

Product Specification Series 80 "Mighty Mouse" Connectors



CONNECTORS, ELECTRICAL, CIRCULAR, MINIATURE, ENVIRONMENTAL,
RECEPTACLES AND PLUGS, GENERAL SPECIFICATION FOR



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1 SCOPE

- 1.1 Scope. This specification covers performance requirements for Glenair Series 80 “Mighty Mouse” miniature circular connectors for aerospace and harsh environment applications.
- 1.2 Description. Series 80 connectors with size 23 contacts, environmental sealing, crimp, solder cup or printed circuit board termination, aluminum and corrosion resistant steel shells and coupling nuts, crimp rear-release or non-removable contacts, hermetic versions, threaded, push-pull and bayonet coupling mechanisms, and filtered versions.

2 ORDER OF PRECEDENCE

- 2.1 Order of precedence. In the event of a conflict between the requirements of this specification and the references cited herein, this document takes precedence. The requirements set forth in customer specifications and Glenair detail drawings shall take precedence over this document.

3 REQUIREMENTS

- 3.1 Materials and finishes. Materials and finishes shall be in accordance with Table 1 Materials and Table 2 Finishes, unless otherwise specified in detail drawings. Materials and finishes shall be selected to insure the connector is capable of meeting the performance requirements of this specification.

**Table 1
Materials and Finishes**

Aluminum Shell, Barrel, and Coupling Nut	Aluminum alloy 6061 per ASTM B211
Stainless Steel Shell, Barrel Coupling and Jam Nut	Stainless steel per AMS-QQ-S-763
Front and Rear Insulators	Glass-filled liquid crystal polymer (LCP) in accordance with MIL-M-24519, Type GLP-30F
Contact Retention Clip	Beryllium copper, heat-treated, unplated
Grommet, Peripheral Seal and Interfacial Seal	Blended fluorosilicone/silicone elastomer, 30% silicone per ZZ-R-765, 70% fluorosilicone per MIL-R-25988
Hermetic Insert	Vitreous glass
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
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	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.
Socket Contact Hood	Stainless steel, passivated per AMS-QQ-P-35
Adhesives	Silicone and epoxy
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.
Filter Element	Multilayer Ceramic Planar Array, ferrite inductors

Table 2
Finishes for Connector Shell and Nut

	Plating Code	Finish	Specification
Aluminum Shell, Barrel, Coupling Nut and Jam Nut	M	Electroless Nickel	AMS-C-26074
	NF	Olive Drab Cadmium over Electroless Nickel	AMS-QQ-P-416, over AMS-C-26074
	ZN	Olive Drab Zinc-Nickel	Zinc alloy per ASTM B841-91, Class 1 Type E Grade 3 over Electroless nickel per ASTM B733-90 SC2, Type 1 Class 5 (500 Hour Salt Fog)
	ZNU	Zinc Nickel, Black	Zinc alloy per ASTM B841-91, Class 1 Type E Grade 3 over Electroless nickel per ASTM B733-90 SC2, Type 1 Class 5 (500 Hour Salt Fog)
	C	Black Anodize	MIL-A-8625, Type II Class 2
Stainless Steel Shell, Barrel, Coupling Nut and Jam Nut	Z1	Passivate	AMS-QQ-P-35
	ZB	Olive Drab Cadmium	AMS-QQ-P-416
	ZC	Black Chromate over Zinc Cobalt	ASTM B841-91
	ZM	Electroless Nickel	AMS-C-26074

3.2 Electrical performance requirements.

3.2.1 Insulation resistance.

3.2.1.1 Insulation resistance at ambient temperature. 5,000 megohms minimum between any pair of contacts and any contact and the shell when tested in accordance with EIA-364-21.

3.2.1.2 Insulation resistance at elevated temperature. 200 megohms minimum between any pair of contacts and any contact and the shell, when tested in accordance with EIA-364-21. Temperature shall be the maximum operating temperature stated in paragraph 3.4.1

3.2.2 Dielectric withstanding voltage.

3.2.2.1 Dielectric withstanding voltage (sea level). 500 volts ac, rms 60 Hz. Connectors shall show no evidence of breakdown or flashover when subjected to the DWV test of EIA-364-20.

3.2.2.2 Dielectric withstanding voltage (70,000 feet). 100 volts ac, rms 60 Hz. Connectors shall show no evidence of breakdown or flashover when subjected to the DWV test of EIA-364-20.

3.2.3 Contact resistance. The voltage drop of a mated pair of contacts attached to wires shall not exceed the values shown in Table 3 when tested in accordance with EIA-364-06, using M22759/11 silver-plated copper wire (six inches between probes of voltmeter).

