

Test pieces and test methods for metallic materials for aircraft —

Metric units

Confirmed
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Foreword

This British Standard contains a number of alterations from the last revision issued in August 1949, when the one standard covered tensile, impact, and ductility tests at room temperatures for metallic materials for aircraft.

The procedures specified herein are for use in conjunction with the inspection and testing procedures and material specifications in the British Standard aircraft materials series; they are also applicable to other specifications for aircraft materials such as those in the Ministry of Aviation D.T.D. series.

The revision was considered an appropriate opportunity to divide the standard into a number of separate parts each dealing with a particular type of mechanical test. This will permit the introduction of additional sections or parts of the standard to cover other tests, as they are required.

The following parts for tests at room temperature are included in this standard:

- *Part 1: Tensile tests;*
- *Part 2: Impact tests;*
- *Part 3: Bend tests;*
- *Part 4: Drifting tests on tubes;*
- *Part 5: Hardness tests.*

NOTE Information concerning SI units is given in Supplement No. 1, “Additional Tables for SI conversions” to BS 350, “*Conversion factors and tables*”, and PD 5686, “*The use of SI units*”.

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.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10 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.

Amendments issued since publication

Amd. No.	Date of issue	Comments
319	September 1969	
7710	June 1993	
7919	November 1993	Indicated by a sideline in the margin

This British Standard, having been approved by the Aircraft Industry Standards Committee and endorsed by the Chairman of the Engineering Divisional Council, was published under the authority of the General Council of the Institution on 10 February 1966

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The following BSI references relate to the work on this standard:
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Part 1. Tensile tests

Section 1. Tensile tests — Room temperature

Reference is made in this section to the following British Standards:

BS 1610, *Methods for the load verification of testing machines.*

BS 3846, *Methods for calibration and grading of extensometers for testing of metals.*

Section 2. Tensile tests — Elevated temperature (Issued under separate cover)

Section 3. Uninterrupted creep and rupture tests (Issued under separate cover)

1 Scope

1.1 This Section covers tensile testing of aircraft metallic materials at room temperature. It defines the properties that may need to be determined and the terms used in describing tests and test pieces. It specifies the dimensions of standard test pieces and the standard methods of testing.

2 Symbols

2.1 In this Section the following symbols apply:

Symbol	Description
d	Diameter of test section of test piece of circular cross section. Bore of tube, or inside diameter.
D	Outside diameter of tube.
a	Thickness of test section.
b	Width of test section.
r	Transition radius.
L_o	Original gauge length.
L_e	Extensometer gauge length.
L_c	Parallel length.
L_t	Total length.
L_u	Final gauge length after fracture.
S_o	Original cross-sectional area of test section.
S_u	Minimum cross-sectional area of test section after fracture.
A	Percentage elongation after fracture.
Z	Percentage reduction of area after fracture.
F_m	Maximum load.
R_p	Proof stress.
R_m	Tensile strength.

3 Definitions

3.1 For the purposes of this Section the following definitions apply:

test piece

the portion of the test sample on which the tensile test is carried out

proportional test piece

a test piece of circular cross section with a gauge length having a specified relation to the square root of the cross-sectional area, e.g. a gauge length equal to $5.65 \sqrt{S_o}$

non-proportional test piece

a test piece having a gauge length not specifically related to cross-sectional area

gauge length

a length of the parallel portion of the test piece defined and used for measurement of elongation. The term is hereafter used in this standard to denote the original gauge length (L_o) marked on the test piece for the determination of percentage elongation after fracture (A)

extensometer gauge length (L_e)

the length of the parallel portion of the test piece used for the measurement of the extension by means of an extensometer. This length may be different from the original gauge length L_o

extension

the increase of the extensometer gauge length from the original at any moment during the test

stress

the load on the test piece divided by the original cross-sectional area of the parallel portion

strain

the extension per unit length

young's modulus of elasticity

the value of the increment in stress divided by the corresponding increment in strain for the straight portion of the stress-strain (or load-extension) diagram (see Figure 5)

NOTE Some materials do not give a single clearly defined straight stress-strain line, and for such materials the limits between which the apparent modulus of elasticity is determined shall be stated by the Inspecting Authority.

proof-stress (R_p)

the stress which produces, while the load is still applied, a non-proportional extension equal to a specified percentage of the extensometer gauge length (see Figure 5)

proving test

a test made to ascertain whether or not the material fulfills the specified requirements