

**Ingress Protection Evaluation of CPC Plugs**

**1. INTRODUCTION**

1.1. Purpose

Testing was performed on the TE Connectivity (TE) Circular Plastic Connector (CPC) plugs in combination with 10 and 7.5 mm cable, cable entry boots and heat shrink tubing to determine their conformance to IEC60529 tests IPX5 and IP6X.

1.2. Scope

This report covers the environmental performance of the TE CPC plug, cable entry boot, and heat shrink tubing. Testing was performed at the Harrisburg Electrical Components Test Laboratory between 02May11 and 04May11. The test file number for this testing is EA20110344T Revision A. This documentation is on file at and available from the Harrisburg Electrical Components Test Laboratory.

1.3. Conclusion

All specimens conformed to IPX5 protection against water ingress and the IP6X protection against foreign objects per IEC60529 Edition 2.1.

1.4. Test Specimens

Specimens identified with the following part numbers were used for test. See Figures 1, 2 and 3.

Test Group	Quantity	Part Number	Description
1,3	5 each	206037-2	CPC plug, Size 17
		213933-1	Cable entry seal boot
		HTAT-32/8	Heat shrink tubing
		NA	Customer supplied 7.5 mm cable
2	4	206037-2	CPC plug, Size 17
		213933-1	Cable entry seal boot
		ATUM-40/13	Heat shrink tubing
		NA	Customer supplied 10 mm cable
4	5	206037-2	CPC plug, Size 17
		213933-1	Cable entry seal boot
		ATUM-40/13	Heat shrink tubing
		NA	Customer supplied 10 mm cable

Figure 1



Figure 2  
10 mm Specimen



Figure 3  
7.5 mm Specimen

1.5. Environmental Conditions

Unless otherwise stated, the following environmental conditions prevailed during testing:

- Temperature: 15 to 35°C
- Relative Humidity : 20 to 80%

1.6. Test Sequence

Test or Examination	Test Group (a)			
	1	2	3	4
	Test Sequence (b)			
Initial examination of product	1	1	1	1
IPX5			2	2
IP6X	2	2		
Final examination of product	3	3	3	3

- NOTE** (a) See paragraph 1.4.  
 (b) Numbers indicate sequence in which tests are performed.

Figure 4

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## 2. SUMMARY OF TESTING

### 2.1. Initial Examination of Product

Specimens were visually examined and no evidence of physical damage detrimental to product performance was observed.

### 2.2. IPX5

All specimens conformed to IPX5 protection against water jets per IEC60529 Edition 2.1.

### 2.3. IP6X

All specimens conformed to IP6X protection against foreign objects per IEC60529 Edition 2.1.

### 2.4. Final Examination of Product

No visual evidence of physical damage detrimental to product performance was observed. There was no water or dust observed in the specimens following testing.

## 3. TEST METHODS

### 3.1. Initial Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance in accordance with EIA 364-18B.

### 3.2. IPX5

Specimens were assembled using customer provided cable. The cable was placed inside the heat shrink tubing which was then shrunk to the cable. The wire cavities on the mating half were sealed using silicone. The cable end and the mating half was sealed using dielectric wax. A piece of paper towel was placed inside the specimen to aid in water ingress detection. The specimen was then covered with approximately 60 mm of additional heat shrink tubing to seal the threaded interface. Test parameters included 12.5 l/min  $\pm$  5% flow rate, specimens were tested at a distance of 2.5 to 3.0 m from the nozzle for a duration of 3 minutes. A 6.3 mm spray nozzle used during the test is shown in IEC60529 Edition 2.1, Figure 6. Specimens were then dried, unmated, and inspected for signs of water ingress.

### 3.3. IP6X

Specimens were assembled using customer provided cable. The cable was placed inside the heat shrink tubing which was then shrunk to the cable. The wire cavities on the mating half were sealed using silicone and allowed to cure for 24 hours. The wire cable end and the mating half wire cavities were sealed using dielectric wax. The specimen was then covered with approximately 60 mm of additional heat shrink tubing to seal the threaded interface. Specimens were placed into the talcum dust chamber and subjected to 8 hours of dust testing. Specimens were then brushed off, unmated and inspected for signs of dust ingress.

### 3.4. Final Examination of Product

Specimens were visually examined for evidence of physical damage detrimental to product performance in accordance with EIA 364-18B.