Brammer Standard Company, Inc.

Certificate of Analysis

BS 8740

Certified Reference Material for Low Alloy Steel Grade 8740 - UNS Number G87400

Certified Values[3]

	Certified Value[1]	Estimate of Uncertainty[2]		Certified Value[1]	Estimate of Uncertainty[2]
Al	**0.037**	0.003	**N**	**0.0073**	0.0008
As	**0.0051**	0.0006	**Ni**	**0.55**	0.01
B	**0.0003**	0.0001	**P**	**0.011**	0.001
C	**0.39**	0.01	**S**	**0.023**	0.002
Co	**0.0086**	0.0009	**Sb**	**0.0017**	0.0005
Cr	**0.49**	0.01	**Si**	**0.25**	0.01
Cu	**0.16**	0.01	**Sn**	**0.008**	0.001
Fe	**96.91**	0.09	**Ti**	**0.0012**	0.0004
Mn	**0.86**	0.01	**V**	**0.0024**	0.0007
Mo	**0.27**	0.01	**W**	**0.0023**	0.0003

Informational Values[3,4]

Ca (0.0003)	Mg (0.0002)	Nb (0.0007)	O (0.001)	Pb (0.0003)
Ta (0.003)	Zr (0.001)			

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

Trace element information values for Bi, Cl, Ga, Ge, K, Na, Re, Sr, and Zn 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.

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BS 8740 * Code for method Certified values listed as weight percent

