



Technical Standard Order

PROPOSED

Subject: TSO-C171, AIRCRAFT CLAMPS

1. **PURPOSE.** This technical standard order (TSO) is for manufacturers of aircraft clamps. In it, we (the Federal Aviation Administration, or FAA) prescribe the property test requirements you must meet if applying for a TSO authorization or letter of design approval. The TSO describes the minimum performance standards (MPS) of aircraft clamps to be identified with the applicable TSO marking.

2. **APPLICABILITY.** This TSO affects new applications submitted after its effective date. The standards of this TSO apply to the types of clamps meant for applications in the manufacture and maintenance of aircraft products (described in appendix 1). You can adapt this TSO to manufacturer's catalog or proprietary designs. Do not use this TSO for parts used in critical applications or standard parts. (Standard parts are manufactured to an established industry or U.S. government specification.)

3. **REQUIREMENTS.** Aircraft clamps to be identified with this TSO and manufactured on or after the date of this TSO must meet the MPS specified in the manufacturer's part drawing(s) and applicable part specification(s) submitted with your application for TSO authorization.

a. Test Requirements. Demonstrate the required performance by testing each property in the part drawing and applicable part specification(s), and in the derived material and process specifications under the test procedures in appendix 1.

b. Deviations. You may use alternate test procedures that produce an equivalent level of safety, if you specify this when applying for TSO authorization, and we approve it under Title 14, Code of Federal Regulations (CFR) § 21.609.

4. **MARKING.**

a. Part Marking. Each individual clamp manufactured under this TSO must be permanently and legibly marked with at least the name or symbol of the manufacturer and the manufacturer's part number. When practical, mark the clamp with the TSO number. You can use alternate methods of marking if the Administrator approves them.

b. Package Marking. Package marking must conform to 14 CFR § 21.607(d) and include manufacturer name and address, part number and applicable TSO number permanently and

legibly marked on each package or container. In addition, mark the clamp type and manufacturer inspection lot number permanently and legibly on each package or container.

5. APPLICATION DATA REQUIREMENTS. Under 14 CFR § 21.605 (a), as a manufacturer, you must give the following data to the FAA Aircraft Certification Office (ACO) manager responsible for your facility to support each TSO application:

a. Part drawing and applicable specifications necessary to define the design and minimum performance for each clamp part number or series.

b. Manufacturer's TSO qualification test report in accordance with the test procedures in appendix 1.

c. Inspection lot number(s) of qualification parts.

d. Batch traceability number(s) of the qualification parts material.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data required by paragraph 5, make the following data available for review by the responsible ACO manager:

a. Copies of all standards and specifications used in the application for TSO authorization.

b. Inspection lot number and quantity for each production lot of clamps.

c. Batch traceability number of the material for each lot of clamps.

d. Acceptance test results for each lot of clamps.

7. FURNISHED DATA. This data and information must accompany aircraft clamps manufactured under this TSO:

a. Inspection lot number(s) and quantity of parts shipped.

b. A note with the following statement:

The parts contained in this shipment were manufactured and inspected per TSO-C171. The conditions and tests required for TSO approval of this article are minimum performance standards. Aircraft clamps approved under this TSO are not necessarily interchangeable with other aircraft clamps approved under this TSO. Clamps of similar dimensional properties may have widely varying performance and material properties. Clamps may be substituted only if acceptable to, or approved by, the Administrator.

8. INSPECTION LOT OF CLAMPS. An inspection lot is a quantity of clamps with one part number, produced consecutively from a single batch of material, finished in one continuous process, and submitted for final inspection at one time.

9. HOW TO GET REFERENCE DOCUMENTS.

a. Order copies of American Society for Testing and Materials (ASTM) documents from: ASTM, 100 Barr Harbor Drive, West Conshohocken PA 19428-2959. You can also order online at: www.astm.org.

b. Buy copies of Society of Automotive Engineers (SAE) documents from: SAE, 400 Commonwealth Drive, Warrendale PA 15096-0001. You can also order online at: www.sae.org.

c. Buy copies of federal aviation regulations (such as Title 14 CFR part 21, Subpart O), from: Superintendent of Documents, Government Printing Office, Washington DC 20402-9325.

d. Order (at no charge) FAA advisory circular (AC) 20-110 (current revision), "Index of Aviation Technical Standard Orders," from: U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover MD 20785.

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APPENDIX 1

AIRCRAFT CLAMP PROPERTY TEST REQUIREMENTS

1. CLAMP PROPERTIES. The specific material and values for dimensions and configuration, defined on the manufacturers drawing(s) or specification(s), form the basis of the clamp's design. The specific material, meeting the test property requirements of Table 1, forms the basis of the clamp's "minimum performance."

2. CLAMP APPLICATIONS. This TSO applies to loop, saddle, center mount, hinged and block clamp configurations. Clamps typically mechanically fasten or support equipment, such as electrical wire or hydraulic lines, to the structure of the aircraft.

3. CLAMP SERIES TEST SAMPLE. A clamp series (model) of a particular design and type, with a range defined in the clamp manufacturer's application for TSO authorization, may be qualified by submitting test data for the series.

Table 1 - Aircraft Clamp Property Test Requirements for Materials

For: Loop, Saddle, Center mount, Hinged and Block clamps	Metal Clamp Strap (if present)	Applicable Test Documents
	Material	Per part Drawing, Part Specification and Drawing Specification
	Dimensions & Configuration	Per part Drawing, Part Specification and Drawing Specification
	Heat Treat	Per Part Drawing, AMS-H-6875, AMS-H-6088, and AMS2770
	Finish	Per part Drawing, Part Specification and Drawing Specification
For: Loop, Saddle, Center mount, Hinged and Block clamps	Elastomeric Cushion (if present)	Applicable Test Documents
	Dimensions & Configuration	Per Part Drawing
	Hardness	ASTM D2240
	Tensile	ASTM D412
	Elongation	ASTM D412
	Specific Gravity	ASTM D297, D792
	Compression Set	ASTM D395
	Dry Heat Resistance	ASTM D573
	Fluid Resistance	ASTM D471

APPENDIX 1 continued

4. APPLICABLE DOCUMENTS. The documents (or successor documents) listed below in effect on the date of TSO application are acceptable to the Administrator. You can use them to set up procedures for test and evaluation of aircraft clamps as shown in the part drawing and procurement or product specification(s). When you apply for TSO authorization, list all extra specifications governing test and evaluation of a clamp covered by this TSO.

<u>Document No.</u>	<u>Title</u>
ASTM D 297	Standard Test Methods for Rubber Products - Chemical Analysis
ASTM D 395	Standard Test Method for Rubber Property - Compression Set
ASTM D 412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers – Tension
ASTM D 471	Standard Test Method for Rubber Property - Effect of Liquids
ASTM D 573	Standard Test Method for Rubber - Deterioration in an Air Oven
ASTM D 792	Standard Test Methods for Density and Specific Gravity of Plastics by Displacement
ASTM D 2240	Standard Test Method for Rubber Property - Durometer Hardness
(SAE) AMS-H-6088	Heat Treatment of Aluminum Alloys
(SAE) AMS 2770	Heat Treatment of Wrought Aluminum Alloy Parts
(SAE) AMS-H-6875	Heat Treatment of Steel Raw Materials