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**High Current Commercial (HC<sup>3</sup>) Connectors**

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**TENTATIVE****1. SCOPE****1.1. Content**

This specification covers the performance requirements for the AMP\* high current commercial connectors (HC<sup>3</sup>). These connectors provide a highly reliable and economic means of grouping multiple lead connections in large air conditioning systems, heating units and power supplies.

**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 Specifications**

- 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. 114-1004: Contact, High Current Connector, Application of

**2.2. Commercial Standards**

- UL 498: Attachment Plugs and Receptacles

**3. REQUIREMENTS****3.1. Design and Construction**

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

**3.2. Materials**

- A. Contacts: Phosphor bronze, pre-tin, electrodeposited
- B. Housings: Nylon 6/6

# PRELIMINARY

3.3. Ratings

- A. Current/Voltage: 600 vac at 35 amperes maximum
- B. Temperature: -55° to 85° C
- C. Disconnect rating: 125 vac maximum at 35 amperes maximum

3.4. Performance and Test Description

Connector assemblies 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	Meets requirements of product drawing and AMP Spec 114-1004.	Visual, dimensional and functional per applicable inspection plan.																		
<b>ELECTRICAL</b>																				
Termination Resistance, Rated Current	<table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Wire Size, AWG</th> <th>Test Current, amperes</th> <th>Resistance, milliohms maximum initial</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>8</td> <td>0.75</td> </tr> <tr> <td>14</td> <td>10</td> <td>0.75</td> </tr> <tr> <td>12</td> <td>14</td> <td>0.70</td> </tr> <tr> <td>10</td> <td>20</td> <td>0.60</td> </tr> <tr> <td>8</td> <td>28</td> <td>0.60</td> </tr> </tbody> </table>	Wire Size, AWG	Test Current, amperes	Resistance, milliohms maximum initial	16	8	0.75	14	10	0.75	12	14	0.70	10	20	0.60	8	28	0.60	Measure potential drop of mated contacts assembled in housing, see Figure 4; AMP Spec 109-25, calculate resistance.
Wire Size, AWG	Test Current, amperes	Resistance, milliohms maximum initial																		
16	8	0.75																		
14	10	0.75																		
12	14	0.70																		
10	20	0.60																		
8	28	0.60																		
Dielectric Withstanding Voltage	5.0 kvac dielectric withstanding voltage.	Test between adjacent pins and sockets of mated connector assemblies; AMP Spec 109-29-1.																		
Temperature Rise vs Current (b)	Temperature rise, see Figure 2; termination resistance, rated current.	Temperature Rise at rated current; AMP Spec 109-45.																		
Overload	No electrical or mechanical failure, no undue burning or pitting of contacts.	Mate and unmate for 50 cycles at 150% rated current; UL 498.																		
Resistance to Arcing	No electrical or mechanical failure, no undue burning or pitting of contacts.	Mate and unmate for 200 cycles at 150% rated current; UL 498.																		

Figure 1 (cont)

Test Description	Requirement	Procedure															
<b>MECHANICAL</b>																	
Vibration (a)	<p>No discontinuities greater than 10 microseconds; termination resistance, rated current.</p> <p>Wire Test Resistance, Size, Current, milliohms <u>AWG amperes maximum</u></p> <table border="1"> <tr> <td>16</td> <td>8</td> <td>0.80</td> </tr> <tr> <td>14</td> <td>10</td> <td>0.80</td> </tr> <tr> <td>12</td> <td>14</td> <td>0.75</td> </tr> <tr> <td>10</td> <td>20</td> <td>0.65</td> </tr> <tr> <td>8</td> <td>28</td> <td>0.65</td> </tr> </table>	16	8	0.80	14	10	0.80	12	14	0.75	10	20	0.65	8	28	0.65	<p>10-55-10 Hz traversed in 1 minute at .06 inches total excursion; 2 hours in each of 3 mutually perpendicular directions; AMP Spec 109-21-1, cond A.</p>
16	8	0.80															
14	10	0.80															
12	14	0.75															
10	20	0.65															
8	28	0.65															
Physical Shock (a)	<p>No discontinuities greater than 10 microseconds; termination resistance, rated current.</p> <p>Wire Test Resistance, Size, Current, milliohms <u>AWG amperes maximum</u></p> <table border="1"> <tr> <td>16</td> <td>8</td> <td>0.90</td> </tr> <tr> <td>14</td> <td>10</td> <td>0.90</td> </tr> <tr> <td>12</td> <td>14</td> <td>0.85</td> </tr> <tr> <td>10</td> <td>20</td> <td>0.75</td> </tr> <tr> <td>8</td> <td>28</td> <td>0.75</td> </tr> </table>	16	8	0.90	14	10	0.90	12	14	0.85	10	20	0.75	8	28	0.75	<p>50 G's sawtooth at 11 milliseconds; 3 shocks in each direction applied along the 3 mutually perpendicular directions, total 18 shocks; AMP Spec 109-26-7, cond G.</p>
16	8	0.90															
14	10	0.90															
12	14	0.85															
10	20	0.75															
8	28	0.75															
Mating Force	20 pounds maximum initial.	Measure force necessary to mate connector assembly with locking latches removed; AMP Spec 109-42 calculate force per contact.															
Unmating Force	5 pounds minimum final.	Measure force necessary to unmate connector assembly with locking latches removed; AMP Spec 109-42, calculate force per contact.															
Contact Retention	Contact shall not dislodge from housing.	Apply axial load of 40 pounds to crimped contacts gripping wire; AMP Spec 109-30.															

