

# Brammer Standard Company, Inc.

## Certificate of Analysis

### BS 285BE

Certified Reference Material for Chill Cast Iron

	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>	<b>Certified Values<sup>3</sup></b>	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>	
<b>Al</b>	<b>0.0162</b>	0.0004		<b>Nb</b>	<b>0.0038</b>	0.0002
<b>As</b>	<b>0.0010</b>	0.0003		<b>Ni</b>	<b>1.38</b>	0.02
<b>B</b>	<b>0.0084</b>	0.0003		<b>P</b>	<b>0.0474</b>	0.0009
<b>C</b>	<b>3.45</b>	0.04		<b>Pb</b>	<b>0.0007</b>	0.0002
<b>Ca</b>	<b>0.0009</b>	0.0001		<b>S</b>	<b>0.0128</b>	0.0008
<b>Cr</b>	<b>1.047</b>	0.007		<b>Si</b>	<b>1.93</b>	0.01
<b>Cu</b>	<b>0.321</b>	0.002		<b>Sn</b>	<b>0.0016</b>	0.0004
<b>Fe</b>	<b>90.53</b>	0.08		<b>Ti</b>	<b>0.0428</b>	0.0007
<b>Mg</b>	<b>0.049</b>	0.001		<b>V</b>	<b>0.122</b>	0.001
<b>Mn</b>	<b>0.732</b>	0.003		<b>W</b>	<b>0.0607</b>	0.0008
<b>Mo</b>	<b>0.238</b>	0.002		<b>Zr</b>	<b>0.0054</b>	0.0003

### Informational Values<sup>3,4</sup>

Co (0.003)

Sb (0.2)

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 5-6 for more information on its calculation.

<sup>2</sup> For each element, the uncertainty listed is based on a statistical evaluation of the contributions of homogeneity and the interlaboratory testing program. See page 5-6 for more information on its calculation.

<sup>3</sup> Values are given in weight percent. Values in brackets are reported by difference.

<sup>4</sup> Values in parentheses are not certified and are provided for information only.

