Analytical Reference Materials International
Certificate of Analysis
Certified Reference Material

Grade: Nitronic 60

Part Number (Q.A. NO.): IARM 18B

Certification Date: 10/23/1998 **Certificate No.: 18B-10231998-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!

Aluminum	Boron	Carbon	Cobalt	Chromium	Copper	Manganese
0.006	(0.002)	0.085	0.124	16.37	0.362	8.58
(0.001)		(0.002)	(0.005)	(0.06)	(0.005)	(0.05)
Molybdenum	**Nitrogen**	**Niobium**	**Nickel**	**Oxygen**	**Phosphorus**	**Sulfur**
0.31	0.157	0.004	8.50	0.0016	0.032	0.0012
(0.01)	(0.004)	(0.001)	(0.04)	(0.0003)	(0.002)	(0.0001)
Silicon	**Tin**	**Titanium**	**Vanadium**	**Tungsten**		
3.67	0.003	0.006	0.058	0.020		
(0.03)	(0.001)	(0.001)	(0.001)	(0.002)		

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

AK Steel - Middletown, OH
Allvac Steel - Lockport, NY
Armco, Inc. - Butler, PA
Chicago Spectro Service Laboratories - Chicago, IL
Laboratory Testing, Inc. - Dublin, PA
Timken Latrobe Steel - Latrobe, PA
Allegheny Ludlum Corp. - Brackenridge, PA
Anderson Laboratories, Inc. - Greendale, WI
Bodycote Metals Analysis, Inc. - Huntington Park, CA
Jorgensen Forge Corp. - Seattle, WA
Lockheed Martin Astronautics - Littleton, CO
Wisconsin Centrifugal, Inc. - Waukesha, WI

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 1226, 1261A, 1262A, 1265A, C1151, C1152, C1153, C1154, 1155, 1193, 1194, 1195, 1230, C2400, JSS 650, 651, 652, 653, 654, 655, BCS331, 332, 333, 334, 335, 336, 337, 338, ARMCO 8709, 8710, 8711, 8712, MBH14933, 14934, 14935, BSC 401/1, 402/1, 403/1, 404/1, 405/1, 406/1, 407/1, 408/1, 409/1, 410/1, IARM 1B, 2B, 4B, 5B, 9B, 11B, 152A, 157A162A, 163A, 205A, 27B, 28B, 29B, 30B, 31B, 32B, 33B, 34B, 35B, 36B, 48B, 49B, 155A, 156A, 164A, 165A, 166A, 167A, 168A, 169A, 170A, 171A, 172A, BS 181, NIST 348A, 121D, 133B, 345, 101E, 2159, LECO 501-644, 501-643, TSNH-500, TASN-100, TBA-250, TBIN-250, TCAN-500, TMGN-500, TPBN-250, TSEN-100, TTEN-100, TZRN-250, NIST 1763,1765,1766,368,NITRO 60, LECO 501-553, 501-551, NIST 15L, 346A, 73C, IARM 18A, BS 181, LECO 501-550, IARM 18A, BS 181, IARM 18A, LECO 501-674, 501-675, 502-016, 502-256, AR 663, IARM 18A, BS 182, NIST 367, 2165, 2166, 2167, C 25, 28, BS 81C, 82A, 88C, CT 455, LECO 501-643, 501-644, A10

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.

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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 11/13/2000.

