

Recommended methods for the spectrographic analysis of high purity zinc and zinc alloys for die casting

Co-operating organizations

The Non-ferrous Metals Industry Standards Committee, under whose supervision this British Standard was prepared, consists of representatives from the following Government departments and scientific and industrial organizations:

Aluminium Federation	Institution of Mechanical Engineers
Association of Bronze and Brass Founders	(Automobile Division)
Association of Consulting Engineers	Institution of Mining and Metallurgy
Board of Trade	Institution of Production Engineers
British Bronze and Brass Ingot Manufacturers' Association	Institution of Structural Engineers
British Electrical and Allied Manufacturers' Association*	Lead Development Association
British Lead Manufacturers' Association	Light Metal Founders' Association
British Non-ferrous Metals Federation*	London Metal Exchange*
British Non-ferrous Metals Federation — High Conductivity Copper Group	Magnesium Industry Council
British Non-ferrous Metals Research Association*	Ministry of Defence, Army Department*
Copper Development Association	Ministry of Defence, Navy Department*
Crown Agents for Oversea Governments and Administrations	National Brassfoundry Association
Electric Cable Makers' Confederation	Non-ferrous Metal Stockists
Institute of British Foundrymen	Post Office*
Institute of Metals*	Royal Institute of British Architects
	Society of Motor Manufacturers and Traders Ltd.*
	Tin Research Institute
	Zinc Development Association*
	Individual manufacturers

The Government departments and scientific and industrial organizations marked with an asterisk in the above list, together with the following, were directly represented on the committee entrusted with the preparation of this British Standard:

British Steel Industry	Ministry of Technology — Laboratory of the
Imperial Smelting Corporation	Government Chemist
Institute of Iron and Steel Wire Manufacturers	Zinc Alloy Die Casters' Association
Institute of Sheet Metal Engineering	Individual analysts

This British Standard, having been approved by the Non-Ferrous Metals Industry Standards Committee was published under the authority of the Executive Board on 24 November 1970

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First published November 1945
First revision November 1970

The following BSI references relate to the work on this standard:
Committee references NFE/8 and NFE/8/4
Draft for comment 68/21190

ISBN 0 580 05828 x

Amendments issued since publication

Amd. No.	Date	Comments

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Foreword

This standard makes reference to the following British Standards:

BS 1004, *Zinc alloys for die casting and zinc alloy die castings*.

BS 1470, *Wrought aluminium and aluminium alloys — Plate, sheet and strip*.

BS 3436, *Ingot zinc*.

BS 3630, *Methods for the sampling and analysis of zinc and zinc alloys*.

These British Standard recommended methods for spectrographic analysis of high purity zinc and zinc alloys for die casting were first published together with polarographic methods of analysis as BS 1225 in 1945. Since that date chemical methods of analysis for zinc and zinc alloys have improved and a new series of methods is being issued as BS 3630, “*Methods for the sampling and analysis of zinc and zinc alloys*”, each method being published as a separate part of the standard. This new series will include polarographic methods where appropriate and spectrographic methods only are, therefore, included in this new edition of BS 1225.

It is emphasized that these recommended methods are intended to be a guide to analysis and not a rigorously binding specification. The broad range of equipment available together with the inability completely to specify all electrical conditions in a spectrographic technique make attempts at standardization imprudent.

This new edition refers to methods involving photographic recording which were included in the 1945 edition, but it also refers to direct reading instruments, and figures are included to indicate both the typical reproducibility and the minimum reproducibility to be expected with both types of equipment; much of the information previously included relating specifically to different types of spectrographs has been omitted and the recommendations now included are intended to apply to any type of instrument provided it is capable of recording a spectrum within the specified wavelength range and with the required dispersion.

The recommended methods relate to the determination of impurities in high purity zinc and zinc alloys for die casting and to the determination of alloying constituents in zinc alloys complying with BS 1004 Alloy A and Alloy B.

The time consuming oxide arc method previously included for the determination of impurities has been omitted, but the intermittent a.c. arc method has been retained and the use of an intermittent d.c. arc method is also permitted; alternative schematic circuits are given.

The method for the determination of copper and magnesium in Alloy B requiring the use of a graphite rod and an alloy electrode has not been included as copper in Alloy B can be determined with sufficient accuracy using two metallic electrodes provided the appropriate standard alloys are used and in any case the copper content of Alloy B can be determined readily by chemical methods.

The whole standard has been completely redrafted, and recommended methods of preparing metallic standards have been included in an appendix.

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 9 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 Introduction

1.1 Principle. A pair of electrodes of the sample are excited by

1) a.c. intermittent arc or d.c. intermittent arc discharge for impurity constituents

or

2) simple condensed spark discharge for alloying elements.

The radiation is dispersed by e.g. a medium quartz spectrograph and recorded either photographically, in which case the densities of the spectrum lines are derived by microphotometer measurement, or electronically in the case of direct readers. The spectra obtained are evaluated by comparison with those obtained from standard alloys.

1.2 Application. The method is applicable to the analysis of high purity zinc complying with grade Zn1 of BS 3436¹⁾ (previously BS 1003) and of zinc alloys for die casting complying with BS 1004²⁾. The elements which may be determined and the concentration ranges covered are as follows:

	Alloying element	Impurity maximum
	%	%
Copper	0.75–1.25	0.10
Cadmium	—	0.005
Iron	—	0.10 ^a
Lead	—	0.005
Tin	—	0.002
Thallium	—	0.001
Indium	—	0.000 5
Aluminium	3.8–4.3	—
Magnesium	0.03–0.06	—

^a Above the level of 0.03 % for iron in zinc alloys segregation tends to occur and the spectrographic determination of the higher contents is therefore not recommended.

1.3 Reproducibility. Coefficient of variation calculated from not less than 20 results should not be significantly worse than:

Element	Content	Coefficients of variation
	%	%
Lead	0.005	5
Cadmium	0.005	5
Tin	0.002	10
Iron	0.003	10
Copper	0.1	10
Aluminium	4	2½
Magnesium	0.045	5

¹⁾ BS 3436, "Ingot zinc".

²⁾ BS 1004, "Zinc alloys for die casting and zinc alloy die castings".