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

Analysis	*	Al	*	As	*	B	*	C	*	Ca	*	Cr	*	Cu	*	Fe	*	Mg	*	Mn	
1	3	0.0156	3	0.0002	4	0.00753	3	3.35	4	0.0006	4	1.0327	4	0.311667	3	90.43	3	0.0485875	14	0.722333	
2	3	0.0157	3	0.0003	14	0.0081	3	3.36	4	0.0006	3	1.04	10	0.313	3	90.45	3	0.0486325	3	0.723	
3	3	0.0157	3	0.0003	3	0.00811	3	3.36	3	0.00084	3	1.04	4	0.313	3	90.45	3	0.048695	3	0.727	
4	4	0.015767	3	0.0003	3	0.0082	3	3.37	3	0.00086	3	1.04	3	0.317	3	90.46	3	0.0486975	3	0.727	
5	3	0.0158	3	0.0004	3	0.0082	1	3.38667	3	0.00086	3	1.04	3	0.318	3	90.47	3	0.0487375	3	0.727	
6	3	0.0158	3	0.0004	3	0.00822	3	3.39	3	0.00088	3	1.04	3	0.318	3	90.47	3	0.0487675	3	0.728	
7	3	0.0159	3	0.0005	3	0.00826	1	3.40873	3	0.00089	3	1.04	3	0.318	3	90.48	3	0.0487775	3	0.728	
8	3	0.0159	3	0.0006	3	0.00827	3	3.41	3	0.00089	3	1.04	3	0.319	3	90.48	3	0.048785	3	0.728	
9	3	0.0159	3	0.0006	3	0.00833	3	3.41	3	0.00092	3	1.04	3	0.319	3	90.49	3	0.04881	3	0.728	
10	3	0.0159	3	0.0007	3	0.00833	3	3.42	3	0.00092	3	1.04	3	0.319	3	90.49	3	0.048825	3	0.729	
11	3	0.016	3	0.0007	3	0.00835	3	3.42	3	0.00092	3	1.04	3	0.319	3	90.5	3	0.0489225	3	0.729	
12	3	0.016	3	0.0007	3	0.00835	1	3.42667	3	0.00092	3	1.04	3	0.319	3	90.5	3	0.0489575	3	0.73	
13	3	0.016	3	0.0007	3	0.00836	3	3.43	3	0.00093	3	1.04	3	0.319	3	90.5	3	0.0489675	3	0.73	
14	3	0.016	3	0.0008	3	0.00836	3	3.44	3	0.00093	3	1.04	3	0.319	3	90.5	3	0.0490225	3	0.73	
15	3	0.016	3	0.0008	3	0.00836	3	3.44	3	0.00093	10	1.04	3	0.32	3	90.5	3	0.0490275	3	0.731	
16	3	0.0161	3	0.0008	3	0.00838	3	3.45	3	0.00094	3	1.04	3	0.32	3	90.51	3	0.04903	3	0.731	
17	4	0.0161	3	0.0008	3	0.0084	3	3.45	3	0.00095	3	1.04	3	0.32	3	90.51	3	0.0490525	3	0.732	
18	3	0.0161	3	0.0009	3	0.0084	3	3.45	3	0.00095	3	1.04	3	0.32	3	90.51	3	0.0490975	10	0.732	
19	3	0.0162	3	0.0009	3	0.0084	3	3.46	3	0.00096	3	1.04667	3	0.32	3	90.52	3	0.0491125	3	0.732	
20	3	0.0162	3	0.001	3	0.00841	3	3.46	3	0.00097	3	1.05	3	0.32	3	90.52	3	0.0491225	3	0.732	
21	3	0.0162	3	0.0011	3	0.00841	3	3.46	3	0.00098	3	1.05	3	0.32	3	90.53	3	0.049165	3	0.732	
22	3	0.0162	3	0.0011	3	0.00842	3	3.46	3	0.00098	14	1.05	3	0.32	16	90.53333	3	0.04923	3	0.733	
23	3	0.0163	3	0.0011	3	0.00842	3	3.46	3	0.00099	3	1.05	3	0.321	16	90.5392	3	0.04925	3	0.733	
24	3	0.0163	3	0.0011	3	0.00843	1	3.46653	3	0.00099	3	1.05	3	0.321	3	90.55	3	0.04926	3	0.733	
25	3	0.0163	3	0.0012	3	0.00844	3	3.47	3	0.00102	3	1.05	3	0.321	3	90.56	3	0.049263	3	0.733	
26	3	0.0163	3	0.0012	3	0.00847	3	3.47	3	0.00102	3	1.05	3	0.321	3	90.56	3	0.049293	3	0.734	
27	3	0.0164	5	0.001233	3	0.00849	3	3.47	3	0.00102	3	1.05	3	0.321	3	90.56	3	0.049308	4	0.734667	
28	3	0.0164	3	0.0013	3	0.00849	3	3.48	3	0.00103	3	1.05	3	0.321	3	90.56	3	0.049338	3	0.735	
29	14	0.0164	3	0.0015	3	0.00849	3	3.48	14	0.001067	3	1.05	14	0.321333	3	90.57	3	0.049388	3	0.735	
30	3	0.0165	3	0.0016	3	0.0085	3	3.49	3	0.0011	3	1.05	3	0.322	3	90.59	3	0.049393	3	0.735	
31	3	0.0165	5	0.001767	3	0.00855	3	3.49	3	0.00123	3	1.05	3	0.322	3	90.59	3	0.04946	3	0.735	
32	3	0.0166	3	0.0019	3	0.00858	3	3.49	3	0.00132	3	1.05	3	0.322	14	90.6	3	0.04948	3	0.736	
33	3	0.0167	9	0.002	3	0.0086	3	3.49	3	0.0014	3	1.05	3	0.322	3	90.6			3	0.736	
34	3	0.0167	5	0.002067	5	0.00862	3	3.5	3	0.00213	3	1.05	3	0.322	3	90.6			3	0.736	
35	3	0.0168			3	0.00869	3	3.50667			3	1.06	3	0.323	4	90.60667			3	0.737	
36					4	0.01043	3	3.51			3	1.06	3	0.325	3	90.63			3	0.737	
37							3	3.53			4	1.06433	3	0.326					4	0.743467	
38											4	1.07333									
Average		0.01616		0.000620		0.00839		3.452		0.000938		1.047		0.3206		90.532		0.04904		0.731742	
Std Dev		0.00029		0.000045		0.00021		0.036		0.000071		0.012		0.0048		10.034		0.00087		0.000052	
H		0.0012		0.00033		0.00089		0.023		0.00038		0.011		0.0054		0.23		0.0020		0.0086	
U <sub>1</sub>		0.0012		0.00034		0.00092		0.043		0.00039		0.016		0.0072		0.23		0.0022		0.0086	
t-statistic		2.03		2.03		2.03		2.03		2.03		2.03		2.03		2.03		2.04		2.03	
U <sub>2</sub>		0.0025		0.00068		0.0019		0.086		0.00079		0.033		0.015		0.46		0.0045		0.018	
U <sub>3</sub>		0.00042		0.00012		0.00031		0.014		0.00014		0.0053		0.0024		0.077		0.00079		0.0029	
Certified		<b>0.0162</b>		<b>0.0010</b>		<b>0.0084</b>		<b>3.45</b>		<b>0.0009</b>		<b>1.047</b>		<b>0.321</b>		<b>90.53</b>		<b>0.049</b>		<b>0.732</b>	
Uncertainty		0.0004		0.0003		0.0003		0.04		0.0001		0.007		0.002		0.08		0.001		0.003	
Tolerance		0.0025		0.0009		0.0019		0.16		0.0008		0.021		0.015		0.46		0.003		0.009	

