
.040II/.070II Hybrid I/O Connector MK-II for Wire-To-Board Termination

1. SCOPE

This specification covers the requirements for product performance, test methods and quality assurance provisions of .040II/.070II Hybrid I/O Connector MK-II for Wire-To-Board Termination. Applicable product description and part numbers are shown in the Appendix.

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. Tyco Electronics Documents

- 108-5342: Product Specification (.040II/.070II Hybrid I/O Connector MK-II for Wire-to-Board Termination)
- 109-5000: Test Specification (General Requirements for Test Specification)
- 114-5159: Application Specification (Crimping .040II Series Tab and Receptacle Contact)
- 114-5160: Application Specification (Crimping .070II Series Tab and Receptacle Contact)
- 114-5198: Application Specification (Crimping .070III Unsealed Contact, Receptacle)
- 501-5303: Qualification Test Report (.040II/.070II Hybrid I/O Connector MK-II for Wire-To-Board Termination)
- 501-5303-1: Qualification Test Report (.040II/.070II Hybrid I/O Connector MK-II for Wire-To-Board Termination)

2.2. Commercial Standards and Specifications

- JASO D605: Multi-Pole Connector for Automobiles
- JASO D7101: Test Methods for Plastic Molded Parts
- JIS C3406: Low Voltage Wires and Cables for Automobiles
- JIS D0203: Method of Moisture, Rain and Spray Test for Automobile Parts
- JIS D0204: Method of High and Low Temperature Test for Automobile Parts
- JIS D1601: Vibration Testing Method for Automobile Parts
- JIS R5210: Portland Cement
- MIL-STD-202, Method 208: Method of Soldering
- USCAR PF-1: Performance Standard

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

Materials used in the construction of this product shall be as specified on the applicable product drawing.

3.3. Ratings

- Temperature: -30 to 105°C

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 2. Unless otherwise specified, all tests shall be performed at room temperature.

3.5. Test Requirements and Procedures Summary

Para	Test Item	Requirement	Procedure
3.5.1	Confirmation of Product	Product shall be conforming to the requirements of applicable product drawing and Application Specifications 114-5159 and 114-5160.	Visually, dimensionally and functionally inspected per applicable quality inspection plan.
ELECTRICAL REQUIREMENTS			
3.5.2	Termination Resistance, Specified Current	.040II: 10 milliohms maximum initial; 20 milliohms maximum final. .070II, III: 3 milliohms maximum initial; 10 milliohms maximum final.	Measure initial millivolt drop of contact test circuit in mated connectors. Figure 3. AMP Spec 109-5311-2.
3.5.3	Termination Resistance, Low Level	.040II: 10 milliohms maximum initial; 20 milliohms maximum final. .070II, III: 3 milliohms maximum initial; 10 milliohms maximum final.	Subject mated contacts assembled in housing to closed circuit current of 10 milliamperes maximum at open circuit voltage of 20 millivolts maximum. Figure 3. AMP Spec 109-5311-1.
3.5.4	Dielectric Strength	No creeping discharge nor flashover shall occur.	1 kilovolt AC for 1 minute. Test between adjacent circuits of mated/unmated connectors. AMP Spec 109-5301.
3.5.5	Insulation Resistance	100 megohms minimum.	Impressed voltage 500 volts DC. Test between adjacent circuits of mated connectors. AMP Spec 109-5302.
3.5.6	Current Leakage	1 milliampere maximum.	12 volts DC impressed 1 minute. AMP Spec 109-5312.
3.5.7	Temperature Rising	60°C maximum under specified current.	Measure temperature rise by energized current. AMP Spec 109-5310.
3.5.8	Current Cycling	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final. No ignition allowed during test.	Applied current per Figures 6 and 7. 45 minutes ON, 15 minutes OFF, 200 cycles. AMP Spec 109-5308.

