# Spectrochemical Reference Materials

Certified Reference Materials for Metals Analysis

# Product Catalog

ARCONIC

## Quality Accreditations

Guide 34: 2009

ISO/IEC 17025: 2005

ISO 9001: 2015

## Contact

Toll-Free Phone: 1-800-858-4638

Phone: 1-724-337-5816

Fax: 1-724-337-4090

Email: referencematerials@arconic.com

Web: www.arconic.com/crms

Revision 16 - September 2017

## Table of Contents


**Introduction** . . . . . 1

**Purchase Procedure** . . . . . 2
- Where to Order
- Wording of Orders
- Pricing & Shipping
- Inquiries & Technical Assistance

**International Sales Offices** . . . . . 3

**Accreditations** . . . . . 4

**Types of Reference Materials** . . . . . 5
- Selection of CRMs
- Trace Metal CRMs
- Drift Correction RMs
- CRMs for Single Elements
- CRMs for Chemical Analysis
- MicrO CRMs
- Alu-H2™ Hydrogen RM
- Specialty CRMs

**Spark-AES CRMs and RMs** . . . . . 6
- Spark-AES Application Notes (6)
- Wrought Alloys (7-24)
- Casting Alloys (25-34)
- Trace Metals (35-36)
- Drift Correction and Normalization (37)
- Single Elements (38-60)
- Aluminum-Lithium Alloys (61)
- High Silicon Alloys (62)

**MicrO CRMs** . . . . . 63
- MicrO CRM Application Notes (63)
- Wrought Alloys (64)
- Casting Alloys (65)

**Alu-H2™** . . . . . 66
- Alu-H2™ Hydrogen RM Application Notes (66)
- Alu-H2™ Hydrogen RM (67)

# Introduction

## Arconic

As a global leader in lightweight metals technology, engineering and manufacturing, Arconic innovates multi-material solutions that advance our world. Our technologies enhance transportation from automotive and commercial transport to air and space travel, and improve industrial and consumer electronics products.

We pioneered the aluminum industry over 128 years ago, and today, our 42,250 people in 25 countries deliver value-add products made of titanium, nickel and aluminum alloys. For more information, visit www.arconic.com.

## Arconic Spectrochemical Reference Materials

Arconic's Spectrochemical Reference Materials business has been operating for over 70 years. Accredited to ISO Guide 34:2009, ISO 17025:2005, and ISO 9001:2015, Arconic Spectrochemical Reference Materials is the trusted manufacturer and supplier of certified reference materials (CRMs) and reference materials (RMs) for compositional analysis and is the sole manufacturer of specialty CRMs produced to customer specifications.

We perform all facets of CRM production and analysis:

- Casting and machining
- Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)
- Inductively Coupled Plasma Mass Spectrometry (ICP-MS)
- Spark Atomic Emission Spectroscopy (Spark-AES)
- Certification

Arconic Spectrochemical Reference Materials offers more than 340 different aluminum alloy CRMs and RMs. Arconic CRMs and RMs are designed to support analysis by Spark-AES, XRF, LIBS, ICP, ICP-MS, and inert gas fusion.

## Arconic Technology Center

Arconic's Spectrochemical Reference Materials business is based at the world's largest lightweight metals R&D center, the Arconic Technology Center. Located just twenty miles outside of Pittsburgh, PA on a 127-acre campus, over four hundred engineers and scientists are constantly inventing and innovating for the next generation of technology through R&D projects spanning aluminum, nickel, titanium and ceramics.

## Purchase Procedure

### How to Order

All orders can be placed through Arconic Inc., Amazon, or an international sales office (see page 3):

**Arconic Inc.**
Arconic Spectrochemical Reference Materials
100 Technical Dr.
New Kensington, PA 15069 USA
Phone: (724) 337-5816 or 1-800-858-4638
Fax: (724) 337-4090
Email: referencematerials@arconic.com

**Arconic Spectrochemical Reference Materials' Amazon Storefront**

amazonbusiness

**www.amazon.com**

### Guidelines for Ordering

All orders for spectrochemical CRMs must include the following:

1. Customer purchase order number and date
2. Address for invoicing
3. Address for shipping
4. Name and address of person to receive certificate of analysis
5. Description of required CRMs including catalog number
6. Additional Information:
   a. State whether partial shipments are permitted
   b. Indicate taxes, shipping date, etc. as required

### Pricing and Shipping

Prices are quoted by the sales office and are subject to change without notice. CRMs are shipped F.O.B. destination via FedEx (domestic sales only). Requests for special handling on domestic orders and for shipments outside the United States will be subject to the discretion of Arconic. Permission for partial shipment will ensure prompt delivery of available CRMs in the event some are out of stock. This catalog lists the CRMs available at this printing, but Arconic reserves the right to discontinue any CRM, to limit the quantity supplied to any customer, to modify compositions as necessary, and to change prices at any time.

### Inquiries & Technical Assistance

You may inquire before placing an order if the availability, description, and applicability of the CRMs are not clear. Experts in the production and application of CRMs are available to assist with technical questions concerning the use of Arconic CRMs and the analysis of aluminum and aluminum alloys. Inquiries for technical assistance can be placed to the following:

Phone: (724) 337-5816 or 1-800-858-4638

Fax: (724) 337-4090

Email: referencematerials@arconic.com

Visit us on the web at: www.arconic.com/crms

### Full Terms & Conditions

Full Terms and Conditions can be found on our website or by clicking here.

**Purchase orders must be mailed, emailed or faxed prior to order processing. Verbal orders will not be accepted.**

**American Express, VISA, and Mastercard accepted.**

## International Sales Offices

**UNITED STATES**
Arconic Inc.
Arconic Spectrochemical Reference Materials
100 Technical Dr.
New Kensington, PA 15069-0001
Phone: (724) 337-5816 or 1-800-858-4638
Fax: (724) 337-4090
Email: referencematerials@arconic.com

**JAPAN**
Seishin Trading Co. Ltd.
www.seishin-syoji.co.jp
1-4-4, Minatojima-Minamimachi
Chuo-ku, Kobe 650-0047 JAPAN
Phone: +81 (0)78-303-3810
Fax: +81 (0)78-303-3822
Email: h_yoshizawa@seishin-syoji.co.jp
info@seishin-syoji.co.jp

**MEXICO**
Servicio Corelmex S.A de C.V.
Francisco Petrarca 223, Apartment 202
Col. Chapultepec Morales
Deleg. Miguel Hidalgo
Mexico, D.F. 11570 MEXICO
Phone: (01152)555-208-8008
Email: Rosario.corelmex@att.net.mx

**UNITED STATES**
Brammer Standard Company, Inc.
www.brammerstandard.com
14603 Benfer Road
Houston, TX 77069 USA
Phone: 281-440-9396
Fax: 281-440-4432
Email: contact@brammerstandard.com

**CHINA**
Arconic Asia Pacific Investment Company Limited
Rm. 1903, Arconic, China Fortune Tower
No.1568 Century Avenue
Pudong District, 200122, Shanghai, CHINA
Phone: 86-10-59215045
Fax: 86-10-59215100
Email: Xiaoling.li@arconic.com

# Accreditations

## ISO Guide 34:2009

Arconic Spectrochemical Reference Materials holds an accreditation to ISO Guide 34: 2009 international standard for "General Requirements for the Competence of Reference Material Producers". ISO Guide 34 Accreditation is the highest level of quality attainable by reference materials producers. It ensures that the production and certification of Arconic CRMs and RMs is performed in accordance with a rigorous set of internationally recognized requirements. ISO Guide 34 covers the process for making Certified Reference Materials from initial customer inquiry through the manufacturing, testing, certification and distribution of the aluminum spectrochemical reference materials to our customers. Certificates of analysis for all CRMs certified after October 8, 2015 will include the ANAB Guide 34 accreditation logo.

*Scope*

Arconic Spectrochemical Reference Materials holds certificate number AR-1993 and operates a Quality Management System which complies with ISO Guide 34: 2009 for the manufacturing and certification of both Certified Reference Materials and Reference Materials (Aluminum Alloy Chemical Standards and High Purity Aluminum Chemical Standards)

Certificate Number: AR-1993

## ISO/IEC 17025:2005

The testing methods used during the certification process have been accredited by the American Association of Laboratory Accreditation (A2LA) to the ISO 17025:2005 international standard for 'General Requirements for the Competence of Testing and Calibration Laboratories'. The accreditation also meets the requirements for the International Laboratory Accreditation Cooperation (ILAC) for ISO 17025:2005. Certificates of analysis for CRMs certified after August 2010 include the A2LA and ILAC logos. Our testing certificate number is 1019.01

*Scope*

Arconic Technology Center Materials Testing holds certificate number 1019.01. Spectrochemical reference material analysis by Spark-AES by ASTM Test Method E1251 and E716 is performed by Arconic Spectrochemical Reference Materials. Spectrochemical reference material analysis by inductively coupled plasma (ICP-AES) by ASTM Test Method E3061 is performed by Arconic Spectrochemical Reference Materials.

Testing Certificate Number: 1019.01
17025:2005 Chemical Testing

## ISO 9001:2015

The scope of this ISO 90001:2015 quality system at the Arconic Technology Center (ATC) includes administrative activities as well as the production and certification of Spectrochemical Reference Materials. The operations process begins in the casting department where ingots of various aluminum alloys are cast. Then the process moves to the machine shop where the ingots are scalped, cut into sections, faced, and stenciled. After the sections are machined, they are then certified using Spark-Atomic Emission Spectrometry (SPARK-AES), Inductively Coupled Plasma (ICP-AES) analysis and Glow Discharge Mass Spectrometry (GD-MS).

The quality system is designed with controls that assure that product quality meets or exceeds the requirements and expectations of our customers. It provides for the prevention of nonconforming product, early detection of discrepancies and corrective action to assure consistent delivery of quality product.

*Scope*

Arconic Spectrochemical Reference Materials holds certificate number US009740-1 and operates a Quality Management System which complies with the requirements of ISO 9001:2015 for the following scope: Manufacture and Supply of Reference Materials for Metals Analysis.

Certificate Number: US010354-1
ISO 9001:2015

## Types of Reference Materials

**Selection of CRMs**: CRMs are classified by alloy using Aluminum Association designations, when available, and Arconic designations in other cases. Under each alloy are listed those CRMs specifically prepared for that alloy. Among them, one will have a catalog number consisting of "SS" followed by the alloy designation. This SS CRM has a composition typical of the alloy and is used both in the preparation of analytical curves and for the periodic adjustment of those curves. When only an SS CRM is listed, it is to be assumed that the analytical curves can be established by this SS CRM and a combination of CRMs of other alloys for which CRMs are listed or from the CRMs listed for single elements. Range CRMs for wrought alloys are identified with a two letter prefix beginning with W (WA, WB, etc.). Range CRMs for casting alloys have a two letter prefix beginning with K (KA, KB, etc.). Compositions listed in this catalog are only approximate since successive lots under a given catalog number vary to some degree. The composition specifically applying to a given CRM section is furnished when the CRM is shipped. Certified compositions are usually reported utilizing the Aluminum Association rules for reporting compositions. Concentrations listed in parentheses are considered reference values only and are not certified.

**Trace Metal CRMs:** Arconic Trace Metal CRMs supplement our regular alloy CRMs and are made with pure aluminum. A unique method for trace metal additions allows alloys to be produced with highly controlled trace metal concentrations. Trace metal concentrations have been picked to provide both low end calibration points (<0.0001%) and points that are typical for trace metal content and can be measured with good precision and accuracy by today's instrumentation. Actual concentrations may vary from those shown in this catalog but will always be certified using a combination of analytical techniques including SPARK-AES, ICP-AES, GD-MS and other appropriate techniques. For some of the most sought after aluminum CRMs, our nominal alloy CRMs have been modified to include trace metals of interest. CRMs designated by the prefix "ST" have been made to be similar to a specific alloy family which is indicated by the number following the "ST" designation, e.g. ST1-1050. Note: Values given as less than, denoted by "<", indicate that those elements are typically below this value. No attempt is made to modify the base metal composition for these elements; however, these elements will be certified to the actual composition observed.

**Drift Correction RMs:** Drift correction RMS are used for ongoing drift correction when instruments are kept in continuous calibration for a variety of alloys. "SQ" RMs do not correspond to any particular alloy matrix, and their metallurgical structures may not match that of chill cast disks. Their recommended use is to provide reproducible spectral intensities for drift correction and their relationship to analytical curves must be determined by the user under the particular conditions of use. The compositions are designed to provide convenient check points on a large number of analytical curves with a minimum number of tests. They are checked carefully for reproducibility of spectral response but are not certified with respect to true composition. Only approximate values will be issued with these RMs.

**CRMs for Single Elements:** Single element CRMs are available in a series for each element with various concentrations in a variety of alloy matrices. They are useful when extending existing calibration curves as well as making adjustments to curves when alloy specific SS CRMs are not adequate. Single element CRMs are designated with a two-letter identifier that corresponds with the chemical abbreviation for the element added.

**CRMs for Chemical Analysis:** With the proliferation of techniques such as ICP-AES, ICP-MS, GD-AES, GD-MS and XRF, Arconic recognizes the need to supply its CRMs in a form more suitable for use with these and similar techniques. All CRMs in the catalog are available in lathe turnings (~100 g quantity) for subsequent dissolution. Other sizes may be available upon special request.

**MicrO CRMs**: Similar to CRMs for chemical analysis, Arconic recognizes a need for portable CRMs for use in the field with handheld instrumentation. A selection of CRMs in this catalog are available in a smaller, 1 inch diameter size.

**Alu-H2™ Hydrogen RM:** Arconic Alu-H2 ™ Hydrogen RM is provided in rod form and is intended for use in inert gas fusion analysis of hydrogen in aluminum as described in ASTM method E2792.

**Specialty CRMs:** Every effort is made to supply our customers with a wide variety of alloy CRMs. However, to better serve our customers' needs, CRMs can be made to customer specifications and target compositions. These specialty CRMs are made with the same exact quality as our catalog CRMs. (Minimum order quantities are required.) Experts in the production and use of Arconic Spectrochemical CRMs are available to discuss special needs at the phone numbers listed in the section on page 2 in this catalog.

## Spark-AES Application Notes

**Description of CRM/RM:** Aluminum discs are generally 64 mm (2.5 inches) in diameter by 25 mm (1 inch) high. In a few cases, the height may vary depending on the particular alloy or drift correction standard purchased (see the catalog for details). Upon request, the certified reference materials (CRMs) and reference materials (RMs) are available as millings or chips for use in chemical methods of analysis requiring dissolution. Arconic CRMs and RMs are produced by proprietary casting techniques that minimize or substantially eliminate both macro and micro segregations. Metallurgical structure is controlled to match chill cast disks and therefore produce the same spectral response when used according to the methods cited. All CRMs and RMs are labeled and stenciled to show the catalog number, production lot and individual section number.

