Brammer Standard Company, Inc.

Provisional Certificate of Analysis

BS 291JH

Certified Reference Material for Chill Cast Iron

Analysis listed as percent by weight

	Estimated Analysis[1]		Estimated Analysis[1]
Al	**0.027**	**Nb**	**0.003**
As	**0.005**	**Ni**	**0.095**
B	**0.011**	**O**	**<0.005**
C	**3.35**	**P**	**0.021**
Ca	**0.0006**	**Pb**	**0.0009**
Co	**0.003**	**S**	**0.018**
Cr	**0.032**	**Sb**	**0.005**
Cu	**0.22**	**Si**	**2.34**
Fe	**[93.3]**	**Sn**	**0.002**
H	**<0.005**	**Ti**	**0.031**
Mg	**0.044**	**V**	**0.030**
Mn	**0.47**	**W**	**0.0009**
Mo	**0.027**	**Zr**	**0.002**
N	**<0.05**		

[1] The estimated value listed is the present best estimate of the true value. Values are given in weight percent.

Form: This CRM is machined in the form of a disc, approximately 33mm in diameter and 31mm thick by Brammer Standard Company, Inc.

A detailed final certificate of analysis will be supplied by August 29, 2027

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291JH	Al	As	B	Be	Bi	C	Ca	Ce	Co	Cr	Cu	Fe	H	Mg
CSONH						3.4							0.00052	
BSC SAES	0.027	0.0054	0.0109			3.32	0.0005		0.0035	0.0305	0.219	93.28		0.044
BSC SAES	0.027	0.0049	0.0111			3.37	0.0004		0.0037	0.0304	0.216	93.23		0.044
BSC SAES	0.027	0.0054	0.0111			3.35	0.0006		0.0039	0.0306	0.218	93.25		0.044
BSC SAES	0.026	0.0046	0.011			3.34	0.0002		0.0022	0.0308	0.219	93.29		0.044
BSC SAES	0.027	0.0051	0.011			3.34	0.0002		0.0026	0.0304	0.219	93.3		0.044
BSC SAES	0.027	0.005	0.0112			3.34	0.0001		0.0029	0.0306	0.218	93.3		0.044
BSC SAES	0.027	0.0055	0.0115			3.33	0.0005		0.0028	0.031	0.219	93.26		0.044
BSC SAES	0.027													0.044
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BSC SAES	0.027													0.044
BSC SAES	0.028													0.044
BSC SAES	0.027													0.044
BSC GDS			0.0105			3.35	0.0009		0.0015	0.0325	0.226	93.26		
BSC GDS			0.0104			3.34	0.001		0.0021	0.0328	0.226	93.27		
BSC GDS			0.0104			3.35	0.001		0.0016	0.0329	0.226	93.25		
BSC GDS			0.0104			3.36	0.0008		0.0018	0.0323	0.226	93.24		
BSC GDS			0.0105			3.36	0.0009		0.0018	0.0331	0.226	93.23		
BSC GDS			0.0105			3.37	0.0009		0.0023	0.0324	0.226	93.22		
BSC GDS			0.0106			3.34	0.0009		0.003	0.0325	0.226	93.24		
MTR		0.00456343	0.01095459			3.37993413				0.03230037	0.21949866			
Average	0.0269	0.005057929	0.010803639			3.352495883	0.000635714		0.00255	0.031673358	0.221966577	93.25857143	0.00052	0.044
Certificate	**0.027**	**0.005**	**0.011**			**3.35**	**0.0006**		**0.003**	**0.032**	**0.22**	**[93.3]**	**<0.005**	**0.044**