Figure 1 (continued)

Para	Test Item	Requirement	Procedure			
MECHANICAL REQUIREMENTS						
3.5.9	Vibration, High Frequency	No electrical discontinuity greater than 1 microsecond shall occur. .040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	Vibration frequency: 20-200-20 Hz/3 min. Accelerated velocity: 44.1 m/8 ² (4.5 G).			
			Vibration Direction	Up and Down	Back and Forth	Right and Left
			Duration	4 hours	2 hours	2 hours
			AMP Spec 109-5202.			
3.5.10	Vibration plus Current Cycle	No electrical discontinuity greater than 1 microsecond shall occur. .040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	Vibration frequency: 20-200-20 Hz/3 min. Accelerated velocity: 44.1 m/8 ² (4.5 G).			
			Vibration Direction	Up and Down	Back and Forth	Right and Left
			Duration	4 hours	2 hours	2 hours
			Test current: .040II: 4.4 amperes DC. .070II, III: 10 amperes DC.			
3.5.11	Contact Mating Force	.040II: 5.8 N maximum. .070II, III: 10 milliohms maximum final.	Operation speed: 100 mm per minute. Measure force required to mate contacts. AMP Spec 109-5206.			
3.5.12	Contact Unmating Force	.040II: 0.98 N minimum for silver plating; 0.69 N minimum for gold plating. .070II, III: 0.98 N minimum for silver plating; 0.69 N minimum for gold plating.	Operation speed: 100 mm per minute. Measure force required to mate contacts. AMP Spec 109-5206.			
3.5.13	Connector Mating Force	10 position: 69 N maximum.	USCAR PF-1			
		12 position: 69 N maximum. 16 position: 69 N maximum. 22 position: 88.3 N maximum. 26 position: 98.1 N maximum.	Operation speed: 100 mm per minute. Measure force required to mate connectors. AMP Spec 109-5206.			
3.5.14	Connector Unmating Force	10 position: 69 N maximum.	USCAR PF-1			
		12 position: 69 N maximum. 16 position: 69 N maximum. 22 position: 88.3 N maximum. 26 position: 98.1 N maximum.	Operation speed: 100 mm per minute. Measure force required to unmate connectors. AMP Spec 109-5206.			
3.5.15	Housing Locking Strength	98 N minimum.	Operation speed: 100 mm per minute. Measure housing locking strength. AMP Spec 109-5210.			

Figure 1 (continued)

Para	Test Item	Requirement		Procedure
3.5.16	Contact Insertion Force	9.8 N maximum per contact.		Measure force required to insert contacts into housing. AMP Spec 109-5211.
3.5.17	Contact Retention Force, Pre-Lock	49 N minimum.		Operation speed: 100 mm per minute. Apply an axial pull-off load to crimped wire. AMP Spec 109-5212.
3.5.18	Contact Retention Force, Secondary Lock	78 N minimum.		Operation speed: 100 mm per minute. Measure contact retention force with secondary lock in effect.
3.5.19	Crimp Tensile Strength	Wire Size		Crimp Tensile N minimum
		mm ²	AWG	
		0.3	22	58
		0.5	20	88
		0.85	18	127
1.25	16	177		
3.5.20	Durability, Repeated Mating/Unmating	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.		Operation speed: 100 mm per minute. 30 cycles. AMP Spec 109-5213.
3.5.21	Resistance to "Kojiri"	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.		Repeated mating/unmating by hand. 30 cycles. AMP Spec 109-5215.
3.5.22	Solderability	Wet solder coverage: 95% minimum, plated area only.		Solder temperature: 230 ± 5°C Immersion duration: 3 ± 0.5 seconds Flux: Alpha 100 AMP Spec 109-5203.
3.5.23	Handling Ergonomics	No abnormalities allowed in manual mating/unmating handling.		Manually operated.
3.5.24	Double Lock Plate Locking Strength	59 N Maximum.		Operation speed: 100 mm per minute. Measure force required to lock the double lock plate.
ENVIRONMENTAL REQUIREMENTS				
3.5.25	Thermal Shock	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.		-30 °C for 120 minutes; 80°C for 120 minutes (1 cycle). Repeat for 5 cycles. AMP Spec 109-5103.

