

NEXT GENERATION GRACE INERTIA CONNECTOR 3.3 W-B

1 Scope :**1.1 Contents**

This specification covers the requirements for product performance, test methods and quality assurance provisions of Grace Inertia Connector 3.3mm Pitch connector.

Applicable product description and part numbers are as shown in Appendix 1.

2. Applicable Documents:

The following documents form a part of this specification to the extent specified herein. In the event of conflict between the requirements of this specification and the product drawing, the product drawing shall take precedence. In the event of conflict between the requirements of this specification and the referenced documents, this specification shall take precedence.

2.1 AMP Specifications :

- A. 109-5000 Test Specification, General
Requirements for Test Methods
- B. 501-106094 Test Report

2.1 Commercial Standards and Specifications :

- A. MIL-STD-202

3. Requirements :

3.1 Design and Construction :

Product shall be of the design, construction and physical dimensions specified on the applicable product drawing.

3.2 Materials :

A. Rec Contact (Crimp Type)

Tin Copper Alloy (Tin PL 0.8 μ m min.)

B. Plug Housing

6/6 Nylon (Glass Filled) (UL 94 V-0)

Tracking Index : LEVEL 2

C. HDR Assy :

HDR Hsg : 6/6 Nylon (Glass Filled) UL 94 V-0

Tracking Index : LEVEL 2

Tab Cont : Copper Alloy

Tin PL (Tin PL 0.8 μ m min.)

3.3 Ratings :

A. Voltage Rating : 250V AC/DC

B. Current Rating : See Fig. 2

C. Temperature Rating : -30°C to 105°C

(Include temperature rising by energized current)

D. Minimum Rating : 1mV, 1 μ A Minimum

E. Applicable P.C.B :

Thickness : 1.6 mm

Diameter of The hole :

For Tine : 0.7+0.1/-0 (Punched Hole)

0.8 $\pm$ 0.05 (Drilled Hole)

For Boss : 1.4 $\pm$ 0.05 (Punched Hole & Drilled Hole)

3.4 Performance Requirements and Test Descriptions :

The product shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Fig.3. All tests shall be performed in the room temperature unless otherwise specified.

Unit : A

Contact Wire Size Pos.	Rec. Contact :				
	AWG #20	AWG #22	AWG #24		
4	4	2.5	2.2		
6	4	2.5	2.2		
8	4	2.5	2.2		
10	3.5	2.5	2.2		
12	3.5	2.5	2.2		

Fig. 2

3.5 Test Requirements and Procedures Summary :

No.	3.5.1
Test Items	Examination of Product
Requirements	Meets requirements of product drawing and AMP Specification (114-5372) After test, no corrosion influence performance.
Procedures	Visual inspection No physical damage
Electrical Requirements	
No.	3.5.2
Test Items	Termination Resistance (Low Level)
Requirements	10 m Ω Max. (Initial) 20 m Ω Max. (Final)
Procedures	Subject mated contacts assembled in housing to 20mV Max. open circuit at 10mA. Take the resistance of the wire only away from measurement Fig. 8. AMP Spec. 109-5311-1
No.	3.5.3
Test Items	Insulation Resistance
Requirements	1000 M Ω Min. (Initial) 500 M Ω Min. (Final)
Procedures	Impressed voltage 500 V DC. Test between adjacent circuits and between the surface of housing and contact of mated connectors. AMP Spec. 109-5302 MIL-STD-202, Method 302 Condition B

Fig. 3 (To be Continued)

No.	3.5.4
Test Items	Dielectric withstanding Voltage
Requirements	No creeping discharge nor flashover shall occur. Current leakage : 5 mA Max.
Procedures	1.5kVAC for 1 minute. Test between adjacent circuits and between the surface of housing and contact of mated connectors.
No.	3.5.5
Test Items	Temperature Rising
Requirements	30°C Max. under loaded specified current.
Procedures	Measure temperature rising by energized current. Subject measurement must do at the place of no influence from convection of air. And contacts assembled in housing all of circuits. The thermocouple attach to the contact of center circuit number. Fig. 2, 8 AMP Spec. 109-5310
Mechanical Requirements	
No.	3.5.6
Test Items	Vibration (Low Frequency)
Requirements	No electrical discontinuity greater than 1 μ sec. shall occur. 20 m Ω Max. (Final)
Procedures	Subject mated connectors to 10-55-10 Hz traversed in 1 minute at 1.52mm amplitude 2 hours each of 3 mutually perpendicular planes. 100 mA applied. Fig. 9 AMP Spec. 109-5201 MIL-STD-202, Method 201A

