

Brammer Standard Company, Inc.

Certificate of Analysis

BS 91F

Certified Reference Material for 430 Grade Stainless Steel (UNS Number S43000)

	Certified Value ¹	Estimate of Uncertainty ²		Certified Value	Estimate of Uncertainty ²	
	Analysis listed as percent by weight			Analysis listed as percent by weight		
C	0.060	0.003	Sn	0.0054	0.0004	
Mn	0.762	0.006	Ti	0.0018	0.0002	
P	0.022	0.001	W	0.0120	0.0012	
S	0.0071	0.0005				
Si	0.381	0.006				
Cu	0.167	0.004				
Ni	0.40	0.01				
Cr	16.34	0.05				
Mo	0.112	0.003				
Al	0.0029	0.0005	Not Certified - Informational Values ³			
V	0.071	0.002	B	(0.0002)		
Ca	0.0012	0.0002	O	(0.0076)		
Co	0.0174	0.0008	Sb	(0.0017)		
N	0.0558	0.0015				
Nb	0.0120	0.0008				

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 the following pages for more information.

Certificate Number 91F-081209p1

BS 91F	* code for analytical method		analysis listed as percent by weight										Certificate No. 91F-081209p2									
Analysis	*	C	*	Mn	*	P	*	S	*	Si	*	Cu	*	Ni	*	Cr	*	Mo	*	Al	*	V
1	1	0.050	3	0.7457	11	0.0199	1	0.0058	3	0.372	3	0.160	5	0.390	8	16.25	3	0.1066	3	0.0024	3	0.067
2	1	0.0564	3	0.754	11	0.0203	1	0.0060	9	0.372	7	0.160	3	0.39	8	16.28	3	0.107	3	0.0025	3	0.070
3	1	0.0578	10	0.756	3	0.0203	1	0.0060	3	0.373	7	0.163	3	0.39	3	16.31	3	0.1105	3	0.0026	3	0.070
4	1	0.0592	3	0.758	3	0.0208	1	0.0060	9	0.374	3	0.1639	5	0.391	3	16.32	3	0.111	3	0.0028	3	0.071
5	1	0.0592	3	0.759	5	0.021	1	0.0061	9	0.378	5	0.165	5	0.394	8	16.32	3	0.111	3	0.0029	5	0.071
6	1	0.0600	10	0.762	3	0.021	1	0.0066	5	0.379	3	0.165	5	0.394	3	16.33	3	0.112	3	0.0030	5	0.071
7	1	0.0603	3	0.762	3	0.0212	1	0.0069	3	0.3800	5	0.167	5	0.395	3	16.34	5	0.112	12	0.0036	5	0.071
8	1	0.0608	3	0.7640	3	0.022	1	0.0070	9	0.380	5	0.167	3	0.3988	3	16.34	3	0.113	12	0.0037	5	0.071
9	1	0.0608	5	0.764	3	0.022	1	0.0070	9	0.383	5	0.168	3	0.40	8	16.34	5	0.113			3	0.071
10	1	0.0610	5	0.764	3	0.022	1	0.0071	5	0.383	5	0.168	3	0.40	5	16.38	5	0.113			5	0.072
11	1	0.0611	5	0.765	5	0.022	1	0.0071	5	0.385	3	0.169	3	0.405	5	16.39	5	0.114			3	0.0725
12	1	0.0611	3	0.765	5	0.022	1	0.0072	5	0.385	3	0.169	3	0.411	5	16.40	3	0.115			3	0.0733
13	1	0.0614	5	0.765	5	0.022	1	0.0075	5	0.385	3	0.169	3	0.412	5	16.40	3	0.115			3	0.0735
14	1	0.0615	5	0.766	5	0.023	1	0.00750	3	0.390	3	0.1700	7	0.413	5	16.42	5	0.117			3	0.0752
15	1	0.0616	3	0.768	3	0.023	1	0.00753	9	0.392	3	0.174	3	0.4150								
16	1	0.0621	3	0.768	3	0.0244	1	0.0076			3	0.175	7	0.416								
17	1	0.0624					1	0.0076														
18	1	0.0625					1	0.0076														
19							1	0.0076														
20							1	0.00761														
21							1	0.0077														
22							1	0.00775														
23							1	0.0078														
Average		0.0600		0.7616		0.0217		0.00707		0.3807		0.1671		0.401		16.344		0.1122		0.00294		0.0714
Std Dev		0.0029		0.0059		0.0012		0.00066		0.0063		0.0042		0.010		0.049		0.0029		0.00048		0.0019
Certified		0.060		0.762		0.022		0.0071		0.381		0.167		0.40		16.34		0.112		0.0029		0.071
t		2.11		2.13		2.13		2.07		2.14		2.13		2.13		2.16		2.16		2.36		2.16
C(95%)		0.0015		0.0031		0.0006		0.00029		0.0035		0.0023		0.005		0.028		0.0017		0.00040		0.0011

Data listed as ppm by weight (mg/kg)

