

Analytical Reference Materials International

Certificate of Analysis Certified Reference Material



Grade: **Alloy 6B / UNS R30016**

Part Number (Q.A. NO.): **IARM 95C**

Certificate Date: **09/29/1999**

Certificate No.: **95C-09291999-IARM-F**

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.
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 "**± Confidence Interval at 95%**" is enclosed by a **parentheses ()** below the individual element's concentration.

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> 0.13 (0.01)	<u>Boron</u> (0.002)	<u>Carbon</u> 1.10 (0.01)	<u>Cobalt</u> 57.0 (0.3)	<u>Chromium</u> 29.0 (0.2)	<u>Copper</u> 0.014 (0.002)	<u>Iron</u> 2.47 (0.05)	<u>Magnesium</u> (0.0004)
<u>Manganese</u> 1.55 (0.02)	<u>Molybdenum</u> 1.37 (0.01)	<u>Nitrogen</u> 0.033 (0.001)	<u>Niobium</u> (0.008)	<u>Nickel</u> 2.88 (0.03)	<u>Oxygen</u> (0.004)	<u>Phosphorus</u> 0.009 (0.001)	<u>Sulfur</u> 0.001 (0.001)
<u>Silicon</u> 0.54 (0.02)	<u>Tantalum</u> 0.03 (0.01)	<u>Tin</u> <0.0005	<u>Titanium</u> 0.004 (0.001)	<u>Tungsten</u> 3.96 (0.03)	<u>Vanadium</u> 0.004 (0.001)	<u>Zirconium</u> (0.005)	

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

Allvac - Monroe, NC

Bodycote Metal Analysis, Inc. - Huntington Park, CA

Haynes International, Inc. - Kokomo, IN

Laboratory Testing, Inc. - Hatfield, PA

Special Metals Wiggins LTD. - Hereford, England

Allvac Lockport - Lockport, NY

Cannon Muskegon Corp. - Muskegon, MI

Howmet Dover Alloy - Dover, NJ

Lockheed Martin Astronautics - Littleton, CO

Wah Chang - Albany, OR

Anderson Laboratories, Inc. - Greendale, WI

Deloro Stellite - Belleville, Ontario, Canada

Howmet Research Center - Whitehall, MI

Special Metals Corporation - Huntington, WV

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: NIST 167, 16E, IARM 95A, BS 170, CAN BF94P1, BF94P2, VV-417, CLAX ST6, NIST 1765, 361, 349a, 661, 367, 2165, 16f, 1254, 1187, 363, 2423, 2425a, 2424a, 168, 348a, 367, 364, 361, 123b, 363, 132b, c2402, 3167, 160b, 1208-1, 134a, 173b, 135, 155, 343a; LECO 401-553, 502-016, NIST 1765, 361, 349A, 661, 367, 2165, 16F, 1254, 364, 1187, 160B, 1208-1, 168, 134A, 363, 173B, 168, 1187, 2423, 2424A, 2425A, 135, C2402, 155, 343A, 348A, 1765, 123B, 132B, 3167, 363, LECO 501-553, 502-016, HAYNES718, H-5, NIST C1251, 1159, 1160, 1186, 1187, 1188, 1190, 1191, 1192, 1193, 1195, 1197, 1198, 1201, 1203, 1204, 1205, 1206/2, 1207/1, 1207/2, 1208/1, 1208/2, 1243, 1244, 1245A, 1247, 1271, 1762, 131F, 367, 6G, LECO 501, 502, 501-550, 502-256, 501-644, 502-016, SM1199, SM1200, BS170B, BS171B, U3933, U3934, LECO 501-503, BCS401, SPEX 5-106AL, 5-140B, 6-17CO, 5-146CU, 6-48FE, 5-151MG, 5-148MN, 5-96MO, 5-78NB, 5-68NI, 5-149P, 5-89SIA, 5-156TI, 6-24V, 6-51W, 5-85ZR, 5-19AG, 5-30AS, 6-50BI, 5-24CA, 4-255LA, 5-43PB, 6-1SN, 6-2TA, 5-139Y, 5-46ZN, LECO 501-505, NIST 349, KD760-3, TALN-500, TBA-250, TCUN-500, TFEN-500, TMNN-500, TMONF-500, TNBF-250, TNIN-500, TPN-250, TSINF-500, TTINF-500, TVN-250, TWNF-250, TZRH-250, NIST 2160, LECO 501-553, IARM 95A, 95B, BS 170A, NIST 131F, 101G, 3107, IARM 95A, NIST 3107, 131F, 101G, IARM 95A, BS 170b, IARM 95b, NIST 1242, BS 170B, 170A, IARM 64B, LECO 501-506, 501-643, 502-226