Analysis	*	Mo	*	Nb	*	Ni	*	P	*	Pb	*	S	*	Si	*	Sn	*	Ti	*	V
1	5	0.23	3	0.0036	4	1.31233	5	0.03863	5	0.0002	1	0.00943	3	1.92	3	0.0006	5	0.0415667	3	0.115
2	4	0.231233	3	0.0036	10	1.32	10	0.044	9	0.0002	3	0.011	3	1.92	3	0.0008	3	0.0419	5	0.118667
3	3	0.235	3	0.0037	3	1.34	3	0.0441	3	0.0003	1	0.01103	3	1.92	5	0.001	3	0.042	3	0.12
4	10	0.235	3	0.0037	4	1.34643	3	0.0465	3	0.0004	3	0.0115	3	1.92	5	0.001033	3	0.0423	10	0.12
5	3	0.236	3	0.0037	4	1.35333	3	0.0465	3	0.0004	3	0.012	3	1.92	3	0.0011	3	0.0424	3	0.121
6	3	0.236	3	0.0037	3	1.35967	3	0.0466	3	0.0004	3	0.012	3	1.92	3	0.0012	3	0.0424	3	0.121
7	3	0.237	3	0.0037	3	1.36	3	0.0467	3	0.0004	3	0.0121	14	1.926667	10	0.0012	3	0.0424	3	0.121
8	3	0.237	3	0.0037	3	1.36	3	0.0469	3	0.0005	3	0.0121	3	1.93	3	0.0012	3	0.0424	3	0.121
9	3	0.237	3	0.0038	3	1.36	3	0.047	3	0.0006	3	0.0122	3	1.93	3	0.0013	3	0.0425	3	0.121
10	3	0.237	3	0.0038	3	1.37	3	0.047	3	0.0006	3	0.0122	3	1.93	3	0.0013	3	0.0425	3	0.121
11	3	0.237	3	0.0038	3	1.38	3	0.0471	3	0.0007	3	0.0122	3	1.93	3	0.0013	10	0.0425	3	0.121
12	3	0.237	3	0.0038	3	1.38	3	0.0471	3	0.0007	3	0.0122	3	1.93	3	0.0014	3	0.0426	3	0.122
13	3	0.237	3	0.0038	3	1.38	14	0.0472	3	0.0007	3	0.0123	3	1.93	3	0.0014	14	0.0426333	3	0.122
14	3	0.238	3	0.0038	3	1.38	3	0.0473	3	0.0007	3	0.0124	3	1.93	3	0.0015	3	0.0427	3	0.122
15	3	0.238	3	0.0038	3	1.38	3	0.0473	10	0.0008	3	0.0124	3	1.93	3	0.0015	4	0.0427333	3	0.122
16	14	0.238	3	0.0038	14	1.38667	3	0.0474	3	0.0008	3	0.0125	3	1.93	3	0.0015	3	0.0428	3	0.122
17	3	0.238	3	0.0038	3	1.39	3	0.0475	3	0.0008	3	0.0125	3	1.93	3	0.0015	3	0.0428	3	0.122
18	3	0.238	3	0.0038	3	1.39	3	0.0476	3	0.0008	1	0.0126	3	1.93	3	0.0016	3	0.0428	3	0.122
19	3	0.238	14	0.003867	3	1.39	3	0.0477	3	0.0008	3	0.0126	3	1.93	3	0.0016	3	0.0428	3	0.122
20	3	0.238	4	0.003867	3	1.39	3	0.0478	3	0.0008	3	0.0126	3	1.93	3	0.0016	3	0.0429	3	0.122
21	3	0.238667	3	0.0039	3	1.39	3	0.0479	3	0.0008	1	0.01267	3	1.93	3	0.0016	3	0.0429	3	0.122
22	3	0.239	3	0.0039	3	1.39	3	0.0479	3	0.0008	3	0.0127	3	1.93	9	0.001667	3	0.0429	3	0.122
23	3	0.239	3	0.0039	3	1.39	3	0.048	3	0.0009	3	0.0128	3	1.93	3	0.0017	3	0.0429	3	0.122
