AMPOWER* Quick-Disconnect and Bolt-Disconnect Power Connectors for Traction Motor Leads

1. SCOPE

This specification contains performance requirements and test procedures for the qualification of AMPOWER* quick-disconnect and bolt-disconnect connectors. Connectors covered by this specification are intended to terminate 1/0 to 600 MCM stranded copper conductor and facilitate quick connect/disconnect capabilities for traction motor leads on rapid transit vehicles. They are intended to be used inside standard cleat boxes as those utilized in actual service on those vehicles.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the latest edition of the document applies.

2.1. Military Specification

MIL-C-45662: Calibration of Standards

2.2. Federal Specifications

A. QQ-B-626: Brass, Leaded and Nonleaded
B. QQ-S-365: Silver Plating, Electrodeposited

2.3. Military Standards

A. MIL-STD-105: Sampling Procedures and Tables For Inspection by Attributes
B. MIL-STD-202: Test Methods for Electronic and Electrical Component Parts

3. REQUIREMENTS

3.1. Design and Construction

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

3.2. Materials and Finish

The materials used in the construction of these connectors and the finish or plating of the connectors shall be as specified on the applicable AMP Product Drawing.

3.3. Functional Characteristics

A. Wire Range

Connectors shall be manufactured to accommodate wire sizes 1/0 to 600 MCM.

B. Current Rating

Connectors shall be capable of conducting 340 amperes DC continuously and 670 amperes DC surges of approximately 10 seconds duration.

* Trademark
I Indicates change

C. Quick Disconnect Feature

Connectors shall be capable of repeated mating and unmating cycles performed with the aid of a mallet.

3.4. Performance

Connectors shall be designed to meet the performance requirements specified herein. To verify compliance to this specification, representative samples shall be subjected to the tests specified in Figure 2.

A. Examination of Product

When visually examined before and after crimping, connectors shall show no evidence of defects or damage that would render them unsuitable for testing. In addition, a crimped mated connector pair shall be capable of passing through a straight hole 6 inches long and having the following diameters, as applicable.

Cable Size	Hole Diameter (Inches)
1/0 to 4/0	1⅛
250 to 350 MCM	1½
400 to 600 MCM	

Figure 1

B. Connector Resistance

When tested as specified in paragraph 4.6.B., the resistance of a mated pair of connectors shall not exceed 0.5 milliohm initially or after test.

C. Tensile Strength

When tested as specified in paragraph 4.6.C., the connectors shall not break, unmate, or become separated from the wire with a force of 250 pounds applied for 1 minute.

D. Durability

After 100 mating/unmating cycles as specified in paragraph 4.6.D., connectors shall show no evidence of physical damage or excessive wear of plating and shall meet the dimensional requirements of the Product Drawing.

E. Thermal Shock

After 5 cycles of thermal shock as specified in paragraph 4.6.E., connectors shall show no evidence of physical damage.

F. Vibration

When tested as specified in paragraph 4.6.F. at 10 to 55 Hz, connectors shall show no evidence of physical damage.

G. Current Cycling

After 500 current cycles at 340 and 670 amperes DC as specified in paragraph 4.6.G., connectors shall meet the performance requirements of voltage drop, paragraph 3.4.B., and tensile strength, paragraph 3.4.C.

4. QUALITY ASSURANCE PROVISIONS

4.1. General Provisions

The quality provisions specified herein shall be employed in the manufacturing and testing of this product to ensure that normal production units continue to meet the performance requirements of this specification.

4.2. Classification of Test

A. Qualification Inspection: See paragraph 4.4.
B. Quality Conformance Inspection: See paragraph 4.5.

4.3. Test Conditions

A. Measurements

Measurements shall be taken with instruments that have been calibrated in accordance with specification MIL-C-45662.

B. Laboratory Conditions

Unless otherwise specified, normal laboratory temperature, humidity and atmospheric pressure shall be considered acceptable for test purposes.

4.4. Qualification Inspection

A. Sample Inspection

Terminals selected for test purposes shall be representative of current design and construction. Preparation of test samples shall be conducted in accordance with AMP Instruction Sheets governing assembly and crimping technique.

B. Test Procedure

Qualification inspection shall be conducted in accordance with Figure 2 in the sequence specified.

