

CERTIFICATE OF ANALYSIS

41X 2951Zn1 (batch A)

Certified Reference Material Information

Type: LOW-ALLOY ZINC - ILZRO16-type (CAST)
Form and Size: Disc 50mm Diameter x 20mm Thickness
Manufactured by: G Rhodes
Certified and Supplied by: MBH Analytical Limited

Certified Analysis

Percentage element by weight

Element	Pb	Mg	Al	Cd	Fe	Sn
Value ¹	0.0042	0.0029	0.029	0.0005	0.011	(0.0007)
Uncertainty ²	0.0004	0.0003	0.002	0.0001	0.001	-

Element	Cu	Ti	Cr	Mn	Ni
Value ¹	0.79	0.278	0.083	0.0013	0.0038
Uncertainty ²	0.02	0.003	0.002	0.0001	0.0002

Note: values given in parentheses are not certified - they are provided for information only.

Definitions

- ¹ The certified values are derived from the results of an interlaboratory testing programme, detailed on page 3.
- ² The uncertainty values are generated from the 95% confidence interval derived from the wet analysis results (page 3). When appropriate, these values have been modified to account for additional information from the material homogeneity checks.

Certified by:

MBH ANALYTICAL LIMITED _____

on 12th September 2001



Method of Preparation

This reference material was produced from 99.999 high-purity zinc, commercial ILZRO16 alloy, and master alloys. The metal was cast into individual iron chill moulds. At least 1mm was machined from the upper and lower surfaces of each disc, to minimise surface effects.

Sampling

Samples for chemical analysis were taken from throughout the casting process. In addition 10% of all discs, chosen at random from the complete cast, were selected for homogeneity checks.

Homogeneity

Discs were checked for uniformity using an optical emission spectrometer. One additional disc was checked for vertical uniformity using the same method.

Multiple measurements were taken from each surface under test, and averaged.

The mean value of the material was then calculated from these averages.

For each of the surfaces checked, the differences between the averaged result and the overall mean value were evaluated to ensure that the homogeneity of the material satisfied the acceptance criteria defined in ISO guide 30 - 1992, and fell within 95% probability limits.

Chemical Analysis

Analysis was carried out on millings taken from samples representative of the product. It was performed by participating laboratories mostly operating within the terms of EN ISO/IEC 17025 - 2000, using documented standard methods of analysis.

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

Usage

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

Recommended method of use: Zinc and zinc alloys are generally prepared by machining on a mill or lathe. 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.

For OES the sample should be of sufficient mass to prevent excess heating during sparking, and the discharge chamber should be regularly cleaned as directed by the instrument manufacturer.

A minimum of three consistent replicate analyses is recommended to optimise precision and accuracy. Users are advised to check against possible bias between reference materials and production samples due to differences in metallurgical history, and be aware of possible inter-element effects.

Analytical Data

Sample	<u>Percentage element by weight</u>					
	Pb	Mg	Al	Cd	Fe	Sn
1	0.0037	0.0025	0.0258	0.0004	0.0099	0.0005
2	0.0039	0.0025	0.0278	0.0004	0.010	0.0008
3	0.0040	0.0029	0.0284	0.0004	0.010	<0.001
4	0.0041	0.0030	0.029	0.0004	0.010	<0.001
5	0.0042	0.0030	0.030	0.0005	0.010	<0.005
6	0.0043	0.0030	0.030	0.0005	0.0100	
7	0.005	0.0033	0.032	0.0007	0.012	
8			0.0324		0.0136	
Mean	0.0042	0.0029	0.0294	0.0005	0.0107	(0.0007)
Std Dev	0.0004	0.0003	0.0022	0.0001	0.0014	-
C_(95%)	0.0004	0.0003	0.0018	0.0001	0.0011	-

Sample	Cu	Ti	Cr	Mn	Ni
1	0.768	0.273	0.0792	0.001	0.0032
2	0.772	0.277	0.082	0.0012	0.0037
3	0.772	0.279	0.082	0.0013	0.0038
4	0.773	0.279	0.083	0.0013	0.0038
5	0.795	0.280	0.084	0.0013	0.0039
6	0.814	0.281	0.0846	0.0014	0.004
7	0.819		0.085	0.0014	0.004
8				0.0015	0.0040
Mean	0.788	0.278	0.0828	0.0013	0.0038
Std Dev	0.022	0.003	0.0020	0.0002	0.0003
C_(95%)	0.020	0.003	0.0018	0.0001	0.0002

Note: 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.

Participating Laboratories

London & Scandinavian Met Co Ltd
 RoTech Laboratories
 Sheffield Assay Office
 Universal Scientific Laboratory Pty Ltd
 Central Iron & Steel Research Inst
 Non-Ferrous Materials Technology
 Development Centre
 Minton, Treharne and Davies Ltd
 Birmingham Assay Office Ltd
 Brock Metals Ltd
 Coleshill Laboratories Ltd

Rotherham, England
 Wednesbury, England
 Sheffield, England
 Milperra, NSW, Australia
 Beijing, China

UKAS approval 1091
 UKAS approval 0366
 UKAS approval 0012
 NATA approval 492
 CNAACL 0435

Hyderabad, India
 Cardiff, Wales
 Birmingham, England
 Cannock, England
 Coleshill, England

Analytical Methods Used

Lead:	FAAS	ICP	polarographic
Magnesium:	FAAS	ICP	
Aluminium:	FAAS	ICP	
Cadmium:	FAAS	ICP	
Iron:	FAAS	ICP	photometric (sulfosalicylic acid)
Tin:	FAAS	ICP	
Copper:	FAAS	ICP	photometric (bis-cyclohexanone oxalyldihydrazone)
Titanium:	FAAS	ICP	photometric (di-antipyrylmethane)
Chromium:	FAAS	ICP	
Manganese:	FAAS	ICP	
Nickel:	FAAS	ICP	

Notes

This Certified Reference Material has been produced in accordance with the requirements of ISO Guide 34-2000, ISO Guide 31-2000, ISO Guide 35-1989, and ASTM Guides E1724 and E1831.

To achieve National Accreditation (eg UKAS, NATA, CNAACL), test houses must demonstrate conformity to the general requirements of EN ISO/IEC 17025 and ISO9002.

The combination of alloying elements used in a complex cast material of this type, coupled with the unidirectional solidification effects associated with semi-chill casting, may lead 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. Material to the rear of the disc, to a depth of ~5mm, is not certified.

For OES the sample should be of sufficient mass to prevent excess heating during sparking, and the discharge chamber should be regularly cleaned as directed by the instrument manufacturer.

This product is designed as part of a calibration series for alloy type ILZRO16. ILZRO is a trademark of the International Lead Zinc Research Organisation Inc, based in North Carolina, USA.

This product is also available in the form of chippings.

This material will remain stable provided adequate precautions are taken to protect it from cross-contamination, extremes of temperature and atmospheric moisture.

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