

# Brammer Standard Company, Inc.

## Certificate of Analysis

### BS 925A

Certified Reference Material for Inconel 925 - UNS Number N09925

	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>0.20</b>	0.01		<b>Mo</b>	0.03
<b>As</b>	<b>0.0015</b>	0.0005		<b>N</b>	0.0006
<b>B</b>	<b>0.0022</b>	0.0003		<b>Nb</b>	0.005
<b>Co</b>	<b>0.23</b>	0.01		<b>Ni</b>	0.3
<b>Cr</b>	<b>19.9</b>	0.1		<b>O</b>	0.0003
<b>Cu</b>	<b>1.96</b>	0.06		<b>S</b>	0.0003
<b>Fe</b>	<b>26.8</b>	0.4		<b>Ti</b>	0.04
<b>Mn</b>	<b>0.137</b>	0.003		<b>W</b>	0.004

	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>	<b>Reference Values<sup>4</sup></b>	Certified Value <sup>1</sup>	Estimate of Uncertainty <sup>2</sup>
<b>C</b>	<b>0.010</b>	0.002		<b>Si</b>	0.01
<b>P</b>	<b>0.007</b>	0.002			

#### Informational Values<sup>3,5</sup>

Ca (0.0008)	Mg (0.0005)	Pb (0.0002)	Sb (0.0003)	Sn (0.0022)
Ta (0.0014)	V (0.037)	Zr (0.002)		

<sup>1</sup> 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.

<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 4 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> Reference Values are not certified and are provided for information only.

<sup>5</sup> Values in parentheses are not certified and are provided for information only.

Trace element information values for Ga, Ge, Ir, Os, Re, U, 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.

Analysis	*	Al	*	As	*	B	*	Co	*	Cr	*	Cu	*	Fe	*	Mn	*	Mo	*	N
1	10	0.179133	3	0.0008	5	0.0018	4	0.2091	10	19.6166667	11	1.81	4	26.12	4	0.13003	3	3.05	2	0.00257
2	5	0.184333	3	0.0008	4	0.0020333	3	0.21	4	19.7266667	4	1.819	3	26.28	4	0.13333	3	3.05	2	0.0032
3	3	0.187667	5	0.001667	14	0.0020333	4	0.2136667	4	19.8433333	4	1.889533	3	26.28	10	0.13433	4	3.0620333	2	0.00331
4	4	0.189	5	0.0013667	3	0.0021	10	0.22325	11	19.85	3	1.906667	11	26.35	3	0.135	10	3.09075	2	0.00347
5	11	0.19	5	0.0014033	4	0.0021	11	0.224	4	19.864	4	1.914833	14	26.4333	10	0.135	4	3.0991667	2	0.0040
6	8	0.191	9	0.0016667	3	0.0021	11	0.225	14	19.90	10	1.937033	4	26.4967	3	0.135	10	3.10	2	0.004
7	4	0.193333	12	0.0019667	5	0.00212	10	0.226	4	19.906667	4	1.9379	4	26.6833	4	0.13567	3	3.10	2	0.00413
8	4	0.193533	5	0.0019667	11	0.0022	4	0.2266667	17	19.9057667	10	1.968	3	26.6933	11	0.137	4	3.1001333	2	0.0043
9	11	0.202	11	0.0023	12	0.0022	10	0.227	3	19.91	14	1.97	11	26.75	11	0.138	10	3.1066667	2	0.0044
10	4	0.203467			3	0.0023	4	0.2298	3	19.91	10	1.97	10	26.79	5	0.13933	4	3.11	2	0.0044
11	4	0.204			4	0.0023	3	0.232	11	19.98	4	1.977	4	26.88	10	0.14	14	3.1133333	2	0.0047
12	10	0.207			4	0.0024	3	0.232	8	19.99	3	1.98	10	26.9167	14	0.140	4	3.1166667		
13	10	0.208			11	0.0025	14	0.2323333	4	20.0	3	1.98	10	27.044	4	0.14003	4	3.120		
14	4	0.209833			4	0.0026	10	0.2343333	10	20.05648	4	2.00	10	27.0831	4	0.1402	4	3.1266667		
15	14	0.210333			7	0.00275	4	0.2386667	10	20.081	10	2.01	4	27.1	4	0.14333	4	3.1346667		
16	3	0.227					4	0.24	10	20.09	4	2.013333	13	27.1477	3	0.14967	8	3.14		
17	3	0.227					4	0.2403667	13	20.1096667	4	2.019	4	27.237	3	0.15	10	3.154		
18	4	0.24					5	0.241	10	20.133	8	2.04	4	27.2468	4	0.15	11	3.17		
19							3	0.2523333			3	2.05					11	3.19		
Average		0.2014		0.00154		0.002236		0.2280		19.937069		1.957489		26.785		0.1369		3.112320		0.00386
Std Dev		0.0031		0.00012		0.000082		0.0033		0.000075		0.000073		0.048		0.0035		0.000073		0.00010
H		0.0045		0.00050		0.00058		0.0048		0.0066		0.016		0.080		0.0037		0.021		0.00072
U <sub>1</sub>		0.0055		0.00052		0.00059		0.0059		0.066		0.016		0.093		0.0051		0.021		0.00073
t-statistic		2.11		2.31		2.14		2.10		2.11		2.10		2.11		2.11		2.10		2.23
U <sub>2</sub>		0.012		0.0012		0.0013		0.012		0.14		0.033		0.20		0.011		0.044		0.0016
U <sub>3</sub>		0.0027		0.00040		0.00032		0.0028		0.033		0.0077		0.046		0.0025		0.010		0.00049
Certified		<b>0.20</b>		<b>0.0015</b>		<b>0.0022</b>		<b>0.23</b>		<b>19.9</b>		<b>1.96</b>		<b>26.8</b>		<b>0.137</b>		<b>3.11</b>		<b>0.0039</b>
Uncertainty		0.01		0.0005		0.0003		0.01		0.1		0.06		0.4		0.003		0.03		0.0006
Tolerance		0.03		0.0012		0.0013		0.03		0.3		0.18		0.9		0.011		0.09		0.0018

