

Analytical Reference Materials International

Provisional Certificate of Analysis

Certified Reference Material



Grade: Alloy 254SMO / UNS S31254

Part Number (Q.A. NO.): IARM 302A

Certificate Date: 12/10/2008

Certificate No.: 302A-12102008-IARM-P

Revision Date: 12/10/2008

Interpretation of Data

1. Certified values listed below reflect analysis results submitted by qualified analytical laboratories using a combination of methods and instrumentation that emulate actual methods and instrumental techniques currently utilized in the analytical community and are reported as % wt. unless otherwise noted.
2. Any data reported and enclosed by a **parentheses ()** is a "best estimate" and is NOT CERTIFIED. This data could not be quantified sufficiently for certification. It was however, reported by enough laboratories to be considered as potentially present in the matrix of the material being examined.
3. The "Inter-laboratory Analysis Program" (ILAP) utilized in the establishment of the data are an ongoing program with permanent membership. Certain elements may be selected by a consensus of the members for more extensive testing. Therefore the data in **brackets []** indicates further testing is in process.
4. The "**±Estimated Uncertainty**" is enclosed by a **parentheses ()** below the individual element's concentration and is based on a Confidence Interval at 95%. Included in this estimated uncertainty, are the combined effects of method imprecision, material inhomogeneity, and any bias between methods.

Important: A "User Registration Card" accompanies all shipments. This card should be completed immediately upon receipt of materials with the appropriate user information. This is the only way in which ARMI can guarantee customer updates or possible data modifications!

<u>Aluminum</u> [0.015] [(0.002)]	<u>Boron</u> [0.0027] [(0.0002)]	<u>Carbon</u> [0.023] [(0.001)]	<u>Cobalt</u> [0.069] [(0.002)]	<u>Chromium</u> [20.4] [(0.1)]	<u>Copper</u> [0.69] [(0.01)]	<u>Manganese</u> [0.93] [(0.01)]
<u>Molybdenum</u> [6.15] [(0.03)]	<u>Nitrogen</u> [0.183] [(0.001)]	<u>Niobium</u> [0.01] [(0.004)]	<u>Nickel</u> [17.7] [(0.1)]	<u>Oxygen</u> [0.003] [(0.001)]	<u>Phosphorus</u> [0.024] [(0.001)]	<u>Sulfur</u> [0.0008] [(0.0001)]
<u>Selenium</u>	<u>Silicon</u> [0.55] [(0.01)]	<u>Tantalum</u>	<u>Tin</u> [0.008] [(0.002)]	<u>Titanium</u> [0.003] [(0.001)]	<u>Vanadium</u> [0.05] [(0.003)]	<u>Tungsten</u> [0.02] [(0.01)]

The laboratories participating in the "Inter-Laboratory Analysis Program" (ILAP) and certification of this material are as follows:

AK Steel, Middletown Works - Middletown, OH

ATI Allvac, Lockport - Lockport, NY

Bodycote Testing - Los Angeles, CA

Bodycote Testing - Riverside Park, Middlesbrough, UK

Colorado Metallurgical Services - Denver, CO

Latrobe Specialty Steel Co. - Latrobe, PA

The Timken Company - Canton, OH

Anderson Laboratories, Inc. - Greendale, WI

Bodycote Testing - Chicago, IL

Bodycote Testing - Portland, OR

Carpenter Technology Corporation - Reading, PA

Laboratory Testing, Inc. - Hatfield, PA

Special Metals IncoTest - Hereford, UK

Traceability: All members of the "Inter-Laboratory Analysis Program" (ILAP) listed above validate test methods and instrument performance utilizing SRMs produced by the National Institute of Standards and Technology, (NIST) as well as other CRMs and RMs produced by recognized Certifying Bodies from around the world. The specific SRMs, CRMs, and RMs applicable to the material covered by this certificate are: BS 187, 189, IARM 157B, RV 717, 720, 721, LECO 501-643, 501-674, 502-016, NIST 367, 849, 850, C1154, 1154, 1155, 1156, 1172, 1233, 1267, BS 303, LECO 501-643, 501-644, 502-016, IARM 157B, BS 189, NIST 160A, IARM 5C, LECO 501-643, 502-016, ALPHA AR881, BCS 351, 454/1, 462/1, 466, HAS 904A, R5657, LECO 501-551, 502-102, NIST 106, 106A, 160A, 337A, 1160, 1161, 1162, 1163, 1164, 1754, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, , BAS 401/1, 401/2, 402/1, 403/1, 404/1, 405/1, 406/1, 407/2, 408/1, 409/1, 410/2, 474, JSS ST01, 168-4, 169-4, 170-4, 171-4, BS CA-1, CA-2, CA-3, CA-4, CA1A, CA3A, LECO 501-510, 501-645, NIST 101E, 101G, 160B, BCS 464/1, IARM 5B, IARM 4B, 5B, 212A, 239A, LECO 501-674, 502-016, ECRM 287/1, BS 317, IH RR99/3, LECO 501-673, NIST 362, IARM 27D, 157A, BS 189, ALPHA AR1848, LECO 502-072, X54710, IC9028, NIST 1151, 1152, 1153, 1154, 1761, 1762, 1763, 1764, 1765, 1766, 1767, LECO 502-016, IARM 4B, 15A, 157A, LECO 501-501, 501-510, 501-550, 502-016, CPI 4400-10M343, CN3M, IARM 157A, 212A, 239A, SUS 318, 18/10, 12/3, 14/18, 13/10, 12/2.

