

CERTIFICATE OF ANALYSIS

42X Z7 (batch C)

Certified Reference Material Information

Type: ZINC / ALUMINIUM 'GALFAN' TYPE (CAST)
Form and Size: Disc 50mm Diameter x 20mm Thickness
Produced by: G Rhodes
Certified and supplied by: MBH Analytical Limited

Certified Analysis

Percentage element by weight

Element	Pb	Mg	Al	Cd	Fe	Sn	Cu
Value ¹	0.0097	0.0095	4.39	0.030	0.027	0.012	0.0249
Uncertainty ²	0.0009	0.0004	0.05	0.001	0.003	0.001	0.0007

Element	Ni	Si	Mn	Cr	Ti	Ce	La
Value ¹	0.0067	0.006	0.0045	(0.0001)	(0.0001)	0.09	0.08
Uncertainty ²	0.0003	0.001	0.0003	-	-	0.01	0.01

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 17th September 2001

Method of Preparation

This reference material was produced from master alloys and commercial-purity zinc. 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 checking.

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

Percentage element by weight

Sample	Pb	Mg	Al	Cd	Fe	Sn	Cu
1	0.0082	0.0089	4.30	0.0267	0.023	0.009	0.0238
2	0.0086	0.009	4.30	0.028	0.0245	0.0116	0.024
3	0.009	0.0091	4.306	0.0294	0.0246	0.012	0.024
4	0.010	0.0091	4.38	0.030	0.0247	0.012	0.024
5	0.010	0.0095	4.384	0.030	0.026	0.012	0.0244
6	0.010	0.0097	4.39	0.030	0.028	0.012	0.0251
7	0.0104	0.0098	4.41	0.0310	0.0285	0.012	0.0256
8	0.0114	0.010	4.45	0.031	0.030	0.0124	0.026
9		0.0101	4.45	0.032	0.030		0.026
10		0.0102	4.49	0.0321			0.026
Mean	0.0097	0.0095	4.386	0.0300	0.0266	0.0116	0.0249
Std Dev	0.0010	0.0005	0.067	0.0017	0.0026	0.0011	0.0009
C_(95%)	0.0009	0.0003	0.048	0.0012	0.0020	0.0009	0.0007

Sample	Ni	Si	Mn	Cr	Ti	Ce	La
1	0.0059	0.005	0.004	0.0001	0.0001	0.079	0.069
2	0.0064	0.0050	0.0041	0.0001	0.00016	0.083	0.070
3	0.0064	0.006	0.0043	0.0002	<0.0004	0.088	0.074
4	0.0065	0.006	0.0044	<0.0002	<0.0005	0.094	0.080
5	0.0066	0.007	0.0045	<0.0004	<0.0005	0.10	0.092
6	0.0069	0.008	0.0045	<0.0005	<0.001	0.105	
7	0.007	<0.02	0.0046	<0.0005	<0.001		
8	0.0072		0.0046	<0.002	<0.001		
9	0.0073		0.0048		<0.002		
10			0.005				
Mean	0.0067	0.006	0.0045	0.0001	0.0001	0.092	0.077
Std Dev	0.0004	0.001	0.0003	-	-	0.010	0.009
C_(95%)	0.0003	0.001	0.0002	-	-	0.010	0.012

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

LGC-NW	Runcorn, England	UKAS approval 1214
London & Scandinavian Met Co	Rotherham, England	UKAS approval 1091
Bodycote Materials Testing Ltd	Middlesbrough, England	UKAS approval 0239
Rotech Laboratories Ltd	Wednesbury, England	UKAS approval 0366
Sheffield Assay Office	Sheffield, England	UKAS approval 0014
University Metals Advisory Centre	Sheffield, England	UKAS approval 0041
Universal Scientific Laboratory Pty Ltd	Milperra, NSW, Australia	NATA approval 492
Laboratory Testing Inc	Hatfield, Pa, USA	A2LA approval 0117
Central Iron & Steel Research Inst	Beijing, China	CNACL approval 0435
Bodycote Materials Testing	Shotton, Wales	
Eastern Alloys Inc	Maybrook, NY, USA	
Coleshill Laboratories Ltd	Coleshill, England	
Birmingham Assay Office	Birmingham, England	

Analytical Methods Used

Lead:	FAAS	ICP	square-wave polarography
Magnesium:	FAAS	ICP	
Aluminium:	FAAS	ICP	volumetric (EDTA)
Cadmium:	FAAS	ICP	square-wave polarography
Iron:	FAAS	ICP	photometric (sulfosalicylic acid)
Tin:	FAAS	ICP	
Copper:	FAAS	ICP	photometric (bis-cyclohexanone oxalyldihydrazone)
Nickel:	FAAS	ICP	
Silicon:	FAAS	ICP	gravimetric (perchloric acid)
Manganese:	FAAS	ICP	photometric (periodate)
Chromium:	FAAS	ICP	GF-AAS
Titanium:	FAAS	ICP	GF-AAS
Cerium:		ICP	
Lanthanum:		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, A2LA, NATA, CNACL), 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 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.