**Table 3
Contact Resistance**

Contact Material	Wire Size	Test Current amperes	Maximum Voltage Drop (millivolts) 25° C
Copper Alloy	12	23	42
	14	17	40
	16	13	49
	20	7.5	55
	22	5	73
	24	3	45
	26	2	52
	28	1.5	54

3.2.4 Low-signal level contact resistance (dry circuit). Contact resistance shall not exceed the values in table 4 when tested in accordance with EIA-364-23.

**Table 4
Low-Level Signal Contact Resistance**

Wire Size	Maximum Contact Resistance (milliohms)	
	Initial Condition	After Conditioning
16	5	6
20	9	11
22	15	17
24	20	23
26	31	38
28	50	60

3.2.5 Current rating.

3.2.5.1 Current rating at ambient temperature, unconfined.

**Table 5
Maximum Contact Current Rating**

Contact Size	Amperes
12	23
16	13
20HD	7.5
23	5

3.2.6 Shell-to-shell conductivity. The maximum voltage drop across a mated pair of connectors shall not exceed the values shown in Table 6 when tested in accordance with EIA-364-83, for connectors with electroless nickel plating or olive drab cadmium plating.

Table 6
Shell-To-Shell Conductivity

Series	Maximum Millivolt Drop	
	Initial Condition	After Conditioning (Salt Spray)
800	10	20
801	10	20
802	10	20
803	100	200
804	2	4
805	2	4

3.2.7 EMI shielding effectiveness. The EMI shielding effectiveness of mated connectors with electroless nickel plating shall not be less than the values specified in Table 7, when tested in accordance with MIL-DTL-38999 para. 4.5.27.

Table 7
EMI Shielding Effectiveness

Frequency	Leakage Attenuation, dB Minimum					
	Connector Series					
	800	801	802	803	804	805
100 MHz	75	75	75	60	80	90
200 MHz	70	70	70	55	76	88
300 MHz	65	65	65	55	73	88
400 MHz	63	63	63	50	68	87
800 MHz	58	58	58	45	64	85
1GHz	55	55	55	40	60	80
3GHz	50	50	50	---	55	75
6GHz	45	45	45	---	45	65
10GHz	40	40	40	---	40	60

3.2.8 Transfer impedance. Mated connectors shall be capable of meeting the requirements of FCC docket 20780 Part 15 Subpart J governing emission limits for Class A (office) electronic equipment.

3.2.9 Magnetic permeability. 2.0 μ maximum.

3.2.10 Insertion loss, filter connectors. When tested in accordance with MIL-STD-220, at 25° C. with no load, the insertion loss shall meet the requirements of Table 8.

Table 8
Insertion Loss, Filter Connectors

Frequency	Insertion Loss, dB Min, 25°C., C Filter						
	Filter Class						
	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
Frequency	Insertion Loss, dB Min., 25°C., Pi Filter						
	Filter Class						
	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

3.2.11 Capacitance, filter connectors. Capacitance shall meet the requirements of Table 6 when tested at 25°C., 1kHz, 1.0 VAC RMS.

Table 9
Capacitance, Filter Connectors

Filter Class	Capacitance, C Filter (pF)	Capacitance, Pi filter (pF)
A	19000-28000	38000-56000
B	16000-22500	32000 – 45000
C	9000-16500	18000 – 33000
D	4000-6000	8000 – 12000
E	1650-2500	3300 – 5000
F	400-650	800 – 1300
G	200-300	400 - 600

3.3 Mechanical requirements.

3.3.1 Weights. Connector Weights are published in the Series 80 Catalog

3.3.2 Durability.

3.3.2.1 Durability for Series 800, 801, 802, 804. Connectors shall withstand 2000 cycles of mating without mechanical or electrical degradation.

3.3.2.2 Durability for Series 803. Connectors shall withstand 250 cycles of mating.

3.3.3 Contact engaging and separation force. Contacts shall meet the force requirements of SAE AMS39029 Table IX, when tested in accordance with EIA-364-37.

3.3.3.1 Contact engaging and separation force (initial)

3.3.4 Contact retention. Contacts shall withstand the axial force specified in Table 10 without exceeding the .012 inch (0.30 mm) displacement when tested in accordance with EIA-364-29 method B.

**Table 10
Contact Retention**

Contact Size	Load \pm 10% in Pounds
12	25
16	25
20HD	15
23	6

3.3.5 Crimp joint strength. Contacts shall meet the wire pull forces in table 11 when crimped to silver-plated copper wire in accordance with MIL-W-22759/11.

