MBH ANALYTICAL LTD

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CERTIFICATE OF ANALYSIS

57X G12H5 (batch G)

Certified Reference Material Information

Type:	ALUMINIUM/COPPER/SILICON (CAST)
Form and Size:	Disc 40-50mm diameter x 15-20mm thick
Supplied by:	MBH Analytical Limited
Produced by:	Coleshill Laboratories Limited

Certified Analysis

Percentage element by weight

Element	Cu	Mg	Si	Fe	Mn	Ni
%	12.2	0.028	0.55	0.19	0.073	0.11

Element	Zn	Pb	Sn	Co	Ti	Cr
%	0.072	0.068	0.067	0.054	0.036	0.016

Element	Zr	V	Sb	Be	Ga	Cd
%	0.045	0.033	0.066	0.003	0.017	0.023

Usage

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

Recommended method of use: Aluminium and aluminium alloys are generally prepared by machining on a 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.

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.

Certified by:

MBH ANALYTICAL LIMITED _____ on 12th January 1999

Method of Preparation

This reference material was produced from commercial-purity aluminium, pure elements and master alloys. The melt was degassed using sodium-free degasser, and was cast into iron chill moulds. 2mm has been removed from the cast face to minimise any surface effects.

Sampling

Samples for chemical analysis, and discs for homogeneity checks, were taken from the start, middle and end of the casting process

Homogeneity

For a series of three discs, 2mm was removed from the chilled face and then each disc checked for vertical uniformity using an optical emission spectrometer.

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 checked to ensure that the homogeneity met the acceptance criteria defined in ISO guide 30 - 1992.

Chemical Analysis

Analysis was carried out on millings taken from samples representative of the cast product. For analysis purposes, the selected participating laboratories normally followed the requirements of ISO guide 25 - 1990. The individual values listed overpage are usually the average of each analyst's results.

Confidence Limits

These are the upper and lower values between which the actual measurements will fall, with the stated probabilities, assuming a Gaussian distribution.

68.3% of the results will fall within $\pm$ 1 x Standard Deviation of the mean.

95.4% of the results will fall within $\pm$ 2 x Standard Deviation of the mean.

99.7% of the results will fall within $\pm$ 3 x Standard Deviation of the mean.

Analytical Data

Percentage element by weight

Sample	Cu	Mg	Si	Fe	Mn	Ni
1	12.2	0.025	0.56	0.20	0.080	0.105
2	-	0.027	-	0.20	0.08	0.11
3	12.40	0.027	0.56	0.20	-	0.11
4	-	0.029	-	0.182	0.072	0.098
5	-	0.03	-	0.18	0.07	-
6	12.0	-	0.55	0.17	0.07	-
7	12.21	0.025	-	0.184	0.07	0.105
8	-	-	0.56	0.20	0.075	0.12
9	12.04	0.031	0.51	0.187	0.07	-
Mean	**12.17**	**0.028**	**0.548**	**0.189**	**0.073**	**0.108**
Std Dev	**0.16**	**0.002**	**0.022**	**0.011**	**0.004**	**0.007**

Sample	Zn	Pb	Sn	Co	Ti	Cr
1	0.066	-	0.064	0.049	0.030	0.013
2	0.07	0.063	-	0.05	0.04	0.015
3	0.07	0.072	0.06	0.06	0.035	0.017
4	-	0.066	0.068	-	0.038	-
5	0.08	0.07	0.07	0.06	0.04	0.015
6	0.08	0.07	0.07	0.05	0.03	-
7	-	0.063	0.061	0.053	0.039	0.018
8	0.072	0.073	0.078	-	-	-
9	0.069	-	-	-	-	-
Mean	**0.072**	**0.068**	**0.067**	**0.054**	**0.036**	**0.016**
Std Dev	**0.005**	**0.004**	**0.006**	**0.005**	**0.004**	**0.002**

Sample	Zr	V	Sb	Be	Ga	Cd
1	0.04	0.033	0.066	0.0015	0.015	0.020
2	0.04	0.03	-	0.003	0.017	0.03
3	0.05	0.035	-	0.003	-	0.020
4	0.047	0.037	-	-	-	-
5	-	0.03	-	-	-	-
6	-	0.03	0.07	0.003	-	0.02
7	0.05	-	0.058	0.003	0.018	-
9	-	0.037	0.069	-	-	0.027
Mean	**0.045**	**0.033**	**0.066**	**0.0027**	**0.017**	**0.023**
Std Dev	**0.005**	**0.003**	**0.005**	**0.0007**	**0.002**	**0.005**

Participating Laboratories

Metals Technology (Testing) Ltd	Sheffield, England	NAMAS Approval 0963
RoTech Laboratories	Wednesbury, England	NAMAS Approval 0366
Sheffield Assay Office	Sheffield, England	NAMAS Approval 0012
Coleshill Laboratories Ltd	Birmingham, England	NAMAS Approval 0121
University Metals Advisory Centre	Sheffield, England	NAMAS Approval 0411
London & Scandinavian Met Co	Rotherham, England	NAMAS Approval 1091
Birmingham Assay Office	Birmingham, England	NAMAS Approval 0667
Central Iron & Steel Research Inst	Beijing, China	National Reg. E0584
Shiva Analyticals Ltd	Bangalore, India	

Analytical Methods Used

Copper:	FAAS	ICP	electrogravimetric
Magnesium:	FAAS	ICP	
Silicon:	FAAS	ICP	gravimetric photometric (molybdenum blue)
Iron:	FAAS	ICP	photometric (orthophenanthroline)
Manganese:	FAAS	ICP	photometric (periodate)
Nickel:	FAAS	ICP	photometric (dimethyl glyoxime)
Zinc:	FAAS	ICP	photometric (dithione extraction)
Lead:	FAAS	ICP	
Tin:	FAAS	ICP	photometric (phenylfluorone)
Cobalt:	FAAS	ICP	
Titanium:	FAAS	ICP	
Chromium:	FAAS	ICP	
Zirconium:	FAAS	ICP	
Vanadium:	FAAS	ICP	
Antimony:	FAAS	ICP	
Beryllium:	FAAS	ICP	
Gallium:	FAAS	ICP	
Cadmium:	FAAS	ICP	

Notes

This Certified Reference Material has been produced in accordance with the general principles of ISO Guide 34 - 1996. The certification conforms with the guidelines given in ISO Guide 31 - 1981.

To achieve NAMAS (UK National Measurement Accreditation Scheme) approval, test houses must demonstrate conformity to the general requirements of BS EN 45001, ISO Guide 25 and ISO9002.

Some cast discs may exhibit shrinkage cavities on their upper surfaces. The above certification is therefore only applicable to the front face of the disc. Material to the rear (engraved) face of the disc, to a depth of 5mm, is not certified.

Figures shown in brackets are not certified; they are provided for information only.

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.