Brammer Standard Company, Inc.

Certificate of Analysis

BS CC-11B

Certified Reference Material for Chill-Cast Iron

Certified Values[3]

	Certified Value[1]	Estimate of Uncertainty[2]			Certified Value[1]	Estimate of Uncertainty[2]
Al	0.028	0.002		P	0.020	0.002
As	0.0074	0.0007		Pb	0.014	0.002
B	0.0033	0.0005		S	0.008	0.001
C	2.97	0.03		Sb	0.026	0.003
Ce	0.045	0.004		Si	1.94	0.02
Cr	0.189	0.004		Sn	0.021	0.002
Cu	0.0210	0.0008		Te	0.019	0.002
Fe	93.2	0.2		Ti	0.031	0.001
Mg	0.025	0.001		V	0.0179	0.0009
Mn	1.17	0.01		W	0.028	0.003
Mo	0.018	0.002		Zn	0.008	0.001
Nb	0.043	0.003		Zr	0.0165	0.008
Ni	0.173	0.006				

Reference Values[3,4]

	Reference Value[1]	Estimate of Uncertainty[2]			Reference Value[1]	Estimate of Uncertainty[2]
Bi	0.016	0.002		N	0.008	0.001
Co	0.022	0.003				

Informational Values[3,5]

Ca   (0.002)   La   (0.008)   O   (0.002)

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[1] For each element, the certified value listed is the present best estimate of the true value based on the mean of the weighted results of an interlaboratory testing program. See page 4 for more information on its calculation.

[2] For each element, the uncertainty listed is based on a statistical evaluation of the contributions of homogeneity and the interlaboratory testing program. See page 4 for more information on its calculation.

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

[4] Reference values are not certified and are provided for information only.

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

Trace element information values for Ba, Cl, Dy, Ga, Gd, Ge, Hf, K, Li, Na, Nd, Pr, Re, Se, Sm, Sr, Ta, Th, U, and Y are shown on page 4.

The requirements of ISO Guides 30, 31, and 35 were followed for the preparation of this Certified Reference Material and certificate of analysis.