Figure 1 (cont)

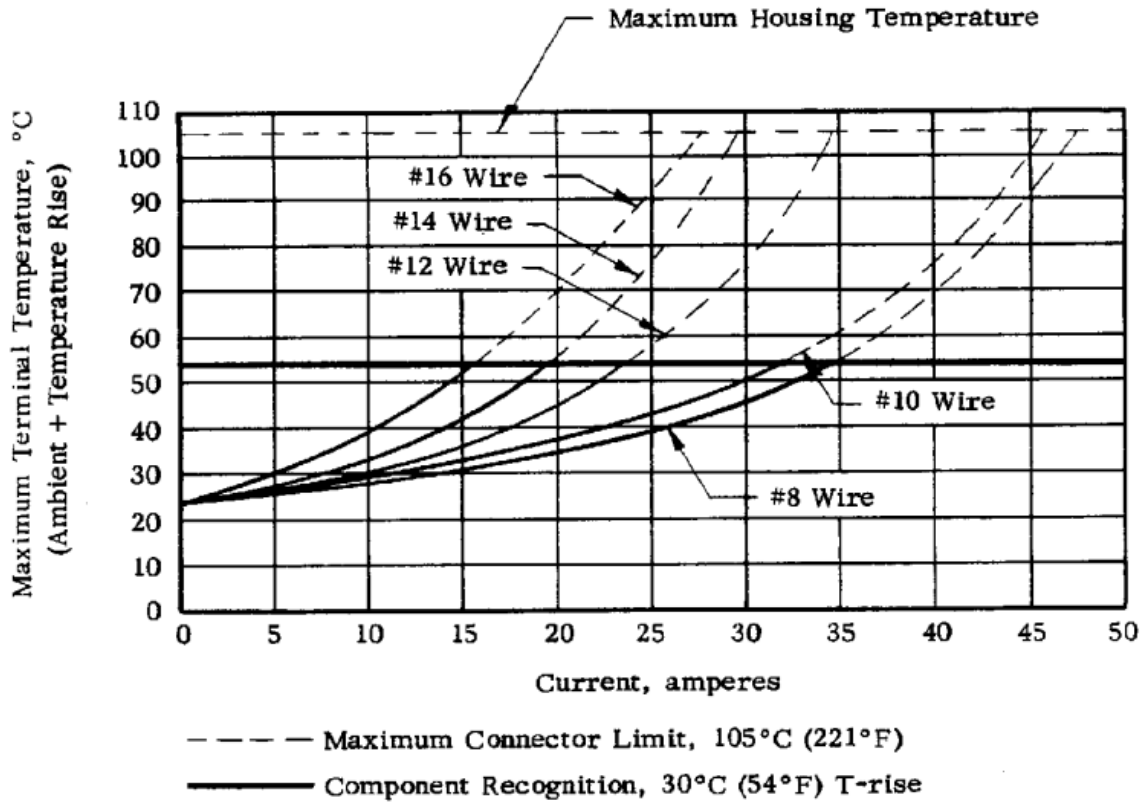
Test Description	Requirement	Procedure																		
Crimp Tensile	<table border="1"> <thead> <tr> <th>Wire Size, AWG</th> <th>Crimp Tensile, pounds minimum</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>70</td> </tr> <tr> <td>14</td> <td>100</td> </tr> <tr> <td>12</td> <td>140</td> </tr> <tr> <td>10</td> <td>175</td> </tr> <tr> <td>8</td> <td>200</td> </tr> </tbody> </table>	Wire Size, AWG	Crimp Tensile, pounds minimum	16	70	14	100	12	140	10	175	8	200	Determine crimp tensile at a rate of 1 inch/minute; AMP Spec 109-16.						
Wire Size, AWG	Crimp Tensile, pounds minimum																			
16	70																			
14	100																			
12	140																			
10	175																			
8	200																			
Durability	<p>Mating-unmating; termination resistance, rated current.</p> <table border="1"> <thead> <tr> <th>Wire Size, AWG</th> <th>Test Current, amperes</th> <th>Resistance, milliohms maximum</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>8</td> <td>0.80</td> </tr> <tr> <td>14</td> <td>10</td> <td>0.80</td> </tr> <tr> <td>12</td> <td>14</td> <td>0.75</td> </tr> <tr> <td>10</td> <td>20</td> <td>0.65</td> </tr> <tr> <td>8</td> <td>28</td> <td>0.65</td> </tr> </tbody> </table>	Wire Size, AWG	Test Current, amperes	Resistance, milliohms maximum	16	8	0.80	14	10	0.80	12	14	0.75	10	20	0.65	8	28	0.65	Mate and unmate connector assemblies for 25 cycles; mount appropriate connector half in panel and manually mate; AMP Spec 109-27.