24	3	0.239	3	0.0039	3	1.39	3	0.048	3	0.0009	3	0.0129	3	1.93	3	0.0017	3	0.0429	3	0.122
25	3	0.239	3	0.0039	3	1.39	3	0.0481	3	0.0009	10	0.013	3	1.93	3	0.0017	3	0.0429	3	0.122
26	3	0.239	3	0.0039	3	1.39	3	0.0483	3	0.0009	3	0.013	3	1.93	3	0.0018	3	0.043	3	0.122
27	3	0.239	3	0.0039	3	1.4	3	0.0483	3	0.0009	3	0.0131	3	1.93	3	0.0018	3	0.043	3	0.122
28	3	0.239	3	0.004	3	1.4	3	0.0484	3	0.0009	3	0.0131	3	1.93	3	0.0018	3	0.043	3	0.122
29	3	0.239	3	0.004	3	1.4	3	0.0484	3	0.0009	3	0.0131	3	1.93	3	0.0019	3	0.043	4	0.1223
30	4	0.239	3	0.004	3	1.4	3	0.0485	3	0.0009	3	0.0132	3	1.93	3	0.0019	3	0.0431	14	0.123
31	3	0.239	3	0.004	3	1.4	3	0.0485	3	0.001	3	0.0132	3	1.94	3	0.002	3	0.0431	3	0.123
32	3	0.239	3	0.0041	3	1.4	3	0.0485	3	0.001	3	0.0135	3	1.94	3	0.0022	3	0.0431	3	0.123
33	3	0.239	3	0.0041	3	1.41	3	0.0485	3	0.001	3	0.0137	3	1.94	3	0.0023	3	0.0432	3	0.123
34	3	0.24	3	0.0043	3	1.41	3	0.0485	3	0.0012	3	0.0138	17	1.948833	5	0.002467	3	0.0432	3	0.123
35	3	0.24			3	1.42	3	0.0487	3	0.0012	3	0.0138			3	0.0025	3	0.0432	3	0.123
36	3	0.24			3	1.42	4	0.04937			3	0.0142			3	0.0025	3	0.0432	3	0.123
37	3	0.241			3	1.43	3	0.0502			3	0.0146			3	0.0027	3	0.0435	3	0.123
38	3	0.241			3	1.43	4	0.05103			3	0.0189							4	0.127333
Average		0.2380		0.00384		1.382		0.04744		0.000737		0.01277		1.928		0.001618		0.04277		0.1215
Std Dev		0.0036		0.00013		0.017		0.00080		0.000053		0.00023		0.026		0.000052		0.00073		0.0020
H		0.0046		0.000647		0.013		0.00197		0.00035		0.0011		0.016		0.00047		0.001877		0.0032
U <sub>1</sub>		0.0058		0.00066		0.021		0.0021		0.0036		0.0011		0.030		0.00047		0.0020		0.0037
t-statistic		2.03		2.03		2.03		2.03		2.03		2.03		2.03		2.03		2.03		2.03
U <sub>2</sub>		0.012		0.0013		0.043		0.0043		0.00073		0.0022		0.061		0.0010		0.0041		0.0076
U <sub>3</sub>		0.0019		0.00023		0.0069		0.00070		0.00012		0.00036		0.010		0.00016		0.00067		0.0012
Certified		<b>0.238</b>		<b>0.0038</b>		<b>1.38</b>		<b>0.0474</b>		<b>0.0007</b>		<b>0.0128</b>		<b>1.93</b>		<b>0.0016</b>		<b>0.0428</b>		<b>0.122</b>
Uncertainty		0.002		0.0002		0.02		0.0009		0.0002		0.0008		0.01		0.0004		0.0007		0.001
Tolerance		0.012		0.0013		0.06		0.0027		0.0006		0.0024		0.06		0.0012		0.0041		0.008

