BRITISH STANDARD AEROSPACE SERIES

BS 2L 169:2002

Ingots (as cast) and castings (solution treated and artificially aged) of aluminium-silicon-magnesium alloy (Si 7, Mg 0.6)

ICS 49.025.20

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ACE/24, Wrought and cast light alloys for aerospace, upon which the following bodies were represented:

Aluminium Federation

Aluminium Stockholders Association

Association of Light Alloy Refiners Limited

BNF Metals Technology Centre

British Forging Industry Association

British Industrial Fasteners Federation

British Investment Casting Trade Association

Institute of British Foundrymen

Light Metal Founders' Association

Magnesium Industry Council

Ministry of Defence

Society of British Aerospace Companies Limited

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Committee reference ACE/24
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Contents

Foreword

This British Standard is a new edition of BS L 169:1986 and incorporates technical changes only. It does not reflect a full review or revision of the standard, which will be undertaken in due course.

It has been prepared by Technical Committee ACE/24, Wrought and cast light alloys for aerospace, and supersedes BS L 169:1986, which is withdrawn.

This new edition deletes beryllium from the chemical composition of ingots and castings and adjusts the requirements for grain refinement.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its 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 3 and a back cover.

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1 Scope

This British Standard specifies the inspection and testing procedure, chemical composition, heat treatment and mechanical properties applicable to ingots and castings of aluminium-silicon-magnesium alloy.

NOTE 1 The title of the publication referred to in this standard is given on the inside back cover.

NOTE 2 The latest revision of an Aerospace Series standard is indicated by a prefix number.

2 Inspection and testing procedure

The inspection and testing procedure shall be as specified in the relevant sections of the latest edition of BS L 101.

3 Chemical composition

3.1 The chemical composition of ingots and castings shall be as given in Table 1.

Table 1 — Chemical composition of ingots and castings

Element	Composition by mass	
	Min. %	Max. %
Copper	—	0.10
Magnesium	0.50	0.75
Silicon	6.5	7.5
Iron — Ingots	—	0.15
Iron — Castings	—	0.20
Manganese	—	0.10
Nickel	—	0.05
Zinc	—	0.10
Lead	—	0.05
Tin	—	0.05
Titanium	0.10	0.20
Others each	—	0.05
Others total	—	0.15
Aluminium	—	Remainder

NOTE 1 Specific modifying elements may be added in sufficient quantities to provide the necessary casting material quality.

NOTE 2 Up to 0.07 % beryllium may be added to the melt by agreement with the purchaser.

3.2 Grain refinement shall be carried out using titanium and/or boron.

3.3 The release documentation for ingots shall include a statement of grain refining elements used, if any.

4 Conditions of supply

4.1 Ingots shall be supplied as cast.

4.2 Castings shall be supplied fully heat treated in accordance with Clause **5** unless otherwise stated on the order.

5 Heat treatment

5.1 The castings and test samples shall be heat treated together in accordance with a) to d) as follows.

a) Solution treat at a temperature of 540 ± 5 °C for not less than 10 h.

b) Quench in water or in a polymer quenchant at a temperature not greater than 30 °C.

NOTE The use of a polymer quenchant as an alternative to water should be agreed by the purchaser.

c) Artificially age at a temperature in the range 155 °C to 165 °C for not less than 2 h. The temperature selected shall be maintained within a tolerance of ±5 °C.

d) Cool in air.

5.2 Where a polymer quenchant has been used in **5.1**b), the nature of the quenchant shall be defined on the certificate of conformity for the castings.

6 Mechanical properties of castings

6.1 Tensile tests

6.1.1 The mechanical properties obtained from separately cast test samples, selected and prepared in accordance with the relevant requirements of the latest edition of BS L 101, shall be not less than those given in Table 2, when heat treated in accordance with Clause **5**.

Table 2 — Tensile properties of separately cast samples

Test sample	0.2 % proof stress min. MPa	Tensile strength min. MPa	Elongation min. %
Sand	240	290	3.0
Investment cast	240	300	3.5
Chill cast	240	320	4.0

6.1.2 The mechanical properties obtained from cut-up and integrally cast test samples, heat treated in accordance with Clause **5**, and selected and prepared in accordance with the relevant requirements of the latest edition of BS L 101 shall be not less than those given in Table 3 or shall be as stated on the drawing for the casting or on the Inspection Schedule in accordance with the latest edition of BS L 101.

6.2 Hardness test

The hardness of castings, heat treated in accordance with Clause **5** shall be not less than the following:

a) sand and investment cast 80 HB,
b) chill cast 85 HB.

Table 3 — Tensile properties of cut-up and integrally cast test samples

Casting thickness (t) mm	Location of test samples	0.2 % proof stress min. MPa	Tensile strength min. MPa	Elongation %
$t < 5$	Designated locations	250	320	5
	Other locations	230	300	3
$5 \leq t < 20$	Designated locations	240	300	3
	Other locations	220	270	2
$t \geq 20$	—	As stated on the drawing for the casting or on the Inspection Schedule		

Bibliography

Standards publication

BS 4L 101, *Procedure for inspection, testing and acceptance of aluminium-base and magnesium-base ingots and castings.*[1)]

[1)] Use the latest available edition of BS L 101.

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