

Brammer Standard Company, Inc.

Certificate of Analysis

BS 74C

**AISI Grade 12L14 Certified Reference Material¹
(UNS Identification G12144)**

	Certified Value²	Estimate of Uncertainty³	Information Values⁴	
Analysis listed as percent by weight				
C	0.077	0.002	Si	(0.002)
Mn	0.94	0.01	Al	(<0.002)
P	0.082	0.003	Nb	(<0.005)
S	0.294	0.008	Sn	(<0.002)
Cu	0.005	0.0015		
Ni	0.011	0.003		
Cr	0.019	0.003		
As	0.004	0.001		
Mo	0.008	0.003		
N	0.0040	0.0004		
Pb	0.328	0.012		
V	0.0016	0.0006		

¹ Brammer Standard Company, Inc., is accredited to ISO Guide 34 as a Reference Material Producer to produce Certified Reference Materials by A2LA (Certificate Number 656.02)

² The certified value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

³ 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.

⁴ Information values are not certified and are provided for information only.

See the following pages for more information.

Certificate Number 74C-111507p1

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Analysis	*	C	*	Mn	*	P	*	S	*	Si	*	Cu	*	Ni	*	Cr
1		C 0.074	COL	0.929	ICPA	0.079	C	0.2793	ICPA	0.0012	ICPA	0.0032	ICPA	0.0093	AES	0.0171
2		C 0.074	ICPA	0.938	ICPA	0.0796	C	0.287	ICPA	0.0013	ICPA	0.0033	ICPA	0.0096	ICPA	0.0188
3		C 0.0761	T	0.939	SP	0.0805	C	0.290	ICPA	0.002	ICPA	0.005	ICPA	0.0104	ICPA	0.0194
4		C 0.0763	ICPA	0.940	SP	0.0825	C	0.292	AES	0.0038	AAS	0.0057	ICPA	0.012	ICPA	0.020
5		C 0.0768	ICPA	0.946	ICPA	0.0825	C	0.294	ICPA	0.0038	ICPA	0.0058	AES	0.0134	ICPA	0.0203
6		C 0.0771	ICPA	0.947	ICPA	0.0837	C	0.294			AAS	0.0059				
7		C 0.0778			AES	0.0843	C	0.296								
8		C 0.0783					C	0.301								
9		C 0.079					C	0.308								
Average		0.0766		0.9398		0.0817		0.2935		0.0024		0.0048		0.0109		0.0191
Std Dev		0.0018		0.0065		0.0020		0.0082		0.0013		0.0013		0.0017		0.0013
Certified		0.077		0.94		0.082		0.294		(0.002)		0.005		0.011		0.019
t		2.306		2.5706		2.4469		2.306				2.5706		2.7764		2.7764
C (95%)		0.0014		0.0068		0.0019		0.0063				0.0013		0.0021		0.0016

Analysis	*	As	*	Mo	*	N	*	Pb	*	V	*	Al	*	Nb	*	Sn
1		AES 0.0022	ICPA	0.006	F	0.0036	ICPA	0.314	ICPA	0.0010	ICPM	<0.001	ICPM	<0.0001	ICPA	<0.001
2		GFAA 0.0035	ICPA	0.0067	F	0.0037	ICPA	0.330	ICPA	0.0014	ICPM	<0.001	ICPA	<0.001	ICPM	0.0002
3		ICPA 0.0044	ICPA	0.0071	F	0.0038	ICPA	0.330	ICPA	0.0015	ICPM	0.0010	AES	0.0011	ICPM	0.0002
4		GFAA 0.0045	ICPA	0.0077	F	0.0040	ICPA	0.330	ICPA	0.0019	ICPA	0.0015	ICPM	0.0043	ICPA	0.0012
5		GFAA 0.0049	AES	0.0109	F	0.00412	AES	0.333	AES	0.0020			ICPM	0.0044	AES	0.0014
6		GFAA 0.0049			F	0.00425										
7		GFAA 0.0051			F	0.00427										
8					F	0.00429										
Average		0.0042		0.0077		0.0040		0.3275		0.0016						
Std Dev		0.0010		0.0019		0.0003		0.0076		0.0004						
Certified		0.004		0.008		0.0040		0.328		0.0016		(<0.002)		(<0.005)		(<0.002)
t		2.4469		2.7764		2.3646		2.7764		2.7764						
C (95%)		0.0010		0.0024		0.0002		0.0095		0.0005						

* Methods of analysis listed below

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

$C(95\%) = (t \cdot x \cdot sd) / \sqrt{n}$ 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 sections 6 & 10.

