



(Hybrid 20P CONNECTOR)

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1. Scope

1.1. Content

This specification covers the requirements for product performance, test methods and quality assurance provisions of **Hybrid 20P Connector**.

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

1.2. Qualification

When tests are performed on the subject product line, procedures specified in 3.5 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

2. Applicable Documents

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies. 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 Document

- A. 102-950 Quality specification (Qualification of Separable Interface Connectors).
- B. 114-5175 Application Specification (Power Double Lock)
114-61065 Application Specification (Power Triple Lock)
- C. 501-61083 Qualification Test Report
502-139029 Engineering Report for Glow Wire Test

2.2 Commercial Standards and Specifications

- A. EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications.

2.3 Reference Document

- A.109-197: Test Specification (Tyco Electronics Test Specifications vs. EIA and IEC Test Methods).

3. Requirements

3.1 Design and Construction

Product should be of the design, construction and physical dimension 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.

- A. Contact (Crimp Type): Copper Alloy Pre-tin plating or Tin plating
- B. Housing: Thermoplastic
- C. Terminal Position Assurance (TPA): Thermoplastic

3.3 Ratings

- A. Voltage Rating: 300 VAC/DC
- B. Current Rating: See Appendix2 for applicable current carrying capability. Maximum rated current that can be carried by this product is limited by the maximum operating temperature of the housings and the temperature rise of the contacts (30°C).
- C. Temperature Rating: -30°C to +105°C (Include temperature rising by energized current)

3.4 Performance Requirements & Test Description:



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The product should be designed to meet the electrical, mechanical and environmental performance requirements specified in 3.5. All tests shall be performed in the room temperature unless otherwise specified.

Contact Number	Inside 16 Poles							Outside 4 Poles				
Wire AWG #	16	18	20	22	24	26	2*24	16	18	20	2*18	2*20
Rated Current, A	7	5	4	2	2	1.5	3	7	5	4	7	5.6

Fig. 1

3.5 Test requirements and Procedure Summary:

No.	Test Items	Requirements	Procedures
3.5.1	Examination of Product	Meets requirements of product drawing and TE/AMP specification (114-5175 and 114-61065). After test, no corrosion influence performance and no physical damage	Visual inspection. EIA-364-18
		Electrical Requirements	
3.5.2	Terminal Resistance (Low Level Contact Resistance)	7 mΩ Max.(Initial) 10 mΩ Max.(Final)	Subject mated contact assembled in housing to 20mV Max. open circuit at 100mA. Take the resistance of the wire only away from measurement. Fig.3 TE Spec. 109-5311-1 EIA-364-23
3.5.3	Insulation Resistance	1000 MΩ Min.(Initial) 500 MΩ Min.(Final)	Impressed voltage 500 V DC for 2minute. Test between adjacent circuits and between the surface of housing and contact of mate connectors. TE Spec: 109-5302 EIA-364-21
3.5.4	Dielectric withstanding Voltage	Neither creeping discharge nor flashover shall occur. Current leakage: 5 mA Max.	2.2 kV AC for 1 minute. Test between adjacent circuits and between the surface of housing and contact of mated connectors. EIA-364-20,Condition I



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3.5.5	Temperature Rising	30°C Max. under loaded specified current		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 with all of circuits connected. The thermocouple attach to the contact of center circuit number. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C. TE Spec. 109-5310 EIA-364-70, Method 1.	
Mechanical Requirements					
3.5.6	Sinusoidal Vibration (Low Frequency)	No electrical discontinuity greater than 1 µsec shall occur. LLCR 10 mΩ Max. (Final) No physical damage.		Subject mated connectors to 10-55-10 Hz traversed in 1 minute at 1.52mm amplitude maximum total excursion, 2 hours each of 3 mutually perpendicular planes. 100 mA Applied TE Spec. 109-5201 EIA-364-28, Test Condition I	
3.5.7	Mechanical Shock	No electrical discontinuity greater than 1 µsec shall occur. LLCR 10 mΩ Max. (Final). No physical damage.		Subject mated connector to 50G's half-sine shock pulse of 11ms duration. 3 drops each to normal and reversed directions of X, Y and Z axes, totally 18 drops TE Spec. 109-5208 EIA-364-27, Method A.	
3.5.8	Connector Mating / Unmating Force		PDL Contacts	PTL Contacts	Operation speed: 25mm/min. Measure the force required to mate connectors without locking latches. TE Spec. 109-5206 EIA-364-13
		Mating	(5.39 x Pos.) N Max. (0.55 x Pos.) Kgf Max.	(6.86 x Pos.) N Max. (0.70 x Pos.) Kgf Max.	
		Un-mating	(1.47 x Pos.) N Min. (0.15 x Pos.) Kgf Min.	(1.47 x Pos.) N Min. (0.15 x Pos.) Kgf Min.	
3.5.9	Contact Insertion Force	14.7N (1.5kgf) Max. per PDL contact 13.3N Max.(1.36kgf) per PTL contact		Measure the force required to insert contact into housing. TE Spec. 109-5211 EIA-364-5	



