39.7)	1.501(38.1) 1.495(38.0)	.218(5.5)	1.508(38.3)
25	1.688(42.9)	1.626(41.3) 1.620(41.1)		1.643(41.7)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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MS27475
Wall Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *MS*

Shell Style
MS27475 - *Wall Mount, Series II*

Connector Material / Finish
D - *Carbon Steel - Fused Tin Finish*
E - *Stainless Steel - Passivate Finish*
N - *Stainless Steel - Nickel Finish*

Contact Termination
P - *Pin, Solder Cup*
X - *Pin, Eyelet*
C - *Pin, PCB Flex Feedthrough*
S - *Socket, Solder Cup*
Z - *Socket, Eyelet*
D - *Socket, PCB Flex Feedthrough*

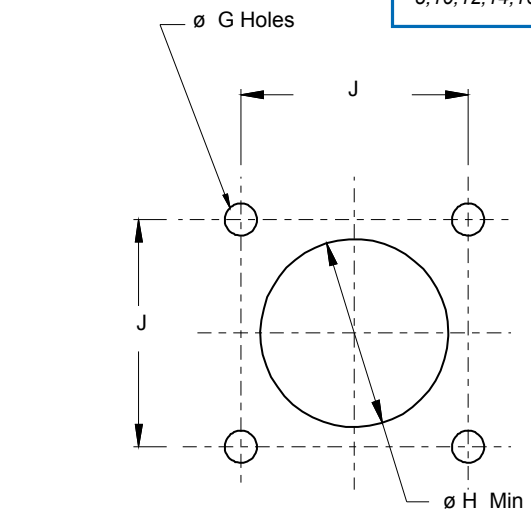
MS27475	Y	10	N	35	P	A

Class
Y- Hermetic

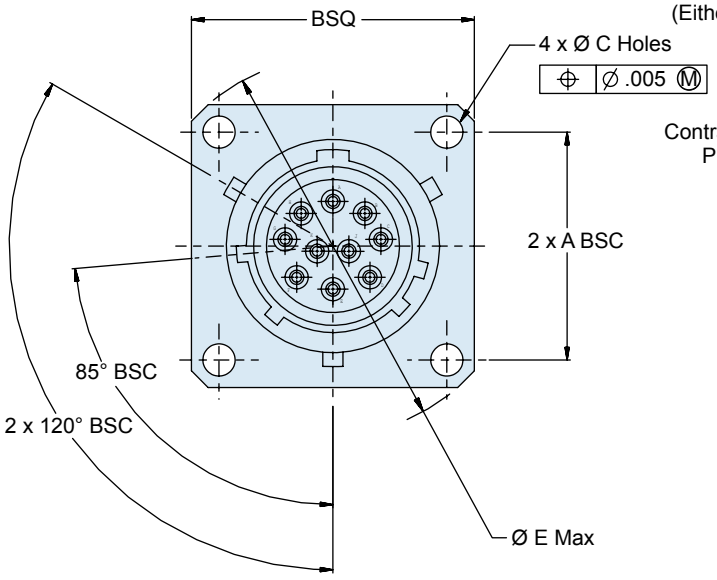
Shell Size
8,10,12,14,16,18,20,22,24

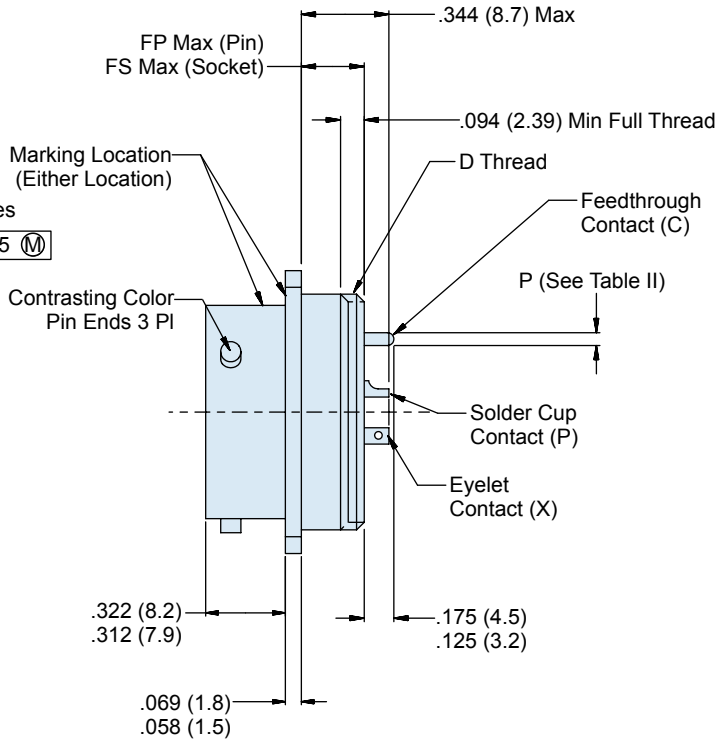
Insert Arrangement
MIL-DTL-38999 Series II Hermetic Inserts Per MIL-STD-1560; See Pages B-2 - B4

Alternate Key Position
A, B, C, D (Omit for Normal)



Front Panel Mounting





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MS27475
Wall Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *Commercial*

Connector Series	Shell Style	Shell Size	Contact Termination				Insert Arrangement	Alternate Key Position
232	H0	08,10,12,14,16,18,20,22,24	P - Pin, Solder Cup	S - Socket, Solder Cup			35	N
			X - Pin, Eyelet	Z - Socket, Eyelet				
			C - Pin, PCB	D - Socket, PCB				

232 - 100 - H0 Z1 10 - 35 P N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated
FT - Carbon Steel, Fused Tin

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D,
(*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

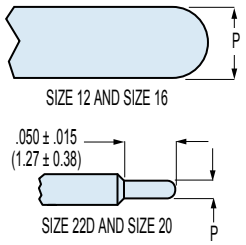
SHELL SIZE	A BSC	B SQ MAX	ø C HOLES	D Threads (UNEF-2A)	ø E MAX	FP MAX	FS MAX
8/08	.594(15.1)	.828(21.0)	.130(3.3) .115(2.9)	.5625-24	1.078(27.4)	.250 (6.35)	.375 (9.5)
10	.719(18.3)	.954(24.2)		.6875-24	1.256(31.9)		
12	.812(20.6)	1.047(26.6)		.8125-20	1.391(35.3)		
14	.906(23.0)	1.141(29.0)		.9375-20	1.516(38.5)		
16	.969(24.6)	1.234(31.3)		1.0625-18	1.641(41.7)		
18	1.062(27.0)	1.328(33.7)		1.1875-18	1.766(44.9)		
20	1.156(29.4)	1.453(36.9)		1.3125-18	1.891(48.0)		
22	1.250(31.8)	1.578(40.1)		1.4375-10	2.016(51.2)		
24	1.375(34.9)	1.703(43.3)	.157(4.0) .142(3.6)	1.5625-18	2.204(56.0)	.375 (9.53)	.406 (10.3)

TABLE I (CONTINUED): CONNECTOR DIMENSIONS

SHELL SIZE	ø G HOLES	ø H MIN	ø J BSC
8	.133(3.4) .123(3.1)	.570(14.5)	.594(15.1)
10		.690(17.5)	.719(18.3)
12		.820(20.8)	.812(20.6)
14		.940(23.9)	.906(23.0)
16		1.070(27.2)	.969(24.6)
18		1.190(30.2)	1.062(27.0)
20		1.320(33.5)	1.156(29.4)
22	.159(4.0) .149(3.8)	1.440(36.6)	1.250(31.8)
24		1.570(39.9)	1.375(34.9)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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MS27476
Box Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *MS*

Shell Style
MS27476 - *Box Mount, Series II*

Connector Material / Finish
D - *Carbon Steel - Fused Tin Finish*
E - *Stainless Steel - Passivate Finish*
N - *Stainless Steel - Nickel Finish*

Contact Termination
P - *Pin, Solder Cup*
X - *Pin, Eyelet*
C - *Pin, PCB Flex Feedthrough*
S - *Socket, Solder Cup*
Z - *Socket, Eyelet*
D - *Socket, PCB Flex Feedthrough*

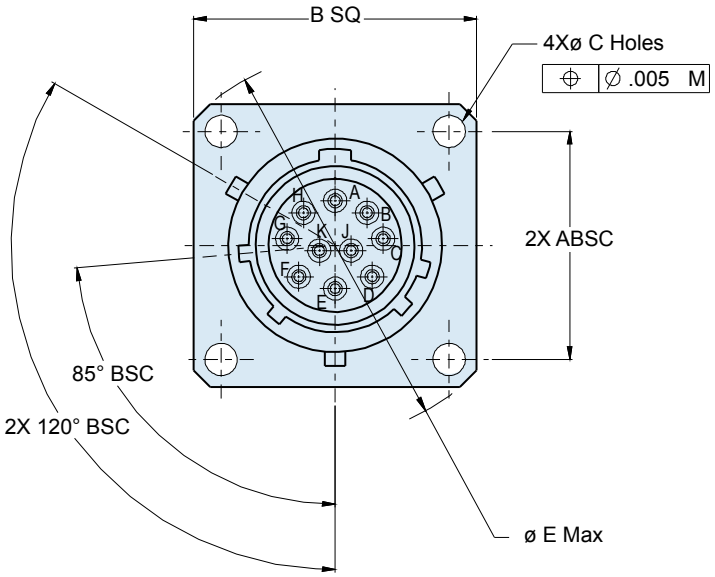
MS27476	Y	10	N	35	P	A

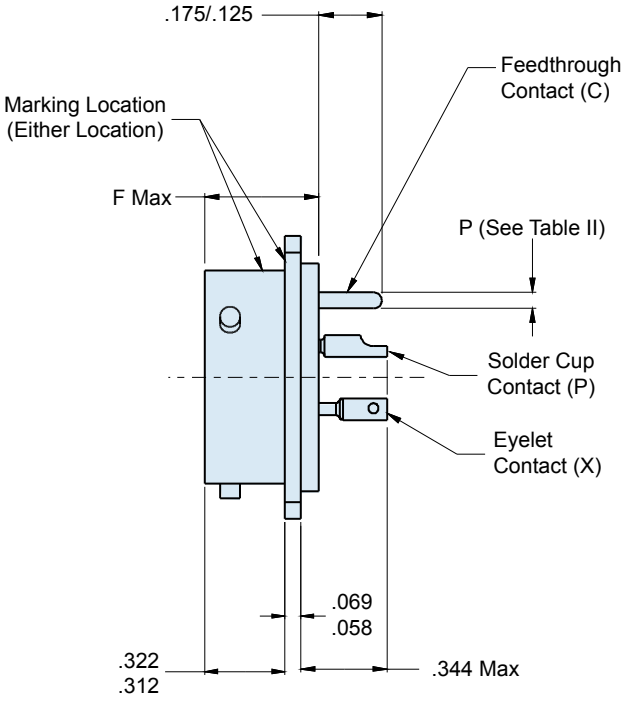
Class
Y- Hermetic

Shell Size
8,10,12,14,16,18,20,22,24

Insert Arrangement
MIL-DTL-38999 Series II Hermetic Inserts Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D
(Omit for Normal)





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MS27476
Box Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *Commercial*

Connector Series	Shell Style	Shell Size	Contact Termination				Connector Type	Connector Material / Finish	Insert Arrangement	Alternate Key Position
232 - Series II Type	H2 - Hermetic Box Mount	08,10,12,14,16,18,20,22,24	P - Pin, Solder Cup	S - Socket, Solder Cup	X - Pin, Eyelet	Z - Socket, Eyelet	100 - Hermetic Receptacle	ZL - CRES, Nickel Z1 - CRES, Passivated FT - Carbon Steel, Fused Tin	Per MIL-STD-1560; See Pages B-2 - B-4	A, B, C, D, (N = Normal)
			C - Pin, PCB	D - Socket, PCB						