**Table 11
Crimp Joint Strength**

Wire Size	Pull Force in Pounds
12	110
14	70
16	50
20	20
22	12
24	8
26	5
28	3

3.3.6 Torque.

Table 12
Recommended Torque

Shell Size	Coupling Torque				Jam Nut Tightening				Backshell Tightening			
	In-Lbs.		NM		In-Lbs.		NM		In-Lbs.		NM	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
5	35	45	4.0	5.1	30	40	3.4	4.5	25	35	2.8	4.0
6	40	50	4.5	5.7	35	45	4.0	5.1	30	40	3.4	4.5
7	40	50	4.5	5.7	35	45	4.0	5.1	35	45	4.0	5.1
8	40	50	4.5	5.7	35	45	4.0	5.1	35	45	4.0	5.1
9	45	55	5.1	6.2	35	45	4.0	5.1	35	45	4.0	5.1
10	50	60	5.7	6.8	45	55	5.1	6.2	40	50	4.5	5.7
12	50	60	5.7	6.8	45	55	5.1	6.2	40	50	4.5	5.7
14	55	65	6.2	7.3	45	55	5.1	6.2	40	50	4.5	5.7
15	55	65	6.2	7.3	45	55	5.1	6.2	40	50	4.5	5.7

3.3.7 Insert retention. Unmated connectors shall retain their inserts in their proper location in the shell and there shall be no cracking or loosening when an axial force is applied to the mating face of the insert per the values shown in Table 13, when tested in accordance with EIA-364-35.

Table 13
Insert Retention

Shell Size	Minimum force in Pounds
5	25
6	25
7	25
9	25
12	30
14	45
15	50

3.3.8 Unmating force, Series 804 push-pull. The force required to unmate Series 804 quick-disconnects shall be as specified in Table 14.

Table 14
Series 804 Unmate force

Layout	Average force in Pounds
5-3	10.6
6-4	10.8
6-7	11.4
7-10	12.0
8-13	12.6
9-19	13.8
10-26	15.2
12-37	17.4
14-55	21.0
15-85	27.0

3.4 Environmental requirements.

3.4.1 Operating temperature.

3.4.1.1 Operating temperature, environmental and hermetic Connectors: Connectors shall be capable of performing satisfactorily when operated at a temperature range of -65° C. to +150° C..

3.4.1.2 Operating temperature, filter connectors: Connectors shall be capable of performing satisfactorily when operated at a temperature range of -55° C. to +125° C.

3.4.2 Corrosion resistance (salt fog). Following exposure to the salt fog requirement of EIA-364-26, connectors shall exhibit no corrosion sites or other defects detrimental to the function of the connector.

**Table 15
Corrosion Resistance**

Shell Material	Plating Code	Shell Finish	Test Condition	Length of Exposure (Hrs.)
Aluminum	M	Electroless Nickel	B	48
	NF	Olive Drab Cadmium-Nickel	C	500
	ZN	Olive Drab Zinc-Nickel	C	500
	ZNU	Zinc Nickel, Black	C	500
	C	Black Anodize	B	48
Stainless Steel	Z1	Passivate	D	1000

3.4.3 Sand and dust. Connectors shall be able to withstand the effects of blowing sand and dust test specified in MIL-STD-810, Method 510.4.

3.4.4 Thermal shock. Connectors shall be able to withstand rapid changes in temperature from the minimum operating temperature to the maximum recommended operating temperature. Connectors shall be considered capable of meeting this requirement if they are successfully subjected to 5 cycles as defined in EIA-364-32, with each cycle consisting of the following steps:

- Step 1: 60 minute duration -65° C.
- Step 2: 2 minute duration Transition from -65° to +150°C.
- Step 3: 60 minute duration 150° C.
- Step 4: 2 minute duration Transition from +150° to -65°C.

3.4.5 Altitude immersion: A mated pair of connectors shall be capable of meeting 500 VAC dielectric withstanding voltage and 1000 megohms insulation resistance requirements during and subsequent to simulated exposure to condensation caused by three cycles of rapid descent from 40,000 feet altitude. EIA-364-03 shall define the test procedure.

3.4.6 Altitude –low temperature: Connectors shall be able to withstand concurrent exposure to -65° low temperature and 40,000 feet altitude for a 1 hour duration, when tested in accordance with EIA-364-105. Wired, mated connectors shall not exhibit voltage breakdown between the connector shell and contacts with 100 VAC applied to all contacts in series.

3.4.7 Immersion.

- 3.4.7.1 Immersion, Series 800,801, 804 and 805.
Mated connectors shall be able to withstand 1 hour immersion in fresh water at a depth of 1 meter.
- 3.4.7.2 Immersion, Series 803.
Series 803 connectors are not required to meet immersion requirements.
- 3.4.8 Air leakage. Hermetic connectors shall meet an air leakage requirement of less than 1×10^6 cc/sec of helium at a pressure differential of 1 atmosphere (30 PSI). The test procedure is defined in MIL-STD-1344 method 1008.1.
- 3.4.9 Outgassing. The entire connector assembly shall be capable of meeting a maximum Total Mass Loss (TML) of 1% and a Total Collected Volatile Material Loss (TCVML) of 0.1% when tested in accordance with ASTM-E595, following additional processing for outgassing control. This additional processing, when invoked by customer purchase order requirements, customer specification or Glenair modification code, shall consist of the following:
Fully assembled connectors shall be baked out for 24 hours at a temperature of +125°C and a vacuum of 10-6 Torr.
Table 16 provides detailed information regarding the outgassing characteristics of the non-metallic materials.