BS CC-11B * Code for method Certified values listed as weight percent

Analysis	*	Al	*	As	*	B	*	C	*	Ce	*	Cr	*	Cu	*	Fe	*	Mg	*	Mn
1	5	0.025667	3	0.0032	3	0.0027	10	2.9267	11	0.033	4	0.17933	12	0.0150	11	93.06	4	0.0224	4	1.1599
2	3	0.026333	5	0.006367	14	0.0028	1	2.9433333	3	0.04	4	0.18217	4	0.015633	3	93.06333	14	0.023667	11	1.16
3	4	0.026533	5	0.006367	12	0.002833	1	2.9477333	4	0.0423	4	0.1824	4	0.020233	3	93.07	4	0.0238	11	1.16
4	3	0.027	4	0.006763	3	0.0029	1	2.950	4	0.0447333	3	0.185	10	0.020367	3	93.07	11	0.0238	4	1.16
5	3	0.0272	12	0.007367	3	0.0030	1	2.950	14	0.0456667	10	0.1853	10	0.0207	14	93.1	4	0.023933	7	1.1604
6	4	0.027433	5	0.007397	3	0.0032	1	2.95	5	0.0461333	3	0.1867	3	0.021	16	93.1	3	0.0241	7	1.162
7	11	0.028	3	0.0077	3	0.0032	1	2.9523333	4	0.0466333	11	0.187	11	0.0211	11	93.16	11	0.0243	4	1.163
8	11	0.028	4	0.007833	4	0.0032	1	2.9574	3	0.0472	4	0.18767	7	0.0211	4	93.17667	4	0.0243	3	1.16667
9	4	0.0281	4	0.008	4	0.0033	1	2.96125	4	0.0499667	11	0.188	3	0.0211	4	93.2178	17	0.025	4	1.17
10	3	0.029	9	0.0080	7	0.003423	1	2.97	4	0.0555	3	0.189	4	0.021167	13	93.25367	3	0.0251	3	1.17
11	3	0.029	3	0.0081	11	0.0036	1	2.974	4	0.0577	4	0.18933	7	0.0212	4	93.4	4	0.0256	4	1.178
12	14	0.029067	3	0.0081	4	0.003933	11	2.98			3	0.19	4	0.021267	10	93.45	4	0.025867	4	1.1786
13	4	0.029267	10	0.0089	11	0.0043	11	2.98			3	0.19	10	0.02146			3	0.026	17	1.18
14	3	0.030233	4	0.0093			3	2.99			4	0.19	4	0.022167			3	0.028	3	1.18
15	7	0.0303					1	2.9966667			17	0.190	14	0.022167			4	0.0282	14	1.18
16	4	0.0304					1	3			14	0.19	3	0.0226					3	1.1818
17	7	0.0306					1	3.01			4	0.19023	3	0.022889					10	1.18661
18	3	0.0306					1	3.017			4	0.1919	3	0.023					10	1.1897
19							3	3.04			3	0.19622	3	0.0231					10	1.19
20							3	3.07			10	0.19967	11	0.0233					3	1.19
21																			3	1.19
Average		0.02804		0.00738		0.003261		2.9661		0.0448		0.1891		0.02097		93.174		0.02499		1.1721
Std Dev		0.00085		0.00031		0.000088		0.0064		0.0016		0.0028		0.00073		0.032		0.00079		0.0053
H		0.0017		0.00095		0.00068		0.020		0.0021		0.0044		0.0015		0.18		0.0016		0.011
U_1		0.0019		0.0010		0.00068		0.021		0.0027		0.0052		0.0017		0.19		0.0018		0.013
t-statistic		2.11		2.16		2.18		2.09		2.23		2.09		2.09		2.20		2.14		2.09
U_2		0.0040		0.0022		0.0015		0.044		0.0060		0.011		0.0035		0.41		0.0039		0.027
U_3		0.0010		0.00058		0.00041		0.010		0.0018		0.0024		0.00078		0.12		0.0010		0.0059
Certified		**0.028**		**0.0074**		**0.0033**		**2.97**		**0.045**		**0.189**		**0.0210**		**93.2**		**0.025**		**1.17**
Uncertainty		0.002		0.0007		0.0005		0.03		0.004		0.004		0.0008		0.2		0.001		0.01
Tolerance		0.006		0.0022		0.0015		0.09		0.012		0.012		0.0035		0.6		0.004		0.03

