

BRAMMER STANDARD COMPANY, INC.

Certificate of Analysis

BS 130/2

Reference Material for High Carbon Ferrochromium

	Certified Value ¹	Estimate of Uncertainty ²	Certified Values ³
C	7.70	0.15	
Cr	52.6	0.7	
Mn	0.44	0.04	
P	0.015	0.004	
S	0.045	0.008	
Si	2.12	0.08	

Informational Values^{3,4}

Cu (0.012) Mo (0.003) Pb (0.0001) Sn (0.001) Ti (0.18)
V (0.36)

Revision: This reference material was originally certified on certificate CC277 in the late 1970's. It was re-certified as 130/1 on June 15, 1987. It was revised on September 03, 2009 to show the statistics used to produce the certified value, the estimates of uncertainty, and additional digit was shown for Cr. This revision demonstrates stability with additional laboratory testing from an ISO 17025 accredited laboratory. Revised values for all elements except S and Si are presented. The new revised values all fall within the previous uncertainties, proving stability.

¹ For each element, the value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

² For each element, the uncertainty listed is based on a value judgement of the material inhomogeneity and the 95% confidence interval. The half-width confidence interval C(95%) is shown on page 2.

³ Values are given in weight percent. Values in brackets are reported by difference.

⁴ Values in parentheses are not certified and are provided for information only.

The requirements of ISO Guides 31, 34, and 35 were followed for the preparation of this Reference Material and certificate of analysis. This is a Reference Material as defined by ISO Guide 30.

BS 130/2 * Code for method values listed as weight percent

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Analysis	C	Cr	Mn	P	S	Si
1	7.44	51.63	0.35	0.10	0.025	2.04
2	7.53	51.97	0.42	0.12	0.044	2.04
3	7.65	52.40	0.44	0.12	0.044	2.11
4	7.69	52.58	0.446	0.138	0.046	2.11
5	7.72	52.64007	0.45	0.14	0.046	2.1674
6	7.75	52.70	0.46	0.14	0.046567	2.18
7	7.790967	52.75	0.46	0.16	0.047	2.22
8	7.83	53.10	0.47	0.25	0.053	
9	7.89	53.80			0.0545	
Average	7.6990	52.6189	0.4370	0.01460	0.04512	2.1239
Std dev	0.1429	0.6224	0.0383	0.00457	0.00840	0.0692
t-statistic	2.31	2.31	2.36	2.36	2.31	2.45
C(95%)	0.1098	0.4784	0.0320	0.00382	0.00646	0.0640
Certified	7.70	52.6	0.44	0.015	0.045	2.12
Uncertainty	0.15	0.7	0.04	0.004	0.008	0.08

BS 130/2 * Code for method Informational values listed as weight percent

Analysis	Cu	Mo	Pb	Sn	Ti	V
1	0.008	0.002533	0.0001	0.001233	0.177233	0.318533
2	0.015567					0.41
Average	0.0118	0.002533	0.0001	0.001233	0.177233	0.364267
Std dev	0.0054					0.1
t-statistic	12.71					12.71
C(95%)	0.0481					0.6
Informational)	(0.012)	(0.003)	(0.0001)	(0.001)	(0.18)	(0.36)

$C(95\%) = (t \times sd) / \sqrt{n}$ 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.

Laboratory

Anderson Laboratories
 Andrew S. McCreath & Son, Inc.
 Booth, Garrett, & Blair, Inc.
 Carpenter Technology Corporation
 Ledoux & Company
 R.M. Hardy & Associates LTD.
 Union Carbide
 Allegheny Ludlum Steel
 Laboratory Testing, Inc.

Location

Milwaukee, WI
 Harrisburg, PA
 Ambler, PA
 Reading, PA
 Teaneck, NJ
 Edmonton, AL
 Marietta, OH
 Brackenridge, PA
 Hatfield, PA

Registrar

PRI/Nadcap

Accreditation

17025

Nadcap = National Aerospace and Defense Contractors Accreditation Program
 PRI =Performance Review Institute

Analysis: Chemical analyses were made from representative samples for the portion of the lot in accordance with ASTM Standard Practice E1806. The laboratories participating in the testing generally followed the requirements of ISO Standard 17025.

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Traceability: The following Certified Reference Materials were used to validate the analytical data: SRM 64A, 64C, 3114, 3128, 3134, 3161A, 3162A.

Homogeneity: This Reference Material (CRM) was tested for homogeneity using ASTM Standard Method E826 and found acceptable.

Validity statement: ISO Guide 31 states that the certification should contain an expiration date for all materials where instability has been demonstrated or is considered possible, after which the certified value is no longer guaranteed by the certifying body. The certification of BS 130/2 is valid for 20 years at which time stability is verified and a new certificate will be issued. The certification is nullified if this RM is damaged, contaminated, or otherwise modified.

Source: The stock for this RM was produced by Union Carbide Corp., River View, OH.

Form: This RM is bottled with approximately 100g. of powder by Brammer Standard Company, Inc.

Use: This RM is intended for use by any method of analysis capable of analyzing powders or pressed powders. Refer to ISO Guide 33 for information about the use of Reference Materials.

Sample Preparation: For best results, thoroughly mix the ferroalloy material immediately before weighing. "Sampling of the sample" weighing techniques should be used. Pour approximately 5g. of the material onto glazed paper and take small portions from various areas of the 5g. sample when weighing for analysis.

Certificate Number: The unique identification number for this certificate of analysis is 130-2-063016. You may obtain information on revisions of certificates from the internet at www.brammerstandard.com.

Safety Notice: A Safety Data Sheet (SDS) 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 Web: www.brammerstandard.com
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Houston, Texas 77069-2895 USA Fax: (281) 440-4432 Email: contact@brammerstandard.com

Brammer Standard Company, Inc., is accredited by the American Association For Laboratory Accreditation (A2LA) to ISO Guide 34 as a Reference Material Producer for the production of Certified Reference Materials and Reference Materials (Certificate Number 656.02)

Brammer Standard Company's Chemical Laboratory is accredited by A2LA to ISO Standard 17025. (Certificate Number 656.01)

By Certificate Number 10539, the Quality System of Brammer Standard Company, Inc., is registered to ISO 9001:2008 by National Quality Assurance (NQA), U.S.A.

The scopes of accreditation are listed on the website: www.brammerstandard.com

References:

Versions used were those available at the time of testing and characterization

- E826 Standard Practice for Testing Homogeneity of a Metal Lot or Batch in Solid Form by Spark Atomic Emission Spectrometry
- E1019 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques
- E1806 Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

ISO Standard 17025:2005 General requirements for the competence of testing and calibration laboratories

ISO Standard 9001:2008 Quality Management Systems - Requirements

ISO Guide 30:1992 Terms and definitions used in connection with reference materials + 2008 amendment

ISO Guide 31:2000 Reference materials - Contents of certificates and labels

ISO Guide 33:2000 Uses of certified reference materials

ISO Guide 34:2009 General requirements for the competence of reference material producers

ISO Guide 35:2006 Reference Materials - General and statistical principles for certification

ASTM documents available from ASTM, 100 Barr Harbor Dr., West Conshohocken, Pa 19428.

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

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

Certified by: _____ on June 30, 2016.

Beau R. Brammer