AMP

QUALIFICATION TEST REPORT

AMP* AMPLI-BOND* TERMINALS
Per MIL-T-7928

501-33 Rev. 0

Product Specification:	MIL-T-7928
CTL No.:	CTL3024-006
Date:	April 30, 1986
Classification:	Unrestricted
Distribution:	11

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AMP

AMP INCORPORATED

HARRISBURG, PENNSYLVANIA 17105 PHONE: 717-564-0100 TWX: 510-657-4110

CORPORATE TEST LABORATORY

Qualification Retention Test
AMP AMPLI-BOND Class 2 Terminals per
MIL-T-7928, Group C

1. Introduction

1.1 Purpose

Testing was conducted to determine that AMP AMPLI-BOND Class 2 Terminals continue to comply with the Group C Inspection requirements of MIL-T-7928, paragraph 4.6.4.2.

1.2 Scope

This report covers electrical and mechanical performance of these terminals, made by the General Products Division of the General Products Group. Terminals, representative of current production, were subjected to inspection and were accepted by the Product Assurance Department of the division. They were submitted to the laboratory on Oct. 2, 1985. Testing was performed between Nov. 19, 1985 and Jan. 17, 1986.

1.3 Conclusions

All samples met the Group C periodic inspection requirements specified in MIL-T-7928 for Class 2 terminals.

1.4 Product Description

AMP AMPLI-BOND terminals consist of a tin plated copper body with an insulating sleeve which fits over the terminal barrel. AMP Class 2 crimping tools produce crimps for a given size wire and terminal that are precisely alike in appearance and performance. The resulting termination is extremely resistant to vibration, shock and critical environments, and its tensile strength far exceeds the requirements of the specification.

1.5 Test Samples

The following terminals were subjected to the Group C Inspection test sequence of MIL-T-7928:

AMP Part No.	Military Part No.	Description	
		Wire Range	Stud Size
322049	M25036-116	8	1/4
322153	M25036-119	6	#10
322053	M25036-123	4	1/4
322125	M25036-126	2	1/4
322085	M25036-132	1/0	1/4
322090	M25036-136	2/0	3/8
322059	M25036-138	3/0	3/8
322061	M25036-140	4/0	3/8

These terminals are typical of the product line from wire sizes 8 through 4/0 AWG. Other catalog numbers represent variations of the tongues and bolt hole sizes.

Class 2 hydraulic crimping tools used to prepare test samples were Cat. #69066 hydraulic head and the following dies that fit it:

Wire Size	Die Catalog Number
8	48858-1
6	48859-1
4	48860-1
2	48861-1
1/0	48756-1
2/0	48757-1
3/0	48758-1
4/0	48759-1

1.6 Test Sequence as specified in MIL-T-7928

Samples were subjected to the test sequence listed below:

Inspection	Requirement Paragraph	Method Paragraph
Group I		
Current Cycling	3.5.2	4.7.3
Voltage Drop	3.5.1	4.7.2
Group II		
Vibration	3.5.6	4.7.7
Voltage Drop	3.5.1	4.7.2
Tensile Strength	3.5.7	4.7.8
Group III		
Immersion (105°C)	3.5.8	4.7.9.1
Dielectric Withstanding Voltage	3.5.3	4.7.4
Group IV		
Flammability	3.5.10	4.7.11
Group V		
Salt Spray (corrosion)	3.5.4	4.7.5
Voltage Drop	3.5.1	4.7.2
Tensile Strength	3.5.7	4.7.8
Group VI		
Heat Aging (105°C)	3.5.9	4.7.10.1
Dielectric Withstanding Voltage	3.5.3	4.7.4
Group VII		
Low Temperature Crimp	3.5.11	4.7.12
Dielectric Withstanding Voltage	3.5.3	4.7.4
Group VIII		
Axial Load	3.5.5.2	4.7.6.3 & 4.7.6.4
Dielectric Withstanding Voltage	3.5.3	4.7.4

2. Summary of Test Results

2.1 Group I

Four samples of each terminal, crimped on wire, were subjected to current cycling. After 50 current cycles at the specified currents, all samples met the voltage drop requirement.

Test Methods:

Four samples of each size terminal, crimped on the wire size for which they were designed, were current cycled. Samples were attached to 3-foot lengths of wire. One cycle consisted of 30 minutes of current "on" time, followed by 15 minutes of current "off" time.

