

# Spectrochemical Reference Materials

Certified Reference Materials for Metals Analysis



**ARCONIC**

## Product Catalog

### Quality Accreditations

ISO 17034: 2016

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](mailto:referencematerials@arconic.com)

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## 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](http://www.arconic.com).

### **Arconic Spectrochemical Reference Materials**

Arconic's Spectrochemical Reference Materials business has been operating for over 70 years. Accredited to ISO 17034:2016, 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 350 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](mailto:referencematerials@arconic.com)

### Arconic Spectrochemical Reference Materials' Amazon Storefront



[www.amazon.com](http://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 or product information sheet
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](mailto:referencematerials@arconic.com)

Visit us on the web at: [www.arconic.com/crms](http://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 (Formal Distributors)

### UNITED STATES

Arconic Technologies LLC  
Arconic Spectrochemical Reference Materials 100  
Technical Dr. New Kensington, PA 15068-0001 Phone:  
(724) 337-5816 or 1-800-858-4638  
Fax: (724) 337-4090  
Email: [referencematerials@arconic.com](mailto:referencematerials@arconic.com)

Brammer Standard Company, Inc.  
[www.brammerstandard.com](http://www.brammerstandard.com)  
14603 Benfer Road  
Houston, TX 77069 USA  
Phone: 281-440-9396  
Fax: 281-440-4432  
Email: [contact@brammerstandard.com](mailto:contact@brammerstandard.com)

Rocky Mountain Reference Materials, LLC  
[www.RMRMs.com](http://www.RMRMs.com)  
521 Violet St.  
Golden, CO 80401 USA  
Phone: 720-943-7676  
Fax: 720-943-7670  
Email: [Sales@RMRMs.co](mailto:Sales@RMRMs.co)

### CHINA

DHJ Analysis Co., LTD  
[www.dhj-1.com](http://www.dhj-1.com)  
Rm 1008 Zhongkun Bld. N.  
59 Gaoliangqiaoxie St.,  
Haidian Dist., Beijing, 100044, CHINA  
Phone: +86-10-62275851 or +86-(0)13701318289  
FAX: +86-10-62273150  
Email: [ulia97@yahoo.com](mailto:ulia97@yahoo.com)

Thintech Co., Limited Chengdu Office  
[www.thintech-hk.com](http://www.thintech-hk.com)  
1-102#, 1st Building, Zone D  
West Zhigu, No. 166 Wu Xing  
Four Road, Wuhou District, Chengdu, 610045, CHINA  
Phone: +86-13881837121 or +86-28-61331462  
Fax: +86-28-87448356  
Email: [cohen\\_xi@thintech-hk.com](mailto:cohen_xi@thintech-hk.com)

### JAPAN

Seishin Trading Co. Ltd.  
[www/seishin-syoji.co.jp](http://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](mailto:h_yoshizawa@seishin-syoji.co.jp)  
[info@seisin-syoji.co.jp](mailto:info@seisin-syoji.co.jp)

## Accreditations

### ISO 17034:2016

Arconic Spectrochemical Reference Materials holds an accreditation to ISO 17034: 2016 international standard for “General Requirements for the Competence of Reference Material Producers”. ISO 17034 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 17034 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 ISO 17034 accreditation logo.

#### Scope

Arconic Spectrochemical Reference Materials holds certificate number [AR-1993](#) and operates a Quality Management System which complies with ISO 17034:2016 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 9001:2015 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: FM 763899  
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-H<sub>2</sub><sup>TM</sup> Hydrogen RM:** Arconic Alu-H<sub>2</sub><sup>TM</sup> 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 or product information sheet.

**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 or product information sheet (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  $U = k \cdot uc$  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. parenthetical numbers.

**Traceability:** CRMs are prepared and certified for the spectrochemical analyses of aluminum alloys using methodology similar to that described in ASTM methods E716, E1251, and E3061. 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, both solid and liquid, directly traceable to NIST SRMs. Balances used during production and analyses are calibrated with and traceable to NIST standard weight sets.





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	<0.0050	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	<0.0050	<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 page 66
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	<0.0010	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	<0.0010	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	<0.0010	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.



CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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 page 66
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.



**CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS**



**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	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0005
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	<0.0010	<0.0010	<0.0010	0.002x	<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 page 66
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	<0.0010	<0.0010	0.020x	<0.0005x	<0.0005x	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	0.010x	<0.0030	
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	<b>Yes</b>
	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	<0.0010	<0.0010	<0.020	<0.0005x	<0.0005x	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<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.

