PRODUCT SPECIFICATION

1. SCOPE

1.1. Content

This specification covers the performance, tests and quality requirements for the standard CHAMP* connector designed for discrete wire insulation displacement applications.

1.2. Qualification

When tests are performed on the subject product line, the procedures specified in AMP 109 series specifications shall be used. All inspections 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

A. 109-1: General Requirements for Test Specifications
B. 109 Series: Test Specifications as indicated in Figure 1. (Comply with MIL-STD-202, MIL-STD-1344 and EIA RS-364)
C. Corporate Bulletin 401-76: Cross-reference between AMP Test Specifications and Military or Commercial Documents
D. 114-6041 : CHAMP Application Specification
E. 501-110 : CHAMP Test Report

3. REQUIREMENTS

3.1. Design and Construction

Connectors shall be of the design,construction and physical dimensions specified on the applicable Product Drawing.

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Product Codes: 1210, 1284

				DR C.E.Fritz 9/23/76	AMP Incorporated Harrisburg, PA 17105-3608		
				CHK B.R.Hurdle 9/26/76			
				APP G.H.Foster 9/26/76	NO 108-6005	REV V	LOC B
V	Revise per ECN AA-6668	fR	4/9/90	PAGE 1 OF 14	TITLE CONNECTOR CHAMP STANDARD		
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3.2. Material

A. Contacts: Phosphor bronze, selective gold plating on contact area over nickel underplating with a thin microcrystalline wax coating over contact area for lubrication.
B. Housing: Phenylene oxide base resin having an oxygen index of 28.
C. Strain relief and strain relief cover: Same as Para 3.2.B.

3.3. Ratings

A. Voltage: The adjacent poles (even numbered poles on top row to odd numbered poles in bottom row) may carry voltage at potentials not exceeding 250 volts between any two circuits. Up to 600 volts may be placed on any two nonadjacent poles if the intervening poles are omitted to increase the total spacing between live parts of opposite polarity to 1/8 inch.
B. Current: See Figure 2 for applicable current carrying capability.
C. Temperature: -40° to 75°C
D. Reliability (see Para 4.6 and 4.7)
(1) On the basis of the test data it can be said with 95% confidence that 99.99% of the CHAMP contacts should exhibit a change in contact resistance less than 10 milliohms after 40 years at 57°C when the failure mechanism is stress relaxation.
(2) On the basis of test data it can be said with 95% confidence that 99.99% of CHAMP contacts should exhibit a change in contact resistance less than 10 milliohms after 10 years when exposed to class III Industrial Mixed Flowing Gas (IMFG) and the failure mechanism is corrosion.
(3) On the basis of the test data it can be said with 95% confidence that 99.99% of CHAMP contacts should exhibit a change in contact resistance less than 10 milliohms when exposed to humidity/ temperature cycling (4° to 60°C temperature and 95% RH for 3600 hours; AMP Spec 109-76-1) and the failure mechanism is corrosion.

3.4. Performance and Test Description

Connectors shall be designed to meet the electrical, mechanical and environmental performance requirements specified in Figure 1.

3.5. Test Requirements and Procedures Summary

Test Description	Requirement	Procedure
Examination of Product	Meet requirements of product drawing and AMP Spec 114-6041	Visual, dimensional and functional per applicable inspection plan.
ELECTRICAL		
Termination Resistance, Specified Current	Wire Size and Type / Test Current amperes / Resistance maximum milliohms initial: 22AWG solid — 5.0 — 20 24 AWG solid — 3.0 — 20 26AWG solid — 2.0 — 20 22AWG stranded — 5.0 — 20 24AWG stranded — 3.0 — 20 26AWG stranded — 2.0 — 20 28 AWG stranded — 1.5 — 20 27AWG non-twisted stranded — 1.75 — 20	Measure potential drop of mated contacts assembled in housing, see Figure 7; AMP Spec 109-25, calculate resistance.
Termination Resistance, Dry Circuit	20 milliohms maximum initial.	Subject mated contacts assembled in housing to 50 mv open circuit at 50 ma maximum, see Figure 7; AMP Spec 109-6-3.
Dielectric Withstanding Voltage	1000 vac dielectric withstanding voltage, one minute hold. 5 milli-amperes maximum leakage current.	Test between adjacent contacts of mated connector assemblies; AMP Spec 109-29-1.
Insulation Resistance	20,000 megohms minimum initial.	Test between adjacent contacts of mated connector assembly; AMP Spec 109-28-5.
Current Cycling	26.5 milliohms maximum termination resistance, dry circuit.	Subject mated contacts to 500 cycles at 125% rated current for 15 minutes "ON"- 15 minutes "OFF"; AMP Spec 109-51, cond. B, test method 2.

