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## EP II connector system

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### 1. SCOPE

#### 1.1. Content

This specification covers performance, tests, and quality requirements for the TE Connectivity (TE) Economy Power (EP) II Connector System used for wire-to-board interconnection and mates with EP headers.

#### 1.2. Qualification

When tests are performed on the subject product line, procedures specified in Figure 1 shall be used. All inspections shall be performed using the applicable inspection plan and product drawing.

### 2. APPLICABLE DOCUMENTS AND FORMS

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. TE Connectivity Specifications

- 102-950: Quality Specification (Qualification of Separable Interface Connectors)
- 114-13265: Application Specification (Economy Power II Contacts and Connectors)
- 501-134020: Qualification Test Report (EP II Connector System)

#### 2.2. Commercial Standards and Specifications

EIA-364	Electrical Connector/Socket Test Procedures Including Environmental Classifications
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#### 2.3. Reference Documents

<a href="#">109-197</a>	Test Specification (AMP Test Specifications vs EIA and IEC Test Methods)
<a href="#">109-1</a>	General Requirements for Testing
<a href="#">102-950</a>	Qualification of Separable Interface Connectors

### 3. REQUIREMENTS

#### 3.1. Design and Construction

Product shall be of the design, construction, materials 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 TE drawing.

#### 3.3. Ratings

- Voltage: 600 volts AC
- Current: See Figure 5 for applicable current carrying capability. Maximum rated current that can be carried by this product is limited by maximum operating temperature of the housings (105° C) and temperature rise of the housings (30° C). Variables to be considered for each application are: wire size, connector size, contact material, ambient temperature, and printed circuit board design.
- Temperature: -55° C to 105° C

### 3.4. Performance Requirements and Test Description

The product should meet the electrical, mechanical and environmental performance requirements specified in Figure 1. All tests shall be performed at ambient environmental conditions otherwise specified.

### 3.5. Test Requirements and Procedure Summary

Test Description	Requirement	Procedure
Initial examination of product	Meets requirements of product drawing and Application Specification 114-13265.	EIA-364-18. Visual and dimensional (C of C) inspection per product drawing.
Final examination of product	Meets visual requirements.	EIA-364-18. Visual inspection.
<b>ELECTRICAL</b>		
Low Level Contact Resistance (LLCR)	10 milliohms maximum initial, 20 milliohms maximum final.	EIA-364-23 Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. See Figure 4.
Insulation resistance	1000 megohms minimum initial (with wire bulk removed). 500 megohms minimum final (with wire bulk removed).	EIA-364-21. 500 volts DC, 2 minute hold. Test between adjacent contacts.
Withstanding voltage	One minute hold with no breakdown or flashover.	EIA-364-20, Condition I. 1500 volts AC at sea level. Test between adjacent contacts. Leakage current at 5.0 milliamps.
Temperature rise vs current	30° C maximum temperature rise.	EIA-364-70, Method 1. Stabilize at a single current level until 3 readings at 5 minute intervals are within 1°C. See Figure 5.
<b>MECHANICAL</b>		
Random vibration	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-28, Test Condition VII, Condition Letter D. Subject mated specimens to 3.10 G's rms between 20 to 500 Hz. Fifteen minutes in each of 3 mutually perpendicular planes.
Mechanical shock	No discontinuities of 1 microsecond or longer duration. See Note.	EIA-364-27, Condition H. Subject mated specimens to 30 G's half-sine shock pulses of 11 milliseconds duration. Three shocks in each direction applied along 3 mutually perpendicular planes, 18 total shocks.
Durability	See Note.	EIA-364-9. Mate and unmate specimens for 15 cycles at a maximum rate of 500 cycles per hour
Mating force	9.8 N maximum per contact.	EIA-364-13. Measure force necessary to mate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.
Unmating force	0.9 N minimum per contact.	EIA-364-13. Measure force necessary to unmate specimens with latches disengaged at a maximum rate of 12.7 mm per minute.

