

# Reference Material Certificate

**613/09**

Aluminium Base (Type of Standard)

AlMgSi, Set 610

## Certified Values

Element	Analytical methods used for certification	Mass content <sup>1)</sup> in [%]	Uncertainty <sup>2)</sup> in [%]
Silicon (Si)	a, h	0.381	0.009
Iron (Fe)	a, b, c, d, f, i	0.240	0.004
Copper (Cu)	a, b, c, d, e, f	0.0100	0.0002
Manganese (Mn)	a, b, c, d, e, f	0.0185	0.0003
Magnesium (Mg)	a, b, c, d, f	0.427	0.008
Chromium (Cr)	a, b, c, d, e, f	0.0050	0.0002
Nickel (Ni)	a, b, c, d, e, f	0.0046	0.0002
Zinc (Zn)	a, b, c, d, e	0.0094	0.0004
Titanium (Ti)	a, b, c, d, e, i	0.0150	0.0003
Arsenic (As)	c, d, e	0.0021	0.0002
Beryllium (Be)	a, b, c, d, e	0.0010	0.0001
Bismuth (Bi)	a, b, c, e	0.0054	0.0004
Calcium (Ca)	b, c	0.0008	0.0003
Cadmium (Cd)	a, b, c, d, e, f	0.0042	0.0001
Gallium (Ga)	a, b, c, d, e	0.0146	0.0004
Mercury (Hg)	e, g	0.0010	0.0002
Lithium (Li)	a, b, c, d, e	0.0007	0.0001
Sodium (Na)	b, g	0.0005	0.0002
Phosphorus (P)	c, d, e	0.0020	0.0002
Lead (Pb)	a, b, d, e, f	0.0093	0.0004
Antimony (Sb)	c, d, e	0.0099	0.0005
Tin (Sn)	a, b, d, e	0.0097	0.0004
Vanadium (V)	a, b, c, e	0.0123	0.0002
Zirconium (Zr)	b, c, e	0.0050	0.0001

1) Unweighted mean value of the means of accepted sets of data (consisting of at least 5 but usually 6 single results), each set being obtained by a different digestion and / or method of measurement.

2) Uncertainty generated from the 95% confidence interval (calculated as  $C(95\%) = t \times S_M / \sqrt{n}$  where  $t$  is the appropriate two sided Student's  $t$  value at the 95% confidence level for  $n$  acceptable mean values and  $S_M$  is the single standard deviation of the accepted mean values) in combination with the standard deviation from sample homogeneity measurements using the square root of the summed squares.

#### **Analytical Methods used for Certification:**

- a ICP-OES, digestion with caustic soda
- b ICP-OES, digestion with acid
- c ICP-OES, closed vessel digestion with acid
- d ICP-MS, digestion with acid
- e ICP-MS, closed vessel digestion with acid
- f FAAS, digestion with acid
- g CV-AAS, closed vessel digestion with acid
- h Spectrophotometry, digestion with caustic soda
- i Spectrophotometry, digestion with acid

#### **Abbreviations:**

ICP-OES	Inductively coupled plasma - optical emission spectrometry
ICP-MS	Inductively coupled plasma - mass spectrometry
FAAS	Flame atomic absorption spectrometry
CV-AAS	Cold vapor atomic absorption spectrometry

#### **Manufacturing**

This certified reference material for the analysis of aluminium and its alloys is produced using six strand vertical continuous casting out of a single melt.

#### **Analysis**

The analysis of this material was performed in our ISO/IEC 17025 accredited analytical laboratory (STS 0023) by different established wet chemical procedures. Every certified value is the result of multiple independent analyses.

#### **Homogeneity**

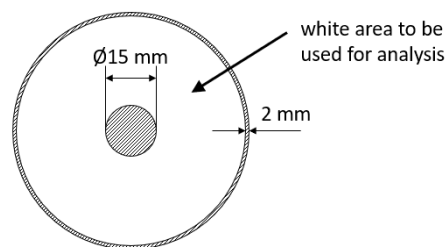
Homogeneity testing is performed by means of spark emission spectroscopy. Tests involve making multiple measurements on individual samples taken at regular intervals along the entire length of each cast rod. Depending on the mass content of the element, the relative standard deviation of multiple measurements between discs or within one disc is typically found between 0.3% - 1% for alloying and other elements and 0.5% - 5% for trace elements. The homogeneity within one sample is taken into account in the calculation of the uncertainty of the certified value.

#### **Description of Sample**

This reference material is available in the form of discs (approx. 60mm diameter and 25mm height)

### Intended use and Stability

This certified reference material is primarily intended for use in spark optical emission spectroscopy. Other applications are X-ray fluorescence spectrometry (XRF) and classical wet chemical procedures. The minimum sample size for wet chemical analysis is 0.2g. The material will remain stable for the period given below (certification validity) if it is stored in a dry and clean environment at room temperature.



### Instructions for Use

Calibration measurements should be made within a ring (see white area in the picture). For wet chemical analysis chips have to be prepared by turning or milling of the sample surface.

### Traceability

Traceability of the certified mass contents to the SI (Système International d'Unités) is ensured by calibration using certified standard solutions or pure metals or substances of known stoichiometry.

Dr. Benedikt Moser  
CTO

Patrik Bachmann  
Laboratory Manager Elemental Analytics

Suisse Technology Partners Ltd  
Querstrasse 5  
8212 Neuhausen am Rheinfall  
Switzerland

Phone: +41 52 551 11 00  
Fax : +41 52 551 11 99  
Email: [refmat@suisse-tp.ch](mailto:refmat@suisse-tp.ch)  
Internet: <https://reference-materials.ch>

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This certificate is valid until: Jun / 2096