Brammer Standard Company, Inc.

Certificate of Analysis

BS 291A

Cast Iron Certified Reference Material[1]

	Certified Value[2]	Estimate of Uncertainty[3]		Certified Value[2]	Estimate of Uncertainty[3]
		Analysis listed as percent by weight			
C	**3.25**	0.02	**N**	**0.0063**	0.0008
Mn	**0.457**	0.010	**Sn**	**0.034**	0.002
P	**0.022**	0.002	**Ti**	**0.008**	0.002
S	**0.020**	0.001	**V**	**0.006**	0.001
Si	**2.28**	0.02			
Cu	**0.191**	0.012	Uncertified Values		
Ni	**0.095**	0.003	B	0.0004	
Cr	**0.098**	0.003	Ca	0.002	
Mo	**0.033**	0.002	Sb	0.003	
Mg	**0.024**	0.003	W	0.002	
Al	**0.011**	0.002			
Co	**0.007**	0.001			

[1] Brammer Standard Company, Inc., is accredited to ISO Guide 34 as a Reference Material Producer to produce Certified Reference Materials by A2LA (Certificate Number 656.02)

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

[3] 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.

See the following pages for more information.

Certificate Number 291A-030708p1

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BS 291A **Data listed as mass fraction expressed as percent.** **Certificate Number 291A-030708p2**

Analysis	*	C	*	Mn	*	P	*	S	*	Si	*	Cu	*	Ni	*	Cr	*	Mo	*	Mg
1	1	3.23	2	0.436	3	0.020	1	0.0185	6	2.262	2	0.1777	4	0.0922	2	0.0957	2	0.0323	2	0.0205
2	1	3.23	2	0.449	5	0.0203	1	0.019	2	2.270	8	0.182	2	0.0928	2	0.0959	2	0.0327	8	0.0207
3	1	3.24	8	0.459	5	0.0216	1	0.0193	6	2.285	2	0.1837	4	0.0930	2	0.0973	2	0.0329	2	0.0244
4	1	3.24	2	0.459	2	0.0216	1	0.0196	6	2.285	2	0.187	2	0.0932	2	0.098	2	0.0330	2	0.0250
5	1	3.247	2	0.459	2	0.0219	1	0.0201	8	2.29	4	0.193	2	0.0947	8	0.0982	8	0.035	2	0.0255
6	1	3.249	2	0.459	2	0.0223	1	0.0202	6	2.293	4	0.196	2	0.0965	4	0.100	2	0.035	2	0.026
7	1	3.256	2	0.4617	3	0.0243	1	0.0204	6	2.299	3	0.203	8	0.0969	2	0.1006				
8	1	3.264	2	0.469	8	0.0251	1	0.0209			3	0.206	2	0.097	4	0.102				
9	1	3.272					1	0.0209												
10	1	3.274																		
Average		3.250		0.4565		0.0221		0.0199		2.283		0.1911		0.0945		0.0985		0.0334		0.0237
Std Dev		0.016		0.0099		0.0018		0.0008		0.013		0.0102		0.0020		0.0022		0.0011		0.0024
Certified		3.25		0.46		0.022		0.020		2.28		0.191		0.095		0.098		0.033		0.024
# Labs		10		8		8		9		7		8		8		8		6		6
t		2.2622		2.3646		2.3646		2.306		2.4469		2.3646		2.3646		2.3646		2.5706		2.5706
C(95%)		0.0114		0.0083		0.0015		0.0006		0.012		0.0085		0.0017		0.0019		0.0012		0.0026

* Indicates method of analysis

(Continued from above)

Analysis	*	Al	*	Co	*	N	*	Sn	*	Ti	*	V	*	B	*	Ca	*	Sb	*	W
1	2	0.0098	4	0.0063	3	0.0053	8	0.0334	8	0.0064	8	0.0059	2	0.0002	2	0.0004	2	0.0011	7	0.00071
2	7	0.0103	8	0.0064	3	0.0056	2	0.0335	2	0.0070	2	0.006	7	0.00025	2	0.0005	2	0.0014	7	0.00099
3	8	0.0105	4	0.0064	3	0.0063	2	0.0341	2	0.0073	2	0.0060	8	0.00033	8	0.00072	9	0.0033	2	0.001
4	7	0.0111	2	0.0068	3	0.00652	2	0.0343	3	0.0082	2	0.0064	7	0.0004	2	0.0024	2	0.0033	7	0.0012
5	2	0.0116	3	0.0073	3	0.00668	2	0.0356	3	0.0084	2	0.0064	7	0.0006	2	0.003	8	0.0038	7	0.00143
6	2	0.0125	3	0.0074	3	0.00671	2	0.036	2	0.009	2	0.0069	5	0.0006	2	0.0031	2	0.005	8	0.003
7	2	0.0127	2	0.008	3	0.00685							5	0.0007					2	0.0034
8			2	0.0087																
Average		0.0112		0.0072		0.00628		0.0345		0.0077		0.0063		0.00044		0.0017		0.0030		0.0017
Std Dev		0.0011		0.0009		0.00060		0.0011		0.0010		0.0004		0.00019		0.0013		0.0015		0.0011
Certified		0.011		0.007		0.0063		0.034		0.008		0.006		(0.0004)		(0.002)		(0.003)		(0.002)
-# Labs		7		8		7		6		6		6		7		6		6		7
t		2.4469		2.3646		2.44690		2.5706		2.5706		2.5706		2.44690		2.5706		2.5706		2.4469
C(95%)		0.0010		0.0007		0.00055		0.0011		0.0010		0.0004		0.00018		0.0013		0.0016		0.0010

