

Brammer Standard Company, Inc.

Certificate of Analysis

BS 197A

Grade RA 333 Nickel Base Alloy Reference Material

Unified Number N06333

AMS Number 5593, 5717

	Certified Value ¹	Estimate of Uncertainty ²		Certified Value ¹	Estimate of Uncertainty ²
Analysis listed as percent by weight					
C	0.050	0.003	B	0.0019	0.0003
Mn	1.56	0.02	Co	3.06	0.05
P	0.021	0.002	Nb	0.20	0.01
Si	0.96	0.02	Ti	0.017	0.003
Cu	0.119	0.006	V	0.051	0.005
Ni	44.44	0.05			
Cr	25.11	0.05	Informational values ³		
Fe	18.07	0.09	Mg	(0.0030)	
Mo	2.99	0.04	N	(0.052)	
W	2.80	0.04	Pb	(0.0002)	
Al	0.185	0.004	S	(<0.001)	

¹ The certified value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

² The uncertainties listed are based on value judgments of the material inhomogeneity and the 95% confidence interval. The half-width confidence interval C(95%) is shown on page 2.

³ Data in parentheses are not certified and are provided for information only.

See the following pages for more information.

Certificate Number REV2-197A-080610

New Certificate Number REV2-197A-080610 was Revised on August 6, 2010 to show estimates of uncertainty

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069-2895
Telephone (281) 440-9396 Fax (281) 440-4432

Analysis	C	Mn	P	Si	Cu	Ni	Cr	Fe	Mo	W
1	0.049	1.54	0.020	0.94	0.11	44.36	25.05	17.95	2.95	2.74
2	0.049	1.55	0.020	0.94	0.113	44.414	25.07	17.98	2.95	2.77
3	0.050	1.57	0.021	0.96	0.116	44.42	25.11	18.00	2.98	2.78
4	0.050	1.57	0.022	0.96	0.116	44.42	25.12	18.00	2.99	2.80
5	0.053	1.58	0.024	0.963	0.12	44.43	25.15	18.02	3.01	2.80
6				0.98	0.122	44.44	25.15	18.14	3.02	2.85
7				0.997	0.126	44.50		18.15	3.04	2.85
8					0.127	44.51		18.20		
9						44.51		18.23		
Average	0.0502	1.562	0.0214	0.963	0.1188	44.445	25.108	18.074	2.991	2.799
Std Dev	0.0016	0.016	0.0017	0.020	0.0061	0.051	0.041	0.1051	0.034	0.041
Certified	0.050	1.56	0.021	0.96	0.119	44.44	25.11	18.07	2.99	2.80
t	2.78	2.78	2.78	2.45	2.36	2.31	2.57	2.31	2.45	2.45
C(95%)	0.0020	0.020	0.0021	0.019	0.0051	0.040	0.043	0.081	0.032	0.038

Analysis	Al	B	Co	Nb	Ti	V	Mg	N	Pb	S
1	0.18	0.0017	3.01	0.19	0.012	0.043	0.0028	0.0517	0.0001	0.0005
2	0.18	0.0017	3.03	0.19	0.015	0.0467	0.0032	0.053	0.00017	<0.0003
3	0.183	0.0017	3.04	0.194	0.016	0.047			0.0004	<0.0005
4	0.184	0.0018	3.06	0.195	0.017	0.052				
5	0.187	0.0021	3.08	0.20	0.018	0.054				
6	0.188	0.0022	3.08	0.20	0.020	0.0553				
7	0.19		3.13	0.21	0.0215	0.057				
Average	0.1846	0.00187	3.061	0.197	0.0171	0.0507	0.0030	0.0524	0.00022	
Std Dev	0.0039	0.00023	0.040	0.007	0.0032	0.0052	0.0003	0.0009	0.00016	
Certified	0.185	0.0019	3.06	0.20	0.017	0.051	(0.0030)	(0.052)	(0.0002)	<0.001
t	2.45	2.57	2.45	2.45	2.45	2.45	12.71	12.71	4.30	
C(95%)	0.0036	0.00024	0.037	0.007	0.0029	0.0048	0.0025	0.0083	0.00039	

Values listed as mass fraction expressed as percent.