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CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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 page 66
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	

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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	
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	0.020x	<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	0.020x	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 page 66
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.

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**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 page 66
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	

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CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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 page 66
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.

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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
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	<0.0050	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010
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 page 66
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.





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
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 page 66
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.

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**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	<0.0010	<0.0010	<0.0010	0.001x	<0.0010	<0.0005
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
	WA-5754	0.20x	0.18x	0.060x	0.15x	3.5x	0.040x	<0.0050	0.007x	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 page 66
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	<0.0010	<0.0010	0.020x	<0.0005x	<0.0005x	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	0.010x	<0.0030	
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	
	WA-5754	<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	

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.

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CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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	<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 page 66
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	<0.0010	<0.0010	<0.020x	<0.0005x	<0.0005x	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.015x	<0.0030	

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CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0005	
	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	<0.0010	<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 page 66
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	<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	
	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.



CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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
6013	SS-6013	0.80x	0.25x	0.85x	0.50x	1.0x	0.050x	<0.0050	0.13x	0.050x	<0.0010	<0.0010	<0.0010	<0.0005	<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
6016	SS-6016	1.2x	0.25x	0.10x	0.10x	0.45x	0.050x	<0.0050	0.10x	0.070x	<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
6026	SS-6026	1.0x	0.35x	0.35x	0.60x	0.90x	0.15x	<0.0050	0.15x	0.10x	<0.0010	<0.0010	<0.0010	<0.0005x	0.80x	<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

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 page 66
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	
6013	SS-6013	<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	
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	
6016	SS-6016	<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	
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
6026	SS-6026	<0.0010	<0.0010	0.015x	<0.0005x	<0.0005x	<0.0010	0.20x	<0.0010	<0.0010	0.025x	<0.0010	0.015x	<0.0030	
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	

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.



**CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS**



**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	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
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
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
6082	SS-6082	1.0x	0.25x	0.050x	0.70x	0.90x	0.12x	<0.0050	0.10x	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
6181	ST2-6181	0.90x	0.30x	0.060x	0.060x	0.80x	0.050x	0.005x	0.040x	0.040x	<0.0010	<0.0010	<0.0010	0.0005x	0.001x	0.001x
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

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 page 66
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	<b>Yes</b>
	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	
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	
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	
6082	SS-6082	<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	
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	
6181	ST2-6181	0.001x	0.001x	0.020x	0.0005x	0.0005x	<0.0010	0.001x	0.001x	<0.0010	0.001x	0.001x	0.010x	0.010x	
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	

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.



CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



6XXX ALLOYS

Typical Analysis - Weight Percent																
Alloy	Catalog Number	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B	Be	Bi	Ca
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
6361	SS-6361	0.75x	0.20x	0.35x	0.15x	1.2x	0.17x	0.020x	0.12x	0.075x	<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 page 66
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	
6361	SS-6361	<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.



**CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS**



**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 page 66
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	<b>Yes</b>
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.





CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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 page 66
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.

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CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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
7085	SS-7085	0.030x	0.050x	1.6x	0.020x	1.5x	0.020x	<0.0050	7.5x	0.030x	<0.0010	<0.0010	<0.0010	<0.0005x	<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 page 66
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	
7085	SS-7085	<0.0010	<0.0010	0.020x	<0.0005x	<0.0005x	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	<0.0010	0.010x	0.11x	
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.

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CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS



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
8009	SS-8009	1.8x	8.7x	<0.050	<0.100	<0.050	<0.100	<0.050	<0.250	<0.100	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050
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 page 66
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	
8009	SS-8009	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	1.3x	<0.050	
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	

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CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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	<0.0010	<0.0010	<0.0010	<0.0005x	0.020x	<0.0030
	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 page 67	
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	<0.0010	<0.0010	0.015x	<0.0010	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	0.020x	<0.0010	0.010x	<0.0030		
	KB-242							0.050x			0.050x					

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CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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 page 67
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	

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CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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
	KA-319	6.0x	0.60x	3.4x	0.30x	0.30x	<0.0050	0.050x	0.60x	0.12x	<0.0010	<0.0010	<0.0010	<0.0005x	0.004x	<0.0030
	KB-319	6.0x	1.0x	3.5x	0.25x	0.075x	<0.0050	0.35x	2.5x	0.20x	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0030
	KC-319	6.5x	0.60x	3.4x	0.40x	0.30x	<0.0050	0.10x	0.80x	0.10x	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0030
	KD-319	5.7x	0.30x	3.2x	0.050x	0.050x	0.010x	0.050x	0.050x	0.050x	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0030
320	ST2-320	7.0x	1.0x	3.4x	0.40x	0.30x	<0.0050	0.10x	2.0x	0.15x	<0.0010	<0.0010	<0.0010	0.0005x	0.001x	0.001x
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