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3.5.10	Contact Retention Force	Without TPA 46.16N (4.2kgf) Min. per PDL contact 80N (8.16kgf) Min. per PTL contact		Apply an axial pull-off load to crimped wire. Operation speed: 25mm/min. TE Spec. 109-5210 EIA-364-29	
		With TPA 58.8N (6.0kgf) Min. per PDL contact 98N (10.0kgf) Min. per PTL contact			
3.5.11	Contact Mating / Unmating Force	Mating 6.86N (700g) Max. (1st ~25th) Unmating 0.58N (60g) Min. (1st) 0.39N (40g) Min. (25th)		Operation speed: 25mm/min. Measure the force required to mate and un-mate contacts. TE Spec. 109-5206 EIA-364-13	
3.5.12	Crimp Tensile Strength	Wire Size (AWG)	Crimp Tensile (Min.) N (kgf)		Apply an axial pull-off load to crimped wire of contact secured on the tester. Operation speed: 25mm/min. Take insulation barrel away. TE Spec. 109-5205 EIA-364-5
		26	19.6 (2)		
		24	29.4 (3)		
		2x24	29.4 (3)		
		22	49.0 (5)		
		20	58.8 (6)		
		18	89.0 (9.1)		
		16	89.0 (9.1)		
		2 x 20	58.8 (6)		
2 x 18	89.0 (9.1)				
3.5.13	Durability (repeated Mate / Unmating)		PDL Contact	PTL Contact	Manually mate and unmate specimens No. of Cycles: 25 cycles
		Mating	(5.39 x Pos.) N Max. (0.55 x Pos.) Kgf Max.	(6.86 x Pos.) N Max. (0.70 x Pos.) Kgf Max.	
		Un-mating	(1.47 x Pos.) N Min. (0.15 x Pos.) Kgf Min.	(1.47 x Pos.) N Min. (0.15 x Pos.) Kgf Min.	
3.5.14	Housing Locking Strength	98N (10kgf) Min.		Measure connector locking strength. Operation speed: 25mm/min. TE Spec: 109-5210 EIA-364-98	
3.5.15	Housing Panel Retention Force	98N (10kgf) Min.		Measure panel retention force using nominal panel cut dimensions as specified in the customer drawing. Operation speed: 25mm/min. EIA-364-97	



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3.5.16	Drop Test	No crack and no physical damage influencing the performance	Subject mated connector wired 150mm length to -30 °C for 24 hours, and drop at 50cm height down to a steel plate.
		Environmental Requirements	
3.5.17	Thermal shock	LLCR 10 mΩ Max. (Final)	Subject mated specimens to 25 cycles between -40 °C and 85 °C with 30 minutes dwells at temperature extremes and 1 minute transition between temperatures. TE Spec. 109-5103 Condition A EIA-364-32, test condition I. This measurement is held after being left indoor for 3 hours.
3.5.18	Humidity-Temperature Cycling	Dielectric withstanding voltage (final) 2.2 kV AC 1 minute Insulation resistance (final) 500 MΩ Min. Termination resistance 10 mΩ Max. (Final)	Subject mated specimens to 10 cycles between 25 °C and 65 °C at 80~100% R.H. TE Spec. 109-5106 EIA-364-31,method III. The measurement is held after being left indoor for 3 hours. 1 cycle=24hours
3.5.19	Temperature Life	Termination resistance 10 mΩ Max. (Final)	Subject mated connector to 105±2°C for a duration of 96hours TE spec. 109-5104-3 Condition A EIA-364-17, method A The measurement is held after being left indoor for 3 hours.
3.5.20	Salt spray	Termination resistance 10 mΩ Max. (Final) No corrosion influence performance	Subject mated connectors to 5±1% salt concentration for 48 hours; EIA-364-26B,condition B. The measurement is held after remove the salt and dry up indoor.
3.5.21	Glow Wire Test 750°C	1.Te-Ti ≤2s or no flame 2.Light tissue paper should not burns	1. The extremity of the wire is positioned horizontally and brought into contact with the sample with a force between 0.8 and 1.2N for a period of 30s. 2. Test temperature: 750°C 3. Execute visual check and take picture after the test. IEC 60695-2-11