**Intended Use:** Arconic CRMs and RMs in disc form are intended for use with Spark-AES instruments for analysis of chill cast disks as described in American Society for Testing and Materials (ASTM) methods E716 and E1251. Because of the effects of macro and micro segregation and metallurgical structure on spectral response, metal in any form other than chill cast discs (ingot, billet, sheet, plate, extrusion, forging, castings, etc.) should be remelted and cast in disk form, as described in ASTM B985, prior to comparison to alloy CRMs. CRMs may be used for calibration, type standardizing, control standards and method validation for Spark-AES methods. RMs, typically designated as "SQ", are intended for drift correction of Spark-AES instruments. The CRMs may also be used for calibration, control and method validation for other methods, including but not limited to classical wet chemical approaches, ICP-AES, ICP-MS, GD-AES, GD-MS, and XRF.

**Instructions for Use - Spark-AES:** The surface of the disc should be prepared using a lathe or milling machine. Carbide or diamond tipped tool bits are recommended. Avoid use of tool bits that may contaminate the surface with elements of interest. Do not grind or sand. If using a machining lubricant such as alcohol, make sure that it is of sufficient purity to avoid contamination of the surface with elements of interest. The surface roughness should be less than 0.0016 mm (63 µinches) RMS. Do not touch the prepared analysis surface or allow the surface to come into contact with any source of contamination. Sparks should be placed, without overlapping, around the circumference of the CRM/RM close to the outer edge. Avoid the zone within a 12 mm (0.5 inch) radius of the center of the sample because of the slight chance that radial segregation may occur. This zone should also be avoided when collecting machine turnings or chips for chemical analysis methods that involve dissolution. The CRMs and RMs are certified using a Spark-AES spectrometer with a spark circumference of approximately 12 mm (0.5 inch) and ICP-AES results based on sample sizes that are greater than or equal to 0.1 g. Spark diameters or subsample sizes less than those used during the certification may invalidate the use of the certified value.

**Storage:** For best results the CRM/RM should be stored in a cool dry place free from corrosive fumes. Exposure to temperatures above approximately 200 °C (392 °F) may cause metallurgical changes that will invalidate the certificate of analysis.

**Shelf Life:** The certification is valid indefinitely, within the measurement uncertainty specified, provided the CRM is handled and stored in accordance with the instructions given in the certificate (see "Instructions for Use"). Periodic recertification of the CRM is not required. The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

**Material Certification:** Compositions are determined using two or more independent analytical methods which may include, Spark-AES, ICP-AES, XRF, GD-MS, ICP-MS or other approaches deemed appropriate for a specific application. All CRM/RM ingots are evaluated for uniformity both within and among sections by extensive Spark-AES testing. Spectral response is determined by comparison with Arconic master CRMs. Rigorous statistical analysis is used to ensure the accuracy of the final composition certification, the chemical and physical uniformity, and the performance of the CRMs/RMs in use. Values contained within parentheses, e.g. (0.05), are provided for reference only and are not certified for use as calibrants, standardants, or analytical performance checks.

**Limits of Uncertainty:** The certified values shown are generally weighted mean values from the analysis of representative samples, using at least two independent analytical methods. The given limits of uncertainty represent a combined uncertainty and seek to estimate, with a 95% confidence level, a range in which the true value may be expected to lie. While the homogeneity of the ingots and the mean values given as the certified compositions are determined using rigorous statistical techniques, the cited uncertainties represent not only this statistical treatment but also estimates of bias based on extensive historical data and technical judgment. The uncertainties cited represent an expanded uncertainty given by U=kuc where uc represents the combined standard uncertainty and k is a coverage factor chosen to represent a desired level of confidence. For this application k=2 and U expresses an estimate of a 95% confidence level. The use of this expression is consistent with guidelines given in the International Organization for Standardization (ISO) document "Guide to The Expression of Uncertainty in Measurement" and National Institute of Standards and Technology (NIST) Technical Note 1297 "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results". In some cases no uncertainty is given because of limited data or the lack of a second independent measure. No uncertainties are provided for estimated compositions, i.e. parenthetic numbers.

**Traceability:** CRMs are prepared and certified for the analyses of aluminum alloys using methodology similar to that described in ASTM methods E716 and E1251. All certifications are produced using at least two independent methods and detailed statistical analysis to assure homogeneity. Traceability to NIST is maintained through the use of NIST Standard Reference Materials® (SRM) or certified reference materials directly traceable to NIST SRMs. NIST traceable weights are used for the calibration and verification of balances in both CRM production and analytical certification methods. Balances used during production and analyses are calibrated with and traceable to NIST standard weight sets.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

## HIGH PURITY ALUMINUM

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | SS-1000* | 0.0002 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001x | <0.0001 | <0.0001 |
| | WA-1000 | 0.10x | 0.10x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.010x | <0.0005 |
| | WB-1000 | 0.10x | 0.10x | 0.030x | 0.030x | 0.030x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.030x | <0.0005 |
| | WC-1000 | 0.10x | 0.10x | 0.080x | 0.080x | 0.080x | 0.080x | 0.080x | 0.080x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.080x | <0.0005 |
| | WD-1000 | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.004x | <0.0005 |
| | WE-1000 | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.010x | <0.0005 |
| | SS-1020 | 0.080x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | 0.002x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | SS-1050 | 0.12x | 0.30x | 0.040x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST1-1050 | 0.15x | 0.33x | 0.030x | 0.040x | 0.030x | 0.020x | 0.010x | 0.040x | 0.030x | <0.0010 | 0.0005 | <0.0010 | 0.0002x | 0.030x | 0.002x |
| | SS-1075 | 0.070x | 0.12x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | SS-1000* | <0.0001 | <0.0001 | <0.0001 | <0.0001x | <0.0001x | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | |
| | WA-1000 | <0.0010 | <0.0010 | <0.0050 | <0.0005x | <0.0005x | <0.0010 | 0.010x | <0.0010 | <0.0010 | 0.010x | <0.0010 | 0.010x | <0.0030 | |
| | WB-1000 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.030x | <0.0010 | <0.0010 | 0.030x | <0.0010 | 0.020x | <0.0030 | |
| | WC-1000 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.080x | <0.0010 | <0.0010 | 0.080x | <0.0010 | 0.040x | <0.0030 | |
| | WD-1000 | <0.0010 | <0.0010 | 0.004x | <0.0005x | <0.0005x | <0.0010 | 0.004x | <0.0010 | <0.0010 | 0.004x | <0.0010 | 0.004x | <0.0030 | |
| | WE-1000 | <0.0010 | <0.0010 | 0.010x | <0.0005x | <0.0005x | <0.0010 | 0.010x | <0.0010 | <0.0010 | 0.010x | <0.0010 | 0.010x | <0.0030 | |
| | SS-1020 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.012x | <0.0030 | |
| | SS-1050 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.003x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | ST1-1050 | 0.0005 | 0.0005 | 0.025x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.025x | 0.004x | |
| | SS-1075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.003x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.030x | <0.0030 | |

*SS-1000 is greater than 99.999% pure.

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 11XX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1100 | SS-1100 | 0.18x | 0.50x | 0.15x | 0.040x | 0.030x | <0.0050 | <0.0050 | 0.080x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-1100 | 0.12x | 0.30x | 0.20x | 0.080x | 0.050x | <0.0050 | <0.0050 | 0.020x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WB-1100 | 0.22x | 0.60x | 0.10x | 0.020x | 0.010x | <0.0050 | <0.0050 | 0.040x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 1188 | SS-1188 | 0.040x | 0.060x | <0.0050 | 0.005x | 0.010x | <0.0050 | <0.0050 | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 1199 | WA-1199 | 0.002x | 0.002x | 0.001x | 0.001x | 0.001x | 0.001x | 0.001x | 0.001x | 0.001x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1100 | SS-1100 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | Yes |
| | WA-1100 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-1100 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 1188 | SS-1188 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 1199 | WA-1199 | 0.001x | 0.001x | 0.001x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.003x | <0.0010 | 0.001x | <0.0010 | 0.001x | 0.001x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 2XXX ALLOYS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011 | SS-2011 | 0.30x | 0.55x | 5.5x | 0.040x | 0.040x | 0.040x | 0.040x | 0.10x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.50x | <0.0005 |
| | WA-2011 | 0.20x | 0.70x | 4.9x | 0.060x | 0.020x | 0.060x | 0.020x | 0.15x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.60x | <0.0005 |
| | WB-2011 | 0.40x | 0.25x | 6.0x | 0.020x | 0.060x | 0.020x | 0.060x | 0.050x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.40x | <0.0005 |
| 2014 | SS-2014 | 1.0x | 0.50x | 4.5x | 0.80x | 0.55x | 0.040x | 0.040x | 0.12x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2017 | SS-2017 | 0.60x | 0.45x | 4.0x | 0.60x | 0.60x | 0.050x | 0.030x | 0.070x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-2017 | 0.75x | 0.65x | 3.5x | 0.40x | 0.75x | 0.020x | 0.060x | 0.030x | 0.050x | | | | | | |
| 2018 | SS-2018 | 0.70x | 0.40x | 4.2x | 0.050x | 0.65x | 0.050x | 2.1x | 0.12x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.050x | <0.0005 |
| 2024 | SS-2024 | 0.20x | 0.35x | 4.6x | 0.65x | 1.6x | 0.060x | 0.040x | 0.10x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-2024 | 0.30x | 0.30x | 4.0x | 0.70x | 1.6x | 0.060x | 0.040x | 0.060x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| | WB-2024 | 0.30x | 0.30x | 5.0x | 0.70x | 1.6x | 0.060x | 0.040x | 0.25x | 0.030x | | | | <0.0005x | | |
| | WE-2024 | 0.45x | 0.20x | 4.6x | 0.45x | 1.6x | 0.10x | 0.020x | 0.25x | 0.010x | | | | 0.007x | | |
| | WF-2024 | 0.15x | 0.45x | 4.6x | 0.80x | 1.6x | 0.020x | 0.070x | 0.030x | 0.060x | | | | 0.002x | | |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2011 | SS-2011 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.50x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-2011 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.40x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-2011 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.60x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2014 | SS-2014 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2017 | SS-2017 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-2017 | | | 0.020x | | | | | | | | | 0.010x | | |
| 2018 | SS-2018 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2024 | SS-2024 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | **Yes** |
| | WA-2024 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-2024 | | | | | | | | | | | | | | |
| | WE-2024 | | | | | | | | | | | | | | |
| | WF-2024 | | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 2XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2025 | SS-2025 | 0.80x | 0.55x | 4.6x | 0.80x | 0.050x | 0.040x | 0.040x | 0.10x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2117 | SS-2117 | 0.50x | 0.40x | 2.6x | 0.050x | 0.30x | 0.030x | 0.030x | 0.050x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2xxx | ST2-2000 | 0.50x | 0.45x | 2.5x | 0.50x | 0.50x | 0.050x | 0.010x | 0.15x | 0.030x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 2219 | SS-2219 | 0.15x | 0.20x | 6.3x | 0.28x | 0.020x | 0.010x | 0.010x | 0.030x | 0.060x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2324 | SS-2324 | 0.050x | 0.050x | 4.2x | 0.50x | 1.5x | 0.010x | 0.010x | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2618 | SS-2618 | 0.20x | 1.2x | 2.2x | 0.050x | 1.6x | <0.0050 | 1.1x | 0.050x | 0.070x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2724 | SS-2724 | 0.035x | 0.050x | 4.3x | 0.60x | 1.5x | <0.0050 | <0.0050 | 0.065x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2025 | SS-2025 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2117 | SS-2117 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2xxx | ST2-2000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x | |
| 2219 | SS-2219 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.12x | 0.16x | |
| 2324 | SS-2324 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2618 | SS-2618 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 2724 | SS-2724 | <0.0010 | <0.0010 | 0.010x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.10x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 3XXX ALLOYS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3003 | SS-3003 | 0.20x | 0.50x | 0.15x | 1.2x | 0.030x | <0.0050 | <0.0050 | 0.080x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-3003 | 0.40x | 0.65x | 0.090x | 0.95x | 0.010x | 0.030x | 0.030x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| | WB-3003 | 0.15x | 0.30x | 0.20x | 1.5x | 0.050x | <0.0050 | <0.0050 | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST1-3003 | 0.30x | 0.33x | 0.15x | 1.2x | <0.0010 | <0.0005 | <0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST2-3003 | 0.30x | 0.65x | 0.15x | 1.2x | 0.010x | 0.015x | 0.020x | 0.020x | 0.020x | <0.0010 | 0.0005 | <0.0010 | 0.0002x | 0.020x | 0.002x |
| | ST2-3000 | 0.20x | 0.50x | 0.15x | 1.2x | 0.030x | 0.010x | 0.010x | 0.050x | 0.020x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 3004 | SS-3004 | 0.18x | 0.50x | 0.15x | 1.2x | 1.1x | <0.0050 | <0.0050 | 0.050x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-3004 | 0.22x | 0.60x | 0.10x | 1.0x | 1.3x | 0.010x | 0.010x | 0.15x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.005x | <0.0005 |
| | WB-3004 | 0.10x | 0.40x | 0.20x | 1.4x | 0.90x | 0.020x | 0.020x | 0.10x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.002x | <0.0005 |
| | ST1-3000 | 0.20x | 0.50x | 0.15x | 1.2x | 1.0x | 0.010x | 0.010x | 0.050x | 0.020x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3003 | SS-3003 | <0.0005 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-3003 | 0.001x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.006x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-3003 | 0.003x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | ST1-3003 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | |
| | ST2-3003 | 0.0005 | 0.0005 | 0.020x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.015x | 0.004x | |
| | ST2-3000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x | |
| 3004 | SS-3004 | <0.0005 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | **Yes** |
| | WA-3004 | 0.001x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.006x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-3004 | 0.003x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | ST1-3000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

