

**MIL-STD-1312-2**  
**19 OCTOBER 1984**

**SUPERSEDING**  
**MIL-STD-1312 (In part)**  
**31 MAY 1967**

# MILITARY STANDARD

FASTENER TEST METHODS

METHOD 2,

INTERACTION



FSC 53GP

DEPARTMENT OF DEFENSE  
WASHINGTON, DC 20301

Fastener Test Methods, Method 2, Interaction

MIL-STD-1312-2

1. This Military Standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Engineering Center, Systems Engineering and Standardization Department (SESD), Code 93, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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FOREWORD

This standard sets forth a standard test method to determine the interaction life cycle capabilities of any configuration of installed fastener when subjected to combined tension and shear loads.

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## 1. SCOPE

1.1 Applicability. The interaction test for a complete fastener system is a method for determining the properties of the fastener system under combined tension and shear loading for any configuration of installed fastener system.

## 2. REFERENCED DOCUMENTS

2.1 Government documents.

Not applicable.

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.

## AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 83 Verification and Classification of Extensometers

(Applications for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

## 3. DEFINITIONS

Not applicable.

## 4. GENERAL REQUIREMENTS

4.1 Test apparatus.

4.1.1 Test fixtures. The fixtures for performing the interaction test on 1/2-inch and smaller fasteners is shown on figures 1 through 5. This fixture shall be adapted by transition studs to any standard type testing machine capable of applying a tensile load smoothly at a controlled rate. Test bushings (figure 4) shall be modified to suit the configuration of the fastener to be tested. Fixtures for larger fasteners shall be proportionately larger, similar in shape and design, and equivalent in dimensional control.

4.1.2 Instrumentation. The fixture shown on figure 1 provides a means of attaching an extensometer with 7-inch gage length. The extensometer shall be an averaging, differential-transformer extensometer, or equivalent. It shall conform to ASTM E 83, class B-1.

