

Grace Inertia (GI) 3.5W 8-12P Connector

1. INTRODUCTION

1.1. Purpose

Testing was performed on Grace Inertia (GI) 3.5W 8-12P Connector to determine its conformance to the requirements of product specification 108-5810 Revision C2.

1.2. Scope

This report covers the electrical, mechanical, and environmental performance of Grace Inertia (GI) 3.5W 8-12P Connector. Testing was performed at the Shanghai Electrical Components Test Laboratory. The test file number for this testing is on file and maintained at the TE Shanghai Electrical Components Test Laboratory under TP-20-02029-RECORD, TP-20-02041-RECORD, TP-20-02042-RECORD, TP-20-02753-RECORD and TP-21-00494-RECORD.

1.3. Conclusion

All part numbers listed in Paragraph 1.4 conformed to the electrical, mechanical, and environmental performance requirements of product specification 108-5810 Revision C2.

1.4. Test Specimens

Test Group	Quantity	Part Number	Description
1	5	2357089-1	GI 3.5W PLUG 8P
	5	2357090-1	GI 3.5W CAP 8P
	5	2357092-1	GI 3.5W PLUG 10P
	5	2357093-1	GI 3.5W CAP 10P
	5	2357095-1	GI 3.5W PLUG 12P
	5	2357096-1	GI 3.5W CAP 12P
	140	1565079-1	GI 3.5 REC CONTACT(L)_20AWG
	140	1565080-1	GI 3.5 TAB CONTACT(L)_20AWG
2	3	2357089-1	GI 3.5W PLUG 8P
	3	2357090-1	GI 3.5W CAP 8P
	3	2357092-1	GI 3.5W PLUG 10P
	3	2357093-1	GI 3.5W CAP 10P
	3	2357095-1	GI 3.5W PLUG 12P
	3	2357096-1	GI 3.5W CAP 12P
	90	1565079-1	GI 3.5 REC CONTACT(L)_20AWG
	90	1565080-1	GI 3.5 TAB CONTACT(L)_20AWG
3	15	2357089-1	GI 3.5W PLUG 8P
	15	2357090-1	GI 3.5W CAP 8P

	15	2357095-1	GI 3.5W PLUG 12P
	15	2357096-1	GI 3.5W CAP 12P
	60	1565079-1	GI 3.5 REC CONTACT(L)_18AWG
	60	1565079-1	GI 3.5 REC CONTACT(L)_20AWG
	60	1612334-1	GI 3.5 REC CONTACT(S)_22AWG
	60	1612334-1	GI 3.5 REC CONTACT(S)_24AWG
	60	1612334-1	GI 3.5 REC CONTACT(S)_26AWG
	60	1565080-1	GI 3.5 TAB CONTACT(L)_18AWG
	60	1565080-1	GI 3.5 TAB CONTACT(L)_20AWG
	60	1612335-1	GI 3.5 TAB CONTACT(S)_22AWG
	60	1612335-1	GI 3.5 TAB CONTACT(S)_24AWG
	60	1612335-1	GI 3.5 TAB CONTACT(S)_26AWG
4	3	2357089-1	GI 3.5W PLUG 8P
	3	2357090-1	GI 3.5W CAP 8P
	3	2357092-1	GI 3.5W PLUG 10P
	3	2357093-1	GI 3.5W CAP 10P
	3	2357095-1	GI 3.5W PLUG 12P
	3	2357096-1	GI 3.5W CAP 12P
	90	1612334-1	GI 3.5 REC CONTACT(S)_24AWG
	90	1612335-1	GI 3.5 TAB CONTACT(S)_24AWG
5	3	2357089-1	GI 3.5W PLUG 8P
	3	2357090-1	GI 3.5W CAP 8P
	3	2357092-1	GI 3.5W PLUG 10P
	3	2357093-1	GI 3.5W CAP 10P
	3	2357095-1	GI 3.5W PLUG 12P
	3	2357096-1	GI 3.5W CAP 12P
	90	1612334-1	GI 3.5 REC CONTACT(S)_24AWG
	90	1612335-1	GI 3.5 TAB CONTACT(S)_24AWG
6	3	2357089-1	GI 3.5W PLUG 8P
	3	2357090-1	GI 3.5W CAP 8P
	3	2357092-1	GI 3.5W PLUG 10P
	3	2357093-1	GI 3.5W CAP 10P
	3	2357095-1	GI 3.5W PLUG 12P
	3	2357096-1	GI 3.5W CAP 12P
	90	1612334-1	GI 3.5 REC CONTACT(S)_24AWG
	90	1612335-1	GI 3.5 TAB CONTACT(S)_24AWG

Figure 1

1.5. Test Sequence

Test or Examination	Test Groups (a)					
	1	2	3	4	5	6
	Test Sequence (b)					
Examination of Product	1,11	1,3	1,3	1,6,7	1,7	1,7
Low Level Contact Resistance (LLCR)	4,8			2,4,6	2,4,6	2,4
Insulation Resistance						5
Dielectric Withstanding Voltage						6
Temperature Rising			2			
Vibration (Low Frequency)				3		
Physical Shock				5		
Connector Mating Force	3,7					
Connector Un-mating Force	5,9					
Durability (Repeated Mating / Un-mating)	6					
Contact Insertion Force	2					
Contact Retention Force	10					
Housing Locking Strength		2				
Humidity-Temperature Cycling						3
Thermal Shock					3	
Heat Aging					5	


NOTE

- a) See Paragraph 1.4.
 b) Numbers indicate sequence in which tests shall be performed.