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 11/08/2002.

95C	Al	B	C	Co	Cr	Cu	Fe	Mg	Mn	Mo	N	Nb	Ni	O	P	S	Si
1	0.145	0.0012	1.09	56.83	29.66	0.019	2.56	0.0007	1.48	1.36	0.0320	0.01	2.85	0.0009	0.008	0.002	0.56
2	0.142	0.0029	1.10	57.5	28.54	0.015	2.44	0.0001	1.54	1.35	0.034	0.01	2.95	0.0016	0.008	0.001	0.503
3	0.14	0.0007	1.12	56.8	28.56	0.015	2.48	0.0002	1.47	1.352	0.033	0.01	2.952	0.0004	0.010	0.0004	0.56
4	0.12	0.0046	1.107	57.27	29.05	0.012	2.509	0.0002	1.587	1.38	0.032	0.016	2.88	0.0112	0.008	0.0029	0.565
5	0.135	0.0038	1.102	56.6413	29.01	0.009	2.53	0.0005	1.58	1.38	0.0324	0.003	2.86	0.0114	0.0098	0.001	0.50
6	0.136	0.00029	1.111	56.82	29.20	0.015	2.47	0.0005	1.55	1.37	0.0318	0.002	2.84	0.0043	0.0106	0.0005	0.54
7	0.1397		1.11	56.6	29.00	0.0135	2.55	0.0006	1.53	1.392	0.0340	0.0136	2.8333	0.00078	0.009	0.0020	0.55
8	0.12		1.103	57.333	28.67	0.0099	2.452	0.0001	1.539	1.353	0.0329	0.0043	2.826		0.0092	0.00171	0.5904
9	0.1251		1.10		28.68	0.018	2.315		1.484	1.365	0.0322	0.021	2.881		0.010	0.002	0.537
10	0.12		1.099		29.112	0.013	2.526		1.573	1.399		0.002	2.845		0.0087		0.50
11	0.14		1.12		29.60	0.0100	2.47		1.564	1.392		0.0088	2.94		0.011		0.5673
12	0.1297		1.11		29.4	0.0120	2.33		1.59	1.40		0.004					0.494
13	0.142		1.0839		29.1101	0.015	2.43		1.59	1.362							0.55
14			1.1097		28.82				1.5820	1.35							0.5638
15									1.54								0.51
Mean	0.1327	0.0022	1.1043	56.9743	29.0455	0.0135	2.4693	0.0004	1.5471	1.3735	0.0328	0.0087	2.8779	0.0044	0.0091	0.0015	0.5415
STDV.	0.0093	0.0018	0.0104	0.3419	0.3666	0.0031	0.0785	0.0002	0.0424	0.0182	0.0009	0.0060	0.0478	0.0049	0.0010	0.0008	0.0306
Certified	0.13	(0.002)	1.10	57.0	29.0	0.014	2.47	(0.0004)	1.55	1.37	0.033	(0.008)	2.88	(0.004)	0.009	0.001	0.54
95% C.I.	0.01		0.01	0.3	0.2	0.002	0.05		0.02	0.01	0.001		0.03		0.001	0.001	0.02
Methods	A,X,I,O	D,I,O	C,O	W,X,I,O	W,X,I,O	X,I,O,A	X,I,O,A	X,D,I,O,A	X,I,O	X,I,O	F	X,I,O	X,I,O	F	W,X,I,O	C,W,O	X,I,O

