

# CERTIFICATE OF ANALYSIS

**59X G7075 (batch B)**

## Certified Reference Material Information

Type: ALUMINIUM/ZINC/COPPER/MAGNESIUM (WROUGHT)  
Form and Size: Disc, ~50mm diameter  
Produced by: Sankyo Tateyama Europe, Belgium  
Certified and Supplied by: MBH Analytical Ltd

## Assigned Values

### Percentage element by weight

Element	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb
Value <sup>1</sup>	1.227	2.231	0.066	0.122	0.0229	0.0035	5.49	0.0011
Uncertainty <sup>2</sup>	0.015	0.017	0.004	0.002	0.0006	0.0008	0.04	0.0002

Element	Sn	Ti	Cr	Zr	V	B	Ga
Value <sup>1</sup>	(0.0008)	0.0248	0.1831	0.0008	0.0058	(0.0030)	0.0105
Uncertainty <sup>2</sup>	-	0.0009	0.0031	0.0001	0.0004	-	0.0005

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

## Definitions

- <sup>1</sup> The certified values are the present best estimates of the true content for each element. Each value is a panel consensus, based on the averaged results of an interlaboratory testing programme, detailed on page 3.
- <sup>2</sup> The uncertainty values are generated from the 95% confidence interval derived from the wet analysis results, in combination with a statistical assessment of the homogeneity data, as described on page 2.

## Certified by:

MBH ANALYTICAL LIMITED \_\_\_\_\_

on 30<sup>th</sup> June 2018

C Eveleigh

## **Method of Preparation**

This reference material was produced by slicing a single length of commercial barstock to alloy designation 7075, UNS A97075, into discs of 20mm length. The metallurgical history of this material is unknown.

## **Sampling**

Samples for chemical analysis were taken from various positions throughout the bar. At least 5% of all discs were selected for non-destructive homogeneity testing.

## **Homogeneity**

The discs were checked for sample and batch uniformity using an optical emission spectrometer.

Using the combined data for each surface, standard deviation values were derived for each element as an indicator of any non-homogeneity (as determined for the specific sample size taken by 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 by appropriate reference materials. The individual values listed overpage are the average of each analyst's results.

## **Estimation of Uncertainties**

Each element certified has been analysed by several laboratories, and 95% half-width confidence intervals ( $C_{(95\%)}$ ) for the resultant mean values have been derived by the method shown on page 3.

As a separate exercise, the degree of non-homogeneity of the batch for each element has been quantified by a programme of non-destructive application testing, discussed above.

The final certified uncertainty for each element has been derived by combining these two factors, using the square-root of the summed squares.

## **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 of use: Aluminium alloys are generally prepared by machining on a mill or a lathe. However, users method 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 five 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, and be aware of possible inter-element effects.

## Analytical Data

### Percentage element by weight

Sample	Cu	Mg	Si	Fe	Mn	Ni	Zn	Pb
1	1.188	2.190	0.0563	0.1161	0.0207	0.0023	5.391	0.0009
2	1.190	2.200	0.0570	0.1170	0.0209	0.0023	5.430	0.0009
3	1.198	2.218	0.0593	0.1180	0.0220	0.0024	5.430	0.0010
4	1.208	2.219	0.0629	0.1182	0.0222	0.0024	5.430	0.0011
5	1.218	2.225	0.0632	0.1190	0.0225	0.0025	5.459	0.0011
6	1.225	2.228	0.0644	0.1208	0.0226	0.0032	5.460	0.0011
7	1.234	2.235	0.0649	0.1210	0.0232	0.0032	5.480	0.0011
8	1.239	2.239	0.0661	0.1210	0.0233	0.0037	5.520	0.0012
9	1.240	2.240	0.0701	0.1220	0.0236	0.0042	5.521	0.0016
10	1.247	2.249	0.0703	0.1228	0.0237	0.0050	5.523	
11	1.250	2.250	0.0733	0.1230	0.0237	0.0051	5.524	
12	1.251	2.276	0.0742	0.1236	0.0238	0.0054	5.567	
13	1.262		0.0749	0.1240	0.0239		5.581	
14				0.1240	0.0243			
15				0.1268				
16				0.1281				
<b>Mean</b>	<b>1.227</b>	<b>2.231</b>	<b>0.0659</b>	<b>0.1216</b>	<b>0.0229</b>	<b>0.0035</b>	<b>5.486</b>	<b>0.0011</b>
<b>Std Dev</b>	0.025	0.023	0.0063	0.0034	0.0011	0.0012	0.058	0.0002
<b>C<sub>(95%)</sub></b>	0.015	0.015	0.0038	0.0018	0.0006	0.0008	0.035	0.0002

