



AEROSPACE STANDARD

AS70991™**REV. C**

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Superseding AS70991B

(R) Terminals: Lug and Splice, Crimp Style, Aluminum,
for Aluminum Aircraft Wire

FSC 5940

RATIONALE

Total revision required to update references, address qualification issues, and make minor technical changes as needed.

1. SCOPE

This specification covers crimp-style aluminum lug terminals and conductor splices for aluminum aircraft wire. Lug terminals and conductor splices are hereafter called "terminals."

1.1 Classification

Terminals shall be of the types specified on applicable standards specified in 2.1, and shall be of the following Classes as applicable (see Section 5):

Class 1 - Terminals which conform to this specification when installed with a crimping tool and dies as specified in AS5259/1 (see 6.1.1 and 6.1.4).

Class 2 - Terminals which are replaceable by Class 1 terminals and which, when installed with a tool recommended by the terminal manufacturer, conform to the performance requirements of this specification (see 6.1.2 and 6.1.3).

(Class 2 terminals and tools are not approved for use on items intended for use by the U.S. Air Force, or for procurement by or for the U.S. Air Force.)

2. APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of the other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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2.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

AS5259/1	Crimping Tool and Accessories, Remote Crimp Head, Hydraulic, Wire Size 8 to 0000 for Insulated and Un-Insulated Crimp Barrels
AS5259/3	Crimping Tool and Accessories, Hand Operated, Die Type, Wire Sizes 8 to 0000 Un-Insulated and Insulated Crimp Barrels
AS25435*	Terminal-Lug, Crimp Style, Straight Type, for Aluminum Aircraft Wire, Class 1
AS25436*	Terminal-Lug, Crimp Style, 90° Upright Type, for Aluminum Aircraft Wire, Class 1
AS25438*	Terminal-Lug, Crimp Style, Right Angle Type, for Aluminum Aircraft Wire, Class 1
AS25439*	Splice-Permanent Crimp Style, 2 Way Type, for Aluminum Aircraft Wire, Class 1
AS29606	Wire, Electrical, Stranded, Uninsulated Copper, Copper Alloy, or Aluminum, or Thermocouple Extension, General Specification for

* AS70991 detail specifications.

2.2 ASQ Publications

Available from American Society for Quality, 600 North Plankinton Avenue, Milwaukee, WI 53203, Tel: 800-248-1946 (United States or Canada), 001-800-514-1564 (Mexico), or +1-414-272-8575 (all other locations), www.asq.org.

ASQC-Z1.4 Sampling Procedures and Tables for Inspection by Attributes (DoD adopted)

2.3 ASTM Publications

Available from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, Tel: 610-832-9585, www.astm.org.

ASTM B117	Salt Spray (Fog) Apparatus, Operating
ASTM E11	Wire, Woven Test Sieve Cloth and Test Sieves
ASTM E18	Materials, Metallic, Rockwell Hardness of
ASTM E323	Sieves, Perforated-Plate, for Testing Purposes

2.4 U.S. Government Publications

Copies of these documents are available online at <http://quicksearch.dla.mil>.

MIL-STD-129	Military Marking for Shipment and Storage
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
SAM*	System for Award Management
SD-6	Provisions Governing Qualification

* Available from <https://www.sam.gov/portal/public/SAM/>.

2.5 NASM Publications

Available from Aerospace Industries Association, 1000 Wilson Boulevard, Suite 1700, Arlington, VA 22209-3928, Tel: 703-358-1000, www.aia-aerospace.org.

NASM25440 Washers Used with Aircraft Aluminum Terminals

NASM315 Nut, Plain, Hexagon, Airframe

2.6 NCSL Publications

Available from NCSL International, 2995 Wilderness Place, Suite 107, Boulder, CO 80301, Tel: 303-440-3339, www.ncsli.org.

NCSL Z540.3 Calibration of Measuring and Test Equipment, Requirements for

3. REQUIREMENTS

3.1 Detail Specification (see 2.1)

The product requirements shall be as specified herein and in accordance with the applicable detail specification. In the event of any conflict between the requirements of this specification and the detail specification, the latter shall govern.

3.2 Qualification (see 6.3)

The terminals furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List at the time set for opening of bids (see 4.3 and 6.3).