4.2 Test specimens.

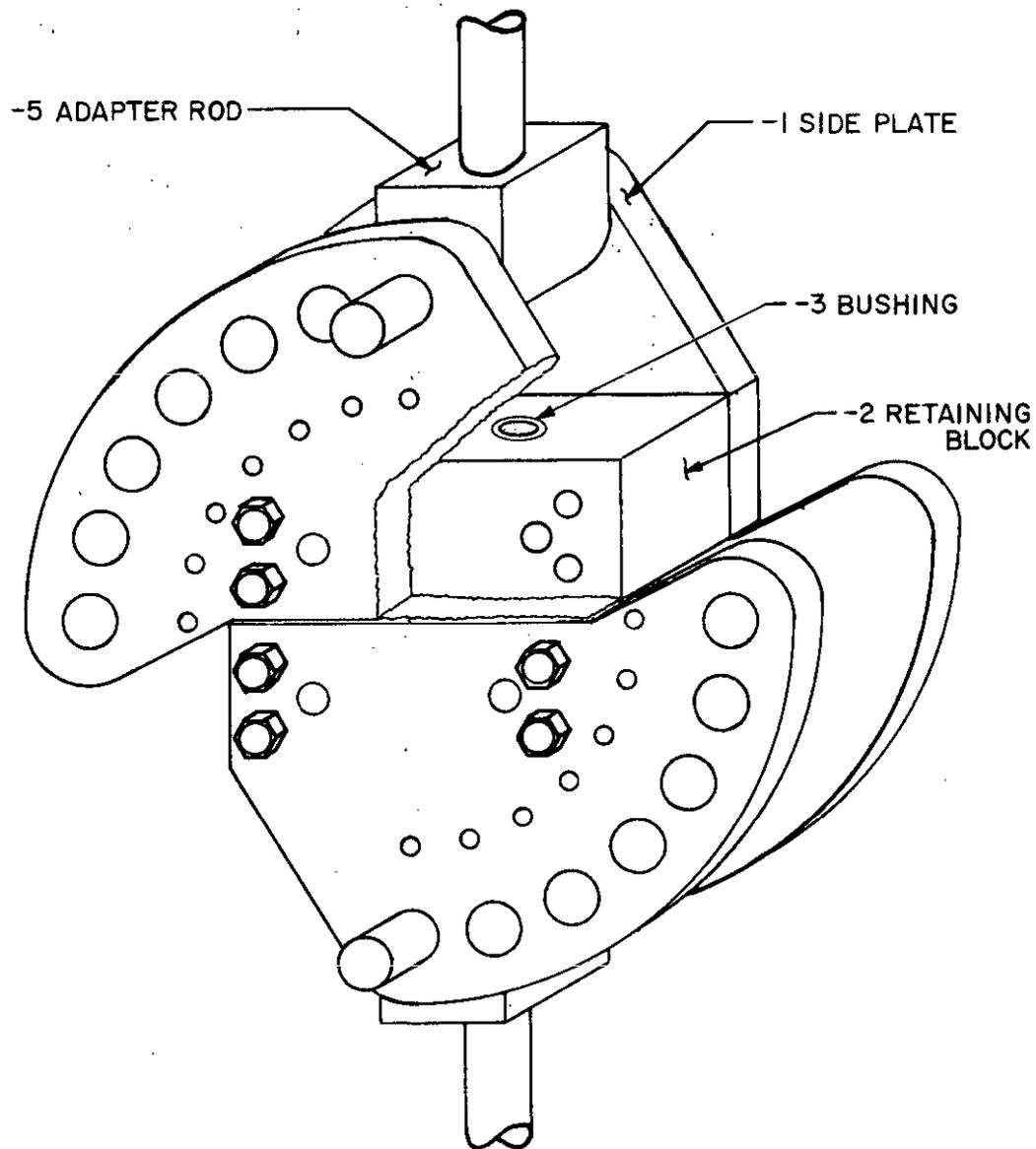
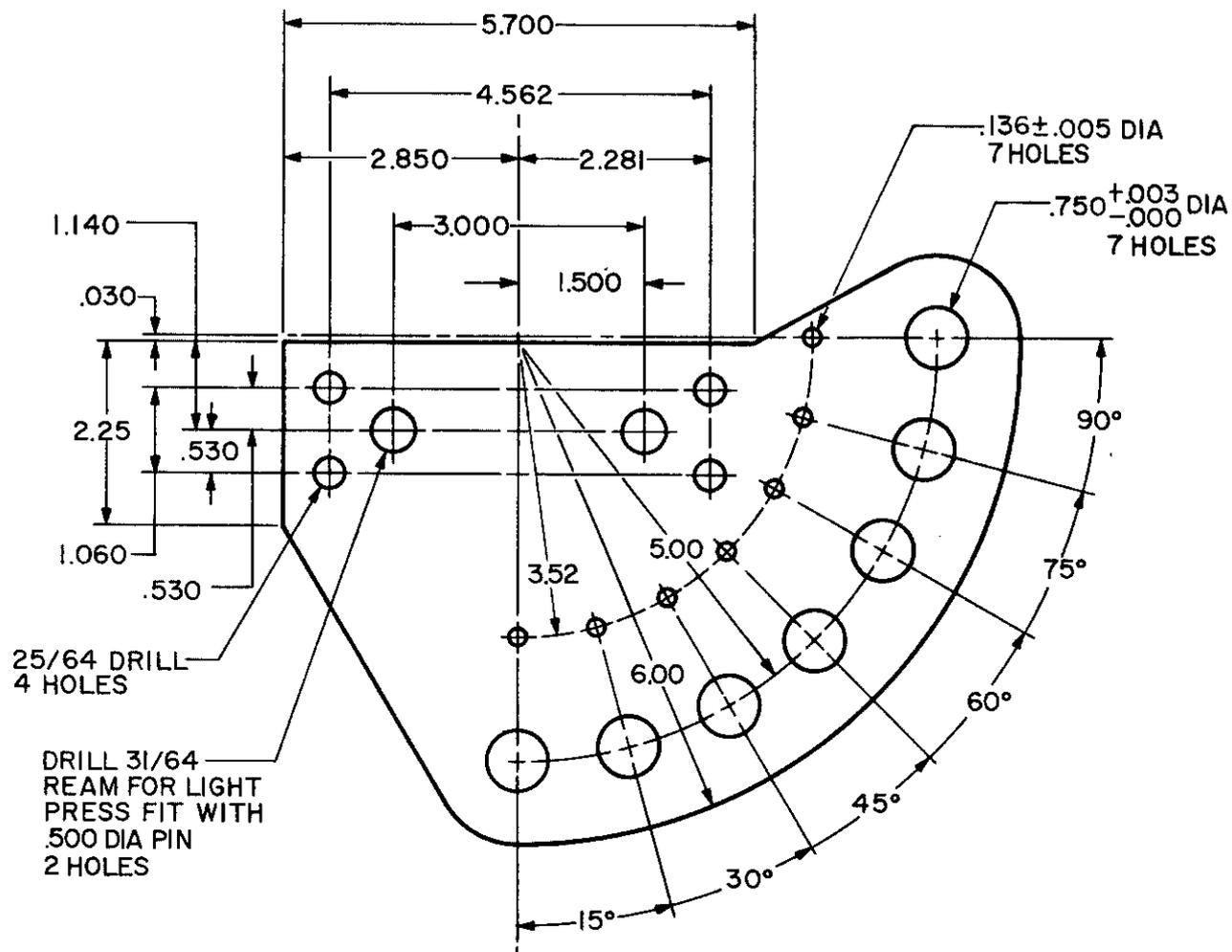