Figure 1 (cont)

Test Description	Requirement	Procedure
Temperature Rise vs Current	Maximum temperature rise at specified current, 30°C Reference Figure 2.	Measure temperature rise vs current, see Figure 7; AMP Spec 109-45-1.
	MECHANICAL	
Vibration, Sinusoidal Low Frequency	No discontinuities greater than 1 microsecond. No evidence of cracking, breaking or loosening of parts.	Subject mated connectors with strain reliefs applied to 10-55-10 Hz, traversed in 1 minute at .06 inch total excursion; 2 hours in each of 3 mutually perpendicular planes; see Figure 7; AMP Spec 109-21-1
Physical Shock	No discontinuities greater than 1 microsecond. No evidence of cracking, breaking or loosening of parts.	Subject mated connector to 50 G's halfsine shock pulse of 11 milliseconds duration, 3 shocks in each direction applied along the 3 mutually perpendicular planes total 18 shocks; see Figure 7; AMP Spec 109-26-1.
Mating Force	0.6 pounds maximum initial per contact.	Measure force necessary to mate connector assembly a distance of .3 inches from mating face, incorporating free floating fixtures at a rate of .5 inch/minute; AMP Spec 109-42, cond A, calculate force per contact.
Unmating Force	0.15 pounds minimum final per contact.	Measure force necessary to unmate connector assembly at a rate of .5 inch/minute; AMP Spec 109-42, cond A, calculate force per contact.
Contact Retention	Contacts shall not dislodge from housing under an axial load of 3 pounds minimum.	Terminate connector with approximately 12 inches of wire in each contact per Application Spec 114-6041. Apply an axial pull at a rate of 1 inch/min. until the wire breaks or the contact is pulled from housing; AMP Spec 109-30.

Figure 1 (cont)

Test Description	Requirement	Procedure
Insulation Displacement Slot Tensile	Wire Size, AWG / Axial Pull pounds minimum: 22AWG solid — 5 24AWG solid — 5 26AWG solid — 4 22AWG stranded — 4 24AWG stranded — 4 26AWG stranded — 2.6 28AWG stranded — 2.6 27AWG non-twisted stranded — 2.6	Terminate connector with approximately 12 inches of wire in each contact per Application Spec 114-6041. Remove terminated contacts from housing and secure to test fixture. Apply an axial pull to slotted beam individually terminated wires at a rate of 1 inch/minute until the wire breaks or is pulled out of the contact; AMP Spec 109-16.
Durability	Mating-unmating forces; 26.5 milliohms maximum termination resistance, dry circuit. No physical damage.	Mate and unmate connector assemblies for 200 cycles at a maximum rate of 600 cycles/hour; AMP Spec 109-27.
ENVIRONMENTAL		
Thermal Shock	1000 vac dielectric withstanding voltage; 25 milliohms maximum termination resistance, dry circuit. No evidence of cracking, breaking or loosening of parts.	Mated connector samples shall be preconditioned by mating and unmating 25 times and subjected to 1024 cycles between -40° and 60°C; AMP Spec 109-22.
Humidity-Temperature Cycling	20,000 megohms final insulation resistance; 26.5 milliohms maximum termination resistance, dry circuit.	Mated connector samples shall be preconditioned by mating and unmating 25 times and subjected to 10 humidity-temperature cycles between 25°C and 65°C at 95% RH; AMP Spec 109-23, method III, cond B, with cold shock at -10°C less step 7b.

Figure 1 (cont)

Test Description	Requirement	Procedure
Industrial Mixed Flowing Gas	26.5 milliohms maximum termination resistance, dry circuit.	Mated connector samples shall be preconditioned by mating and unmating 25 times and subjecting to environmental class III for 20 days; AMP Spec 109-85-3.
Temperature Life	26.5 milliohms maximum termination resistance, dry circuit; mating and unmating force. No evidence of cracking, breaking or loosening of parts.	Subject mated connectors to temperature life; AMP Spec 109-43, test level 2, test duration D.

