

FOREWORD

This standard sets forth a standard test procedure for determining the shear joint fatigue of fasteners at room temperature.

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THE INITIAL RELEASE OF THIS DOCUMENT SUPERSEDES MIL-STD-1312-21.
DESIGNATION FOR THIS TEST METHOD REMAINS MIL-STD-1312-21.

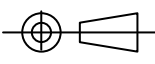
THIRD ANGLE PROJECTION		CUSTODIAN NATIONAL AEROSPACE STANDARDS COMMITTEE	REVISION 2
PROCUREMENT SPECIFICATION NONE	TITLE FASTENER TEST METHODS METHOD 21 SHEAR JOINT FATIGUE, CONSTANT AMPLITUDE	CLASSIFICATION STANDARD PRACTICE NAS 1312-21	SHEET 1 OF 16

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1. SCOPE

- 1.1 Applicability. This test method covers the procedure and apparatus required for testing the shear joint fatigue of fasteners at room temperature.

2. REFERENCED DOCUMENTS

2.1 Government documents

- 2.1.1 Specifications, standards and handbooks. Unless otherwise specified, the following specifications, standards and handbooks of the issue listed in the current Department of Defense Index of Specifications and Standards (DoDISS) and the supplement thereto (if applicable), form a part of this standard to the extent specified herein.

Federal

QQ-A-250/5 — Aluminum Alloy Alclad 2024, Plate and Sheet
TT-P-1757 — Primer Coating, Zinc Chromate, Low Moisture Sensitivity

Military

MIL-P-6808 — Primer Coating, Zinc Chromate, Process for Application of
MIL-T-9046 — Titanium and Titanium Alloy, Sheet, Strip and Plate

Copies can be obtained from the Department of Defense Single Stock Point (DODSSP). <http://dodssp.daps.dla.mil>.

- 2.2 Other publications. The following document(s) forms a part of this specification to the extent specified herein. The issues of the documents which are indicated as DOD adopted shall be the issue in the current DoDISS and the supplement thereto, if applicable.

ASTM International

ASTM E4 — Load Verification of Testing Machines
ASTM E8/E8M — Metallic Materials, Tension Testing of
ASTM E74 — Verification of Calibration, Devices for Verifying Testing Machines

Copies can be obtained from ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. www.astm.org

SAE International

AMS4911 — Titanium Alloy, Sheet, Strip, and Plate 6Al-4V Annealed (UNS R56400)
AMS-QQ-A-250/5 — Aluminum Alloy Alclad 2024, Plate and Sheet

Copies can be obtained from SAE International, 400 Commonwealth Dr., Warrendale, PA 15096-0001. www.sae.org

3. DEFINITIONS

Not applicable.

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NAS Documents
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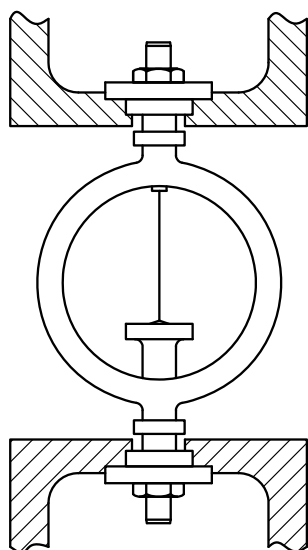
4. GENERAL REQUIREMENTS

4.1 Test apparatus

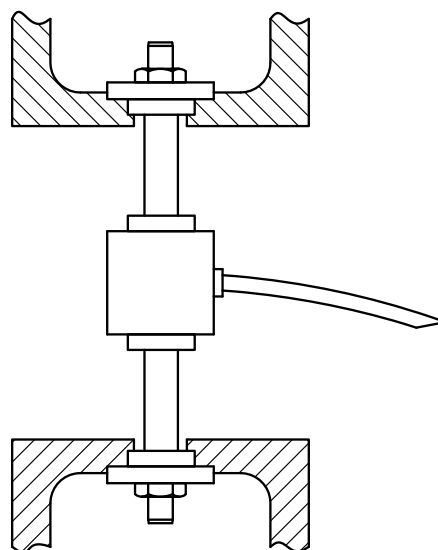
4.1.1 Fatigue test machine loading system. The dynamic loading system shall be accurate within ± 2 percent of the programmed maximum load, for load greater than 10% of the range of the machine. The load maintaining system shall be capable of maintaining the required load. Machines operating without load maintainers shall be monitored at intervals by the operator. The intervals shall be determined according to the expected cycle life and equipment capability.

