



QUALIFICATION TEST REPORT

AMP* Multimate Type II Contacts

501-28

Rev. A

Product Specification: 108-10039, Rev. 0
CTL No: CTL5021-400-001
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Corporate Test Laboratory Harrisburg, Pennsylvania

Table of Contents

1.	Introduction	Page 1
1.1	Purpose	Page 1
1.2	Scope	Page 1
1.3	Conclusions	Page 1
1.4	Product Description	Page 2
1.5	Test Samples	Page 2
1.6	Qualification Test Sequence	Page 3
2.	Summary of Testing	Page 3
2.1	Examination of Product	Page 3
2.2	Termination Resistance, Dry Circuit- Groups 1, 2, 3 and 4.	Page 3
2.3	Industrial Mixed Flowing Gas Exposure - Group 1.....	Page 7
2.4	Crimp Tensile Strength - Group 1.....	Page 8
2.5	Contact Engaging Force - Groups 2, 3, and 4.....	Page 9
2.6	Contact Separating Force - Groups 2, 3, and 4.....	Page 9
2.7	Temperature Life - Group 2.....	Page 10
2.8	Thermal Shock - Group 3.....	Page 10
2.9	Durability.....	Page 10
2.10	Salt Spray.....	Page 11
2.11	Contact Pin Strength	
	Group 5 (Applies to Size 20 Contacts Only).....	Page 11
3.0	Validation.....	Page 12



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CORPORATE TEST LABORATORY

Product Qualification Test Report AMP Multimate Type II Contacts

1. Introduction

1.1 Purpose

Testing was conducted to determine product performance when tested to the requirements of AMP Product Specification 108-10039, Rev. 0.

1.2 Scope

This report covers electrical and mechanical performance of AMP Multimate Type II contacts made by the Connector Products Division of the Connector and Electronic Products Group. Testing was performed between December 21, 1983 and August 1, 1984.

1.3 Conclusions

AMP Multimate Type II Contacts conform to the performance requirements of Product Specification 108-10039, Rev. 0.

1.4 Product Description

AMP Multimate Type II Contacts are screw machined crimp snap-in contacts which employ a confined "C" crimp. External stainless steel springs provide firm seating in connector blocks. Contacts have a copper alloy body and are finished with 30 microinches of gold over 30 microinches of nickel. Socket contacts are closed entry, with a stainless steel cantilever beam engagement spring.

1.5 Test Samples

Test samples were crimped on suitable lengths of test wire as noted below:

<u>Part No.</u>	<u>Quantity</u>	<u>Wire Size</u>	<u>Description</u>	<u>Contact Size</u>
201568-1	25	14	Socket	#16 (.062")
201645-1	25	14	Standard Pin	#16 (.062")
200333-1	25	16	Socket	#16 (.062")
200333-1	25	18	Socket	#16 (.062")
200681-1	25	16	Standard Pin	#16 (.062")
200681-1	25	18	Standard Pin	#16 (.062")
202726-1	25	Two 18	Socket	#16 (.062")
202725-1	25	Two 18	Long Pin	#16 (.062")
201328-1	25	20	Socket	#16 (.062")
201328-1	25	24	Socket	#16 (.062")
201330-1	25	20	Long Pin	#16 (.062")
201330-1	25	24	Long Pin	#16 (.062")
201613-1	25	24	Socket	#16 (.062")
201613-1	25	28	Socket	#16 (.062")
201649-1	25	24	Standard Pin	#16 (.062")
201649-1	25	28	Standard Pin	#16 (.062")
201554-1	25	30	Socket	#16 (.062")
201554-1	25	32	Socket	#16 (.062")
201555-1	25	30	Long Pin	#16 (.062")
201555-1	25	32	Long Pin	#16 (.062")
201589-1	25	16	Socket	#20 (.040")
201589-1	25	18	Socket	#20 (.040")
201591-1	25	16	Standard Pin	#20 (.040")
201591-1	25	18	Standard Pin	#20 (.040")
200331-1	25	20	Socket	#20 (.040")
200331-1	25	24	Socket	#20 (.040")
200334-1	25	20	Standard Pin	#20 (.040")
200334-1	25	24	Standard Pin	#20 (.040")
201353-1	25	24	Socket	#20 (.040")
201353-1	25	28	Socket	#20 (.040")
201354-1	25	24	Standard Pin	#20 (.040")
201354-1	25	28	Standard Pin	#20 (.040")
201627-1	25	30	Socket	#20 (.040")
201627-1	25	32	Socket	#20 (.040")
201625-1	25	30	Standard Pin	#20 (.040")
201625-1	25	32	Standard Pin	#20 (.040")

Samples were divided into 5 groups of 5 contacts each and were tested in accordance with the test sequence in paragraph 1.6.