Figure 1 (end)

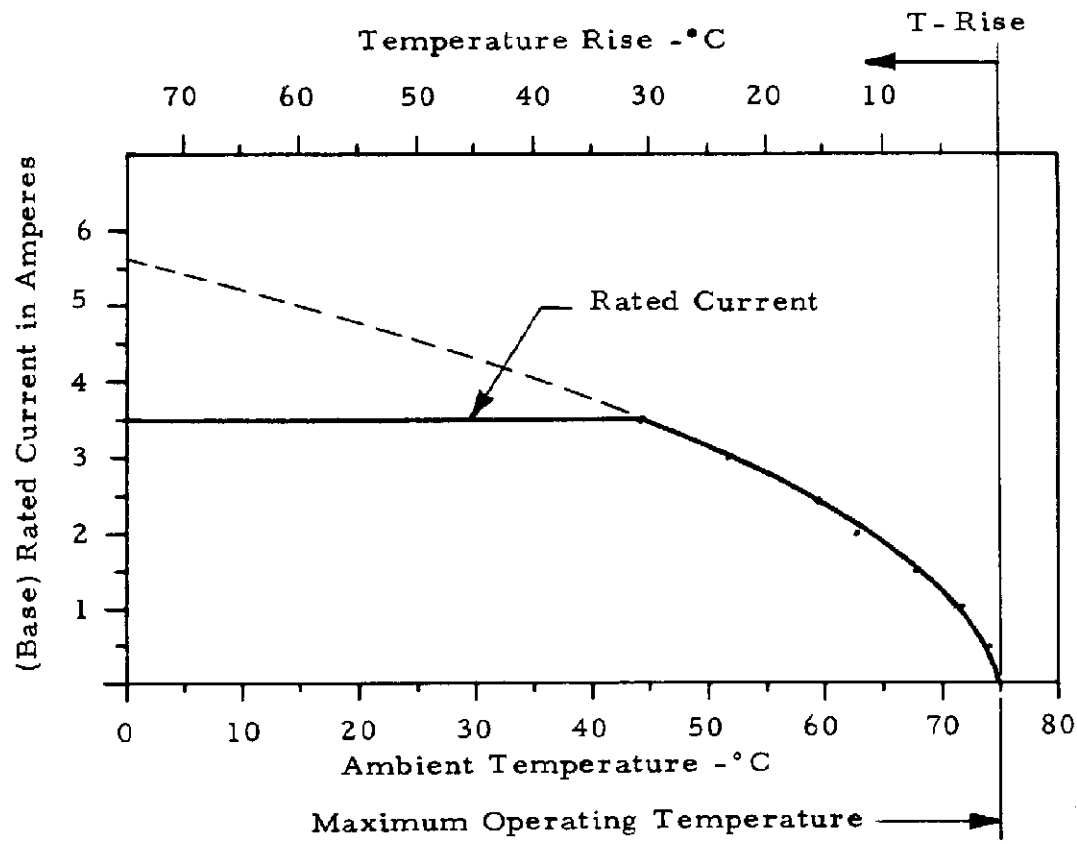


Figure 2A

Wire Gage

% Connector Loading * \ AWG	28	26	24	22
Single Contact	.65	.74	.86	1.0
25	.61	.69	.78	.92
50	.55	.63	.72	.84
75	.45	.55	.63	.75
100	.31	.44	.51	.59

Multiplication Factor - F

* Connector loading is uniformly distributed.

Note:

To determine the acceptable current carrying capacity for the percentage connector loading and wire gage indicated, use the multiplication factor (F) from the above chart and multiply it times the base rated current for a single circuit at the maximum ambient operating temperature as shown on Figure 2A.