Analysis	*	Al	*	As	*	B	*	C	*	Co	*	Cr	*	Cu	*	Fe	*	Mn	*	Mo
1	4	0.031	4	0.00433333	5	0.0002	1	0.3750	10	0.00666667	4	0.46867	3	0.15	13	96.806667	4	0.84	4	0.250767
2	4	0.031	5	0.00436667	12	0.00022	3	0.376	10	0.00666667	4	0.47333	4	0.15	16	[96.86334]	4	0.84	10	0.257
3	10	0.0332	4	0.00446667	12	0.00026	1	0.377333	12	0.0071	4	0.476	4	0.15	16	[96.86334]	4	0.844	10	0.260
4	4	0.0343	12	0.00446667	5	0.0002667	1	0.377667	12	0.0072	4	0.48	10	0.156	16	[96.866]	10	0.844	4	0.26
5	10	0.0349667	5	0.00456667	7	0.0003	1	0.3786	5	0.0076	4	0.48	10	0.15633333	16	[96.8705]	10	0.850333	4	0.26
6	5	0.0351667	12	0.0048	5	0.0003	3	0.37875	5	0.00812	4	0.48233	10	0.157	14	96.9	4	0.850667	4	0.261467
7	3	0.0362333	5	0.00483333	5	0.0003	1	0.3789	3	0.0082	10	0.48467	3	0.157	14	96.9	10	0.851	3	0.262333
8	4	0.0363	5	0.00486667	3	0.0003	1	0.383933	10	0.0082	3	0.485	4	0.15733333	4	96.906667	3	0.851667	4	0.262433
9	4	0.0365667	5	0.00493333	5	0.0003	1	0.384	5	0.00836667	10	0.486	10	0.15733333	16	[96.91]	3	0.852	3	0.262667
10	3	0.0366667	4	0.0051	5	0.0003	1	0.388333	4	0.0086	4	0.487	4	0.158	3	96.913333	4	0.852333	14	0.265667
11	11	0.0367	3	0.0051	4	0.0003167	1	0.389333	5	0.0086	10	0.487	4	0.15866667	4	96.916667	3	0.854	11	0.266
12	4	0.0370667	11	0.0051	3	0.00038	3	0.39	4	0.00863333	10	0.48767	4	0.1589	3	96.916667	14	0.856667	14	0.266333
13	14	0.0371333	5	0.0051	3	0.00039	11	0.391	5	0.00866667	10	0.490	3	0.15933333	16	[96.918]	4	0.857467	4	0.266667
14	14	0.0372333	4	0.00516667	3	0.0004	1	0.391333	4	0.00876667	8	0.49	4	0.15936667	16	[96.92]	4	0.8579	4	0.268
15	4	0.0373	10	0.0053	4	0.0004	1	0.391433	3	0.0088	3	0.491	14	0.15966667	16	[96.95]	11	0.859	3	0.269
16	3	0.0373	3	0.0053			11	0.392375	4	0.00893333	4	0.49333	11	0.16	10	96.956333	10	0.859	4	0.269833
17	5	0.0376333	15	0.00539			1	0.393167	4	0.00896667	3	0.494	5	0.16	10	96.976333	4	0.859933	3	0.27
18	4	0.0376667	10	0.0055			1	0.393333	8	0.00914667	11	0.495	3	0.16	10	96.996667	8	0.86	3	0.27
19	4	0.0376667	9	0.0055			1	0.393667	4	0.00933333	4	0.49533	5	0.16	10	97.01	10	0.86	10	0.27
20	3	0.0377	4	0.00553333			1	0.396	3	0.0094	3	0.49567	14	0.160			3	0.86	10	0.27
21	4	0.038	9	0.005633			1	0.396333	10	0.0094	4	0.49623	4	0.160367			3	0.861	3	0.271
22	5	0.039733	5	0.005933			1	0.40	4	0.009403	4	0.49877	4	0.160397			4	0.861567	7	0.272333
23	8	0.040	5	0.00606			1	0.402	3	0.009433	14	0.49933	3	0.160667			4	0.863	4	0.272667
24	4	0.041933	5	0.006167			1	0.407667	14	0.009467	10	0.500	8	0.161			14	0.863333	10	0.275
25	3	0.042					1	0.41	11	0.0095	3	0.500	8	0.164			7	0.867667	4	0.276667
26	3	0.042					1	0.41	14	0.009567	3	0.500	3	0.165			4	0.868867	10	0.278667
27	4	0.044767					3	0.41	4	0.0101	14	0.500	10	0.165			10	0.87	4	0.2833
28							1	0.413333			4	0.5003	10	0.166333			3	0.87	5	0.289333
29											4	0.50703	4	0.167			4	0.873333	8	0.29
30													4	0.167267			4	0.875333	4	0.290667
31													4	0.170667			4	0.876	5	0.291667
Average		0.03745		0.005147		0.000313		0.3909		0.008624		0.4903		0.1620		96.913711		0.8587		0.2703
Std Dev		0.00088		0.000065		0.000024		0.0031		0.000061		0.0036		0.0023		0.000073		0.0041		0.0029
H		0.0020		0.00081		0.00028		0.0064		0.0010		0.0073		0.0041		0.19		0.010		0.0053
U_1		0.0022		0.00082		0.00028		0.0072		0.0010		0.0081		0.0047		0.19		0.011		0.0060
t-statistic		2.06		2.07		2.14		2.05		2.06		2.05		2.04		2.10		2.04		2.04
U_2		0.0044		0.0017		0.00061		0.015		0.0021		0.017		0.010		0.40		0.022		0.012
U_3		0.00085		0.0035		0.00016		0.0028		0.00040		0.0031		0.0017		0.091		0.0039		0.0020
Certified		**0.037**		**0.0051**		**0.0003**		**0.39**		**0.0086**		**0.49**		**0.16**		**96.91**		**0.86**		**0.27**
Uncertainty		0.003		0.0006		0.0001		0.01		0.0009		0.01		0.01		0.09		0.01		0.01
Tolerance		0.009		0.0018		0.0002		0.03		0.0027		0.03		0.03		0.40		0.03		0.03