Analysis	*	W	*	Zr
1	3	0.0585	14	0.002933
2	3	0.0586	5	0.0036
3	3	0.0596	3	0.0051
4	3	0.0598	3	0.0053
5	3	0.0599	3	0.0053
6	10	0.06	3	0.0053
7	3	0.06	3	0.0054
8	3	0.0603	3	0.0054
9	3	0.0604	3	0.0054
10	3	0.0604	3	0.0054
11	3	0.0604	3	0.0055
12	3	0.0604	3	0.0055
13	3	0.0604	3	0.0055
14	3	0.0604	3	0.0055
15	3	0.0604	3	0.0055
16	3	0.0605	3	0.0055
17	3	0.0605	3	0.0055
18	3	0.0605	3	0.0055
19	3	0.0605	3	0.0055
20	3	0.0606	3	0.0055
21	3	0.0606	3	0.0055
22	3	0.0607	3	0.0055
23	4	0.0608	3	0.0055
24	14	0.0608	3	0.0055
25	3	0.0608	3	0.0056
26	3	0.0609	3	0.0056
27	3	0.061	3	0.0056
28	3	0.0611	3	0.0056
29	3	0.0611	3	0.0056
30	3	0.0611	3	0.0056
31	3	0.0612	3	0.0057
32	3	0.0613	3	0.0057
33	3	0.0614	3	0.0057
34	3	0.0615	3	0.0058
35	3	0.0621		
36	4	0.063		
37	3	0.063333		
38	5	0.063933		
Average		0.0607		0.00543
Std Dev		0.0010		0.00014
H		0.0022		0.00075
U <sub>1</sub>		0.0024		0.00076
t-statistic		2.03		2.03
U <sub>2</sub>		0.0050		0.0015
U <sub>3</sub>		0.00080		0.00026
<b>Certified</b>		<b>0.0607</b>		<b>0.0054</b>
Uncertainty		0.0008		0.0003
Tolerance		0.0050		0.0015

