

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 199A

Nickel Alloy - Waspaloy

Carbon	0.033	Molybdenum	3.99
Manganese	0.014	Vanadium	0.020
Phosphorus	0.006	Niobium	0.040
Sulfur	<0.001	Cobalt	13.47
Silicon	0.05	Titanium	3.07
Copper	0.022	Aluminum	1.26
Nickel	57.8	Iron	1.05
Chromium	19.25	Boron	(0.004)

Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, PA
Allegheny Ludlum Steel Corp., Lockport, NY
Anderson Laboratories, Greendale, WI
Brammer Standard Co., Houston, TX
Crucible Specialty Metals, Syracuse, NY
J. Dirats and Co., Westfield, MA
Jessop Steel Co., Washington, PA

CAUTION: Because this Reference Material contains a high percent of chromium, cobalt, molybdenum, titanium, and aluminum, care must be taken in its application. Corrections are likely to be necessary due to element interference and dilution effects.

See data on reverse side.

Certificate No. 199A-080990

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069
Telephone (281) 440-9396 Telex 775376 Fax (281) 440-4432

BS 199A

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Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
1	0.031	0.010	0.004	0.0002	0.031	0.020	57.60	19.13	3.96
2	0.031	0.012	0.005	0.0003	0.040	0.021	57.74	19.20	3.97
3	0.032	0.012	0.006	0.0006	0.045	0.021	57.83	19.20	3.98
4	0.032	0.014	0.008	0.0006	0.046	0.022	57.93	19.24	3.99
5	0.033	0.016			0.057	0.022	57.98	19.30	4.01
6	0.035	0.020			0.059	0.024		19.30	4.02
7	0.035							19.38	
8	0.036								
Average	0.0331	0.0140	0.0058	0.0004	0.0463	0.0217	57.816	19.250	3.988
Std.Dev.	0.0020	0.0036	0.0017	0.0002	0.0105	0.0014	0.152	0.083	0.023
Certified	0.033	0.014	0.006	<0.001	0.05	0.022	57.8	19.25	3.99

continued

Analysis	V	Co	Al	Nb	Ti	B	Zr	Fe
1	0.019	13.44	1.18	0.038	3.04	0.0034	0.029	0.99
2	0.019	13.45	1.23	0.040	3.05	0.0035	0.040	1.04
3	0.019	13.45	1.25	0.040	3.05	0.004	0.042	1.04
4	0.020	13.52	1.26	0.040	3.07	0.006	0.043	1.04
5	0.020		1.31		3.08		0.059	1.06
6	0.025		1.31		3.09			1.08
7					3.11			1.10
Average	0.0203	13.465	1.257	0.0395	3.070	0.0042	0.0426	1.050
Std.Dev.	0.0023	0.037	0.050	0.0010	0.025	0.0012	0.0107	0.035
Certified	0.020	13.47	1.26	0.040	3.07	(0.004)	(0.04)	1.05

Data in parentheses are not certified but provided for information only.

Chemical analyses were made on millings from cross-sections of the bars. The values listed above are individual laboratory analytical results.

Methods of analysis used were a combination of ASTM Standard Methods E 354, E 1019, and various ICP and AA spectrometric methods.

Inquiries concerning this Reference Material should be directed to:

Brammer Standard Co., Inc.
14603 Benfer Road
Houston, Texas 77069 USA

Phone: (281) 440-9396
Fax: (281) 440-4432

Certified by: G. R. Brammer _____ on August 9, 1990.