

# Reference Material Certificate

312/02

Aluminium Base (Type of Standard)

AlMn, Set 310

## Certified Values

Element	Analytical methods used for certification	Mass fraction <sup>1)</sup> in [%]	Uncertainty <sup>2)</sup> in mass fraction [%]
Silicon (Si)	a, h	0.096	0.005
Iron (Fe)	a, b, c, d, f, i	0.324	0.007
Copper (Cu)	a, b, c, d, f	0.199	0.005
Manganese (Mn)	a, b, c, d, e, f	0.495	0.007
Magnesium (Mg)	a, b, c, e	0.599	0.010
Chromium (Cr)	a, b, c, d, e, f	0.0500	0.0008
Nickel (Ni)	a, b, c, d, e, f	0.0270	0.0005
Zinc (Zn)	a, b, c, d, e, f	0.0507	0.0013
Titanium (Ti)	a, b, c, d, e, f, i	0.0303	0.0006
Boron (B)	b, d	(0.0002)	-
Beryllium (Be)	a, b, c, d, e	0.0019	0.0001
Bismuth (Bi)	b, c, e	0.0024	0.0003
Calcium (Ca)	c	(0.0024)	-
Cadmium (Cd)	a, b, c, d, e	0.0030	0.0001
Gallium (Ga)	a, b, c, d, e	0.0103	0.0003
Mercury (Hg)	e, g	0.0031	0.0004
Lithium (Li)	a, b, c, d, e, f	0.00087*	0.00008
Sodium (Na)	b, c, e, f	0.0047*	0.0009
Phosphorus (P)	b, c, e	(0.0029)	-
Lead (Pb)	a, b, c, d, e, f	0.0295	0.0007
Antimony (Sb)	b, c, e	(0.0014)	-
Tin (Sn)	a, b, c, e	0.0018	0.0002
Vanadium (V)	a, b, c, d, e	0.0554	0.0011
Zirconium (Zr)	b, c, e	0.0049	0.0002

Values in brackets ( ) are not certified but given for information only.

- \* The mass fraction of these elements is not constant over the entire cast. This is the reason for the relatively large uncertainty for the certified values of these elements. For the marked elements each disc has individually certified values with a smaller uncertainty. Those values are available on special-certificates (to be ordered individually for each disc).

- 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 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 optical 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 (Si, Fe, Cu, Mn, Mg, Cr, Ni, Zn, Ti, Ga, Pb, and V) and 0.5% - 5% for trace elements (all elements with mass fraction <0.01%). The homogeneity within one sample and between discs (cast homogeneity) is taken into account in the calculation of the uncertainty of the certified value.

### **Description of Sample**

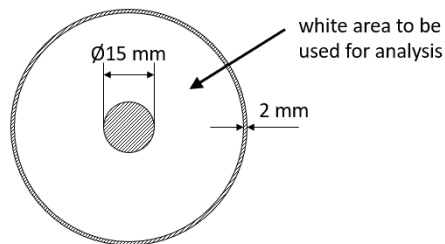
This reference material is available in the form of discs (approx. 65 mm diameter and 25 mm height).

### **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. It may be used for instrument calibration, validation of analytical methods and drift correction over time. The material will remain stable for the period given below (certificate validity) if it is stored in a dry (non-condensing) and clean environment at room temperature ( $\leq 40$  °C).

### Instructions for Use

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. The minimum mass to be used is 0.2 g. For spark OES analysis, the surface of the material needs to be prepared by milling. The minimum area to be analyzed for spark OES and XRF analysis is 30 mm<sup>2</sup>.



### Traceability

Traceability of the certified mass fractions to the SI (Système International d'Unités) is ensured by calibration using certified standard solutions. This certified reference material is produced, analyzed and certified in accordance with ISO 17034 standard (SRMS 0006).

### Accreditation

Suisse Technology Partners Ltd. is accredited as a producer of reference materials and certified reference materials according to ISO 17034 (SRMS 0006). This material was produced according to the rules of ISO 17034 and analyzed in our own laboratories accredited according to ISO/IEC 17025 (STS 0023). This material is an accredited certified reference material according to ISO 17034 (SRMS 0006).

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ISO 17034 (SRMS 0006)

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This certificate is valid until: Sep / 2047