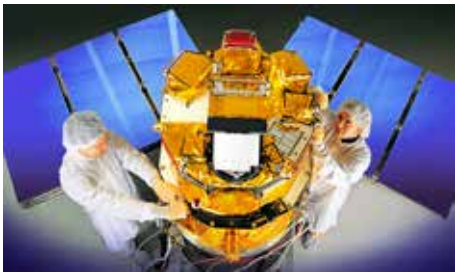
Glenair®

Series 79 Micro-Crimp Connectors for Space Flight



Micro-D connectors are a popular choice for space flight. Their small size and reduced weight, combined with excellent shock and vibration performance, has led to their widespread use on space vehicles. The Micro-Crimp connector brings the benefits of a crimp, rear-release contact system to the Glenair Micro-D family. Connectors can be terminated onto complicated, multi-branch wiring harnesses without splicing or soldering.

Five things you should know about Series 79 connectors for space flight

***1 Material Selection:** What materials are approved for space-grade connectors? What materials are prohibited? Does the Series 79 connector contain space-approved materials?*

***2 Outgassing:** What is outgassing, why is it important, and how does it affect connector selection? Is special processing required to meet outgassing requirements?*

***3 Screening:** What is NASA screening and what level of screening is required?*

***4 Magnetic permeability:** Are nonmagnetic connectors required?*

***5 Cryogenic exposure:** Are these connectors suitable for -200° C. exposure?*

MICRO-CRIMP™

HOW TO ORDER SPACE GRADE SERIES 79 CONNECTORS

Step 1: Find a Standard Part Number

Electroless nickel plated shells are preferred for space flight. Cadmium plating is prohibited.

Step 2: Select a NASA Screening Level

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

Step 3: Choose Outgassing Processing

A detailed explanation of outgassing is on the following pages. The fluorosilicone rubber seals commonly used on aerospace-grade connectors such as MIL-DTL-38999 and Series 79 connectors, along with certain bonding agents and inks, do not meet NASA outgassing requirements unless the connector is specially processed. Glenair outgassing tests have shown oven baking or thermal vacuum outgassing processing are sufficient to reduce outgassing levels to NASA standards. Oven baking is more economical than thermal vacuum outgassing.

Step 4: Select the Mod 429 Code that Matches the Desired Level of Screening and Outgassing

Use the following table to choose the right modification code. Add the mod code to the connector part number. Example: 790-024PC-13ML-***429C***

NASA SCREENING LEVELS AND MODIFICATION CODES

NASA Screening Level	Special Screening Only		Special Screening Plus Outgassing Processing	
	Interfacial Seal is Installed	Interfacial Seal is Deleted	48 Hour Oven Bake 175° C.	Thermal Vacuum Outgassing 24 hrs. 125° C.
Level 1 Highest Reliability	Mod 429B	Mod 429F	Mod 429J	Mod 429C
Level 2 High Reliability	Mod 429	Mod 429D	Mod 429K	Mod 429A
Level 3 Standard Reliability	(Use standard part no.)	Mod 432	Mod 186	Mod 186M

Dimensions in Inches (millimeters) are subject to change without notice.

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Specifying Micro-Crimp Connectors for Space Flight

1 Material Selection: What materials are approved for space flight? What materials are restricted? How to choose the right materials for Series 79 Micro-Crimp connectors.

What materials are approved for space flight?

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.

What materials are prohibited?

100% tin plating shall not be used. Pure tin can grow “whiskers” which can lead to catastrophic electrical short circuits. Silver plating is prohibited because of corrosion concerns. Cadmium is prohibited because it is unstable in vacuum environments.

Specifying Series 79 connectors for space flight

Standard Series 79 connectors meet NASA guidelines for material selection. Specify “M” for aluminum shells with electroless nickel finish. The table below lists Series 79 materials.

SERIES 79 CONNECTOR MATERIALS APPROVED FOR SPACE FLIGHT

Component	Material	Notes
Shells	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
Retention Clips	Beryllium copper, heat-treated, unplated	Approved for Space Flight
Grommet, Interfacial Seal	Blended fluorosilicone/silicone elastomer, 30% silicone per ZZ-R-765, 70% fluorosilicone per MIL-R-25988	Requires outgassing processing
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
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

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Specifying Micro-Crimp Connectors for Space Flight

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

What is outgassing?

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

How is outgassing measured?