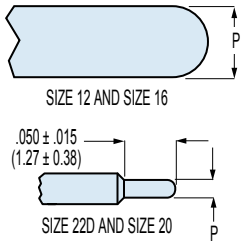
232 - 100 - H2 Z1 10 - 35 P N

TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE	A BSC	B SQ MAX	ø C HOLES	ø E MAX	F MAX
8/08	.594(15.1)	.828(21.0)	.130(3.3) .115(2.9)	1.078(27.4)	.453(11.5)
10	.719(18.3)	.954(24.2)		1.266(32.2)	
12	.812(20.6)	1.047(26.6)		1.391(35.3)	
14	.906(23.0)	1.141(29.0)		1.516(38.5)	
16	.969(24.6)	1.234(31.3)		1.641(41.7)	
18	1.062(27.0)	1.328(33.7)		1.766(44.9)	
20	1.156(29.4)	1.453(36.9)		1.891(48.0)	
22	1.250(31.8)	1.578(40.1)		2.016(51.2)	
24	1.375(34.9)	1.703(43.3)	.157(4.0) .142(3.6)	2.204(56.0)	.484(12.3)

TABLE II: CONTACT SIZE

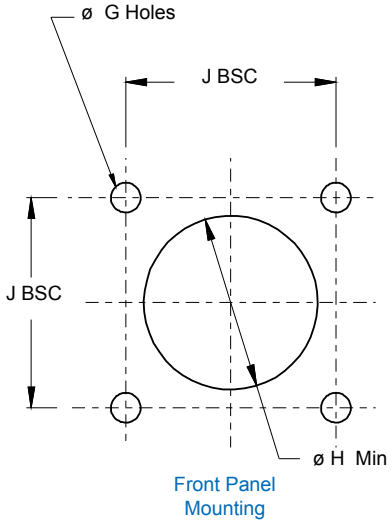
PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

TABLE I (CONTINUED): CONNECTOR DIMENSIONS

SHELL SIZE	ø G HOLES	ø H MIN	ø J BSC
8/08	.133(3.4) .123(3.1)	.570(14.5)	.594(15.1)
10		.690(17.5)	.719(18.3)
12		.820(20.8)	.812(20.6)
14		.940(23.9)	.906(23.0)
16		1.070(27.2)	.969(24.6)
18		1.190(30.2)	1.062(27.0)
20		1.320(33.5)	1.156(29.4)
22	.159(4.0) .149(3.8)	1.440(36.6)	1.250(31.8)
24		1.570(39.9)	1.375(34.9)



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MS27477
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *MS*

Shell Style
MS27477 - *Jam Nut Mount, Series II*

Connector Material / Finish
D - *Carbon Steel - Fused Tin Finish*
E - *Stainless Steel - Passivate Finish*
N - *Stainless Steel - Nickel Finish*

Contact Termination
P - *Pin, Solder Cup*
X - *Pin, Eyelet*
C - *Pin, PCB Flex Feedthrough*
S - *Socket, Solder Cup*
Z - *Socket, Eyelet*
D - *Socket, PCB Flex Feedthrough*

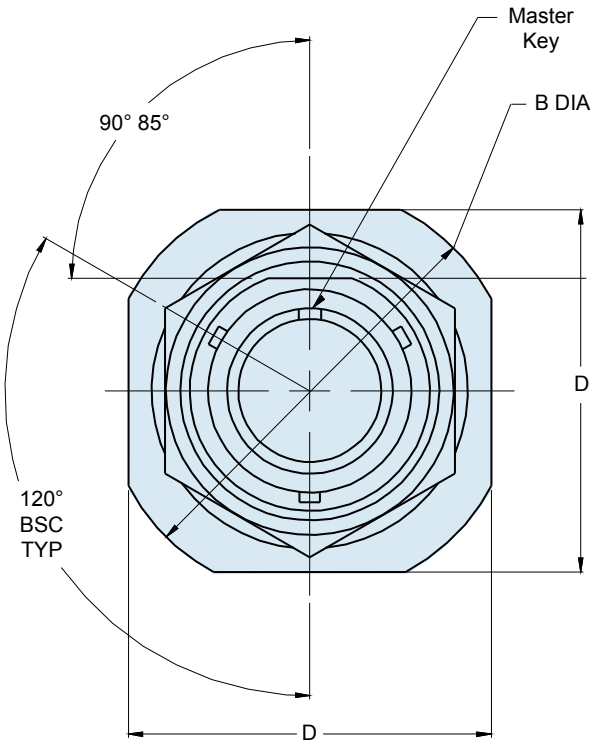
MS27477	Y	10	N	35	P	A

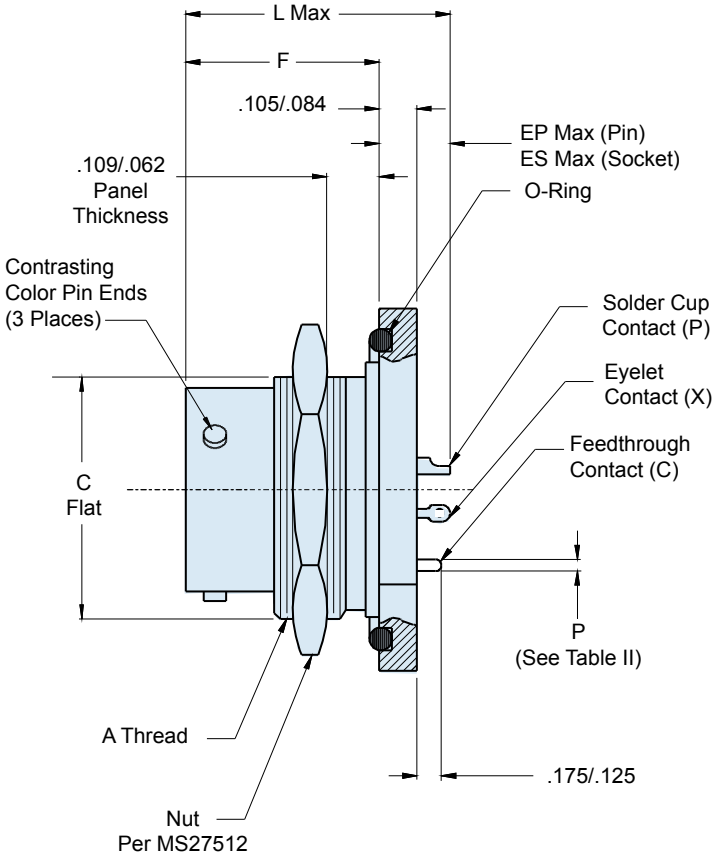
Class
Y- Hermetic

Shell Size
8,10,12,14,16,18,20,22,24

Insert Arrangement
MIL-DTL-38999 Series II Hermetic Inserts Per MIL-STD-1560; See Pages B-2 - B-4

Alternate Key Position
A, B, C, D
(Omit for Normal)





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MS27477
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *Commercial*

Connector Series
232 - Series II Type

Shell Style
H7 - Hermetic Box Mount

Shell Size
08,10,12,14,16,18,20,22,24

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

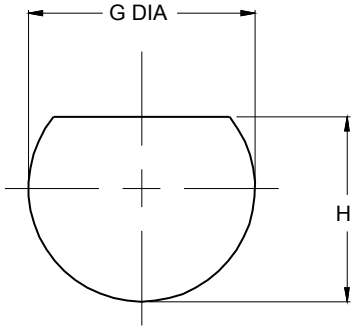
232 - 100 - H7 Z1 10 - 35 P N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated
FT - Carbon Steel, Fused Tin

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D,
(*N* = Normal)



Recommended Panel Cut-Out

TABLE I: CONNECTOR DIMENSIONS

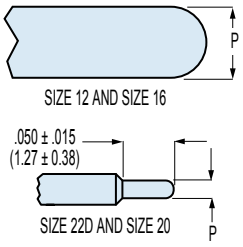
SHELL SIZE	A THREAD CLASS 2A	B DIA ±.016(0.4)	C FLAT ±.004(0.1)	D A/F ±.016(0.4)
8/08	.875-20 UNEF	1.375(34.9)	.815(20.7)	1.25(31.8)
10	1.000-20 UNEF	1.5(38.1)	.939(23.9)	1.375(34.9)
12	1.125-18 UNEF	1.625(41.3)	1.063(27.0)	1.5(38.1)
14	1.250-18 UNEF	1.75(44.5)	1.188(30.2)	1.625(41.3)
16	1.375-18 UNEF	1.938(49.2)	1.318(33.5)	1.781(45.2)
18	1.500-18 UNEF	2.016(51.2)	1.438(36.5)	1.890(48.0)
20	1.625-18 UNEF	2.141(54.4)	1.563(39.7)	2.016(51.2)
22	1.750-18 UNS	2.265(57.5)	1.688(42.9)	2.140(54.4)
24	1.875-16 UN	2.39(60.7)	1.813(46.1)	2.265(57.5)

TABLE I (CONTINUED): CONNECTOR DIMENSIONS

SHELL SIZE	EP MAX	ES MAX	F ±.005(0.1)	G DIA ±.005(0.1)	H ±.005(0.1)	L MAX
8/08	.281 (7.1)	.359 (9.1)	.438(11.1)	.889(22.6)	.828(21.0)	.724(18.4)
10	.281 (7.1)	.359 (9.1)	.438(11.1)	1.015(25.8)	.952(24.2)	.724(18.4)
12	.281 (7.1)	.359 (9.1)	.438(11.1)	1.139(28.9)	1.076(27.3)	.724(18.4)
14	.281 (7.1)	.359 (9.1)	.438(11.1)	1.264(32.1)	1.201(30.5)	.724(18.4)
16	.281 (7.1)	.359 (9.1)	.438(11.1)	1.389(35.3)	1.331(33.8)	.724(18.4)
18	.281 (7.1)	.359 (9.1)	.438(11.1)	1.515(38.5)	1.451(36.9)	.724(18.4)
20	.250 (6.4)	.344 (8.7)	.464(11.8)	1.640(41.7)	1.576(40.0)	.719(18.3)
22	.250 (6.4)	.344 (8.7)	.464(11.8)	1.745(44.3)	1.701(43.2)	.719(18.3)
24	.250 (6.4)	.344 (8.7)	.464(11.8)	1.890(48.0)	1.826(46.4)	.719(18.3)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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MS27478
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *MS*

Shell Style
MS27478 - *Solder Mount, Series II*

Connector Material / Finish
D - *Carbon Steel - Fused Tin Finish*
E - *Stainless Steel - Passivate Finish*
N - *Stainless Steel - Nickel Finish*

Contact Termination
P - *Pin, Solder Cup*
X - *Pin, Eyelet*
C - *Pin, PCB Flex Feedthrough*
S - *Socket, Solder Cup*
Z - *Socket, Eyelet*
D - *Socket, PCB Flex Feedthrough*