Fig. 3 (To be Continued)

No.	3.5.7	
Test Items	Shock	
Requirements	No electrical discontinuity greater than 1 μ sec. shall occur. 20 m Ω Max. (Final)	
Procedures	Mated Conn. (50 G) Waveform : Halfsign Curve Duration : 11 m sec. Number of Drops : 3 drops each to normal and reversed directions of X, Y and Z axes, totally 18 drops AMP Spec. 109-5208 See Fig. 9 MIL-STD-202, Method 213 Condition A	
No.	3.5.8	
Test Items	Connector Mating/Unmating Force	
Requirements	Mating Force	5.88 $\times$ Pos. N Max. (0.6 $\times$ Pos.)kg Max.
	Unmating Force	(0.58 $\times$ Pos.)N Min. (1 st) (60 $\times$ Pos.)g Min. (1 st) (0.29 $\times$ Pos.)N Min. (30 th) (30 $\times$ Pos.)g Min. (30 th)
Procedures		
No.	3.5.9	
Test Items	Contact Insertion Force	
Requirements	8.82N (0.9 kgf) Max. per contact	
Procedures	Measure the force required to insert contact into housing. AMP Spec. 109-5211	

Fig. 3 (To be Continued)

No.	3.5.10		
Test Items	Contact Retention Force		
Requirements	19.8N(2kgf) Min.		
Procedures	Apply an axial pull-off load to crimped wire. Operation Speed : 100 mm / min. AMP Spec. 109-5210		
No.	3.5.11		
Test Items	Contact Mate/Unmating Force		
Requirements	Mate	5.88N(600g)Max.(1st～30th)	
	Unmating	0.34N(35g)Min. (1st) 0.25N(25g)Min. (30th)	
Procedures	Measured by gage tab (Fig. 10) and operation speed 100 mm/min AMP Spec. 109-5206		
No.	3.5.12		
Test Items	Crimp Tensile Strength		
Requirements	Wire Size		Crimp Tensil (min.)
	mm ²	(AWG)	N (kgf)
	0.22	24	29.4(3)
	0.31	22	49(5)
	0.51	20	58.8 (6)
Procedures		Apply an axial pull-off load to crimped wire of contact secured on the tester, Operation Speed : 100 mm/min. Subject take insulation barrel away. AMP Spec. 109-5205	

Fig. 3 (To be Continued)

No.	3.5.13
Test Items	Durability (Repeated Mate/Unmating)
Requirements	20 mΩ MAX.
Procedures	No. of Cycles : 30 cycles
No.	3.5.14
Test Items	Housing Locking Strength
Requirements	24.5 N (2.5 kgf) Min.
Procedures	Measure connector locking strength. Operation Speed : 100 mm/min. AMP Spec. 109-5210
No.	3.5.15
Test Items	Post Retention Force
Requirements	9.8 N (1.0 kgf) Min.
Procedures	Measure post retention force. Operation Speed : 100 mm/min
No.	3.5.16
Test Items	Hammering Shocks
Requirements	20 mΩ Max. (Final) No evidence of abnormalities
Procedures	Mated connectors to under 10000 cycles of repeated hammering shocks Hammering height : 80mm Hammering weight : 50g Hammering speed : 1cycle/sec. DC 10V, 1mA applied Fig.11

Fig. 3 (To be Continued)

Environmental Requirements	
No.	3.5.17
Test Items	Thermal Shock
Requirements	20 m Ω Max. (Final)
Procedures	Mated connector -55°C/30 min., 85°C/30 min. Making this a cycle, repeat 25 cycles. AMP Spec. 109-5103 Condition A MIL-STD-202 Method 107-1 Condition A-1 The measurement is held after being left indoor for 3 hours.
No.	3.5.18
Test Items	Humidity-Temperature Cycling
Requirements	Dielectric withstanding voltage 1.5 kV AC 1 minute. Insulation resistance (final) 500 M Ω Min. Termination resistance 20 m Ω Max. (Final)
Procedures	Mated connector, 25~65°C, 80~98 % R. H. 10 cycles Cold shock -10°C(not) performed AMP Spec. 109-5106 MIL-STD-202, Method 106 Condition D The measurement is held after being left indoor for 3 hours. 1cycle=24hours
No.	3.5.19
Test Items	Salt Spray
Requirements	20 m Ω Max. (Final) No corrosion influence performance
Procedures	Subject mated connectors to 5 $\pm$ 1% salt concentration for 48 hours : MIL-STD-202, Method 101 Condition B The measurement is held after remove the salt and dry up at indoor.