Figure 2B

3.6. Product Qualification and Requalification Tests

Test or Examination	Test Group (a)								
	1(d)	2	3	4(b)	5	6	7	8	9
	Test Sequence (c)								
Examination of Product	1,9	1,6	1,6	1,10	1,5	1,8	1,6		
Termination Resistance, Specified Current							2,5		
Termination Resistance, Dry Circuit	3,7	2,5	2,5	2,8	2,4				
Dielectric Withstanding Voltage						3,7			
Insulation Resistance						2,6			
Temperature Rise vs Current				3,9			3		
Current Cycling							4		
Vibration	5			7					
Physical Shock	6								
Mating Force	2								
Unmating Force	8								
Contact Retention								1	
Tensile, Insulation Displacement Slot									1
Durability	4	3	3	4					
Thermal Shock						4			
Humidity-Temperature Cycling			4(e)	5(e)		5			
Industrial Mixed Flowing Gas					3				
Temperature Life		4		6					

(a) See Para 4.1.A
(b) Discontinuities shall not be measured for this test group.
(c) Numbers indicate sequence in which tests are performed.
(d) Two samples monitored for discontinuity greater than 1 microsecond and 2 different samples monitored for resistance measurements.
(e) Humidity-Temperature mate/unmate cycling provided by Durability test.

Figure 3

3.7. Test Samples Required per Group for Qualification and Requalification

Group No.	Contact Letter Designation	Wire Size and Type			Sample Quantity	
		Solid	Stranded 7 strand	Non-twisted Stranded (7)	Plug	Receptacle
1	B	24AWG			4	4
2	B	24AWG			2	2
			24AWG		2	2
		26AWG			2	2
	C	22AWG			2	2
			22AWG		2	2
	E		26AWG		2	2
			28AWG		2	2
	F	22AWG			2	2
			22AWG		2	2
	T			27AWG	2	2
3	B	24AWG			2	2
4	B	24AWG			2	2
			24AWG		2	2
		26AWG			2	2
	C	22AWG			2	2
			22AWG		2	2
	E		26AWG		2	2
			28AWG		2	2
	F	22AWG			2	2
			22AWG		2	2
	T			27AWG	2	2
5	B	24AWG			2	2
6	B	24AWG			2	2
7	B	24AWG			2	2
			24AWG		2	2
		26AWG			2	2
	C	22AWG			2	2
			22AWG		2	2
	E		26AWG		2	2
			28AWG		2	2
	T			27AWG	2	2
8	B	24AWG			2	2
9	B	24AWG			2	2
			24AWG		2	2
		26AWG			2	2
	C	22AWG			2	2
			22AWG		2	2
	E		26AWG		2	2
			28AWG		2	2
	F	22AWG			2	2
			22AWG		2	2
	T			27AWG	2	2

Figure 4

3.8 Retention of Qualification Tests

Test or Examination	Test Group (a)	
	1	2
	Test Sequence (b)	
Examination of Product	1,8	1,8
Termination Resistance, Dry Circuit		3,7
Dielectric Withstanding Voltage	3,7	
Insulation Resistance	2,6	
Mating Force		2
Unmating Force		6
Durability		4
Thermal Shock	4	
Humidity-Temperature Cycling	5	5

