

Brammer Standard Company, Inc.
Certificate of Analysis

B.S. 17A
High Manganese Steel Reference Material

	Certified Value ¹	Estimate of Uncertainty ²		Certified Value ¹	Estimate of Uncertainty ²
Analysis listed as percent by weight					
C	0.588	0.005	Co	0.013	0.003
Mn	19.38	0.10	N	0.038	0.0015
P	0.043	0.005	Nb	0.06	0.010
S	0.005	0.002	Sn	0.012	0.005
Si	0.22	0.015	V	0.016	0.006
Cu	0.135	0.006			
Ni	0.060	0.005	Informational values		
Cr	1.37	0.05	B	(0.0001)	
Mo	0.52	0.02	Ti	(0.002)	
Al	0.052	0.004			

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.

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

The requirements of ISO Guide 31 and ISO Guide 35 were generally followed for the preparation of this reference material and certificate of analysis. This is a reference material as defined by ISO Guide 30.

See reverse side for more information.

Certificate Number 17A-122393

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
1	0.582	19.28	0.038	0.0031	0.201	0.128	0.057	1.30	0.50
2	0.585	19.33	0.041	0.0038	0.21	0.133	0.058	1.33	0.509
3	0.588	19.38	0.043	0.004	0.210	0.136	0.0596	1.35	0.509
4	0.588	19.38	0.0431	0.004	0.214	0.136	0.060	1.376	0.513
5	0.588	19.38	0.044	0.0046	0.218	0.136	0.0618	1.380	0.520
6	0.5887	19.42	0.0446	0.0049	0.221	0.137	0.062	1.383	0.52
7	0.59	19.46	0.046	0.0053	0.221	0.138	0.062	1.40	0.525
8	0.592			0.0060	0.227	0.139		1.41	0.525
9	0.592			0.007	0.229				0.530
10									0.530
Average	0.5882	19.376	0.0428	0.0047	0.217	0.1354	0.0601	1.3661	0.518
Std Dev	0.0032	0.058	0.0026	0.0012	0.009	0.0035	0.0020	0.0370	0.010
Certified	0.588	19.38	0.043	0.005	0.22	0.135	0.060	1.37	0.52

Analysis	Al	Co	N	Nb	Sn	V	B	Ti
1	0.0499	0.010	0.0370	0.047	0.0103	0.0107	0.0001	0.002
2	0.051	0.0118	0.0375	0.053	0.011	0.012	0.00006	0.0026
3	0.0519	0.012	0.0386	0.0558	0.011	0.015		
4	0.0524	0.0124	0.0388	0.0567	0.0111	0.015		
5	0.053	0.0126	0.0394	0.057	0.013	0.016		
6	0.054	0.015		0.057	0.014	0.0192		
7	0.055	0.018		0.068	0.017	0.02		
8					0.0177	0.023		
Average	0.0525	0.0131	0.0383	0.0564	0.0117	0.0164	0.0001	0.0023
Std Dev	0.0017	0.0026	0.0010	0.0063	0.0051	0.0041		0.0004
Certified	0.052	0.013	0.038	0.06	0.012	0.016	(0.0001)	(0.002)

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

Analysis: Chemical analyses were made on chips prepared by a lathe from the certified portion of the discs. The laboratories participating in the testing normally followed the requirements of ISO Guide 25. The individual values listed above are the average of each analyst's results. Methods of analysis used were a combination of ASTM Standard Methods E 350, E 352, E 354, E 1019, plus additional ICP, and AA spectrometric methods. The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 5L, 16f, 73c, 122g, 125b, 153a, 160b, 342a, 348a, 365; ECRM 085-1, 088-1, 235-1, 184-1, 478-1, 481-1; BCS 455/1, 456/1, 494, 495; BAM 126-1

Co-operating Laboratories: Some of the co-operating laboratories were:
 Analytical Associates, Detroit, Michigan
 Anarem Company, Prague, Czech Republic
 Brammer Standard Co., Inc., Houston, Texas
 Crucible Specialty Metals, Syracuse, New York
 J. Dirats and Co., Inc., Westfield, Massachusetts
 Shiva Laboratories, Inc., Cicero, New York
 VHG Laboratories, Inc., Manchester, New Hampshire

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

Traceability: This Reference Material was also examined by optical emission spectrometry and found to be compatible with the following Certified Reference Materials: NIST SRM 1233; SS 491, 492/1, 493, 494, 495

Source: This material was melted and cast by American Centrifugal, Birmingham, Alabama, using an electric arc furnace. It was chill-cast into a water-cooled sample mold producing 648 discs simultaneously.

Available Form: This Reference Material is available only in the form of a chill-cast disc, approximately 32 mm in diameter and 17 mm thick.

Certified Area: The certified area of each disc is the portion extending upward 10 mm from the larger diameter surface.

Note: Shrinkage cavities may appear in the top portion of some discs. These cavities are normal and will not affect the certified portion of the disc.

Use: This Reference Material is intended for use in optical emission and x-ray spectrometric methods of analysis.

Caution: Because of the high concentration of manganese, an averaging of two or three analytical measurements may be required. Be aware of interelement effects.

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.

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
14603 Benfer Road
Houston, Texas 77069-2895 USA Fax: (281) 440-4432

Certified by: _____ on December 23, 1993.
G. R. Brammer

Certificate Number 17A-122393

Referenced Documents

ASTM documents available from ASTM, 1916 Race Street, Philadelphia, PA, 19103.

E 350 - 90 Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

E 352 - 93 Standard Test Methods for Chemical Analysis of Tool Steels and Other Similar Medium and High-Alloy Steels

E 354 - 93 Standard Test Methods for Chemical Analysis of High-Temperature, Electrical, Magnetic, and other Similar Iron, Nickel, and Cobalt Alloys

E 826 - 85 (Reapproved 1990) Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

E-2 SM 9-43 Suggested Method for Optical Emission Vacuum Spectrometric Analysis of Hadfield Steel

E 1019-93 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 25 (Third edition, 1990), General requirements for the competence of calibration and testing laboratories.

ISO Guide 30 (Second edition, 1991), Terms and definitions used in connection with reference materials.

ISO Guide 31 (First edition, 1981), Contents of certificates of reference materials.

ISO Guide 33 (First edition, 1989), Uses of certified reference materials.

ISO Guide 35 (Second edition, 1989), Certification of reference materials - General and statistical principles.

Other useful documents available at no cost from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.

NBS 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