Figure 1 (continued)

Para	Test Item	Requirement	Procedure
3.5.26	Humidity, Steady State	Insulation resistance: 100 megohms minimum final. Termination resistance: .040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	Mated/unmated connector, 90 to 95% RH, 60°C, 96 hours. AMP Spec 109-5105.
3.5.27	Industrial Gas, SO ₂	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	SO ₂ gas: 10 ppm, 95% RH, 20°C, 96 hours. AMP Spec 109-5107.
3.5.28	Temperature Life, Heat Aging	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	120°C, 120 hours. AMP Spec 109-5104.
3.5.29	Resistance to Cold	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	-50 ± 5°C, 120 hours. AMP Spec 109-5108.
3.5.30	Dust Bombardment	.040II: 20 milliohms maximum final. .070II, III: 10 milliohms maximum final.	Subject JIS R5210 cement blow of 1.5 kg per 10 seconds in 15 minute intervals for 90 minutes. AMP Spec 109-5110.

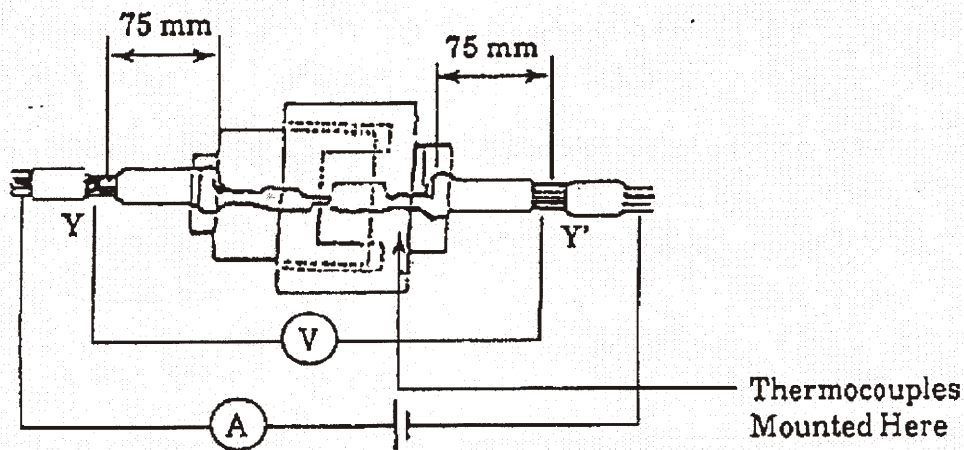
Figure 1 (end)

4. PRODUCT QUALIFICATION TEST SEQUENCE

Test Item	Test Group										
	1	2	3	4	5	6	7	8	9	10	11
	Test Sequence (a)										
Confirmation of product	1	1	1	1	1,19	1,11	1,11	1,13	1,16	1,11	1
Termination Resistance, Specified Current			4								
Termination Resistance, Low Level			3		3,5,7	3,6,8	3,6,8	3,6,8,10	2,7,9,14	3,6,8	
Dielectric Strength				3					4,12		
Insulation Resistance				2					3,11		
Current Leakage				4					5,10		
Temperature Rising			5								
Current Cycling								9			
Vibration, High Frequency								7			
Vibration plus Current Cycle										7	
Contact Mating Force	2										
Contact Unmating Force	3										
Connector Mating Force			2			2,10	2,10	2,12		2,10	
Connector Unmating Force			6			4,9	4,9	4,11		4,9	
Housing Locking Strength		2									
Contact Insertion Force											2
Contact Retention Force, Pre-Lock											3
Contact Retention Force, Secondary Lock			7								
Crimp Tensile Strength	4										
Durability, Repeated Mating/Unmating									6		
Resistance to "Kojiri"							5	5		5	
Solderability					2						
Handling Ergonomics					8				15		
Double Lock Plate Locking Strength											4
Thermal Shock					4						
Humidity, Steady State					6				8		
Industrial Gas, SO ₂									13		
Temperature Life, Heat Aging						5					
Resistance to Cold						7					
Dust Bombardment							7				

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

Figure 2



From the measured readings, deduct the resistance of the 150 mm long wire used for termination. When testing for rated current measurement, apply 12 volts DC, 1 ampere to the circuit. For obtaining uniformity of the current density on the probing points Y Y', apply soldering on the probing points prior to testing.