## 3XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3005 | SS-3005 | 0.22x | 0.60x | 0.15x | 1.2x | 0.40x | 0.020x | 0.010x | 0.030x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 3102 | SS-3102 | 0.25x | 0.45x | 0.070x | 0.18x | 0.020x | 0.020x | 0.020x | 0.10x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 3104 | SS-3104 | 0.25x | 0.42x | 0.20x | 1.0x | 1.2x | 0.015x | 0.005x | 0.01x | 0.020x | <0.0010 | <0.0010 | <0.0005 | <0.0005x | <0.0010 | <0.0005 |
| | ST2-3104 | 0.20x | 0.40x | 0.20x | 1.0x | 1.2x | 0.015x | 0.030x | 0.060x | 0.020x | <0.0010 | <0.0010 | <0.0005 | 0.001x | 0.008x | 0.003x |
| 3105 | SS-3105 | 0.20x | 0.50x | 0.15x | 0.40x | 0.50x | 0.050x | 0.020x | 0.20x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3005 | SS-3005 | <0.0005 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 3102 | SS-3102 | <0.0005 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 3104 | SS-3104 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.001x | <0.0010 | 0.015x | <0.0030 | |
| | ST2-3104 | 0.001x | <0.0010 | 0.020x | 0.003x | 0.003x | 0.002x | 0.004x | 0.002x | <0.0010 | 0.015x | 0.002x | 0.020x | 0.002x | |
| 3105 | SS-3105 | <0.0005 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 4XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4032 | SS-4032 | 12.2 | 0.30x | 0.90x | 0.030x | 1.1x | 0.050x | 0.90x | 0.10x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 4043 | SS-4043 | 5.2x | 0.30x | 0.050x | 0.020x | 0.020x | 0.025x | 0.035x | 0.030x | 0.045x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.010x | <0.0030 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4032 | SS-4032 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | 0.020x | 0.010x | <0.0030 | |
| 4043 | SS-4043 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.010x | <0.0010 | <0.0010 | 0.010x | 0.005x | 0.015x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 5XXX ALLOYS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5005 | SS-5005 | 0.15x | 0.50x | 0.060x | 0.030x | 0.85x | 0.020x | 0.020x | 0.060x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-5005 | 0.12x | 0.55x | 0.030x | 0.010x | 0.35x | 0.010x | 0.010x | 0.030x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.030x | <0.0005 |
| | WB-5005 | 0.010x | 0.010x | <0.0050 | <0.0050 | 0.80x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5042 | SS-5042 | 0.10x | 0.23x | 0.030x | 0.30x | 3.5x | <0.0050 | <0.0050 | 0.010x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5050 | SS-5050 | 0.18x | 0.45x | 0.050x | 0.040x | 1.4x | 0.030x | 0.030x | 0.040x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5xxx | ST1-5000 | 0.15x | 0.30x | 0.050x | 0.050x | 1.8x | 0.15x | 0.030x | 0.040x | 0.020x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 5052 | SS-5052 | 0.15x | 0.20x | 0.060x | 0.050x | 2.6x | 0.25x | 0.050x | 0.080x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-5052 | 0.25x | 0.10x | 0.10x | 0.020x | 2.2x | 0.30x | 0.010x | 0.12x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WB-5052 | 0.080x | 0.30x | 0.020x | 0.10x | 2.8x | 0.15x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST1-5052 | 0.15x | 0.30x | 0.10x | <0.0010 | 2.7x | 0.25x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST2-5052 | 0.15x | 0.30x | 0.10x | 0.050x | 2.7x | 0.25x | 0.020x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.0002x | 0.020x | 0.002x |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5005 | SS-5005 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-5005 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | 0.030x | <0.0010 | <0.0010 | 0.010x | <0.0010 | 0.010x | <0.0030 | |
| | WB-5005 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5042 | SS-5042 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5050 | SS-5050 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5xxx | ST1-5000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | 0.001x | 0.001x | 0.001x | 0.010x | 0.001x | |
| 5052 | SS-5052 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | **Yes** |
| | WA-5052 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WB-5052 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | ST1-5052 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | |
| | ST2-5052 | 0.0005 | 0.0005 | 0.025x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.015x | 0.004x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 5XXX ALLOYS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5056 | SS-5056 | 0.15x | 0.20x | 0.080x | 0.10x | 5.3x | 0.11x | 0.050x | 0.050x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-5056 | 0.15x | 0.20x | 0.080x | 0.10x | 4.7x | 0.11x | 0.050x | 0.050x | <0.0050 | | | | 0.0001x | | |
| | WB-5056 | 0.15x | 0.20x | 0.080x | 0.10x | 5.8x | 0.11x | 0.050x | 0.050x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | 0.003x | <0.0010 | <0.0005 |
| | WC-5056 | 0.25x | 0.40x | 0.010x | 0.050x | 5.3x | 0.20x | 0.020x | 0.020x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | 0.008x | <0.0010 | <0.0005 |
| 5082 | SS-5082 | 0.12x | 0.25x | 0.040x | 0.040x | 4.5x | 0.040x | 0.010x | 0.040x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5083 | SS-5083 | 0.15x | 0.20x | 0.050x | 0.80x | 4.5x | 0.10x | 0.010x | 0.050x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5086 | SS-5086 | 0.15x | 0.25x | 0.050x | 0.50x | 4.0x | 0.12x | 0.030x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5154 | SS-5154 | 0.15x | 0.25x | 0.050x | 0.030x | 3.6x | 0.25x | 0.030x | 0.050x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5182 | SS-5182 | 0.15x | 0.20x | 0.050x | 0.35x | 4.6x | 0.030x | 0.020x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-5182 | 0.20x | 0.30x | 0.010x | 0.30x | 4.8x | 0.050x | 0.010x | 0.020x | 0.040x | <0.0010 | <0.0010 | <0.0010 | 0.0005x | <0.0010 | <0.0005 |
| | WB-5182 | 0.080x | 0.10x | 0.070x | 0.45x | 4.4x | 0.010x | 0.040x | 0.10x | 0.010x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5056 | SS-5056 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-5056 | | | 0.020x | | | | | | | | | 0.010x | | |
| | WB-5056 | <0.0010 | <0.0010 | 0.020x | <0.0005 | <0.0005 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WC-5056 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5082 | SS-5082 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5083 | SS-5083 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5086 | SS-5086 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5154 | SS-5154 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5182 | SS-5182 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | Yes |
| | WA-5182 | 0.003x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-5182 | 0.001x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.006x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

## 5XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5252 | SS-5252 | 0.030x | 0.050x | 0.040x | 0.010x | 2.5x | <0.0050 | <0.0050 | 0.010x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5357 | SS-5357 | 0.050x | 0.080x | 0.080x | 0.25x | 1.1x | 0.010x | 0.010x | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5454 | SS-5454 | 0.15x | 0.20x | 0.070x | 0.80x | 2.8x | 0.10x | 0.010x | 0.050x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-5454 | 0.080x | 0.10x | 0.020x | 0.50x | 2.5x | 0.050x | 0.030x | 0.15x | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 5456 | SS-5456 | 0.15x | 0.020x | 0.060x | 0.80x | 5.2x | 0.10x | 0.010x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-5456 | 0.10x | 0.25x | 0.10x | 0.50x | 5.5x | 0.15x | 0.010x | 0.25x | 0.050x | | | | 0.001x | | |
| 5657 | SS-5657 | 0.040x | 0.060x | 0.040x | 0.020x | 0.80x | 0.010x | 0.010x | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5754 | SS-5754 | 0.11x | 0.21x | 0.055x | 0.35x | 3.3x | 0.080x | <0.0050 | 0.015x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5252 | SS-5252 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0050 | <0.0030 | |
| 5357 | SS-5357 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5454 | SS-5454 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-5454 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5456 | SS-5456 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WA-5456 | | | 0.020x | | | | | | | | | 0.010x | | |
| 5657 | SS-5657 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 5754 | SS-5754 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 6000 ALLOYS RANGE CRMs

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6000 Range CRMs | WA-6000 | 0.60x | 0.30x | 0.10x | 0.030x | 0.45x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WB-6000 | 0.60x | 0.30x | 0.10x | 0.030x | 0.60x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WC-6000 | 0.60x | 0.30x | 0.10x | 0.030x | 0.75x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST1-6000 | 0.55x | 0.30x | 0.15x | 0.050x | 0.80x | 0.15x | 0.050x | 0.080x | 0.040x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| | WD-6000 | 0.60x | 0.30x | 0.10x | 0.030x | 0.95x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WF-6000 | 0.60x | 0.30x | 0.10x | 0.030x | 1.2x | 0.030x | 0.030x | 0.030x | 0.030x | | | | | | |
| | WG-6000 | 0.60x | 0.30x | 0.10x | 0.030x | 1.4x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WH-6000 | 0.25x | 0.30x | 0.10x | 0.030x | 0.90x | 0.030x | 0.030x | 0.030x | 0.030x | | | | | | |
| | WJ-6000 | 0.35x | 0.30x | 0.10x | 0.030x | 0.90x | 0.030x | 0.030x | 0.030x | 0.030x | | | | | | |
| | WK-6000 | 0.50x | 0.30x | 0.10x | 0.030x | 0.90x | 0.030x | 0.030x | 0.030x | 0.030x | | | | | | |
| | WL-6000 | 0.70x | 0.30x | 0.10x | 0.030x | 0.90x | 0.030x | 0.030x | 0.030x | 0.030x | | | | | | |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6000 Range CRMs | WA-6000 | <0.0010 | <0.0010 | <0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015x | <0.0030 | |
| | WB-6000 | <0.0010 | <0.0010 | <0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015x | <0.0030 | |
| | WC-6000 | <0.0010 | <0.0010 | <0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015x | <0.0030 | |
| | ST1-6000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x | |
| | WD-6000 | <0.0010 | <0.0010 | <0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015x | <0.0030 | |
| | WF-6000 | | | | | | | | | | | | | | |
| | WG-6000 | <0.0010 | <0.0010 | <0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015x | <0.0030 | |
| | WH-6000 | | | | | | | | | | | | | | |
| | WJ-6000 | | | | | | | | | | | | | | |
| | WK-6000 | | | | | | | | | | | | | | |
| | WL-6000 | | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 6000 ALLOYS RANGE CRMs

