

---

The product described in this document has not been fully tested to ensure conformance to the requirements outlined below. Therefore, TE Connectivity (TE) makes no representation or warranty, express or implied, that the product will comply with these requirements. Further, TE may change these requirements based on the results of additional testing and evaluation. Contact TE Engineering for further details.

---

## ISO Fuse and Relay Box Assembly

---

### 1. SCOPE

#### 1.1. Content

This specification covers performance, tests, and quality requirements for the TE Connectivity ISO Fuse and Relay Box.

#### 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.

#### 1.3. Qualification Test Results

Successful qualification testing on the subject product line was completed March 2021.

### 2. APPLICABLE DOCUMENTS AND FORMS

The following documents and forms constitute a part of this specification to the extent specified herein. Unless otherwise indicated, 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 Documents

- 114-151059: Application Specification and Relay Box Assembly

#### 2.2. Industry Documents

- EIA-364: Electrical Connector/Socket Test Procedures Including Environmental Classifications
- ISO 20653: Road vehicles — Degrees of protection (IP code) – Protection of electrical equipment against foreign objects, water, and access
- SAE J2030- 2015: Heavy-Duty Electrical Connector Performance Standard
- IEC 60512-5-1: Connectors for electronic equipment - Tests and measurements - Part 5-1: Current-carrying capacity tests - Test 5a: Temperature rise

### 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 product drawing.

3.3. Ratings

- Temperature: -40°C to 85°C
- Current: Refer to TE Connectivity AMP MCP 2.8 terminal system, Product Specification 108-18513
- Current: Refer to TE Connectivity AMP MCP 6.3 terminal system, Product Specification 108-18718
- Sealing: IP6K6, IP6K7

3.4. Performance and Test Description

Product is designed to meet the electrical, mechanical, and environmental performance requirements specified in Figure 1. Unless otherwise specified, all tests shall be performed at ambient environmental conditions.

3.5. Test Requirements and Procedures Summary

TEST DESCRIPTION	REQUIREMENT	PROCEDURE						
Visual examination.	Meets requirements of product drawing.	EIA 364-18B Examine visually under fluorescent lighting for form, fit and function. Verify print dimensions.						
<b>ELECTRICAL</b>								
Insulation Resistance.	100MΩ at 500VDC	EIA 364-21E 500 VDC, Test between adjacent contacts.						
Withstanding voltage.	Two-minute hold with no breakdown or flashover.	EIA 364-21E Condition I. 500 volts DC. Test between adjacent contacts. Instantaneous rate of rise.						
Connection Resistance.	100 Millivolts Max Voltage Drop.	EIA 364-6C Measurements taken across each interface after thermal equilibrium is reached at current levels shown. Subtract bulk resistance of Equal Wire Length.  <table style="margin-left: auto; margin-right: auto;"> <tr> <td style="text-align: center;">Wire Size (AWG)</td> <td style="text-align: center;">Test Current (Amperes)</td> </tr> <tr> <td style="text-align: center;">12</td> <td style="text-align: center;">15</td> </tr> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">40</td> </tr> </table>	Wire Size (AWG)	Test Current (Amperes)	12	15	10	40
Wire Size (AWG)	Test Current (Amperes)							
12	15							
10	40							
Termination resistance, dry circuit Relay unenergized.	Fuses: 10 mΩ Max. Relays: 40 mΩ Max.	EIA 364-23C Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. Relay unenergized - Measure across position 30 & 87a for each relay.						

Termination resistance, dry circuit Relay energized.	Fuses: 10 mΩ Max. Relays: 40 mΩ Max.	EIA 364-23C Subject specimens to 100 milliamperes maximum and 20 millivolts maximum open circuit voltage. Relay energized (12 VDC across 85 & 86) - Measure across position 30 & 87 for each relay.
<b>MECHANICAL</b>		
Mechanical shock.	No discontinuities greater than 10 microseconds.	EIA 364-27C Method H. 30 G's, total of 18 shocks.
Random vibration.	No discontinuities greater than 10 microseconds.	Subject specimens to 3.2 Grms between 10 to 2000 Hz. Eight hours in each of 3 mutually perpendicular planes. See figure 4 for vibration profile.
Contact retention.	AMP MCP 2.8 – 80N minimum. AMP MCP 6.3 – 80N minimum.	EIA 364-29C Method C - test to failure, 25.4mm/min test speed, push from mating side.
Housing locking mechanism strength.	Shall withstand disengagement force of 100 N without depressing latches.	EIA-364-98 Subject specimens to a force of 100 N for 1 minute in the unmating direction with latches engaged.
Housing locking mechanism retention force to failure.	Shall withstand disengagement force of 250 N before latches are damaged (pull to failure).	EIA-364-98 Subject specimens to force in the unmating direction until latches are damaged. 13mm/min, CPA engaged.
Durability, misaligned hinges.	No breakage after misaligned forces. Stress mark surface cracking permissible.	Subject specimens to 3 misaligned mounting/dismounting cycles on each hinge at room ambient temperature applying a force of 100 N for 1 minute.
Connector cover durability at room ambient temperature.	See Note.	Mount and unmount cover 50 times at room ambient temperature.
Connector cover durability at -40°C.	See Note.	Mount and unmount cover 5 times at -40°C.
Secondary Lock Strength.	Latch shall not disengage.	Attempt to open cover while applying a force of 45N to the latch unit.