Table 16
Outgassing Properties of Non-Metallic Materials

Component	Material	TML %	TCVML %	Test Reference
Front and Rear Insulator	Liquid Crystal Polymer Vectra C130	0.03	0.0	NASA Test # GSC17478
Front and Rear Insulator 3, 4 and 7 pin	Epoxy Epiall 1908	0.84	0.00	NASA Test GSC15435
Rear Grommet	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
Interfacial Seal		0.48	0.14	
Peripheral Seal, Receptacle		0.48	0.14	
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, Clear, 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	Scotch Weld Epoxy #2214 Gray	0.77	0.02	NASA Test # GSFC3835
O-Ring	Flourosilicone Rubber	TBD	TBD	
White Epoxy Ink for Silkscreening	Markem 7224 White	0.49	0.03	NASA Test #GSC19899
Black Ink for Part Number Identification	Videojet #16-5600Q	TBD	TBD	
Potting Compound, Solder Cup and PC Tail Connectors	Stycast epoxy 2651/Catalyst 9	0.31	0.03	Mfgr Data Sheet
Potting Compound, Filter Receptacles	Stycast epoxy, 2850FT/Catalyst 11	0.29	0.02	Mfgr Data Sheet

- 3.4.10 Vibration. Connectors shall be capable of withstanding the following sine and random vibration requirements with no discontinuities greater than 1 microsecond.

- 3.4.10.1 Vibration, random. Connectors shall be able of withstanding the random vibration test defined in EIA-364-28 Condition V Letter I with the following details:
 Duration: 4 hours each of three axes
 Temperature: ambient
 Frequency range: 50 Hz to 2000 Hz.
 37.8 g RMS
- 3.4.10.2 Vibration, sine. Connectors shall be subjected to the sine vibration test of MIL-STD-202 Method 204 Condition G. 12 sweep cycles per axis, 20 minutes per 10-2000-10Hz sweep cycle.
- 3.4.11 Shock. Connectors shall be capable of meeting the shock requirement specified in EIA-364-27. 300 g. half-sine, 3 millisec. duration, 3 axes. No discontinuities greater than 1 microsecond, no visible signs of damage.
- 3.4.12 Acceleration: Wired, mated connectors shall be able to withstand 50g acceleration with no circuit interruption greater than 1 microsecond. MIL-STD-1344 Method 2011-1 Test Condition A shall apply.
- 3.4.13 Gunfire Vibration: Wired, mated connectors shall be able to withstand the simulated effects of gunfire vibration when tested in accordance with MIL-STD-810F Method 519.5. The frequency and amplitude shall approximate close proximity to the M230 chain gun deployed on an AH-64 Apache helicopter.
- 3.4.14 Fungus. Connector materials shall resist microbial deterioration caused by fungus growth when tested per MIL-STD-810, Method 508.5
- 3.4.15 Contamination by Fluids. Connectors shall withstand intermittent exposure to the fluids shown in Table 17 when tested per MIL-STD-810 method 504. Unmated connectors shall withstand complete immersion in the specified fluid without excessive swelling, damage or distortion to dielectric materials including seals, grommets and insulators.

Table 17
Contamination by Fluids

Contaminant Fluid Group	Test Fluid	Test Fluid Temperature +/-2° C.	Immersion Duration (Hrs.)
Fuels	Kerosene	JP-4 (NATO F40)	70
	Gasoline	ASTM 4814	ambient
Hydraulic Oils	Mineral oil based	MIL-H-5606	70
Solvents and Cleaning Fluids	Isopropyl alcohol		ambient
De-icing Fluids	25% urea/ 25% ethylene glycol in water		ambient

- 3.4.16 Humidity. Fully wired, mated connectors shall be able to withstand high humidity environments at varying temperatures without degradation. Connectors shall be considered to be able to meet this requirement if subjected to the humidity test of MIL-EIA-364-31, Method IV. Connectors shall show no evidence of deterioration and shall be tested for insulation resistance. The minimum insulation resistance shall be 100 megohms.
- 3.4.17 Hydrostatic pressure rating. Series 802 connectors shall be capable of meeting a hydrostatic pressure rating of 3500 PSI (241 bar) fully mated.
- 3.4.18 Open face pressure rating. Hermetic receptacles shall be capable of meeting 1000 PSI (68 bar) pressure in an unmated condition.