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6000 Range CRMs | WM-6000 | 0.90x | 0.30x | 0.10x | 0.030x | 0.90x | 0.030x | 0.030x | 0.030x | 0.030x | | | | | | |
| | WP-6000 | 1.3x | 0.30x | 0.10x | 0.030x | 0.90x | 0.030x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WR-6000 | 0.60x | 0.25x | 0.020x | 0.080x | 0.90x | 0.010x | 0.050x | 0.080x | 0.030x | | | | | | |
| | WS-6000 | 0.60x | 0.35x | 0.050x | 0.020x | 0.90x | 0.030x | 0.010x | 0.040x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WT-6000 | 0.60x | 0.15x | 0.10x | 0.040x | 0.90x | 0.08x | 0.030x | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WU-6000 | 0.60x | 0.65x | 0.18x | 0.040x | 0.90x | 0.35x | 0.030x | 0.15x | 0.020x | | | | | | |
| | WV6000 | 0.60x | 0.80x | 0.30x | 0.15x | 0.90x | 0.13x | 0.010x | 0.080x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WW-6000 | 0.60x | 0.50x | 0.45x | 0.080x | 0.90x | 0.25x | 0.050x | 0.040x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WX-6000 | 0.42x | 0.20x | 0.030x | 0.020x | 0.65x | 0.32x | 0.010x | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WZ-6000 | 0.40x | 0.15x | 0.030x | 0.010x | 0.70x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0010 | <0.0010 | <0.0005 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6000 Range CRMs | WM-6000 | | | | | | | | | | | | | | |
| | WP-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WR-6000 | | | | | | | | | | | | | | |
| | WS-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WT-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WU-6000 | | | | | | | | | | | | | | |
| | WV6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WW-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WX-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.015 | <0.0030 | |
| | WZ-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.005x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 6XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6005 | SS-6005 | 0.75x | 0.15x | 0.010x | 0.010x | 0.50x | 0.060x | <0.0050 | 0.030x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6010 | SS-6010 | 1.0x | 0.25x | 0.32x | 0.32x | 0.80x | 0.040x | 0.030x | 0.12x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6014 | SS-6014 | 0.62x | 0.25x | 0.10x | 0.13x | 0.65x | 0.020x | <0.0050 | 0.080x | 0.070x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-6014 | 0.90x | 0.17x | 0.060x | 0.060x | 0.55x | 0.030x | <0.0050 | 0.12x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WB-6014 | 0.50x | 0.20x | 0.15x | 0.10x | 0.60x | 0.040x | <0.0050 | 0.060x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6022 | SS-6022 | 0.90x | 0.13x | 0.070x | 0.070x | 0.60x | 0.030x | <0.0050 | 0.10x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6053 | SS-6053 | 0.70x | 0.30x | 0.050x | 0.020x | 1.2x | 0.25x | 0.030x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6061 | SS-6061 | 0.65x | 0.35x | 0.30x | 0.050x | 1.0x | 0.23x | 0.050x | 0.080x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-6061 | 0.60x | 0.35x | 0.30x | 0.050x | 1.0x | 0.050x | 0.050x | 0.12x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6063 | SS-6063 | 0.48x | 0.25x | 0.060x | 0.020x | 0.65x | 0.020x | 0.020x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-6063 | 0.45x | 0.17x | 0.010x | 0.030x | 0.48x | <0.0050 | <0.0050 | <0.0050 | 0.013x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST1-6063 | 0.45x | 0.22x | <0.0010 | <0.0010 | 0.55x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6005 | SS-6005 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.015x | <0.0030 | |
| 6010 | SS-6010 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6014 | SS-6014 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.18x | <0.0030 | |
| | WA-6014 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.050x | <0.0030 | |
| | WB-6014 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.060x | <0.0030 | |
| 6022 | SS-6022 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.011x | <0.0030 | **Yes** |
| 6053 | SS-6053 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6061 | SS-6061 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | **Yes** |
| | WA-6061 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6063 | SS-6063 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | **Yes** |
| | WA-6063 | <0.0010 | <0.0010 | 0.014x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.001x | |
| | ST1-6063 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 6XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6063 | ST2-6063 | 0.45x | 0.22x | 0.050x | 0.050x | 0.55x | 0.015x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.0002x | 0.020x | 0.002x |
| 6066 | SS-6066 | 1.5x | 0.35x | 1.0x | 0.90x | 1.2x | 0.030x | 0.030x | 0.10x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6070 | SS-6070 | 1.3x | 0.25x | 0.30x | 0.70x | 0.80x | 0.060x | 0.020x | 0.15x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6101 | WZ-6000 | 0.40x | 0.15x | 0.030x | 0.010x | 0.70x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0010 | <0.0010 | <0.0005 | <0.0005x | <0.0010 | <0.0005 |
| 6111 | SS-6111 | 0.80x | 0.25x | 0.70x | 0.25x | 0.60x | 0.030x | <0.0050 | 0.10x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6151 | SS-6151 | 1.0x | 0.45x | 0.25x | 0.060x | 0.65x | 0.22x | 0.040x | 0.080x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6201 | SS-6201 | 0.75x | 0.25x | 0.030x | 0.010x | 0.75x | <0.0050 | <0.0050 | 0.020x | <0.0050 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0010 | <0.0005 |
| 6253 | SS-6253 | 0.70x | 0.25x | 0.050x | 0.020x | 1.3x | 0.22x | 0.010x | 2.0x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6262 | SS-6262 | 0.60x | 0.35x | 0.30x | 0.050x | 1.0x | 0.040x | 0.030x | 0.050x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.58x | <0.0005 |
| 6351 | SS-6351 | 1.0x | 0.30x | 0.050x | 0.70x | 0.65x | 0.030x | 0.020x | 0.030x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6951 | SS-6951 | 0.40x | 0.40x | 0.30x | 0.030x | 0.70x | 0.020x | 0.020x | 0.10x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6063 | ST2-6063 | 0.0005 | 0.0005 | 0.025x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.010x | 0.004x | |
| 6066 | SS-6066 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6070 | SS-6070 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6101 | WZ-6000 | <0.0010 | <0.0010 | <0.020 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.005x | <0.0030 | |
| 6111 | SS-6111 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | 0.003x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6151 | SS-6151 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6201 | SS-6201 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0050 | <0.0030 | |
| 6253 | SS-6253 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6262 | SS-6262 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.58x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6351 | SS-6351 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 6951 | SS-6951 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 7XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7001 | SS-7001 | 0.10x | 0.15x | 2.1x | 0.040x | 3.1x | 0.21x | 0.010x | 7.6x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7005 | SS-7005 | 0.15x | 0.20x | 0.10x | 0.50x | 1.3x | 0.10x | 0.020x | 4.5x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7xxx | ST2-7000 | 0.15x | 0.25x | 0.15x | 0.20x | 1.3x | 0.10x | 0.020x | 3.5x | 0.040x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 7010 | SS-7010 | 0.060x | 0.080x | 1.7x | 0.040x | 2.3x | 0.015x | 0.030x | 6.2x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7021 | SS-7021 | 0.12x | 0.30x | 0.080x | 0.050x | 1.5x | 0.030x | <0.0050 | 5.4x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7029 | SS-7029 | 0.10x | 0.10x | 0.75x | 0.020x | 1.7x | <0.0050 | <0.0050 | 4.8x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7039 | SS-7039 | 0.15x | 0.20x | 0.080x | 0.25x | 3.0x | 0.20x | 0.020x | 4.0x | 0.050x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7046 | SS-7046 | 0.12x | 0.14x | 0.15x | 0.20x | 1.3x | 0.10x | <0.0050 | 7.1x | 0.040x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7047 | SS-7047 | 0.040x | 0.050x | 0.020x | 0.020x | 1.5x | 0.010x | <0.0050 | 7.5x | 0.030x | 0.37x | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7050 | SS-7050 | 0.080x | 0.15x | 2.4x | 0.030x | 2.3x | 0.020x | 0.020x | 6.2x | 0.040x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7055 | SS-7055 | 0.070x | 0.10x | 2.3x | 0.010x | 2.0x | 0.010x | <0.0050 | 8.0x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7065 | SS-7065 | 0.020x | 0.040x | 2.1x | 0.015x | 1.6x | 0.005x | <0.0050 | 7.7x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7001 | SS-7001 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 7005 | SS-7005 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.14x | |
| 7xxx | ST2-7000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x | |
| 7010 | SS-7010 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.13x | |
| 7021 | SS-7021 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.13x | |
| 7029 | SS-7029 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.020x | <0.0030 | |
| 7039 | SS-7039 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 7046 | SS-7046 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.12x | |
| 7047 | SS-7047 | <0.0010 | <0.0010 | 0.010x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | 0.10x | |
| 7050 | SS-7050 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0050 | 0.12x | **Yes** |
| 7055 | SS-7055 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.018x | 0.15x | |
| 7065 | SS-7065 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.007x | 0.11x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 7XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7072 | SS-7072 | 0.14x | 0.28x | 0.030x | 0.040x | 0.030x | 0.030x | 0.030x | 1.1x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7075 | SS-7075 | 0.16x | 0.15x | 1.6x | 0.080x | 2.6x | 0.20x | <0.0050 | 5.8x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WA-7075 | 0.15x | 0.25x | 1.2x | 0.10x | 2.6x | 0.25x | <0.0050 | 5.8x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WB-7075 | 0.15x | 0.25x | 2.0x | 0.10x | 2.6x | 0.25x | <0.0050 | 5.8x | 0.050x | | | | 0.001x | | |
| | WC-7075 | 0.15x | 0.25x | 1.6x | 0.10x | 2.2x | 0.25x | <0.0050 | 5.8x | 0.050x | <0.0010 | <0.0010 | <0.0010 | 0.002x | <0.0010 | <0.0005 |
| | WD-7075 | 0.15x | 0.25x | 1.6x | 0.10x | 2.9x | 0.25x | <0.0050 | 5.8x | 0.050x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| | WE-7075 | 0.15x | 0.25x | 1.6x | 0.10x | 2.6x | 0.25x | <0.0050 | 5.3x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | WF-7075 | 0.15x | 0.25x | 1.6x | 0.10x | 2.6x | 0.25x | <0.0050 | 6.2x | 0.050x | | | | <0.0005x | | |
| | WG-7075 | 0.30x | 0.15x | 1.6x | 0.20x | 2.6x | 0.18x | <0.0050 | 5.8x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005 | <0.0010 | <0.0005 |
| | WH-7075 | 0.10x | 0.35x | 1.6x | 0.030x | 2.6x | 0.30x | <0.0050 | 5.8x | 0.010x | | | | 0.002x | | |
| 7xxx | ST1-7000 | 0.15x | 0.25x | 1.5x | 0.25x | 2.5x | 0.15x | 0.020x | 6.5x | 0.040x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7072 | SS-7072 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 7075 | SS-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.007x | <0.0030 | **Yes** |
| | WA-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WB-7075 | | | | | | | | | | | | | | |
| | WC-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WD-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.007x | <0.0030 | |
| | WE-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | WF-7075 | | | | | | | | | | | | | | |
| | WG-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.007x | <0.0030 | |
| | WH-7075 | | | | | | | | | | | | | | |
| 7xxx | ST1-7000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 7XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7076 | SS-7076 | 0.15x | 0.35x | 0.65x | 0.55x | 1.7x | 0.020x | 0.020x | 7.6x | 0.050x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7079 | SS-7079 | 0.15x | 0.22x | 0.65x | 0.20x | 3.5x | 0.16x | <0.0050 | 4.6x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7178 | SS-7178 | 0.15x | 0.20x | 2.0x | 0.080x | 2.9x | 0.25x | 0.020x | 6.8x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7076 | SS-7076 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 7079 | SS-7079 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 7178 | SS-7178 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## 8XXX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8xxx | ST2-8000 | 0.30x | 1.5x | 0.15x | 0.60x | 0.04x | 0.010x | 0.010x | 0.050x | 0.010x | <0.0010 | <0.0010 | <0.0010 | 0.0006x | 0.010x | 0.001x |
| 8011 | SS-8011 | 0.55x | 0.70x | 0.020x | 0.020x | 0.002x | <0.0050 | <0.0050 | 0.020x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 8079 | ST1-8079 | 0.13x | 1.2x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| | ST2-8079 | 0.13x | 1.2x | 0.030x | 0.003x | 0.003x | 0.003x | 0.004x | 0.015x | 0.004x | <0.0010 | 0.0005 | <0.0010 | 0.0002x | 0.004x | 0.002x |
| | ST3-8079 | 0.10x | 1.0x | 0.010x | 0.020x | 0.005x | 0.010x | 0.010x | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0005 | 0.0005x | 0.080x | 0.001x |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8xxx | ST2-8000 | 0.001x | 0.001x | 0.020x | 0.001x | 0.001x | 0.001x | 0.010x | 0.001x | <0.0010 | 0.010x | 0.001x | 0.020x | 0.001x | |
| 8011 | SS-8011 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.012x | <0.0030 | |
| 8079 | ST1-8079 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | |
| | ST2-8079 | 0.0005 | 0.0005 | 0.016x | 0.0005x | 0.001x | 0.0005 | 0.004x | <0.0010 | <0.0010 | 0.005x | 0.001x | 0.002x | 0.004x | |
| | ST3-8079 | 0.001x | <0.0010 | 0.020x | 0.001x | 0.001x | 0.0015 | 0.004x | 0.003x | <0.0010 | 0.020x | 0.0015 | 0.020x | 0.002x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 2XX ALLOYS

| Typical Analysis - Weight Percent | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
| 201 | SS-201 | 0.040x | 0.060x | 4.5x | 0.30x | 0.25x | <0.0050 | 0.005x | 0.005x | 0.25x | 0.55x | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 206 | SS-206 | 0.060x | 0.080x | 4.6x | 0.35x | 0.28x | 0.010x | 0.010x | 0.030x | 0.20x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 208 | SS-208 | 3.0x | 0.60x | 4.0x | 0.15x | 0.050x | <0.0050 | 0.080x | 0.15x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 213 | KA-213 | 2.0x | 1.0x | 7.0x | 0.30x | 0.050x | <0.0050 | 0.20x | 1.0x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-213 | 3.5x | 1.0x | 7.0x | 0.35x | 0.15x | <0.0050 | 0.30x | 1.2x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 222 | KA-222 | 0.75x | 1.0x | 10.0 | 0.15x | 0.30x | <0.0050 | 0.15x | 0.25x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 224 | REFER TO ALLOY 2219 | | | | | | | | | | | | | | | |
| 238 | SS-238 | 4.0x | 1.0x | 10.2 | 0.20x | 0.30x | <0.0050 | 0.20x | 0.20x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 242 | SS-242 | 0.50x | 0.55x | 4.0x | 0.080x | 1.5x | 0.030x | 2.0x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-242 | 0.25x | 0.40x | 3.6x | 0.020x | 1.8x | <0.0050 | 2.2x | 0.030x | 0.060x | | | | | 0.020x | |
| | KB-242 | 0.40x | 0.20x | 4.4x | 0.050x | 1.2x | <0.0050 | 1.8x | 0.050x | 0.15x | | | | | 0.050x | |

| Typical Analysis - Weight Percent | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
| 201 | SS-201 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.005x | <0.0010 | 0.010x | <0.0030 | |
| 206 | SS-206 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.020x | <0.0010 | 0.010x | <0.0030 | |
| 208 | SS-208 | <0.0010 | <0.0010 | 0.012x | <0.0010 | <0.0010 | <0.0010 | 0.10x | <0.0010 | <0.0010 | 0.10x | <0.0010 | 0.010x | 0.040x | |
| 213 | KA-213 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.55x | <0.0010 | <0.020 | <0.0030 | |
| | KB-213 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | <0.0030 | |
| 222 | KA-222 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.20x | <0.0010 | <0.0010 | 0.12x | <0.0010 | <0.020 | <0.0030 | |
| 224 | REFER TO ALLOY 2219 | | | | | | | | | | | | | | |
| 238 | SS-238 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 242 | SS-242 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| | KA-242 | | | | | | | 0.020x | | | 0.020x | | | | |
| | KB-242 | | | | | | | 0.050x | | | 0.050x | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 2XX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A242 | SS-A242 | 0.30x | 0.45x | 4.1x | 0.050x | 1.6x | 0.20x | 2.0x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 295 | SS-295 | 0.90x | 0.70x | 4.5x | 0.12x | 0.050x | <0.0050 | 0.050x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-295 | 0.55x | 1.0x | 4.1x | 0.10x | 0.010x | <0.0050 | 0.020x | 0.15x | 0.070x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-295 | 1.3x | 0.35x | 4.9x | 0.030x | 0.010x | <0.0050 | 0.080x | 0.050x | 0.17x | | | | | | |
| 296 | SS-296 | 2.8x | 0.60x | 4.5x | 0.20x | 0.060x | <0.0050 | 0.15x | 0.25x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| A242 | SS-A242 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 295 | SS-295 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.003x | <0.0010 | 0.010x | <0.0030 | |
| | KA-295 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.004x | <0.0010 | <0.020 | <0.0030 | |
| | KB-295 | | | | | | | 0.050x | | | 0.010x | | | | |
| 296 | SS-296 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.010x | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 3XX ALLOYS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 305 | REFER TO KC-355 | | | | | | | | | | | | | | | |
| 308 | SS-308 | 5.5x | 0.65x | 4.5x | 0.10x | 0.080x | <0.0050 | 0.10x | 0.25x | 0.060x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 319 | SS-319 | 6.2x | 0.85x | 3.8x | 0.50x | 0.10x | <0.0050 | 0.20x | 0.35x | 0.15x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.050x | <0.0030 |
| 332 | SS-332 | 9.2x | 0.70x | 3.2x | 0.25x | 1.0x | <0.0050 | 0.50x | 0.25x | 0.14x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-A332 | 12.4 | 0.50x | 1.0x | 0.060x | <0.0050 | <0.0050 | 2.7x | <0.0050 | 0.060x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 336 | SS-336 | 12.0 | 0.65x | 1.0x | 0.060x | 1.2x | <0.0050 | 2.5x | 0.050x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 339 | SS-339 | 11.5 | 0.40x | 2.0x | 0.20x | 0.90x | <0.0050 | 0.80x | 0.60x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 354 | SS-354 | 9.0x | 0.15x | 1.8x | 0.050x | 0.55x | 0.010x | 0.010x | 0.050x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-354 | 9.0x | 0.10x | 1.8x | 0.010x | 0.35x | <0.0050 | <0.0050 | <0.0050 | 0.060x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-354 | 9.0x | 0.12x | 1.8x | 0.050x | 0.35x | 0.010x | 0.010x | 0.050x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KC-354 | 9.0x | 0.12x | 1.8x | 0.15x | 0.35x | 0.010x | 0.010x | 0.050x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 355 | SS-355 | 5.1x | 0.35x | 1.3x | 0.080x | 0.54x | 0.025x | 0.050x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 305 | REFER TO KC-355 | | | | | | | | | | | | | | |
| 308 | SS-308 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 319 | SS-319 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | 0.090x | <0.0010 | <0.0010 | 0.20x | <0.0030 | 0.020x | <0.0030 | |
| 332 | SS-332 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | 0.10x | <0.0010 | <0.0010 | 0.10x | 0.020x | 0.020x | <0.0030 | |
| | KA-A332 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.005x | <0.0030 | 0.003x | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 336 | SS-336 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | 0.003x | <0.0030 | 0.003x | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 339 | SS-339 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.015x | <0.0030 | |
| 354 | SS-354 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.020x | 0.020x | 0.010x | <0.0030 | |
| | KA-354 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| | KB-354 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.012x | <0.015 | <0.0030 | |
| | KC-354 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.012x | 0.10x | 0.10x | |
| 355 | SS-355 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 3XX ALLOYS

