



Protective Covers for Medium Voltage (AMPACT and U.D.C.)

1. SCOPE

1.1 Content

This specification covers the performance, tests and quality requirements of the **Protective Covers for Medium Voltage**, used on U.D.C. and AMPACT Connectors.

1.2 Qualification

When tests are performed on the subject product line, the procedures specified in AMP 109 Series Specifications 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. 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 AMP Documents

- 109-1 *General Requirements for Test Specifications*
- 109 Series *Test Specifications as indicated in Figure 1 (Comply with MIL-STD-202, MIL-STD-1344 and EIA RS-364)*
- Corporate Bulletin 401-76 *Cross-reference between AMP Test Specifications and Military or Commercial Documents*
- Instruction Sheet 411-37020 *AMPACT / U.D.C. Protective Covers for Medium Voltage*

2.2 Other Standards

- ASTM D-149 *Standard Test method for dielectric breakdown voltage and dielectric strength of solid electrical insulating materials at commercial power frequencies.*
- ASTM D-257 *DC Resistance or conductance of insulating materials.*
- ASTM G-26 *Standard recommended practice for operating light-exposure apparatus (xenon-arc type) with and without water for exposure of nonmetallic materials.*

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- NBR 6241 *Tração à ruptura em materiais isolantes e coberturas extrudadas para fios e cabos elétricos (Tensile strength of insulating materials and extruded covers for electrical wires and cables) .*
- NBR 10296 *Material isolante elétrico - avaliação de sua resistência ao trilhamento elétrico e erosão sob severas condições ambientais (Electrical insulating material - evaluating resistance to tracking and erosion under severe ambient conditions - test method) .*
- NBR 6936 *Técnicas de Ensaio Elétricos de Alta Tensão (High Voltage Electrical Tests Techniques)*

### 3. REQUIREMENTS

#### 3.1 Design and Construction

Product shall be of design , construction and physical dimensions specified on the applicable product drawing .

#### 3.2 Materials

- Body, Cover and Spacer Components Polypropylene, black, UV established grade (or other approved by Product Engineering)
- Sealant Compound Polybutene Based Mastic Compound (or other approved by Product Engineering)
- Sealant Grease Hidrocarbon Based Sealant (or other approved by Product Engineering)

#### 3.3 Ratings

- Voltage : Insulated for 6 kV / Protected for 15 kV
- Temperature : -20° C to 130° C
- Insulation Resistance :  $8 \times 10^9$  Ohms minimum
- Withstand Voltage : 15 kV
- Breakdown Voltage : 20 kV minimum

#### 3.4 Performance and Test Description

The product (raw material & cover + connector samples) is designed to meet the electrical , mechanical and environmental performance requirements specified in Figures 1, 2 and 3 . All tests are performed at ambient environmental conditions per AMP Specification 109-1 or otherwise specified .

#### 3.5 Test Requirements and Procedures Summary

## 3.5.1 Raw Material Tests

(on the Polypropylene, black, UV established grade molding compound)

Test Description	Requirement	Procedure
<b>ELECTRICAL</b>		
Dielectric strength	30 kV minimum in all the samples tested.	Use five discs of 57 mm of diameter and 1.6 mm of thickness (or use five bodies/covers components) as samples. Use a tank with insulation oil and put inside two opposite electrodes (described as Type II on the ASTM D-149) against one sample. Apply the AC test voltage, increasing uniformly its value, until the breakdown occurs, according to ASTM D-149, Method A. Repeat the operation in all the five samples.
Resistance to tracking and erosion under severe ambient	2.75 kV minimum (Method 2, Criteria A) Before artificial aging	Before aging and after aging (from UV test) different test samples should be tested.
	2.50 kV minimum (Method 2, Criteria A) After artificial aging	Use five plates of material of 50 mm x 120 mm (minimum) with 6 mm approximately thickness, according to NBR 10296.
<b>MECHANICAL</b>		
Tensile strength	Tensile strength = 30 N/mm <sup>2</sup> (minimum)  All the average values after aging should be compared to the average value before aging and the maximum variation between these values must be $\pm 25\%$ .	Before aging and after aging (from heat and UV tests) different test samples should be tested. Test samples according ISO R527 should be submitted to tensile strength tests, according NBR 6241 (or equivalent standard). The average value of tensile strength from a minimum of 5 samples should be calculated.
<b>ENVIRONMENTAL</b>		
Artificial Aging (exposition to high temperature)	168 hours, in dry oven at $135 \pm 3^\circ \text{C}$ .  Tensile strength test should be performed on the samples after aging.	Test samples (minimum 5) according ISO R527 should be submitted to heat exposition, on a dry oven according to NBR 6238 (or other equivalent standard).
Artificial Aging (exposition to UV)	2000 hours, with cycles of 102 minutes of radiation at $50^\circ \text{C}$ , humidity 50%, and 18 minutes of rain, at $50^\circ \text{C}$ . Tensile strength test should be performed on the samples after aging.	Test samples (minimum 5) according ISO R527 should be submitted to UV on a radiation chamber according to ASTM G-26, Method A.
	2000 hours, with cycles of 102 minutes of radiation at $50^\circ \text{C}$ , humidity 50%, and 18 minutes of rain, at $50^\circ \text{C}$ . Resistance to tracking test should be performed on the samples after aging.	Test samples (5) according NBR 10296 should be submitted to UV on a radiation chamber according to ASTM G-26, Method A.