1.6 Qualification Test Sequence

Test or Examination	Test Group				
	1	2	3	4	5
	Test Sequence (a)				
Examination of Product	1	1	1	1	1
Termination Resistance, Dry Circuit	2,4	4,6	2,5	2,4	
Contact Engaging Force (b)		2,7	6	5	
Contact Separating Force (b)		3,8	7	6	
Temperature Life		5			
Thermal Shock			3		
Salt Spray				3	
Industrial Gas	3				
Durability			4		
Crimp Tensile	5				
Contact Pin Strength (c)					2

(a) Numbers indicate sequence in which tests are performed.

(b) Test a total of twenty sockets per contact size.

(c) Perform on contact size 20 only.

2. Summary of Testing

2.1 Examination of Product

Contacts submitted for testing were selected from production lots that were inspected and found to be acceptable by the Quality Department of the Connector Products Division. After crimping, samples were visually examined to insure they were suitable to test. No defects nor damage was detected.

2.2 Termination Resistance, Dry Circuit - Groups 1, 2, 3, and 4

All samples conformed with the requirements of the specification.

All readings are in milliohms

Group 1 - Initial

Contact Size	Wire Size	Resistance		Required Max.
		Min.	Max.	
16	14	1.06	1.24	2.5
16	16	1.09	1.40	3.0
16	18	1.17	1.48	4.5
16	2-18	1.18	1.30	4.5
16	20	1.29	1.49	6.0
16	24	2.11	2.32	10.0
16	24	1.48	1.63	10.0
16	28	1.77	2.03	25.0
16	30	3.71	5.07	38.0
16	32	5.48	6.46	55.0

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
20	16	1.09	1.54	3.0
20	18	1.23	1.67	4.5
20	20	1.43	1.67	6.0
20	24	2.23	2.57	10.0
20	24	1.69	2.39	10.0
20	28	2.86	3.10	25.0
20	30	3.93	4.53	38.0
20	32	5.53	6.14	55.0

Group 1 - After Exposure to Industrial Gas

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	1.17	1.50	3.5
16	16	1.16	1.47	4.0
16	18	1.31	1.41	5.5
16	2-18	1.33	1.57	5.5
16	20	1.46	1.81	8.0
16	24	2.58	2.79	13.0
16	24	1.73	1.81	13.0
16	28	2.47	2.83	35.0
16	30	4.63	5.91	50.0
16	32	6.95	7.94	70.0
20	16	1.16	1.84	4.0
20	18	1.12	2.06	5.5
20	20	1.47	1.87	8.0
20	24	2.38	2.81	13.0
20	24	2.07	2.46	13.0
20	28	3.67	4.49	35.0
20	30	4.96	5.86	50.0
20	32	7.01	7.58	70.0

Group 2 - Initial, After Contact Separating Force

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	1.02	1.33	2.5
16	16	1.14	1.22	3.0
16	18	1.16	1.29	4.5
16	2-18	1.18	1.49	4.5
16	20	1.39	1.44	6.0
16	24	2.21	2.37	10.0
16	24	1.50	1.66	10.0
16	28	2.13	2.45	25.0
16	30	4.02	4.94	38.0
16	32	5.56	6.83	55.0
20	16	1.39	1.69	3.0
20	18	1.00	1.86	4.5

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
20	20	1.31	1.53	6.0
20	24	2.07	2.84	10.0
20	24	1.58	2.00	10.0
20	28	3.28	3.91	25.0
20	30	4.51	5.82	50.0
20	32	5.91	7.08	70.0

Group 2 - After 1000 Hours of Temperature Life

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	1.27	1.63	3.5
16	16	1.37	1.79	4.0
16	18	1.36	1.75	5.5
16	2-18	2.06	2.99	5.5
16	20	2.08	2.44	8.0
16	24	2.74	4.02	13.0
16	24	1.76	2.68	13.0
16	28(a)	2.28	2.98	35.0
16	30	4.80	16.10	50.0
16	32(b)	7.80	7.94	70.0
20	16	1.72	2.67	4.0
20	18	1.46	2.52	5.5
20	20	1.63	1.93	8.0
20	24	3.56	5.15	13.0
20	24	2.04	3.88	13.0
20	28	3.90	5.10	35.0
20	30	5.27	13.28	50.0
20	32	7.31	15.72	70.0

(a) One wire was broken during removal of samples from the oven.

(b) Two wires were broken during removal of samples from the oven.