Sample	Sn	Ti	Cr	Zr	V	B	Ga
1	0.0005	0.0220	0.1750	0.0004	0.0050	0.0014	0.0092
2	0.0005	0.0222	0.1760	0.0006	0.0051	0.0017	0.0093
3	0.0007	0.0230	0.1790	0.0007	0.0051	0.0017	0.0099
4	0.0008	0.0241	0.1795	0.0007	0.0054	0.0022	0.0101
5	0.0009	0.0242	0.1805	0.0008	0.0056	0.0031	0.0105
6	0.0010	0.0242	0.1806	0.0008	0.0056	0.0031	0.0106
7	0.0012	0.0245	0.1820	0.0009	0.0057	0.0035	0.0110
8		0.0253	0.1824	0.0010	0.0059	0.0042	0.0110
9		0.0255	0.1826	0.0010	0.0059	0.0044	0.0112
10		0.0256	0.1858		0.0059	0.0046	0.0112
11		0.0258	0.1874		0.0062		0.0112
12		0.0260	0.1890		0.0069		
13		0.0261	0.1910		0.0073		
14		0.0264	0.1923				
15		0.0265					
<b>Mean</b>	<b>0.0008</b>	<b>0.0248</b>	<b>0.1831</b>	<b>0.0008</b>	<b>0.0058</b>	<b>0.0030</b>	<b>0.0105</b>
<b>Std Dev</b>	0.0003	0.0015	0.0053	0.0002	0.0007	0.0012	0.0007
<b>C<sub>(95%)</sub></b>	0.0002	0.0008	0.0031	0.0001	0.0004	0.0009	0.0005

Note: C<sub>(95%)</sub> 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

Exova Ltd  
Sheffield Analytical Services  
Anchorcert Analytical  
Universal Scientific Laboratory Pty Ltd  
Shandong Metallurgical & Science Research  
Lou Yang Copper Co  
Raghavendra SpectroMet Laboratory  
TCR Engineering Servs Pvt Ltd  
Genitest Inc  
Tec-Eurolab  
Institute of Non-Ferrous Metals  
INCDMNR-IMNR  
Mineral & Metallurgical Laboratories  
AMG Superalloys UK Ltd  
Analyticka Laborator Lithea sro

Middlesbrough, England  
Sheffield, England  
Birmingham, England  
Sydney, Australia  
Shandong, Jinan, China  
Luo Yang, He Nan, China  
Bangalore, India  
Mumbai, India  
Montreal, Canada  
Campogalliano, Italy  
Gliwice, Poland  
Pantelimon, Romania  
Bangalore, India  
Rotherham, England  
Brno, Czech Republic

UKAS accreditation 0239  
UKAS accreditation 0012  
UKAS accreditation 0667  
NATA accreditation 492  
CNAS accreditation 1461  
CNAS accreditation 0173  
NABL accreditation T371  
NABL accreditation T367  
PJ accreditation L17-153  
ACCREDIA accreditation 52  
PCA accreditation AB274  
RENAR accreditation 1056

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

## Analytical Methods Used

ELEMENT	RESULT No. & METHOD		
	ICP-AES	FAAS	OTHER
Copper	1, 4-6, 8-10	2, 7, 11, 13	3 12 volumetric (iodide) photometric (BCO)
Magnesium	1, 3, 4, 6, 7, 9, 10, 12	2, 8, 11	5 volumetric (CDTA)
Silicon	1-3, 5-7, 9, 10, 13	-	4, 8, 12 11 photometric (molybdenum blue) gravimetric (perchloric acid)
Iron	1-3, 6, 8, 10-12, 14-16	4, 9, 13	5 volumetric (redox)
Manganese	2, 3, 5-7, 9, 10, 12-14	1, 11	7 4 photometric (orthophenanthroline) photometric (periodate) volumetric (bismuthate)
Nickel	1-3, 5-7, 9, 12	4, 8, 10, 11	8 volumetric (EDTA)
Zinc	1, 4, 5, 7, 10-12	2, 3, 6, 8	9 13 gravimetric (8-hydroxyquinoline)
Lead	2, 4, 6-8	1, 3, 5, 9	6 photometric (phenylfluorone)
Tin	2-5, 7	1	8, 9 14 photometric (di-antipyryl methane) photometric (peroxide)
Titanium	1-7, 11, 13, 15	10, 12	12 volumetric (ferrous ammonium sulfate)
Chromium	1, 3-5, 7-11, 14	2, 6, 13	9 photometric (5-Br-PADAP)
Zirconium	1-7, 9	8	
Vanadium	1, 3-7, 10-13	2, 8	
Boron	1-10	-	
Gallium	1-11	-	

## Notes

This Certified Reference Material has been tested and certified in accordance with the requirements of ISO Guide 34, ISO Guide 31 and ISO Guide 35, taking into account the requirements of the ISO Guide to the Expression of Uncertainty in Measurement (GUM).

CAUTION: This certification is applicable to the majority of the disc. However, there is some lateral segregation for Zn, and hence it is appropriate to avoid usage of the central portion of approx 15mm diameter.

This material will remain stable 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 original analysis. This certification will therefore expire in June 2038, although we reserve the right to make changes as issue revisions, in the intervening period.

This sample is also available in the form of chippings.

The testing, 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.