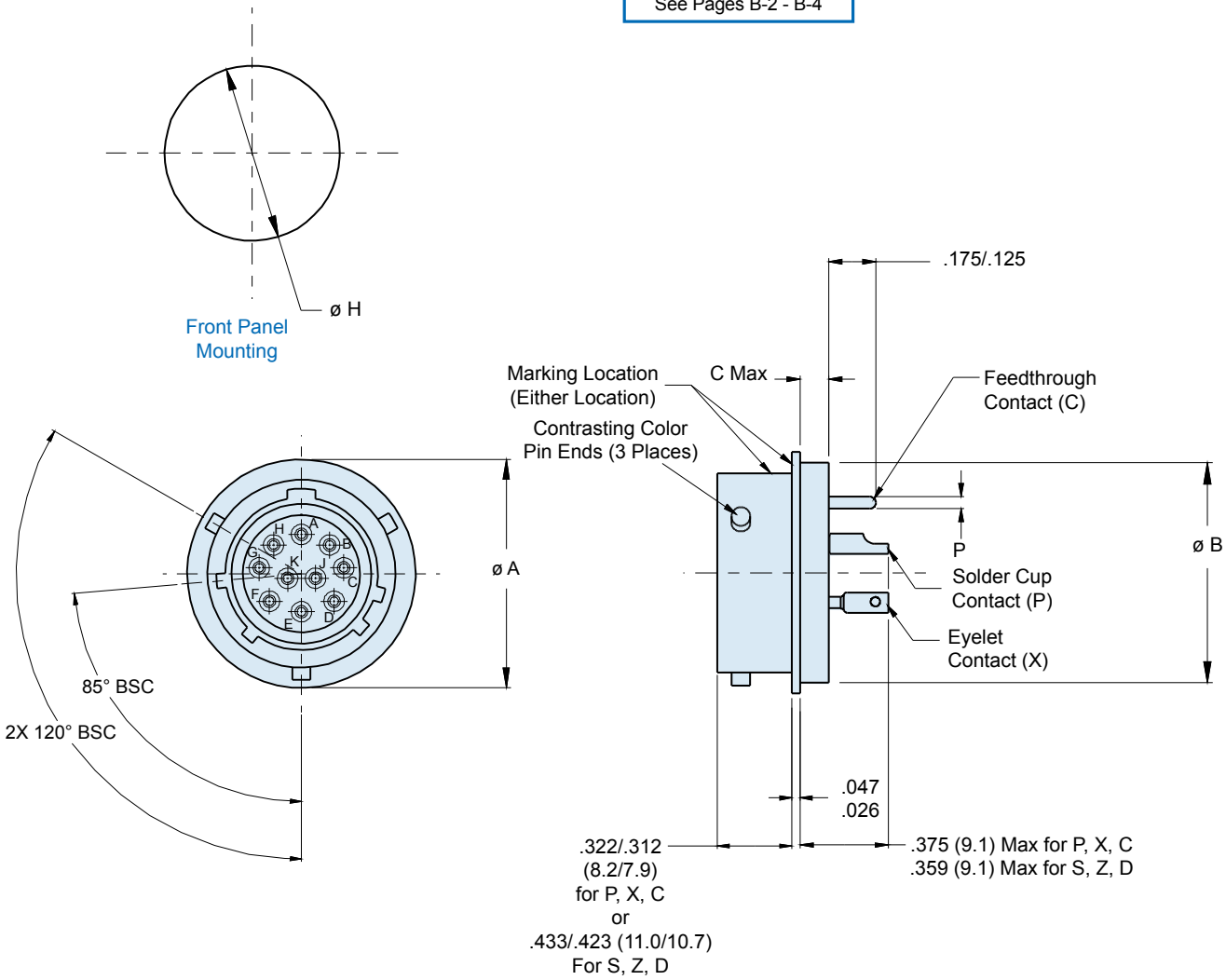
MS27478	Y	10	N	35	P	A

Class
Y- Hermetic

Shell Size
8,10,12,14,16,18,20,22,24

Insert Arrangement
MIL-DTL-38999 Series II Hermetic Inserts Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D
(Omit for Normal)



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MS27478
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series II

How To Order: *Commercial*

Connector Series
232 - Series II Type

Shell Style
H5 - Hermetic Solder Mount

Shell Size
08,10,12,14,16,18,20,22,24

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

232	-	100	-	H5	Z1	10	-	35	P	N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated
FT - Carbon Steel, Fused Tin

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

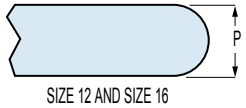
Alternate Key Position
A, B, C, D,
(*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

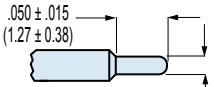
SHELL SIZE	ø A ±.011(0.3)	ø B	C MAX	ø H ±.005(0.1)
8/08	.688(17.5)	.557(14.) .557(14.1)	.125(3.2)	.570(14.5)
10	.798(20.3)	.673(17.1) .667(16.9)		.680(17.3)
12	.907(23.0)	.782(19.9) .776(19.7)		.789(20.0)
14	1.032(26.2)	.907(23.0) .901(22.9)		.914(23.2)
16	1.157(29.4)	1.032(26.2) 1.027(26.1)		1.039(26.4)
18	1.282(32.6)	1.157(29.4) 1.151(29.2)		1.164(29.6)
20	1.376(35.0)	1.251(31.8) 1.245(31.6)		1.258(32.0)
22	1.501(38.1)	1.376(35.0) 1.370(34.8)	.156(4.0)	1.383(35.1)
24	1.626(41.3)	1.501(38.1) 1.495(38.0)		1.508(38.3)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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D38999/21
Box Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *MS*

Basic Specification	Connector Material / Finish	Insert Arrangement	Alternate Key Position
D38999	*N* - CRES, Nickel *Y* - CRES, Passivated	Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, E* (*N* = Normal)

D38999	/21	Y	B	35	P	N

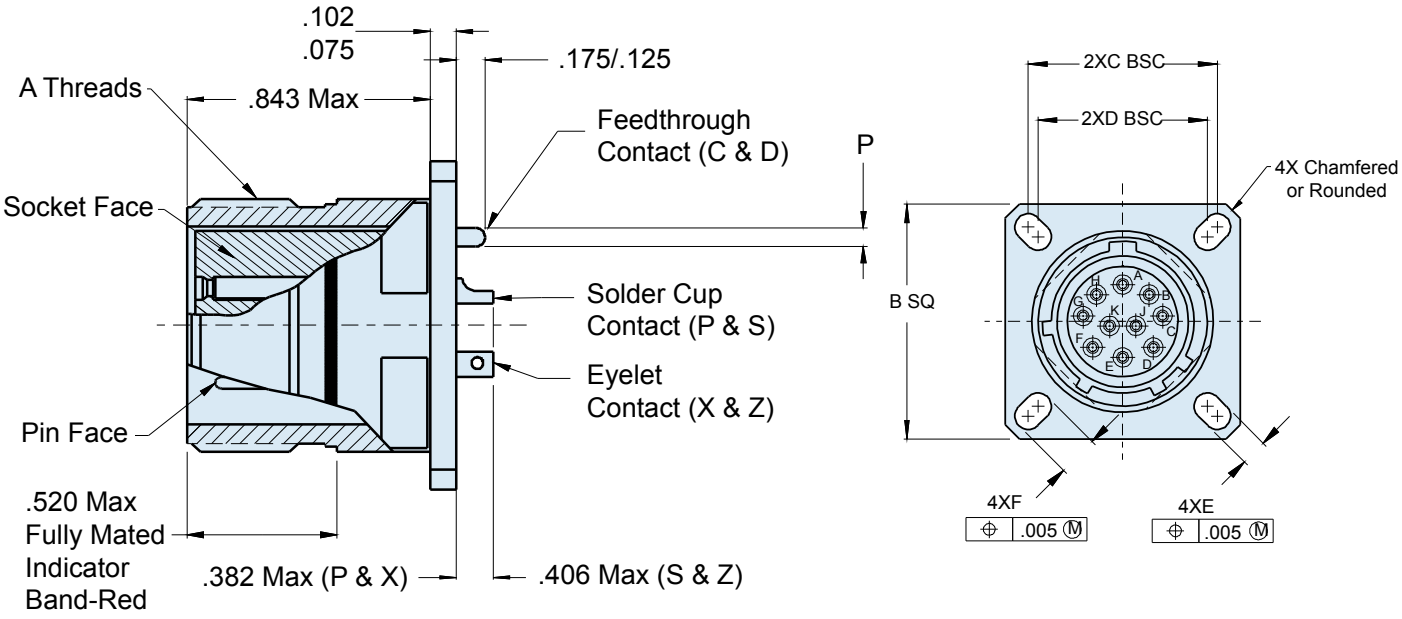
Shell Style
/21 - Box Mount

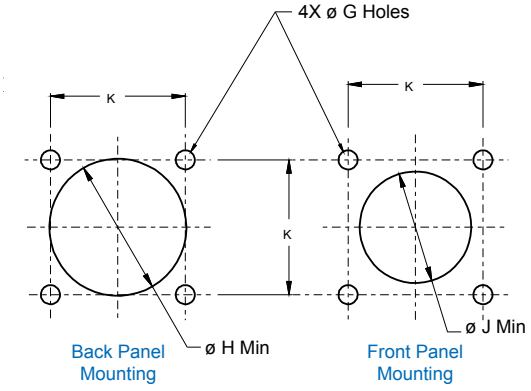
Shell Size

A - 9	*F* - 19
B - 11	*G* - 21
C - 13	*H* - 23
D - 15	*J* - 25
E - 17	

Contact Termination

P - Pin, Solder Cup	*S* - Socket, Solder Cup
X - Pin, Eyelet	*Z* - Socket, Eyelet
C - Pin, PCB Flex Feedthrough	*D* - Socket, PCB Flex Feedthrough





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D38999/21
Box Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *Commercial*

Connector Series
233 - D38999 Series III Type

Shell Style
H2 - Hermetic Box Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

233	-	100	-	H2	Z1	11	-	35	P	N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D, E
(*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

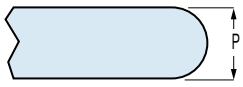
SHELL SIZE CODE	SHELL SIZE	A THREAD	B SQ ±.012(0.3)	C BSC	D BSC	E ±.008(0.2)	F ±.008(0.2)
A	9/09	.6250-.1P-.3L-TS-2A	.937(23.8)	.719(18.3)	.594(15.1)	.128(3.3)	.216(5.5)
B	11	.7500-.1P-.3L-TS-2A	1.031(26.2)	.812(20.6)	.719(18.3)	.128(3.3)	.194(4.9)
C	13	.8750-.1P-.3L-TS-2A	1.126(28.6)	.906(23.0)	.812(20.6)	.128(3.3)	.194(4.9)
D	15	1.0000-.1P-.3L-TS-2A	1.220(31.0)	.969(24.6)	.906(23.0)	.128(3.3)	.194(4.9)
E	17	1.1875-.1P-.3L-TS-2A	1.311(33.3)	1.062(27.0)	.969(24.6)	.128(3.3)	.194(4.9)
F	19	1.2500-.1P-.3L-TS-2A	1.437(36.5)	1.156(29.4)	1.062(27.0)	.128(3.3)	.194(4.9)
G	21	1.3750-.1P-.3L-TS-2A	1.563(39.7)	1.250(31.8)	1.156(29.4)	.128(3.3)	.194(4.9)
H	23	1.5000-.1P-.3L-TS-2A	1.689(42.9)	1.375(34.9)	1.250(31.8)	.154(3.9)	.242(6.1)
J	25	1.6250-.1P-.3L-TS-2A	1.811(46.0)	1.500(38.1)	1.375(34.9)	.154(3.9)	.242(6.1)

