

Australian Standard<sup>®</sup>

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**METHODS FOR THE ANALYSIS  
OF SOLDERS**

**Part 2—DETERMINATION OF  
SILVER, BISMUTH,  
CADMIUM, COPPER  
ANTIMONY, IRON AND  
ZINC—  
FLAME ATOMIC  
ABSORPTION  
SPECTROMETRIC  
METHOD**

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This Australian Standard was prepared by Committee CH/10, Analysis of Metals under the direction of the Chemicals Standards Board. It was approved on behalf of the Council of the Standards Association of Australia on 3 June 1987 and published on 6 July 1987.

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The following interests are represented on Committee CH/10:

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Australasian Institute of Mining and Metallurgy  
Australian Lead Development Association  
Australian Mineral Development Laboratories  
Australian Tin Information Centre  
Australian Zinc Development Association  
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STANDARDS AUSTRALIA

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RECONFIRMATION

OF

AS 2292.2—1987

Methods for the analysis of solders

**Part 2: Determination of silver, bismuth, cadmium, copper, antimony, iron and zinc—Flame atomic absorption spectrometric method**

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NOTES

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## PREFACE

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## STANDARDS ASSOCIATION OF AUSTRALIA

## Australian Standard

## METHODS FOR THE ANALYSIS OF SOLDERS

PART 2—DETERMINATION OF SILVER, BISMUTH, CADMIUM, COPPER,  
ANTIMONY, IRON AND ZINC—  
FLAME ATOMIC ABSORPTION SPECTROMETRIC METHOD

**1 SCOPE.** This Standard sets out a flame atomic absorption spectrometric method for the determination of silver, bismuth, cadmium, copper, antimony, iron and zinc in solders. Two dilution procedures are described in the method: the top-loading balance dilution procedure and the volumetric dilution procedure.

**2 APPLICATION.** This method is applicable to solders with trace element contents in the following ranges:

Silver, 0.001 to 0.08 percent  
Bismuth, 0.02 to 0.10 percent  
Cadmium, 0.0001 to 0.007 percent  
Copper, 0.001 to 0.10 percent  
Antimony, 0.002 to 0.60 percent  
Iron, 0.0005 to 0.02 percent  
Zinc, 0.0001 to 0.004 percent.

Typical element concentrations found in solders are shown in Table 2.

**3 REFERENCED DOCUMENTS.** The following Standards are referred to in this Standard:

- AS 2134 Recommended Practice for Chemical Analysis of Materials by Atomic Absorption Spectrometry  
Part 1—Flame Atomic Absorption Spectrometry
- AS 2164 One-mark Volumetric Analysis.
- ISO 5725 Precision of Test Methods — Determination of Repeatability and Reproducibility by Inter-laboratory Tests.

**4 PRINCIPLE.** The sample is dissolved in a mixture of nitric and hydrofluoric acids, and boric acid is added. Dilution may be carried out on a mass basis or volumetrically. The concentration of each element in the acid solution is determined by flame atomic absorption spectrometry.

#### 5 REAGENTS.

**5.1 General requirements.** During the analysis, only reagents of recognized analytical reagent grade and distilled water or water of an equivalent purity shall be used.

#### 5.2 Solid reagents.

- 5.2.1 Silver metal** (purity > 99.9 percent silver).
- 5.2.2 Bismuth metal** (purity > 99.9 percent bismuth).

**5.2.3 Cadmium metal** (purity > 99.9 percent cadmium).

**5.2.4 Copper metal** (purity > 99.9 percent copper).

**5.2.5 Antimony metal** (purity > 99.9 percent antimony).

**5.2.6 Iron metal** (purity > 99.9 percent iron).

**5.2.7 Zinc metal** (purity > 99.9 percent zinc).

**5.2.8 Tin metal** (purity > 99.9 percent tin).

**5.2.9 Lead metal** (purity > 99.99 percent lead).

#### 5.3 Solutions.

**5.3.1 Hydrofluoric acid** ( $\rho_{20}$  1.15 g/mL).

CAUTION: Care when diluted, hydrofluoric acid is extremely dangerous and harmful to the eyes and skin; rubber gloves and goggles should be worn when using this acid.

**5.3.2 Nitric acid** ( $\rho_{20}$  1.42 g/mL).

**5.3.3 Nitric acid (400 mL/L).** Add 400 mL of nitric acid (5.3.2) to 600 mL of water.

**5.3.4 Nitric acid-hydrofluoric acid mixture.** To 650 mL of water add 100 mL of hydrofluoric acid (5.3.1) and 250 mL of nitric acid (5.3.2). Store in a plastics bottle.

CAUTION: This acid mixture is extremely corrosive. All operations involving it should be conducted in a fume cupboard. The operator should wear rubber gloves and safety glasses.

**5.3.5 Boric acid solution (40 g/L).** Dissolve 40 g of boric acid powder ( $\text{H}_3\text{BO}_3$ ) in hot water. Dilute to 1 L.

**5.3.6 Mercury (II) nitrate solution (50 g/L).** Dissolve 5 g of mercury(II) nitrate ( $\text{Hg}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ ) in water. Add 2 mL of nitric acid (5.3.2) and dilute to 100 mL with water.

#### 5.4 Standard solutions.

**5.4.1 Standard metals solution** (1 mL  $\equiv$  2.0 mg Bi, 1.2 mg Cu, 1.6 mg Ag, 0.5 mg Fe, 0.2 mg Cd, 0.1 mg Zn). Weigh to the nearest 0.0001 g, 2.0 g of bismuth (5.2.2), 1.2 g of copper (5.2.4), 1.6 g of silver (5.2.1), 0.50 g of iron (5.2.6), 0.20 g of cadmium (5.2.3), and 0.10 g of zinc (5.2.7). Add 5 mL of mercury(II) nitrate solution (5.3.6). Dissolve in 200 mL of nitric acid (5.3.3), transfer to a volumetric flask and dilute to 1 L with water.

**5.4.2 Working standard metals solution** (1 mL  $\equiv$  1.2 mg Sb, 0.2 mg Bi, 0.12 mg Cu, 0.16 mg Ag, 0.05 mg Fe, 0.02 mg Cd, 0.01 mg Zn). Weigh, to the nearest 0.0001 g, 0.3 g of antimony (5.2.5) into a plastics beaker. Add 5 mL of nitric acid-hydrofluoric acid mixture (5.3.4) and heat to 50°C to 60°C using a water bath, to complete solution. Cool.