Figure 2

1.6. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15°C to 35°C
- Relative Humidity: 45% to 75%

2. SUMMARY OF TESTING

Test Group	Test Item	Test Specimen	Unit	Min	Max	Ave	Requirement	Judgment
1	Contact Insertion Force	Plug 8P	N	3.1	4.1	3.5	6.86 Max	OK
		Cap 8P		3.4	4.3	3.8		
		Plug 10P		1.4	3.7	2.9		
		Cap 10P		1.7	3.7	2.6		
		Plug 12P		3.1	4.3	3.7		
		Cap 12P		3.9	6.1	4.8		
	Connector Mating Force	Plug&Cap 8P	N	13.4	16.1	15.0	78.4 Max	OK
		Plug&Cap 10P		26.3	30.9	27.9	98.0 Max	OK
		Plug&Cap 12P		24.5	29.1	26.2	117.6 Max	OK
	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	mΩ	1.36	1.95	1.65	10 Max	OK
		Plug&Cap 10P		1.90	2.61	2.18		
		Plug&Cap 12P		1.27	1.97	1.56		
	Connector Un-mating Force	Plug&Cap 8P	N	12.1	14.9	13.1	11.76 Min	OK
		Plug&Cap 10P		15.0	34.7	25.6	14.7 Min	OK
		Plug&Cap 12P		17.7	19.7	18.4	17.64 Min	OK
	Durability 25 cycles (Repeated Mating / Un-mating)	Plug&Cap 8,10,12P	-	-	-	-	No physical damage	OK
	Connector Mating Force	Plug&Cap 8P	N	14.1	16.4	15.1	78.4 Max	OK
		Plug&Cap 10P		21.8	27.4	24.2	98.0 Max	OK
		Plug&Cap 12P		14.2	16.4	15.3	117.6 Max	OK
	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	mΩ	1.53	2.10	1.75	20 Max	OK
		Plug&Cap 10P		2.07	3.51	2.59		
		Plug&Cap 12P		1.27	2.68	1.91		
	Connector Un-mating Force	Plug&Cap 8P	N	15.2	18.1	17.2	11.76 Min	OK
		Plug&Cap 10P		18.2	33.8	23.4	14.7 Min	OK
		Plug&Cap 12P		13.6	15.4	14.68	17.64 Min	OK
	Contact Retention Force	Plug 8P	N	65.9	78.4	71.0	34.3 Min	OK
		Cap 8P		43.7	62.1	53.0		
Plug 10P		61.9		80.6	71.6			
Cap 10P		47.5		73.8	58.8			
Plug 12P		64.3		81.9	74.2			
Cap 12P		48.7		62.4	55.7			
2	Housing Locking Strength	Plug&Cap 8P	N	239.4	250.2	243.6	29.4 Min	OK
		Plug&Cap 10P		244.5	258.3	249.4		

		Plug&Cap 12P		266.7	273.0	269.9		
3	Temperature Rising	8P_18AWG_5A	$\Delta^{\circ}\text{C}$	9.84	10.81	10.11	30 Max	OK
		8P_20AWG_4A		7.85	10.19	8.81		
		8P_22AWG_2A		3.9	4.4	4.13		
		8P_24AWG_2A		5.3	6.1	5.73		
		8P_26AWG_2A		7.0	9.0	7.97		
		12P_18AWG_5A		10.1	12.9	11.3		
		12P_20AWG_4A		10.5	12.3	11.1		
		12P_22AWG_2A		3.9	4.7	4.3		
		12P_24AWG_2A		5.2	5.8	5.5		
		12P_26AWG_2A		7.2	8.8	7.9		
4	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	m Ω	1.65	2.20	1.98	10 Max	OK
		Plug&Cap 10P		1.63	2.29	2.04		
		Plug&Cap 12P		1.79	2.27	2.08		
	Vibration (Low Frequency)	Plug&Cap 8,10,12P	-	-	-	-	No physical damage nor electrical discontinuity greater than 1 μs	OK
	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	m Ω	1.69	2.25	1.95	20 Max	OK
		Plug&Cap 10P		0.75	2.45	1.76		
		Plug&Cap 12P		0.03	2.75	1.83		
	Physical Shock	Plug&Cap 8,10,12P	-	-	-	-	No physical damage nor electrical discontinuity greater than 1 μs	OK
	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	m Ω	1.65	2.25	1.96	20 Max	OK
		Plug&Cap 10P		1.56	2.45	1.98		
Plug&Cap 12P		1.63		2.27	2.0			
5	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	m Ω	1.42	3.54	2.08	10 Max	OK
		Plug&Cap 10P		1.50	3.48	2.14		
		Plug&Cap 12P		1.48	3.37	2.04		
	Thermal Shock	Plug&Cap 8,10,12P	-	-	-	-	No physical damage	OK
	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	m Ω	1.36	1.71	1.56	20 Max	OK
		Plug&Cap 10P		1.33	1.71	1.62		
		Plug&Cap 12P		1.33	1.92	1.57		
Heat Aging	Plug&Cap 8,10,12P	-	-	-	-	No physical damage	OK	
		Plug&Cap 8P	m Ω	1.60	2.71	2.06	20 Max	OK