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 page 67
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	
	KA-319	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	0.020x	0.002x	<0.0010	0.020x	0.020x	0.020x	<0.0030	
	KB-319	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	0.010x	0.010x	<0.0030	
	KC-319	<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	
	KD-319	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	0.015x	0.010x	<0.0030	
320	ST2-320	0.001x	0.001x	0.020x	0.0005x	0.0005x	<0.0010	0.001x	0.001x	<0.0010	0.001x	0.010x	0.010x	0.10x	
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	

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.



CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



3XX ALLOYS

Typical Analysis - Weight Percent																
Alloy	Catalog Number	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B	Be	Bi	Ca
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
354	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
	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

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 page 67
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	
354	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	
	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	

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.



**CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS**



**3XX ALLOYS**

Typical Analysis - Weight Percent																
Alloy	Catalog Number	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B	Be	Bi	Ca
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
357	KA-357	6.5x	0.020x	0.020x	0.035x	0.40x	<0.0050	<0.0050	0.010x	0.060x	<0.0010	<0.0010	<0.0010	0.045x	<0.0010	<0.0030
	KB-357	7.5x	0.050x	0.15x	0.070x	0.70x	<0.0050	<0.0050	0.070x	0.18x	<0.0010	<0.0010	<0.0010	0.0001x	<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
	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	KE-360	10.0	0.80x	0.080x	0.30x	0.45x	<0.0050	0.10x	0.10x	0.050x	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0030
	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

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 page 67
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	
357	KA-357	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	0.005x	<0.0010	<0.0010	0.005x	0.015x	0.010x	<0.0030	
	KB-357	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	<0.0030	<0.0010	<0.0010	<0.0010	0.010x	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	
	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	
360	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	
	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	
	KE-360	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	0.050x	<0.0010	<0.0010	0.050x	0.015x	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	

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.





CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



3XX ALLOYS

Typical Analysis - Weight Percent																
Alloy	Catalog Number	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B	Be	Bi	Ca
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
367	KA-367	9.5x	0.20x	0.015x	0.30x	0.35x	<0.0050	0.025x	0.05x	0.1x	<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
	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

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 page 67
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	
367	KA-367	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	0.025x	<0.0010	<0.0010	0.025x	0.015x	0.010x	<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	<b>Yes</b>
	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	
	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	

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.

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CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



3XX ALLOYS

Typical Analysis - Weight Percent																
Alloy	Catalog Number	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B	Be	Bi	Ca
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 page 67
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.



CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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
	KD-413	12.0	0.80x	0.90x	0.30x	0.080x	0.050x	0.25x	0.25x	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	<0.0010	<0.0010	<0.0010	<0.0005x	<0.0010	<0.0030
444	KC-443	5.1x	1.1x	0.15x	0.10x	0.050x	<0.0050	0.10x	0.15x	0.10x						
	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 page 67
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	
	KD-413	<0.0010	<0.0010	0.020x	<0.0010	<0.0010	<0.0010	0.050x	<0.0010	<0.0010	0.10x	0.015x	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	<0.0010	<0.0010	<0.020	<0.0010	<0.0010	<0.0010	0.050x	<0.0010	<0.0010	0.050x	0.020x	<0.020	<0.0030	
444	KC-443							0.20x			0.15x	0.020x			
	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.



CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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	<0.0010	<0.0010	<0.0010	0.002x	<0.0010	<0.0010
	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 page 67
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	<0.0030	<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	<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	
	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.

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CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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 page 67
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.

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CERTIFIED REFERENCE MATERIALS FOR CASTING ALLOYS



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 page 67
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.



**CERTIFIED REFERENCE MATERIALS FOR TRACE METALS**



**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
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

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
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

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.