TABLE I (CONTINUED): CONNECTOR DIMENSIONS

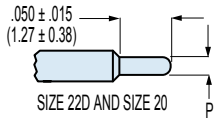
SHELL SIZE CODE	SHELL SIZE	ø G HOLES ±.005(0.1)	ø H MIN	ø J MIN	K ±.005(0.1)
A	9/09	.128(3.3)	.656(16.7)	.516(13.1)	.719(18.3)
B	11	.128(3.3)	.781(19.8)	.625(15.9)	.812(20.6)
C	13	.128(3.3)	.921(23.4)	.750(19.1)	.906(23.0)
D	15	.128(3.3)	1.047(26.6)	.906(23.0)	.968(24.6)
E	17	.128(3.3)	1.218(30.9)	1.016(25.8)	1.062(27.0)
F	19	.128(3.3)	1.296(32.9)	1.142(35.9)	1.156(29.4)
G	21	.128(3.3)	1.421(36.1)	1.266(32.2)	1.250(31.8)
H	23	.154(3.9)	1.546(39.3)	1.375(34.9)	1.375(34.9)
J	25	.154(3.9)	1.672(42.5)	1.484(37.7)	1.500(38.1)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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D38999/23
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *MS*

Basic Specification	Connector Material / Finish	Insert Arrangement	Alternate Key Position
D38999	*N - CRES, Nickel* *Y - CRES, Passivated*	Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, E* (*N* = Normal)

D38999	/23	Y	B	35	P	N

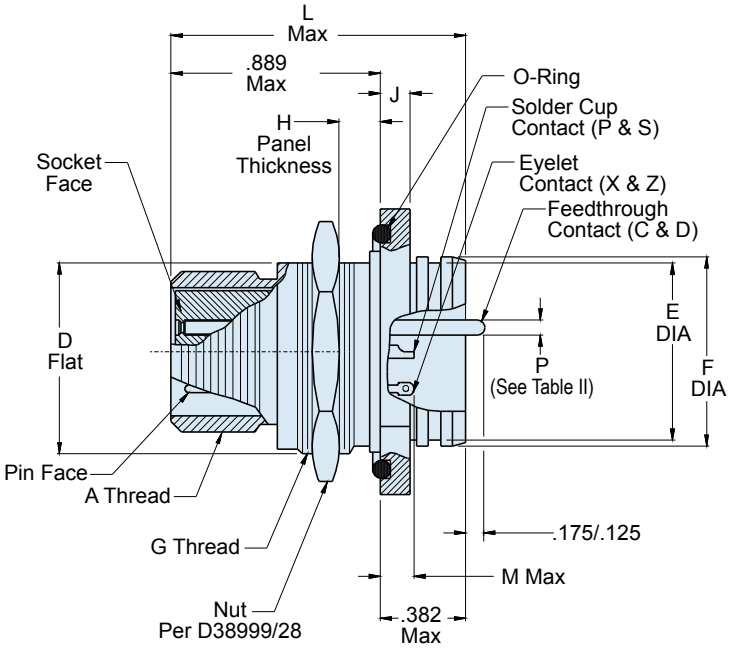
Shell Style
/23 - Jam Nut Mount

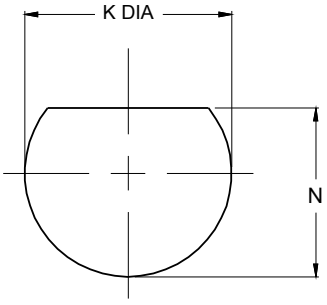
Shell Size

A - 9	*F* - 19
B - 11	*G* - 21
C - 13	*H* - 23
D - 15	*J* - 25
E - 17	

Contact Termination

P - Pin, Solder Cup	*S - Socket, Solder Cup*
X - Pin, Eyelet	*Z - Socket, Eyelet*
C - Pin, PCB Flex Feedthrough	*D - Socket, PCB Flex Feedthrough*





Recommended Panel Cut-Out

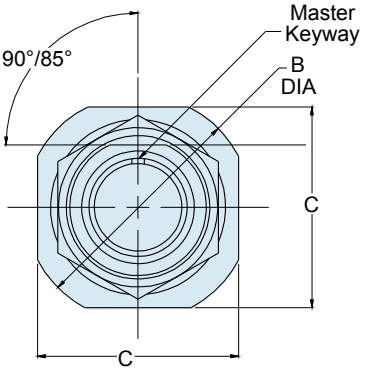
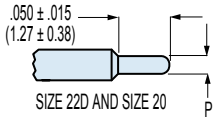


TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D

SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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D38999/23
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *Commercial*

Connector Series
233 - Series III Type

Shell Style
H7 - Hermetic Jam Nut Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

233 - 100 - H7 Z1 11 - 35 P N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D, E
(*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE CODE	SHELL SIZE	A THREAD -0.1P-0.03L-TS	B DIA	C A/F ±.015(0.4)	D FLAT ±.005(0.1)	E DIA ±.012(0.3)	F DIA	G THREAD ISO METRIC	H ±.032(0.8)
A	9/09	0.625	1.200(30.5) 1.178(29.9)	1.063(27.0)	.650(16.5)	.603(15.3)	.653(16.6) .642(16.3)	M17 X 1.0-6g	.094(2.4)
B	11	0.750	1.385(35.2) 1.363(34.6)	1.252(31.8)	.750(19.1)	.725(18.4)	.775(19.7) .764(19.4)	M20 X 1.0-6g	.094(2.4)
C	13	0.875	1.511(38.4) 1.489(37.8)	1.374(34.9)	.937(23.8)	.851(21.6)	.905(23.0) .894(22.7)	M25 X 1.0-6g	.094(2.4)
D	15	1.000	1.637(41.6) 1.615(41.0)	1.500(38.1)	1.061(26.9)	.977(24.8)	1.031(26.2) 1.020(25.9)	M28 X 1.0-6g	.094(2.4)
E	17	1.187	1.763(44.8) 1.741(44.2)	1.626(41.3)	1.186(30.1)	1.103(28.0)	1.153(29.3) 1.142(29.0)	M32 X 1.0-6g	.094(2.4)
F	19	1.250	1.948(49.5) 1.926(48.9)	1.811(46.0)	1.311(33.3)	1.229(31.2)	1.278(32.5) 1.268(32.2)	M35 X 1.0-6g	.094(2.4)
G	21	1.375	2.074(52.7) 2.051(52.1)	1.937(49.2)	1.436(36.5)	1.351(34.3)	1.405(35.7) 1.394(35.4)	M38 X 1.0-6g	.094(2.4)
H	23	1.500	2.200(55.9) 2.177(55.3)	2.063(52.4)	1.561(39.6)	1.477(37.5)	1.531(38.9) 1.520(38.6)	M41 X 1.0-6g	.094(2.4)
J	25	1.625	2.322(59.0) 2.300(58.4)	2.189(55.6)	1.686(42.8)	1.603(40.7)	1.653(42.0) 1.642(41.7)	M44 X 1.0-6g	.094(2.4)

TABLE I: (Continued) CONNECTOR DIMENSIONS

J ±.008(0.2)	K DIA ±.005 (0.1)	L MAX	M MAX		N ±.005 (0.1)
			P&X	S&Z	
.106(2.7)	.703/.693 (17.86/17.60)	1.149(29.2)	.208(5.3)	.232(5.9)	.657/.655 (16.69/16.70)
.106(2.7)	.835/.825 (20.96/20.96)	1.149(29.2)	.208(5.3)	.232(5.9)	.771/.769 (19.58/19.53)
.106(2.7)	1.020/1.010 (25.65/25.65)	1.153(29.3)	.200(5.1)	.224(5.7)	.955/.953 (24.26/24.21)
.106(2.7)	1.145/1.135 (28.83/28.83)	1.153(29.3)	.200(5.1)	.224(5.7)	1.085/1.083 (27.56/27.51)
.106(2.7)	1.270/1.260 (32.01/32.00)	1.153(29.3)	.200(5.1)	.224(5.7)	1.210/1.208 (30.73/30.68)
.138(3.5)	1.395/1.385 (35.43/35.18)	1.185(30.1)	.200(5.1)	.224(5.7)	1.335/1.333 (33.91/33.86)
.138(3.5)	1.520/1.510 (38.60/38.35)	1.185(30.1)	.200(5.1)	.224(5.7)	1.460/1.458 (37.08/37.03)
.138(3.5)	1.645/1.635 (41.78/41.53/)	1.185(30.1)	.200(5.1)	.224(5.7)	1.585/1.583 (40.26/40.21)
.138(3.5)	1.770/1.760 (44.96/44.70)	1.185(30.1)	.200(5.1)	.224(5.7)	1.710/1.708 (43.43/43.38)

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D38999/25
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *MS*

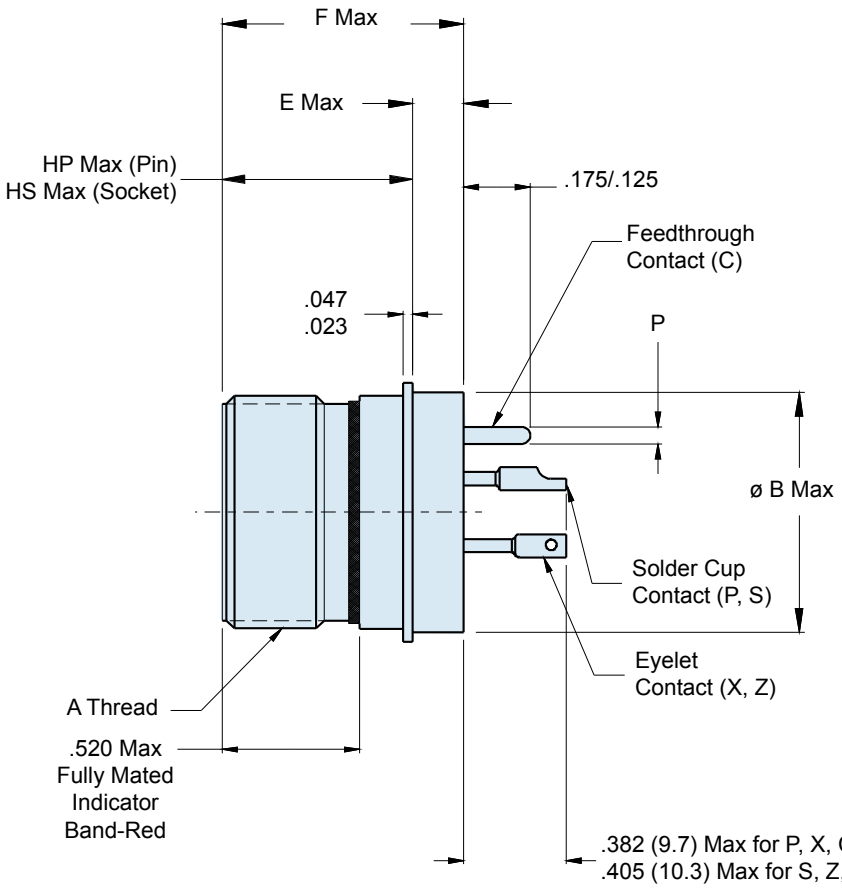
Basic Specification	Connector Material / Finish		Insert Arrangement	Alternate Key Position		
D38999	*N - CRES, Nickel*		Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, E* (*N* = Normal)		
D38999	**/25**	**Y**	**B**	**35**	**P**	**N**

Shell Style
/25 - Solder Mount

Shell Size

A - 9	*F* - 19	*P* - Pin, Solder Cup	*S* - Socket, Solder Cup
B - 11	*G* - 21	*X* - Pin, Eyelet	*Z* - Socket, Eyelet
C - 13	*H* - 23	*C* - Pin, PCB Flex Feedthrough	*D* - Socket, PCB Flex Feedthrough
D - 15	*J* - 25		
E - 17			

Contact Termination



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D38999/25
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *Commercial*

Connector Series
233 - Series III Type

Shell Style
H5 - Hermetic Solder Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup *S - Socket, Solder Cup*
X - Pin, Eyelet *Z - Socket, Eyelet*
C - Pin, PCB *D - Socket, PCB*

233	-	100	-	H5	Z1	11	-	35	P	N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D, E
(*N* = Normal)