Wire Size, AWG	Test Current, amperes	Resistance, milliohms maximum																		
16	8	0.80																		
14	10	0.80																		
12	14	0.75																		
10	20	0.65																		
8	28	0.65																		
Housing Panel Retention	100 pounds minimum.	Measure panel retention force using nominal panel cutout dimensions as specified in the AMP Customer Drawing; AMP Spec 109-49.																		
Housing Lock Strength	75 pounds minimum.	Determine strength of housing locking mechanism; AMP Spec 109-50.																		
<b>ENVIRONMENTAL</b>																				
Thermal Shock (a)	<p>Dielectric withstanding voltage; termination resistance, rated current.</p> <table border="1"> <thead> <tr> <th>Wire Size, AWG</th> <th>Test Current, amperes</th> <th>Resistance, milliohms maximum</th> </tr> </thead> <tbody> <tr> <td>16</td> <td>8</td> <td>0.85</td> </tr> <tr> <td>14</td> <td>10</td> <td>0.85</td> </tr> <tr> <td>12</td> <td>14</td> <td>0.80</td> </tr> <tr> <td>10</td> <td>20</td> <td>0.70</td> </tr> <tr> <td>8</td> <td>28</td> <td>0.70</td> </tr> </tbody> </table>	Wire Size, AWG	Test Current, amperes	Resistance, milliohms maximum	16	8	0.85	14	10	0.85	12	14	0.80	10	20	0.70	8	28	0.70	Subject mated connectors to 25 cycles between -55° and 85°C; AMP Spec 109-22.
Wire Size, AWG	Test Current, amperes	Resistance, milliohms maximum																		
16	8	0.85																		
14	10	0.85																		
12	14	0.80																		
10	20	0.70																		
8	28	0.70																		