Fig. 3 (To be Continued)

No.	3.5.20
Test Items	Heat Aging
Requirements	20 mΩ Max. (Final)
Procedures	Mated Conn. 105±2°C Duration :96 hr AMP Spec. 109-5104-3 Condition A The Measurement is held after being left indoor for 3 hours.
No.	3.5.21
Test Items	Resistance to Cold
Requirements	20 mΩ Max. (Final)
Procedures	Mated connector -30°C±2°C, 96 hours AMP Spec. 109-5108-3 Condition D
No.	3.5.22
Test Items	H ₂ S
Requirements	20 mΩ Max. (Final) No corrosion influence performance
Procedures	Mated connector 3±1 ppm, 40±2°C 96 hours
No.	3.5.23
Test Items	NH ₃ Gas
Requirements	20 mΩ Max. (Final) No corrosion influence performance
Procedures	Mated conn. is put into atmosphere that rated 25 ml/l of 3% NH ₃ for 7hr.

Fig. 3 (To be Continued)

No.	3.5.24
Test Items	Solderability
Requirements	Wet Solder Coverage : 95 % Min.
Procedures	Eutectic solder Solder Temperature : $230 \pm 5^{\circ}\text{C}$ Immersion Duration : 3 ± 0.5 sec. Lead-Free solder (Sn-Ag-Cu) Solder Temperature : $240 \pm 5^{\circ}\text{C}$ Immersion Duration : 3 ± 0.5 sec. MIL-STD-202 Method 208
No.	3.5.25
Test Items	Resistance to Soldering Heat
Requirements	No physical damage shall occur.
Procedures	Test connector on PCB. Solder Temperature : $260 \pm 5^{\circ}\text{C}$ Immersion Duration : 10 ± 0.5 sec. AMP Spec. 109-5204 MIL-STD-202 Condition B In case of manual soldering iron, apply it as $360 \pm 10^{\circ}\text{C}$, 3 ± 0.5 sec without forcing pressure to affect the time of contact.

Fig. 3 (End)

* Product must be without rust, corrosion transformation, crack and discoloration.

3.6 Product Qualification Test Sequence

Test or Examination	Test Group								
	1	2	3	4	5	6	7	8	9
	Test Sequence (a)								
Confirmation of Product	1,3	1,4	1,3	1,3	1,3	1,4	1,7	1,7	1,4
Termination Resistance (Low Level)							2,4,6	3,6	2,5
Dielectric withstanding Voltage						3			
Insulation Resistance						2			
Temperature Rising					2				
Vibration (Low Frequency)							5		
Physical Shock							3		
Connector Mating Force								2	
Connector Unmating Force								4	
Contact Insertion Force				2					
Contact Mating Force		2							
Contact Unmating Force		3							
Crimp Tensile strength	2								
Durability (Repeated Mating/Unmating)								5	
Housing Locking Strength			2						
NH ₃									
Humidity-Temperature Cycling									
H ₂ S									
Thermal Shock									3
Salt Spray									
Resistance to Cold									
Contact Retention Force						5			
Heat Asing									
Post Retention Force									
Solderability									
Resistance to Soldering Heat									
Hammering Shocks									

(a) Numbers indicate the sequence in which the tests are performed.

Fig. 5(1/2)

Test or Examination	Test Group										
	10	11	12	13	14	15	16	17	18	19	
	Test Sequence (a)										
Confirmation of Product	1,4	1,4	1,4	1,4	1,4	1,4	1,3	1,3	1,3	1,3	
Termination Resistance (Low Level)	2,5	2,5	2,5	2,5	2,5	2,5				2,5	
Dielectric withstanding Voltage	7										
Insulation Resistance	6										
Temperature Rising											
Vibration (Low Frequency)											
Physical Shock											
Connector Mating Force											
Connector Unmating Force											
Contact Insertion Force											
Contact Mating Force											
Contact Unmating Force											
Crimp Tensile strength											
Durability (Repeated Mating/Unmating)											
Housing Locking Strength											
NH ₃						3					
Humidity-Temperature Cycling	3										
H ₂ S					3						
Thermal Shock											
Salt Spray		3									
Resistance to Cold				3							
Contact Retention Force											
Heat Asing			3								
Post Retention Force							2				
Solderability								2			
Resistance to Soldering Heat									2		
Hammering Shocks										4	

(a)Numbers indicate the sequence in which the tests are performed.

Fig. 5(2/2)

4. Quality Assurance Provisions :

4.1 Test Conditions :

Unless otherwise specified, all the test shall be performed in any combination of the following test conditions.

