

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 4330V

**AISI Grade 4330 modified
Low Alloy Steel**

Certified Elements			Uncertified Elements	
	Certified Value ¹	Estimate of Uncertainty ²	Information values	
C	0.318	0.005	As	0.006
Mn	0.91	0.015	B	<0.0001
P	0.008	0.001	Cd	<0.0001
S	0.0009	0.0002	Mg	0.0001
Si	0.240	0.01	Pb	0.00004
Cu	0.181	0.01	Sb	0.002
Ni	1.91	0.015	Ti	0.0004
Cr	0.91	0.01	W	0.001
Mo	0.475	0.01	Zn	0.0002
Al	0.021	0.002		
Ca	0.0010	0.0002		
Co	0.011	0.002		
Sn	0.010	0.001		
V	0.094	0.003		
N	0.0076	0.0004		
O	0.0018	0.0004		

Analysis listed as percent by weight

¹ The certified value listed is the present best estimate of the true value.

² The uncertainties listed are based on value judgments of the material inhomogeneity and possible bias in the determined analytical values.

Some of the co-operating laboratories were:

Brammer Standard Co., Inc., Houston, Texas
Crucible Specialty Metals, Syracuse, New York
Hoesch Stahl AG, Dortmund, Germany

J. Dirats and Co., Inc., Westfield, Massachusetts
VHG Laboratories, Inc., Manchester, New Hampshire

See reverse side for more information.

Certificate Number 4330V-062915

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069
Telephone (281) 440-9396 Fax (281) 440-4432

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	Ca	Co	Sn	V
1	0.314	0.903	0.0065	0.0007	0.234	0.171	1.89	0.897	0.461	0.018	0.0008	0.0090	0.0090	0.092
2	0.315	0.903	0.0066	0.0008	0.234	0.177	1.90	0.897	0.468	0.0196	0.00087	0.0096	0.0096	0.093
3	0.318	0.906	0.0080	0.0009	0.235	0.178	1.904	0.899	0.472	0.0196	0.0009	0.0102	0.010	0.093
4	0.318	0.914	0.008	0.0010	0.238	0.180	1.908	0.901	0.472	0.020	0.0010	0.0105	0.0101	0.094
5	0.319	0.915	0.008	0.0010	0.238	0.181	1.91	0.913	0.475	0.0203	0.0010	0.0106	0.0102	0.0945
6	0.319	0.915	0.0082	0.0010	0.240	0.181	1.91	0.917	0.479	0.021	0.00105	0.0109	0.0103	0.0955
7	0.321	0.925	0.009		0.242	0.183	1.918	0.918	0.483	0.021	0.00108	0.011	0.0105	
8	0.322	0.929	0.009		0.243	0.184	1.92		0.488	0.0219	0.0011	0.0118	0.0108	
9					0.244	0.187	1.933			0.022	0.00116	0.013	0.011	
10					0.250	0.188				0.0233		0.014	0.0117	
Average	0.3183	0.9138	0.0079	0.00090	0.2398	0.1810	1.910	0.9060	0.4748	0.0207	0.00100	0.0111	0.0103	0.0937
Std Dev	0.0027	0.0097	0.0009	0.00013	0.0051	0.0050	0.012	0.0096	0.0085	0.0015	0.00012	0.0015	0.0007	0.0013
Certified	0.318	0.91	0.008	0.0008	0.240	0.181	1.91	0.91	0.475	0.021	0.0010	0.011	0.010	0.094

Analysis	As	B	Cd	Mg	N	O	Pb	Sb	Ti	W	Zn
1	0.005	0.00003	0.00006	0.0001	0.0073	0.0014	0.00004	0.0007	0.0003	0.0007	0.0001
2	0.0051	0.00009	<0.00001	0.0001	0.0073	0.0016	0.00005	0.0018	0.00045	0.001	0.00016
3	0.0065	<0.0001		0.00012	0.0075	0.0017		0.0027		0.0022	0.0002
4	0.0076	<0.00005			0.0075	0.00173					0.0004
5					0.0076	0.00175					
6					0.0077	0.0023					
7					0.00781						
8					0.0083						
Average	0.0061			0.00011	0.00763	0.00175	0.000045	0.0017	0.0004	0.0013	0.0002
Std Dev	0.0012			0.000012	0.00032	0.00030	0.000007	0.0010	0.0001	0.0008	0.0001
Certified	(0.006)	(<0.0001)	(<0.0001)	(0.0001)	0.0076	0.0018	(0.00004)	(0.002)	(0.0004)	(0.001)	(0.0002)

Data in parentheses are not certified but provided for information.

Analysis: Chemical analyses were made on chips prepared by a lathe from cross-sections of the bars. 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 415, 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 32e, 125b, 361 to 365; BAM 039-2, 044-1; BCS 455/1, 456/1, 458/1; ECRM 085-1, 088-1, 096-1, 184-1, 481-1; GBW 01402; IMZ 1.22, 1.74

Revision: To correct Ti values.

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable. It was also examined by optical emission spectrometry and found to be compatible with the following NIST Certified Reference Materials: SRM 1222, 1224, 1225, 1261A to 1265A, 1761 to 1767

Source: This material was produced by Latrobe Steel Company, Latrobe, Pennsylvania. The material was made by consumable electrode vacuum melting and cast into ingots. The bar stock material was produced by hot rolling. The bar stock was given a normalizing and tempering heat treatment.

Description and Use: This Reference Material is in the form of a disc, approximately 37 mm (1.50") in diameter and 19 mm (0.75") thick. It is intended for the 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.

Preparation: Use the same method for preparing the analytical surface on all reference materials and specimens for best results.

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. Phone: (281) 440-9396
 14603 Benfer Road
 Houston, Texas 77069-2895 USA Fax: (281) 440-4432

Certified by: _____ on June 29, 2015.
 Beau R. Brammer