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3.6 QUALIFICATION AND REQUALIFICATION TEST SEQUENCE

Test or Examination	Test Group										
	1	2	3	4	5	6	7	8	9	10	11
	Test Sequence (a)										
1 Examination of Product	1,7	1,8	1,9	1,11	1,5	1,3	1,3	1,4	1,4	1,3	1,3
2 Terminal Resistance (Low Level Contact Resistance)	2,4,6	3,6	2,5,7	2,6,8	2,4						
3 Insulation Resistance				3,9							
4 Dielectric withstanding Voltage				4,10							
5 Temperature Rising			3,8								
6 Sinusoidal Vibration (Low Frequency)	3										
7 Mechanical Shock	5										
8 Connector Mating Force		2									
8 Connector Unmating Force		4,7									
9 Contact Insertion Force								2			
10 Contact Retention Force								3			
11 Contact Mating / Unmating Force							2				
12 Crimp Tensile Strength						2					
13 Durability (repeated Mate / Unmating)		5									
14 Housing Locking Strength									2		
15 Housing Panel Retention Force									3		
16 Drop Test										2	
17 Thermal shock				5							
18 Humidity-Temperature Cycling			4 (b)	7							
19 Temperature Life			6								
20 Salt spray					3						
21 Glow Wire Test 750°C											2

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

(b) Connectors shall be preconditioned with 5 cycles of durability.



4. Quality Assurance Provisions

4.1 Test Conditions

Unless otherwise specified, all the tests 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. 2

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 specification (114-5175 and 114-61065) and should be selected at random from the part list in appendix 1.

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. 3.

Calculated Cross-sectional Area (mm ²)	AWG	Diameter of a Conductor (mm)	Number of Conductors	Insulation Outer Diameter (mm)
0.14	26	0.16	7	1.28~2.06
0.22	24	0.16	11	1.41~2.19
0.34	22	0.16	17	1.56~2.34
0.56	20	0.16	26	1.74~2.52
0.82	18	0.16	41	1.98~2.76
1.32	16	0.254	26	2.29~3.08

Fig. 3

4.3 Requalification Testing

If changes significantly affecting form, fit or functions are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.4 Acceptance

Acceptance is based on verification that the product meets the requirements of Section 3.5. Failures attributed to equipment, test setup or operator deficiencies shall not disqualify the product. If product failure occurs, corrective action shall be taken and specimens resubmitted for qualification. Testing to confirm corrective action is required before resubmitted.

4.5 Quality Conformance Inspection

The applicable quality inspection plan shall specify the sampling acceptable quality level to be used. Dimensional and functional requirements shall be in accordance with the applicable product drawing and this specification.



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P/N	Description	Remarks	
□-177914-□	PDL Receptacle Contact	AWG #26~#22	-1: Normal type
□-177915-□		AWG #20~#16	-2: High pressure type
□-1743728-□	PDL (FG) Receptacle Contact	AWG #26~#22	High pressure & Seam off type
□-1743729-□		AWG #20~#16	
□-177916-□	PDL Tab Contact	AWG #26~#22	-
□-177917-□		AWG #20~#16	
□-1971783-□	PTL Receptacle Contact	AWG #19~#16	-
□-1971784-□	PTL Tab Contact	AWG #19~#16	-
□-1971785-□	PTL Receptacle Contact	AWG #22~#20	-
□-1971786-□	PTL Tab Contact	AWG #22~#20	-
□-2232498-□	PTL Tab Contact	2 x AWG #20 2 x AWG #18	-
□-2232499-□	PTL Receptacle Contact		-
□-2188645-□	Plug Housing	-	20 Pos
□-2188646-□	Cap Housing	Panel Mount Type	20 Pos
□-2188647-□	Terminal Position Assurance	Center TPA	20 Pos

Appendix 1

5. SPECIFICATION APPROVAL

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