BS 8740 * Code for method Certified values listed as weight percent

Analysis	*	N	*	Ni	*	P	*	S	*	Sb	*	Si	*	Sn	*	Ti	*	V	*	W
1	2	0.0064667	3	0.522	12	0.0083333	1	0.0190	10	0.0012	10	0.233	5	0.0057	12	0.0006667	12	0.0014	4	0.0016
2	2	0.0065	3	0.537	12	0.0088667	1	0.0200	5	0.0012	10	0.23567	5	0.00593333	12	0.00074	12	0.0015	3	0.0019
3	2	0.0065	3	0.53866667	5	0.0106333	3	0.021	5	0.00126667	10	0.24267	4	0.00656667	4	0.0008333	4	0.0017	4	0.0019
4	2	0.0066	10	0.54	5	0.0106667	1	0.021133	9	0.0013	10	0.24333	12	0.00693333	4	0.001	5	0.001733	10	0.002
5	2	0.0068667	8	0.54	4	0.0107	1	0.0215	9	0.0015	3	0.24667	9	0.00696667	5	0.0010833	3	0.0019	4	0.002
6	2	0.0069	4	0.544	10	0.011	1	0.021533	5	0.00173333	3	0.24767	4	0.00723333	5	0.0011	5	0.00192	4	0.002133
7	2	0.0071	4	0.54533333	10	0.011	1	0.021733	12	0.0018	4	0.248	4	0.00726667	3	0.0011	3	0.002	12	0.002233
8	2	0.0073	4	0.54566667	4	0.0110667	1	0.021867	5	0.00183333	3	0.248	5	0.0074	11	0.0011	3	0.002	4	0.002267
9	2	0.0073	10	0.546	10	0.0112333	3	0.0219	10	0.0019	4	0.248	12	0.0076	5	0.0011	10	0.002	12	0.0023
10	2	0.0073667	10	0.54766667	4	0.0112667	1	0.0219	5	0.0019	4	0.24933	3	0.0077	5	0.0011333	5	0.002	10	0.002333
11	2	0.0074	10	0.54766667	3	0.0113	3	0.022	12	0.0019	4	0.2497	9	0.00776667	14	0.0011333	5	0.002067	5	0.0025
12	2	0.0074333	4	0.5499	4	0.0113667	10	0.022	5	0.0019	4	0.2498	5	0.0078	5	0.0011333	4	0.0022	4	0.002567
13	2	0.0075133	14	0.550	4	0.0114	1	0.0223	5	0.00199667	17	0.25	5	0.0079	14	0.0012333	5	0.002267	5	0.002567
14	2	0.0075667	10	0.55	4	0.0114333	1	0.022333	5	0.002	10	0.25	5	0.00796667	4	0.0012333	10	0.002333	5	0.002567
15	2	0.0075967	4	0.55	10	0.0114333	1	0.022333	5	0.002	10	0.25	5	0.00800	4	0.0014333	4	0.002533	5	0.002567
16	2	0.0076333	11	0.551	7	0.0114333	1	0.022347			3	0.25	4	0.00803333	4	0.0016	4	0.002633	5	0.002577
17	2	0.00768	3	0.551	11	0.0115	11	0.0224			14	0.25133	3	0.0084	3	0.0017	4	0.0027	4	0.00277
18	2	0.0077267	10	0.55133333	4	0.0118	1	0.022767			11	0.252	10	0.0084	3	0.0019	4	0.0027	4	0.002933
19	2	0.0080333	14	0.55233333	3	0.0119	10	0.023			6	0.253	5	0.0088			10	0.0027		
20	2	0.0080333	4	0.553	3	0.012	1	0.023			4	0.253	5	0.0088			11	0.0027		
21	2	0.0083	4	0.5565	17	0.012	1	0.023			14	0.25333	4	0.008833			10	0.0028		
22			4	0.5577	3	0.012	1	0.023			4	0.254	11	0.0089			4	0.003233		
23			4	0.558333	10	0.0121	1	0.0232			4	0.25782	3	0.009			14	0.003267		
24			4	0.5586	4	0.012133	1	0.023267			3	0.259	3	0.009			14	0.0034		
25			4	0.559167	4	0.012133	1	0.023667			4	0.26	10	0.0092			4	0.003533		
26			4	0.56	10	0.012367	1	0.024033			4	0.26								
27			3	0.56	4	0.012433	1	0.0246			8	0.26								
28			3	0.56	7	0.012867	1	0.024717			4	0.2614								
29			4	0.561333	3	0.0137	1	0.0248			5	0.26933								
30			4	0.567667	3	0.013733	1	0.024833			5	0.27467								
31					3	0.0178														
Average		0.00735		0.5502		0.011729		0.02303		0.001695		0.2516		0.00766		0.001179		0.002369		0.002258
Std Dev		0.00020		0.0034		0.000057		0.00059		0.000082		0.0030		0.00024		0.000075		0.000063		0.000065
H		0.00095		0.0078		0.0012		0.0016		0.00052		0.0051		0.00096		0.00045		0.00059		0.00058
U_1		0.00097		0.0085		0.0012		0.0017		0.00053		0.0059		0.00099		0.00046		0.00060		0.00059
t-statistic		2.09		2.05		2.04		2.05		2.14		2.05		2.06		2.11		2.06		2.11
U_2		0.0020		0.017		0.0024		0.0034		0.0011		0.012		0.0021		0.0010		0.0012		0.0012
U_3		0.00044		0.0032		0.00043		0.00063		0.00029		0.0022		0.00041		0.00023		0.00025		0.00029
Certified		**0.0073**		**0.55**		**0.011**		**0.023**		**0.0017**		**0.25**		**0.008**		**0.0012**		**0.0024**		**0.0023**
Uncertainty		0.0008		0.01		0.001		0.002		0.0005		0.01		0.001		0.0004		0.0007		0.0003
Tolerance		0.0024		0.03		0.003		0.006		0.0015		0.03		0.003		0.0011		0.0021		0.0012