A specific line of traceability is established to NIST and other Certifying Bodies for those elements that are noted as "Certified Values" on the Certificates of Analyses referenced above.

See Reverse Side for Statistical Data and Additional Information Regarding this Material.

The following data and accompanying statements represent all pertinent information reported in the ILAP as it applies to the chemical characterization of this material as of 12/10/2008.

302A	Al	B	C	Co	Cr	Cu	Mn	Mo	N	Nb	Ni	O	P	S	Se
1	0.016	0.0025	0.020	0.067	20.03	0.710	0.950	6.07	0.180	0.0123	17.74	0.00278	0.0230	0.0010	<0.0003
2	0.018	0.0026	0.0240	0.071	20.322	0.695	0.912	6.162	0.1828	0.008	17.73	0.0043	0.0228	0.00086	0.0033
3	0.0127	0.0028	0.024	0.0733	20.62	0.696	0.930	6.217	0.185	0.024	17.791	0.0032	0.022	0.0007	0.00002
4	0.0149	0.0025	0.0233	0.0770	20.477	0.7071	0.9116	6.193	0.1797	0.0019	17.533	0.0015	0.02525	0.0007	<0.005
5	0.017	0.0024	0.0240	0.0683	20.289	0.7137	0.933	6.207	0.1813	0.02	17.600	0.0030	0.0276	0.0010	0.005
6	0.0128	0.0029	0.0230	0.063	20.28	0.691	0.911	6.142	0.18303	0.0167	17.65	0.00375	0.023	0.00064	0.3098
7	0.0171	0.0031	0.0238	0.070	20.265	0.712	0.931	6.18	0.1817	0.0072	17.643	0.0040	0.0241	0.0010	0.0153
8	0.0142	0.0025	0.022	0.070	20.633	0.697	0.942	6.148	0.184	0.0163	17.748	0.0022	0.0222	0.0007	
9	0.0096		0.0262	0.0649	20.28	0.677	0.902	6.146	0.184	0.005	17.80	0.0031	0.0267	0.0005	
10	0.0149		0.0246	0.070	20.240	0.720	0.922	6.10	0.1825	0.0031	17.756	0.0034	0.025	0.0012	
11			0.0177	0.066	20.335	0.654	0.971	6.129	0.187	0.010	17.496	0.0043	0.0258	0.0009	
12			0.0228	0.0680	20.307	0.676	0.912			0.012	17.55		0.0245		
13			0.0211		20.859	0.6436	0.9386			0.0033			0.0258		
14			0.0184		19.985		0.8887			0.0147			0.0233		
Mean	0.0147	0.0027	0.0225	0.0690	20.3516	0.6917	0.9254	6.1540	0.1828	0.0110	17.6698	0.0032	0.0244	0.0008	0.0667
STDV.	0.0025	0.0002	0.0024	0.0038	0.2320	0.0233	0.0213	0.0446	0.0022	0.0067	0.1057	0.0009	0.0017	0.0002	0.1360
Certified	0.015	0.0027	0.023	0.069	20.4	0.69	0.93	6.15	0.183	0.01	17.7	0.003	0.024	0.0008	
95% C.I.	0.002	0.0002	0.001	0.002	0.1	0.01	0.01	0.03	0.001	0.004	0.1	0.001	0.001	0.0001	
Methods	X,A,I,O	I,O	C,O	X,A,I,O	X,W,A,I,O	X,A,I,O	X,A,I,O	X,A,I,O	F,O	X,I,O	X,W,I,O	F	X,I,O	C,O	

Legend: W = Classical, C = Combustion, F = Fusion, A = AA or GFAA, I = ICP or DCP, D = DC Arc, O = OE, X = XRF, G = GDMS, H = Hollow Cathode OE