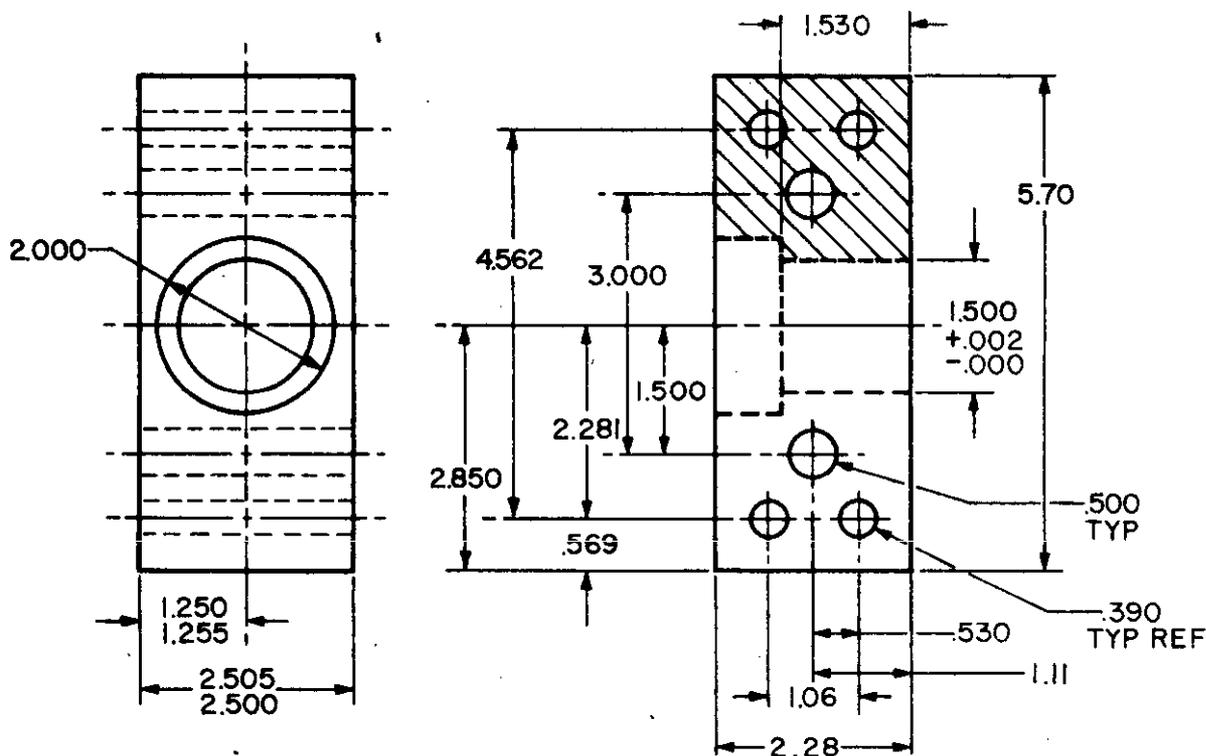
FIGURE 1. Assembly, interaction test fixture.



## NOTE:

1. All dimensions in inches.
2. Unless otherwise specified tolerance  $\pm .030$  for .XXX.  
 $\pm .010$  for .XX.
3. Material thickness .500 inch.

FIGURE 2. -1 Side plate, interaction test fixture.