Analysis	*	Mo	*	Nb	*	Ni	*	P	*	Pb	*	S	*	Sb	*	Si	*	Sn	*	Te
1	12	0.014667	3	0.040	10	0.159333	3	0.0163	3	0.009	1	0.00608	10	0.01698	4	1.88	12	0.015667	5	0.01223
2	10	0.014667	3	0.040	17	0.165	12	0.0166667	12	0.0110	3	0.0069	4	0.0193	10	1.88707	3	0.0176	4	0.01777
3	4	0.014867	4	0.040267	3	0.167	10	0.0172	5	0.0113667	3	0.007	4	0.0194	6	1.917	3	0.0188	5	0.0185
4	3	0.0156	4	0.0408	4	0.168667	4	0.0175667	5	0.0122667	11	0.0072	11	0.0215	3	1.92	3	0.019	12	0.01867
5	7	0.015933	4	0.0409	3	0.169	10	0.01776	11	0.0129	1	0.0074	3	0.025	7	1.923	3	0.019333	15	0.0205
6	3	0.016	10	0.0410	14	0.17	7	0.0185333	11	0.013	3	0.0074	14	0.026133	4	1.928667	10	0.0200	11	0.0269
7	3	0.017	3	0.0411	4	0.17	4	0.0188	3	0.013	1	0.00767	4	0.0263	7	1.933	3	0.0202		
8	3	0.0172	4	0.0422	4	0.170333	5	0.0195	4	0.0137667	10	0.0077	4	0.026633	18	1.94	5	0.021		
9	4	0.0173	3	0.0432	4	0.170733	3	0.020	10	0.014	1	0.00795	12	0.026667	3	1.94	3	0.0210		
10	4	0.0177	3	0.0436	10	0.17139	18	0.020	3	0.0140	11	0.008	10	0.0267	4	1.943	4	0.0210		
11	10	0.0180	4	0.043767	4	0.171667	11	0.0207	3	0.014	1	0.008	3	0.0269	6	1.945	4	0.021033		
12	7	0.0181	14	0.043933	3	0.172	11	0.0209	17	0.0140	1	0.0082	3	0.028	9	1.946667	4	0.0212		
13	7	0.0181	4	0.044	3	0.173111	4	0.021	3	0.0142	11	0.0082	5	0.0282	3	1.95	4	0.0212		
14	5	0.0188	4	0.044167	4	0.173567	4	0.0211667	3	0.015	1	0.00854	5	0.028967	6	1.950067	5	0.021567		
15	11	0.0192	11	0.0467	7	0.1746	14	0.0213	9	0.0178667	13	0.0088	3	0.033	3	1.9548	4	0.0222		
16	11	0.0197	11	0.0468	7	0.1758	3	0.0215333	4	0.0179333	13	0.00883	3	0.0352	3	1.96	4	0.0223		
17	4	0.019733	10	0.04795	10	0.1780	3	0.022	4	0.0197	1	0.0094			3	1.968889	11	0.0256		
18	14	0.021033			8	0.179	7	0.0222							10	1.9690	11	0.0257		
19	10	0.02257			11	0.179	7	0.02251							11	1.97				
20	3	0.023556			11	0.179	3	0.0226							11	1.97				
21	4	0.0260			3	0.18	3	0.0234												
22					3	0.1806	10	0.0234												
Average		0.018368		0.042964		0.1730		0.02014		0.01414		0.00771		0.025930		1.939808		0.020800		0.0188
Std Dev		0.000069		0.000077		0.0028		0.00065		0.00044		0.00027		0.000079		0.000071		0.000075		0.0016
H		0.0014		0.0021		0.0042		0.0015		0.0013		0.0010		0.0017		0.016		0.0015		0.0014
U_1		0.0014		0.0021		0.0050		0.0016		0.0013		0.0010		0.0017		0.016		0.0015		0.0021
t-statistic		2.09		2.12		2.08		2.09		2.12		2.12		2.13		2.09		2.11		2.57
U_2		0.0030		0.0045		0.010		0.0034		0.0028		0.0021		0.0035		0.033		0.0032		0.0055
U_3		0.00065		0.0011		0.0022		0.00076		0.00069		0.00052		0.00089		0.0074		0.00075		0.0022
Certified		**0.018**		**0.043**		**0.173**		**0.020**		**0.014**		**0.008**		**0.026**		**1.94**		**0.021**		**0.019**
Uncertainty		0.002		0.003		0.006		0.002		0.002		0.001		0.003		0.02		0.002		0.002
Tolerance		0.006		0.009		0.018		0.006		0.006		0.003		0.009		0.06		0.006		0.005