Analysis	*	Nb	*	Ni	*	O	*	S	*	Ti	*	W								
1	4	0.28	16	44.263333	2	0.00034	1	0.0005	3	2.17	14	0.0285								
2	4	0.282	8	44.43	2	0.0003667	2	0.00065	3	2.19	4	0.030733								
3	4	0.2823	4	44.6	2	0.0006667	1	0.00067	3	2.19	4	0.036667								
4	4	0.284267	3	44.656667	2	0.0007	1	0.0007	10	2.19333333	4	0.037033								
5	10	0.289	4	44.666133	2	0.0007333	1	0.0007	4	2.21506667	4	0.038067								
6	10	0.289267	10	44.699	2	0.00080	1	0.0007667	10	2.22	5	0.0390								
7	3	0.29	6	44.777333	2	0.0008267	1	0.0009333	10	2.220	4	0.0391								
8	10	0.29	10	44.8	2	0.0012	1	0.0010333	4	2.22006667	4	0.04								
9	11	0.29	16	44.81	2	0.0012	12	0.00106	4	2.22223333	11	0.0425								
10	4	0.290133	13	44.837667	2	0.0015	8	0.0011	10	2.225683	10	0.0448								
11	14	0.291	4	44.936667			1	0.0011333	4	2.22733333	3	0.048267								
12	11	0.292	14	45.1			3	0.0013	4	2.23033333										
13	4	0.293667	4	45.146667			3	0.0013	4	2.24										
14	3	0.295	10	45.15			11	0.0014	11	2.25										
15	3	0.295	16	45.170223			1	0.0014333	11	2.25										
16	3	0.295667	16	45.25					4	2.255										
17	4	0.299667	16	45.35					4	2.28666667										
18	4	0.302333							3	2.32666667										
Average		0.2914		44.861394		0.00083		0.000979		2.229577		0.038606								
Std Dev		0.0037		0.000077		0.00010		0.000082		0.000075		0.000095								
H		0.0055		0.11		0.00040		0.00042		0.017		0.0020								
U <sub>1</sub>		0.0066		0.11		0.00041		0.00043		0.017		0.0020								
t-statistic		2.11		2.12		2.26		2.14		2.11		2.23								
U <sub>2</sub>		0.014		0.24		0.00093		0.00092		0.036		0.0045								
U <sub>3</sub>		0.0033		0.058		0.00029		0.00024		0.0085		0.0013								
Certified		<b>0.291</b>		<b>44.9</b>		<b>0.0008</b>		<b>0.0010</b>		<b>2.23</b>		<b>0.039</b>								
Uncertainty		0.005		0.3		0.0003		0.0003		0.04		0.004								
Tolerance		0.015		0.9		0.0007		0.0009		0.12		0.016								