| Typical Analysis - Weight Percent | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
| 355 | KA-355 | 4.5x | 0.65x | 1.0x | 0.050x | 0.63x | <0.0050 | 0.030x | 0.050x | 0.18x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-355 | 5.5x | 0.15x | 1.5x | 0.15x | 0.40x | 0.050x | 0.010x | 0.15x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KC-355 | 5.0x | 0.15x | 1.3x | 0.080x | 0.030x | 0.030x | 0.050x | 0.030x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 356 | SS-356 | 7.1x | 0.35x | 0.12x | 0.050x | 0.35x | <0.0050 | 0.030x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-356 | 6.5x | 0.50x | 0.20x | 0.030x | 0.22x | <0.0050 | <0.0050 | 0.18x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-356 | 7.5x | 0.15x | 0.050x | 0.12x | 0.45x | <0.0050 | <0.0050 | 0.040x | 0.16x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KC-356 | 7.0x | 0.080x | 0.040x | 0.020x | 0.35x | <0.0050 | 0.010x | 0.030x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 3xx | ST1-300 | 7.5x | 0.60x | 0.80x | 0.15x | 0.30x | <0.0050 | 0.10x | 0.10x | 0.10x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0030 |
| A357 | SS-A357 | 7.1x | 0.10x | 0.050x | 0.020x | 0.60x | 0.015x | 0.020x | 0.030x | 0.12x | <0.0010 | <0.0010 | <0.0010 | 0.060x | <0.0010 | <0.0030 |
| 358 | KA-358 | 8.0x | 0.20x | 0.080x | 0.050x | 0.65x | 0.020x | 0.020x | 0.060x | 0.12x | <0.0010 | <0.0010 | <0.0010 | 0.22x | <0.0010 | <0.0030 |
| 360 | SS-360 | 9.6x | 0.60x | 0.25x | 0.15x | 0.55x | <0.0050 | 0.17x | 0.17x | 0.060x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-360 | 10.0 | 0.35x | 0.40x | 0.10x | 0.45x | <0.0050 | 0.25x | 0.25x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

| Typical Analysis - Weight Percent | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
| 355 | KA-355 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | <0.020 | <0.0030 | |
| | KB-355 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| | KC-355 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 356 | SS-356 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | Yes |
| | KA-356 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.003x | <0.0030 | 0.003x | <0.0010 | <0.0030 | 0.050x | 0.010x | <0.0030 | |
| | KB-356 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.060x | <0.0010 | <0.0010 | 0.060x | 0.020x | 0.010x | <0.0030 | |
| | KC-356 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 3xx | ST1-300 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.020x | 0.01x | 0.001x | |
| A357 | SS-A357 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 358 | KA358 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| 360 | SS-360 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.050x | <0.0010 | <0.0010 | 0.070x | 0.020x | 0.010x | <0.0030 | |
| | KA-360 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.20x | <0.0010 | <0.0010 | 0.030x | 0.020x | <0.020 | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 3XX ALLOYS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | KB-360 | 9.0x | 1.0x | 0.10x | 0.25x | 0.65x | <0.0050 | 0.10x | 0.10x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KC-360 | 9.6x | 1.1x | 0.30x | 0.15x | 0.58x | <0.0050 | 0.20x | 0.25x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KD-360 | 9.0x | 0.10x | 0.75x | 0.050x | 0.52x | 0.010x | 0.020x | 0.030x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 364 | SS-364 | 8.8x | 0.90x | 0.15x | 0.060x | 0.35x | 0.40x | 0.050x | 0.050x | <0.0050 | <0.0010 | <0.0010 | <0.0010 | 0.030x | <0.0010 | <0.0030 |
| 365 | SS-365 | 10.5 | 0.090x | 0.015x | 0.65x | 0.32x | <0.0050 | <0.0050 | 0.020x | 0.095x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 380 | SS-380 | 8.9x | 0.90x | 3.6x | 0.40x | 0.20x | <0.0050 | 0.30x | 0.35x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-380 | 9.4x | 1.1x | 3.1x | 0.15x | 0.45x | <0.010 | 0.45x | 0.15x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-380 | 7.6x | 0.65x | 4.1x | 0.60x | 0.050x | 0.030x | 0.10x | 0.90x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.10x | <0.0030 |
| | KC-380 | 9.0x | 1.2x | 3.6x | 0.30x | 0.20x | 0.060x | 0.20x | 0.60x | 0.070x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KD-380 | 9.2x | 1.1x | 3.6x | 0.30x | 0.20x | 0.060x | 0.20x | 2.7x | 0.060x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KE-380 | 9.6x | 1.1x | 3.6x | 0.20x | <0.0050 | 0.020x | 0.030x | <0.0050 | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KF-380 | 8.4x | 0.70x | 2.6x | 0.45x | 0.30x | 0.020x | 0.10x | 3.5x | 0.11x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.10x | <0.0030 |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 360 | KB-360 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.10x | <0.0010 | <0.0010 | 0.10x | 0.020x | 0.010x | <0.0030 | |
| | KC-360 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.12x | 0.020x | <0.020 | <0.0030 | |
| | KD-360 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.003x | <0.0030 | 0.10x | <0.0010 | <0.0030 | <0.0050 | 0.010x | <0.0030 | |
| 364 | SS-364 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.050x | 0.020x | 0.010x | <0.0030 | |
| 365 | SS-365 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.015x | <0.020 | <0.0030 | |
| 380 | SS-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | **Yes** |
| | KA-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.10x | <0.0010 | <0.0010 | 0.20x | 0.020x | 0.010x | <0.0030 | |
| | KB-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.20x | <0.0010 | <0.0010 | 0.10x | 0.020x | 0.010x | <0.0030 | |
| | KC-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.050x | <0.0010 | <0.0010 | 0.060x | 0.020x | 0.010x | <0.0030 | |
| | KD-380 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.050x | <0.0010 | <0.0010 | 0.060x | 0.020x | <0.020 | <0.0030 | |
| | KE-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| | KF-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.10x | <0.0010 | <0.0010 | 0.15x | <0.0050 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 3XX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380 | KG-380 | 9.2x | 0.90x | 3.2x | 0.30x | 0.10x | 0.010x | 0.30x | 3.0x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.050x | <0.0030 |
| | KH-380 | 9.6x | 1.2x | 3.8x | 0.15x | 0.050x | <0.0050 | 0.40x | 2.2x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.15x | <0.0030 |
| | KJ-380 | 8.0x | 0.60x | 3.5x | 0.10x | 0.10x | 0.035x | 0.10x | 0.10x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 3xx | ST2-300 | 9.0x | 1.1x | 3.5x | 0.50x | 0.20x | 0.030x | 0.10x | 2.5x | 0.10x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0030 |
| 383 | SS-383 | 11.0 | 1.0x | 2.5x | 0.35x | 0.25x | 0.060x | 0.10x | 2.5x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-383 | 10.8 | 0.75x | 3.0x | 0.40x | 0.25x | <0.0050 | 0.30x | 0.80x | 0.15x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 384 | SS-384 | 11.5 | 1.0x | 3.5x | 0.30x | 0.10x | 0.020x | 0.25x | 0.60x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 390 | SS-390 | 16.5 | 0.90x | 4.5x | 0.25x | 0.60x | 0.050x | 0.10x | 0.50x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-390 | 16.0 | 1.0x | 4.1x | 0.35x | 0.70x | 0.050x | 0.20x | 1.0x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 380 | KG-380 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.20x | <0.0010 | | 0.10x | 0.020x | <0.020 | <0.0030 | |
| | KH-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.050x | <0.0010 | <0.0010 | 0.050x | <0.0050 | 0.010x | <0.0030 | |
| | KJ-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.015x | 0.010x | <0.0030 | |
| 3xx | ST2-300 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.020x | 0.01x | 0.001x | |
| 383 | SS-383 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.20x | <0.0010 | <0.0010 | 0.15x | 0.030x | 0.010x | <0.0030 | **Yes** |
| | KA-383 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.10x | <0.0010 | <0.0010 | 0.20x | 0.015x | <0.020 | <0.0030 | |
| 384 | SS-384 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.12x | <0.0010 | <0.0010 | 0.12x | 0.020x | 0.010x | <0.0030 | |
| 390 | SS-390 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.010x | 0.080x | <0.0010 | <0.0010 | 0.080x | <0.0050 | 0.010x | <0.0030 | **Yes** |
| | KA-390 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.006x | 0.16x | <0.0010 | <0.0010 | 0.050x | <0.0050 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 4XX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 413 | SS-413 | 12.0 | 0.60x | 0.12x | 0.080x | 0.050x | <0.0050 | 0.10x | 0.15x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-413 | 11.0 | 0.75x | 0.080x | 0.15x | 0.020x | <0.0050 | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KB-413 | 12.6 | 0.30x | 0.050x | 0.050x | 0.030x | <0.0050 | 0.050x | 0.080x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KC-413 | 11.8 | 1.2x | 0.20x | 0.10x | 0.050x | <0.0050 | 0.15x | 0.15x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 443 | SS-443 | 5.5x | 0.50x | 0.080x | 0.10x | 0.050x | <0.0050 | 0.050x | 0.10x | 0.11x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| | KA-443 | 4.5x | 0.65x | 0.050x | 0.15x | 0.080x | <0.0050 | 0.080x | 0.15x | 0.040x | | | | | | |
| | KB-443 | 6.0x | 0.30x | 0.15x | 0.050x | 0.030x | <0.0050 | 0.030x | 0.050x | 0.15x | | | | | | |
| | KC-443 | 5.1x | 1.1x | 0.15x | 0.10x | 0.050x | <0.0050 | 0.10x | 0.15x | 0.10x | | | | | | |
| 444 | SS-A444 | 7.1x | 0.15x | 0.12x | 0.050x | <0.0050 | <0.0050 | 0.030x | <0.0050 | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 413 | SS-413 | <0.0010 | <0.0010 | 0.012x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| | KA-413 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.040x | <0.0010 | <0.0010 | 0.040x | 0.020x | 0.010x | <0.0030 | |
| | KB-413 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.12x | <0.0010 | <0.0010 | 0.12x | 0.020x | <0.020 | <0.0030 | |
| | KC-413 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 0.080x | 0.020x | 0.010x | <0.0030 | |
| 443 | SS-443 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |
| | KA-443 | | | | | | | 0.020x | | | 0.020x | 0.020x | | | |
| | KB-443 | | | | | | | 0.050x | | | 0.050x | 0.020x | | | |
| | KC-443 | | | | | | | 0.20x | | | 0.15x | 0.020x | | | |
| 444 | SS-A444 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 5XX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 513 | SS-513 | 0.20x | 0.30x | 0.050x | 0.080x | 4.0x | 0.030x | 0.030x | 1.8x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.0001x | <0.0010 | <0.0010 |
| 514 | SS-514 | 0.15x | 0.25x | 0.050x | 0.12x | 4.1x | 0.030x | 0.030x | 0.080x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| | KA-514 | 0.080x | 0.35x | 0.10x | 0.050x | 3.5x | <0.0050 | <0.0050 | <0.0050 | 0.16x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0010 |
| | KB-514 | 0.25x | 0.10x | 0.020x | 0.20x | 4.5x | <0.0050 | <0.0050 | <0.0050 | 0.050x | <0.0010 | <0.0010 | <0.0010 | 0.003x | <0.0010 | <0.0010 |
| 518 | KA-518 | 0.20x | 1.0x | 0.080x | 0.050x | 8.1x | <0.0050 | 0.050x | 0.10x | 0.010x | <0.0010 | <0.0010 | <0.0010 | 0.004x | <0.0010 | <0.0010 |
| 520 | SS-520 | 0.15x | 0.20x | 0.12x | 0.050x | 10.2 | <0.0050 | <0.0050 | 0.040x | 0.10x | <0.0010 | <0.0010 | <0.0010 | 0.0001x | <0.0010 | <0.0010 |
| | KA-520 | 0.20x | 0.10x | 0.17x | 0.020x | 9.5x | <0.0050 | <0.0050 | 0.080x | 0.050x | | | | 0.002x | | |
| | KB-520 | 0.080x | 0.30x | 0.080x | 0.080x | 10.6 | <0.0050 | <0.0050 | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | 0.005x | <0.0010 | <0.0010 |
| 535 | SS-535 | 0.10x | 0.10x | 0.030x | 0.18x | 7.0x | <0.0050 | 0.020x | 0.030x | 0.15x | <0.0010 | <0.0010 | <0.0010 | 0.003x | <0.0010 | <0.0010 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 513 | SS-513 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | 0.010x | <0.0030 | |
| 514 | SS-514 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | 0.010x | <0.0030 | |
| | KA-514 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.030x | <0.0010 | <0.0010 | 0.030x | <0.0010 | 0.010x | <0.0030 | |
| | KB-514 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.060x | <0.0010 | <0.0010 | 0.060x | <0.0010 | <0.020 | 0.060x | |
| 518 | KA-518 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | 0.030x | <0.0010 | <0.0010 | 0.050x | <0.0010 | <0.020 | <0.0030 | |
| 520 | SS-520 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | 0.010x | <0.0030 | |
| | KA-520 | | | | | | | | | | | | | | |
| | KB-520 | <0.0010 | <0.0010 | <0.020 | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.020 | <0.0030 | |
| 535 | SS-535 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.020 | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 7XX ALLOYS

| Typical Analysis - Weight Percent | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
| 711 | SS-711 | 0.15x | 0.90x | 0.50x | 0.030x | 0.40x | 0.030x | 0.030x | 6.5x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| 712 | SS-712 | 0.20x | 0.50x | 0.15x | 0.10x | 0.65x | 0.50x | <0.0050 | 5.9x | 0.15x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| 713 | SS-713 | 0.12x | 0.55x | 0.80x | 0.20x | 0.40x | 0.060x | 0.050x | 7.6x | 0.20x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |

| Typical Analysis - Weight Percent | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
| 711 | SS-711 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 712 | SS-712 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |
| 713 | SS-713 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

ARCONIC

## 8XX ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 850 | SS-850 | 0.50x | 0.40x | 1.1x | 0.050x | <0.0050 | <0.0050 | 1.1x | <0.0050 | 0.12x | <0.0010 | | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| 851 | SS-851 | 2.5x | 0.45x | 1.0x | 0.050x | 0.030x | <0.0050 | 0.50x | 0.030x | 0.080x | <0.0010 | | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| 852 | SS-852 | 0.22x | 0.35x | 2.0x | 0.050x | 0.84x | <0.0050 | 1.2x | 0.050x | 0.040x | <0.0010 | | <0.0010 | <0.0005x | <0.0010 | <0.0010 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | Available as MicrO CRM, see pages 64-65 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 850 | SS-850 | <0.0010 | <0.0010 | 0.012x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 6.3x | <0.0010 | 0.010x | <0.0030 | |
| 851 | SS-851 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 6.3x | <0.0010 | 0.010x | <0.0030 | |
| 852 | SS-852 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | 6.3x | <0.0010 | 0.010x | <0.0030 | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR TRACE METALS