BS CC-11B   * Code for method   Certified values listed as weight percent

Analysis	*	Ti	*	V	*	W	*	Zn	*	Zr
1	10	0.0273	3	0.0155	4	0.021	5	0.0055333	11	0.015
2	3	0.027889	4	0.016267	4	0.0221	3	0.0073	3	0.015
3	4	0.028333	10	0.0170	3	0.025	3	0.008	14	0.015767
4	10	0.0287	5	0.017067	12	0.0250	5	0.0081633	4	0.015967
5	3	0.030	4	0.0171	3	0.0264	10	0.0083	5	0.0160
6	4	0.030433	4	0.0171	14	0.026767	4	0.0086	4	0.016067
7	4	0.0307	3	0.0175	10	0.0270	3	0.009	11	0.0162
8	3	0.0307	3	0.0175	4	0.0282	14	0.009	11	0.0165
9	3	0.031	4	0.017967	4	0.0292	12	0.0091333	4	0.0165
10	3	0.031	3	0.018	4	0.029267	4	0.0093	4	0.0166
11	3	0.0312	4	0.018033	3	0.030	4	0.0093933	10	0.0167
12	11	0.0315	14	0.0181	3	0.0311	4	0.0099333	3	0.017
13	4	0.031633	3	0.0185	5	0.0315			3	0.0172
14	4	0.0318	11	0.0185	3	0.033			4	0.0173
15	14	0.032	11	0.0186	4	0.0353			3	0.017333
16	4	0.0321	3	0.0190					3	0.0175
17	11	0.0321	3	0.019					5	0.017967
18	4	0.0323	4	0.0192						
19	10	0.037167	10	0.020033						
Average		0.03056		0.017893		0.028056		0.00843		0.01653
Std Dev		0.00097		0.000073		0.000082		0.00037		0.00060
H		0.0018		0.0018		0.0018		0.0018		0.0013
U_1		0.0020		0.0018		0.0018		0.0018		0.0015
t-statistic		2.10		2.1		2.14		2.20		2.12
U_2		0.0043		0.0038		0.0038		0.0040		0.0031
U_3		0.0010		0.00086		0.0010		0.0012		0.00076
Certified		**0.031**		**0.0179**		**0.028**		**0.008**		**0.0165**
Uncertainty		0.001		0.0009		0.003		0.001		0.0008
Tolerance		0.004		0.0038		0.009		0.004		0.0031

BS CC-11B   * Code for method   Reference values listed as weight percent

Analysis	*	Bi	*	Co	*	N
1	12	0.0110	10	0.0183	2	0.006433
2	3	0.0117	5	0.0185	2	0.0067
3	5	0.012533	4	0.0195	2	0.007
4	5	0.012833	8	0.0195	2	0.007086
5	4	0.0146	4	0.0196	2	0.007437
6	3	0.015	3	0.020	2	0.0082
7	14	0.018767	4	0.021233	2	0.008267
8	4	0.0229	12	0.021667	2	0.00853
9	4	0.0234	4	0.021833	2	0.0089
10			3	0.022	2	0.0098
11			4	0.022067		
12			3	0.0222		
13			14	0.022867		
14			4	0.023		
15			10	0.02363		
16			3	0.024		
17			3	0.024		
18			11	0.0241		
19			11	0.0242		
20			3	0.0248		
Average		0.01586		0.021850		0.00790
Std Dev		0.00011		0.000071		0.00030
H		0.0013		0.0015		0.0010
U_1		0.0013		0.0015		0.0010
t-statistic		2.31		2.09		2.26
U_2		0.0031		0.0032		0.0023
U_3		0.0010		0.00072		0.00073
Reference		**0.016**		**0.022**		**0.008**
Uncertainty		0.002		0.003		0.001
Tolerance		0.006		0.009		0.003

BS CC-11B   * Code for method   Informational values listed as weight percent

Analysis	*	Ca	*	La	*	O
1	4	0.000267	12	0.002967	2	0.0008
2	11	0.0005	3	0.0043	2	0.00093
3	3	0.0006	5	0.0056	2	0.001
4	12	0.000997	4	0.006213	2	0.00116
5	4	0.0012	5	0.006563	2	0.001667
6	3	0.0014	14	0.0092	2	0.001757
7	4	0.001553	11	0.0096	2	0.001933
8	1	0.0018	4	0.009967	2	0.003
9	4	0.0024	4	0.0127	2	0.003474
10	4	0.0039	4	0.014		
11	3	0.0053				
12	3	0.007				
Average		0.0022		0.008		0.0017
Std Dev		0.0083		0.055		0.0064
H		0.0006		0.001		0.0005
U_1		0.0083		0.055		0.0064
t-statistic		2.20		2.26		2.31
U_2		0.018		0.13		0.015
U_3		0.0053		0.040		0.0049
Informational		(0.002)		(0.008)		(0.002)

