British Standard
4L 101 : 1990

British Standard Aerospace Series : Procedure for

Inspection, testing and acceptance of aluminium-base and magnesium-base ingots and castings

Série aérospatiale. Méthode de contrôle, d'essai et de réception des lingots et pièces moulées à base d'aluminium et de magnésium — Spécifications

Luft- und Raumfahrt-Reihe. Verfahren zur Prüfung, Überwachung und Abnahme von Blöcken und Gußteilen auf Aluminium- oder Magnesiumbasis

Contents

British Standards Institution

Foreword

This British Standard has been prepared under the direction of the Aerospace Standards Policy Committee. It is a revision of British Standard 3L 101 : 1970 which is withdrawn.

It gives the general inspection and testing requirements for light alloy ingots and castings to be used for aerospace purposes. The procedure given is primarily for use in conjunction with related material specifications in the 'L' series of British Standards and in the Ministry of Defence (Procurement Executive) DTD series and Defence Standards.

The standard was first published in February 1950 and was revised in November 1959 in the light of the experience gained in working to the provisions of the first edition. A second revision, to bring the procedures into line with current industrial practice in the UK and with international inspecting and testing procedures, was published in March 1970. This revision has been undertaken to take account of advances in the foundry industry, particularly in the manufacture of precision castings, and to eliminate shortcomings in the previous edition which had become apparent.

The principal changes are the inclusion of requirements relating to the heat treatment of castings, including the use of a polymer quenchant, requirements relating to radiographic defects and requirements relating to certification. In addition, forms of test sample to represent precision castings have been included, the requirements for the repair of castings have been amplified and the special test requirements for castings not subject to cut-up testing have been deleted.

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

Section one. General

1.1 Scope

This British Standard specifies a procedure for the inspection and testing of aluminium alloy and magnesium alloy ingots and castings to be used for aerospace purposes and other critical applications.

NOTE 1. It is strongly recommended that the technical representative of the founder should be given the opportunity to examine the casting drawing at the initial stages of design and to advise on the optimum design which will enable acceptable castings to be produced consistently.

NOTE 2. A summary of requirements for production castings is given in appendix C.

1.2 References

This British Standard makes reference to the following publications.

BS 240	Method for Brinell hardness test and for verification of Brinell hardness testing machines
BS 891	Method for Rockwell hardness test Part 1. Testing of metals
BS 1957	Presentation of numerical values (fineness of expression; rounding of numbers)
British Standard A 4	Test pieces and test methods for metallic materials for aircraft
British Standard M 34	Method of preparation and use of radiographic techniques
British Standard M 39	Method for penetrant inspection of aerospace materials and components
British Standard M 54	Temperature control requirements for the heat-treatment of metals
ASTM E155*	Standard reference radiographs for inspection of aluminium and magnesium castings

NOTE. The latest revision of an Aerospace Series Standard is indicated by a prefix. The latest edition of the standard should be used.

*Published by the American Society for the Testing of Materials (ASTM). Available from BSI Sales Department, Linford Wood, Milton Keynes, MK14 6LE.

1.3 Definitions

For the purposes of this British Standard the following definitions apply.

1.3.1 Quality Assurance Authority. The body responsible for authorizing the manufacturer or supplier to issue certification, when to certify means to attest as meeting a standard.

1.3.2 Design Authority. The organization responsible for the detailed design of materiel and which has the responsibility of certifying and/or sealing drawings and specifications.

1.3.3 approved ingot. Ingot which has been proved to comply with the chemical composition specified in the material specification.

1.3.4 approved scrap. Scrap which arises from the founder's own production from approved material and which is segregated and identified. It may include headers, runners and heavy fettling scrap, but excludes all small particles.

1.3.5 virgin metal. Pure aluminium or magnesium with impurity levels such that they will conform to the material specification for which its use is intended.

1.3.6 alloying additions. Materials in elemental or alloy form for use in making up melts from a virgin metal base.

1.3.7 batch. A batch consists of ingots for remelting or castings each of which is:

(a) of the same form and of the same nominal dimensions or of the same drawing number; and

(b) from the same cast for ingots or from the same melt for castings; and

(c) from the same heat treatment charge.

1.3.8 cast. (term used for ingots). Metal taken from the same furnace or from the same ladle or from several furnaces and mixed in the same furnace or in the same ladle before pouring.

Where a continuous melting process is used, a cast may be defined as metal taken from the furnace before the next following charge.

1.3.9 melt. (term used for castings). Metal taken from the same furnace or from the same ladle, or from several furnaces and mixed in the same furnace or in the same ladle before pouring.

1.3.10 permanent mould casting. A casting made by introducing molten metal by gravity or pressure into a metal mould.

1.3.11 precision casting. A casting made by any of the following processes or any similar process:

(a) investment, including ceramic shell, and block mould;

(b) ceramic piece moulding, e.g. Shaw;

(c) resin shell mould;

(d) plaster.

1.3.12 sand casting. A casting made by a process involving the moulding of a pattern with a suitably bonded sand.

1.3.13 designated area. Highly stressed or otherwise important region of a casting, the location of which is determined by the purchaser and stated on the drawing or associated documents.

1.3.14 undesignated area. All regions within a casting which have not been designated.

1.4 General

In this standard whenever agreement between the manufacturer and the purchaser is required, the onus is on the purchaser to obtain the concurrence of the Design Authority to such agreement. If concurrence is essential the word 'purchaser' is marked with an asterisk.

1.5 Foundry techniques

1.5.1 Sample casting

The foundry techniques for each accepted sample casting shall be recorded, noting the following:

(a) material specification;

(b) position of runners and risers;

(c) position and nature of chills;

(d) type of moulding material(s) and details of control parameters;

(e) mould temperature;

(f) casting temperature range;

(g) heat-treatment details;

(h) method of surface finishing.

1.5.2 Production casting

All subsequent production castings shall be made by the same technique. If for any reason the technique needs to be altered, production shall not proceed without the authority of the purchaser* who may require sample castings made by the new technique.

1.5.3 Design Authority access

The Design Authority shall have access to the foundry technique.

*See 1.4.