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

* Methods of analysis

1	Induction/IR ASTM E 1019	6	Gravimetric
2	ICP-AES	7	ICP-MS
3	Fusion -ASTM E 1019	8	Spark AES
4	Flame AAS	9	Graphite Furnace AAS
5	Spectrophotometric		

Co-operating Laboratories: The co-operating laboratories were:

Laboratory
National Analysis Center Iron and Steel, Beijing, China
Brammer Standard Company, Inc., Houston, TX
Dirats Laboratory, Westfield, MA
Laboratory Testing Inc, Hatfield, PA
Leco Technical Services Laboratory, St. Joseph, MI
Lehigh Testing Laboratories Inc,. New Castle, DE
VHG Labs, Manchester, NH

Certification Process: The requirements of ISO Guide 31, ISO Guide 34, ISO Guide 35, and ASTM Standard Guides E 1724 and E 1831 were followed for the preparation of this reference material and certificate of analysis. This is a Certified Reference Material as defined by ISO Guide 30.

Analysis: Chemical analyses were made on chips prepared by a lathe from the certified portion of the discs in accordance with ASTM Standard Practice E 1806. The laboratories participating in the testing normally followed the requirements of ISO Standard 17025. Methods of analysis used were a combination of ASTM Standard Test Method E 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 10g, 82b, 338, 363, 3101a, 3102a, 3107, 3109a, 3112a, 3113, 3114, 3132, 3134, 3136, 3139a, 3150, 3165, 3161a, 3162a, 3163; ECRM 480-1; CKD 227; BS CSN 2-1; LECO 501-105, 501-024, 501-551, 501-674; CMSI 1551

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable. It was also examined by optical emission spectrometry using ASTM Standard Test Method E 415 and found to be compatible with the following Reference Materials:. NIST SRM 1140, C2455; CKD 2458; BS CC-10, BS CC-18, BS 1C, BS 26A, BS29 .

Validity statement: ISO Guide 31 states that the certification should contain an expiration date for all materials where instability has been demonstrated or is considered possible, after which the certified value is no longer guaranteed by the certifying body. Whereas this material is in a solid form and stable, no expiration date is specified.

Source: This CRM was chill-cast white on opposite flat surfaces by a rapid unidirectional solidification procedure with the addition of inoculants. This CRM was produced by Greens Bayou Foundry, Houston, Texas..

Form: This CRM is in the form of a disc, approximately 34 mm in diameter and 17 mm thick.

Use: This CRM is intended for use in optical 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. Beware of possible voids in the center of the discs.

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 291A-030708-px, where x indicates the page number. Refer to future Brammer Standard Company catalogs for information on any revisions to this or other Brammer Standard reference materials. You may also obtain information on revisions of certificates from the internet at www.brammerstandard.com.

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 web: www.brammerstandard.com
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Houston, Texas 77069-2895 USA Fax: (281) 440-4432 e-mail contact@brammerstandard.com

Certified by: _____ on March 7, 2008
Beau R. Brammer

Brammer Standard Company, Inc., is accredited to ISO Guide 34 as a Reference Material Producer for the production of Certified Reference Materials and Reference Materials by A2LA (Certificate Number 656.02)
The scope of accreditation is listed on the website: www.brammerstandard.com

By Certificate Number 10539, the Quality System of Brammer Standard Company, Inc., is registered to ISO 9001:2000 by National Quality Assurance, U.S.A.

Brammer Standard Company's Chemical Laboratory is accredited to ISO Standard 17025 by A2LA.
(Certificate Number 656.01)

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

E 826 - 85 (Withdrawn 2005) Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

E 1019 - 2003 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys

E 1724 - 95 (Reapproved 2001) Standard Guide for Testing and Certification of Metal and Metal-Related Reference Materials

E 1806 - 96 (Reapproved 2006) Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

E 1831 - 96 (Withdrawn 2005) Standard Guide for Preparing Certificates for Reference Materials Relating to Chemical Composition of Metals, Ores, and Related Materials.

ISO Guides and Standards available from Global Engineering - www.global.ihs.com

ISO Standard 17025 (Second edition, 2005), General requirements for the competence of calibration and testing laboratories.

ISO Guide 30 (Second edition, 1992), Terms and definitions used in connection with reference materials.

ISO Guide 31 (Second edition, 2000), Reference materials -Contents of certificates and labels.

ISO Guide 33 (Second edition, 2000), Uses of certified reference materials.

ISO Guide 34 (Second edition, 2000), General requirements for the competence of reference material producers.

ISO Guide 35 (Third edition, 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