Analysis	*	Ca	*	Co	*	N	*	Nb	*	Sn	*	Ti	*	W	*	B	*	O	*	Sb		
1	3	10	7	160	2	540	3	100	12	50	3	12	3	100	3	2	2	70	12	11		
2	3	11	3	160	2	543	12	109	12	50	3	15	3	104	12	2.0	2	83	12	12		
3	3	11	3	170	2	543	3	110	3	54	3	17	3	119	12	2.1			3	18		
4	3	12	3	170	2	546	3	116	12	54	5	17	3	120	11	2.3			6	19		
5	3	12	3	170	2	549	3	120	6	55	3	18	3	120	11	2.4			6	20		
6	3	12	5	170	2	551	5	120	6	55	5	18	3	120	4	2.9			6	20		
7	3	13	5	170	2	551	3	120	6	58	3	19	12	124					6	22		
8	3	13	5	170	2	557	5	120	6	58	5	19	3	125								
9	3	15	7	175	2	567	12	124			5	19	12	127								
10			3	175	2	567	12	126			3	19	3	130								
11			5	180	2	573	5	130			5	19	3	132								
12			5	180	2	576	5	130			3	20										
13			3	190	2	587	5	130														
14			3	198																		
Average		12.1		174.1		557.7		119.6		54.3		17.7		120.1		2.3		76.5			17.4	
Std Dev		1.5		10.4		14.9		9.1		3.1		2.2		10.0		0.3		9.2			4.2	
Certified		12		174		558		120		54		18		120		(2)		(76)			(17)	
t		2.31		2.16		2.18		2.18		2.36		2.20		2.23								
C(95%)		1.1		6.0		9.0		5.5		2.6		1.4		6.7								

* Methods of Analysis are listed on page 3.

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 35:2006 section 6.

* Methods of Analysis used

1	Combustion	5	XRF Spectrometry	9	Gravimetric
2	Fusion	6	Graphite Furnace Atomic Absorption Spectrometry	10	Colorimetric
3	ICP-AES	7	Flame Atomic Absorption Spectrometry	11	Photometric
4	Spark-AES	8	Titrimetric	12	ICP - Mass Spectrometry

AES = Atomic Emission Spectrometry

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

Laboratory

Brammer Standard Company, Inc., Houston, TX
Dirats Laboratory, Westfield, MA
IMZ - Instytut Metalurgii Zelaza, Gliwice, Poland
Laboratory Testing Inc, Hatfield, PA
Leco Technical Services Laboratory, St. Joseph, MI
National Analysis Center Iron and Steel, Beijing, China
VHG Labs, Manchester, NH

Accredited/Registered by

A2LA - ISO 17025, ISO Guide 34
Nadcap - 17025
PCA - AB 554
Nadcap - 17025
BSI - ISO 9001
CNAS - L0272
URS - ISO 17025

Certification Process: The requirements of ISO Guide 31, ISO Guide 34, ISO Guide 35, and ASTM Standard Guides E 1724 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. Methods of analysis used were a combination of ASTM Standard Test Method E 1019 plus additional, spark-AES, ICP-AES and AA spectrometric methods.

Traceability: The following Certified Reference Materials were used to validate the analytical data listed on page 2: NIST SRM 168, 121d, 324, 345, 867, 2159, 3101a, 3102a, 3103a, 3107, 3107a, 3109a, 3112a, 3114, 3128, 3132, 3134, 3136, 3137, 3139a, 3150, 3161a, 3162a, 3163, 3165, 3168a; ECRM 065-1, 085-1, 292-1; BAS BCS 265/2, 320, 322, 345, 346, 402, 431, 459, 464; IMZ 1.10/1, 1.25/3, 1.4/3, 119, 124, 153, 171; JSS GS-5d;

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable. It was also examined by spark atomic emission spectrometry and found to be compatible with the following Reference Materials: NIST SRM 1295; BAS SS 470; Brammer BS 94A, 94C, 98, 0022, 0231, 9732.

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: The bar stock for this CRM was melted by Universal Stainless & Alloy Products, at Bridgeville, Pennsylvania in an electric arc furnace (EAF) plus argon-oxygen decarburization (AOD), annealed and centerless ground.

Form: This CRM is machined in the form of a disc, approximately 38 mm (1.5") in diameter and 19 mm (0.75") thick by Brammer Standard Company, Inc.

Use: This CRM is intended for use in 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 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 91F-081209-px, where x indicates the page number.

Revisions: Refer to the Brammer Standard Company website (www.brammerstandard.com) "Certificates" section 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:

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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

Certified by: _____ on August 12, 2009
Beau R. Brammer

Certificate Number 91F-081209p3

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

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

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.

References:

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

- E 826 - 08 Standard Practice for Testing Homogeneity of a Metal Lot or Batch in Solid Form by Spark Atomic Emission Spectrometry
- E 1019 - 08 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
- E 1724 - 95 (Reapproved 2001) Standard Guide for Testing and Certification of Metal and Metal-Related Reference Materials
- E 1806 - 09 Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

ISO Guides and Standards available from Global Engineering - 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
- 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