

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. A-10

A-10 Tool Steel

Carbon	1.41	Tungsten	<0.005
Manganese	1.75	Vanadium	(0.004)
Phosphorus	0.016	Cobalt	(0.010)
Sulfur	0.022	Tin	(0.010)
Silicon	1.15	Aluminum	0.006
Copper	0.16	Niobium	<0.006
Nickel	1.82	Titanium	(0.002)
Chromium	0.24	Lead	0.0001
Molybdenum	1.53	Arsenic	(0.005)

(analysis listed as percent by weight)

Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
Allegheny Ludlum Steel Corp., Lockport, New York
Brammer Standard Co., Inc., Houston, Texas
Conam Inspection, Inc., Gary, Indiana
J. Dirats and Co., Inc., Westfield, Massachusetts
Hoesch Stahl AG, Dortmund, Germany
VHG Laboratories, Inc., Manchester, New Hampshire

See reverse side for more information.

Certificate Number A10-012591

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	W
1	1.40	1.73	0.015	0.021	1.14	0.15	1.77	0.229	1.46	<0.001
2	1.41	1.74	0.015	0.022	1.14	0.16	1.78	0.23	1.50	<0.001
3	1.41	1.75	0.015	0.022	1.15	0.161	1.81	0.231	1.51	0.001
4	1.42	1.755	0.017	0.0232	1.15	0.163	1.82	0.248	1.54	0.003
5		1.76	0.0172		1.19	0.168	1.85	0.25	1.55	0.004
6		1.79				0.17	1.86	0.25	1.56	
7								0.26	1.57	
Average	1.410	1.754	0.0158	0.0221	1.154	0.162	1.815	0.243	1.527	
Std Dev	0.008	0.021	0.0012	0.0009	0.021	0.007	0.036	0.012	0.039	
Certified	1.41	1.75	0.016	0.022	1.15	0.16	1.82	0.24	1.53	<0.005

Analysis	V	Co	Sn	Al	Nb	Ti	Pb	Ca	N	As	Sb
1	0.002	0.007	0.005	0.004	<0.001	0.001	0.00006	0.0002	0.0079	0.0039	0.0012
2	0.0027	0.0098	0.0068	0.005	<0.001	0.001	0.0001	0.0004		0.0053	0.0019
3	0.003	0.010	0.010	0.005	<0.002	0.0027	0.00014				
4	0.004	0.010	0.010	0.006	<0.003	0.0031					
5	0.005	0.012	0.011	0.006	0.001						
6	0.006		0.0115	0.007	0.004						
7			0.013	0.007	0.005						
Average	0.0038	0.0098	0.0096	0.0057		0.0020	0.00010	0.0003		0.0046	0.0016
Std Dev	0.0015	0.0018	0.0028	0.0011		0.0011	0.00004	0.0001		0.0010	0.0005
Certified	(0.004)	(0.010)	(0.010)	0.006	<0.006	(0.002)	0.0001	(0.0003)		(0.005)	(0.002)

Data in parentheses are not certified but provided for information only.

Chemical analyses were made on millings from cross-sections of the bars. The individual values listed above are the average of each analyst's analytical 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 106b, 293, 361 to 365

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, 1761 to 1767

The bar stock used for this material was produced by hot-rolling billets. The entire depth of the disc may be used.

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: G. R. Brammer on January 25, 1991.