Values in parentheses are not certified but provided for information only.

$C(95\%) = (t \times sd) / \sqrt{n}$ The half-width confidence interval, where t is the appropriate Student's t value, sd is the interlaboratory standard deviation, and n is the number of acceptable mean values. For further information regarding the confidence interval for the certified value, see ISO Guide 35:2006 section 6.

Co-operating Laboratories: Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
 Allegheny Ludlum Steel Corp., Lockport, New York
 Analytical Associates, Detroit, Michigan
 Andrew S. McCreath & Son, Inc., Harrisburg, Pennsylvania
 Brammer Standard Co., Houston, Texas
 Crucible Specialty Metals, Syracuse, New York
 Crucible Research, Pittsburgh, Pennsylvania
 J. Dirats and Co., Westfield, Massachusetts
 Jessop Steel Co., Washington, Pennsylvania
 Keywell - Vac Air, Frewsburg, New York
 Ledoux & Company, Teaneck, New Jersey
 VHG Laboratories, Inc., Manchester, New Hampshire

Analysis: Chemical analyses were made on chips prepared by a lathe from the certified portion of the bars. Each individual value listed above is the average of each analyst's results.

Analytical Methods: Methods of analysis used were a combination of ASTM Standard Methods E 350, E 354, and 1019 plus additional ICP and AA spectrometric methods.

Traceability: The following Certified Reference Materials were used to validate the analytical data listed on page 2: NIST SRM 126b, 349, 866, 867, 1247 and BCS 251, 387/1.

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Practice E 826 and found acceptable.

Form: This Reference Material was machined by Brammer Standard Company in the form of a disc, approximately 38 mm diameter and 12 mm thick. The bar stock used for this material was produced by hot-rolling billets.

Certified Area: The entire depth of the disc may be used.

Use: This Reference Material is intended for use in spark atomic emission and x-ray spectrometric methods of analysis. The entire depth of the disc may be used.

Caution: As with any bar material, avoid spark atomic emission spectrometric burns in the center of the disc (5 mm radius), as some segregation may be present.

Sample Preparation: For best analytical results, use the same method for preparing the analytical surface on all reference materials as you use for production specimens. Avoid overheating the disc during surface preparation.

Certificate Number: The unique identification number for this certificate of analysis is REV2-197A-080610. This BS 197A Certificate of Analysis was revised to show the estimates of uncertainty for the certified values. After reviewing the analytical data, a third decimal place was certified for copper and aluminum. The sulfur value was changed to uncertified due to lack of sufficient analytical data. The certified value for tungsten was corrected to 2.80%. On the first revision, the iron analysis was revised and nickel analysis was added to certified elements on May 21, 1993 after a new interlaboratory testing program. The original certificate of analysis was produced on February 5, 1992.

Refer to the "Certificates" section of the Brammer Standard Company website for any revision to this or other Brammer Standard Company's Certificates of Analysis.

Safety Notice: A Material Safety Data Sheet (MSDS) is not required for this material. This material will not release or otherwise result in exposure to a hazardous chemical, under normal conditions of use. Inquiries concerning this Reference Material should be directed to:

Brammer Standard Co., Inc. 14603 Benfer Road Houston, Texas 77069-2895 USA	Phone: (281) 440-9396 Fax: (281) 440-4432	website: brammerstandard.com .email: contact@brammerstandard.com
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Certified by: _____ on August 6, 2010.
Beau R. Brammer

References:

*ASTM documents available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959,
Telephone: 610-832-9500 Fax: 610-832-9555 e-mail: service@astm.org Website: www.astm.org*

Versions used were those available at the time of interlaboratory testing

- E 354 Standard Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and Other Similar Iron, Nickel, and Cobalt Alloys
- E 826 Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials
- E 1019 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys

ISO Guides available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

ISO Guide 35:2006 Certification of reference materials - General and statistical principles.

Other useful documents available from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.

NIST Special Publication 260-100, Handbook for SRM Users

NIST Special Publication 829, Use of NIST Standard Reference Materials for Decisions on Performance of Analytical Chemical Methods and Laboratories

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