BS 8740 * Code for method Informational values listed as weight percent

Analysis	*	Ca	*	Mg	*	Nb	*	O	*	Pb	*	Ta	*	Zr
1	12	0.000067	12	0.000095	12	0.000080	2	0.000433	12	0.0000117	4	0.00303	12	0.0000427
2	12	0.000077	12	0.0000967	12	0.000087	2	0.000533	12	0.0000127	3	0.0033	12	0.0000467
3	3	0.0002	5	0.00013333	5	0.00009	2	0.00054	5	0.0002	4	0.0033	10	0.0005
4	4	0.0002	1	0.0002	5	0.0001	2	0.0006	9	0.0002	4	0.00333	10	0.0005
5	4	0.0002	4	0.0002	5	0.0001	2	0.000667	9	0.00023333	4	0.00337	3	0.0014
6	11	0.0002	1	0.0002	5	0.0001067	2	0.000733	5	0.0003			4	0.00146667
7	3	0.0002	4	0.0002	4	0.0007	2	0.000733	11	0.0007			4	0.00146667
8	4	0.0007	3	0.0002	4	0.0007	2	0.000767	4	0.0007			4	0.0015
9	4	0.0011	5	0.00026667	3	0.0007	2	0.000833	4	0.00076667			4	0.0016
10			1	0.0004	4	0.0009	2	0.0010					11	0.0018
11					11	0.0009	2	0.0010						
12					4	0.0010	2	0.0013						
13					10	0.0023	2	0.001333						
14					10	0.0023	2	0.001767						
15							2	0.001967						
16							2	0.00209						
17							2	0.002167						
18							2	0.002353						
19							2	0.004533						
Average		0.00033		0.000199		0.0007		0.0013		0.00035		0.003		0.0010
Std Dev		0.00027		0.000088		0.0011		0.0028		0.00031		0.023		0.0025
H		0.00029		0.00024		0.0004		0.0005		0.00029		0.001		0.0004
U_1		0.00040		0.00026		0.0011		0.0028		0.00043		0.023		0.0025
t-statistic		2.31		2.26		2.16		2.10		2.31		2.78		2.26
U_2		0.00091		0.00058		0.0024		0.0060		0.0010		0.064		0.0056
U_3		0.00030		0.00018		0.00065		0.0014		0.00033		0.028		0.0018
Informational		(0.0003)		(0.0002)		(0.0007)		(0.001)		(0.0003)		(0.003)		(0.001)

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 8740 * Code for analytical method Trace analysis listed as mg/kg (ppm)