ARCONIC

## TRACE METALS

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | SS-1000 | 0.0002 | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001x | <0.0001 | <0.0001 |
| 1050 | ST1-1050 | 0.15x | 0.33x | 0.030x | 0.040x | 0.030x | 0.020x | 0.010x | 0.040x | 0.030x | <0.0010 | 0.0005 | <0.0010 | 0.0002x | 0.030x | 0.002x |
| 2xxx | ST2-2000 | 0.50x | 0.45x | 2.5x | 0.50x | 0.50x | 0.050x | 0.010x | 0.15x | 0.030x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 3xxx | ST1-3000 | 0.20x | 0.50x | 0.15x | 1.2x | 1.0x | 0.010x | 0.010x | 0.050x | 0.020x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| | ST2-3000 | 0.20x | 0.50x | 0.15x | 1.2x | 0.030x | 0.010x | 0.010x | 0.050x | 0.020x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 3003 | ST1-3003 | 0.30x | 0.33x | 0.15x | 1.2x | <0.0010 | <0.0005 | <0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST2-3003 | 0.30x | 0.65x | 0.15x | 1.2x | 0.010x | 0.015x | 0.020x | 0.020x | 0.020x | <0.0010 | 0.0005 | <0.0010 | 0.0002x | 0.020x | 0.002x |
| 3104 | ST2-3104 | 0.20x | 0.40x | 0.20x | 1.0x | 1.2x | 0.015x | 0.030x | 0.060x | 0.020x | <0.0010 | <0.0010 | <0.0005 | 0.001x | 0.008x | 0.003x |
| 5xxx | ST1-5000 | 0.15x | 0.30x | 0.050x | 0.050x | 1.8x | 0.15x | 0.030x | 0.040x | 0.020x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 5052 | ST1-5052 | 0.15x | 0.30x | 0.10x | <0.0010 | 2.7x | 0.25x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| | ST2-5052 | 0.15x | 0.30x | 0.10x | 0.050x | 2.7x | 0.25x | 0.020x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.0002x | 0.020x | 0.002x |

### Typical Analysis - Weight Percent

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1000 | SS-1000 | <0.0001 | <0.0001 | <0.0001 | <0.0001x | <0.0001x | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| 1050 | ST1-1050 | 0.0005 | 0.0005 | 0.025x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.025x | 0.004x |
| 2xxx | ST2-2000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x |
| 3xxx | ST1-3000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x |
| | ST2-3000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x |
| 3003 | ST1-3003 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| | ST2-3003 | 0.0005 | 0.0005 | 0.020x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.015x | 0.004x |
| 3104 | ST2-3104 | 0.001x | <0.0010 | 0.020x | 0.003x | 0.003x | 0.002x | 0.004x | 0.002x | <0.0010 | 0.015x | 0.002x | 0.020x | 0.002x |
| 5xxx | ST1-5000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | 0.001x | 0.001x | 0.001x | 0.010x | 0.001x |
| 5052 | ST1-5052 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| | ST2-5052 | 0.0005 | 0.0005 | 0.025x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.015x | 0.004x |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR TRACE METALS

ARCONIC

## TRACE METALS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6xxx | ST1-6000 | 0.55x | 0.30x | 0.15x | 0.050x | 0.80x | 0.15x | 0.050x | 0.080x | 0.040x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 6063 | ST1-6063 | 0.45x | 0.22x | <0.0010 | <0.0010 | 0.55x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| | ST2-6063 | 0.45x | 0.22x | 0.050x | 0.050x | 0.55x | 0.015x | 0.030x | 0.030x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.0002x | 0.020x | 0.002x |
| 7xxx | ST1-7000 | 0.15x | 0.25x | 1.5x | 0.25x | 2.5x | 0.15x | 0.020x | 6.5x | 0.040x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| | ST2-7000 | 0.15x | 0.25x | 0.15x | 0.20x | 1.3x | 0.10x | 0.020x | 3.5x | 0.040x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0010 |
| 8xxx | ST2-8000 | 0.30x | 1.5x | 0.15x | 0.60x | 0.04x | 0.010x | 0.010x | 0.050x | 0.010x | <0.0010 | <0.0010 | <0.0010 | 0.0006x | 0.010x | 0.001x |
| 8079 | ST1-8079 | 0.13x | 1.2x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0010 |
| | ST2-8079 | 0.13x | 1.2x | 0.030x | 0.003x | 0.003x | 0.003x | 0.004x | 0.015x | 0.004x | <0.0010 | 0.0005 | <0.0010 | 0.0002x | 0.004x | 0.002x |
| | ST3-8079 | 0.10x | 1.0x | 0.010x | 0.020x | 0.005x | 0.010x | 0.010x | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0005 | 0.0005x | 0.080x | 0.001x |
| 3xx | ST1-300 | 7.5x | 0.60x | 0.80x | 0.15x | 0.30x | <0.0050 | 0.10x | 0.10x | 0.10x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0030 |
| | ST2-300 | 9.0x | 1.1x | 3.5x | 0.50x | 0.20x | 0.030x | 0.10x | 2.5x | 0.10x | 0.001x | <0.0010 | <0.0010 | 0.0005x | 0.001x | <0.0030 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 6xxx | ST1-6000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x |
| 6063 | ST1-6063 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| | ST2-6063 | 0.0005 | 0.0005 | 0.025x | 0.001x | 0.001x | 0.0005 | 0.020x | 0.003x | <0.0010 | 0.020x | 0.001x | 0.010x | 0.004x |
| 7xxx | ST1-7000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x |
| | ST2-7000 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.001x | 0.010x | 0.001x |
| 8xxx | ST2-8000 | 0.001x | 0.001x | 0.020x | 0.001x | 0.001x | 0.001x | 0.010x | 0.001x | <0.0010 | 0.010x | 0.001x | 0.020x | 0.001x |
| 8079 | ST1-8079 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0005x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0010 |
| | ST2-8079 | 0.0005 | 0.0005 | 0.016x | 0.0005x | 0.001x | 0.0005 | 0.004x | <0.0010 | <0.0010 | 0.005x | 0.001x | 0.002x | 0.004x |
| | ST3-8079 | 0.001x | <0.0010 | 0.020x | 0.001x | 0.001x | 0.0015 | 0.004x | 0.003x | <0.0010 | 0.020x | 0.0015 | 0.020x | 0.002x |
| 3xx | ST1-300 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.020x | 0.01x | 0.001x |
| | ST2-300 | 0.001x | 0.001x | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.003x | 0.001x | <0.0010 | 0.001x | 0.020x | 0.01x | 0.001x |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# DRIFT CORRECTION AND NORMALIZATION

## REFERENCE MATERIALS

### Typical Analysis - Weight Percent

| | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CALIBRATION | SQ-10 | | | | | | | | | | | | | | | |
| | SQ-11 | (0.2) | (0.2) | (0.5) | (0.38) | (3.0) | (0.12) | | (6.6) | (0.08) | | | | (0.005) | | (0.02) |
| | SQ-12 | (1.1) | (0.6) | (4.8) | (1.1) | (0.15) | | (0.25) | (0.2) | | (0.05) | | | (0.005) | (0.06) | |
| | SQ-13 | (0.5) | (0.6) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | | | | (0.005) | (0.04) | |
| | SQ-14 | (0.1) | (0.1) | (0.5) | (0.4) | (0.9) | | (0.4) | (1.2) | (0.1) | | | | (0.002) | (0.5) | |
| | SQ-15 | (12.0) | (0.7) | (0.5) | (0.05) | (1.2) | (0.05) | (2.5) | | (0.1) | | | | | | |
| | SQ-16 | (4.0) | (1.0) | (10.0) | (0.2) | (0.3) | | (0.2) | (0.2) | | | | | | | |
| | SQ-17 | (0.7) | (0.4) | (0.35) | (0.12) | (1.6) | (0.25) | (0.12) | (0.12) | (0.08) | | | | (0.005) | (0.08) | |
| | SQ-18 | | | | | | | | | | | | (0.02) | | | |
| | SQ-19 | (0.6) | (0.15) | (0.6) | | (1.0) | (0.1) | | (0.4) | | | (0.03) | | | | |

### Typical Analysis - Weight Percent

| | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CALIBRATION | SQ-10 | | | | | | | | | | | | | |
| | SQ-11 | | (0.01) | (0.03) | | | | | | | | | | |
| | SQ-12 | (0.2) | (0.01) | (0.03) | | | | (0.06) | | | (0.06) | | (0.1) | (0.15) |
| | SQ-13 | (0.04) | (0.01) | (0.03) | | | | (0.04) | | | (0.04) | | (0.04) | (0.04) |
| | SQ-14 | | | | | | | (0.5) | | | (0.1) | | | |
| | SQ-15 | | | | | | | | | | | (0.02) | | |
| | SQ-16 | | | | | | | | | | | | | |
| | SQ-17 | | | (0.03) | | | | (0.1) | | | (0.1) | | (0.03) | |
| | SQ-18 | | | | (0.02) | (0.02) | | | | | | | | |
| | SQ-19 | | | (0.01) | | | (0.01) | | (0.02) | (0.2) | | | (0.1) | (0.005) |

Note: SQ RMs are 64mm diameter, 37mm thick except SQ-18 which is 25mm thick. These RMs are to beused for reproducibility of spectral response, but are not certified with respect to true composition. Only approximate values are issued for these RMs.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## SILICON SERIES IN UNALLOYED ALUMINUM

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SI-1 | 0.50x | (0.5) | | | | | | | | | | | | | |
| SI-2 | 1.0x | (0.5) | | | | | | | | | | | | | |
| SI-3 | 1.6x | (0.5) | | | | | | | | | | | | | |
| SI-4 | 2.2x | (0.5) | | | | | | | | | | | | | |
| SI-5 | 3.0x | (0.5) | | | | | | | | | | | | | |
| SI-6 | 5.0x | (0.5) | | | | | | | | | | | | | |
| SI-7 | 7.0x | (0.5) | | | | | | | | | | | | | |
| SI-8 | 10.0 | (0.5) | | | | | | | | | | | | | |
| SI-9 | 12.5 | 0.50x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | |
| SS-390 | 16.5 | 0.90x | 4.5x | 0.25x | 0.60x | 0.050x | 0.10x | 0.50x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SI-1 | | | | | | | | | | | | | |
| SI-2 | | | | | | | | | | | | | |
| SI-3 | | | | | | | | | | | | | |
| SI-4 | | | | | | | | | | | | | |
| SI-5 | | | | | | | | | | | | | |
| SI-6 | | | | | | | | | | | | | |
| SI-7 | | | | | | | | | | | | | |
| SI-8 | | | | | | | | | | | | | |
| SI-9 | | | | | | | | | | | 0.020x | | |
| SS-390 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.010x | 0.080x | <0.0010 | <0.0010 | 0.080x | <0.0050 | 0.010x | <0.0030 |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## IRON SERIES IN UNALLOYED ALUMINUM

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FE-4 | (0.1) | 0.25x | (0.01) | | | | | | | | | | | | |
| FE-6 | (0.1) | 0.60x | (0.01) | | | | | | | | | | | | |
| FE-7 | (0.1) | 0.80x | (0.01) | | | | | | | | | | | | |
| FE-8 | 0.10x | 1.0x | 0.010x | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | |
| FE-9 | 0.10x | 1.2x | 0.010x | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | |
| FE-10 | 0.10x | 1.5x | 0.010x | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | |
| FE-11 | 0.10x | 2.0x | 0.010x | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | |
| FE-12 | (0.1) | 2.5x | (0.01) | | | | | | | | | | | | |
| SS-A2800 | 0.25x | 3.0x | 0.030x | <0.010 | <0.010 | <0.0050 | 0.030x | <0.010 | <0.010 | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FE-4 | | | | | | | | | | | | | |
| FE-6 | | | | | | | | | | | | | |
| FE-7 | | | | | | | | | | | | | |
| FE-8 | | | | | | | | | | | | | |
| FE-9 | | | | | | | | | | | | | |
| FE-10 | | | | | | | | | | | | | |
| FE-11 | | | | | | | | | | | | | |
| FE-12 | | | | | | | | | | | | | |
| SS-A2800 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## COPPER SERIES IN UNALLOYED ALUMINUM

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CU-1 | 0.15x | 0.25x | 1.0x | <0.0050 | | | | | | | | | | | |
| CU-2 | 0.15x | 0.25x | 2.5x | <0.0050 | | | | | | | | | | | |
| CU-3 | 0.15x | 0.25x | 4.5x | <0.0050 | | | | | | | | | | | |
| CU-7 | 0.15x | 0.25x | 20.0 | <0.0050 | | | | | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CU-1 | | | | | | | | | | | | | |
| CU-2 | | | | | | | | | | | | | |
| CU-3 | | | | | | | | | | | | | |
| CU-7 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## MANGANESE SERIES IN 3000 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MN-3 | | | | 0.70x | | | | | | | | | | | |
| WA-3003 | 0.40x | 0.65x | 0.090x | 0.95x | 0.010x | 0.030x | 0.030x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| SS-3003 | 0.20x | 0.50x | 0.15x | 1.2x | 0.030x | <0.0050 | <0.0050 | 0.080x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| WB-3003 | 0.15x | 0.30x | 0.20x | 1.5x | 0.050x | <0.0050 | <0.0050 | 0.020x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MN-3 | | | | | | | | | | | | | |
| WA-3003 | 0.001x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.006x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| SS-3003 | <0.0005 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| WB-3003 | 0.003x | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## NICKEL SERIES IN 242 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NI-4 | | | | | | | 1.0x | | | | | | | | |
| NI-5 | | | | | | | 1.5x | | | | | | | | |
| SS-242 | 0.50x | 0.55x | 4.0x | 0.080x | 1.5x | 0.030x | 2.0x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NI-4 | | | | | | | | | | | | | |
| NI-5 | | | | | | | | | | | | | |
| SS-242 | <0.0010 | <0.0010 | 0.015x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## ZINC SERIES IN 7072 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZN-1 | | | | | | | | 0.25x | | | | | | | |
| ZN-2 | | | | | | | | 0.60x | | | | | | | |
| SS-7072 | 0.14x | 0.28x | 0.030x | 0.040x | 0.030x | 0.030x | 0.030x | 1.1x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| ZN-4 | | | | | | | | 2.6x | | | | | | | |
| ZN-5 | | | | | | | | 4.0x | | | | | | | |
| ZN-6 | | | | | | | | 7.0x | | | | | | | |
| ZN-7 | | | | | | | | 10.0 | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZN-1 | | | | | | | | | | | | | |
| ZN-2 | | | | | | | | | | | | | |
| SS-7072 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| ZN-4 | | | | | | | | | | | | | |
| ZN-5 | | | | | | | | | | | | | |
| ZN-6 | | | | | | | | | | | | | |
| ZN-7 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## TITANIUM SERIES IN UNALLOYED ALUMINUM

### Typical Analysis - Weight Percent

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WC-1000 | 0.10x | 0.10x | 0.080x | 0.080x | 0.080x | 0.080x | 0.080x | 0.080x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.080x | <0.0005 |
| TI-2 | | | | | | | | | 0.15x | | | | | | |
| TI-3 | | | | | | | | | 0.30x | | | | | | |