Figure 1 (cont)

Test Description	Requirement	Procedure
Temperature-Humidity Cycling	Termination resistance, rated current. Wire Test Resistance, Size, Current, milliohms <u>AWC amperes maximum</u> 16      8      0.90 14      10      0.90 12      14      0.85 10      20      0.75 8      28      0.75	Subject connector assembly to 10 cycles of temperature-humidity cycling between -10° and 65° C at 95% RH; AMP Spec 109-23, method III, cond B, with low frequency vibration after each cold shock.
Corrosion, Salt Spray	Termination resistance, rated current. Wire Test Resistance, Size, Current, milliohms <u>AWC amperes maximum</u> 16      8      1.00 14      10      1.00 12      14      0.95 10      20      0.85	48 hours at 5% salt concentration; AMP Spec 109-24, cond B.

- (a) Connector assemblies shall remain mated and shall show no evidence of cracking or chipping.
- (b) Maximum rated current that can be carried by this product is limited by maximum operating temperature of housings, which is 105°C, and temperature rise of contacts; which is 30°C. Variables which shall be considered for each application are: wire size, connector size, contact material, and ambient temperature.

Figure 1 (end)



15.0 amperes for #16 AWG Wire  
 20.0 amperes for #14 AWG Wire  
 23.0 amperes for #12 AWG Wire  
 30.0 amperes for #10 AWG Wire  
 35.0 amperes for #8 AWG Wire

Figure 2

Terminal Temperature vs Current/Circuit  
 4 Circuit Housing

3.6. Connector Tests and Sequences

Test or Examination	Test Group (a)								
	1	2	3	4	5	6	7	8	9
	Test Sequence (b)								
Examination of Product	1								
Termination Resistance		1	2, 4, 8, 10	1, 3, 5, 7					
Dielectric Withstanding Voltage			7						
Temperature Rise vs Current		2			3				
Overload					1				
Resistance to Arcing					2				
Vibration				2					
Physical Shock				4					
Mating Force			1						
Unmating Force			5						
Contact Retention							1		
Crimp Tensile						1			
Durability			3						
Housing Panel Retention								1	
Housing Lock Strength									1
Thermal Shock			6						
Temperature-Humidity Cycling			9						
Corrosion, Salt Spray				6					

(a) See Para 4.1.A.

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

Figure 3

4. QUALITY ASSURANCE PROVISIONS

4.1. Qualification Testing

A. Sample Selection

Connector housings and contacts shall be prepared in accordance with applicable Instruction Sheets. They shall be selected at random from current production. Test group 1 shall consist of 1 housing of each size and 5 contacts representative of the entire lot being tested. Test groups 2 through 4 shall consist of 5 connector assemblies per group. The housings and wire sizes shall be chosen randomly to cover the range of the product line. Group 5 shall consist of 2 connector assemblies crimped to #8 AWG wire. Group 6 samples shall consist of 15 contacts per wire size. Group 7 samples shall consist of 15 contacts crimped on #8 AWG wire and tested with appropriate random housings. Group 8 and 9 shall consist of 10 housings of each Available size. All contacts shall be crimped to appropriate PN 10350) and 103502 tin plated test Conductors in accordance with AMP Specificaliton 114-1004.

**B. Test Sequence**

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

**C. Acceptance**

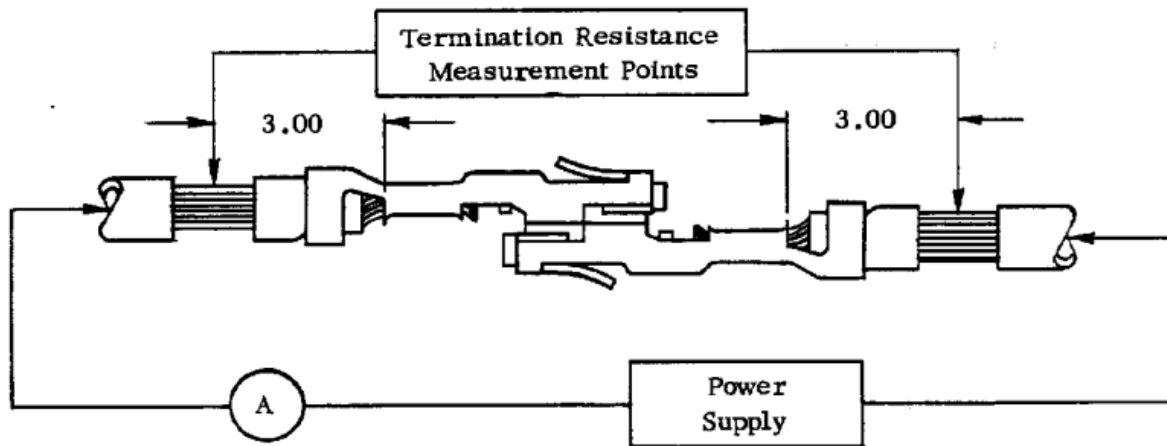
- (1) Requirements put on test samples, as indicated in the requirements portion of Figure 1, exist as either the upper or lower statistical tolerance limit (95% confidence, 99% reliability). All samples tested in accordance with this specification shall meet the stated tolerance limit.
- (2) Failures attributed to equipment, test setup, or operator deficiencies shall not disqualify the product. When product failure occurs, corrective action shall be taken and samples resubmitted for qualification.

**4.2. Quality Conformance Inspection**

The applicable AMP 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.

**4.3. Certification**

This product has been Recognized under Component Recognition Program of Underwriters' Laboratories Inc., Electrical File Number E-28476 and Certified by Canadian Standards Association File Number LR-16455.



- Notes:
- 1. A 1 foot minimum length of continuous lead for heat dissipation.
  - 2. Termination resistance equals millivolts divided by test current less resistance of 6 inches of wire.

Figure 4  
Termination Resistance  
Measurement Points