302A	Si	Sn	Ta	Ti	V	W	Ag	As	Bi	Ca	H	Mg	Pb	Zn	Zr
1	0.520	0.0081	0.0163	0.0037	0.0477	0.029	0.00033	0.0140	<0.00003	0.0065	0.0001437	0.0033	0.000172	0.0183	0.0044
2	0.549	0.0095	0.0042	0.005	0.052	0.0100	0.0002	0.0075	0.0057	0.003		0.0004	0.0033	0.001	<0.0001
3	0.526	0.0090	0.001	0.0023	0.047	0.0283		0.0072	0.00002	0.00248		0.0027	0.0002		0.0001
4	0.5633	0.0085	0.003	0.0013	0.0610	0.018		0.001	0.0182	0.0034			0.001		<0.001
5	0.549	0.0095	<0.001	0.0040	0.056	0.0297		0.0157					0.0025		0.0013
6	0.564	0.004		0.003	0.0585	0.0263									0.0056
7	0.541	0.0056		0.0037	0.0519	0.024									
8	0.551	0.005		0.0022	0.043	0.019									
9	0.564	0.0093		0.0016	0.051	0.0073									
10	0.535			0.0043	0.0485	0.031									
11	0.533				0.051	0.0242									
12	0.598				0.0582										
13	0.5488				0.0551										
14	0.4992														
Mean	0.5458	0.0076	0.0061	0.0031	0.0524	0.0224	0.0003	0.0091	0.0080	0.0038	0.0001	0.0021	0.0014	0.0097	0.0029
STDV.	0.0237	0.0021	0.0069	0.0012	0.0052	0.0080	0.0001	0.0059	0.0093	0.0018	#DIV/0!	0.0015	0.0014	0.0122	0.0026
Certified	0.55	0.008		0.003	0.05	0.02									
95% C.I.	0.01	0.002		0.001	0.003	0.01									
Methods	X,W,I,O	X,H,I,O		X,O	X,A,I,O	X,I,O									

Legend: W = Classical, C = Combustion, F = Fusion, A = AA or GFAA, I = ICP or DCP, D = DC Arc, O = OE, X = XRF, G = GDMS, H = Hollow Cathode OE

The International Standards Organization (ISO) definitions, expressed in ISO Guide 30-1992 list the following:

Certifying Body: Any technically competent body (organization or firm, public or private) that issues a reference material certificate which provides the information detailed in ISO Guide 31. The only generally accepted certifying body in the United States for primary standards - Standard Reference Materials (SRM) is the U. S. Department of Commerce, National Institute of Standards & Technology, (NIST), Gaithersburg, MD. All other certifying bodies in the United States produce Reference Materials (RM) or Certified Reference Materials (CRM).

Reference Material (RM): Material or substance one or more of whose property values are sufficiently homogeneous and well established to be used for the calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Certified Reference Material (CRM): Reference material, accompanied by a certificate, one or more of whose property values are certified by a procedure which establishes its traceability to an accurate realization of the unit in which the property values are expressed, and for which each certified value is accompanied by an uncertainty at a stated level of confidence.

Inter-Laboratory Analysis Program (ILAP): Although ASTM Standard E691-87 applies to inter-laboratory studies to "Determine the Precision of a Single Test Method", it is also a well thought out and logical plan for conducting an inter-laboratory program involving multiple techniques. Therefore, the planning, conducting, analyzing, protocol, and treatment of data resulting from this inter-laboratory program were performed utilizing the guidelines established in ASTM E691-87.

Methods of Analysis: In view of the fact, that the "Inter-Laboratory Analysis Program" entails a wide variety of materials, no single analytical method would provide optimum data results. Therefore, the methods utilized were a combination of ASTM Standard Methods for classical wet chemistry, ICP, AA, Optical Emission, and X-Ray spectrometric methods. The determinations for Carbon, Sulfur, Nitrogen, and Oxygen are the result of combustion instrument procedures.

Selection of Materials: A "batch" or "series" is defined as a single bar of one continuous length and heat. The majority of materials are in wrought condition; other methods of manufacture are utilized as a less desirable resort. ILAP samples are taken by removing a section, a minimum of, every one-twelfth of total length from the entire bar. A portion of the section is converted to chips and thin (pin) disk for analysis by classical wet chemistry, ICP, AA, and combustion procedures, and the balance remains as a thick disk for OES and X-Ray analysis. Each member of the ILAP is furnished a sample pack from a specific location on the batch bar. This systematic sampling procedure results in the homogeneity being reflected as a product of the overall statistics and certified data. This method of homogeneity testing is in accordance with ISO Guide 34, regarding the systematic selection and testing of a representative number of units for the assessment of homogeneity.


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