Analysis	*	Bi	*	Cl	*	Ga	*	Ge	*	K	*	Na	*	Re	*	Sr	*	Zn
1	12	0.02	12	0.01	12	7.7	12	13.0	12	0.18	12	0.01	12	0.16	12	0.01	12	1.7
2	12	0.02	12	0.01	12	7.9	12	13.0	12	0.18	12	0.02	12	0.17	12	0.01	12	1.7
3	12	0.02	12	0.01	12	7.9	12	13.0	12	0.18	12	0.02	12	0.18	12	0.01	12	1.7
4	12	0.02			12	8	12	13	12	0.19	12	0.02	12	0.19	12	0.01	12	1.7
5	12	0.02			12	8.2	12	13	12	0.2	12	0.02	12	0.19	12	0.01	12	1.7
6	12	0.03			12	8.3	12	13	12	0.23	12	0.02	12	0.2			12	1.7
7							5	17										
8							5	17										
9							5	18										
10							5	18										
11							5	19										

Analytical Method Codes:

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

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

Lab Name	Location	Registrar	Accreditation
Brammer Standard Company, Inc.	Houston, TX	A2LA	17025, 17034
NSL Analytical	Cleveland, OH	ANAB	17025
Eurofins EAG Materials Science, LLC	Liverpool, NY	A2LA	17025
Element Materials Technology	Glendale Heights, IL	A2LA	17025
Dirats Laboratories	Westfield,MA	ANAB	17025
TUV Rheinland Pvt Ltd	Bangalore, India	NABL	17025
Laboratory Testing, Inc.	Hatfield, PA	PRI	17025
Vitkovice Testing Center	Ostrava, Czech Republic	ILAC	17025
Shiva Analyticals Private Limited	Hoskote, Bangalore	NABL	17025
Luvak Inc.	Boylston, MA	PRI	17025
Instytut Metalurgii Zelaza	Gliwice, Poland	PCA	17025
National Analysis Center For Iron And Steel	Beijing, China	CNAS	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 an end mill 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: 12X12749W, 12X15259Q, 12X3490, 12X353E, 13X12853K, 13X14212, 13X14418A, 13X31603D, 13X32100, 13X32900A, 13X4100A, 13X42200; AR 165, 644, 654, 657, 673, 882, 886, 892, 961, 1648, 1650, 1652, 1653, 1657; BAS 31, 404/1, 406/2, 408/1, 409, 460, 464/1; BS CSN 2-1, H-13, H1C, HiCaL-1, SS3951, 50G, 61b, 67a, 67b, 80f, 85D, 180A, 180B, 187D, 200-1, 200-2, 200-4, 200A, 316D, 316E, 509, 1018, 1026, 1045, 1951, 2205, 2931A, 8620A, 8620E, 8822, 9325A, 9905A; CKD 181A, 184A, 186A, 189A; DSZU CA013, ECRM 085-1, 184-1; IARM 30H, 299A; IMZ 55/1A, 114A, 117, 123, 152A, 174; IPT 12A, 17/1, 17A; JSS 174-5, 175-7, 651-13, 655-13; LECO 501-502, 501-503, 501-644, 501-677, 502-328, 502-698, 502-712, 502-855, 502-868, 502-916; NCS NS20035B; SRM 16D, 139B, 153A, 160B, 293, 361, 363, 1154, 1222, 1762, 1765, 3137, 3162, 3165, 3169.

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 CSN 2-1, 61B, 67A, 67B, 8620A, 8620E, 8822; CKD 181A; DSZU CA013; NCS NS20035B; SRM 139B, 293, 1222.

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 8740 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 bar stock for this CRM was produced by Timken Steel; Canton, OH.

Form: This CRM is machined in the form of a disc, approximately 38mm in diameter and 19mm 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 entire depth of the CRM may be used.

Caution: As with any bar material, avoid spark atomic emission spectrometric burns in the center of the CRM (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 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 8740-112020. 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 17025:2017 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 November 20, 2020.

Beau R. Brammer

President