Analysis	*	Co	*	Sb
1	3	0.0003	10	0.2
2	3	0.0004		
3	3	0.0006		
4	3	0.0007		
5	3	0.0007		
6	3	0.0008		
7	3	0.0008		
8	3	0.0013		
9	3	0.0013		
10	3	0.0016		
11	3	0.0028		
12	3	0.0029		
13	3	0.0029		
14	3	0.0032		
15	10	0.0032		
16	3	0.003367		
17	4	0.003433		
18	3	0.0037		
19	3	0.0037		
20	14	0.0039		
21	3	0.0043		
22	3	0.0043		
23	3	0.0043		
24	3	0.0043		
25	3	0.0043		
26	3	0.0043		
27	3	0.0043		
28	3	0.0044		
29	3	0.0044		
30	5	0.004667		
31	3	0.0047		
32	3	0.0048		
33	3	0.0048		
34	3	0.0051		
35	5	0.0055		
Average		0.0031		0.20
Std Dev		0.0082		2.18
H		0.0006		0.00
U <sub>1</sub>		0.0082		2.18
t-statistic		2.03		12.71
U <sub>2</sub>		0.017		27.77
U <sub>3</sub>		0.0028		27.77
Informational		(0.003)		(0.2)

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<sub>L</sub>), calculated from its standard deviation (S<sub>L</sub>) and its uncertainty estimate (U<sub>L</sub>), is used as the weight (W<sub>L</sub>) for its mean (M<sub>L</sub>). The standard deviation (S) is calculated as the square root of the reciprocal of the sum of the weights. U<sub>1</sub> is the combined uncertainty from homogeneity and labs. U<sub>2</sub> is U<sub>1</sub> multiplied by the coverage factor (95 % t-statistic). U<sub>3</sub> is U<sub>2</sub> divided by the square root of the number of determinations (n). Thus:

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

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<sub>3</sub> 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.

#### **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 WET
6 Gravimetric	12 GD Mass Spectrometry	

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

Lab Name	Location	Registrar	Accreditation
Dirats Laboratories	Westfield, MA	ANAB	17025
NSL Analytical	Cleveland, OH	ANAB	17025
Laboratory Testing, Inc.	Hatfield, PA	PRI	17025
Instytut Metalurgii Zelaza	Gliwice, Poland	PCA	17025
Luvak Inc.	Boylston, MA	PRI	17025
Brammer Standard Company, Inc.	Houston, TX	A2LA	17025, 17034

A2LA = American Association for Laboratory Accreditation

ANAB = ANSI-ASQ National Accreditation Board

PCA = Polish Center For Accreditation

PRI = Performance Review Institute

**Analysis:** Chemical analyses were made on solid pieces 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, 11XC2R, 11XC6U, 11XSG1A; AR 303, 306, 510, 892, 4007; BS 5, 27, 45B, 188B, 199B, 285, 285AA, 286AE, 291, 291DJ, 410C, 416, 9325A; CKD 235, 236, 238, 239; SPL 2A, 6A, 15A; SRM 16F, 55D, 82, 361, 362, 363, 2159, 3113.

**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 5, 27, 285, 285AA, 286AE, 291, 291DJ.

**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 285BE 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 Shijiazhuang Trump Scientific Co, LTD.

**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 25 mm from the analytical surface.

**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.

**Certificate Number:** The unique identification number for this certificate of analysis is 285BE-052118. You may obtain information on revisions of certificates from the internet at [www.brammerstandard.com](http://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.  
14603 Benfer Road  
Houston, Texas 77069-2895 USA

Phone: (281) 440-9396 Web: [www.brammerstandard.com](http://www.brammerstandard.com)

Fax: (281) 440-4432 Email: [contact@brammerstandard.com](mailto: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](http://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](http://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 May 18, 2018.

Beau R. Brammer

President