

ENVIRONMENTAL AND HERMETIC SERIES 23

Space-grade Guidelines

Outgassing

Space flight equipment requires low-outgassing components in order to prevent degradation to optics and other sensitive instruments. MIL-DTL-38999 connectors contain nonmetallic materials such as rubber, plastic, adhesives and potting compounds which can give off gasses when subjected to a vacuum or high heat. Unless the connector is specially processed, the TML and CVCM can exceed allowable limits. The space industry has adopted a standardized test procedure, ASTM E595, to evaluate outgassing properties. The MIL-DTL-38999 specification Class G also details specific TVM and CVCM values. Glenair's 186T modification code, for example, requires connectors and connector materials to be heated to 175° C at a vacuum of 5×10^{-6} torr for 48 hours. A similar process is used for hermetic connector to meet Class H requirements. Items under test are then weighed to calculate the Total Mass Loss (TML), which may not exceed 1.0% of the total initial mass. A collector plate is used to determine the Collected Volatile Condensable Material (CVCM), which may not exceed 0.1% of the total original specimen mass. Glenair is able to offer both NASA as well as D38999 Class G or H bakeout processes which assure all materials comply with their respective standards. Glenair is now also a QPL supplier of Series IV, environmental, Class G connectors.

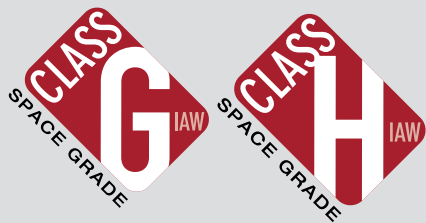
Note on Connector Material and Finish Options

Some types of metals are prohibited for space flight. "Cadmium, zinc, chemically coated cadmium, zinc or silver shall not be used as a connector or contact finish" (NASA EEE-INST-002 Instructions for EEE Parts Selection, Screening, Qualification, and Derating). NASA recommends passivated stainless steel, electroless nickel or gold finish on connector shells and gold finish for contacts.



- QPL supplier of Series IV Class G connectors
- Modification codes may be added to Environmental COTS Part Number Development for bakeout and thermal vacuum outgas processing to meet MIL-DTL-38999 Class G requirements
- Modification code H may be added to Hermetic COTS Part Number Development for bakeout and thermal vacuum outgas processing to meet MIL-DTL-38999 Class H requirements

COTS EQUIVALENT MIL-DTL-38999 Series III and IV Class G (and NASA screening) Space-grade application guidelines for commercial part numbers



NASA and Class G and H Screening

The MIL-DTL-38999 specification defines TML and CVCM values for Class G and H space flight. Glenair modification code 186T assures that our commercial parts are outgassed to meet the **Class G** and **Class H** requirements for outgassing

Additionally NASA recommends that connectors for space flight be specially screened. NASA EEE-INST-002 instructions for EEE parts selection, screening, qualification, and derating contains three levels of screening for space-grade components. These outgassing and screening modification codes are listed at right.

- **“Mission critical” connectors for space flight should undergo rigorous 100% final inspection**
- **Modification codes are available to invoke special screening for both MIL-DTL-38999 and NASA applications**

Important:

when Class G (space grade) connector is required modification code **186T** and finish option **MA** must both be indicated in part number development for proper processing to occur.

If Class H hermetic (space grade) connector is required modification code **186T** and finish option **Z1** must both be indicated in part number development for proper processing to occur.

Specifying Appropriate NASA Screening

- 1 Choose a NASA EEE-INST-002 Table 2A screening level.** This table contains three screening levels: **Level 1** for missions requiring the highest reliability and lowest level of risk, **Level 2** for low to moderate risk missions, and **Level 3** missions where enhanced screening and inspection is not invoked.
- 2 Choose outgassing process and/or NASA inspection requirements.** 9 options are available for NASA outgassing, see Table I for details. Cross reference Table II for inspections completed by screening level as required by NASA standards.
- 3 Select the modification code and proper finish code** from the table and add it to the part number, for example, Environmental: 233-105-26**MA**11-35PN**186T** or Hermetic: or 233-100-H7**Z1**11-35PN**186T**.

Screening	No Outgas Processing	48 Hour Oven Bake 175° C 100% Screened	Thermal Vacuum* Outgassing 24 Hour 125° C 100% Screened	Thermal Vacuum* Outgassing 48 Hour 175° C 100% Screened	Mod Code
None			●		186M (ASTM E595) 186T (Class G or H)
3			●		429L
2	●		●		429
		●			429A 429K
1	●		●		429B
			●		429C
		●			429J

*Thermal vacuum of 10⁻⁷ Torr.

Inspection	Level 1	Level 2	Level 3
Visual	100%	100%	100%
Mechanical	2(0)	2 (0)	
Dielectric Withstanding Voltage	2 (0)	2 (0)	
Insulation Resistance	2 (0)	2 (0)	
Contact Engagement & Separation Force	2 (0)		
Hermeticity (Sealed Receptacles Only)	100%	100%	
Coupling Force	2		
Outgassing	100%	100%	100%

Note: required inspection quantity shown. Zero acceptance of failures allowed for all quantities inspected. Inspection is not performed/required for MIL-DTL-38999, Class G