Temperature :	15~35°C
Relative Humidity :	45~75 %
Atmospheric Pressure :	86.6~106.6 Kpa

Fig. 6

4.2 Tests :

4.2.1 Test Specimens :

The test specimens to be employed for the tests shall be conforming to the requirements specified in the applicable product drawings. The crimped contacts shall be prepared in accordance with the requirements of applicable application Specification, 114-5372, Crimping of Grace Signal Connector 3.3mm Pitch on the wires specified in Fig. 7 of this specification.

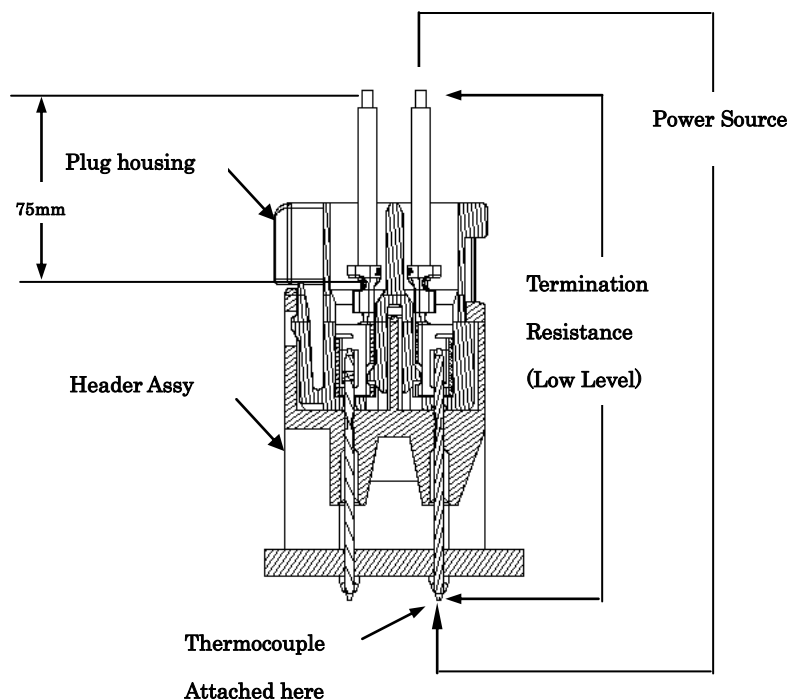
4.2.2 Applicable Wires :

The wires to be used for crimping the samples for performance testing shall be conforming to the requirements specified in Fig. 7.

Calculated Cross-sectional Area(mm ²)	AWG	Diameter of a Conductor (mm)	Number of Conductors	Insulation Outer Diameter (mm)
0.22	24	0.16	11	1.4
0.31	22	0.16	17	1.58
0.53	20	0.18	21	1.9

Fig. 7

Wire-to-Board Termination Type :



* Take the resistance of 75 mm wire only away

Fig. 8 Termination Resistance (Low Level) and Temperature Rising Vs. Current Measuring Methods