Figure 3
Measurement of Termination Resistance

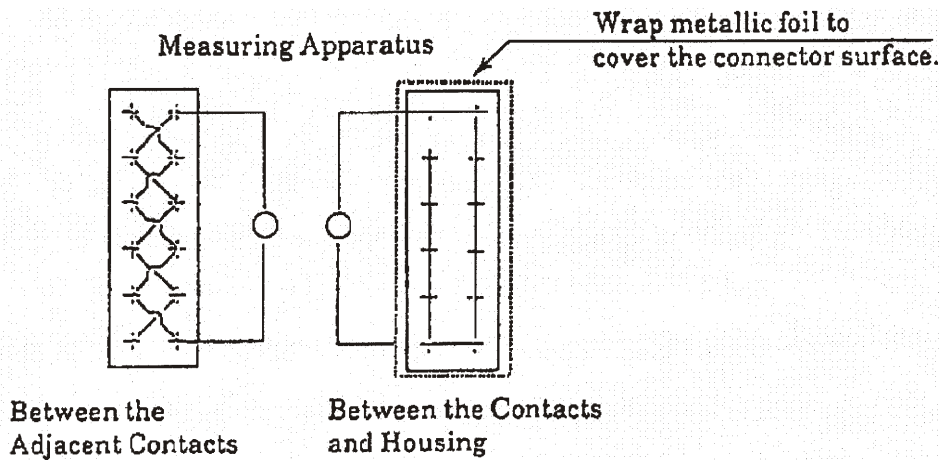


Figure 4

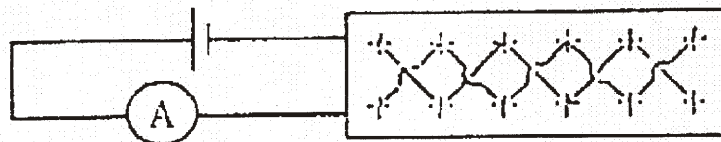


Figure 5

Maximum Allowable Current (I maximum)	
Wire Size (mm ²)	Allowable Current (DC A)
0.3	8
0.5	11
0.85	15
1.25	19
2.0	25

Figure 6

Reduction Coefficient (Kd)	
Number of Energized Contacts	Reduction Coefficient
1	1
2-3	0.75
4-5	0.6
6-8	0.55
9-12	0.5
13-	0.4

Figure 7

- (1) $I_1 = Kd \cdot I_{max}$ Current applied to all positions
- (2) $I_2 = I_{max}$ Current applied to every other position in multiple connector

Wire Size (mm ²)	Test Method I		Test Method II	
	Test Current (amperes)	Duration (minutes)	Test Current (amperes)	Duration (minutes)
0.3	25	5	50	5
0.5	30		80	
0.85	40		110	
1.25	45		170	
2.0	70		250	