4.1.1.1 Calibration. The load accuracy of each machine shall be verified after each 1,000 hours of operating time or every six months, whichever occurs first, and after any machine modification which could affect the load accuracy. All fatigue test machines shall be calibrated using static loads following the procedures of ASTM E4 using elastic calibration devices. Schematic arrangements of ring type and load cell calibration devices are shown in Figure 1.

4.1.1.1.1 Elastic calibration. The elastic calibration device shall be checked for accuracy following the procedures of the latest issue of ASTM E74. The required loads may be produced with known dead weights, a force-calibration frame, and previously verified elastic calibration device or a testing machine with loading ranges that are accurate within .5 percent of reading and that match or overlap the force required for the verification of the calibration device. The three loading systems are listed in descending order of preference.



RING TYPE DEVICE



STRAIN GAGE TYPE DEVICE

FIGURE 1 – ELASTIC CALIBRATION DEVICES

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC.
1000 WILSON BLVD.
ARLINGTON, VA 22209

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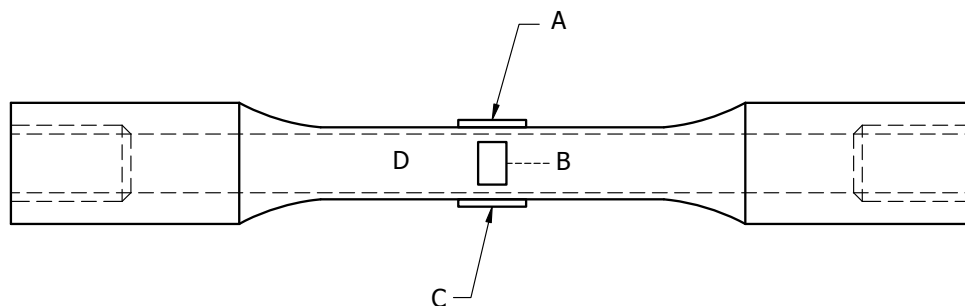
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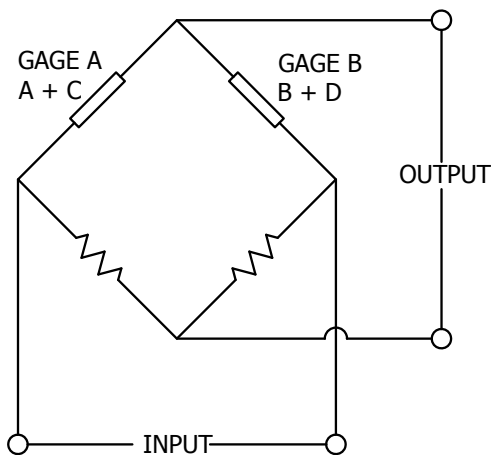
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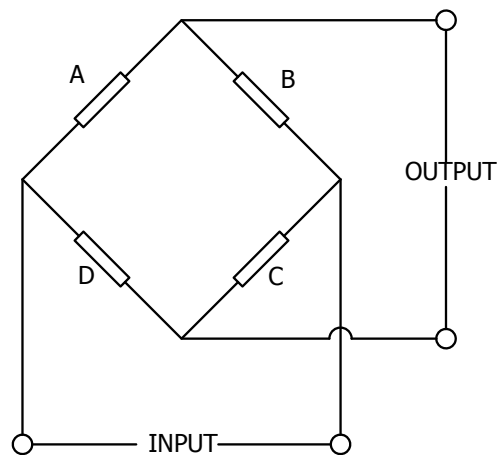
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(a) LOAD CELL



(b) HALF BRIDGE



(c) FULL BRIDGE

FIGURE 2 – TYPICAL LOAD CELL CIRCUITS

Load cell instrumentation

Most load cells used as elastic calibration devices make use of bonded resistance strain gages as the sensing elements. These gages are usually connected to form all or part of a Wheatstone bridge circuit. Some of the possible configurations are shown on Figure 2. The full bridge, Figure 2c is the preferred method and should be used wherever possible. If the circuits as shown in Figure 2b must be used, care must be taken to protect lead wires and resistors from thermal and mechanical effects that might cause resistance changes. The active elements (strain gages) must be mounted on the load cell column in a manner to minimize the effects of bending Figure 2a. The identical load cell system, including the indicator, power supply and all accessory equipment that was used during the load cell verification must be used during calibration of the fatigue test machine.

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