Following current cycling, voltage drop measurements were taken at the test current specified. The measurements were taken after the temperature of the conductors had stabilized. The average voltage drop reported has had an equal length of wire measurement deducted from the measured values.

Test Results:

Voltage Drop:

Wire Size	Average Voltage Drop Difference	Required Voltage Drop Difference	DC Test Current	DC Cycling Current
8	-0.45 mv.	+3.0 mv.	73 a.	92 a.
6	-0.63 mv.	+3.0 mv.	101 a.	127 a.
4	-0.15 mv.	+3.0 mv.	135 a.	167 a.
2	-0.19 mv.	+3.0 mv.	181 a.	227 a.
1/0	-0.12 mv.	+4.0 mv.	245 a.	307 a.
2/0	-0.44 mv.	+4.0 mv.	283 a.	354 a.
3/0	-0.39 mv.	+4.0 mv.	328 a.	410 a.
4/0	-0.21 mv	+4.0 mv.	380 a.	475 a.

2.2 Group II

Four samples of each terminal, crimped on wire, were vibrated for 18 hours in two mutually perpendicular planes, then were measured for termination resistance. This was followed by tensile testing. All samples passed the vibration, termination resistance and tensile requirements of the specification.

Test Methods:

Four samples of each size terminal, crimped on the wire size for which they were designed, were rigidly mounted to the vibration fixture by their normal mounting means. The other end was mounted to a stable support 12 inches back from the vibration table, with all slack removed. The terminals were vibrated in accordance with MIL-STD-202, Method 201 for 18 hours in each of two mutually perpendicular axes. Following vibration, the terminals were measured for voltage drop as described in Para. 2.1 above, after which the terminals were pulled to destruction, using a head speed of 1 inch per minute.

Test Results:

Voltage Drop:

Wire Size	Average Voltage Drop Difference	Required Voltage Drop Difference	DC Test Current
8	-0.35 mv.	+3.0 mv.	73 a.
6	-0.36 mv.	+3.0 mv.	101 a.
4	-0.20 mv.	+3.0 mv	135 a.
2	+0.44 mv.	+3.0 mv	181 a.
1/0	+0.15 mv.	+4.0 mv.	245 a.
2/0	+0.09 mv.	+4.0 mv	283 a.
3/0	+0.15 mv	+4.0 mv.	328 a.
4/0	+0.08 mv	+4.0 mv	380 a.

Tensile Strength:

Wire Size	Maximum Force (lbs.)	Minimun Force (lbs.)	Required Force (lbs.)
8	442	405	225
6	640	593	300
4	830	810	400
2	1205	1020	550
1/0	1725	1695	700
2/0	2190	2055	750
3/0	2935	2880	825
4/0	3455	2305	875

2.3 Group III

Four samples of each terminal, crimped on wire, were immersed in hydraulic fluid and four additional samples of each terminal, crimped on wire, were immersed in lubricating oil, each for a period of 20 hours. Then the samples were subjected to the dielectric withstanding test of 1.5 kv. ac for one minute. There was no breakdown or flashover on any sample, meeting the requirement of the specification.

Test Methods:

Four samples of each size terminal, crimped on the wire size for which they were designed, were immersed in hydraulic oil (MIL-H-5606) for 20 hours. Four additional samples, as above, were submerged in lubricating oil (MIL-L-7808) for 20 hours. After samples were removed from the oils, they were air dried for an hour, and the excess oil was wiped off. Then the tongues of the terminals were sealed with wax up to the crimp area. Each sample was submerged above the crimp area in a 5% salt water solution and a potential of 1.5 kv. ac was applied between the wire and the water for one minute.

2.4 Group IV

Two samples of each size terminal were tested for flammability. Burn time was zero seconds, which complies with the specification requirement of 30 seconds, maximum.

Test Method:

The crimped samples were subjected to the flammability test specified in MIL-T-7928. The tip of a 2 inch gas flame was applied for a period of 20 seconds to one half the length of insulation. When the flame was removed, the burn time of the insulation was observed.

2.5 Group V

Four samples of each terminal, crimped on wire, were exposed to a 5% salt spray for 48 hours. Then the samples were measured for voltage drop and tensile tested. All samples passed the termination resistance and tensile requirements of the specificaton.

2.5 Group V (continued)

Test Methods:

Four samples of each size terminal, crimped on the wire size for which they were designed, were exposed to 48 hours of 5% salt spray in accordance with MIL-STD-202, Method 101, condition B. Then they were rinsed in distilled water and air dried for a minimum of one hour. They were measured for voltage drop as described in Para. 2.1, and pulled to destruction as described in Para 2.2.