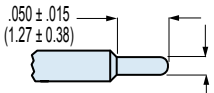
TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE CODE	SHELL SIZE	A THREAD	ø B MAX	ø C MAX	ø D ±.005(0.1)	E MAX	F MAX	HP MAX	HS MAX
A	9/09	.6250-.1P-.3L-TS-2A	.673(17.1)	.764(19.4)	.680(17.3)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
B	11	.7500-.1P-.3L-TS-2A	.783(19.9)	.858(21.8)	.789(20.0)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
C	13	.8750-.1P-.3L-TS-2A	.909(23.1)	.980(24.9)	.914(23.2)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
D	15	1.0000-.1P-.3L-TS-2A	1.031(26.2)	1.106(28.1)	1.038(26.4)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
E	17	1.1875-.1P-.3L-TS-2A	1.157(29.4)	1.232(31.3)	1.164(29.6)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
F	19	1.2500-.1P-.3L-TS-2A	1.252(31.8)	1.323(33.6)	1.258(32.0)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
G	21	1.3750-.1P-.3L-TS-2A	1.378(35.0)	1.449(36.8)	1.383(35.1)	.201(5.1)	.937(23.8)	.677(17.2)	.764(19.4)
H	23	1.5000-.1P-.3L-TS-2A	1.504(38.2)	1.575(40.0)	1.508(38.3)	.232(5.9)	.969(24.6)	.677(17.2)	.764(19.4)
J	25	1.6250-.1P-.3L-TS-2A	1.626(41.3)	1.701(43.2)	1.643(41.7)	.232(5.9)	.969(24.6)	.677(17.2)	.764(19.4)

TABLE II: CONTACT SIZE

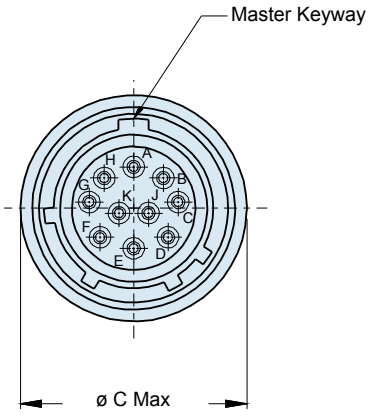
PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D

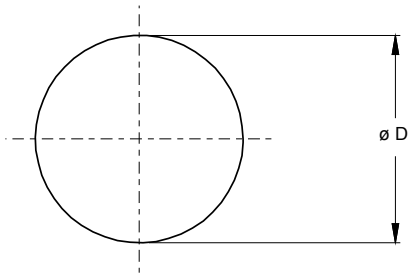
SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)





Recommended Panel Cut-Out

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D38999/27
Weld Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *MS*

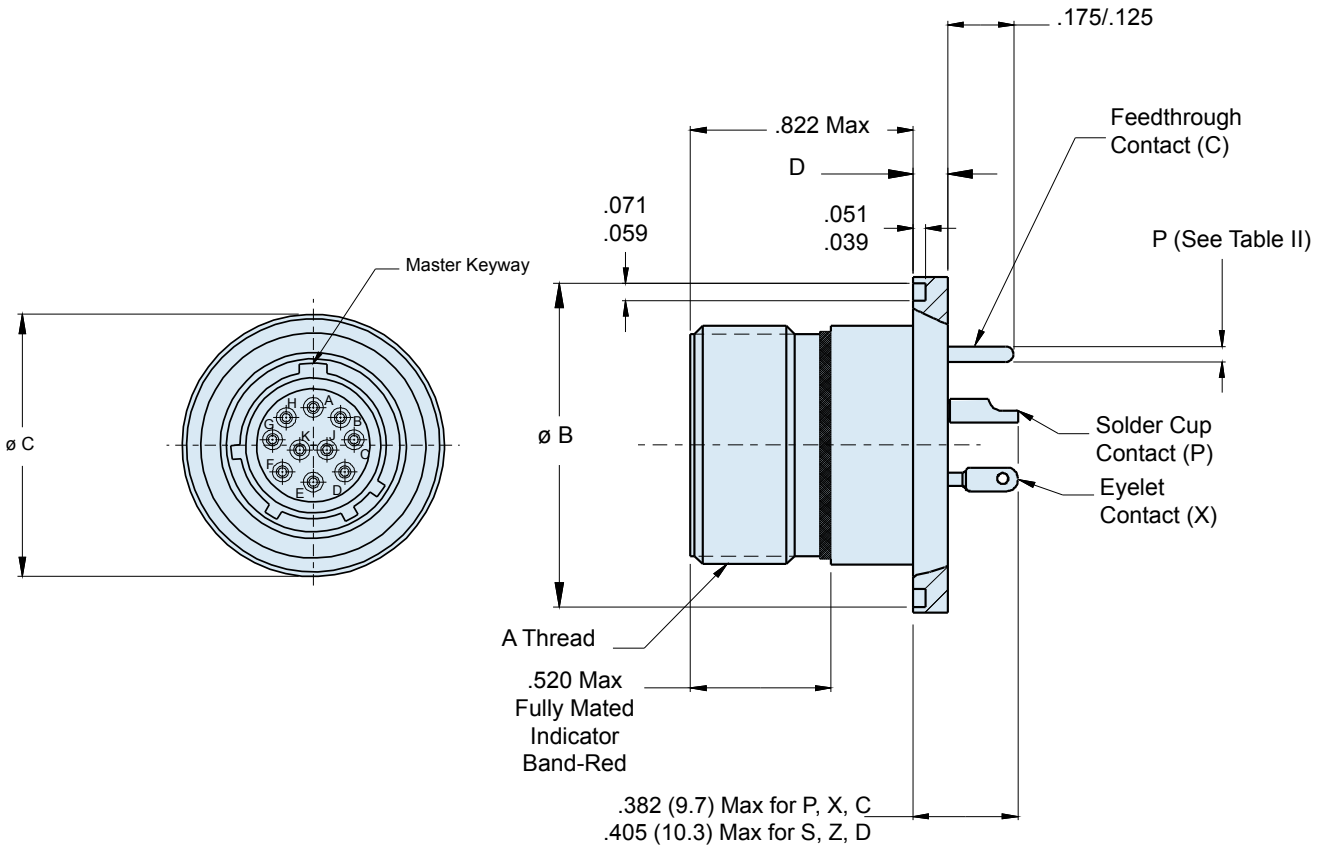
Basic Specification		Connector Material / Finish		Insert Arrangement		Alternate Key Position	
D38999		*N - CRES, Nickel* *Y - CRES, Passivated*		Per MIL-STD-1560; See Pages B2 - B4		*A, B, C, D, E* (*N* = Normal)	
D38999	**/27**	**Y**	**B**	**35**	**P**	**N**	

Shell Style
/27 - Weld Mount

Shell Size

A - 9	*F* - 19	*P* - Pin, Solder Cup	*S* - Socket, Solder Cup
B - 11	*G* - 21	*X* - Pin, Eyelet	*Z* - Socket, Eyelet
C - 13	*H* - 23	*C* - Pin, PCB Flex Feedthrough	*D* - Socket, PCB Flex Feedthrough
D - 15	*J* - 25		
E - 17			

Contact Termination



Consult Factory for Recommended Panel Cutout Dimensions

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D38999/27
Weld Mount Hermetic Receptacle
MIL-DTL-38999 Series III

How To Order: *Commercial*

Connector Series
233 - Series III Type

Shell Style
H8 - Hermetic Weld Mount

Shell Size
09,11,13,15,17,19,21,23,25

Contact Termination
P - Pin, Solder Cup
X - Pin, Eyelet
C - Pin, PCB
S - Socket, Solder Cup
Z - Socket, Eyelet
D - Socket, PCB

233	-	100	-	H8	Z1	11	-	35	P	N

Connector Type
100 - Hermetic Receptacle

Connector Material / Finish
ZL - CRES, Nickel
Z1 - CRES, Passivated

Insert Arrangement
Per MIL-STD-1560;
See Pages B-2 - B-4

Alternate Key Position
A, B, C, D, E
(*N* = Normal)

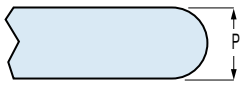
B

TABLE I: CONNECTOR DIMENSIONS

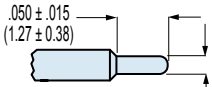
SHELL SIZE CODE	SHELL SIZE	A THREAD	Ø B	Ø C	Ø D
A	9/09	.6250-.1P-.3L-TS-2A	.941 (23.9) .929 (23.6)	.984 (25.0) .972 (24.7)	.134 (3.4) .118 (3.0)
B	11	.7500-.1P-.3L-TS-2A	1.063 (27.0) 1.051 (27.0)	1.106 (28.1) 1.094 (27.8)	.134 (3.4) .118 (3.0)
C	13	.8750-.1P-.3L-TS-2A	1.189 (30.2) 1.177 (28.9)	1.232 (31.3) 1.220 (31.0)	.134 (3.4) .118 (3.0)
D	15	1.0000-.1P-.3L-TS-2A	1.315 (33.4) 1.303 (33.1)	1.358 (34.5) 1.346 (34.2)	.134 (3.4) .118 (3.0)
E	17	1.1875-.1P-.3L-TS-2A	1.402 (35.6) 1.390 (35.3)	1.445 (36.7) 1.433 (36.4)	.134 (3.4) .118 (3.0)
F	19	1.2500-.1P-.3L-TS-2A	1.547 (39.3) 1.535 (39.0)	1.591 (40.4) 1.579 (40.1)	.134 (3.4) .118 (3.0)
G	21	1.3750-.1P-.3L-TS-2A	1.689 (42.9) 1.677 (42.6)	1.732 (44.0) 1.720 (43.7)	.134 (3.4) .118 (3.0)
H	23	1.5000-.1P-.3L-TS-2A	1.854 (47.1) 1.842 (46.8)	1.898 (48.2) 1.886 (47.4)	.165 (4.2) .149 (3.8)
J	25	1.6250-.1P-.3L-TS-2A	1.941 (49.3) 1.929 (49.0)	1.984 (50.4) 1.972 (50.1)	.165 (4.2) .149 (3.8)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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D38999/41
Box Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *MS*

Basic Specification	Connector Material / Finish	Insert Arrangement	Alternate Key Position
D38999	*N - CRES, Nickel* *Y - CRES, Passivated*	Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

D38999	/41	Y	B	35	P	N

Shell Style
/41 - Box Mount

Shell Size

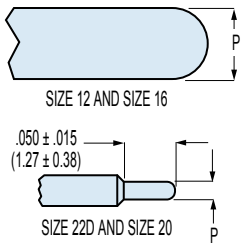
B - 11	*F* - 19
C - 13	*G* - 21
D - 15	*H* - 23
E - 17	*J* - 25