291JH	Mn	Mo	N	Nb	Ni	O	P	Pb	S	Sb	Si	Sn	Ta	Ti
CSONH			0.0067			0.00035			0.0195					
BSC SAES	0.472	0.0252		0.0028	0.0943		0.0206	0.0011	0.0174	0.0034	2.35	0.0024		0.0311
BSC SAES	0.47	0.0254		0.0029	0.093		0.02	0.0011	0.0171	0.0043	2.36	0.0016		0.0304
BSC SAES	0.469	0.0258		0.0031	0.0935		0.0211	0.0012	0.0173		2.35	0.0018		0.0314
BSC SAES	0.472	0.0249		0.0023	0.0932		0.0206	0.0012	0.0162	0.0043	2.33	0.0027		0.0312
BSC SAES	0.468	0.0252		0.0027	0.0932		0.0211	0.0014	0.0147		2.31	0.0011		0.0319
BSC SAES	0.467	0.0255		0.0031	0.0939		0.0213	0.0012	0.0166		2.32	0.0024		0.0313
BSC SAES	0.477	0.0257		0.0035	0.0944		0.0211	0.0011	0.0187		2.35	0.0021		0.0309
BSC GDS	0.475	0.0274		0.0023	0.0962		0.0204	0.0008	0.0186		2.34			0.0301
BSC GDS	0.476	0.0273		0.0018	0.0965		0.0203	0.0006	0.0191		2.33			0.0299
BSC GDS	0.475	0.0275		0.0023	0.0958		0.0205	0.0007	0.0185	0.009	2.34			0.0305
BSC GDS	0.475	0.0274		0.0023	0.0969		0.0208	0.0006	0.0187		2.34			0.0307
BSC GDS	0.476	0.0279		0.0022	0.0971		0.0205	0.0006	0.0188		2.36			0.0309
BSC GDS	0.475	0.0276		0.0021	0.0968		0.0207	0.0005	0.0188		2.36			0.0306
BSC GDS	0.473	0.0274		0.0023	0.0973		0.0207	0.0005	0.019		2.36			0.0305
MTR	0.48293155	0.02789886			0.09935024		0.02086940		0.01707259		2.26311985	0.00401481		0.02983134
Average	0.47352877	0.026539924	0.0067	0.00255	0.095430016	0.00035	0.020704627	0.0009	0.017879537	0.00525	2.337541323	0.002264351		0.030748756
Certificate	**0.47**	**0.027**	**<0.05**	**0.003**	**0.095**	**<0.005**	**0.021**	**0.0009**	**0.018**	**0.005**	**2.34**	**0.002**		**0.031**

291JH	V	W	Zn	Zr
CSONH				
BSC SAES	0.0301	0.0012		0.002
BSC SAES	0.0287	0.0013		0.0018
BSC SAES	0.0303	0.0005		0.002
BSC SAES	0.0302	0.0011		0.0019
BSC SAES	0.0313	0.001		0.0023
BSC SAES	0.0306	0.0005		0.002
BSC SAES	0.0294	0.0005		0.0018
BSC GDS	0.0294	0.0005		0.0017
BSC GDS	0.0294	0.0016		0.0018
BSC GDS	0.0299	0.0014		0.0019
BSC GDS	0.0293			0.0014
BSC GDS	0.0292			0.0005
BSC GDS	0.0291	0.000018		0.0016
BSC GDS	0.0294	0.0013		0.0016
MTR	0.03002159			
Average	0.029754773	0.000909833		0.00174
Certificate	0.030	0.0009		0.002

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 282A, 291, 291CE, 291DG, 291EH, 291GI, 291HI.

Validity statement: ISO Standard 33401 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 291JH 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 Jey Swen Enterprises; Kaohsiung, China.

Certified Area: The certified area of each disc is the portion extending several mm inward from each surface.

Note: Shrinkage cavities may appear in the horizontal center of some discs. These cavities are normal and will not affect the certified portions 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.

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.
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Houston, Texas 77069-2895 USA

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Email: contact@brammerstandard.com

Brammer Standard Company, Inc., is accredited by the American Association for Laboratory Accreditation (A2LA) to ISO Standard 17034:2016 as a Reference Material Producer for the production of Certified Reference Materials and Reference Materials (our current Certificate Number 656.02 expires 01/31/2027)

Brammer Standard Company's Chemical Laboratory is accredited by A2LA to ISO Standard 17025:2017. (Our current Certificate Number 656.01 expires 01/31/2027)

By current Certificate Number 10539 expiring 01/01/2027 the Quality System of Brammer Standard Company, Inc., is registered to ISO 9001:2015 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 Standard 33401:2024 Reference materials - Contents of certificates, labels and accompanying documentation

ISO Standard 33403:2024 Reference materials – Requirements and recommendations for use

ISO Standard 17034:2016 General requirements for the competence of reference material producers

ISO Standard 33405:2024 Reference materials – Approaches for characterization and assessment of homogeneity and stability

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 August 29, 2025.

Beau R. Brammer

President