Test Results:

Voltage Drop:

Wire Size	Average Voltage Drop Difference	Required Voltage Drop Difference	DC Test Current
8	-0.40 mv.	+3.0 mv.	73 a.
6	-0.67 mv.	+3.0 mv.	101 a.
4	-0.10 mv.	+3.0 mv.	135 a.
2	-0.02 mv.	+3.0 mv.	181 a.
1/0	-0.19 mv.	+4.0 mv.	245 a.
2/0	-0.27 mv.	+4.0 mv.	283 a.
3/0	-0.14 mv	+4.0 mv.	328 a.
4/0	+0.05 mv.	+4.0 mv.	380 a.

Tensile Strength:

Wire Size	Maximum Force (lbs.)	Minimum Force (lbs.)	Required Force (lbs.)
8	415	405	225
6	640	632	300
4	816	810	400
2	1220	1202	550
1/0	1722	1710	700
2/0	2150	2150	750
3/0	2945	2915	825
4/0	3480	3445	875

2.6 Group VI

Four samples of each terminal, crimped on wire, were conditioned at 121°C for 120 hours. The cooled samples were subjected to the dielectric withstanding test of 1.5 kv. ac for one minute. There was no breakdown or flashover on any sample, meeting the requirements of the specification.

Test Methods:

Four samples of each size terminal, crimped on the wire size for which they were designed, were placed in a circulating air oven at 121°C for 120 hours. After cooling to room temperature, they were dielectrically tested as described in Para. 2.3.

2.7 Group VII

Four samples of each terminal and the crimping tools were conditioned at -5°C for one hour, then crimped to the specified wires while at that temperature. Then they were exposed to -65°C for one hour. After reaching room temperature, they were subjected to the dielectric test of 1.5 kv. for one minute. There was no evidence of rupture, cracking, breakdown or flashover on any sample, meeting the requirements of the specification.

Test Methods:

Four samples of each size terminal were placed in a circulating air oven for one hour at -5°C. While at that temperature, the terminals were crimped on the wire size for which they were designed. The assemblies were placed in a circulating air oven for one hour at -65°C, allowed to return to room temperature, and were dielectrically tested as described in Para. 2.3.

2.8 Group VIII

Five uncrimped samples of each size terminal were subjected to the axial load test specified in MIL-T-7928. The insulation on the terminals did not move more than 1/32 inch, meeting the requirements of the specification.

Five additional samples were crimped on the wire size for which they were designed, and exposed to 96 hours of 90%-95% humidity at 40°C. Then they were subjected to the axial load test, followed by the dielectric test of 1.5 kv. for one minute. The insulation on the terminals did not move more than 1/32 inch and there was no breakdown or flashover, meeting the requirements of the specification.

2.8 Group VIII (continued)

Test Method

On the five uncrimped samples, four 0.022 inch diameter holes were drilled through the insulation overhang. Uninsulated wires were inserted through the holes and were fastened together to equally distribute the load on the insulation sleeve. An eight pound force was applied to try to pull the insulation away from the wire barrel.

The five samples crimped on wire were subjected to 90%-95% relative humidity at 40°C for 96 hours described in MIL-STD-202, Method 103, Condition B. Then the samples were tested by applying an eight pound load between the crimped conductor and a suitable test jig positioned under the insulation overhang. The free end of the crimped conductor and the test jig were fastened in the jaws of the tensile machine, and the load was applied at a rate less than one inch per minute. This was followed by dielectric testing as described in Para. 2.3

3. Test Equipment Calibration

3.1 Calibrated Equipment

Calibrated test equipment used for this program is on a periodic calibration schedule which complies with MIL-STD-45662. Calibration of test equipment is performed by AMP Corporate Metrology, with standards that are traceaable to the National Bureau of Standards.

3.2 Uncalibrated Equipmment

Uncalibrated equipment (ovens, chambers, power supplies and the like) used for this program was monitored with calibrated equipment.

4. Validation

Report prepared by:

J. J. Edwards — 4/30/86
Supervisor
Design Assurance Testing
Corporate Test Laboratory

Report reviewed by

James R. Kohout — 4/30/86
Manager
Product Testing Section
Corporate Test Laboratory

Report approved by:

Robert J. Osif — 4/30/86
Manager
Product Assurance
General Products Division