

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 955 MOD
Reference Material for Bronze

	Certified Value ¹	Estimate of Uncertainty ²		Uncertified Value ³
Analysis listed as percent by weight				
Sn	0.096	0.012	P	(<0.002)
Pb	0.035	0.004	As	(<0.003)
Zn	1.05	0.05	Sb	(<0.003)
Fe	5.46	0.13		
Ni	6.28	0.04		
Al	10.37	0.10	Cu	(74.9) by difference
Si	0.054	0.005		
Mn	1.61	0.02		

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 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 reverse side for more information.

Certificate Number 955MOD-022498p1

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069-2895
Telephone (281) 440-9396 Fax (281) 440-4432

Analysis	Sn	Pb	Zn	Fe	Ni	Al	Si
1	0.0822	0.030	1.02	5.37	6.26	10.28	0.050
2	0.094	0.034	1.02	5.44	6.26	10.29	0.050
3	0.100	0.035	1.027	5.47	6.29	10.41	0.0531
4	0.100	0.0355	1.08	5.56	6.30	10.43	0.057
5	0.106	0.039	1.10			10.45	0.058
Average	0.0964	0.0345	1.049	5.460	6.278	10.370	0.0538
Std Dev	0.0090	0.0032	0.038	0.079	0.021	0.078	0.0036
Certified	0.096	0.034	1.05	5.46	6.28	10.37	0.054
C(95%)	0.011	0.0040	0.047	0.125	0.033	0.097	0.0044

continued from above

Analysis	Mn	P	As	Sb	Cu by diff.
1	1.60	<0.002	<0.0005	0.00030	74.750
2	1.60	0.0010	0.0003	0.0019	75.269
3	1.61	0.001	0.002	0.002	75.029
4	1.62				74.713
5					74.897
Average	1.608			0.0014	74.932
Std Dev	0.010			0.0010	0.227
Certified	1.61	(<0.002)	(<0.003)	(<0.003)	(74.9)
C(95%)	0.015				

Data in parentheses are not certified but 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.

Certification Process: The requirements of ISO Guide 31, ISO Guide 34, ISO Guide 35, and ASTM Standard Guides E 1724 and E 1831 were followed for the preparation of this reference material and certificate of analysis. This is a reference material as defined by ISO Guide 30.

Analysis: Chemical analyses were made on chips prepared by a lathe from the certified portion of the bars. 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 ICP, OES, XRF and AA spectrometric methods plus classical wet methods.

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

Brammer Standard Co., Inc., Houston, Texas
 Colonial Metals Company, Columbia, Pennsylvania
 J. Dirats and Co., Inc., Westfield, Massachusetts
 Laboratory Testing Inc., Dublin, Pennsylvania
 VHG Laboratories, Inc., Manchester, New Hampshire

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

Traceability: This Reference Material was also examined by optical emission spectrometry and found to be compatible with the following Certified Reference Materials: CTIF 2206B, 2552K, 3010O, 3298A. The following Certified Reference Materials were used to validate the analytical data listed on page 2: BCS 304/1 and GBW 02118

Source: This material was produced by VEEM Engineering Group PTY LTD, Willetton, Western Australia. The material was chill-cast in a tapered mold.

Available Form: This Reference Material is available in the form of a tapered disc, approximately 40 mm in diameter and 17 mm thick.

Use: This Reference Material is intended for use in optical emission and x-ray spectrometric methods of analysis. Only the first 12 mm from the smaller diameter side of the disc should be used.

Caution: Because this Reference Material contains a high percent of aluminum, nickel, and iron, 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.

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

Certified by: _____ on February 24, 1998.
G. R. Brammer

Certificate Number 955MOD-022498p3

By Certificate Number R-021, the Quality System of Brammer Standard Company, Inc., is registered to ISO 9002 by the American Association for Laboratory Accreditation (A2LA).

**Brammer Standard Company's Chemical Laboratory is accredited to ISO Guide 25 by A2LA.
(Certificate Number 656.01)**

References:

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

E 826 - 85 (Reapproved 1990) Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

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, 1991), 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 34 (First edition, 1996), Quality system guidelines for the production of reference materials.

ISO Guide 35 (Second edition, 1989), Certification of reference materials - General and statistical principles.

Other useful documents available from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.

NIST 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