

# Bolts — Test methods

Confirmed  
October 2010

# Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Aerospace Standards Policy Committee (ACE/-) to Technical Committee ACE/12, upon which the following bodies were represented:

- The Association of Electronics, Telecommunications and Business Equipment Industries
- British Industrial Fasteners Federation
- Ministry of Defence
- Society of British Aerospace Companies Ltd.

This British Standard, having been prepared under the direction of the Aerospace Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 August 1994

© BSI 12-1999

The following BSI references relate to the work on this standard:  
Committee reference ACE/12  
Draft for comment 91/82709 DC

ISBN 0 580 23219 0

## Amendments issued since publication

| Amd. No. | Date | Comments |
|----------|------|----------|
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |

# Contents

|                                                                                                | Page               |
|------------------------------------------------------------------------------------------------|--------------------|
| Committees responsible                                                                         | Inside front cover |
| National foreword                                                                              | ii                 |
| 1 Scope                                                                                        | 1                  |
| 2 Normative references                                                                         | 1                  |
| 3 Tests                                                                                        | 1                  |
| 4 Test validity                                                                                | 10                 |
| 5 Test reports                                                                                 | 10                 |
| Annex A (normative) Calibration of apparatus                                                   | 11                 |
| Annex B (normative) Test reports                                                               | 11                 |
| Annex C (informative) Formulae                                                                 | 12                 |
| Figure 1 — Tensile test — Test device                                                          | 2                  |
| Figure 2 — Tensile test — Position of the nut in relation to the complete threads (shank side) | 2                  |
| Figure 3 — Tensile test — Upper and lower cup details                                          | 3                  |
| Figure 4 — Double shear test — Test device                                                     | 4                  |
| Figure 5 — Double shear test — Upper and lower blocks                                          | 5                  |
| Figure 6 — Stress corrosion test — Test cylinder (principle)                                   | 10                 |
| Table 1 — Rates of load application — Tensile test                                             | 4                  |
| Table 2 — Rates of load application — Double shear test                                        | 6                  |
| Table B.1 — Information to appear in test report                                               | 11                 |
| List of references                                                                             | Inside back cover  |

## National foreword

This British Standard has been prepared under the direction of the Aerospace Standards Policy Committee. It is identical with ISO 7961:1994 *Aerospace — Bolts — Test methods*, published by the International Organization for Standardization (ISO).

**Cross-reference.** The Technical Committee has reviewed the provisions of ISO 7500-1:1986, to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

**Compliance with a British Standard does not of itself confer immunity from legal obligations.**

### Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 12, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

## 1 Scope

This International Standard specifies test methods for bolts for aerospace constructions.

It is applicable whenever quoted in reference.

## 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 7500-1:1986, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tensile testing machines*.

## 3 Tests

### 3.1 Tensile test at ambient temperature

#### 3.1.1 Apparatus

##### 3.1.1.1 Test device (see Figure 1).

The test device shall be centred such that the stress at four equi-spaced points around the test sample is uniform within 1 %, or such that the coaxiality between the bolt and the clearance holes is less than or equal to 0,025 mm to ensure the application of the tensile load along the axis of the bolt<sup>1)</sup>.

Other types of device may be used provided they respect the requirements of Figure 3.

**3.1.1.1.1 Cups**, fixed or removable, in conformity with Figure 3, which specifies only functional requirements.

**3.1.1.1.2 Test nut** (free-running or self-locking) or *threaded part* (assuming the role of a nut), of sufficient strength to guarantee bolt failure.

**3.1.1.2 Tapered spacer**, placed under the head during the test, when required by the procurement specification or definition document to evaluate the effect of angularity. The minimum clearance between the hole and the bolt shank shall be 0,13 mm. At least 90 % of the bolt bearing area shall be supported by the spacer which shall have a diameter sufficient to support the width across the corners of the bolt. The tolerance on the hole diameter in the spacer shall be  $^{+0,08}_0$  mm.