	Low Level Contact Resistance (LLCR)	Plug&Cap 10P		1.72	3.12	2.09		
		Plug&Cap 12P		1.70	2.64	2.10		
6	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	mΩ	1.16	1.94	1.59	10 Max	OK
		Plug&Cap 10P		1.48	2.10	1.68		
		Plug&Cap 12P		1.48	2.24	1.79		
	Humidity-Temperature Cycling	Plug&Cap 8,10,12P	-	-	-	-	No physical damage	OK
	Low Level Contact Resistance (LLCR)	Plug&Cap 8P	mΩ	1.87	2.29	2.10	20 Max	OK
		Plug&Cap 10P		1.87	2.25	2.12		
		Plug&Cap 12P		1.82	2.29	2.13		
	Insulation Resistance	Plug&Cap 8P	GΩ	210	2770	1100	0.5 Min	OK
		Plug&Cap 10P		410	4570	1560		
		Plug&Cap 12P		340	2720	1200		
	Dielectric Withstanding Voltage	Plug&Cap 8P	-	N/B	N/B	N/B	No breakdown nor flashover	OK
		Plug&Cap 10P	-	N/B	N/B	N/B		
Plug&Cap 12P		-	N/B	N/B	N/B			

Figure 3

3. TEST METHODS

3.1 Examination of Product

Precondition parts for 24 hours prior to testing.

Visual Inspection and and no physical damage per the requirements of product drawing.

After testing, parts shall show no damage of physical change detrimental to product performance.

EIA-364-18

3.2 Low Level Contact Resistance (LLCR)

Subject mated contacts assembled in housing to open circuit voltage 20mV Max & current 100mA Max.

Subtract the bulk resistance of the wire from the measurement.

EIA 364-23

3.3 Insulation Resistance

Apply 500 VDC

Test between contacts in adjacent circuits and between the surface of housing and a contact of mated connector.

EIA-364-21

- 3.4 Dielectric Withstanding Voltage
Hold at 2.0 kV AC for 1 minute.
Test between contacts in adjacent circuits and between the surface of housing and a contact of mated a connector.
EIA-364-20
- 3.5 Temperature Rising
Measure the temperature rise by the energized current.
Measurement must be taken at a place where there is no influence from air convection.
Contacts to be assembled in housing with all circuits connected.
The thermocouple is to be attached to the contact of center circuit number.
Stabilize at a single current level until 3 consecutive readings at 5 minute intervals are within 1°C.
EIA-364-70, Method 1
- 3.6 Vibration (Low Frequency)
Subject mated connectors to 10-55-10 Hz traversed in 1 minute at 1.52mm amplitude
Apply 2 hours in each of 3 mutually perpendicular planes.
100mA applied.
EIA-364-28
- 3.7 Physical Shock
Subject mated connector to 50G's half-sine shock pulse of 11 m sec duration.
3 drops each to normal and reversed directions of X, Y and Z axis, totally 18 drops.
EIA-364-27
- 3.8 Connector Mating Force
Measure the force required to mate connectors without locking latches.
Operation Speed: 100 mm/min
EIA-364-13, Method A
- 3.9 Connector Un-mating Force
Measure the force required to unmate connectors without locking latches.
Operation Speed: 100 mm/min
EIA-364-13, Method A
- 3.10 Durability operation (Repeated Mating / Un-mating)
Manually mate and unmate connectors for 25 cycles.
EIA-364-9

- 3.11 Contact Insertion Force
Measure the force required to insert contacts into housing.
EIA-364-5
- 3.12 Contact Retention Force
Measure the axial force required to remove contacts crimped with wire from the housing.
Operation Speed: 100 mm/min
EIA-364-29, Method A
- 3.13 Housing Locking Strength
Measure connector locking strength for the locking latch.
Operation Speed: 100 mm/min
EIA-364-98
- 3.14 Humidity-Temperature Cycling
Subject mated connector to 10 cycles (1 cycle is 24 hours) between 25°C and 65°C at 80-98% RH.
Measurements is held after being left indoor for 3 hours
EIA-364-31
- 3.15 Thermal Shock
Subject mated specimens to 25 cycles between -55°C and 85°C with 30 minute dwell time
at temperature extremes and 5 minute transition (maximum) between temperatures.
Measurement is held after being left indoor for 3 hours.
EIA-364-32
- 3.16 Heat Aging
Subject mated connector to 110±2°C for a duration of 96 hours.
Measurement is held after being left indoor for 3 hours.
EIA-364-17