

Brammer Standard Company, Inc.

Certificate of Analysis¹

B.S. LAS-9

Low Alloy Steel Setting-up Sample

Analysis listed as percent by weight

	Certified Value¹	Estimate of Uncertainty²		Certified Value¹	Estimate of Uncertainty²
C	0.087	0.004	Nb	0.096	0.005
Mn	1.66	0.02	Sb	0.004	0.001
P	0.077	0.004	Sn	0.060	0.003
S	0.004	0.0005	Ta	0.07	0.01
Si	0.088	0.005	Ti	0.10	0.004
Cu	0.026	0.003	V	0.42	0.006
Ni	0.153	0.008	W	0.103	0.008
Cr	1.32	0.02	Zr	0.030	0.004
Mo	0.79	0.02			
Al	0.24	0.01	Uncertified Values		
As	0.041	0.003	Mg	(0.0004)	
B	0.0061	0.0004	La	(0.006)	
Ca	0.0002	0.0001	N	(0.0045)	
Ce	0.016	0.002	O	(0.0011)	
Co	0.20	0.006	Pb	(<0.002)	

¹The 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 the 95% confidence interval. The half-width confidence interval C(95%) is shown on page 2.

³ Data in parentheses are not certified and are provided for information only.

See the following pages for more information.

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Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al
1	0.0825	1.621	0.0722	0.0032	0.084	0.023	0.144	1.307	0.76	0.229
2	0.085	1.649	0.0755	0.0033	0.0855	0.0233	0.145	1.313	0.790	0.23
3	0.085	1.655	0.0763	0.0033	0.086	0.024	0.149	1.318	0.792	0.234
4	0.086	1.660	0.0768	0.0037	0.086	0.025	0.15	1.319	0.794	0.236
5	0.0868	1.67	0.077	0.0038	0.088	0.026	0.154	1.32	0.794	0.237
6	0.087	1.67	0.078	0.004	0.094	0.026	0.154	1.322	0.80	0.237
7	0.088	1.67	0.078	0.0042	0.094	0.027	0.156	1.34	0.803	0.240
8	0.092		0.084	0.0045		0.030	0.16	1.36	0.82	0.26
9	0.094			0.0046			0.163			
Average	0.0874	1.656	0.0772	0.0038	0.0882	0.0255	0.1528	1.325	0.794	0.238
Std Dev	0.0036	0.018	0.0033	0.0005	0.0041	0.0023	0.0064	0.017	0.017	0.010
Certified	0.087	1.66	0.077	0.004	0.088	0.026	0.153	1.32	0.79	0.24
t	2.306	2.4469	2.3646	2.306	2.4469	2.3646	2.306	2.3646	2.3646	2.3646
C(95%)	0.0028	0.016	0.0028	0.0004	0.0038	0.0019	0.0049	0.014	0.014	0.008

Analysis	As	B	Ca	Ce	Co	Nb	Sb	Sn	Ta	Ti
1	0.0393	0.0056	0.0002	0.0144	0.191	0.089	0.003	0.0585	0.066	0.096
2	0.040	0.0059	0.0002	0.015	0.199	0.093	0.0033	0.059	0.068	0.098
3	0.0405	0.0060	0.0002	0.0163	0.20	0.093	0.0037	0.0592	0.068	0.10
4	0.0409	0.006	0.0002	0.0167	0.20	0.098	0.004	0.060	0.069	0.10
5	0.0414	0.0061	0.0002	0.019	0.202	0.099	0.005	0.0601	0.072	0.102
6	0.042	0.0061	0.0003		0.202	0.099	0.0065	0.061	0.085	0.102
7	0.042	0.0063	0.0004		0.205	0.10		0.061	0.0854	0.104
8	0.045	0.0065			0.208	0.101		0.0648		0.105
9					0.209					
Average	0.0414	0.00606	0.00024	0.0163	0.202	0.0965	0.0043	0.0605	0.0733	0.101
Std Dev	0.0017	0.00027	0.00008	0.0018	0.005	0.0043	0.0013	0.0020	0.0083	0.003
Certified	0.041	0.0061	0.0002	0.016	0.20	0.096	0.004	0.060	0.07	0.10
t	2.3646	2.3646	2.4469	2.7764	2.306	2.3646	2.5706	2.3646	2.4469	2.3646
C(95%)	0.0015	0.00022	0.00007	0.0022	0.004	0.0036	0.0014	0.0017	0.0077	0.003

Analysis	V	W	Zr	Mg	La	N	O	Pb
1	0.416	0.096	0.0252	0.00036	0.005	0.0039	0.0008	<0.002
2	0.416	0.096	0.0285		0.0063	0.0044	0.0009	0.0003
3	0.418	0.10	0.029			0.0044	0.0011	0.0009
4	0.420	0.101	0.030			0.0045	0.0017	0.001
5	0.42	0.102	0.031			0.0045		
6	0.42	0.107	0.032			0.0047		
7	0.424	0.109	0.033			0.0054		
8	0.43	0.116						
Average	0.421	0.1034	0.0298		0.0057	0.00454	0.00113	
Std Dev	0.005	0.0069	0.0026		0.0009	0.00045	0.00040	
Certified	0.42	0.103	0.030	(0.0004)	(0.006)	(0.0045)	(0.0011)	(<0.002)
t	2.3646	2.3646	2.4469		12.706	2.4469	3.1824	
C(95%)	0.004	0.0058	0.0024		0.0083	0.00042	0.00064	

Data in parentheses are provided for information only.

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

For further information regarding the confidence interval for the certified value see ISO Guide 35:1989 section 4.

Referenced Documents

*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 415 - 85 (Reapproved 1989) Standard Test Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel

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

E 1724 - 95 Standard Guide for Testing and Certification of Metal and Metal-Related Reference Materials

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

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, 1992), 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

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