

**Brammer Standard Company, Inc.**

# Certificate of Analysis

BS XCCT

Reference Material for AISI 3115 Alloy Steel

	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>		Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>
Analysis listed as percent by weight					
<b>C</b>	<b>0.158</b>	0.005	<b>N</b>	<b>0.0076</b>	0.0004
<b>Mn</b>	<b>0.52</b>	0.01	<b>V</b>	<b>0.031</b>	0.001
<b>P</b>	<b>0.005</b>	0.002			
<b>S</b>	<b>0.011</b>	0.001			
<b>Si</b>	<b>0.28</b>	0.01	Informational Values <sup>3</sup>		
<b>Cu</b>	<b>0.027</b>	0.002	Nb	(0.001)	
<b>Ni</b>	<b>1.27</b>	0.02	O	(0.005)	
<b>Cr</b>	<b>0.65</b>	0.01	Pb	(<0.001)	
<b>Mo</b>	<b>0.020</b>	0.001	Sb	(0.0004)	
<b>Al</b>	<b>0.006</b>	0.001	Sn	(0.002)	
<b>As</b>	<b>0.004</b>	0.001	Ti	(0.002)	
<b>Co</b>	<b>0.017</b>	0.002	Zr	(<0.002)	

<sup>1</sup> The certified value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

<sup>2</sup> 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.

<sup>3</sup> Values 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 the following pages for more information.

Original Certificate Number XCCT-111591  
Revised Certificate Number REV-XCCT-122109

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

BS XCCT	Analysis listed as percent by weight										Certificate number REV-XCCT-122109
Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	As
1	0.150	0.505	0.003	0.0104	0.260	0.0252	1.25	0.644	0.0190	0.006	0.0028
2	0.156	0.508	0.0042	0.0108	0.271	0.0257	1.26	0.645	0.019	0.0060	0.0037
3	0.156	0.510	0.005	0.0110	0.275	0.026	1.27	0.647	0.01970	0.006	0.0038
4	0.157	0.517	0.006	0.0110	0.275	0.027	1.27	0.656	0.020	0.006	0.004
5	0.1573	0.521	0.0069	0.0120	0.280	0.027	1.28	0.65	0.021	0.0070	0.0043
6	0.1602	0.521		0.0120	0.284	0.0272	1.29	0.65	0.021	0.008	
7	0.1603	0.53			0.2900	0.030	1.29	0.66			
8	0.165	0.53						0.666			
Average	0.1577	0.5178	0.0050	0.0112	0.2764	0.0269	1.273	0.652	0.0200	0.0065	0.0037
Std Dev	0.0043	0.0096	0.0015	0.0007	0.0096	0.0016	0.015	0.008	0.0009	0.0008	0.0006
Certified	<b>0.158</b>	<b>0.52</b>	<b>0.005</b>	<b>0.011</b>	<b>0.28</b>	<b>0.027</b>	<b>1.27</b>	<b>0.65</b>	<b>0.020</b>	<b>0.0065</b>	<b>0.004</b>
t	2.36	2.36	2.78	2.57	2.45	2.45	2.45	2.36	2.57	2.57	2.78
C(95%)	0.0036	0.0080	0.0019	0.0007	0.0089	0.0015	0.014	0.006	0.0009	0.0009	0.0007

continued from above

Analysis	Co	N	V	Nb	O	Pb	Sb	Sn	Ti	Zr
1	0.0151	0.00725	0.030	0.0006	0.0048	0.00003	0.00028	0.0013	0.001	0.001
2	0.015	0.0076	0.031	0.001	0.0056	0.00009	0.0003	0.002	0.0017	<0.0001
3	0.016	0.0077	0.031	0.001		<0.0001	0.0005	0.002	0.002	<0.001
4	0.017	0.0077	0.031	0.0010		<0.001	0.0005	0.0021	0.003	<0.002
5	0.017	0.0079	0.031	0.002		<0.001		0.003		
6	0.017		0.031	0.003				0.0031		
7	0.0192		0.032							
8			0.033							
Average	0.0166	0.00763	0.0313	0.0014	0.00520		0.00040	0.0022	0.0019	
Std Dev	0.0014	0.0024	0.0009	0.0009	0.00057		0.00012	0.0007	0.0008	
Certified	<b>0.017</b>	<b>0.0076</b>	<b>0.031</b>	<b>(0.001)</b>	<b>(&lt;0.006)</b>	<b>(&lt;0.001)</b>	<b>(0.0004)</b>	<b>(0.002)</b>	<b>(0.002)</b>	<b>(&lt;0.002)</b>
t	2.45	2.78	2.36	2.57	12.71		3.18	2.57	3.18	
C(95%)	0.0013	0.0003	0.0007	0.0009	0.00508		0.00019	0.0007	0.0013	