3.2.1 Conformity to Qualified Sample

Except for changes approved by the purchase order, it is understood that terminals supplied under the purchase order shall be the same material formulations, material sources, and manufacturing processes as approved by the Qualifying Activity. Any unapproved changes made after the qualification approval date, unless accepted by the Qualifying Activity, may constitute cause for rejection. All identified unapproved changes must be reported to the Qualifying Activity. Failure of a manufacturer to notify the Qualifying Activity of a change in design, material, manufacturing process (including quality conformance), or plant location shall be reason for adverse action or removal from the Qualified Products List.

3.3 Materials

WARNING

This document refers to fixtures and applications that includes cadmium as a plating material. The use of cadmium has been restricted and/or banned for use in many countries due to environmental and health concerns. The user should consult with local officials on applicable health and environmental regulations regarding its use.

The material used in the manufacture of terminals shall be wrought aluminum exhibiting the hardness and conductivity as specified on the applicable standard. Plating or finish per applicable standard or detail sheet.

3.4 Design and Construction

Terminals as specified on applicable detail specification shall be designed for attachment to appropriate sizes of wire, by having the terminal receiving barrel reshaped around the conductor. The terminal shall have a removable wire inspection plug (see 6.5). For Class 1 terminals, it shall be possible to perform this reshaping operation by means of tool and dies as specified in AS5259/1 or AS5259/3. Terminal barrels shall exhibit no evidence of fracturing or spalling as a result of the reshaping operation. For Class 2 terminals, it shall be possible to perform this reshaping operation by means of tooling recommended by the terminal manufacturer.

3.4.1 Dimensions

Terminals shall conform to the dimensions after plating as shown on the applicable detail specification (see 2.1).

3.4.2 Tinning

Terminals shall be either electro or hot-dipped tin plated over their entire surface. The quality and thickness of the tin shall be sufficient to withstand the tests of Section 4.

3.4.3 Abrasive Mixture

An abrasive mixture shall be provided within the conductor receiving barrel of the terminal (see 6.4). The mixture shall occupy 40 to 60% of the interior barrel volume. The mixture shall be uniformly composed of nickel powder or equivalent, and a suitable elastomeric binder. The nickel powder or equivalent shall be minimum 38% by weight of the mixture, and the nickel powder or equivalent shall be of such size that 100% passes through a No. 200 sieve as specified in ASTM E11 and ASTM E323. The elastomeric binder shall maintain its physical characteristics during the tests specified hereafter, and shall remain compatible with the metal used in the terminal, and the wire and insulation used in the terminal.

3.4.4 Inspection Plug

The inspection plug shall not work loose during the insertion of the wire, the crimping operation, or the tests as specified herein (see 6.5).

3.5 Installation Tool

The installing tool for Class 1 terminals shall conform to AS5259/1 or AS5259/3. The dies shall conform to AS5259/7 (MS25442 family). Only one crimp shall be necessary for wire sizes 8 through 00. Two crimps shall be necessary for wire sizes 000 and 0000.

3.6 Performance

Terminals crimped with the tool specified in 3.5 or as specified by the manufacturer shall perform satisfactorily when subjected to the following performance requirements.

3.6.1 Voltage Drop

The voltage drop through the terminals when carrying current shall not exceed the values shown in Table 1.

3.6.2 Life Cycle

3.6.2.1 Vibration

After the vibration test (see 4.7.4.1), the terminals shall conform to the requirements for voltage drop specified in Table 1.

3.6.2.2 Thermal Shock

After the thermal shock test (see 4.7.4.2), the terminals shall show no evidence of a physical breakdown and the measured voltage drop values shall conform to Table 1.

3.6.2.3 Accelerated Aging

After accelerated aging (see 4.7.4.3), the terminals shall conform to the requirements for voltage drop as specified in Table 1.

3.6.2.4 Corrosion Resistance

After the corrosion resistance test (see 4.7.4.4), the terminals shall not indicate blistering of the plating and the base metal shall not be exposed. Surface discoloration shall not be cause for rejection. In addition, the terminals shall conform to the requirements for voltage drop as specified in Table 1.

3.6.2.5 Tensile Strength

After being subjected to the vibration, thermal shock, accelerated aging, and corrosion resistance tests, the terminals shall be subjected to the tensile strength test (see 4.7.4.5). The mechanical connection of the wire and the terminal shall not break or become distorted before the minimum tensile strength as specified in Table 1 is reached.