### Typical Analysis - Weight Percent

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WC-1000 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.080x | <0.0010 | <0.0010 | 0.080x | <0.0010 | 0.040x | <0.0030 |
| TI-2 | | | | | | | | | | | | | |
| TI-3 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## BORON SERIES IN 1075 ALLOY

### Typical Analysis - Weight Percent

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BN-1 | 0.080x | 0.12x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.0005-0.0034 | | | |
| BN-2 | 0.080x | 0.12x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.0035-0.0074 | | | |
| BN-3 | | | | | | | | | | | | 0.0075-0.014x | | | |
| BN-4 | 0.080x | 0.12x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.015x-0.025x | | | |
| BN-5 | 0.080x | 0.12x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.026x-0.034x | | | |

### Typical Analysis - Weight Percent

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BN-1 | | | | | | | | | | | | | |
| BN-2 | | | | | | | | | | | | | |
| BN-3 | | | | | | | | | | | | | |
| BN-4 | | | | | | | | | | | | | |
| BN-5 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## BORON SERIES IN 7.5% SILICON ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BN-11 | 7.5x | 0.40x | 0.10x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.0005-0.0034 | | | |
| BN-12 | 7.5x | 0.40x | 0.10x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.0035-0.0074 | | | |
| BN-13 | 7.5x | 0.40x | 0.10x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.0075-0.014x | | | |
| BN-14 | 7.5x | 0.40x | 0.10x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | 0.015x-0.025x | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BN-11 | | | | | | | | | | | | | |
| BN-12 | | | | | | | | | | | | | |
| BN-13 | | | | | | | | | | | | | |
| BN-14 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## BERYLLIUM SERIES IN 1100 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BE-1 | | | | | | | | | | | | | 0.0005x-0.0025 | | |
| BE-2 | | | | | | | | | | | | | 0.0035-0.0065 | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BE-1 | | | | | | | | | | | | | |
| BE-2 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## CALCIUM SERIES IN 1075 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA-1 | 0.050x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | 0.0005-0.0034 |
| CA-2 | | | | | | | | | | | | | | | 0.0035-0.0084 |
| CA-3 | | | | | | | | | | | | | | | 0.0085-0.024 |
| CA-4 | | | | | | | | | | | | | | | 0.025-0.060 |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA-1 | | | | | | | | | | | | | |
| CA-2 | | | | | | | | | | | | | |
| CA-3 | | | | | | | | | | | | | |
| CA-4 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## CALCIUM SERIES IN 7.5% SILICON ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA-11 | | | | | | | | | | | | | | | 0.0005-0.0024 |
| CA-12 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | 0.0025-0.0064 |
| CA-13 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | 0.0065-0.012 |
| CA-14 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | 0.013-0.020 |
| CA-15 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.010 | | | | | | 0.021-0.040 |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CA-11 | | | | | | | | | | | | | |
| CA-12 | | | | | | | | | | | | | |
| CA-13 | | | | | | | | | | | | | |
| CA-14 | | | | | | | | | | | | | |
| CA-15 | | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## CADMIUM SERIES IN 1075 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD-1 | 0.050x | 0.15x | <0.010 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.0050 | | | | | | |
| CD-2 | 0.050x | 0.15x | <0.010 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.0050 | | | | | | |
| CD-3 | 0.050x | 0.15x | <0.010 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.0050 | | | | | | |
| CD-4 | 0.050x | 0.15x | <0.010 | <0.0050 | <0.0050 | <0.0050 | <0.010 | <0.0050 | <0.0050 | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CD-1 | 0.0005-0.0044 | | | | | | | | | | | | |
| CD-2 | 0.0045-0.014x | | | | | | | | | | | | |
| CD-3 | 0.015x-0.034x | | | | | | | | | | | | |
| CD-4 | 0.035x-0.060x | | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## COBALT SERIES IN 1075 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | | | | | | | | | | | | | | | |
| CO-2 | | | | | | | | | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO-1 | | 0.001x | | | | | | | | | | | |
| CO-2 | | 0.007x | | | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## GALLIUM SERIES IN 1000 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WD-1000 | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | 0.004x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.004x | <0.0005 |
| WE-1000 | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | 0.010x | <0.0005 |
| SS-1050 | 0.12x | 0.30x | 0.040x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WD-1000 | <0.0010 | <0.0010 | 0.004x | <0.0005x | <0.0005x | <0.0010 | 0.004x | <0.0010 | <0.0010 | 0.004x | <0.0010 | 0.004x | <0.0030 |
| WE-1000 | <0.0010 | <0.0010 | 0.010x | <0.0005x | <0.0005x | <0.0010 | 0.010x | <0.0010 | <0.0010 | 0.010x | <0.0010 | 0.010x | <0.0030 |
| SS-1050 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.003x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## LITHIUM SERIES IN 1075 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LI-1 | | | | | | | | | | | | | | | |
| LI-2 | | | | | | | | | | | | | | | |
| LI-3 | | | | | | | | | | | | | | | |
| LI-4 | | | | | | | | | | | | | | | |
| LI-5 | | | | | | | | | | | | | | | |
| LI-6 | | | | | | | | | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LI-1 | | | | 0.0002-0.0009 | | | | | | | | | |
| LI-2 | | | | 0.0010-0.0024 | | | | | | | | | |
| LI-3 | | | | 0.0025-0.0064 | | | | | | | | | |
| LI-4 | | | | 0.0065-0.010 | | | | | | | | | |
| LI-5 | | | | 0.011-0.020 | | | | | | | | | |
| LI-6 | | | | 0.021-0.030 | | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## SODIUM SERIES IN 1075 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NA-1 | 0.050x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| NA-2 | 0.050x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| NA-3 | | | | | | | | | | | | | | | |
| NA-4 | 0.050x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| NA-5 | 0.050x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NA-1 | | | | | 0.0005-0.0024 | | | | | | | | |
| NA-2 | | | | | 0.0025-0.0064 | | | | | | | | |
| NA-3 | | | | | 0.0065-0.012 | | | | | | | | |
| NA-4 | | | | | 0.013-0.020 | | | | | | | | |
| NA-5 | | | | | 0.021-0.030 | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## SODIUM SERIES IN 7.5% SILICON ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NA-11 | | | | | | | | | | | | | | | |
| NA-12 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| NA-13 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| NA-14 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| NA-15 | 7.5x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| NA-11 | | | | | 0.0005-0.0024 | | | | | | | | |
| NA-12 | | | | | 0.0025-0.0064 | | | | | | | | |
| NA-13 | | | | | 0.0065-0.012 | | | | | | | | |
| NA-14 | | | | | 0.013-0.020 | | | | | | | | |
| NA-15 | | | | | 0.021-0.030 | | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## PHOSPHORUS SERIES IN 10.5% SILICON ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P-1 | | | | | | | | | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P-1 | | | | | | 0.005x | | | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## ANTIMONY SERIES IN 1075 ALLOY

### Typical Analysis - Weight Percent

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AN-1 | 0.05x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| AN-2 | 0.05x | 0.15x | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | <0.0050 | | | | | | |
| AN-3 | | | | | | | | | | | | | | | |
| AN-4 | 0.05x | 0.15x | | | | | | | | | | | | | |

### Typical Analysis - Weight Percent

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AN-1 | | | | | | | | 0.005x | | | | | |
| AN-2 | | | | | | | | 0.015x | | | | | |
| AN-3 | | | | | | | | 0.040x | | | | | |
| AN-4 | | | | | | | | 0.090x | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## ANTIMONY SERIES IN 356 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AN-11 | | | | | | | | | | | | | | | |
| AN-12 | 7.1x | 0.35x | 0.12x | 0.050x | 0.35x | <0.0050 | 0.030x | 0.10x | 0.12x | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| AN-11 | | | | | | | | 0.050x | | | | | |
| AN-12 | | | | | | | | 0.10x | | | | | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## ZIRCONIUM SERIES IN 1050 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZR-1 | | | | | | | | | | | | | | | |
| ZR-2 | | | | | | | | | | | | | | | |
| ZR-3 | | | | | | | | | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZR-1 | | | | | | | | | | | | | 0.0035-0.014x |
| ZR-2 | | | | | | | | | | | | | 0.015x-0.044x |
| ZR-3 | | | | | | | | | | | | | 0.045x-0.070x |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR SINGLE ELEMENTS

## ZIRCONIUM SERIES IN 6151 ALLOY

**Typical Analysis - Weight Percent**

| Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZR-11 | | | | | | | | | | | | | | | |
| ZR-13 | | | | | | | | | | | | | | | |
| ZR-14 | | | | | | | | | | | | | | | |
| ZR-15 | | | | | | | | | | | | | | | |

**Typical Analysis - Weight Percent**

| Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ZR-11 | | | | | | | | | | | | | 0.010x |
| ZR-13 | | | | | | | | | | | | | 0.080x |
| ZR-14 | | | | | | | | | | | | | 0.16x |
| ZR-15 | | | | | | | | | | | | | 0.26x |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

ARCONIC

## ALUMINUM-LITHIUM

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LI-2055 | 0.035x | 0.050x | 3.7x | 0.30x | 0.40x | <0.0050 | <0.0050 | 0.50x | 0.050x | 0.45x | <0.0010 | 0.001x | <0.0005 | <0.0010 | 0.0005 |
| | LI-2060 | 0.040x | 0.040x | 4.0x | 0.30x | 0.90x | <0.0050 | <0.0050 | 0.40x | 0.050x | 0.28x | <0.0010 | <0.0010 | <0.0005 | <0.0010 | <0.0010 |
| | LI-2070 | 0.060x | 0.075x | 3.3x | 0.30x | 0.25x | <0.0050 | <0.0050 | 0.30x | 0.050x | <0.0010 | <0.0010 | <0.0010 | <0.0005 | <0.0010 | <0.0010 |
| | LI-2090 | 0.050x | 0.060x | 2.7x | 0.025x | 0.13x | 0.025x | <0.0050 | 0.050x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005 | <0.0010 | <0.0010 |
| | LI-2095 | 0.060x | 0.075x | 4.25 | 0.125 | 0.525 | <0.0050 | <0.0050 | 0.125 | 0.050x | 0.425 | <0.0010 | <0.0010 | <0.0005 | <0.0010 | <0.0010 |
| | LI-2097 | 0.060x | 0.075x | 2.8x | 0.35x | 0.175 | <0.0050 | <0.0050 | 0.175 | 0.075x | <0.0010 | <0.0010 | 0.001x | <0.0005 | <0.0010 | 0.0005 |
| | LI-2099 | 0.025x | 0.040x | 2.7x | 0.30x | 0.30x | <0.0050 | <0.0050 | 0.70x | 0.050x | <0.0010 | <0.0010 | <0.0010 | 0.00005 | <0.0010 | <0.0010 |
| | LI-2195 | 0.060x | 0.080x | 4.0x | 0.13x | 0.50x | <0.0050 | <0.0050 | 0.13x | 0.050x | 0.40x | <0.0010 | 0.001x | <0.0005 | <0.0010 | 0.0005 |
| | LI-2199 | 0.025x | 0.035x | 2.6x | 0.30x | 0.23x | <0.0050 | <0.0050 | 0.55x | 0.050x | <0.0010 | <0.0010 | 0.001x | <0.0005 | <0.0010 | 0.0005 |
| | LI-2397 | 0.050x | 0.050x | 2.8x | 0.30x | 0.125 | <0.0050 | <0.0050 | 0.10x | 0.060x | 0.001x | <0.0010 | 0.001x | <0.0005 | <0.0010 | 0.0005 |
| | LI-8090 | 0.060x | 0.12x | 1.4x | 0.020x | 0.95x | 0.0005 | <0.01 | 0.125 | 0.050x | <0.0010 | <0.0010 | 0.001x | <0.0005 | <0.0010 | 0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | LI-2055 | <0.0010 | <0.0010 | <0.020 | 1.15 | 0.0005 | <0.0010 | 0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.10x | |
| | LI-2060 | <0.0010 | <0.0010 | <0.020 | 0.75x | <0.0005 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.010x | *Call for availability* |
| | LI-2070 | <0.0010 | <0.0010 | <0.020 | 1.2x | <0.0005 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.10x | *Call for availability* |
| | LI-2090 | <0.0010 | <0.0010 | <0.020 | 2.3x | <0.0005 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.12x | *Call for availability* |
| | LI-2095 | <0.0010 | <0.0010 | <0.020 | 1.1x | <0.0005 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.11x | *Call for availability* |
| | LI-2097 | <0.0010 | <0.0010 | <0.020 | 1.5x | 0.0005 | <0.0010 | 0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.12x | *Call for availability* |
| | LI-2099 | <0.0010 | <0.0010 | <0.020 | 1.8x | <0.0005 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.090x | *Call for availability* |
| | LI-2195 | <0.0010 | <0.0010 | <0.020 | 1.0x | 0.0005 | <0.0010 | 0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.12x | |
| | LI-2199 | <0.0010 | <0.0010 | 0.005x | 1.6x | 0.0005 | <0.0010 | 0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.004x | 0.085x | |
| | LI-2397 | <0.0010 | <0.0010 | <0.020 | 1.4x | 0.0005 | <0.0010 | 0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.12x | |
| | LI-8090 | <0.0010 | <0.0010 | 0.015x | 2.45 | 0.0005 | <0.0010 | 0.0005 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.020 | 0.10x | *Call for availability* |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR HIGH SILICON ALLOYS

ARCONIC

## ALUMINUM-SILICON

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SS-SI2001 | 20.x | 5.x | 0.07x | 0.07x | 0.05x | 0.01x | 2.x | 0.2x | 0.03x | <0.0010 | <0.0010 | 0.0015 | <0.0005 | <0.0010 | <0.0060 |
| | SS-SI2101 | 21.x | 2.5x | 3.5x | 0.01x | 1.x | 0.002x | 1.3x | 0.01x | 0.02x | <0.0010 | <0.0010 | 0.0015 | <0.0005 | <0.0010 | <0.020 |
| | SS-SI2401 | 24.x | 0.4x | 1.4x | 0.2x | 1.x | 0.006x | 0.5x | 0.005x | 0.06x | 0.01 | <0.0010 | <0.0010 | <0.0005 | <0.0010 | <0.0060 |
| | SS-SI3001 | 30.x | 0.4x | 1.4x | 0.004x | 1.x | <0.0010 | 0.5x | 0.02x | 0.01x | <0.0010 | <0.0010 | <0.0010 | <0.0005 | <0.0010 | 0.01x |
| | SS-SI4001 | 40.x | 0.3x | 0.01x | 0.01x | 0.05x | 0.004x | 0.007x | 0.01x | 0.01x | <0.0010 | <0.0010 | <0.0020 | <0.0005 | <0.0010 | <0.0600 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | SS-SI2001 | <0.0010 | <0.0050 | 0.02x | <0.0010 | <0.0010 | <0.0030 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.02x | 0.01x | 0.03x | *Call for availability* |
| | SS-SI2101 | <0.0010 | <0.0050 | 0.01x | <0.0010 | <0.0010 | <0.0030 | <0.0030 | <0.0010 | <0.0010 | 0.005x | 0.006x | 0.006x | 0.03x | *Call for availability* |
| | SS-SI2401 | <0.0010 | <0.0050 | 0.01x | <0.0010 | <0.0010 | <0.0030 | <0.0030 | <0.0010 | <0.0010 | 0.003x | 0.006x | 0.01x | 0.2x | *Call for availability* |
| | SS-SI3001 | <0.0010 | <0.0050 | 0.006x | <0.0010 | <0.0010 | <0.0030 | <0.0030 | <0.0010 | <0.0010 | 0.003x | 0.006x | 0.006x | 0.2x | *Call for availability* |
| | SS-SI4001 | <0.0010 | <0.0050 | 0.005x | <0.0010 | <0.0010 | <0.0200 | <0.0100 | <0.0010 | <0.0100 | <0.0010 | 0.01x | 0.01x | 0.006x | |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

## MicrO CRM Application Notes

**Description of CRM/RM:** MicrO CRMs are approximately 25.4 mm (1 inch) in diameter by 6.4 mm (0.25 inch) high. Arconic certified reference materials (CRMs) and reference materials (RMs) are produced by proprietary casting techniques that minimize or substantially eliminate both macro and micro segregations. All MicrO CRMs and Micro RMs are labeled and stenciled to show the catalog number, production lot, individual section number, and sub lot.

