# QUALIFICATION TEST REPORT

CONNECTOR, UNIVERSAL DISTRIBUTION,
REINFORCED

501-289 Rev. O

| | |
|---|---|
| Product Specification: | 108-37019, Rev. E |
| CTL No.: | CTL0946-001 |
| Date: | 2/16/95 |
| Classification: | Unrestricted |
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**Corporate Test Laboratory Harrisburg, Pennsylvania**

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(R0946EP)

AMP

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CORPORATE TEST LABORATORY

Qualification Test Report

1. Introduction

1.1 Purpose

Testing was performed on the AMP* Universal Distribution Connector to determine its conformance to the requirements of AMP do Brasil Product Specification 108-37019, Rev. E.

1.2 Scope

This report covers testing of the electrical, mechanical, and environmental performance of the Universal Distribution Connector manufactured by AMP do Brasil. The testing was performed between December, 1992 and November, 1994.

1.3 Conclusion

The Universal Distribution Connectors represented by the part numbers listed in the tables on pages 2 and 3, when assembled with the wire combinations shown, meet the electrical, mechanical, and environmental performance requirements of AMP do Brasil Product Specification 108-37019 Rev. E.

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## 1.4 Product Description

Universal Distribution Connectors consist of a "C" member and a wedge component, both made of a tin-plated copper alloy. The connector components are configured so as to create a spring action. They are recommended for connecting solid or stranded conductors of aluminum or copper regardless of their combinations. They are installed using conventional "parallel jaw" pliers, and have a locking feature that also provides visual confirmation of a good connection.

## 1.5 Test Samples

The test samples were randomly selected from normal current production lots, and the following part numbers, assembled to the wire types, sizes, and combinations listed, were used for testing:

| Test Group | Quantity | Part # | Wire Combination |
|---|---|---|---|
| 1 | 4 | 444031-1 | 1/0 Str. Copper x 1/0 Str. AAC |
| 1 | 4 | 444031-1 | 1/0 Str. AAC x 1/0 Str. AAC |
| 1 | 4 | 881781-1 | #2 Str. Copper x #2 Str. AAC |
| 1 | 4 | 881781-1 | #2 Str. AAC x #2 Str. AAC |
| 1 | 4 | 881785-1 | #6 Sol. Copper x #6 Str. AAC |
| 1 | 4 | 881785-1 | #6 Str. AAC x #6 Str. AAC |
| 1 | 4 | 688655-1 | #6 Sol. Copper x 2/0 Str. AAC |
| 1 | 4 | 688655-1 | #6 Str. AAC x 2/0 Str. AAC |
| 1 | 4 | 688652-1 | #6 Sol. Copper x #4 Str. AAC |
| 1 | 4 | 688652-1 | #6 Str. AAC x #4 Str. AAC |
| 1 | 4 | 688657-1 | #14 Sol. Copper x #2 Str. AAC |
| 2 | 4 | 444031-1 | 1/0 Str. Copper x 1/0 Str. AAC |
| 2 | 4 | 444031-1 | 1/0 Str. AAC x 1/0 Str. AAC |
| 2 | 4 | 881781-1 | #2 Str. Copper x #2 Str. AAC |
| 2 | 4 | 881781-1 | #2 Str. AAC x #2 Str. AAC |
| 2 | 4 | 881781-1 | #4 Str. AAC x #4 Str. AAC |
| 2 | 4 | 881785-1 | #6 Sol. Copper x #6 Str. AAC |
| 2 | 4 | 881785-1 | #6 Str. AAC x #6 Str. AAC |
| 2 | 4 | 688655-1 | #6 Sol. Copper x 2/0 Str. AAC |
| 2 | 4 | 688655-1 | #6 Str. AAC x 2/0 Str. AAC |
| 2 | 4 | 688652-1 | #6 Sol. Copper x #4 Str. AAC |
| 2 | 4 | 688652-1 | #6 Str. AAC x #4 Str. AAC |
| 2 | 4 | 688657-1 | #14 Sol. Copper x #2 Str. AAC |

| Test Group | Quantity | Part # | Wire Combination |
|---|---|---|---|
| 3 | 3 | 444031-1 | 1/0 Str. Copper x 1/0 ACSR |
| 3 | 3 | 444031-1 | 1/0 ACSR x 1/0 ACSR |
| 3 | 3 | 444031-1 | 1/0 Str. AAC x 1/0 Str. AAC |
| 3 | 3 | 444031-1 | #2 ACSR x 1/0 ACSR |
| 3 | 3 | 881781-1 | #4 Sol. Copper x #2 Str. Copper |
| 3 | 3 | 881781-1 | #2 ACSR x #6 Sol. Copper |
| 3 | 3 | 881781-1 | #2 Str. Copper x #2 Str. Copper |
| 3 | 3 | 881781-1 | #4 Str. AAC x #4 Str. AAC |
| 3 | 3 | 881781-1 | #4 Str. Copper x #4 Str. AAC |
| 3 | 3 | 881781-1 | #2 ACSR x #4 ACSR |
| 3 | 3 | 881785-1 | #4 Sol. Copper x #10 Sol. Copper |
| 3 | 3 | 881785-1 | #6 Sol. Copper x #8 Str. Copper |
| 3 | 3 | 881785-1 | #6 Sol. Copper x #4 Sol. Copper |
| 3 | 3 | 881785-1 | #4 Sol. Copper x #12 Sol. Copper |
| 3 | 3 | 881785-1 | #6 Sol. Copper x #6 Sol. Copper |
| 3 | 3 | 688655-1 | #6 Sol. Copper x 2/0 ACSR |
| 3 | 3 | 688652-1 | #2 Str. Copper x #12 Sol. Copper |
| 3 | 3 | 688652-1 | #2 Str. Copper x #8 Sol. Copper |
| 3 | 3 | 688652-1 | #2 ACSR x #10 Sol. Copper |
| 3 | 3 | 688657-1 | #14 Sol. Copper x #2 Str. AAC |
| 3 | 3 | 688657-1 | #4 Str. AAC x #14 Sol. Copper |
| 3 | 3 | 688657-1 | #2 ACSR x #14 Sol. Copper |

