Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 182

Reference Material for High Manganese Stainless Steel

	Certified Value[1]	Estimate of of Uncertainty[2]	Information vlaues[3]	
Carbon	**0.037**	0.005	Nitrogen	(0.40)
Manganese	**15.09**	0.09	Niobium	(0.005)
Phosphorus	**0.022**	0.002	Tin	(0.003)
Silicon	**0.46**	0.01	Sulfur	(0.003)
Copper	**0.56**	0.01	Titanium	(0.003)
Nickel	**1.11**	0.03	Tungsten	(0.01)
Chromium	**16.67**	0.09		
Molybdenum	**0.99**	0.02		
Vanadium	**0.059**	0.006		
Cobalt	**0.032**	0.003		

(analysis listed as percent by weight)

[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 possible bias in the determined analytical values. No attempt is made to derive exact statistical measurements of imprecision because several methods were used in the determination of most constituents.

[3] Values in parentheses are not certified and are provided for information only.

Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
Alpha Research Laboratory, Stevensville, Michigan
Brammer Standard Co., Inc., Houston, Texas
Crucible Specialty Metals Div., Syracuse, New York
J. Dirats and Co., Inc., Westfield, Massachusetts
Earle M. Jorgensen Company, Seattle Washington
Turret Alloys Ltd., Analytical Services, Sheffield, England
VHG Laboratories, Inc., Manchester, New Hampshire

See the following pages for more information. New Certificate Number REV-182-073010

New Certificate Number REV-182-073010 was Revised on July 30, 2010 to show estimates of uncertainty

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

BS 182 Analysis listed as percent by weight REV-182-073010

Analysis	C	Mn	P	Si	Cu	Ni	Cr	Mo	V
1	0.031	14.97	0.019	0.44	0.55	1.08	16.50	0.958	0.054
2	0.035	15.00	0.020	0.459	0.55	1.10	16.58	0.97	0.055
3	0.039	15.05	0.022	0.46	0.557	1.10	16.65	0.98	0.056
4	0.040	15.07	0.022	0.46	0.56	1.12	16.69	0.99	0.059
5	0.040	15.12	0.022	0.46	0.56	1.14	16.69	1.00	0.064
6		15.19	0.022	0.465	0.565	1.14	16.69	1.01	0.067
7		15.21	0.024	0.47	0.57		16.72	1.01	
8							16.74		
9							16.80		
Average	0.0370	15.087	0.0216	0.459	0.559	1.113	16.673	0.988	0.0592
Std Dev	0.0039	0.091	0.0016	0.009	0.007	0.024	0.089	0.020	0.0053
Certified	0.037	15.09	0.022	0.46	0.56	1.11	16.67	0.99	0.059
t	2.78	2.45	2.45	2.45	2.45	2.57	2.31	2.45	2.57
C(95%)	0.0049	0.084	0.0015	0.009	0.007	0.025	0.068	0.019	0.0055

continued from above

Analysis	Co	N	Nb	Sn	S	Ti	W
1	0.031	0.373	0.0024	0.0025	0.002	0.001	0.006
2	0.031	0.420	0.005	0.003	0.002	0.001	0.008
3	0.034		0.006	0.004	0.003	0.001	0.008
4	0.034		0.006		0.004	0.005	0.019
5						0.007	
Average	0.0325	0.3965	0.0049	0.0032	0.0028	0.0030	0.0103
Std Dev	0.0017	0.033	0.0017	0.0008	0.0010	0.0028	0.0059
Certified	0.032	(0.40)	(0.005)	(0.003)	(0.003)	(0.003)	(0.01)
t	3.18	12.71	3.18	4.30	3.18	2.78	3.18
C(95%)	0.0028	0.299	0.0027	0.0019	0.0015	0.0035	0.0094

$C(95\%) = (t \times sd)/\sqrt{n}$ 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.

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

Analysis: Chemical analyses were made on millings from cross-sections 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 for classical wet chemistry plus additional ICP and AA spectrometric methods and combustion instrument procedures for carbon and sulfur.

Form: This Reference Material was originally machined by Brammer Standard Company in the form of a disc, approximately 38 mm diameter and 10 mm thick. It is currently available only in the 38 mm diameter and 7 mm thick size. The bar stock used for this material was produced by hot-rolling billets and annealing.

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.

Use: This Reference Material is intended for use in spark atomic emission and x-ray spectrometric methods of analysis. Refer to ISO Guide 33 for information about the use of Reference Materials.

Certified area: 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.

Certificate Number: The unique identification number for this certificate of analysis is REV-182-073010. This BS 172A Certificate of Analysis was revised to show the estimate of uncertainty for the certified values. After reviewing the analytical data, the cobalt values was changed from 0.033% to 0.032% per normal data rounding practice. The sulfur and tin values were changed to uncertified due to lack of sufficient analytical determinations.

The first Certificate of Analysis for BS 182 was certified on April 11, 1988. 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. Phone: (281) 440-9396 website: brammerstandard.com
14603 Benfer Road
Houston, Texas 77069-2895 USA Fax: (281) 440-4432 email: contact@brammerstandard.com

Certified by: _____ on July 30, 2010
Beau R. Brammer

Referenced Documents

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.

ISO Guide 33:2000 Uses of certified reference materials