Group 3 - Initial

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	1.01	1.47	2.5
16	16	1.03	1.21	3.0
16	18	1.13	1.44	4.5
16	2-18	1.09	1.28	4.5
16	20	1.17	1.33	6.0
16	24	2.12	2.34	10.0
16	24	1.46	1.77	10.0
16	28	2.07	2.36	25.0
16	30	3.69	5.42	38.0
16	32	5.47	6.68	55.0

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
20	16	1.15	1.57	3.0
20	18	1.30	1.55	4.5
20	20	1.33	1.52	6.0
20	24	2.09	2.46	10.0
20	24	1.54	1.94	10.0
20	28	2.94	3.34	25.0
20	30	3.80	4.87	
20	32	5.43	5.88	

Group 3 - After Thermal Shock and Durability

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	0.99	1.75	3.5
16	16	1.03	1.38	4.0
16	18	1.25	1.65	5.5
16	2-18	1.19	1.75	5.5
16	20	1.43	1.55	8.0
16	24	2.35	2.55	13.0
16	24	1.57	1.86	13.0
16	28	2.42	2.90	35.0
16	30	4.59	5.81	50.0
16	32	6.37	7.05	70.0
20	16	1.31	1.64	4.0
20	18	1.47	2.03	5.5
20	20	1.32	1.65	8.0
20	24	2.15	3.02	13.0
20	24	1.66	2.06	13.0
20	28	2.85	3.71	35.0
20	30	4.06	5.27	50.0
20	32	5.69	6.47	70.0

Group 4 - Initial

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	1.10	1.23	2.5
16	16	1.07	1.21	3.0
16	18	1.10	1.30	4.5
16	2-18	1.18	1.47	4.5
16	20	1.34	1.49	6.0
16	24	2.10	2.37	10.0
16	24	1.48	1.68	10.0
16	28	1.99	2.12	25.0
16	30	3.81	4.70	38.0
16	32	5.30	6.27	55.0

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
20	16	1.01	1.39	3.0
20	18	1.18	1.48	4.5
20	20	1.27	1.68	6.0
20	24	1.85	2.24	10.0
20	24	1.59	1.82	10.0
20	28	3.01	3.45	25.0
20	30	3.44	5.00	38.0
20	32	5.02	6.14	55.0

Group 4 - After Salt Spray

<u>Contact Size</u>	<u>Wire Size</u>	<u>Resistance</u>		<u>Required Max.</u>
		<u>Min.</u>	<u>Max.</u>	
16	14	0.99	1.66	3.5
16	16	1.07	1.81	4.0
16	18	1.04	1.62	5.5
16	2-18	1.39	1.82	5.5
16	20	1.22	2.23	8.0
16	24	1.78	2.33	13.0
16	24	1.33	1.61	13.0
16	28	2.02	2.27	35.0
16	30	3.85	4.79	50.0
16	32	5.37	5.94	70.0
20	16	1.32	2.19	4.0
20	18	1.53	2.66	5.5
20	20	1.46	1.87	8.0
20	24	2.08	2.49	13.0
20	24	1.63	2.74	13.0
20	28	3.34	5.36	35.0
20	30	3.85	6.24	50.0
20	32	5.50	6.46	70.0

Test Method

Termination resistance was measured on all contact pairs in each test group. Current during the test was maintained at 100 milliamperes with an open circuit voltage not exceeding 50 millivolts. Individual contact pairs were mounted on a test fixture. It kept the contacts secure during testing and maintained a 70% pin insertion depth in the socket. Resistance noted was calculated by measuring resistance over six inches of wires and contacts combined, then subtracting the resistance of the total amount of wire in the circuit.

2.3 Industrial Mixed Flowing Gas Exposure - Group 1

At the completion of 20 days exposure, there was some evidence of corrosion on all contacts. Samples were subjected to low level termination resistance measurements and conformed with the requirements of the specification.

Test Method

Mated contact pairs, mounted in the test fixture, were exposed to a mixture of chlorine gas (20 parts per billion), nitrous oxide (200 parts per billion) and hydrogen sulfide (100 parts per billion) in air. The chamber temperature was maintained at 30°C with a relative humidity of 75% for the period of 20 days.

2.4 Crimp Tensile Strength - Group 1

All samples conformed with the requirements of the specification.

All readings are in pounds.

Group 1 - After Industrial Gas Exposure

<u>Contact Size</u>	<u>Wire Size</u>	<u>Min.</u>	<u>Max.</u>	<u>Required Min.</u>
16	14	99.7	110.8	70
16	16	59.3	68.5	50
16	18	51.9	55.5	38
16	2-18(a)	43.8	53.0	38
16	20	27.9	29.9	20
16	24	12.4	12.8	8
16	24	12.0	12.7	8
16	28	4.8	5.0	3
16	30	2.6	2.8	1.5
16	32	1.0	2.1	1.0
20	16	66.8	68.1	50
20	18	47.9	56.2	38
20	20	28.6	31.5	20
20	24	11.6	15.2	8
20	24	11.2	12.7	8
20	28	4.5	4.8	3
20	30	2.5	2.8	1.5
20	32	1.1	2.8	1.0

(a) One wire only was tested.