Figure 8

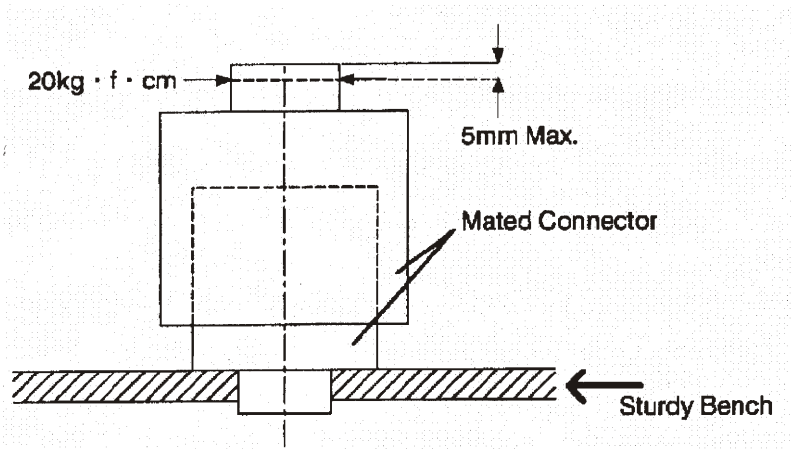


Figure 9

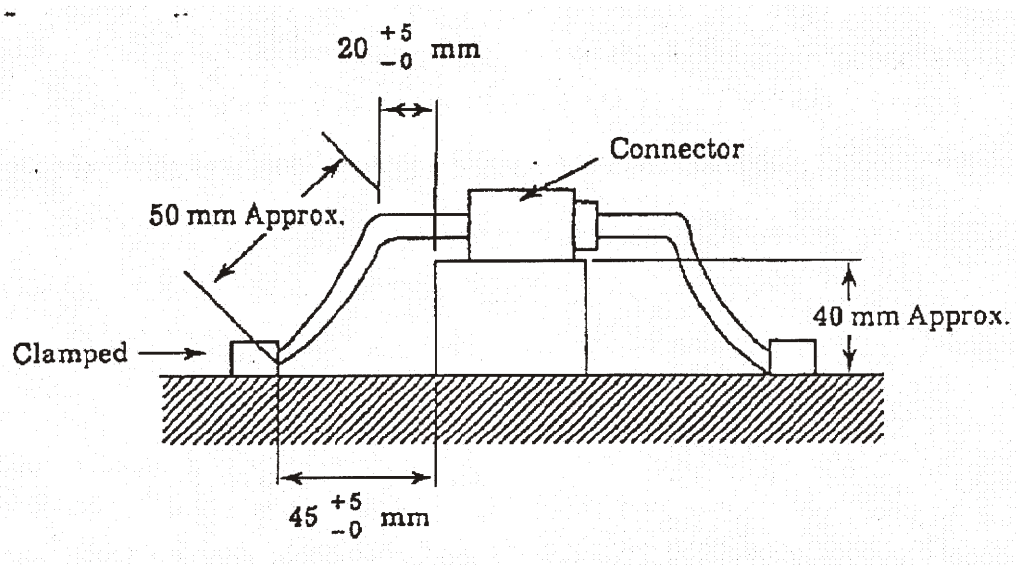


Figure 10

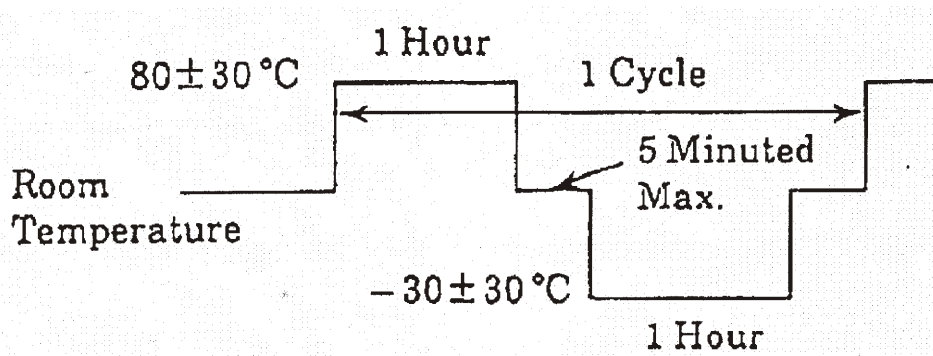


Figure 11

APPENDIX

Product Part Number	Product Description
178845	.040/.070 Hybrid I/O connector MK-II 12 position plug housing assembly (signal)
178881	.040/.070 Hybrid I/O connector MK-II 12 position plug housing assembly (power)
178795	.040/.070 Hybrid I/O connector MK-II 16 position plug housing assembly
178883	.040/.070 Hybrid I/O connector MK-II 16 position plug housing assembly
177545	.040/.070 Hybrid I/O connector MK-II 16 position plug housing assembly
178798	.040/.070 Hybrid I/O connector MK-II 22 position plug housing assembly
178801	.040/.070 Hybrid I/O connector MK-II 26 position plug housing assembly
178885	.040/.070 Hybrid I/O connector MK-II 26 position plug housing assembly
178888	.040/.070 Hybrid I/O connector MK-II 26 position 3 row plug housing assembly
178897	.040/.070 Hybrid I/O connector MK-II 26 position 3 row low profile plug housing assembly
175571	.040/.070 Hybrid I/O connector 26 position cap housing assembly
178811	.040/.070 Hybrid I/O connector 26 position cap housing assembly
175569	.040/.070 Hybrid I/O connector 26 position cap housing assembly
178762	.040/.070 Hybrid I/O connector 26 position cap housing assembly
176206	.040/.070 Hybrid I/O connector 26 position 3 row cap housing assembly
178900	.040/.070 Hybrid I/O connector 26 position 3 row low profile cap housing assembly
178209	.040/.070 Hybrid I/O connector 26 position low profile cap housing assembly
638207	.040/.070 Hybrid I/O connector 10 position plug housing assembly
1438794	.040/.070 Hybrid I/O connector 10 position plug housing assembly
987989	.040/.070 Hybrid I/O connector 22 position plug housing assembly
638211	.040/.070 Hybrid I/O connector 32 position cap housing assembly, vertical
776629	.040/.070 Hybrid I/O connector 32 position cap housing assembly, vertical
776631	.040/.070 Hybrid I/O connector 32 position cap housing assembly, vertical