C. Sample Preparation

Four connector pairs shall be terminated to 15 inch lengths of appropriate 1/0 and 600 MCM wire. Lug terminals shall be attached to the opposite ends of the wires to facilitate energizing the test specimens.

Test or Examination	Test Sequence
Examination of Product	1
Connector Resistance	2,7
Tensile Strength	8
Durability	3
Thermal Shock	4
Vibration	5
Current Cycling	6

Figure 2
Qualification Inspection Sequence

NOTE *After durability (Step 3), connectors shall be assembled inside a cleat box as in normal application for thermal shock, vibration, and current cycling. Upon completion of current cycling, connectors shall be removed from the box, and the insulating tubing taken off to facilitate final voltage drop and tensile strength requirements.*

4.5. Quality Conformance Inspection

A. Sample Selection

Unless otherwise specified, sampling procedures shall be in accordance with MIL-STD-105. Sampling and acceptable quality levels shall be as specified in the applicable AMP Quality Specification. Dimensional requirements shall be in accordance with the applicable AMP Product Drawing.

B. Test Procedure

Terminals supplied in accordance with this specification shall meet the requirements for quality conformance inspection, Figure 3.

Test or Examination	Test Method
Examination of Product	Quality Specification

Figure 3
Quality Conformance Inspection

4.6. Test Methods

A. Examination of Product

Connectors shall be thoroughly examined before and after crimping to ensure proper assembly in accordance with the manufacturer's drawings and crimping instructions. Also, each crimped and mated connector pair shall be passed through a straight hole of the dimensions specified in paragraph 3.4.A.

B. Connector Resistance

Each connector pair shall be mated in the normal manner and the terminal ends bolted together back-to-back in chain fashion. Steel bolts, nuts, flat washers, and spring steel lock washers shall be used and the bolt shall not extend more than ⅛ inch beyond the nut. With 200 amperes DC flowing through the sample chain, voltage drop measurements shall be taken across each connector pair wire-to-wire. Probe points shall pierce the insulation on the conductor ⅛ inch back from the wire receiving end of each connector barrel. Measurements shall be taken after the conductor temperature has stabilized, as indicated by a temperature variation of 1°C or less measured in 3 consecutive readings at 3 minute intervals with a thermocouple located on a conductor, midway between terminations. Connectors shall meet the performance requirements specified in paragraph 3.4.B.

NOTE *Initial voltage drop measurements shall be taken before connectors are assembled in the cleat box. For final measurements, connectors shall be removed from cleat box and the insulating rubber boot removed to facilitate probing.*

C. Tensile Strength

Mated connectors shall be placed in a tensile testing machine, clamping the lug terminals into the jaws. An axial force shall be exerted on the connectors by separating the jaws at a maximum rate of 1 inch per minute until the specified force is attained. This force shall then be held for a period of 1 minute. Connectors shall meet the performance requirements of paragraph 3.4.C.

D. Durability

Connectors shall be fully mated and unmated in the normal manner a total of 100 times. Upon completion, connectors shall meet the performance requirements specified in paragraph 3.4.D.

E. Thermal Shock

Connectors shall be subjected to 5 cycles of thermal shock in the following manner. Each cycle shall consist of 2 hours at -55°C and 2 hours at 120°C.

NOTE *Maximum transfer time between temperature extremes shall be 5 minutes.*

F. Vibration

Connectors shall be subjected to vibration throughout a frequency range of 10 to 55 Hz at a double amplitude of 0.125 inch. The entire frequency range, 10 to 55 to 10 Hz shall be traversed in approximately 1 minute. Vibration shall be conducted for 4 hours in each of 2 axes, mutually perpendicular to each other, and perpendicular to the major axis of the connectors. Connectors shall be mounted in a cleat box which is rigidly fixed to the vibration table, with the lug terminals at the ends of the cables bolted to a stationary support external to the table. Samples shall meet the performance requirements specified in paragraph 3.4.F.

G. Current Cycling

Mated connectors, while mounted inside the cleat box, shall be bolted together in chain fashion and subjected to 500 current cycles in the following manner. Each current cycle shall consist of a 1 minute period, 670 amperes DC applied to the test chain for 10 seconds, and then decreased to 340 amperes for 50 seconds. Upon completion, samples shall meet the performance requirements of paragraph 3.4.G.