For each element, in accordance with the requirements of ISO 17034 and Guide 35, an effort must be made to account for the effects on the certified value of the uncertainty estimate from homogeneity testing (H) and the uncertainties of the contributing laboratories. The average (A) is calculated using a weighted mean where the reciprocal of the square of each laboratory's combined uncertainty (C_L), calculated from its standard deviation (S_L) and its uncertainty estimate (U_L), is used as the weight (W_L) for it's mean (M_L). The standard deviation (S) is calculated as the square root of the reciprocal of the sum of the weights. U_1 is the combined uncertainty from homogeneity and labs. U_2 is U_1 multiplied by the coverage factor (95 % t-statistic). U_3 is U_2 divided by the square root of the number of determinations (n). Thus:

$$C_L = \sqrt{S_L^2 + U_L^2} \qquad W_L = \frac{1}{C_L^2} \qquad A = \frac{\sum_{i=1}^{n} W_L M_L}{\sum_{i=1}^{n} W_L} \qquad S = \frac{1}{\sqrt{\sum_{i=1}^{n} W_L}} \qquad U_1 = \sqrt{H^2 + S^2} \qquad U_2 = t \times U_1 \qquad U_3 = \frac{U_2}{\sqrt{n}}$$

*All but the final reported values are taken to two significant figures as determined by each quantity's uncertainty estimate. The final reported Uncertainty is U_3 rounded to one significant figure and represents the half width of the 95 % confidence interval for the **Certified** value. The final reported **Certified** value is A rounded to the same decimal place as the Uncertainty. The Uncertainty is a measure of the quality of the **Certified** value.*

The Tolerance is a measure of the expected performance of an analysis. This involves further expanding the sample uncertainty to include instrument and operator uncertainty, for those without access to such calculations.

For further information regarding the confidence interval for the certified value see ISO Guide 35:2006 section 6.

BS CC-11B   * Code for analytical method   Trace analysis listed as mg/kg   (ppm)

Analysis	*	Ba	*	Cl	*	Dy	*	Ga	*	Gd	*	Ge	*	Hf	*	K	*	Li	*	Na
1	12	0.78	12	0.02	12	0.02	12	9.5	12	0.06	12	6.1	12	1.7	12	0.05	12	0.005	12	0.01
2	12	0.88	12	0.03	12	0.03	12	9.5	12	0.07	12	6.2	12	1.7	12	0.05	12	0.006		
3	12	0.99	12	0.04	12	0.03	12	9.8	12	0.08	12	6.3	12	1.7	12	0.06	12	0.008		

Analysis	*	Nd	*	Pr	*	Re	*	Se	*	Sm	*	Sr	*	Ta	*	Th	*	U	*	Y
1	12	4.8	12	1.6	12	0.03	12	0.07	12	0.48	12	0.04	12	1.6	12	1.9	12	0.08	12	0.14
2	12	5	12	1.7	12	0.03			12	0.51	12	0.04	12	1.6	12	2	12	0.09	12	0.14
3	12	5	12	1.8	12	0.03			12	0.52	12	0.05	12	1.6	12	2	12	0.09	12	0.15

Analytical Method Codes:

1	Combustion (ASTM E1019)	7	Photometric	13	Titrimetric
2	Fusion (ASTM E1019)	8	Flame Atomic Absorption	14	DCP Atomic Emission
3	Spark Atomic Emission	9	GF Atomic Absorption	15	HG Atomic Fluorescence
4	ICP Atomic Emission	10	X-Ray Fluorescence	16	Difference
5	ICP Mass Spectrometry	11	GD Atomic Emission	17	AAS
6	Gravimetric	12	GD Mass Spectrometry	18	Wet

ICP = Inductively Coupled Plasma   GF = Graphite Furnace   GD = Glow Discharge
DCP = Direct Current Plasma   HG = Hydride Generation   AAS = Atomic Absorption Spectrometry