Methods: W = Classical, C = Combustion, F = Fusion, A = AA or GF AA, I = ICP or DCP, D = DC Arc, O = OE, X = XRF, G = GDMS

95C	Sn	Ta	Ti	V	W	Zr	Ag	As	Bi	Ca	H	La	Pb	Sb	Se	Y	Zn
1	<0.0020	0.036	0.004	0.003	4.06	0.01	<0.0005	<0.01	<0.00005	0.001		0.001	<0.0005	<0.0020	<0.0001	<0.0001	<0.0020
2	<0.001	0.018	0.006	0.005	3.94	0.01	<0.00005	<0.0001	<0.001			<0.001	<0.001	<0.0001	<0.0001	0.0006	<0.0001
3	0.00022	0.0423	0.004	0.003	3.92	0.01	<0.0001	0.0005	<0.00005			0.0018	0.00004	<0.0001		<0.0001	0.0028
4	<0.001	0.0242	0.002	0.0049	3.904	0.0007	<0.0001	<0.0001	<0.0001			0.0003	<0.0001				
5	0.0003	0.0310	0.006	0.0022	3.97	0.005			<0.0001			<0.01	<0.0001				
6	0.0019	0.03	0.002	0.003	3.93	0.0019						0.0024					
7			0.0021		3.94	0.0017						0.0019					
8			0.005		3.972	0.0035											
9			0.004		3.977	0.002											
10			0.005		3.93												
11					3.955												
12					4.05												
13					3.9429												
14					3.98												
Mean	0.0008	0.0303	0.0040	0.0035	3.9608	0.0050	#DIV/0!	0.0005	#DIV/0!	0.0010	#DIV/0!	0.0010	0.0014	#DIV/0!	#DIV/0!	0.0006	0.0028
STDV.	0.0009	0.0086	0.0015	0.0012	0.0468	0.0040	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	0.0008	0.0012	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Certified	<0.0005	0.03	0.004	0.004	3.96	(0.005)	<0.0005	<0.0005	<0.0005			<0.001	<0.001				
95% C.I.		0.01	0.001	0.001	0.03												
Methods	X,D,I	X,D,I	X,I,O	X,D,I	A,O	D,A,O	D,A,O	I		I,O	D,X,A,O	A	A,O	D,A,O	X,I,O	A,I	O,I

Methods: W = Classical, C = Combustion, F = Fusion, A = AA or GF AA, I = ICP or DCP, D = DC Arc, O = OE, X = XRF, G = GDMS

The International Standards Organization (ISO) definitions, expressed in ISO Guide 30-1981-(E) list the following:

Certifying Body: A technically competent body (organization or firm, public or private) that issues a Reference Material Certificate. The only generally accepted certifying body in the United States is the U. S. Department of Commerce, National Institute of Standards & Technology, (NIST), Gaithersburg, MD.

Reference Material (RM): A material or substance with one or more properties which are sufficiently well established to be used for calibration of an apparatus, the assessment of a measurement method, or for assigning values to materials.

Certified Reference Material (CRM): A reference material with one or more properties whose values are certified by a technically valid procedure accompanied by or traceable to a certificate or other documentation, which is issued by a Certifying Body.

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. The majority of materials are in wrought condition. Other methods of manufacture are utilized as a last resort, only in the case of those materials being unavailable in wrought condition. "Batch" samples are taken by removing a one-inch cross section for every thirteen inches of total length from the entire bar. Twenty-five percent of the one inch cross section is converted to chips for analysis by classical wet chemistry, ICP, AA, and combustion procedures and seventy-five percent remains in a solid disk form for OES and X-Ray analysis where applicable. Each member of the ILAP is furnished both a solid sample and the corresponding supply of chips from a specific location on the batch bar. This massive sampling procedure results in the homogeneity being reflected as a product of the overall statistics and certified data.

Certified by: 
 William D. Britt, President & General Manager
 Analytical Reference Materials International Corporation

Certificate No.: 95C-09291999-IARM-F
 Certificate Date: 09/29/1999
 Revision Date/No.: 11/08/2002