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

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

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

Allegheny Ludlum Steel Corp., Brackenridge, PA	Charles C. Kawin Company, Broadview, IL
Allegheny Ludlum Steel Corp., Lockport, NY	TCR Engineering Service Pvt. Ltd., Bombay, India
Anderson Laboratories, Inc. Greendale, WI	United States Steel Corp., Pittsburgh, PA
Brammer Standard Co., Inc., Houston, TX	VHG Laboratories, Manchester, NH
J. Dirats and Co., Inc., Westfield, MA	

**Certification Process:** The requirements of ISO Guide 31, ISO Guide 34, 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.

**Analysis:** Chemical analyses were made on chips prepared by a lathe from the certified portion of the discs. The laboratories participating in the testing normally followed the requirements of ISO Guide 17025. The individual values listed above are the average of each analyst's results.

**Methods of Analysis:** 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 32e, 125b, 361 to 365; BAM 039-2, 044-1; BCS 455/1, 456/1, 458/1; ECRM 085-1, 088-1, 096-1, 184-1, 481-1; GBW 1402; IMZ 1.22, 1.74

**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 spark atomic emission spectrometry and found to be compatible with the following Certified Reference Materials: NIST SRM 1222, 1224, 1225, 1261A to 1265A, and 1761 to 1767.

**Source:** This material was produced by United States Steel Corporation. The material was made in an electric arc furnace, cast into ingots, and rolled into billets.

**Available Form:** This Reference Material is available only in the form of a disc, approximately 37 mm in diameter and 19 mm thick.

**Use:** This Reference Material is intended for use in spark atomic emission and x-ray spectrometric methods of analysis. The entire depth of the disc may be used.

**Caution:** As with any bar material, avoid 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 REV-XCCT-122109. This Reference Material was revised to show the estimate of uncertainties for the certified elements. Also, the values for Nb, Pb, Sb, Sn, Ti, and Zr were reclassified as uncertified values based on the requirements of current editions of the cited ISO Guides.

Refer to the "Certificates" section of the Brammer Standard Company website for any revision to this or other Brammer Standard Company's Certificates of Analysis

**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.

**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: <a href="http://brammerstandard.com">brammerstandard.com</a> email: <a href="mailto:contact@brammerstandard.com">contact@brammerstandard.com</a>
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Certified by: \_\_\_\_\_ on December 21, 2009.  
Beau R. Brammer

**Certificate Number REV-XCCT-122109**

## References:

*ASTM documents available from ASTM, 1916 Race Street, Philadelphia, PA, 19103. - [www.astm.org](http://www.astm.org)*

- E 350 Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron
- E 415 Standard Test Method for Atomic Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel
- E 826 Standard Practice for Testing Homogeneity of a Metal Lot or Batch in Solid Form by Spark Atomic Emission Spectrometry
- E 1019 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques

*ISO Guides and Standards available from Global Engineering - [www.global.ihs.com](http://www.global.ihs.com)*

- ISO Standard 17025:2005 General requirements for the competence of testing and calibration laboratories
- ISO Guide 30:1992 Terms and definitions used in connection with reference materials plus amendment of 2008
- ISO Guide 31:2000 Reference materials - Contents of certificates and labels
- ISO Guide 33:2000 Uses of certified reference materials
- ISO Guide 34:2000 General requirements for the competence of reference material producers
- ISO Guide 35:2006 Reference Materials - General and statistical principles for certification

*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