Contact Termination

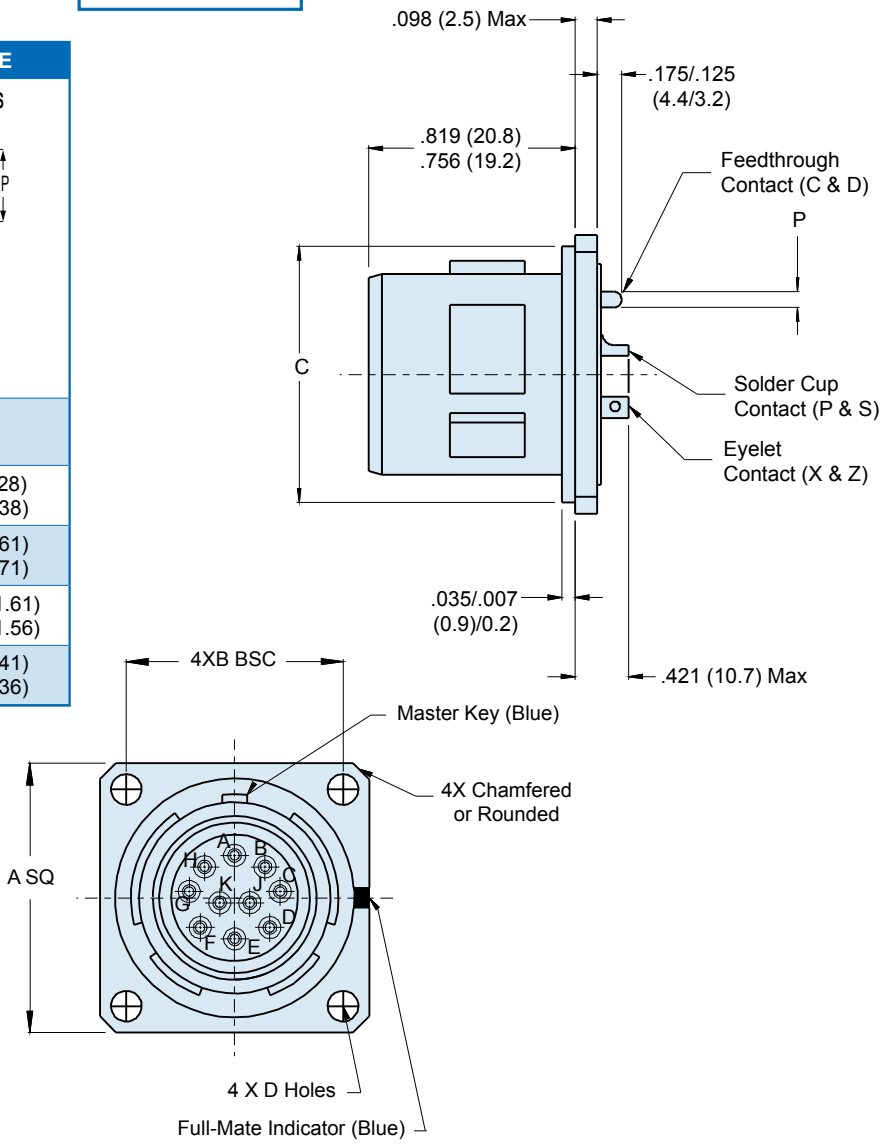
P - Pin, Solder Cup	*S - Socket, Solder Cup*
X - Pin, Eyelet	*Z - Socket, Eyelet*
C - Pin, PCB Flex Feedthrough	*D - Socket, PCB Flex Feedthrough*

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)



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D38999/41
Box Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *Commercial*

Connector Series	Shell Style	Shell Size	Contact Termination			
234 - Series IV Type	*H2 - Hermetic Box Mount*	*11,13,15,17,19,21,23,25*	*P - Pin, Solder Cup*	*S - Socket, Solder Cup*		
			X - Pin, Eyelet	*Z - Socket, Eyelet*		
			C - Pin, PCB	*D - Socket, PCB*		

234	-	100	-	H2	Z1	11	-	35	P	N

Connector Type	Connector Material / Finish	Insert Arrangement	Alternate Key Position
100 - Hermetic Receptacle	*ZL - CRES, Nickel* *Z1 - CRES, Passivated*	Per MIL-STD-1560; See Pages B-2 - B-4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

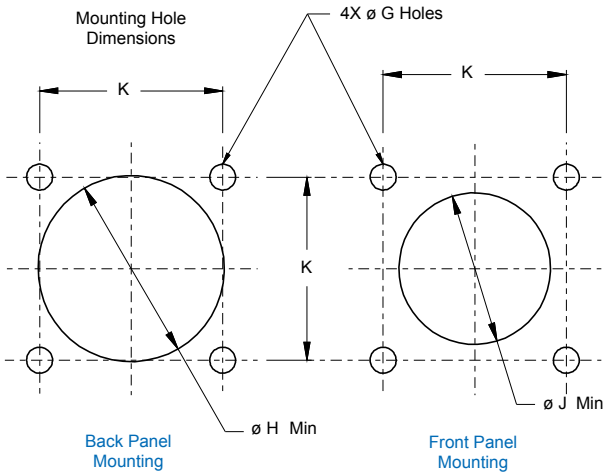

TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE CODE	SHELL SIZE	A SQ	B BSC	C DIA	D DIA	øG HOLES ±.005(0.1)	ø H MIN	ø J MIN	K ±.005(0.1)
B	11	1.051(26.7) 1.008(25.6)	.812(20.6)	.793(20.1) .778(19.8)	.138(3.5) .122(3.1)	.128(3.3)	.781(19.8)	.625(15.9)	.812(20.6)
C	13	1.145(29.1) 1.102(28.0)	.906(23.0)	.919(23.3) .904(23.0)	.138(3.5) .122(3.1)	.128(3.3)	.921(23.4)	.750(19.1)	.906(23.0)
D	15	1.240(31.5) 1.197(30.4)	.969(24.6)	1.044(26.5) 1.029(26.1)	.138(3.5) .122(3.1)	.128(3.3)	1.047(26.6)	.906(23.0)	.968(24.6)
E	17	1.334(33.9) 1.291(32.8)	1.062(27.0)	1.170(29.7) 1.155(29.3)	.138(3.5) .122(3.1)	.128(3.3)	1.218(30.9)	1.016(25.8)	1.062(27.0)
F	19	1.460(37.1) 1.417(36.0)	1.156(29.4)	1.294(32.9) 1.279(32.5)	.138(3.5) .122(3.1)	.128(3.3)	1.296(32.9)	1.142(29.0)	1.156(29.4)
G	21	1.583(40.2) 1.539(39.1)	1.250(31.8)	1.419(36.0) 1.404(35.7)	.138(3.5) .122(3.1)	.128(3.3)	1.421(36.1)	1.266(32.2)	1.250(31.8)
H	23	1.709(43.4) 1.665(42.3)	1.375(34.9)	1.544(39.2) 1.529(38.8)	.157(4.0) .142(3.6)	.154(3.9)	1.546(39.3)	1.375(34.9)	1.375(34.9)
J	25	1.835(46.6) 1.791(45.5)	1.500(38.1)	1.670(42.4) 1.654(42.0)	.157(4.0) .142(3.6)	.154(3.9)	1.672(42.5)	1.484(37.7)	1.500(38.1)

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D38999/43
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *MS*

Basic Specification	Connector Material / Finish	Insert Arrangement	Alternate Key Position
D38999	*N - CRES, Nickel* *Y - CRES, Passivated*	Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

D38999	/43	Y	B	35	P	N

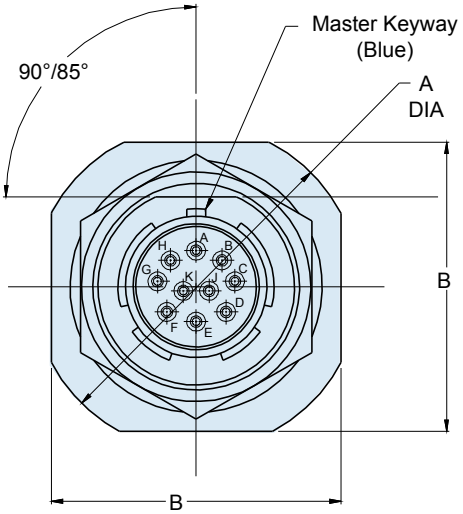
Shell Style
/43 - Jam Nut Mount

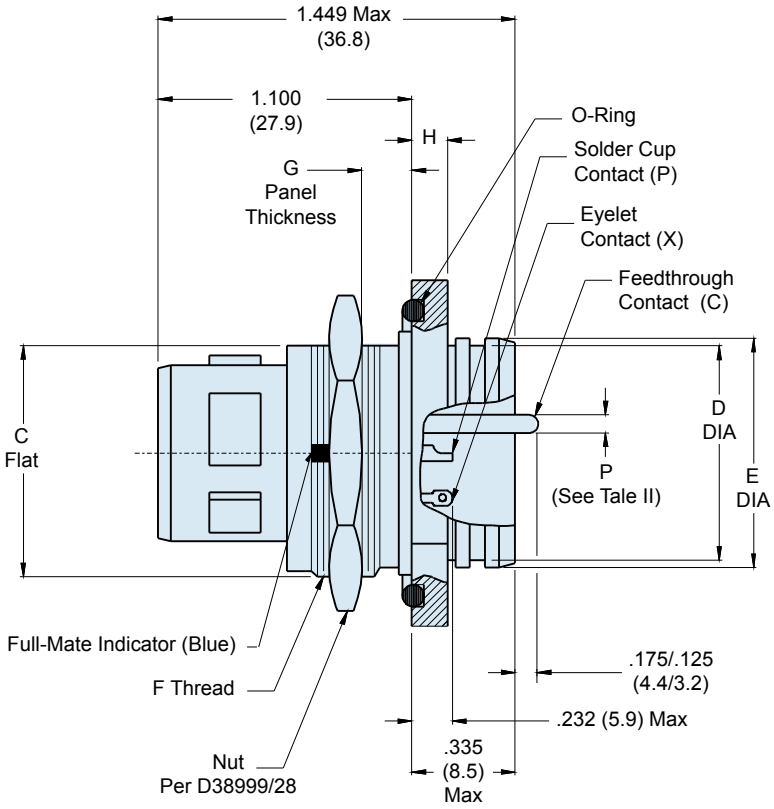
Shell Size

B	*11*	*F*	*19*
C	*13*	*G*	*21*
D	*15*	*H*	*23*
E	*17*	*J*	*25*

Contact Termination

P - Pin, Solder Cup	*S - Socket, Solder Cup*
X - Pin, Eyelet	*Z - Socket, Eyelet*
C - Pin, PCB Flex Feedthrough	*D - Socket, PCB Flex Feedthrough*





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D38999/43
Jam Nut Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *Commercial*

Connector Series	Shell Style	Shell Size	Contact Termination
234 - Series IV Type	*H7 - Hermetic Jam Nut Mount*	*11,13,15,17,19,21,23,25*	*P - Pin, Solder Cup* *S - Socket, Solder Cup* *X - Pin, Eyelet* *Z - Socket, Eyelet* *C - Pin, PCB* *D - Socket, PCB*

234 - 100 - H7 Z1 11 - 35 P N

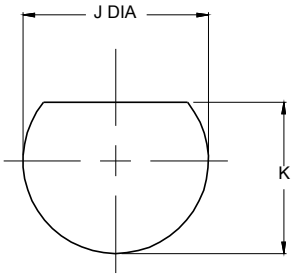
Connector Type	Connector Material / Finish	Insert Arrangement	Alternate Key Position
100 - Hermetic Receptacle	*ZL - CRES, Nickel* *Z1 - CRES, Passivated*	Per MIL-STD-1560; See Pages B-2 - B-4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE CODE	SHELL SIZE	A DIA	B FLATS ±.018(0.5)	C FLAT	D DIA	E DIA ±.010(0.3)	F THREAD ISO METRIC	G ±.033(0.8)	H ±.012(0.3)
B	11	1.385(35.2) 1.362(34.6)	1.250(31.8)	.754(19.2) .745(18.9)	.733(18.6) .716(18.2)	.769(19.5)	M20 X 1.0-6g	.092(2.3)	.106(2.7)
C	13	1.511(38.4) 1.488(37.8)	1.376(35.0)	.941(23.9) .932(23.7)	.858(21.8) .839(21.3)	.899(22.8)	M25 X 1.0-6g	.092(2.3)	.106(2.7)
D	15	1.637(41.6) 1.614(41.0)	1.502(38.2)	1.065(27.1) 1.056(26.8)	.984(25.0) .968(24.6)	1.025(26.0)	M28 X 1.0-6g	.092(2.3)	.106(2.7)
E	17	1.763(44.8) 1.740(44.2)	1.624(41.2)	1.190(30.2) 1.181(30.0)	1.110(28.2) 1.091(27.7)	1.147(29.1)	M32 X 1.0-6g	.092(2.3)	.106(2.7)
F	19	1.948(49.5) 1.925(48.9)	1.813(46.1)	1.316(33.4) 1.306(33.2)	1.236(31.4) 1.220(31.0)	1.273(32.3)	M35 X 1.0-6g	.092(2.3)	.137(3.5)
G	21	2.074(52.7) 2.051(52.1)	1.939(49.3)	1.441(36.6) 1.431(36.3)	1.358(34.5) 1.342(34.1)	1.399(35.5)	M38 X 1.0-6g	.092(2.3)	.137(3.5)
H	23	2.200(55.9) 2.177(55.3)	2.061(52.3)	1.565(39.8) 1.556(39.5)	1.484(37.7) 1.468(37.3)	1.525(38.7)	M41 X 1.0-6g	.092(2.3)	.137(3.5)
J	25	2.326(59.1) 2.299(58.4)	2.187(55.5)	1.692(43.0) 1.681(42.7)	1.610(40.9) 1.594(40.5)	1.647(41.8)	M44 X 1.0-6g	.092(2.3)	.137(3.5)