776633	.040/.070 Hybrid I/O connector 32 position cap housing assembly, vertical
776635	.040/.070 Hybrid I/O connector 32 position cap housing assembly, vertical
175444	.040/.070 Hybrid I/O connector 34 position cap housing assembly
176255	.040/.070 Hybrid I/O connector 34 position cap housing assembly (30 position)
175521	.040/.070 Hybrid I/O connector 38 position cap housing assembly
178093	.040/.070 Hybrid I/O connector 38 position cap housing assembly
353245	.040/.070 Hybrid I/O connector 38 position cap housing assembly, V-type
175446	.040/.070 Hybrid I/O connector 42 position cap housing assembly
176242	.040/.070 Hybrid I/O connector 42 position cap housing assembly
177542	.040/.070 Hybrid I/O connector 42 position cap housing assembly
174917	.040/.070 Hybrid I/O connector 48 position cap housing assembly
175448	.040/.070 Hybrid I/O connector 54 position cap housing assembly
1318471	.040/.070 Hybrid I/O connector 54 position cap housing assembly w/o 16 position
174518	.040/.070 Hybrid I/O connector 64 position cap housing assembly
178764	.040/.070 Hybrid I/O connector 64 position cap housing assembly

Product Part Number	Product Description
177609	.040/.070 Hybrid I/O connector 64 position cap housing assembly
176122	.040/.070 Hybrid I/O connector 64 position cap housing assembly
174915	.040/.070 Hybrid I/O connector 76 position cap housing assembly
176142	.040/.070 Hybrid I/O connector 76 position cap housing assembly
178780	.040/.070 Hybrid I/O connector 76 position cap housing assembly
353468	.040/.070 Hybrid I/O connector 76 position cap housing assembly
353469	.040/.070 Hybrid I/O connector 76 position cap housing assembly
175265	.040II S receptacle contact (pre-tin)
175266	.040II S receptacle contact (selective gold)
175268	.070II S receptacle contact (pre-tin)
175275	.070II S receptacle contact (selective gold)
175269	.070II M receptacle contact (pre-tin)
175276	.070II M receptacle contact (selective gold)
1318629	.070III ML receptacle contact (pre-tin)