

CERTIFICATE OF ANALYSIS

55X G26H3 (batch F)**Certified Reference Material Information**

Type: ALUMINIUM/SILICON/COPPER (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	Zn	Pb
%	2.19	1.01	9.6	1.07	0.45	0.51	0.79	0.23

Element	Sn	Ti	Cr	Co	V	Ga	Li
%	0.16	0.147	0.130	0.076	0.020	0.011	0.006

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 four 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 8th May 2000

Method of Preparation

This reference material was produced from commercial-purity aluminium, with the main and trace elements added as master alloys or pure elements. The melt was degassed using sodium-free flux, and was cast into iron chill moulds. Phosphorus treatment was carried out prior to pouring, in order to refine the cast structure. 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 several positions throughout 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, up to a depth of 10mm from the chill face, 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 below 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 ± 1 x Standard Deviation of the mean.

95.4% of the results will fall within ± 2 x Standard Deviation of the mean.

99.7% of the results will fall within ± 3 x Standard Deviation of the mean.

Analytical Data

Percentage element by weight

Sample	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb
1	2.21	1.00	9.48	1.02	0.44	0.525	0.78	0.225
2	2.22	1.09	9.65	1.05	0.46	0.52	0.82	0.23
3	2.20	1.00	-	-	0.47	0.50	0.75	0.24
4	2.12	-	9.71	1.10	0.483	0.523	0.769	0.232
5	2.18	1.01	-	1.05	0.42	0.51	0.80	0.22
6	-	0.984	-	-	0.447	0.491	0.807	0.203
7	-	1.00	9.52	1.14	0.418	0.518	-	0.236
8	-	1.00	-	1.06	-	-	0.776	0.239
Mean	2.186	1.012	9.59	1.070	0.448	0.512	0.786	0.228
Std Dev	0.040	0.035	0.11	0.043	0.024	0.013	0.024	0.012

Sample	Sn	Ti	Cr	Co	V	Ga	Li
1	0.18	0.16	0.13	0.082	0.018	0.012	0.0052
2	0.165	0.14	0.13	-	0.02	-	0.008
3	0.15	0.15	0.125	-	-	-	-
4	0.164	0.141	0.141	-	0.019	0.013	0.0074
5	0.17	0.15	0.13	0.07	-	0.01	0.004
6	0.140	0.142	0.126	0.0749	0.0176	0.0095	0.0062
7	0.176	0.144	0.137	-	-	-	-
8	-	-	0.117	0.0767	0.024	-	-
Mean	0.164	0.147	0.130	0.076	0.020	0.011	0.006
Std Dev	0.014	0.007	0.007	0.005	0.003	0.002	0.002

Participating Laboratories

Coleshill Laboratories Ltd	Birmingham, England	NAMAS approval 0121
Birmingham Assay Office	Birmingham, England	NAMAS approval 0667
RoTech Laboratories	Wednesbury, England	NAMAS approval 0366
University Metals Advisory Centre	Sheffield, England	NAMAS approval 0411
Metals Technology Testing Ltd	Sheffield, England	NAMAS approval 0963
J B Elds Ltd	Stoke, England	NAMAS approval 1173
Laboratory Testing Inc	Dublin, Pa, USA	A2LA approval 0117
Central Iron & Steel Research Inst	Beijing, China	National reg. E0584
Shiva Analyticals Ltd	Bangalore, India	

Analytical Methods Used

Copper:	FAAS	ICP	
Magnesium:	FAAS	ICP	volumetric (EDTA)
Silicon:	FAAS	ICP	gravimetric
Iron:	FAAS	ICP	photometric (orthophenanthroline)
Manganese:	FAAS	ICP	photometric (periodate)
Nickel:	FAAS	ICP	photometric (dimethyl glyoxime)
Zinc:	FAAS	ICP	
Lead:	FAAS	ICP	polarographic
Tin:	FAAS	ICP	photometric (phenylfluorone)
Titanium:	FAAS	ICP	photometric (diantipyryl methane)
Chromium:	FAAS	ICP	photometric (diphenyl carbazide)
Cobalt:	FAAS	ICP	
Vanadium:	FAAS	ICP	
Gallium:	FAAS	ICP	
Lithium:	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.

This piston alloy is liable to segregation on solidification. The above certification is therefore only applicable to the front face of the disc, to a maximum depth of 10mm. Material at the rear engraved face of the disc, to a depth of 5mm (40mm diameter discs) or 10mm (50mm diameter discs) 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.