Free Fall.	Shall remain functional, some chips and dents permitted but not over seal area.	J2030- 2015 Subject specimens affixed to a 750 mm cable, routed symmetrically, to 8 drops, rotated 45 degrees each drop.
------------	---	---

**ENVIRONMENTAL**

Resistance to thermal shocks.	See Note.	EIA 364-32F Test Condition I. Subject specimens to 50 cycles between -55°C and 85°C for 1 hour at each extreme, with maximum transition time of 5 minutes.
Degree of Protection.	No ingress of water or dust. See Note.	ISO 20653-2013 IP6K6: 100KPa @ambient with 100L/min from 2.5-3m with a nozzle of 12.5mm diameter. Dust-50% Portland Cement-50%Fly Ash with 6 sec agitation every 15 min for 5 hours.  IP6K7: Room ambient parts placed into room ambient container of water of 1m depth for 30 min.
Salt fog.	No water ingress. See Note.	EIA-364-26 Condition D. Subject specimens to 5% salt concentration at 35°C for 1000 hours.
Humidity-temperature cycling.	See Note.	EIA-364-31 Method IV. Subject specimens to 10 cycles (10 days) between 25 and 65°C at 80 to 100% RH with -10°C cold shock.
Temperature life	See Note.	EIA-364-17B Method A, Test Time Condition A. Subject specimens loaded per Figure 3 to 80°C for 96 hours.
Temperature rise vs current at elevated ambient conditions.	Shall not exceed 40°C temperature rise above ambient.	EIA-364-70B IEC 60512-5-1 Measure temperature rise vs current. Subject specimens per Figure 3 to 80°C AMP MCP 2.8 - 10 Amps AMP MCP 6.3 - 20 Amps

*Figure 1*



**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 2.*

### 3.6. Product Qualification and Requalification Test Sequence

The following tests were performed on the Fuse and Relay Box Assembly.

TEST OR EXAMINATION	TEST GROUP (a)							
	1	2	3	4	5	6	7	8
	TEST SEQUENCE (b)							
Visual examination	1,10	1,9	1,6	1,8	1,5	1,5	1,5	1,5
Connection Resistance				2,4,6				
Insulation Resistance		2,4,6,8	2,5					
Withstanding voltage					2,4			2,4
Termination resistance, dry circuit Relay unenergized	2,5,8							
Termination resistance, dry circuit Relay energized	3,6,9							
Random vibration				3				
Mechanical shock				5				
Housing locking mechanism strength						4		
Housing locking mechanism retention force to failure							4	
Connector cover durability at room ambient						3		
Connector cover durability at -40°C				7				
Durability, misaligned hinges						2		
Contact retention							2	
Secondary Lock Strength							3	
Free Fall			3					
Degree of protection, IPX6		7						
Degree of protection, IP6K7		5	4					
Salt fog					3			
Thermal shock		3						
Humidity-temperature cycling								3
Temperature life	7							
Temperature rise vs current at elevated ambient conditions	4							

Figure 2



**NOTE**

- (a) See paragraph 4.1.A.
- (b) Numbers indicate sequence in which tests are performed.
- (c) Samples allowed to vent to atmosphere during exposure via an unpopulated circuit cavity or through wire ends.

**4. QUALITY ASSURANCE PROVISIONS**

4.1. 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 3 samples.

Sample Quantities for Test Sequences

Test Group	Fuse and Relay Box Assembly	Cover	Wire Size (6.3 AMP MCP)	Wire Size (2.8 AMP MCP)	Sample Quantity	Comments
1	2297813-3	1443996-4	10 AWG TXL	12 AWG TXL	3	Max Wire
2	2297813-1 2297813-2 2297813-3	2098164-3	18 AWG TXL	20 AWG TXL	3	Min Wire
3	2297813-1 2297813-2 2297813-3	2098164-3	18 AWG TXL	20 AWG TXL	3	Min Wire
4	2297813-3	2098164-3	10 AWG TXL	12 AWG TXL	3	Max Wire
5	2297813-1 2297813-2 2297813-3	2098164-3	18 AWG TXL	20 AWG TXL	3	Min Wire
6	2297813-3	2098164-3	N/A	N/A	3	
7	2297813-1 2297813-2 2297813-3	2098164-3	10 AWG TXL	12 AWG TXL	3	Max Wire
8	2297813-1 2297813-2 2297813-3	2098164-3	18 AWG TXL	20 AWG TXL	3	Min Wire

Figure 3

B. Test Sequence

Qualification inspection shall be verified by testing specimens as specified in Figure 2.

4.2. 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.

4.3. Acceptance

Acceptance is based on verification that the product meets the requirements of 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.

4.4. Quality Conformance Inspection

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

5. VIBRATION PROFILE

Breakpoint Frequency (Hz)	Magnitude (G <sup>2</sup> /Hz)	Slope Between Breakpoint (dB/Octave)
10 (see Note 1)	.070	0.0
20 (see Note 1)	.070	-5.42
40	.020	0.0
350	.020	-9.20
550	.005	-20.02
700	.001	-100.12
750	.0001	0.0
2000	.0001	0.0

Figure 4

**NOTE**

1. Linear slopes on log-log plots only.
2. RMS G level: -3.2 G's maximum G level limited to 3x the RMS level.
3. Tolerance: ± 4 db from 10 to 2000 Hz.
4. Wires to be firmly supported within 100 mm from base wire exits. Device oriented to horizontal and vertical plane.

---

**6. REVISION HISTORY**

Revision	Date	Revision Description
A	Aug 2, 2023	Initial Release