**Intended Use:** Arconic MicrO CRMs and MicrO RMs in disc form are intended for use with XRF (lab and handheld) and LIBS handheld instruments. MicrO CRMs may be used for calibration, type standardizing, control, and method validation. MicrO RMs are intended for drift correction.

**Instructions for Use**

**XRF:** MicrO CRMs may be used as received for XRF instruments. No preparation is needed as long as the surface is not damaged. If damage occurs to the surface it may be refaced using a lathe, milling machine, high speed rotary tool with a milling attachment or a fine file. Do not sand or grind the surface of MicrO CRMs. If using a machining lubricant such as alcohol, make sure that it is of sufficient purity to avoid contamination of the surface with elements of interest. Do not touch the analysis surface or use any tools that may contaminate the surface. Measurements may be made at any point on the surface.

**LIBS:** MicrO CRMs may be used as received for LIBS instruments. If the surface becomes filled with laser burns it is necessary to remove just enough material to obtain a fresh surface. This can be accomplished using a lathe, milling machine, high-speed rotary tool with a milling attachment or a fine metal file. Do not sand or grind the surface of MicrO CRMs. If using a machining lubricant such as alcohol, make sure that it is of sufficient purity to avoid contamination of the surface with elements of interest. Do not touch the analysis surface or use any tools that may contaminate the surface. Measurements may be made at any point on the surface. The CRMs and RMs are certified using a Spark-AES spectrometer with a spark circumference of approximately 12mm (0.5 inch) and ICP results based on sample sizes that are greater than or equal to 0.1 g. Techniques that measure an area smaller in diameter than Spark-AES may in some alloys show greater variability due to the effects of micro segregation.

**Storage:** The disc should be stored in a dry place free from corrosive fumes. Do not expose the disc to extreme heat 200 °C (392 °F).

**Shelf Life:** The certification is valid indefinitely, within the measurement uncertainty specified, provided the CRM is handled and stored in accordance with the instructions given in the certificate (see "Instructions for Use"). Periodic recertification of the CRM is not required. The certification is nullified if the CRM is damaged, contaminated, or otherwise modified.

**Material Certification:** Compositions are determined using two or more independent analytical methods which may include, Spark-AES, ICP-AES, XRF, GD-MS, ICP-MS or other approaches deemed appropriate for a specific application. All CRM/RM ingots are evaluated for uniformity both within and among sections by extensive Spark-AES testing. Spectral response is determined by comparison with Arconic master CRMs. Rigorous statistical analysis is used to ensure the accuracy of the final composition certification, the chemical and physical uniformity, and the performance of the CRMs/RMs in use. Values contained within parentheses; e.g. (0.05), are provided for reference only and are not certified for use as calibrants, standardants, or for analytical performance checks.

**Limits of Uncertainty:** The certified values shown are generally weighted mean values from the analysis of representative samples, using at least two independent analytical methods. The given limits of uncertainty represent a combined uncertainty and seek to estimate, with a 95% confidence level, a range in which the true value may be expected to lie. While the homogeneity of the ingots and the mean values given as the certified compositions are determined using rigorous statistical techniques, the cited uncertainties represent not only this statistical treatment but also estimates of bias based on extensive historical data and technical judgment. The uncertainties cited represent an expanded uncertainty given by U=kuc where uc represents the combined standard uncertainty and k is a coverage factor chosen to represent a desired level of confidence. For this application k=2 and U expresses an estimate of a 95% confidence level. The use of this expression is consistent with guidelines given in the International Organization for Standardization (ISO) document "Guide to The Expression of Uncertainty in Measurement" and National Institute of Standards and Technology (NIST) Technical Note 1297 "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results". In some cases no uncertainty is given because of limited data or the lack of a second independent measure. No uncertainties are provided for estimated compositions, i.e. parenthetic numbers.

**Traceability:** CRMs are prepared and certified for the analyses of aluminum alloys using methodology similar to that described in ASTM methods E716 and E1251. All certifications are produced using at least two independent methods and detailed statistical analysis to assure homogeneity. Traceability to NIST is maintained through the use of NIST Standard Reference Materials® (SRM) or certified reference materials directly traceable to NIST SRMs. NIST traceable weights are used for the calibration and verification of balances in both CRM production and analytical certification methods. Balances used during production and analyses are calibrated with and traceable to NIST standard weight sets.

ARCONIC

## MicrO CRMs

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1100 | MSS-1100 | 0.18x | 0.50x | 0.15x | 0.040x | 0.030x | <0.0050 | <0.0050 | 0.080x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2024 | MSS-2024 | 0.20x | 0.35x | 4.6x | 0.65x | 1.6x | 0.060x | 0.040x | 0.10x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 2055 | MSS-2055 | 0.02x | 0.030x | 3.6x | 0.28x | 0.34x | 0.003x | 0.003x | 0.50x | 0.030x | 0.47x | <0.0005 | <0.0005 | <0.0001x | <0.0005 | <0.0010 |
| 3004 | MSS-3004 | 0.18x | 0.50x | 0.15x | 1.2x | 1.1x | <0.0050 | <0.0050 | 0.050x | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5052 | MSS-5052 | 0.15x | 0.20x | 0.060x | 0.050x | 2.6x | 0.25x | 0.050x | 0.080x | 0.010x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 5182 | MSS-5182 | 0.15x | 0.20x | 0.050x | 0.35x | 4.6x | 0.030x | 0.020x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6022 | MSS-6022 | 0.90x | 0.13x | 0.070x | 0.070x | 0.60x | 0.030x | <0.0050 | 0.10x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6061 | MSS-6061 | 0.65x | 0.35x | 0.30x | 0.050x | 1.0x | 0.23x | 0.050x | 0.080x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 6063 | MSS-6063 | 0.48x | 0.25x | 0.060x | 0.020x | 0.65x | 0.020x | 0.020x | 0.050x | 0.030x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |
| 7050 | MSS-7050 | 0.080x | 0.15x | 2.4x | 0.030x | 2.3x | 0.020x | 0.020x | 6.2x | 0.040x | <0.0010 | <0.0010 | <0.0010 | 0.001x | <0.0010 | <0.0005 |
| 7075 | MSS-7075 | 0.16x | 0.15x | 1.6x | 0.080x | 2.6x | 0.20x | <0.0050 | 5.8x | 0.040x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0005 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1100 | MSS-1100 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 2024 | MSS-2024 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 2055 | MSS-2055 | <0.0005 | <0.0005 | 0.006x | 1.1x | <0.0001x | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 | 0.005x | 0.12x |
| 3004 | MSS-3004 | <0.0005 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 5052 | MSS-5052 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 5182 | MSS-5182 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | 0.001x | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 6022 | MSS-6022 | <0.0010 | <0.0010 | 0.015x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.011x | <0.0030 |
| 6061 | MSS-6061 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 6063 | MSS-6063 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.010x | <0.0030 |
| 7050 | MSS-7050 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | <0.0050 | 0.12x |
| 7075 | MSS-7075 | <0.0010 | <0.0010 | 0.020x | <0.0005x | <0.0005x | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0010 | <0.0010 | 0.007x | <0.0030 |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

ARCONIC

## MicrO CRMs

ARCONIC

# CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Si | Fe | Cu | Mn | Mg | Cr | Ni | Zn | Ti | Ag | As | B | Be | Bi | Ca |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 356 | MSS-356 | 7.1x | 0.35x | 0.12x | 0.050x | 0.35x | <0.0050 | 0.030x | 0.10x | 0.12x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 380 | MSS-380 | 8.9x | 0.90x | 3.6x | 0.40x | 0.20x | <0.0050 | 0.30x | 0.35x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 383 | MSS-383 | 11.0 | 1.0x | 2.5x | 0.35x | 0.25x | 0.060x | 0.10x | 2.5x | 0.080x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |
| 390 | MSS-390 | 16.5 | 0.90x | 4.5x | 0.25x | 0.60x | 0.050x | 0.10x | 0.50x | 0.10x | <0.0010 | <0.0010 | <0.0010 | <0.0005x | <0.0010 | <0.0030 |

**Typical Analysis - Weight Percent**

| Alloy | Catalog Number | Cd | Co | Ga | Li | Na | P | Pb | Sb | Sc | Sn | Sr | V | Zr |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 356 | MSS-356 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 |
| 380 | MSS-380 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | <0.0030 | <0.0010 | <0.0010 | <0.0030 | 0.020x | 0.010x | <0.0030 |
| 383 | MSS-383 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | <0.0010 | 0.20x | <0.0010 | <0.0010 | 0.15x | 0.030x | 0.010x | <0.0030 |
| 390 | MSS-390 | <0.0010 | <0.0010 | 0.020x | <0.0010 | <0.0010 | 0.010x | 0.080x | <0.0010 | <0.0010 | 0.080x | <0.0050 | 0.010x | <0.0030 |

Note: The 'x' shown as part of the typical analysis concentration is used as a decimal place holder. Actual certified values are reported to the number of digits shown if possible, with a numerical value in place of the 'x'. Actual certified values may vary both above and below those indicated and may have more or less significant figures.

Values given as less than, denoted by "<", indicate that those elements are typically below this value. No intentional addition is made for these elements, however these elements will be certified to the actual composition observed.

## Alu-H2™ Hydrogen RM Application Notes

**Description of RM:** Arconic Alu-H2 ™ Lot A is manufactured from 5005 aluminum alloy rod. The product dimensions are ~½" diameter x ~23 ½" length (~1.3 cm x ~58 cm) and ~½" diameter x ~71 ½" length (~1.3 cm x ~182 cm)**.**

**Intended Use:** Arconic Alu-H2 ™ is provided in rod form and is intended for use in inert gas fusion analysis of hydrogen in aluminum as described in ASTM method E2792. The reference material can be used to establish the instrument analysis parameters and provide ongoing verification of analytical performance.

**Instructions for Use:** Arconic Alu-H2 ™ must be prepared in accordance with ASTM E2792 Standard Test Method for Determination of Hydrogen in Aluminum and Aluminum Alloys by Inert Gas Fusion. Failure to properly prepare the material will lead to incorrect analysis. The sample should be machined using a lathe or milling machine to the manufacturers recommended specifications. A fine surface is important for obtaining accurate results. Rough surfaces may lead to excessively high surface readings and may, in extreme cases, cause high bulk results. Diamond tipped tool bits and use of ethyl alcohol or isopropyl alcohol lubricant during machining may be used to improve the surface and prevent overheating of the sample.

**Analysis:** Seven commercial /industrial laboratories participated in the determination of the hydrogen content and estimated uncertainty of this material. Four of the laboratories are accredited to ISO 17025 for hydrogen analysis. Various models of inert gas fusion hydrogen analyzers utilizing thermal conductivity (TC) and/or infrared (IR) detection technology were used for this analysis. A total of 55 samples were tested at a single ISO 17025 accredited location to assess the within lot homogeneity and 106 additional samples were tested at multiple facilities to determine the reference material content and uncertainty.

**Shelf Life:** Arconic Alu-H2 ™ is considered stable when stored in a manner that prevents contamination or physical damage, no shelf life or expiration date has been determined.

**Traceability:** Arconic Alu-H2 ™ is traceable through LECO 762-747 Lot 0643 and LECO 501-529 lot 10470-5 to NIST SRM 352c.

***NOTE: Manufacturing and assignment of composition for Alu-H2™ Hydrogen reference material is not included in the scopes of the quality accreditations held by Arconic Spectrochemical Reference Materials.***

ARCONIC

# Alu-$H_2$ ™

ARCONIC

## REFERENCE MATERIAL FOR THE ANALYSIS OF HYDROGEN CONTENT IN ALUMINUM

**Typical Analysis**

| Catalog Number | mg Hydrogen / kg Al |
|---|---|
| Alu-$H_2$ ™ | 0.068 ±0.018 |

The reference value above is based on analysis following ASTM method E2792 at seven independent laboratories. Included are locations accredited to ISO 17025 for this analysis and locations which are not accredited but routinely analyze hydrogen within the aluminum industry.

The given limits of uncertainty represent a combined uncertainty and seek to estimate, with a 95% confidence level, a range in which the true value is expected to lie. The uncertainties cited represent the statistical assessment of the within lot homogeneity, between laboratory analysis variability and technical judgment. The uncertainties cited represent an expanded uncertainty given by U = kuc where uc represents the combined standard uncertainty and k is a coverage factor chosen to represent a target confidence level. For this application, k=2 and U expresses the estimated 95% confidence level. This expression is consistent with guidelines given in the ISO document “Guide to the Expression of Uncertainty in Measurement” and NIST Technical Note 1297 “Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results”.

The given limits of uncertainty represent a combined uncertainty and seek to estimate, with a 95% confidence level, a range in which the true value is expected to lie. The uncertainties cited represent the statistical assessment of the within lot homogeneity, between laboratory analysis variability and technical judgment. The uncertainties cited represent an expanded uncertainty given by U = kuc where uc represents the combined standard uncertainty and k is a coverage factor chosen to represent a target confidence level. For this application, k=2 and U expresses the estimated 95% confidence level. This expression is consistent with guidelines given in the ISO document “Guide to the Expression of Uncertainty in Measurement” and NIST Technical Note 1297 “Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results”.