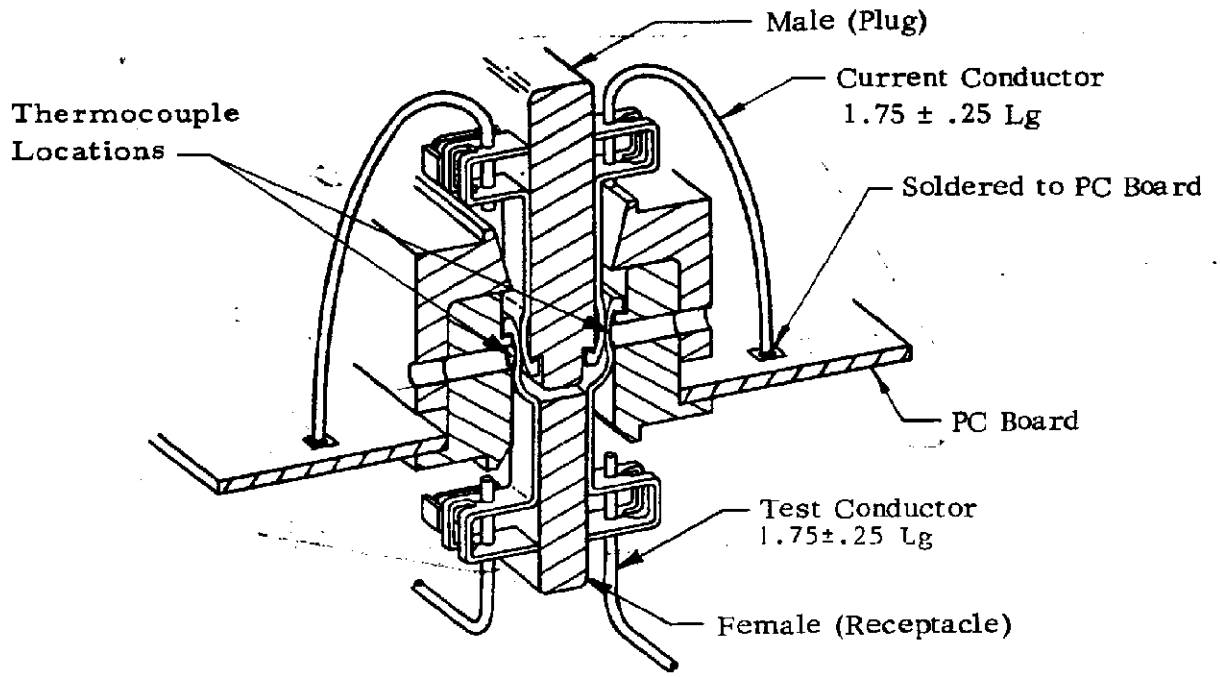
(a) See Para 4.2.
(b) Numbers indicate sequence in which tests are performed.

Figure 5

3.9. Test Samples Required per Group, Retention of Qualification Tests

Group No.	Contact Letter Designation	Wire Size and Type			Sample Quantity	
		Solid	Stranded 7-strand	Non-twisted Stranded (7)	Plug	Receptacle
1	B	24AWG			2	2
2	B	24AWG			2	2
			24AWG		2	2
		26AWG			2	2
	C	22AWG			2	2
			22AWG		2	2
	E		26AWG		2	2
			28AWG		2	2
	F	22AWG			2	2
			22AWG		2	2
	T			27AWG	2	2

Figure 6



Notes:

1. Drill holes thru connectors allowing thermocouples to be positioned just underneath the contact interface point as shown. Holes are to be sealed after attaching thermocouples to prevent heat loss.
2. Resistance due to wire length shall be subtracted from all readings.

Figure 7A
Temperature and Termination Resistance Measurement Points

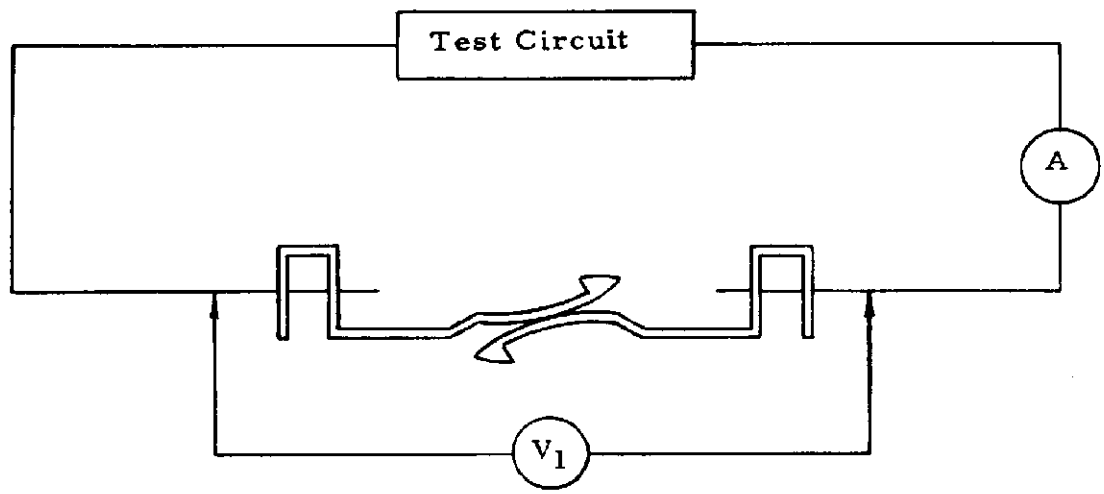


Figure 7B
Millivolt Drop Measurement Test Circuit

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Connector assemblies shall be prepared in accordance with applicable Instruction Sheets. They shall be selected at random from current production. Test groups shall be as specified in Figure 3. Test samples per group shall be as specified in Figure 4. Test groups 8 and 9 shall only test 15 contacts chosen randomly from 2 plugs and 2 receptacles.