**Figure 1 (cont'd)**

Test Description	Requirement	Procedure														
Crimp tensile	<table border="1"> <thead> <tr> <th>Wire Size (AWG)</th> <th>Crimp Tensile N Minimum</th> </tr> </thead> <tbody> <tr> <td>26</td> <td>19.6</td> </tr> <tr> <td>24</td> <td>29.4</td> </tr> <tr> <td>22</td> <td>44.5</td> </tr> <tr> <td>20</td> <td>62.3</td> </tr> <tr> <td>18</td> <td>89</td> </tr> <tr> <td>16</td> <td>100</td> </tr> </tbody> </table>	Wire Size (AWG)	Crimp Tensile N Minimum	26	19.6	24	29.4	22	44.5	20	62.3	18	89	16	100	EIA 364 8. Determine crimp tensile at a rate of 25.4 mm per minute.
Wire Size (AWG)	Crimp Tensile N Minimum															
26	19.6															
24	29.4															
22	44.5															
20	62.3															
18	89															
16	100															
Contact retention force	29.4 N minimum per contact with TPA 20 N minimum per contact without TPA	EIA 364 29. Apply axial load at a rate of 4.4 N per second and hold for 6 seconds.														
Connector locking strength	2Pos: 14.7N Minimum 3~12Pos: 49 N minimum.	EIA-364-98. Measure connector locking strength at a maximum rate of 12.7mm per minute.														
Contact insertion force	6.9 N maximum per contact.	EIA-364-5. Measure force necessary to insert a contact into the housing at a maximum rate of 12.7mm per minute.														

**ENVIRONMENTAL**

Thermal shock	See Note.	EIA-364-32, Test Condition VII. Subject specimens to 10 cycles between – 55° C and 105°C with 30 minute dwells at temperature extremes.
Humidity/temperature cycling	See Note.	EIA-364-31, Method III. Subject specimens to 10 cycles (10 days) between 25° and 65° C at 80 to 100% RH.
Temperature life	See Note.	EIA-364-17, Method A, Test Condition 4, Test Time Condition C. Subject mated specimens to 105° C for 500 hours.
Salt spray	See Note.	EIA-364-26. Subject mated specimens to 5% salt concentration for 48 hours.
Hydrogen sulfide	See Note.	Subject mated specimens to 3 ± 1 ppm H <sub>2</sub> S gas concentration maintained at 40° C±2° C for 96 hours
Ammonia	See Note.	Subject mated specimens to 3% ammonia solution for 7 hours



**NOTE**

*Shall meet visual requirements, show no physical damage, and meet requirements of additional tests as specified in the Product Qualification and Requalification Test Sequence shown in Figure 3.*

**Figure 2 (end)**

## 3.6. Product Qualification and Requalification Test Sequence

TEST OR EXAMINATION	TEST GROUP (a)								
	1	2	3	4	5	6	7	8	9
	TEST SEQUENCE (b)								
Initial examination of product	1	1	1	1	1	1	1	1	1
Low Level Contact Resistance	3, 7	2, 7					2, 4	2, 4	2, 4
Insulation resistance			2, 5						
Withstanding voltage			3, 6						
Temperature rise vs current		3, 8							
Random vibration	5	6(c)							
Mechanical shock.	6								
Durability.	4								
Mating force	2								
Unmating force.	8								
Crimp tensile.				2					
Contact retention force			7						
Connector locking strength.					2				
Contact insertion force.						2			
Thermal shock.			4						
Humidity/temperature cycling.		4(d)							
Temperature life.		5							
Salt spray.							3		
Hydrogen sulfide								3	
Ammonia.									3
Final examination of product.	9	9	8	3	3	3	5	5	5

Figure 3


**NOTE**

- (a) See paragraph 4.2.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Discontinuities shall not be measured. Energize at 18° C level for 100% loadings per Quality Specification 102-950.
- (d) Precondition specimens with 10 durability cycles.

#### 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 shown in Figure 4.

Temperature	15°C – 35°C
Relative Humidity	45% – 75%
Atmospheric Pressure	86.6 – 106.6 kPa

**Figure 4**

##### 4.2. Qualification Testing

###### A. Specimen Selection

Specimens shall be prepared in accordance with applicable instruction sheets and shall be selected at random from current production. Each test group shall consist of a minimum of 5 specimens