## 1.6 Qualification Test Sequence

| | Test Groups | | |
|---|---|---|---|
| **Test or Examination** | **1** | **2** | **3** |
| Examination of Product | 1 | 1 | 1 |
| Termination Resistance | 2-4* | 2-4-6 | |
| Heat Cycle | 3 | | |
| Thermal Shock | | 3 | |
| Corrosion | | 5 | |
| Tensile Strength | | | 2 |

The numbers indicate sequence in which tests were performed.
* - Measurements taken throughout the test as specified.

## 2. Summary of Testing

### 2.1 Examination of Product - All Groups

All samples submitted for testing were selected from normal current production lots. They were inspected and accepted by the Product Assurance Department of AMP do Brasil.

### 2.2 Termination Resistance - Groups 1 & 2

Group 1 - Heat Cycle Test

Voltage drop measurements were taken at the specified intervals during the heat cycle test, converted to termination resistance, and normalized to 20°C. These measurements indicated that the connectors met the requirement for resistance stability during the heat cycle testing. That requirement states that from the 25th cycle to the 500th cycle, no resistance measurement taken on a particular connector, may vary by more than ±5% from the average of the measured values over the test interval for that connector.

Group 2 - Thermal Shock and Corrosion

The voltage drop measurements across each connector in the test group did not deviate by more than 250% from the initial measurements to measurements taken after exposure to either Thermal Shock or Corrosion tests.

### 2.3 Heat Cycle Test - Temperature Stability

Throughout the Heat Cycle test, the temperature of the connectors, as required, did not exceed the temperature of the control conductor. The temperature difference between the control conductor and each connector met the requirement for stability from the 25th cycle to the 500th cycle of testing. Stability is achieved when none of the temperature differences between the control conductor and the connector is more than 10°C below the average of all temperature differences for that connector over the test interval.

### 2.4 Thermal Shock - Group 2

After five cycles of Thermal Shock as specified, all connectors met the requirements for termination resistance (see section 2.2).

### 2.5 Corrosion - Group 2

After completion of the 30-day Salt Spray corrosion test as specified, all connectors met the requirements for termination resistance (see section 2.2).

## 2.6 Tensile Strength - Group 3

The tensile strength test data indicated that all samples met the requirement for tensile strength. That is, the connector shall not break or become separated from the cable until attaining a tensile force of 200 pounds, or 5% of the rated conductor strength of the weaker conductor, whichever is larger, for conductors larger than #6 AWG. For conductors #6 and smaller, the requirement is 100 pounds.

# 3. Test Methods

## 3.1 Examination of Product

Test samples were visually inspected before and after assembly to assure proper manufacturing and assembly in accordance with the drawings and instructions.

## 3.2 Termination Resistance

Termination resistance (voltage drop) measurements were taken at a current of 10 amperes DC, with the exception of the chain containing P/N 688657-1, connecting #14 solid copper wire and #2 AAC. For that chain, a current of 3 amperes DC was used, to avoid appreciable heating due to the smaller wire size. The readings were made using a four terminal measurement technique.

## 3.3 Heat Cycle Test

Test samples were subjected to a heat cycle (current cycling) test in accordance with the ANSI C119.4-1991 specification for Class A electrical connectors. The testing consisted of 500 cycles, each cycle consisting of a 1 hour current-on time, and a 1 hour current-off time for a total cycle time of 2 hours. Current was adjusted during the first 25 cycles to obtain a 100°C temperature rise above ambient in the control conductor. Resistance and temperature measurements were taken at the following intervals: 25, 50, 75, 100, 125, 165, 205, 250, 325, 405, and 500 cycles. Temperature measurements were taken at the end of the current-on period, while resistance measurements were taken at the end of the current-off period.

## 3.4 Thermal Shock

Test samples were subjected to five cycles of Thermal Shock, in accordance with AMP Specification 109-13009. Samples were configured as shown in Figure 2 of the test specification. Each cycle consisted of the following:

- 2½ hours @ 150°C
- ¼ hour @ 0°C (melting ice water)
- ½ hour @ 150°C
- 20 3/4 hours @ room temperature

3.5 Corrosion, Salt Spray

Test samples were subjected to a 30 day Salt Spray Corrosion test in accordance with AMP Specification 109-13010, each daily exposure consisting of:

- 15 hours in a 5% salt spray atmosphere
- 1 hour in a drying oven @ 100°C
- 8 hours @ room temperature

3.6 Tensile Strength

Test samples were placed in a tensile testing machine and an axial force applied to the conductors at a rate of ¼ inch per minute per foot of length between the machine jaws. Force was applied until the connectors broke or became separated from the conductors.

4. Validation

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