**BS 925A** \* Code for method Reference values listed as weight percent

Analysis	*	C	*	P	*	Si
1	1	0.0044	4	0.0039333	10	0.0533
2	1	0.0063	5	0.0049133	12	0.0533333
3	1	0.00672	4	0.00504	3	0.0606
4	1	0.0088	5	0.0059	5	0.0616
5	3	0.0092	12	0.0062	4	0.0643667
6	3	0.0092	10	0.0062	4	0.0654
7	3	0.01	4	0.0063	3	0.0684333
8	1	0.010333	4	0.0064	4	0.0684333
9	11	0.0104	3	0.0073333	14	0.0730333
10	1	0.0104	3	0.0074	11	0.0738
11	11	0.0105	3	0.0074	3	0.0746
12	8	0.011	4	0.008	11	0.0748
13	1	0.011	10	0.0086	3	0.08
14	1	0.011704	3	0.0087	10	0.084017
15	1	0.012333	14	0.0088	4	0.0860667
16	1	0.01252	11	0.0089	4	0.0896667
17	1	0.014533	4	0.0093333	6	0.0902667
Average		0.009961		0.00671		0.071866
Std Dev		0.000077		0.00025		0.000077
H		0.0011		0.00091		0.0027
U <sub>1</sub>		0.0011		0.00095		0.0027
t-statistic		2.12		2.12		2.12
U <sub>2</sub>		0.0023		0.0020		0.0057
U <sub>3</sub>		0.00056		0.00049		0.0014
Reference		<b>0.010</b>		<b>0.007</b>		<b>0.07</b>
Uncertainty		0.002		0.002		0.01
Tolerance		0.006		0.006		0.03

**BS 925A** \* Code for method Informational values listed as weight percent

Analysis	*	Ca	*	Mg	*	Pb	*	Sb	*	Sn	*	Ta	*	V	*	Zr
1	3	0.0006	12	0.00011	3	0.000079	5	0.0001	5	0.0006	5	0.0002	12	0.02533	12	0.00024
2	3	0.0006	5	0.0002	3	0.000079	12	0.0001967	12	0.00061	5	0.00031	4	0.02743	5	0.0004
3	14	0.000667	3	0.00024	5	0.0001	5	0.0002	5	0.00086667	3	0.0004	10	0.0282	5	0.00086
4	11	0.0008	4	0.0002667	4	0.0001	9	0.0002	5	0.00088	5	0.001033	3	0.030	3	0.002
5	11	0.0008	4	0.00028	11	0.0003	5	0.00021	3	0.0023	4	0.002033	10	0.030	3	0.002
6	4	0.000933	11	0.0008	9	0.0007	11	0.0003	5	0.0023	14	0.002133	4	0.03057	11	0.0087
7	5	0.0013	3	0.0008			3	0.0006	9	0.00263333	3	0.0022	4	0.03063		
8			11	0.0008			3	0.0006	3	0.0028	3	0.0022	5	0.0308		
9			3	0.0008					3	0.0028	11	0.0025	11	0.0331		
10			14	0.0009					4	0.00303333			10	0.0340		
11									4	0.00356667			4	0.0342		
12									11	0.0041			11	0.0369		
13													4	0.04623		
14													14	0.0475		
15													4	0.05003		
Average		0.0008		0.00052		0.00023		0.00030		0.002208		0.0014		0.03		0.002
Std Dev		0.0019		0.00067		0.00015		0.00024		0.000091		0.0047		0.20		0.013
H		0.0004		0.00034		0.00025		0.00028		0.00058		0.0005		0.0018		0.001
U <sub>1</sub>		0.0019		0.00075		0.00030		0.00037		0.00058		0.0047		0.20		0.013
t-statistic		2.45		2.26		2.57		2.36		2.20		2.31		2.14		2.57
U <sub>2</sub>		0.0048		0.0017		0.00076		0.00087		0.0013		0.011		0.43		0.033
U <sub>3</sub>		0.0018		0.00054		0.00031		0.00031		0.00037		0.0036		0.11		0.013
Informational		(0.0008)		(0.0005)		(0.0002)		(0.0003)		(0.0022)		(0.0014)		(0.037)		(0.002)



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

A2LA = American Association for Laboratory Accreditation

ANAB = ANSI-ASQ National Accreditation Board

CNAS = China National Accreditation Service

ILAC = International Laboratory Accreditation Cooperation

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: 215X10276, 219X8825A, 28X62510, 28X62520, 28X6253, 28X71820; AR 654, 668, 673, 872, 882, 892, 952, 1650, 1651, 1652, 1653, 1657; BAS 387; BS H2D, H3C, H6B, H8, 199B, 200-4, 510B, 625E, 630B, 630C, 690, 718C, 718D, 825, 825A, 825C, 825E, 825F, 903E, 925, 929, 937C; HRT Ni2013; IARM 54B, 56C, 56H, 59A, 59B, 62E, 67B, 69D, 190A, 275A, 328A, 335A; LECO 501-320, 501-644, 501-676, 502-348, 502-411, 502-712, 802-863, 502-904; SRM 8F, 8J, 124D, 319, 459, 865, 866, 867, 1198, 1247, 3109A.

**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 — BAS 387, BS 855, 825A, 825C, 825E, 825F, 925; DSZU CA01A, CA012, CA013; HRT Ni2013; IARM 189A; SRM 867, 882, 1198, 1247.

**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 925A 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 Boheler Edestahl; Austria.

**Form:** This CRM is machined in the form of a disc, approximately 38 mm in diameter and 19 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 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 925A-052020. 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 17025:2017 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](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 20, 2020.

Beau R. Brammer

President