Methods of Analysis

Code	Method
AES	Arc/Spark Atomic Emission Spectrometry
T	Titration
ICPA	ICP Inductively Coupled Plasma Atomic Emission Spectrometry
ICPM	ICP-MA Inductively Coupled Plasma Mass Spectrometry
GFAA	Flameless Atomic Absorption Spectrometry using graphite furnace
C	Combustion-Infrared Absorption (ASTM E 1019) traceable to CRMs
F	Inert gas Fusion Method (ASTM E 1019) traceable to CRMs

CAUTION: For Arc/Spark Atomic Emission Spectrometry, an extended preburn time may be required due to the high concentration sulfur and lead.

Co-operating Laboratories: The co-operating laboratories were:

Laboratory

Brammer Standard Co., Inc., Houston, Texas
China National Analysis Center for Iron and Steel, Beijing, China
J. Dirats and Co., Inc., Westfield, Massachusetts
LECO Corporation, St. Joseph, Michigan
VHG Laboratories, Inc., Manchester, New Hampshire

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 Certified 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 discs in accordance with ASTM Standard Practice E 1806. The laboratories participating in the testing normally followed the requirements of ISO Standard 17025. Individual values listed on page 2 are the average of each analyst's results. Methods of analysis used were a combination of ASTM Standard Test Method E 1019 and E 415 plus additional ICP and AA spectrometric methods.

Outliers: Some outlying data was excluded from the data listed on page 2 due to technical assessment of the cooperating laboratories and statistical evaluation.

Traceability: The following Certified Reference Materials were used to validate the analytical data listed on page 2: SRM 10g, 15h, 20d, 129c, 2166, 3101a, 3103a, 3109a, 3112a, 3113, 3114, 3128, 3132, 3134, 3136, 3137, 3139a, 3150, 3161a, 3162a, 3163, 3165 ; ECRM 085-1 286-1.

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 using ASTM Standard Test Method E 415 and found to be compatible with the following Reference Materials: SRM 1136; CMSI 5008, 5010; SS 456/2

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. Whereas this material is in a solid form and stable, no expiration date is specified.

Source: This CRM was produced by an electric arc furnace, poured into an ingot, aluminum killed, hot worked, and annealed..

Form: This CRM is in the form of a disc, approximately 41 mm in diameter and 12 mm thick.

Use: This CRM is intended for use in arc/spark atomic emission and x-ray spectrometric methods of analysis. Refer to ISO Guide 33 for information about the use of Reference Materials.

Certified area: The entire depth of the disc may be used.

Caution: As with any bar material, avoid arc/spark atomic emission spectrometric burns in the center of the disc (5 mm radius), as some segregation may be present.

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.

Certificate Number: The unique identification number for this certificate of analysis is 74C-111507-px, where x indicates the page number. Refer to future Brammer Standard Company website postings for information on any revisions to this or other Brammer Standard reference materials..

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	web www.brammerstandard.com e-mail contact@brammerstandard.com
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Certified by: _____ on November 15, 2007
B. R. Brammer

Certificate Number 74C-111507p3

Brammer Standard Company, Inc., is accredited to ISO Guide 34 as a Reference Material Producer for the production of Certified Reference Materials and Reference Materials by A2LA (Certificate Number 656.02) The scope of accreditation is listed on the website: www.brammerstandard.com

By Certificate Number 10539, the Quality System of Brammer Standard Company, Inc., is registered to ISO 9001:2000 by National Quality Assurance, U.S.A.

Brammer Standard Company's Chemical Laboratory is accredited to ISO Standard 17025:2005 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 415 - 99a (2005) Standard Test Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel

E 826 - 85 (Withdrawn 2005) Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

E 1019 - 03 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys

E 1724 - 95 (2001) Standard Guide for Testing and Certification of Metal and Metal-Related Reference Materials

E 1806 - 96 (2006) Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

E 1831 - 96 (Withdrawn 2005) Standard Guide for Preparing Certificates for Reference Materials Relating to Chemical Composition of Metals, Ores, and Related Materials.

ISO/IEC Guides and Standards available from ANSI - <http://www.webstore.ansi.org>

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

ISO Guide 30 (Second edition, 1992), Terms and definitions used in connection with reference materials.

ISO Guide 31 (Second edition, 2000), Reference materials -Contents of certificates and labels.

ISO Guide 33 (Second edition, 2000), Uses of certified reference materials.

ISO Guide 34 (Second edition, 2000), General requirements for the competence of reference material producers.

ISO Guide 35 (Third edition, 2006), 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