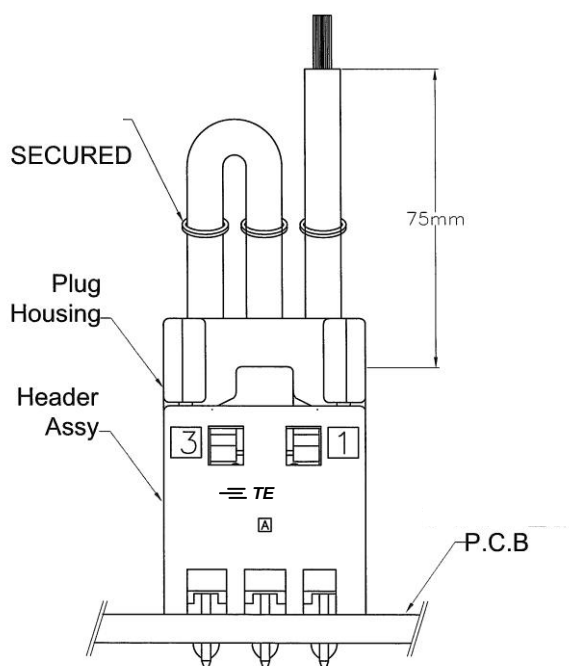


Fig. 9 Connector Mounting

Methods of Low

Frequency Vibration and Physical Shock Tests

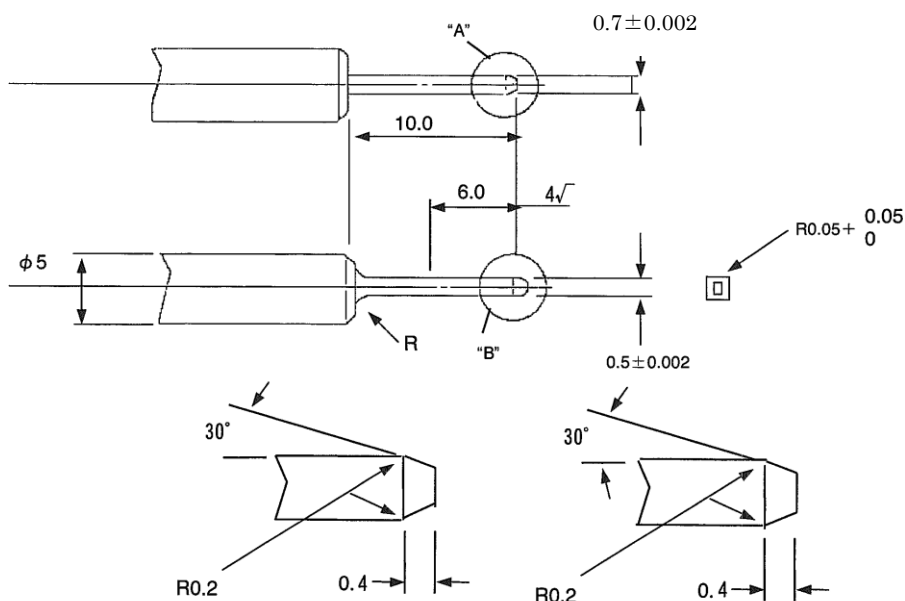


Fig. 10 Gage Design for Contact Mating/Unmating Force Tests

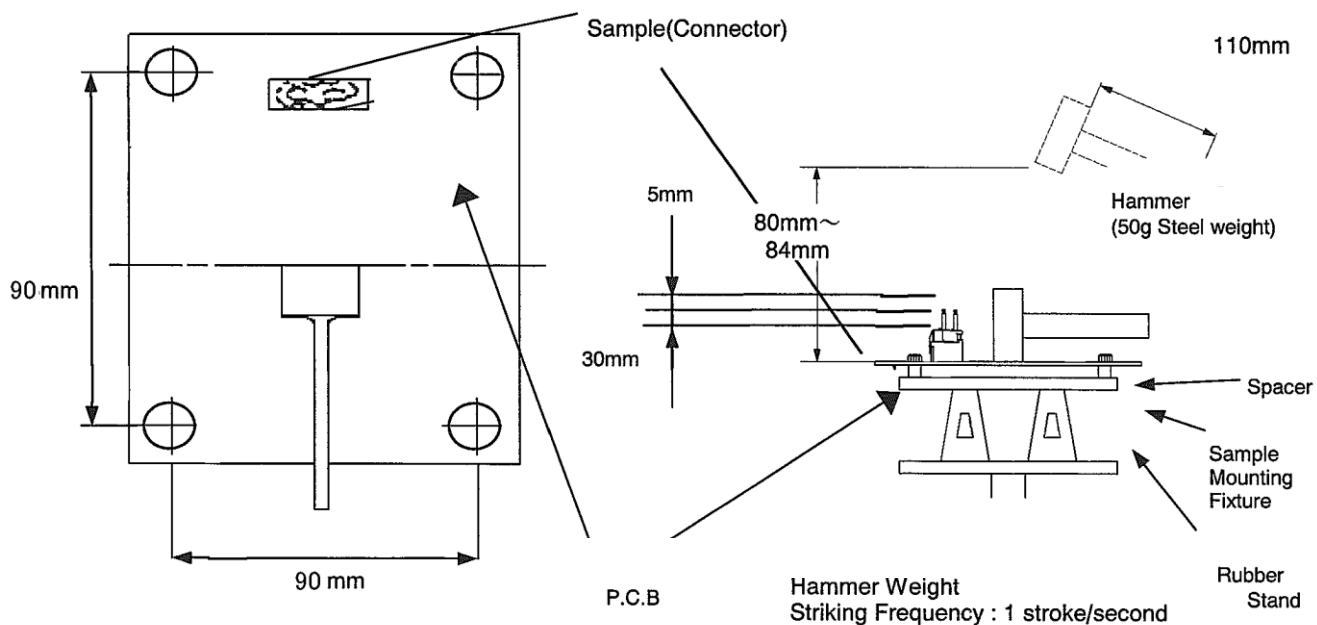


Fig. 1

Part Number	Remarks
1971904 - ☐	TPA
☐ - 1971905 - ☐	Plug housing
☐ -1971906 - ☐	Header Assembly
1983780 -1	Rec contact

Appendix 1