TABLE I (CONTINUED): CUT-OUT DIMENSIONS

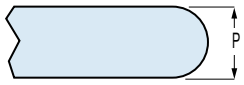
SHELL SIZE CODE	J DIA ±.005 (0.1)	N +.000 -.002 (.05)
B	.698 (17.7)	.698 (17.7)
C	.830 (21.1)	.830 (21.1)
D	1.015 (25.8)	1.015 (25.8)
E	1.140 (29.0)	1.140 (29.0)
F	1.265 (32.1)	1.265 (32.1)
G	1.390 (35.3)	1.390 (35.3)
H	1.515 (38.5)	1.515 (38.5)
J	1.640 (41.7)	1.640 (41.7)



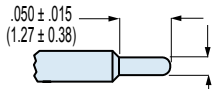
Recommended Panel Cut-Out

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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D38999/45
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *MS*

Basic Specification	Connector Material / Finish	Insert Arrangement	Alternate Key Position
D38999	*N - CRES, Nickel* *Y - CRES, Passivated*	Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

D38999	/45	Y	B	35	P	N

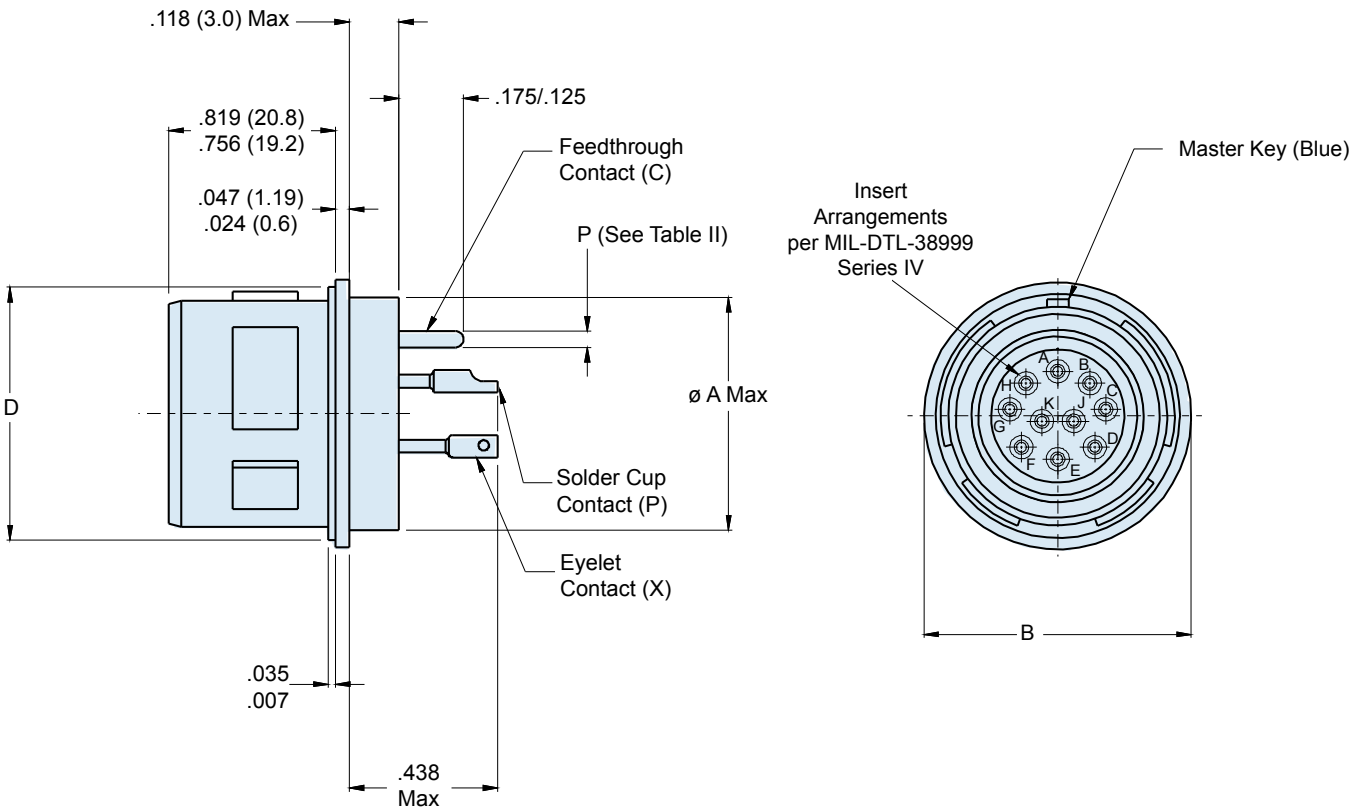
Shell Style
/45 - Solder Mount

Shell Size

B - 11	*F* - 19
C - 13	*G* - 21
D - 15	*H* - 23
E - 17	*J* - 25

Contact Termination

P - Pin, Solder Cup	*S - Socket, Solder Cup*
X - Pin, Eyelet	*Z - Socket, Eyelet*
C - Pin, PCB Flex Feedthrough	*D - Socket, PCB Flex Feedthrough*



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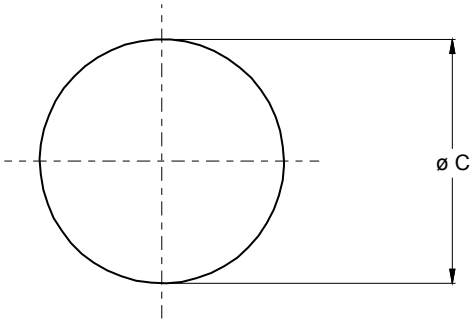
D38999/45
Solder Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *Commercial*

Connector Series	Shell Style	Shell Size	Contact Termination			
234 - Series IV Type	*H5 - Hermetic Solder Mount*	*11,13,15,17,19,21,23,25*	*P - Pin, Solder Cup*	*S - Socket, Solder Cup*	*X - Pin, Eyelet*	*Z - Socket, Eyelet*
			C - Pin, PCB	*D - Socket, PCB*		

234	-	100	-	H5	Z1	11	-	35	P	N

Connector Type	Connector Material / Finish	Insert Arrangement	Alternate Key Position
100 - Hermetic Receptacle	*ZL - CRES, Nickel* *Z1 - CRES, Passivated*	Per MIL-STD-1560; See Pages B-2 - B-4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)



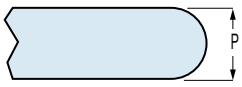
Recommended Panel Cut-Out

TABLE I: CONNECTOR DIMENSIONS

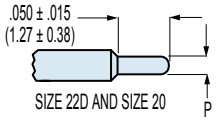
SHELL SIZE CODE	SHELL SIZE	ø A MAX	ø B MAX	ø C ±.005(0.1)	D
B	11	.783(19.9)	.862(21.9)	.789(20.0)	.793(20.1) .778(19.8)
C	13	.909(23.1)	.988(25.1)	.914(23.2)	.919(23.3) .904(23.0)
D	15	1.035(26.3)	1.110(28.2)	1.038(26.4)	1.044(26.5) 1.028(26.1)
E	17	1.157(29.4)	1.236(31.4)	1.164(29.6)	1.170(29.7) 1.155(29.3)
F	19	1.252(31.8)	1.331(33.8)	1.258(32.0)	1.294(32.9) 1.279(32.5)
G	21	1.378(35.0)	1.457(37.0)	1.383(35.1)	1.419(36.0) 1.404(35.7)
H	23	1.504(38.2)	1.583(40.2)	1.508(38.3)	1.544(39.2) 1.528(38.8)
J	25	1.630(41.4)	1.705(43.3)	1.643(41.7)	1.670(42.4) 1.654(42.0)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



SIZE 12 AND SIZE 16



SIZE 22D AND SIZE 20

Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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D38999/48
Weld Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *MS*

Basic Specification	Connector Material / Finish	Insert Arrangement	Alternate Key Position
D38999	*N - CRES, Nickel* *Y - CRES, Passivated*	Per MIL-STD-1560; See Pages B2 - B4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