**CERTIFIED REFERENCE MATERIALS FOR TRACE METALS**



**TRACE METALS**

Typical Analysis - Weight Percent																
Alloy	Catalog Number	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Ti	Ag	As	B	Be	Bi	Ca
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
6181	ST2-6181	0.90x	0.30x	0.060x	0.060x	0.80x	0.050x	0.005x	0.040x	0.040x	<0.0010	<0.0010	<0.0010	0.0005x	0.001x	0.001x
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
320	ST2-320	7.0x	1.0x	3.4x	0.40x	0.30x	<0.0050	0.10x	2.0x	0.15x	<0.0010	<0.0010	<0.0010	0.0005x	0.001x	0.001x

Typical Analysis - Weight Percent														
Alloy	Catalog Number	Cd	Co	Ga	Li	Na	P	Pb	Sb	Sc	Sn	Sr	V	Zr
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
6181	ST2-6181	0.001x	0.001x	0.020x	0.0005x	0.0005x	<0.0010	0.001x	0.001x	<0.0010	0.001x	0.001x	0.010x	0.010x
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
320	ST2-320	0.001x	0.001x	0.020x	0.0005x	0.0005x	<0.0010	0.001x	0.001x	<0.0010	0.001x	0.010x	0.010x	0.10x

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## 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)	(0.04)			(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)	(0.12)	(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 be used for reproducibility of spectral response, but are not certified with respect to true composition. Only approximate values are issued for these RMs.



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)	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.010							
SI-7	7.0x	(0.5)	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.010							
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											0.020x			
SI-7											0.020x			
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.

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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.

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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	<0.0050	<0.0050	<0.010	<0.0050	<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.

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**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.

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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.

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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	0.12x	0.25x	0.030x	0.030x	0.030x	0.030x	0.030x	7.0x	0.030x							
ZN-7								10.x								

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.

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**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.

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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	0.080x	0.12x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050			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.

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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.

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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.

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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	0.050x	0.15x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050						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.

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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	7.5x	0.15x	<0.0050	<0.0050	<0.0050	<0.0050	<0.010	<0.0050	<0.010						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.

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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.

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**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.

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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.

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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	0.07x	0.12x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050						
LI-2	0.07x	0.12x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050						
LI-3																
LI-4	0.07x	0.12x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050						
LI-5																
LI-6	0.07x	0.12x	<0.0050	<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	
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.

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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	<0.0050						
NA-2	0.050x	0.15x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050							
NA-3	0.050x	0.15x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050							
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.

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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	7.5x	0.15x	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050						
NA-12	7.5x	0.15x	<0.0050	<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	<0.0050						
NA-14	7.5x	0.15x	<0.0050	<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	<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.

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**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.

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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	<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
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.

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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.

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**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.

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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	1.0x	0.45x	0.25x	0.06x	0.65x	0.22x	0.040x	0.080x	0.030x							
ZR-13																
ZR-14	1.0x	0.45x	0.25x	0.06x	0.65x	0.22x	0.040x	0.080x	0.030x							
ZR-15	1.0x	0.45x	0.25x	0.06x	0.65x	0.22x	0.040x	0.080x	0.030x							

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.

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**CERTIFIED REFERENCE MATERIALS FOR WROUGHT ALLOYS**



**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-2095	0.060x	0.075x	4.3x	0.12x	0.52x	<0.0050	<0.0050	0.13x	0.050x	0.42x	<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
	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
	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
	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
	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
	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

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**CERTIFIED REFERENCE MATERIALS FOR HIGH SILICON ALLOYS**



**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
	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
	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
	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
	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

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## 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:** 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 or product information sheet.

**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 or product information sheet (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  $U = k \cdot u_c$  where  $u_c$  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. parenthetical numbers.

**Traceability:** CRMs are prepared and certified for the spectrochemical analyses of aluminum alloys using methodology similar to that described in ASTM methods E716, E1251, and E3061. 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, both solid and liquid, directly traceable to NIST SRMs. Balances used during production and analyses are calibrated with and traceable to NIST standard weight sets.



**MicrO CRMs**



**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.



MicrO CRMs



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  $\sim\frac{1}{2}$ " diameter x  $\sim 23\frac{1}{2}$ " length ( $\sim 1.3$  cm x  $\sim 58$  cm) and  $\sim\frac{1}{2}$ " diameter x  $\sim 71\frac{1}{2}$ " length ( $\sim 1.3$  cm x  $\sim 182$  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.**



Alu-H<sub>2</sub>™



REFERENCE MATERIAL FOR THE ANALYSIS OF HYDROGEN CONTENT IN ALUMINUM

Typical Analysis	
Catalog Number	mg Hydrogen / kg Al
Alu-H <sub>2</sub> ™	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".