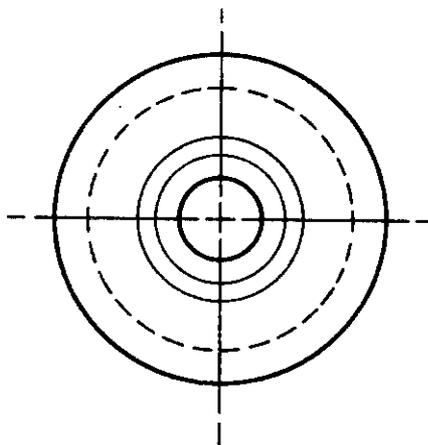
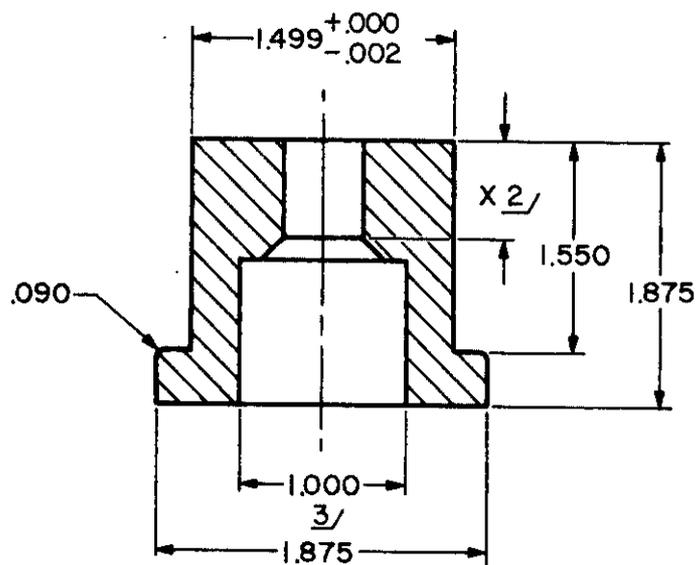


NOTES:

1. Unless otherwise specified, tolerance: Decimals  $\pm 0.010$   
Angles  $\pm 0^{\circ} 10'$
2. All dimensions in inches.

FIGURE 3. -2 Retaining block, interaction test fixture.

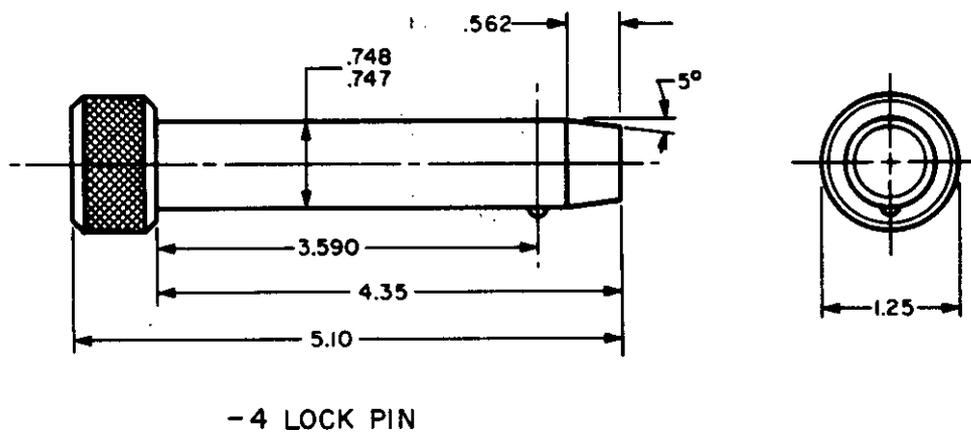
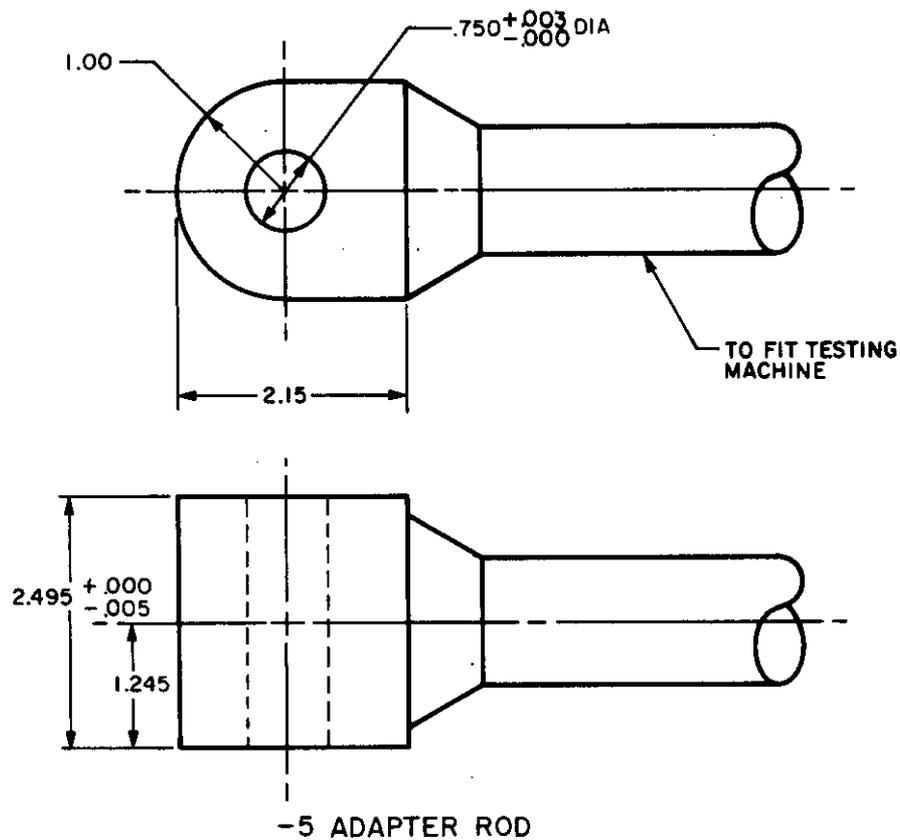
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## NOTES:

1. Unless otherwise specified, tolerances: Decimals  $\pm 0.010$   
Angles  $\pm 0^\circ 10'$
2. X to be 2 times diameter of part being tested.
3. Hole diameter and countersink in accordance with part tested.
4. All dimensions in inches.

FIGURE 4. -3 Bushing, interaction test fixture.



## NOTES:

1. Unless otherwise specified, tolerances: Decimals  $\pm 0.010$   
Angles  $\pm 0^\circ$
2. All dimensions in inches.

FIGURE 5. Adapter rod and lock pin, interaction test fixture.

4.2.1 General. This test evaluates a complete assembly. Tests resulting in failure of any component of the assembly shall be considered a complete test of that fastener. When testing either an internally- or externally-threaded fastener, the mating part shall be of sufficient strength to ensure failure in the test specimen. The grip length shall be at least four times the nominal diameter.

5. DETAIL REQUIREMENTS

5.1 Test procedures.

5.1.1 Installation. The fastener shall be installed in the fixture with standard production tools, using the manufacturer's recommended installation procedures.

5.2 Loading rate. Tension loads shall be applied slowly and evenly; unless otherwise specified, the rate of loading shall be in accordance with table I.

TABLE I. Load rates.

Nominal size (in.)	Load rate +10% (lb/min)	Nominal size (in.)	Load rate +10% (lb/min)
0.125	1,240	0.563	24,800
0.156	1,920	0.625	30,600
0.164	2,100	0.750	44,000
0.190	2,800	0.875	60,000
0.250	5,000	1.000	78,000
0.313	7,700	1.125	100,000
0.375	11,000	1.250	122,000
0.438	15,000	1.375	148,000
0.500	19,600	1.500	176,000

6. NOTES

6.1 Test report. The test report shall include the following data:

- a. Fastener type and part number, including lot identification, fastener diameter, and description of material(s).
- b. Testing machine used with most recent date of certification and calibration, and method used for calibration.
- c. Interaction angle of test.
- d. Individual readings for ultimate strength achieved for each group or specimen.
- e. Computation of average ultimate strength for each specimen.

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- f. Extensometer and gage length.
- g. Installation procedure.
- h. Type of failure.
- i. Cause and duration of any interruption during test.
- j. Results of all inspections.

6.1.1 Yield point data (optional).

6.1.1.1 Autographic curves. Autographic curves for each specimen shall be included with the test data when yield point information is required. Each curve shall show the graphic determination for yield point for each specimen, and shall be completely identified as to specimen, test number, and date of test.

6.1.1.2 Yield data. Yield data shall be presented on the data tabulation sheet for each specimen.

6.1.1.3 Yield strength. Yield strength shall be determined as specified in the procurement document.

6.1.2 Interaction diagram.

6.1.2.1 An interaction diagram may be plotted, using applied load laid out to scale on the angle of the test. The tension load in pounds is the ordinate and the shear load in pounds is the abscissa. Units of the ordinate and abscissa must be equal in value and scale. (Pure tension is on the fastener at 0-degree interaction angle and pure shear load is on the fastener at 90-degree interaction angle.) A sample diagram is included as figure 6.

6.1.2.2 A smooth curve may be drawn between plotted points and intermediate loads picked off this curve. A curve should be drawn for the average load of all tests, the low load recorded for all tests, and when desired, the yield load curve may be drawn.