The space industry has adopted a standardized test procedure, ***ASTM E 595***, to evaluate out-gassing properties of polymers. Small samples of material are heated to 125° C. at a vacuum of 5 X 10^{-5} torr for 24 hours. Then the sample is weighed to calculate the ***Total Mass Loss*** (TML).

The TML cannot exceed 1.00% of the total initial mass. During the test, outgassed matter condenses on a cooled collector plate. The quantity of outgassed matter is caluclated to determine the ***Collected Volatile Condensable Material*** (CVCM). The CVCM cannot exceed 0.10% of the original specimen mass.

Is special outgassing processing necessary on Series 79 connectors?

NASA states “A bakeout for outgassing control is driven by the application and may be required where tight contamination control must be maintained.” NASA generally recommends that connectors undergo outgassing processing. This processing can be performed by Glenair; however, some customers prefer to fabricate higher level subassemblies before outgassing processing is performed.

Outgassing At-a-Glance

- Fluorosilicone rubber components used in Micro-Crimp connectors, such as o-rings, grommets and seals already exceed NASA outgassing limits.
- NASA nevertheless recommends additional processing to reduce outgassing of all materials to minimal levels.
- An inexpensive oven bakeout delivers excellent results compared to thermal vacuum outgassing. The high temperature of the oven bakeout effectively removes volatile materials.
- Glenair 429 mod codes provide easy ordering, whichever outgassing option is required.

OUTGASSING PROPERTIES OF MATERIALS USED IN SERIES 79 CONNECTORS

Component	Material	TML %	TCVML %	Test Reference
Front and Rear Insulator, right angle PCB Trays	Liquid Crystal Polymer Vectra C130	0.03	0.0	NASA Test # GSC17478
Rear Grommet Interfacial 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
PCB Trays (Machined Ultem)	Polyetherimide, Ultem 2300	0.43	0.01	NASA Test GSC19820
White Epoxy Ink for Silkscreening	Markem 7224 White	0.49	0.03	NASA Test #GSC19899
Potting Compound, PC Tail Connectors	Hysol C9-4215	0.48	0.01	Glenair Test
Panel Gasket	Silver-filled Fruorosilicone, Cho-Seal 1287	0.63	0.03	NASA test GSC15165

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3 Screening: What is NASA screening and what level of screening is required?

What is NASA screening?

NASA specification EEE-INST-002 provides instructions on selecting, screening and qualifying parts for use on NASA GSFC space flight projects. Table 2C in the NASA specification contains inspection instructions for MIL-DTL-83513 Micro-D connectors. Series 79 connectors are similar to M83513 connectors, so Table 2C applies by similarity to Series 79 connectors.

What screening level is required?

NASA defines three levels of screening: level 1 for highest reliability, level 2 for high reliability, and level 3 for standard reliability. Level 3 equates to standard lot acceptance inspection. Levels 1 and 2 call for additional testing.

What about qualification requirements?

Projects using connectors covered by military specifications are typically able to waive qualification testing. The Series 79 connector is not covered by a military specification. Projects considering using the Series 79 for space flight should obtain guidance from the overseeing space agency regarding the suitability of this connector and any testing that might be recommended.

NASA EEE-INST-002 SCREENING REQUIREMENTS

Inspection/ Test	NASA Level 1	NASA Level 2
Visual Inspection	100%	100%
Mechanical	2 pcs.	2 pcs.
Voltage (DWV)	2 pcs.	2 pcs.
Insulation Resistance	2 pcs.	2 pcs.
Mating and Unmating Force	2 pcs.	N/A
Contact Engagement and Separation Force	2 pcs.	N/A
Air leakage (Hermetic connectors only)	100%	100%
Solderability/Resistance to Soldering Heat	2 pcs.	N/A

1. NASA screening requirements from Table 2 of EEE-INST-002 Screening Requirements.

4 Magnetic Permeability: Are nonmagnetic connectors required?

What about ferromagnetic materials?

Spacecraft designers generally avoid the use of ferromagnetic materials, which can become magnetized and can interfere with sensitive instruments. Series 79 environmental connectors have a maximum permeability of 2 mu.

5 Cryogenic exposure: Space programs sometimes need cryogenic connectors capable of withstanding temperatures as low as -270° C. Can Series 79 connectors operate satisfactorily at this temperature?

What about low temperature ranges?

Series 79 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)".

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