

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 82D

Reference Material for AISI Stainless Steel Grade 309

	Certified Value ¹	Estimate of Uncertainty ²		Certified Value ¹	Estimate of Uncertainty ²
Analysis listed as percent by weight					
C	0.058	0.003	Ca	0.0007	0.0002
Mn	1.85	0.03	Co	0.042	0.005
P	0.020	0.002	N	0.070	0.001
S	0.009	0.002	Nb	0.053	0.004
Si	0.63	0.02	O	0.007	0.0015
Cu	0.16	0.01	Sn	0.004	0.001
Ni	14.12	0.08	Ti	0.005	0.001
Cr	22.40	0.06	W	0.028	0.004
Mo	0.144	0.006			
V	0.087	0.01		Informational value	
B	0.0040	0.0004	Al	(0.002)	

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.

The figure in parentheses is not certified and is 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.

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Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	V
1	0.054	1.805	0.016	0.0073	0.61	0.15	14.01	22.35	0.140	0.083
2	0.058	1.81	0.019	0.0079	0.61	0.15	14.01	22.35	0.140	0.083
3	0.058	1.82	0.019	0.0082	0.618	0.150	14.05	22.36	0.141	0.085
4	0.058	1.83	0.019	0.0084	0.62	0.160	14.06	22.36	0.141	0.086
5	0.0585	1.84	0.019	0.009	0.626	0.16	14.08	22.37	0.142	0.086
6	0.059	1.84	0.0195	0.0090	0.629	0.16	14.09	22.40	0.142	0.0866
7	0.059	1.84	0.0200	0.0094	0.63	0.16	14.10	22.41	0.142	0.088
8	0.0596	1.846	0.020	0.0100	0.63	0.16	14.11	22.44	0.144	0.088
9	0.0597	1.85	0.020	0.0110	0.63	0.16	14.12	22.44	0.144	0.0886
10	0.061	1.85	0.020	0.0111	0.631	0.1608	14.13	22.47	0.146	0.090
11		1.853	0.021	0.0115	0.632	0.162	14.15		0.150	0.090
12		1.858	0.021		0.64	0.164	14.16		0.150	
13		1.86			0.647	0.17	14.16			
14		1.86					14.17			
15		1.86					14.18			
16		1.86					14.19			
17		1.87					14.22			
18		1.879					14.23			
Average	0.0585	1.846	0.0195	0.0093	0.627	0.159	14.123	22.395	0.1435	0.0867
Std Dev	0.0018	0.020	0.0013	0.0014	0.011	0.006	0.065	0.044	0.0035	0.0025
Certified	0.058	1.85	0.020	0.009	0.63	0.16	14.12	22.40	0.144	0.087

Analysis	Al	B	Ca	Co	N	Nb	O	Sn	Ti	W
1	0.001	0.00373	0.00058	0.039	0.0688	0.050	0.00558	0.0015	0.004	0.025
2	0.0015	0.0038	0.00063	0.040	0.0694	0.0500	0.0057	0.0030	0.0045	0.025
3	0.0015	0.0038	0.0008	0.0400	0.0697	0.052	0.0074	0.004	0.005	0.027
4	0.002	0.0043	0.0008	0.041	0.0700	0.0520	0.0076	0.0040	0.005	0.028
5	0.0032	0.0044	0.0008	0.041	0.0700	0.0530	0.0076	0.0044	0.0059	0.0284
6	0.0032			0.041	0.0702	0.0538		0.0045	0.006	0.029
7	0.004			0.0411	0.0714	0.0546			0.006	0.030
8				0.0415		0.055			0.006	0.030
9				0.042		0.0550			0.0062	
10				0.044		0.0560				
11				0.048						
12				0.049						
Average	0.0023	0.00401	0.0007	0.0423	0.06993	0.0531	0.00678	0.0036	0.0054	0.0278
Std Dev	0.0011	0.00032	0.0001	0.0031	0.00080	0.0021	0.00104	0.0011	0.0008	0.0020
Certified	(0.002)	0.0040	0.0007	0.042	0.070	0.053	0.007	0.004	0.005	0.028

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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 572, E 1019, E 1086, plus additional ICP and AA spectrometric methods. The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 15h, 73c, 101g, 121d, 125b, 133b, 160a, 160b, 344, 345, 348a; ECRM 284-1, 286-1, 292-1; BCS 341, 466/1, 467/1, 475; JK 37.

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

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

Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
Allegheny Ludlum Steel Corp., Lockport, New York
Alpha Research Laboratories, Stevensville, Michigan
Analytical Associates, Inc., Detroit, Michigan
Brammer Standard Co., Inc., Houston, Texas
Coleman Testing Laboratories, Riverside, New Jersey
Crucible Specialty Steel, Syracuse, New York
J. Dirats and Co., Inc., Westfield, Massachusetts
Jessop Steel Company, Washington, Pennsylvania
Metals Analysis, Inc., Huntington Park, California
Andrew S. McCreath & Son, Inc., Harrisburg, Pennsylvania
Midstates Analytical Laboratories, Tulsa, Oklahoma
Republic Engineered Steels, Inc., Canton, Ohio
Shiva Technologies, Inc., Cicero, New York
VHG Laboratories, Inc., Manchester, New Hampshire

Traceability: This Reference Material was also examined by optical emission spectrometry and found to be compatible with the following Certified Reference Materials: NIST SRM C1151, C1152, C1153, C1154; BAS SS 464, 475; JSS 653-8.

Source: This material was produced by Rolled Alloys, Temperance, Michigan. The material was made in an electric arc furnace and cast into ingots. The bar stock was hot rolled and annealed.

Available Form: This Reference Material is available only in the form of a disc, approximately 38 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, it is the best practice to avoid optical emission spectrometric burns in the center of the disc (5 mm radius), as some segregation may be present.

Because this Reference Material contains a high percent of nickel and chromium, care must be taken in its application. Make certain that corrections are made for possible element interference and dilution 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.

Certificate of Analysis Revisions: The original certificate for this BS 82D Reference Material was issued on December 14, 1989. The certified nickel value was revised on December 10, 1992, after testing by additional laboratories. An interlaboratory testing program completed in 1994 produced additional data that made possible the certification of more elements. The addition of new data produced minor changes to some of the originally certified elements. The new certificate of analysis format now lists more details about the reference material, as outlined in ISO Guide 31.

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