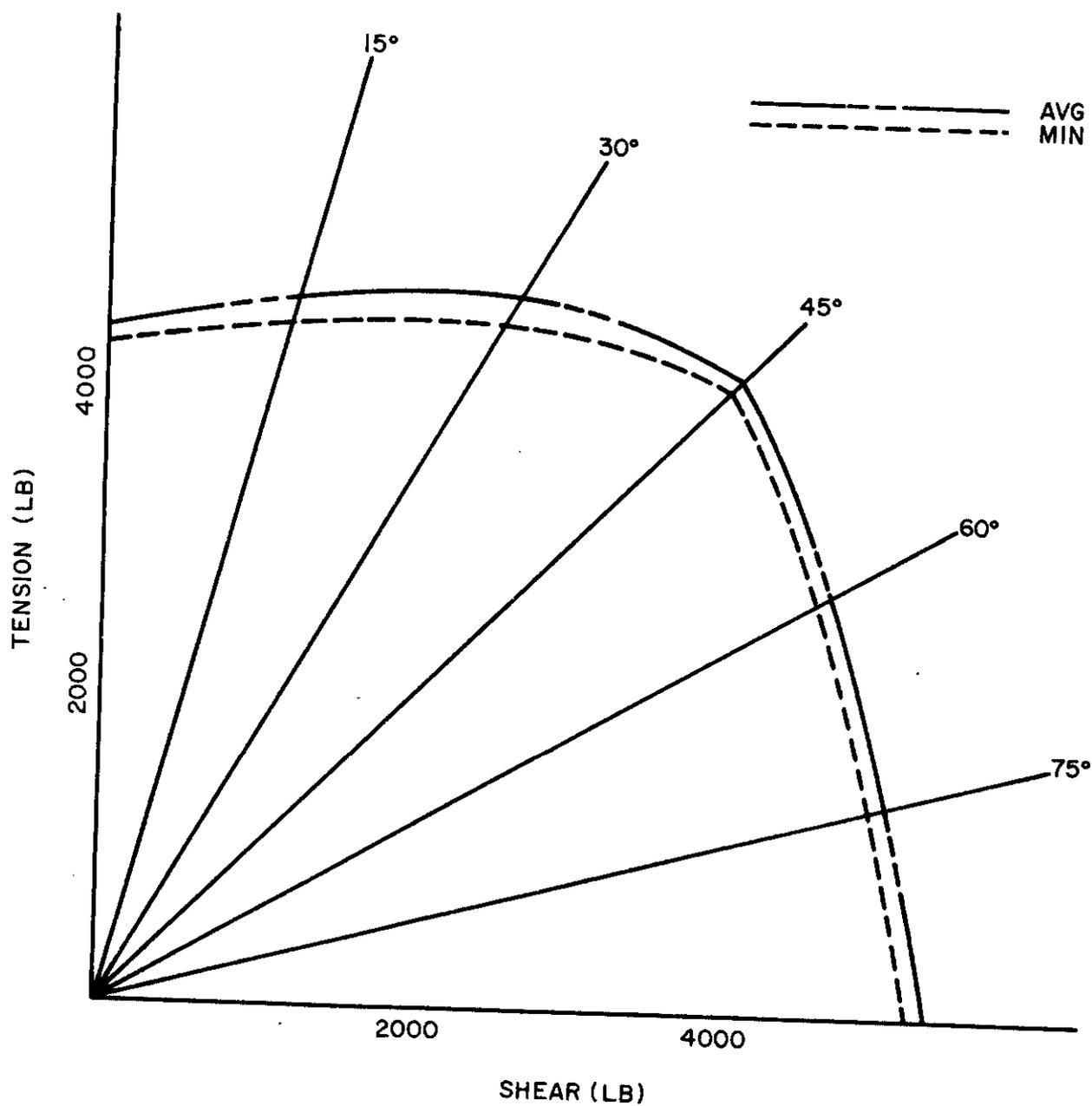


FIGURE 6. Interaction test diagram.

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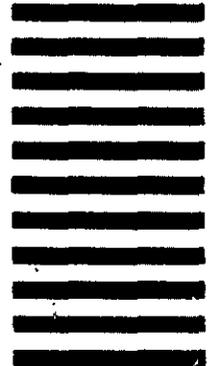


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<b>1. DOCUMENT NUMBER</b> MIL-STD-1312-2		<b>2. DOCUMENT TITLE</b> Fastener Test Method - Method 2, Interaction	
<b>3a. NAME OF SUBMITTING ORGANIZATION</b>		<b>4. TYPE OF ORGANIZATION (Mark one)</b>	
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