

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al
1	0.023	0.396	0.016	0.2721	0.522	0.048	0.133	17.32	0.29	0.0011
2	0.025	0.398	0.017	0.274	0.525	0.048	0.134	17.36	0.29	0.0015
3	0.0258	0.398	0.0175	0.2749	0.530	0.049	0.14	17.36	0.302	0.002
4	0.026	0.41	0.018	0.275	0.530	0.051	0.1400	17.38	0.302	0.003
5	0.0262	0.43	0.018	0.2774	0.540	0.055	0.141	17.42	0.308	0.003
6	0.0271	0.44	0.019	0.2856	0.545	0.0560	0.148	17.45		
7	0.0274			0.287		0.06				
8	0.028			0.29						
Average	0.0261	0.412	0.0176	0.2795	0.532	0.0524	0.139	17.382	0.298	0.0021
Std Dev	0.0016	0.019	0.0010	0.0069	0.009	0.0046	0.005	0.047	0.008	0.0009
Certified	0.026	0.41	0.018	0.280	0.53	0.052	0.140	17.38	0.30	0.002
t	2.36	2.57	2.57	2.36	2.57	2.45	2.57	2.57	2.78	2.78
C(95%)	0.0014	0.02	0.0011	0.0058	0.009	0.0043	0.006	0.049	0.010	0.0011

Analysis	Co	N	Nb	Sn	V	As	Pb	Ti	W
1	0.013	0.0207	0.001	0.0014	0.0405	0.0031	0.00009	0.002	0.002
2	0.0145	0.0209	0.002	0.002	0.044	0.005	0.0001	0.002	0.003
3	0.015	0.022	0.002	0.002	0.045	0.005	0.0012	0.0066	
4	0.017		0.003	0.0024	0.046	0.0012			
5	0.018		0.003		0.047				
6	0.020				0.047				
7	0.020				0.048				
Average	0.0168	0.0212	0.0022	0.0020	0.0454	0.0044	0.0006	0.0035	0.0025
Std Dev	0.0027	0.0007	0.0008	0.0004	0.0025	0.0011	0.0006	0.0027	0.0007
Certified	0.017	0.021	0.002	0.002	0.045	(0.004)	(0.001)	(0.004)	(0.002)
t	2.45	4.30	2.78	3.18	2.45				
C(95%)	0.0025	0.0017	0.0010	0.0007	0.0023				

$C(95\%) = (t \times sd) / \sqrt{n}$ 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 35:2006 section 6.

Values in parentheses are not certified and are provided for information only.

Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, PA
 Allegheny Ludlum Steel Corp., Lockport, NY
 Anderson Laboratories, Inc., Greendale, WI
 Brammer Standard Co., Inc., Houston, TX
 Charles C. Kawin Company, Broadview, IL
 Crucible Specialty Steel, Syracuse, NY
 Hoesch Stahl AG, Dortmund, Germany
 J. Dirats and Co., Inc., Westfield, MA
 Republic Engineered Steels, Canton, OH
 VHG Laboratories, Inc., Manchester, NH

Analysis: Chemical analyses were made on millings from cross-sections of the bars. Each individual value listed on this page is the average of each analyst's results.

Analytical Methods: 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.

Traceability: The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 73c, 101g, 121d, 160b, 344, 345, 348a; BCS 466/1, 467/1, 475; ECRM 284-1, 286-1; IMZ 127/3; JK 37.

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable. It was also examined by spark atomic emission spectrometry and found to be compatible with the following NIST Certified Reference Materials: SRM 1219, 1223, and 1267.

Form: This Reference Material is machined in the form of a disc, approximately 38 mm diameter and 12 mm thick by Brammer Standard Company. The bar stock used for this material was produced by hot-rolling billets and annealing.

Certified area: The entire depth of the disc may be used.

Caution: As with any bar material, avoid spark atomic 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 chromium and sulfur, 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 Number: The unique identification number for this certificate of analysis is REV-153-041610. This BS 153 Certificate of Analysis was revised to show the estimate of uncertainty for the certified values. After reviewing the analytical data, a third decimal place was certified for sulfur and nickel. The aluminum and niobium values were changed to certified to conform to current versions of ISO Guides. Titanium is now listed on the first page as uncertified.

The original Certificate of Analysis was dated January 25, 1991.

Refer to the "Certificates" section of the Brammer Standard Company website for any revision to this or other Brammer Standard Company's Certificates of Analysis.

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. 14603 Benfer Road Houston, Texas 77069-2895 USA	Phone: (281) 440-9396 Fax: (281) 440-4432	website: brammerstandard.com email: contact@brammerstandard.com
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Certified by: _____ on April 16, 2010.
Beau R. Brammer

Certificate Number REV-153-041610

Referenced Documents

ASTM documents available from ASTM, 1916 Race Street, Philadelphia, PA, 19103.

Versions used were those available at the time of interlaboratory testing in 1990

- E 350 Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
- E 353 Standard Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys
- E 572 Standard Test Method for X-Ray Emission Spectrometric Analysis of Stainless Steel
- E 826 Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials
- E 1019 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys
- E 1086 Standard Method for Optical Emission Vacuum Spectrometric Analysis of Stainless Steel by the Point-to-Plane Excitation Technique

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

ISO Guide 35 Reference Materials - General and statistical principles for certification