Lab Name	Location	Registrar	Accreditation
Brammer Standard Company, Inc.	Houston, TX	A2LA	17025, 17034
Dirats Laboratories	Westfield,MA	ANAB	17025
Eurofins EAG Materials Science, LLC	Liverpool, NY	A2LA	17025
TUV Rheinland Pvt Ltd	Bangalore, India	NABL	17025
Vitkovice	Ostrava	ILAC	17025
Enviform	Stare Mesto, Trinec	ILAC	17025
Instytut Metalurgii Zelaza	Gliwice, Poland	PCA	17025
National Analysis Center For Iron And Steel	Beijing, China	CNAS	17025
Laboratory Testing, Inc.	Hatfield, PA	PRI	17025
Luvak Inc.	Boylston, MA	PRI	17025
Chicago Spectro	Chicago, IL	A2LA	17025

A2LA = American Association for Laboratory Accreditation
ANAB = ANSI-ASQ National Accreditation Board
CNAS = China National Accreditation Service
NABL = National Accreditation Board for Testing and Calibration Laboratories
PCA = Polish Center For Accreditation
PRI =Performance Review Institute

Analysis: Chemical analyses were made on solid pieces and chips prepared by a lathe from representative samples for the certified portion of the lot in accordance with ASTM Standard Practice E1806. The laboratories participating in the testing followed the requirements of ISO Standard 17025.

Traceability: The following Certified Reference Materials were used to validate the analytical data: 11XC1N, 11XC4, 12X15255, 12X15260, 12X15266, 12X353, 12X356, 12X43400; AR 306, 644, 654, 668, 673, 892, 1648, 1652, 1653; BAS 423, 451; BS CC-10, CC-11, CE 206, CI4, LF2B, 21A, 26, 26A, 28, 45B, 54H, 8620C; CKD DS2, 167A, 169A, 183A, 186A, 187A, 189A, 210S, 211S, 217A, 222A, 223A, 235, 236, 248, 249; ECRM 096-1, 479-1; IMZ 114A; IPT 43, 45, 75A; JSS 168-7; LECO 501-024, 501-644, 501-646, 501-676, 502-198, 502-255, 502-416, 502-928; NCS NS 20035B; SRM 7G, 8F, 16D, 16E, 36, 82, 107B, 134A, 361, 362, 391, 1140, 1263, 1269, 1762, 3107, 3109A, 3110, 3114, 3127A, 3131A, 3136, 3162A, 3168A.

Homogeneity: This Certified Reference Material (CRM) was tested for homogeneity using ASTM Standard Method E826 and found acceptable. It was also examined by spark atomic emission spectrometry and found to be compatible with the following Reference Materials — BS CC-10, CC-11, CE 206, CI4, 21A, 26, 26A, 28; ECRM 487-1; NCS NS 20035B; SRM 338, 1140.

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 CC-11B is valid indefinitely. The certification is nullified if this CRM is damaged, contaminated, or otherwise modified.

Storage: This CRM must be stored in a cool, dry, non-corrosive environment.

Source: The cast stock for this CRM was produced by Tanjin D&C Technology Development Co., LTD.; Tianjin, China.

Form: This CRM is machined in the form of a disc, approximately 35 mm in diameter and 30 mm thick by Brammer Standard Company, Inc.

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

Certified Area:
The certified area of each disc is the portion extending upward 10 mm from the larger diameter surface.

Note: Shrinkage cavities may appear in the top portion of some discs. These cavities are normal and will not affect the certified portion of the disc.

Sample Preparation: For best analytical results, use the same method for preparing the analytical surface on all reference materials as used for production specimens. Avoid overheating the sample during surface preparation.

Caution: CRM contains significant insoluble soft metal inclusions. Surface smearing may occur. Spark atomic emission spectrometers may require extended preburns to compensate.

Certificate Number: The unique identification number for this certificate of analysis is CC-11B-040720. 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) 440-9396Web: www.brammerstandard.com**
14603 Benfer Road
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 Standard 17034 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 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 9001:2015   Quality Management Systems - Requirements

ISO Guide 30:2015   Terms and definitions used in connection with reference materials + 2008 amendment

ISO Guide 31:2015   Reference materials - Contents of certificates and labels

ISO Guide 33:2015   Uses of certified reference materials

ISO Standard 17034:2016 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 April 7, 2020.

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Beau R. Brammer

President

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