B. Test Sequence

Qualification inspection shall be verified by testing samples as specified in Figure 3.

4.2. Retention of Qualification

If in a 5 year period, no change to the product or process occur, the product shall be subjected to the 2 groups of the testing described in the test sequence, see Figure 5 and Figure 6. Justification for exceeding this time limit must be documented and approved by the division manager.

4.3. Requalification Testing

If changes significantly affecting form, fit or function are made to the product or to the manufacturing process, product assurance shall coordinate requalification testing, consisting of all or part of the original testing sequence as determined by development/product, quality and reliability engineering.

4.4 Acceptance

Acceptance is based on verification that the product meets the requirements of Figure 1. Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failures occurs, corrective action shall be taken and samples resubmitted for qualification. Testing to confirm corrective action is required before resubmittal.

4.5. Quality Conformance Inspection

The applicable AMP quality inspection plan 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.

4.6. Reliability Estimates

A. Estimated reliability is provided relative to acceptance criteria for specific failure mechanisms using environmental test conditions (Heat Age and Industrial Mixed Flowing Gas) with known acceleration factors. Heat Age testing and IMFG testing have acceleration factors that are generally accepted by industry. Corresponding failure mechanisms are stress relaxation and corrosion. "Estimated reliability" refers to the estimated proportion of product whose values of the performance parameter (e.g., change in interface resistance) will be on the acceptable side of the acceptance criterion. See Para 4.6.

B. Humidity/temperature testing is performed and estimated reliability relative to the test is provided, but there are no accepted acceleration factors for relating humidity/temperature testing conditions and duration to operating conditions and life. Therefore these estimates of reliability refer only to the specified test conditions, not to the operating conditions, and are for information or comparative purposes only.

C. Product reliability relative to a specified acceptance criterion for a particular performance parameter is estimated from environmental test data using one-sided tolerance limit factors (k-factors) for the normal distribution.

Greatly simplified, the procedure is as follows: Samples of the product are subjected to environmental stress testing, and measurements are taken of some performance parameter such as change in interface resistance for pressure connections, or resistance across a solder joint for surface-mounted devices, etc. The data are tested for goodness of fit to a normal distribution. If the data provide a satisfactory fit to a normal distribution, then the "k-factor" is computed from $k = (UL-X)/S$, where

UL denotes the specified allowable upper limit, or acceptance criterion, for the performance parameter (measurements greater than UL indicate product failure),

X denotes the average of the sample measurements, and

S denotes the standard deviation of the sample measurements (calculated using a denominator of n-1, where n denotes the sample size)

The calculated value of k is then compared with a table of factors for one-sided tolerance limits for a normal distribution to determine the product reliability and associated "confidence" that may be claimed, based on the test data.

D. The acceptance criterion used is the maximum change in contact resistance permitted in the dry circuit resistance test as determined from contact physics (constriction resistance and super-temperature for high current contacts at rated current). Variables data of change in termination resistance are considered acceptable for making estimates of product reliability if a normal probability plot and appropriate statistical analysis indicate agreement of the data with a normal distribution.

4.7. Reliability Tests

The following tests shall be performed to determine estimates of reliability:

A. Temperature Life*

Fifty contacts shall be tested at 118°C for a period of 792 hours. Measurements shall be taken at 24, 48, 96, 192, 384, and 792 hours according to the requirements of Test Specification 109-43.

B. Industrial Mixed Flowing Gas

Fifty contacts shall be tested according to class III of Test Specification 109-85. Separable connections shall be mated and unmated for 10 cycles before submission to the Industrial Mixed Flowing Gas test.

C. Humidity/Temperature

Fifty contacts shall be cycled at 4°and 60°C and 95%humidity in a Humidity/Temperature chamber according to the requirements of Test Specification 109-76-1.

* Because of the high temperature involved special housings fabricated from polysulfone (or equivalent) shall be used for this Temperature Life Test.