

CERTIFICATE OF ANALYSIS

41X ZMA4.0 (batch A)

Reference Material Information

Type: ZINC-MAGNESIUM-ALUMINIUM TERNARY (CAST)

Form and Size: Disc ~40mm diameter

Produced by: MBH Analytical Ltd

Certified and supplied by: MBH Analytical Ltd

Assigned Values

Percentage element by weight


Element	Mg	Al
Value ¹	4.04	4.02
Uncertainty ²	0.22	0.21

Definitions

- ¹ The values given above are the present best estimates of the true content for each element, as determined by this limited analytical programme. Each value is a panel consensus, based on the averaged results of an interlaboratory testing schedule, detailed on page 3.
- ² The uncertainty values are estimated from a statistical review of the wet analysis results, combined with an assessment of the homogeneity test data. However, due to the small number of results involved in their derivation, all values herein should be treated with due caution.

Certified by:

MBH ANALYTICAL LIMITED



C Eveleighon 24th April 2019

Method of Preparation

This reference material was produced from commercial-purity metals only. The discs are the product of one melt poured by sequential transfer of aliquots into individual steel moulds.

At least 2mm was removed from the cast faces of the discs, to minimise surface effects.

Sampling

Samples for chemical analysis were taken from the working faces of the discs intended for final use.

Homogeneity

Samples representative of the batch were checked for uniformity using an optical emission spectrometer.

For all accepted material, through-batch variation values were derived for each element as an indicator of any minor compositional variation (as determined for the specific sample size and other limitations of the spectrometer).

Chemical Analysis

Analysis was carried out on millings taken from samples representative of the product. It was performed by a panel of laboratories, mostly operating within the terms of EN ISO/IEC 17025, using documented standard reference methods and validated wherever possible by appropriate reference materials.

The individual values listed overpage are the average of each analyst's results.

Traceability

Much of the analytical work performed to assess this material has been carried out by laboratories with proven competence, as indicated by their accreditation to ISO 17025. It is an implicit requirement for this accreditation that analytical work should be performed with due traceability, via an unbroken chain of comparisons, each with stated uncertainty, to primary standards such as the mole, or to nationally- or internationally-recognised reference materials.

Of the individual results herein, some have traceability (to the mole) via primary analytical methods. Some are traceable to substances of known stoichiometry. Most have traceability via commercial solutions. Furthermore, some results have additional traceability to NIST standards, as part of the analytical calibration or process control.

Usage

Intended use: With optical emission and X-ray fluorescence spectrometers.

Recommended method of use: Alloys of this type are generally prepared by turning or milling. However, users are recommended to follow the calibration and sample preparation procedures specified by the relevant instrument manufacturer.

Preparation should be the same for reference materials and the samples for test.

A minimum of four consistent replicate analyses is recommended to provide the necessary sample size. Users are advised to check against possible bias between reference materials and production samples due to differences in metallurgical history.

Analytical Data

Percentage element by weight

Sample	Mg	Method	AI	Method
1	3.977	ICP-AES	3.930	ICP-AES
2	3.998	ICP-AES	4.054	FAAS
3	4.138	FAAS	4.065	ICP-AES
Mean	4.038		4.016	
Std Dev	0.088		0.075	
C_(95%)	0.219		0.187	

FAAS: flame atomic absorption spectrometry

ICP-AES inductively-coupled plasma – atomic emission spectrometry

Notes: C_(95%) is the 95% half-width confidence interval derived from the equation:

$$C_{(95\%)} = (t \times SD) / \sqrt{n}$$

where n is the number of available values, t is the Student's t value for n-1 degrees of freedom, and SD is the standard deviation of the test results.

Statistical analysis of data sets with few values should be treated with due caution.

Participating Laboratories

Universal Scientific Laboratory Pty Ltd	Milperra, NSW, Australia	NATA accreditation 492
Raghavendra Spectrometallurgical Laboratory	Bangalore, India	NABL accreditation T371
Analyticka Laborator Lithea sro	Brno, Czech Republic	

Note: to achieve the above accreditation (NATA, etc), test houses must demonstrate conformity to the general requirements of EN ISO/IEC 17025.

Notes

The unidirectional solidification effects associated with this method of chill casting have led to the formation of inhomogeneous segregates in the rear portion of the disc. The above certification is therefore only applicable from the front face of the disc to a depth of ~12mm. Material to the rear of the disc, to a depth of ~5mm, is not certified.

This material is not necessarily stable, and there may be some chronic recrystallization, or localized segregation into a multi-phase structure. However, the gross chemical composition will remain constant indefinitely, provided adequate precautions are taken to protect it from cross-contamination, extremes of temperature and atmospheric moisture. All production records will be retained for a period of 20 years from the date of this certificate. Technical support for this certification will therefore expire in April 2039, although we reserve the right to make changes as issue revisions, in the intervening period.

The manufacture, analysis and certification of this product were supervised by C Eveleigh, PhD, Technical Director, MBH Analytical Ltd.

The material to which this certificate of analysis refers is supplied subject to our general conditions of sale.