D38999	/48	Y	B	35	P	N

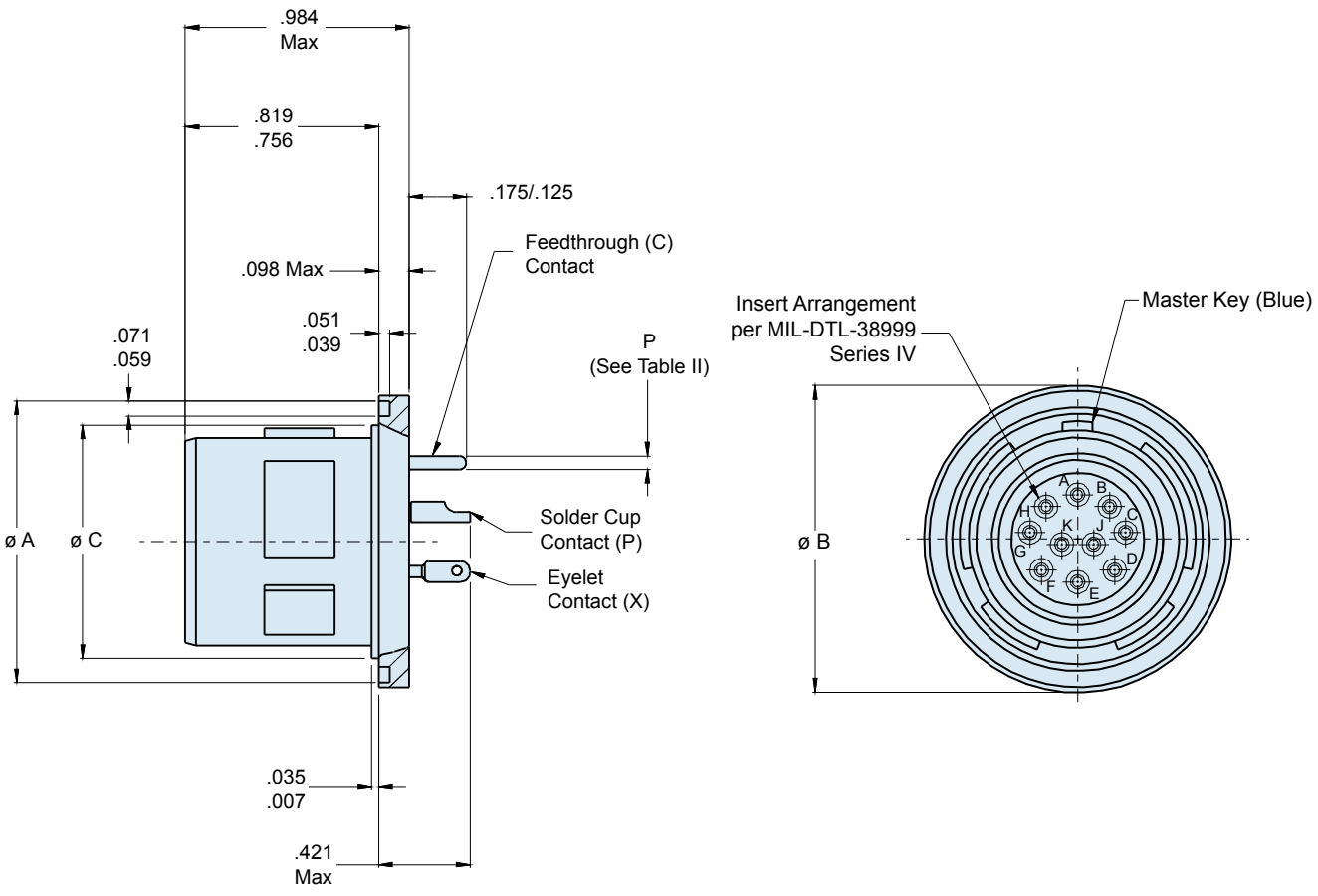
Shell Style
/48 - Weld Mount

Shell Size

B - 11	*F - 19*
C - 13	*G - 21*
D - 15	*H - 23*
E - 17	*J - 25*

Contact Termination

P - Pin, Solder Cup	*S - Socket, Solder Cup*
X - Pin, Eyelet	*Z - Socket, Eyelet*
C - Pin, PCB Flex Feedthrough	*D - Socket, PCB Flex Feedthrough*



Consult Factory for Recommended Panel Cutout Dimensions

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D38999/48
Weld Mount Hermetic Receptacle
MIL-DTL-38999 Series IV

How To Order: *Commercial*

Connector Series	Shell Style	Shell Size	Contact Termination
234 - Series IV Type	*H8 - Hermetic Weld Mount*	*11,13,15,17,19,21,23,25*	*P - Pin, Solder Cup* *S - Socket, Solder Cup* *X - Pin, Eyelet* *Z - Socket, Eyelet* *C - Pin, PCB* *D - Socket, PCB*

234 - 100 - H8 Z1 11 - 35 P N

Connector Type	Connector Material / Finish	Insert Arrangement	Alternate Key Position
100 - Hermetic Receptacle	*ZL - CRES, Nickel* *Z1 - CRES, Passivated*	Per MIL-STD-1560; See Pages B-2 - B-4	*A, B, C, D, K, L, M, R, U* (*N* = Normal)

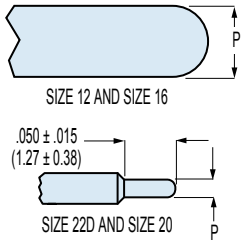
B

TABLE I: CONNECTOR DIMENSIONS

SHELL SIZE CODE	SHELL SIZE	ø A	ø B	ø C
B	11	1.035 (26.3) 1.024 (26.0)	1.106 (28.1) 1.094 (27.8)	.793 (20.1) .778 (19.8)
C	13	1.161 (29.5) 1.150 (29.2)	1.232 (31.3) 1.220 (31.0)	.919 (23.3) .904 (23.0)
D	15	1.287 (32.7) 1.276 (32.4)	1.358 (34.5) 1.346 (34.2)	1.044 (26.5) 1.029 (26.1)
E	17	1.374 (34.9) 1.362 (34.6)	1.445 (36.7) 1.433 (36.4)	1.170 (29.7) 1.155 (29.3)
F	19	1.520 (38.6) 1.508 (38.3)	1.591 (40.4) 1.579 (40.1)	1.294 (32.9) 1.279 (32.5)
G	21	1.661 (42.2) 1.650 (41.9)	1.732 (44.0) 1.720 (43.7)	1.419 (36.0) 1.404 (35.7)
H	23	1.827 (46.4) 1.815 (46.1)	1.898 (48.2) 1.886 (47.4)	1.544 (39.2) 1.529 (38.8)
J	25	1.913 (48.6) 1.902 (48.3)	1.984 (50.4) 1.972 (50.1)	1.669 (42.4) 1.654 (42.0)

TABLE II: CONTACT SIZE

PRINTED CIRCUIT TAIL CONFIGURATIONS
CONTACT STYLE C AND D



Contact Size	ø P
22D	.011 (0.28) .015 (0.38)
20	.024 (0.61) .028 (0.71)
16	.0635 (1.61) .0615 (1.56)
12	.095 (2.41) .093 (2.36)

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257-333
Hermetic Jam Nut Receptacle with Crimp Removable Socket Contacts
MIL-DTL-38999 Series III Type

Basic Number	Shell Size	Contact Style	Finish	Insert Arrangement	Alternate Key Position
257-333	P	17 - 8	P		A

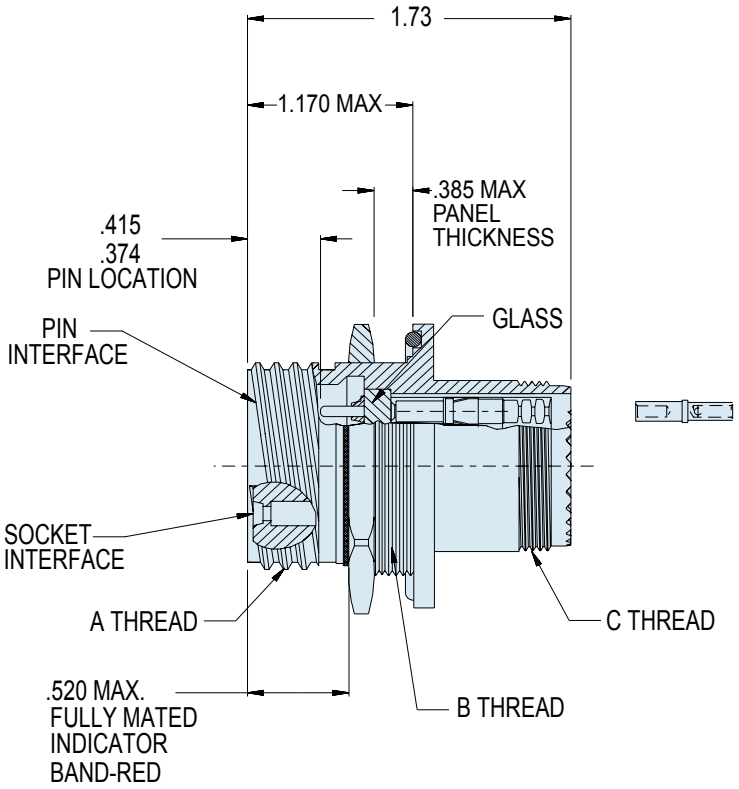
Shell Size
A - 9
B - 11
C - 13
D - 15
E - 17
F - 19
G - 21
H - 23
J - 25

Contact Style
P - Pin Contacts
S - Socket Contacts

Finish
(See Note 2)

Insert Arrangement
Per MIL-STD-1560;
See Pages B2 - B4

Alternate Key Position
A, B, C, D or E
(N for Normal)



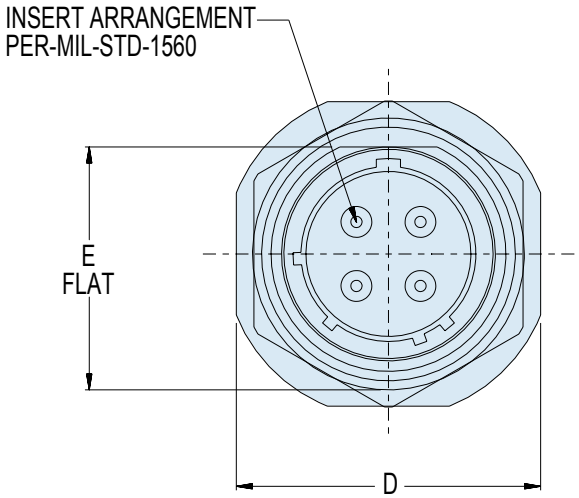


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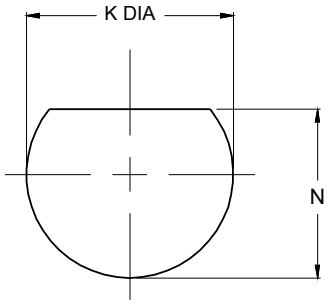
TABLE I (CONTINUED): CUT-OUT DIMENSIONS		
SHELL SIZE CODE	K DIA ±.005 (0.1)	N +.000 -.002 (.05)
A	.698 (17.7)	.698 (17.7)
B	.830 (21.1)	.830 (21.1)
C	1.015 (25.8)	1.015 (25.8)
D	1.140 (29.0)	1.140 (29.0)
E	1.265 (32.1)	1.265 (32.1)
F	1.390 (35.3)	1.390 (35.3)
G	1.515 (38.5)	1.515 (38.5)
H	1.640 (41.7)	1.640 (41.7)
J	1.765 (44.8)	1.765 (44.8)



Recommended Panel Cut-Out

TABLE I: CONNECTOR DIMENSIONS						
SHELL SIZE	SHELL SIZE CODE	A THREAD	B THREAD	C THREAD	D +/- .016 (MM)	E +/-.004-.006 (MM)
9	A	.6250-.1P.3L-TS-2A	M17x1-6g 0.100R	M12x1-6g 0.100R	1.062 (2.70)	0.651 (1.65)
11	B	.7500-.1P.3L-TS-2A	M20x1-6g 0.100R	M15x1-6g 0.100R	1.252 (3.18)	0.751 (1.91)
13	C	.8750-.1P.3L-TS-2A	M25x1-6g 0.100R	M18x1-6g 0.100R	1.374 (3.49)	0.938 (2.38)
15	D	1.000-.1P.3L-TS-2A	M28x1-6g 0.100R	M22x1-6g 0.100R	1.500 (3.81)	1.062 (2.70)
17	E	1.1875-.1P.3L-TS-2A	M32x1-6g 0.100R	M25x1-6g 0.100R	1.626 (4.13)	1.187 (3.01)
19	F	1.250-.1P.3L-TS-2A	M35x1-6g 0.100R	M28x1-6g 0.100R	1.811 (4.60)	1.312 (3.33)
21	G	1.375-.1P.3L-TS-2A	M38x1-6g 0.100R	M31x1-6g 0.100R	1.937 (4.92)	1.437 (3.65)
23	H	1.500-.1P.3L-TS-2A	M41x1-6g 0.100R	M34x1-6g 0.100R	2.063 (5.24)	1.562 (3.97)
25	J	1.625-.1P.3L-TS-2A	M44x1-6g 0.100R	M37x1-6g 0.100R	2.189 (5.56)	1.687 (4.28)

APPLICATION NOTES

1. Assembly to be identified with Glenair's name and part number and date code, space permitting.
2. Material/finishes:
   Shell Receptacle, Jam Nut – CRES Passivated (Z1), CRES/NI (P)
   Pin Contact – alloy 52 / gold plated
   Socket Contact – copper alloy / gold plated
   Insulator – fused vitreous glass / N.A.
   Insulators – high grade rigid dielectric
   Seals—fluorosilicone / N.A.
3. Crimp removable socket contacts to conform to:
   MIL-C-39029/57-358 – size 16;
   MIL-C-39029/57-357 – size 20;
   and MIL-C-39029/57-354 – size 22D (supplied loose)
   Supply 1 extra contact for each size used.

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