

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. FeTi-2

Reference Material for Ferrotitanium

Certified Value ¹	Estimate of Uncertainty ²	Certified Value ¹	Estimate of Uncertainty ²
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Analysis listed as mass fraction expressed as percent

Al	12.7	0.2	Nb	0.03	0.005
B	1.10	0.05	Ni	0.16	0.01
C	0.46	0.015	P	0.053	0.006
Ca	0.96	0.04	S	0.012	0.002
Co	0.04	0.005	Si	3.2	0.16
Cr	0.30	0.01	Sn	0.16	0.014
Cu	0.43	0.03	Ti	19.4	0.20
Mg	(0.4) ³		V	0.81	0.03
Mn	7.91	0.14	Zn	(0.02) ³	
Mo	0.15	0.02	Zr	3.6	0.15
N	0.16	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.

The requirements of ISO Guide 31 and ISO Guide 35 were generally followed for the preparation of this reference material and certificate of analysis. This is a reference material as defined by ISO Guide 30.

See reverse side for more information.

Certificate Number FeTi-2-021099p1

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

BS FeTi-2

Certificate number FeTi-2-021099p2

Analysis	Al	B	C	Ca	Co	Cr	Cu	Mg	Mn	Mo	N
1	12.45	1.052	0.437	0.924	0.032	0.288	0.381	0.153	7.76	0.128	0.121
2	12.50	1.06	0.448	0.930	0.034	0.298	0.404	0.28	7.76	0.15	0.134
3	12.63	1.07	0.448	0.948	0.034	0.30	0.418	0.30	7.85	0.152	0.149
4	12.67	1.08	0.4489	0.95	0.034	0.304	0.44	0.45	7.94	0.154	0.155
5	12.8	1.091	0.453	0.959	0.038	0.307	0.45	0.47	7.95	0.161	0.156
6	12.82	1.15	0.454	0.991	0.04	0.309	0.455	0.499	8.02		0.168
7	12.84	1.16	0.457	1.0142	0.041	0.319	0.481		8.07		0.180
8		1.165	0.458		0.0431						0.1910
9			0.460								
10			0.462								
11			0.48								
Average	12.673	1.104	0.455	0.959	0.037	0.304	0.433	0.359	7.907	0.149	0.1568
Std Dev	0.157	0.047	0.011	0.033	0.004	0.010	0.034	0.136	0.122	0.012	0.0230
Certified	12.7	1.10	0.46	0.96	0.04	0.30	0.43	(0.4)	7.91	0.15	0.16
t	2.4469	2.3646	2.2281	2.4469	2.3646	2.4469	2.4469	2.5706	2.4469	2.7764	2.3646
C(95%)	0.145	0.039	0.007	0.030	0.003	0.009	0.031	0.143	0.112	0.015	0.0192

continued from above

Analysis	Nb	Ni	P	S	Si	Sn	Ti	V	Zn	Zr
1	0.03	0.147	0.0439	0.0088	2.98	0.15	19.27	0.76	0.0083	3.49
2	0.034	0.147	0.051	0.0094	3.09	0.156	19.35	0.80	0.012	3.54
3	0.036	0.149	0.051	0.0105	3.10	0.16	19.35	0.81	0.014	3.59
4	0.0378	0.154	0.053	0.0116	3.15	0.161	19.38	0.823	0.03	3.62
5		0.156	0.054	0.0116	3.16	0.164	19.69	0.825	0.052	3.70
6		0.157	0.058	0.0117	3.23	0.182		0.844		3.81
7		0.164	0.06	0.0127	3.41					
8		0.17		0.0146	3.44					
9		0.18		0.015	3.46					
10				0.015						
Average	0.034	0.158	0.053	0.0121	3.224	0.162	19.408	0.810	0.023	3.625
Std Dev	0.003	0.011	0.005	0.0022	0.173	0.011	0.163	0.029	0.018	0.115
Certified	0.03	0.16	0.053	0.012	3.2	0.16	19.4	0.81	(0.02)	3.6
t	3.1824	2.306	2.4469	2.2622	2.306	2.5706	2.7764	2.5706	2.7764	2.5706
C(95%)	0.005	0.009	0.005	0.0016	0.133	0.011	0.202	0.030	0.022	0.121

Data in parentheses are not certified but provided for information only.
Data listed as mass fraction expressed as percent.

$C(95\%) = (t \times sd) / \sqrt{n}$ 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: Material for chemical analyses were sampled from bulk after mixing. The laboratories participating in the testing normally followed the requirements of ISO Guide 25. The individual values listed on page 2 are the average of each analyst's results. Methods of analysis used were a combination of classical wet methods plus additional ICP-AES, ICP-MS, and AA spectrometric methods.

Cooperating Laboratories: The cooperating laboratories were:

Anarem, Praha, Czech Republic
Brammer Standard Co., Inc., Houston, Texas
China National Analysis Center for Iron and Steel, Beijing, China
J. Dirats and Co., Inc., Westfield, Massachusetts
Andrew S. McCreath & Son, Inc., Harrisburg, Pennsylvania
Laboratory Testing Inc., Dublin, Pennsylvania
Leco Corporaton, St. Joseph, Michigan
Shiva Analyticals (India) Ltd., Bangalore, India
VHG Laboratories, Inc., Manchester, New Hampshire

Homogeneity: The bulk material was randomly sampled and tested for iron content. The material was found to be homogeneous for the iron content.

Traceability: This Reference Material was analyzed by classical wet method, ICP, and AA spectrometric methods and found to be compatible with the following Certified Reference Materials: ECRM 584-1, 589-1; IRSID 510-1.

Source: This material was supplied by Shieldalloy Metallurgical Corporation, Newfield, New Jersey as minus 8 mesh material. Brammer Standard Company processed the material to minus 100 mesh powder.

Available Form: This Reference Material is available in the form of 100 gram unit bottles of minus 100 mesh powder.

Sample Preparation: For best analytical results, use the same method for preparing this material for analysis as for routine analysis of ferrotitanium materials. If the material is stored for a prolonged period of time, it is recommended that the material be dried at 105° C for 1 hour.

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. Use regular precautions as for any work with fine powder material. 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 February 10, 1999.
G. R. Brammer

Certificate Number FeTi-2-021099p3

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, 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 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

Certificate Number FeTi-2-021099p4