Brammer Standard Company, Inc.

Revised Certificate of Analysis

B.S. 410A

AISI Stainless Steel Grade 410 Reference Material

	Certified Value[1]	Estimate of Uncertainty[2]		Certified Value[1]	Estimate of Uncertainty[2]
		Analysis listed as percent by weight			
C	**0.134**	0.005	**N**	**0.036**	0.001
Mn	**0.46**	0.02	**O**	**0.0059**	0.0006
P	**0.017**	0.002	**V**	**0.021**	0.003
S[3]	**0.0009**	0.0003			
Si	**0.37**	0.02			
Cu	**0.027**	0.003	Informational values		
Ni	**0.23**	0.02	Al	(0.003)	
Cr	**13.17**	0.07	Co	(0.011)	
Mo	**0.207**	0.010	Sn	(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.

[3] The certified sulfur value was revised on October 29, 2001, to correct a typing error on the original certificate of analysis. The original certified sulfur value was 0.0010%.

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 Rev410A-102901p1**

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BS 410A **Certificate Number Rev410A-102901p2**

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
1	0.130	0.440	0.016	0.0005	0.338	0.024	0.202	13.08	0.186
2	0.131	0.443	0.0165	0.0007	0.344	0.0243	0.226	13.12	0.204
3	0.132	0.446	0.0165	0.0008	0.365	0.0250	0.227	13.15	0.2040
4	0.132	0.450	0.0166	0.0009	0.370	0.027	0.228	13.16	0.205
5	0.1320	0.452	0.0166	0.0009	0.372	0.0273	0.230	13.165	0.206
6	0.134	0.463	0.0170	0.0010	0.372	0.0275	0.23	13.17	0.206
7	0.1360	0.464	0.0170	0.0010	0.378	0.0285	0.23	13.171	0.209
8	0.136	0.465	0.0175	0.0010	0.378	0.0285	0.2330	13.180	0.212
9	0.139	0.466	0.0175	0.0012	0.380	0.0285	0.24	13.19	0.212
10	0.139	0.467	0.0198	0.0013	0.38	0.029	0.242	13.202	0.215
11		0.476			0.387		0.260	13.21	0.221
12								13.255	
Average	0.1341	0.457	0.0171	0.00092	0.369	0.0270	0.232	13.171	0.2073
Std Dev	0.0032	0.012	0.0011	0.00022	0.015	0.0019	0.014	0.044	0.0088
Certified	0.134	0.46	0.017	0.0009	0.37	0.027	0.23	13.17	0.207

Analysis	N	O	V	Al	Co	Sn
1	0.0349	0.0054	0.018	0.0025	0.0108	0.0017
2	0.0349	0.0054	0.0195	0.0032	0.0108	0.0058
3	0.0350	0.0056	0.020		0.011	
4	0.035	0.0060	0.020			
5	0.0355	0.0060	0.0200			
6	0.0358	0.0061	0.022			
7	0.036	0.0064	0.0223			
8	0.037	0.0066	0.0224			
9	0.0365		0.024			
10	0.0366		0.0248			
11	0.0368					
12	0.037					
Average	0.0359	0.0059	0.0213	0.0029	0.0109	0.0038
Std Dev	0.0008	0.0004	0.0021	0.0005	0.0001	0.0029
Certified	0.036	0.0059	0.021	(0.003)	(0.011)	(0.004)

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 353, 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 73c, 121d, 153a, 160b, 293, 342a, 344, 345, 346, 892; ECRM 283-1, 284-1, 286-1, 292-1; BCS 466/1, 467/1, 475; GBW 01402.

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

Allegheny Ludlum Corporation, Brackenridge, Pennsylvania
Allegheny Ludlum Corporation, Lockport, New York
Analytical Associates, Detroit, Michigan
Andrew S. McCreath & Son, Inc., Harrisburg, Pennsylvania
Atlas Specialty Steels, Welland, Ontario, Canada
Brammer Standard Co., Inc., Houston, Texas
Crucible Specialty Metals, Syracuse, New York
Howmet Corporation, Alloy Division, Dover, New Jersey
J & L Specialty Steel, Midland, Pennsylvania
Jessop Steel Company, Washington, Pennsylvania
Jefery A. Nunes Labs, Inc., Neville Island, Pennsylvania
Slater Steels Corporation, Fort Wayne, Indiana
W. B. Coleman Testing Laboratories, Corp., Riverside, New Jersey

Additional analytical data: This material was used as an unknown test specimen in the Brammer Standard Company's Stainless Steel Proficiency Testing Program (PTP). The participating laboratories used a combination of combustion instruments and XRF and optical emission spectrometers. The data shown below are the results from the PTP.

	C	Mn	P	S	Si	Cu
Number of Labs	22	23	23	18	22	21
Grand Average	0.134	0.459	0.0169	0.0010	0.369	0.0279
Standard Deviation	0.005	0.023	0.0017	0.0005	0.017	0.0034

	Ni	Cr	Mo	V	N	O
Number of Labs	22	22	22	21	16	11
Grand Average	0.228	13.171	0.204	0.0226	0.0363	0.0064
Standard Deviation	0.015	0.167	0.009	0.0036	0.0015	0.0009

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 C1289; SS 469, 472; JSS 650-8; CMSI 2164, 2165, 2166, 2167

Source: This material was produced by Slater Steels Corporation, Fort Wayne, Indiana. The material was made in an electric arc furnace, refined by argon and oxygen decarburization, and cast into ingots by the ladle bottom pour method. The bar stock was hot rolled and heat treated.

Available Form: This Reference Material is available only in the form of a disc, approximately 37 mm (1.50") in diameter and 12 mm (0.50") thick.

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

Caution: As with any bar material, avoid optical 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 Rev410A-102901-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 brammerstandard.com

Revision: The certified sulfur value was revised on October 29, 2001, to correct a typing error on the original certificate of analysis dated December 31, 1993. The original certified sulfur value was 0.0010%.

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:

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

Certified by: _____ on October 29, 2001.
G. R. Brammer

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 353 - 93 Standard Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

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

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