###### B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 3.

##### 4.3. Requalification Testing

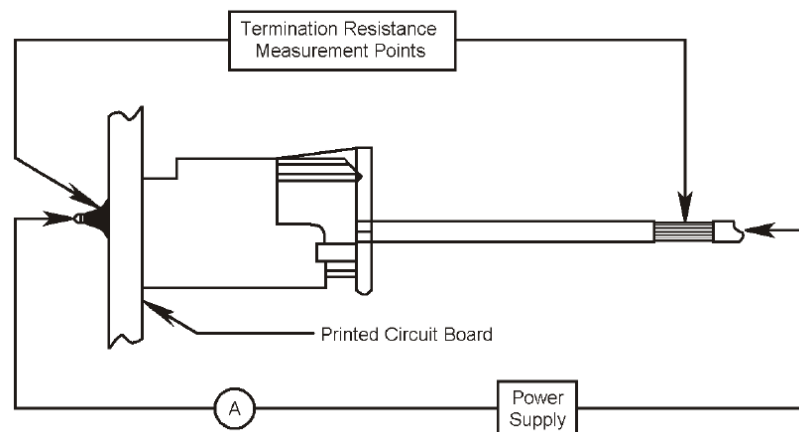
If changes significantly affecting form, fit or function are made to the product or manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

##### 4.4. Acceptance

Acceptance is based on verification that the product meets the requirements in Figure 1. 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 resubmittal.

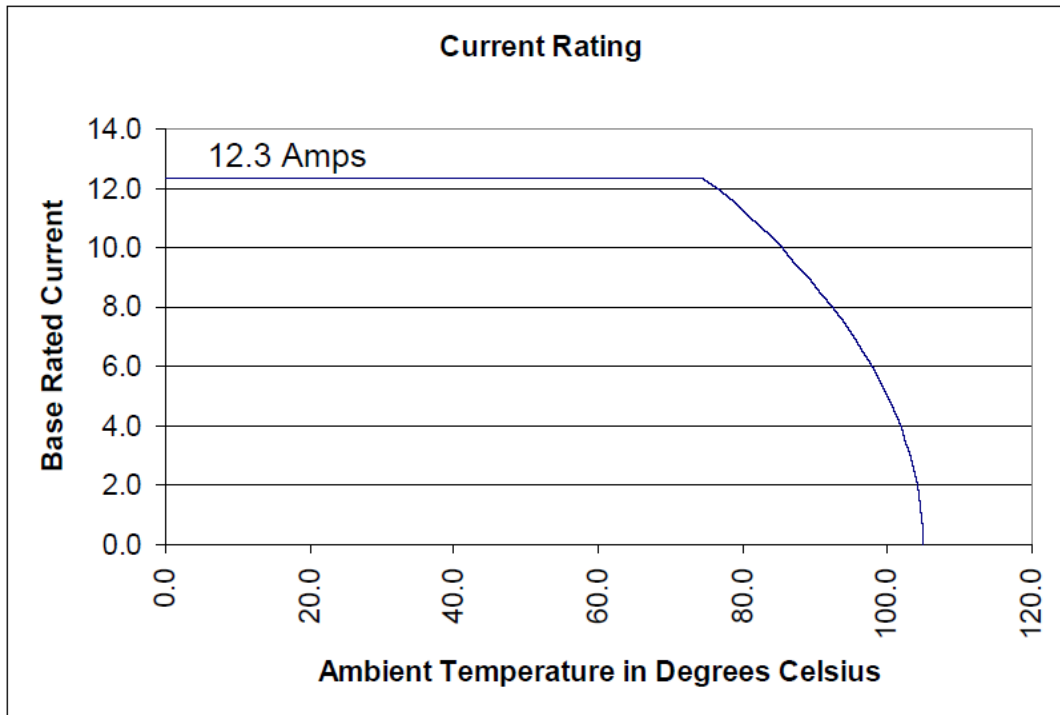
##### 4.5. Quality Conformance Inspection

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.



**Figure 4**

LLCR Measurement Points  
(Subtract Wire Bulk)



Current Carrying Capability

F-Factor Table

Wire Size (AWG)	22	20	18	16
<b>Loading Density</b>				
Single	0.750	0.818	0.899	1.0
50%	0.587	0.639	0.703	0.782
100%	0.435	0.475	0.522	0.580

Wire Size (AWG)	26	24
<b>Loading Density</b>		
Single	0.366	0.390
50%	0.285	0.309
100%	0.244	0.293

Maximum Terminal Temperature  
(Ambient Plus Temperature Rise in Degrees Celcius)



**NOTE**

To determine the acceptable current carrying capacity for percentage connector loading and wire gage indicated, use the Multiplication Factor (F) from the above chart and multiply it times the Base rated Current for a single circuit at the maximum ambient operating temperature shown in Figure 5.

**Figure 5**