18B	Al	B	C	Co	Cr	Cu	Mn	Mo	N	Nb	Ni	O	P	S	Si
1	0.0071	0.0035	0.090	0.125	16.46	0.364	8.71	0.32	0.152	0.005	8.56	0.0016	0.035	0.0011	3.61
2	0.005	0.00039	0.0851	0.1374	16.26	0.365	8.644	0.301	0.149	0.005	8.53	0.0019	0.0286	0.0009	3.7129
3	0.0065	0.0007	0.0805	0.125	16.43	0.3497	8.53	0.32	0.164	0.002	8.53	0.0012	0.032	0.0013	3.68
4	0.0056	0.0010	0.0821	0.116	16.530	0.361	8.65	0.3166	0.1549	0.002	8.545	0.0014	0.0278	0.0015	3.645
5	0.007	0.0002	0.0881	0.115	16.301	0.356	8.497	0.299	0.15633	0.005	8.430	0.0021	0.0359	0.0010	3.696
6	0.007	0.0037	0.0853	0.119	16.35	0.366	8.50	0.299	0.1575	0.002	8.50	0.0017	0.0334	0.001	3.646
7	0.004	0.0007	0.081	0.130	16.364	0.364	8.550	0.30	0.164	0.004	8.595	0.0014	0.033	0.0013	3.676
8	0.005		0.0832	0.12	16.26	0.360	8.71	0.297	0.157		8.53		0.0333	0.0015	3.67
9			0.086	0.118	16.39	0.352	8.47	0.304	0.151		8.40		0.0322	0.0014	3.74
10			0.084	0.125	16.468	0.366	8.62	0.31	0.160		8.426		0.0272	0.0012	3.6338
11			0.0861	0.132	16.41	0.376	8.61	0.309			8.52		0.034	0.0011	3.71
12			0.0858		16.20		8.505				8.462		0.032		3.619
Mean	0.0059	0.0015	0.0848	0.1236	16.3686	0.3618	8.5830	0.3069	0.1566	0.0036	8.5023	0.0016	0.0320	0.0012	3.6699
STDV.	0.0012	0.0015	0.0028	0.0073	0.0987	0.0073	0.0851	0.0087	0.0051	0.0015	0.0599	0.0003	0.0028	0.0002	0.0403
Certified	**0.006**	**(0.002)**	**0.085**	**0.124**	**16.37**	**0.362**	**8.58**	**0.31**	**0.157**	**0.004**	**8.50**	**0.0016**	**0.032**	**0.0012**	**3.67**
95% C.I.	**0.001**		**0.002**	**0.005**	**0.06**	**0.005**	**0.05**	**0.01**	**0.004**	**0.001**	**0.04**	**0.0003**	**0.002**	**0.0001**	**0.03**
Methods	X,D,I,O	I,O,D	C	X,I,O	X,W,O	X,I,O	X,I,O	X,I,O	F	X,I,O	X,W,O	F	X,I,O	C	X,W,O

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

18B	Sn	Ti	V	W	Ag	As	Bi	Ca	H	Mg	Pb	Se	Ta	Te	Zr
1	0.0033	0.0049	0.057	0.0172	<0.0001	0.006372	0.000349	0.0005		0.0002	0.0021	0.001	0.0061	0.00002	0.03
2	0.003	0.005	0.0572	0.0213		0.0057	<0.001			<0.001	<0.001	<0.000025	<0.0001		0.0005
3	0.003	0.0074	0.061	0.022		<0.01					0.00038	0.0109			0.003
4	0.00303	0.00675	0.056	0.018							0.0033	<0.0001			<0.01
5	0.004	0.006	0.055	0.0214							<0.0001				
6	0.0023	0.006	0.055	0.020							0.0001				
7		0.006	0.057	0.018											
8			0.0573												
9			0.058												
10			0.062												
11			0.058												
12															
Mean	0.0031	0.0060	0.0576	0.0197		0.0060	0.0003	0.0005		0.0002	0.0015	0.0060	0.0061	0.0000	0.0112
STDV.	0.0006	0.0009	0.0022	0.0020		0.0005					0.0015	0.0070			0.0164
Certified	**0.003**	**0.006**	**0.058**	**0.020**	**<0.001**	**(0.006)**	**<0.001**	**<0.001**		**<0.005**	**<0.005**	**<0.01**	**<0.01**	**<0.001**	**<0.05**
95% C.I.	**0.001**	**0.001**	**0.001**	**0.002**											
Methods	X,A,O,D	X,I,O	X,I,O	X,I,O	A	A,O,D	A,D	I		I,D	X,A,O,D	X,A,O	X,I	A	I,O,D

Methods: W = Classical, C = Combustion, F = Fusion, A = AA or GFAA, 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 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

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