Figure 1

## 3.5.2 Tests on Cover + Connector assembled samples

## 3.5.2.1 On laboratory conditions

Test Description	Requirement	Procedure
Examination of the Products	Meets requirement of product specification and customer drawings.	Visual, dimensional and functional per each applicable quality inspection plan.
<b>ELECTRICAL</b>		
Insulation Resistance (at room temperature)	$8 \times 10^9$ Ohms minimum  Test Voltage : 500 Vdc  Time : one minute	Apply three samples according to AMP Instruction Sheet 411-37020 , using two convenient pieces of protected cable for each sample . Peel one of the cable end . Wrap up a aluminum (or other conductive material) sheet around the center of the cover. Apply the test voltage using the peeled cable end and the aluminum sheet as electrodes, according to AMP Specification 109-28-4 or ASTM D-257.
Dielectric Withstanding and Breakdown Voltage	Test Voltage: 15 kV Time : Five minutes  No breakdown or flash over  Minimum Breakdown Voltage: 20 kV	Use the same samples applied on the insulation resistance test . Apply the test voltage from zero until the specified , at a rate of 2000 Vac/second. After the time specified , the voltage shall be increased at the same rate until the failure occurs, according to AMP Specification 109-29-3.
Dielectric Withstanding under artificial rain	Test voltage: 15 kV Time: Five minutes Artificial Rain Components: Horizontal : 1.0-2.0 mm/minute Vertical: 1.0-2.0 mm/minute Water resistivity: (100±15) [Ohm x m]  No breakdown or flash over	Apply three samples according to AMP Instruction Sheet 411-37020 , using two convenient pieces of protected cable for each sample . Peel one of the cable end . Wrap up a aluminum (or other conductive material) sheet around the center of the cover. Apply the test voltage using the peeled cable end and the aluminum sheet as electrodes, according to NBR 9326 (or other equivalent standard).

Figure 2

## 3.5.2.2 On simulated span (compact power or spacer cable network) conditions

Test Description	Requirement ELECTRICAL	Procedure
Corona	Test voltage: 15 kV  No corona appearance (visual and by oscilloscope monitoring)	Using the same power distribution structure (cables, spacers, hardware, etc.), in its original insulating minimum dimensions, apply a sample according AMP Instruction Sheet 411-37020 on the middle of the span. Apply the test voltage, according NBR 6936 (or other equivalent standard), between: 1- the cable that the cover + connector are applied and the neutral. 2- the cable that the cover + connector are applied and a circular metallic electrode in the middle of the cover.  Configurations including: just connector, humidity on the cover, sealant removing, changing on the application of the voltage (polarity) should be used, just for comparison and information purposes.
Atmospheric Impulse	1- Test voltage: 110 kV minimum (applied between the cable that the cover + connector are applied and the neutral) 2- Test voltage: 50 kV minimum (applied between the cable that the cover + connector are applied and a circular metallic electrode in the middle of the cover  Number of impulses: 15 in each polarity (+ & -)  No more than two electrical discharges in each polarity are admissible.	Using the same power distribution structure (cables, spacers, hardware, etc.), in its original insulating minimum dimensions, apply a sample according AMP Instruction Sheet 411-37020 on the middle of the span. Apply the test voltage, according NBR 6936 (or other equivalent standard).  Configurations including: just connector, humidity on the cover, sealant removing, changing on the application of the voltage (polarity) should be used, just for comparison and information purposes.

Figure 3

## 3.6 Product Qualification and Requalification Tests Sequences

TEST OR EXAMINATION	Test Groups (a)								
	1	2	3	4	5	6	7	8	9
	Tests Sequence (b)								
Dielectric strength		1							
Resistance to tracking and erosion under severe ambient					1,3				
Tensile strength			1,3	1,3					
Artificial Aging (exposition to high temperature)			2						
Artificial Aging (exposition to UV)				2	2				
Examination of the Product	1								
Insulation Resistance (at room temperature)	2					1			
Dielectric Withstanding and Breakdown Voltage	3					2			
Dielectric Withstanding under artificial rain							1		
Corona								1	
Atmospheric Impulse									1

Figure 4

- (a) The test group 1 is indicated for product receiving and inspection. The test groups 2 through 9 are indicated for product qualification and requalification .
- (b) Numbers indicate sequence in which tests are performed.

## 4. QUALITY ASSURANCE PROVISIONS

## 4.1 Qualification Testing

## a) Sample Selection

Connector samples shall be prepared in accordance with applicable Instruction Sheet no. 411-37020 .They shall be selected at random from current production .

## b) Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 4 .

## 4.2 Requalification Testing

If changes significantly affecting form , fit or function are made to the product or to the manufacturing process , quality 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 Figures 1, 2 and 3, according test sequences as described in Figure 4. Failures attributed to equipment , test setup , or operation deficiencies shall not disqualify the product . When product failure occurs , corrective action shall be taken and samples resubmitted for qualification . Testing to confirm corrective action is required before resubmitted .

#### 4.4 Quality Conformance Inspection

The applicable AMP Quality Inspection Plan (QIP) will 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.

Revision Record		
Revision	Date	Description
O	25-May-1995	Released
A	10-Aug-1998	EC LB00-0213-98