3.6.3 Current Cycling

The terminals, when subjected to the current cycling test (see 4.7.5), shall remain 10 °C less in temperature than the conductor temperature for any given cycle, and at the end of the 60th, 70th, and 80th cycles, it shall conform to the requirements for the voltage drop as specified in Table 1. In addition, the difference in voltage drop between the 60th and 80th cycles shall not exceed 20%.

3.6.4 Metal Relaxation (Lug Terminals Only)

The temperature of the terminals under test shall not exceed that of the conductor. The terminal tongue load shall not relax more than 15% of the preset pressure load at any time during the test, and the terminals shall not exceed the maximum value for voltage drop as specified in Table 1.

Table 1 - Test requirements

Specification Insulated AS29606 Wire Size <u>1/</u>	Test Current (A)	Maximum Voltage Drop (mV)		Tensile Strength (Minimum Pounds)
		Initial	After Test	
AL8	60	7	11	130
AL6	83	6	11	200
AL4	108	6	8	300
AL2	152	6	8	500
AL1	174	6	7	700
AL0	202	6	7	900
AL00	235	6	7	1100
AL000	266	6	7	1300
AL0000	303	6	7	1500

1/ ALU aluminum wire configuration Table 4B.

3.7 Manufacturer's Drawing for Class 2 Tools

The manufacturer shall submit to the qualifying activity a drawing indicating the critical dimensions of the crimping dies furnished with the tool used to qualify Class 2 terminals. This drawing shall be identified by the manufacturer's drawing number. Upon approval by the qualifying activity, such numbers will be listed in the applicable QPL.

3.8 Identification of Product

Each terminal shall have the aircraft wire size followed by AL for which designed, and the manufacturer's name or trademark legibly stamped in its surface. The marking shall be located so that it will not be obliterated during crimping or installation.

3.8.1 Part Number

MS25435 -23

I I _____ Dash Number (i.e., Terminal for a "0" aluminum wire)

I _____ Detail Specification Number

3.9 Workmanship

Workmanship shall be in accordance with high-grade electrical manufacturing practice. The occurrence of defects shall not exceed the applicable acceptable quality levels.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection

Unless otherwise specified herein, the contract, or purchase order, the supplier is responsible for the performance of all contract inspection requirements. Except as otherwise specified herein, the contract or purchase order, the supplier may use any facilities suitable for the performance of the inspection requirements. The Qualifying Activity has the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for Compliance

All items must meet all technical requirements of the product standard. The inspection set forth in this standard shall become a part of the supplier's overall inspection system or quality program. The absence of any inspection requirements in the standard shall not relieve the supplier of the responsibility of assuring that all products comply with all requirements of the contract or purchase order. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the purchaser to acceptance of defective material.

4.1.2 Test Equipment and Inspection Facilities

Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspection shall be established and maintained by the supplier. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with NCSL Z540-3 or equivalent standards.

4.1.3 AS9003 Quality Assurance Compliance

The supplier's quality assurance program for terminal lug production shall comply with the AS9003 Inspection and Test Quality System. Independent certification of the processes is not required. Other established and industry recognized quality assurance standards that assure all products produced conform to the contract requirements are acceptable. However, if used, it is the responsibility of the supplier to provide evidence of compliance to AS9003. The Qualifying Activity (QA) authority reserves the right to monitor, measure, and validate compliance at their discretion.

4.2 Classification of Inspection

The inspection of terminals shall be Classified as:

- a. Initial Qualification and Retention Inspections (see 4.3)
- b. Quality Conformance Inspection (see 4.4)

4.3 Initial Qualification and Retention Inspections

The initial qualification inspection of terminals shall consist of all the requirements, examinations, and tests of this specification specified under Section 3, 4.6, and 4.7.

4.3.1 Initial Qualification Inspection Samples (Class 1)

The initial qualification test samples shall consist of 50 terminals of one barrel size and one stud size in wire size range 8 through 1 and 0 through 0000. Dimensions for the remaining stud sizes desired for qualification shall be extracted from the engineering drawings and compared to the detail specification drawings. In addition, five unplated terminals for each barrel size for the two barrel sizes chosen shall be provided.