**3.1.1.3 Washers**, used under bolt heads or nuts only in the case outlined in 3.1.1.2.

**3.1.1.4 Tensile or compressive test machine**, depending on the fixture, capable of applying the test loads.

#### 3.1.2 Procedure

**3.1.2.1** Assemble the bolt in the test device (3.1.1.1) as shown in Figure 1. Install the nut (3.1.1.2) as shown in Figure 2. Place the complete assembly between the loading platens of the machine.

**3.1.2.2** Apply the load specified in the procurement specification or definition document at the rate specified in Table 1<sup>1)</sup>, in a controlled way.

### 3.2 Double shear test

#### 3.2.1 Apparatus

See Figure 4 and Figure 5, the latter only defining functional requirements.

NOTE 1 Totally enclosed top and bottom blades may be used as an alternative.

#### 3.2.2 Procedure

**3.2.2.1** Assemble the bolt into the lower part of the guillotine. The blend radius under the head and the threaded portion shall not be in contact with the lower part of the guillotine (see Figure 4).

**3.2.2.2** Apply the load required in the procurement specification or definition document at the rate specified in Table 2, in a controlled way.

If this load is attained without breakage of the bolt, the test may be terminated<sup>1)</sup>.

<sup>1)</sup> Calibration requirements: see ISO 7500-1:1986 and Annex A of this International Standard.

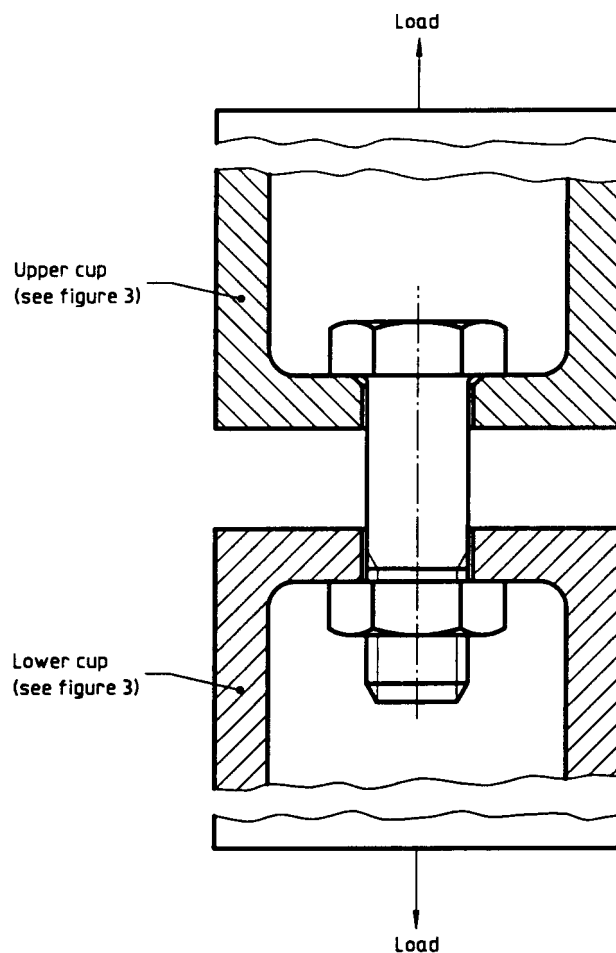


Figure 1 — Tensile test — Test device

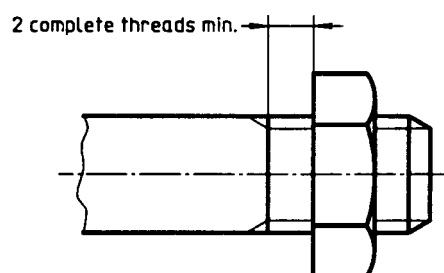


Figure 2 — Tensile test — Position of the nut in relation to the complete threads (shank side)