Test Method

Tensile specimens were pulled to destruction using a separation rate of one inch per minute.

2.5 Contact Engaging Force
Groups 2, 3, and 4

All contacts conformed with the requirements of the specification.

All readings are in ounces.

	<u>Contact Size</u>	<u>Min.</u>	<u>Max.</u>	<u>Required Max.</u>
Group 2				
Initial	16	15.2	24.0	30
	20	3.8	10.4	18
After	16	11.5	18.4	36
Temperature Life	20	5.1	18.7	22
Group 3				
After Thermal	16	7.7	16.6	36
Shock and Durability	20	3.5	10.4	22
Group 4				
After Salt	16	10.6	21.0	36
Spray	20	3.7	13.4	22

Test Method

Engaging forces were measured by inserting the maximum diameter gage pin into the socket to a depth of 0.170 inch. The rate of insertion was 0.5 inch per minute. Size 16 contacts were tested with a pin of 0.0635 inch diameter. Size 20 contacts were tested with a pin of 0.041 inch diameter.

2.6 Contact Separating Force
Groups 2, 3, and 4

All contacts conformed with the requirements of the specification.

All readings are in ounces.

	<u>Contact Size</u>	<u>Min.</u>	<u>Max.</u>	<u>Required Min.</u>
Group 2				
Initial	16	4.6	12.2	2
	20	2.4	8.0	0.7
After	16	4.5	16.3	1.5
Temperature Life	20	1.6	6.1	0.6
Group 3				
After Thermal	16	3.5	10.4	1.5
Shock and Durability	20	1.1	6.2	0.6

Group 4	Contact			Required
	<u>Size</u>	<u>Min.</u>	<u>Max.</u>	<u>Min.</u>
After Salt	16	3.8	12.0	1.5
Spray	20	1.8	7.4	0.6

Test Method

Separating forces were measured by withdrawing the minimum gage pin from the socket after the engaging force measurement. The rate of withdrawal was 0.5 inch per minute. Size 16 contacts were tested with a pin of 0.0615 inch diameter. Size 20 contacts were tested with a pin of 0.039 inch diameter.

2.7 Temperature Life Group 2

After exposure to the temperature life test, all samples conformed to the termination resistance, contact engaging and contact separating force requirements of the specification.

Test Method

Mated pins and sockets were subjected to 1000 hours exposure at 150°C in a circulating air oven.

2.8 Thermal Shock Group 3

After thermal shock, there was no evidence of physical damage to any of the contacts tested.

Test Method

Mated pins and sockets were subjected to ten cycles of thermal shock with temperature extremes of -55°C and +150°C. Each cycle consisted of 30 minutes at each extreme with a transition time less than 5 minutes.

2.9 Durability

There was no evidence of physical damage to any of the contacts tested.

Test Method

Individual pins and sockets were loaded into AMP "M" Series connectors. The loaded connectors were mounted on a durability tester and were mated and unmated 500 times at a rate of 300 matings per hour.

2.10 Salt Spray

There was no evidence of physical damage or significant corrosion on the samples after exposure to salt spray.

Test Method

Mated pins and sockets were subjected to 48 hours of exposure to a 5% concentration of salt fog. After removal from the chamber, samples were rinsed in running tap water and dried in an air oven at 37°C for less than twelve hours.

2.11 Contact Pin Strength
Group 5 (Applies to Size 20 Contacts Only)

When tested as specified in MIL-C-39029C, paragraph 4.7.16, contacts conformed with the requirements of the specification.

Readings are in inches.

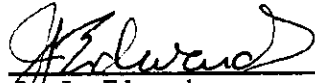
<u>Contact Size</u>	<u>Permanent Set</u>		
	<u>Min.</u>	<u>Max.</u>	<u>Requirement</u>
20	0.0004	0.0014	0.005 Max.

Test Method

Contacts were fixed in a suitable fixture. A gradual load of 0.53 pound inch was applied for one minute.

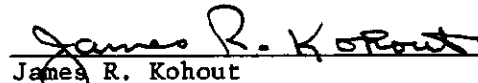
3.0 Validation

Report Prepared by



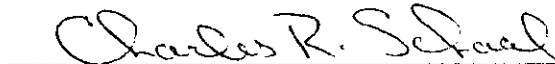
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