

Brammer Standard Company, Inc.
14603 Benfer Road
Houston, Texas 77069 USA

Certificate of Analysis

**Reference Material for Carbon, Sulfur, and Nitrogen
in Stainless Steel**

Certified Values expressed as weight percent

BS CSN-4

	Certified Value	Standard Deviation
Carbon	0.011	0.0006
Sulfur	0.0008	0.00010
Nitrogen	0.026	0.0007

Owing to slight variations in pin weights, best precision and accuracy will be obtained by weighing each pin.

Certificate date: October 10, 1990

Certificate No. REC-CSN4-101090p1

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Telephone (281) 440-9396

Fax: (281)-440-4432

email: contact@brammerstandard.com

Material composition

The material used for making the BS CSN-4 is a modified type 302 stainless steel. The estimated composition in percent by weight is:

Mn 1.6 P 0.04 Si 0.20 Ni 9.4 Cr 18.2 Cu 3.8

Procedure

Each participating laboratory received a set of test specimens consisting of the new Brammer Reference Materials BS CSN-4 and five Certified Reference Materials (CRMs) as shown in the table on the following page in the column headings. The cooperating laboratories are listed on the last page. The participating laboratories were instructed to calibrate their instruments by their normal procedure and to analyze the CRMs and specimens in duplicate on four different days or shifts. All instruments used were manufactured by the LECO Corporation. The types used are listed below.

Lab	Carbon & Sulfur	Nitrogen	Lab	Carbon & Sulfur	Nitrogen
1	CS-244	TC-36	6	CS-444	TC-436
2	CS-444	TC-136	7	CS-244	TC-136
3	CS-344	TC-136	8	CS-244	TC-136
4	CS-444	TC-136	9	CS-244	TN-15
5	CS-444	TC-436AR	10	CS-344	

The test results from each laboratory were compared to certified concentrations by applying a simple linear regression. The regression coefficients were applied to reported determination to have observed concentrations of CRMs agree with certified values with a least sum of squares deviation. Results appear on the following page. Copies of the compiled data and regression calculations are available on request.

Certified Values for BS CSN-4

The carbon and sulfur values for BS CSN-4 were determined on calibrations that were tested with two NIST CRMs and are therefore traceable to NIST. The value for nitrogen on the BS CSN-4 was determined on calibrations that were tested with 2 CRMs approved by the European Committee of Iron and Steel Standardization (ECRM 284-1 and ECRM 287-1) and one CRM from Sweden (JK 37).

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Results of regression analysis

Carbon

Lab No.	BS CSN-4	NIST 101g	NIST 348a	ECRM 284-1	ECRM 287-1	JK 37
1	0.01225	0.01368	0.04403	0.01539	0.01563	0.01376
2	0.01064	0.01248	0.04390	0.01631	0.01593	0.01388
3	0.01096	0.01357	0.04400	0.01554	0.01610	0.01330
4	0.01086	0.01351	0.04392	0.01544	0.01678	0.01284
5	0.01206	0.01310	0.04396	0.01564	0.01635	0.01346
6	0.01066	0.01323	0.04396	0.01553	0.01641	0.01337
7	0.01139	0.01300	0.04397	0.01575	0.01612	0.01366
8	0.01092	0.01414	0.04400	0.01612	0.01482	0.01342
9	0.01024	0.01329	0.04542	0.01576	0.01681	0.01277
10	0.01108	0.01319	0.04396	0.01540	0.01651	0.01345
Average	0.01111	0.01332	0.04411	0.01569	0.01615	0.01339
Std Dev	0.00063					
Certified	0.011	0.0136	0.044	0.0156	0.016	0.0133

Sulfur

Lab No.						
1	0.00091	0.00780	0.00063	0.00061	0.00124	0.00112
2	0.00077	0.00781	0.00065	0.00072	0.00117	0.00105
3	0.00080	0.00780	0.00059	0.00071	0.00127	0.00102
4	0.00081	0.00781	0.00062	0.00071	0.00128	0.00098
5						
6	0.00075	0.00780	0.00061	0.00074	0.00116	0.00109
7	0.00056	0.00779	0.00059	0.00059	0.00128	0.00114
8	0.00076	0.00780	0.00061	0.00069	0.00120	0.00110
9	0.00068	0.00779	0.00063	0.00062	0.00123	0.00114
10	0.00077	0.00781	0.00062	0.00074	0.00127	0.00097
Average	0.00076	0.00780	0.00062	0.00068	0.00123	0.00107
Std Dev	0.00010					
Certified	0.0008	0.0078	0.0007	0.0006	0.0014	0.0009

Nitrogen

Lab No.						
1	0.02538			0.04728	0.01926	0.03386
2	0.02614			0.04714	0.01912	0.03414
3	0.02654			0.04708	0.01906	0.03426
4	0.02564			0.04690	0.01892	0.03457
5	0.02580			0.04715	0.01913	0.03412
6	0.02628			0.04745	0.01945	0.03350
7	0.02555			0.04792	0.02019	0.03230
8	0.02425			0.04789	0.02013	0.03238
9	0.02628			0.04770	0.01980	0.03290
Average	0.02576			0.04739	0.01945	0.03356
Std Dev	0.00069					
Certified	0.026			0.047	0.019	0.0344

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PARTICIPATING LABORATORIES

Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
Bruce Boyles, Frank Long

Allegheny Ludlum Steel Corp., Lockport, New York
Thomas Herdlein, P. S. Widmer

Analytical Associates, Detroit, Michigan
Charles Deak, V. Fair

Armco Research & Technology, Middletown, Ohio
Charles C. Borland, Dr. David E. Gillum, Thomas M. Minor

Crucible Specialty Metals, Syracuse, New York
Howard Mortimer, Robert Tschernjawski, Bruce Powlesland,
John Barrett, Joe Aureli Jr., Jim Gorkey

Jessop Steel Company, Washington, Pennsylvania
Signa Fegely, Matthew Armstrong, Lewis Buckingham

Lukens Steel, Coatsville, Pennsylvania
Joseph H. Morris, Sam Forese

Republic Engineered Steels, Canton, Ohio
Bonnie Pitts, James L. Johnson, William R. Jones

VAC AIR Alloys, Frewsburg, New York
Dennis Trostle

Warren Consolidated Industries, Warren, Ohio
Roy Watt, Marshall Snively, Keith McLaughlin

Inquiries concerning this Reference Material should be directed to:

Brammer Standard Co., Inc.	Phone: (281) 440-9396
14603 Benfer Road	Fax: (281) 440-4432
Houston, Texas 77069	email: contact@brammerstandard.com
www.brammerstandard.com	

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