Brammer Standard Company, Inc.

Provisional Certificate of Analysis

BS 286EF

Certified Reference Material for Nodular Cast Iron

Analysis listed as percent by weight

	Estimated Analysis[1]	Estimate of Uncertainty[2]		Estimated Analysis[1]	Estimate of Uncertainty[2]
Al	**0.019**	0.001	**N**	**<0.05**	
As	**<0.05**		**Ni**	**1.46**	0.09
B	**0.008**	0.001	**O**	**<0.05**	
C	**3.26**	0.09	**P**	**0.21**	0.02
Co	**0.056**	0.006	**S**	**0.012**	0.001
Cr	**0.34**	0.03	**Si**	**2.02**	0.09
Cu	**0.36**	0.04	**Sn**	**<0.05**	
Fe	**[90.9]**	0.9	**Ti**	**0.048**	0.005
H	**<0.005**		**V**	**0.15**	0.02
Mg	**0.036**	0.001	**W**	**0.095**	0.009
Mn	**0.74**	0.07	**Zr**	**0.002**	0.001
Mo	**0.24**	0.02			

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

[2] For each element, the uncertainty listed is based on a statistical evaluation of the contributions of homogeneity.

Form: This CRM is machined in the form of a disc, approximately 33mm in diameter and approximately 26mm thick by Brammer Standard Company, Inc.

A detailed final certificate of analysis will be supplied by September 18, 2028

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069-2895 USA
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BS 286EF	Al	As	B	Be	Bi	C	Ca	Ce	Co	Cr	Cu	Fe	H	Mg
CSONH						3.22							0.00074	
GDS	0.019		0.0078			3.29			0.057	0.345	0.356	90.91		0.036
GDS			0.0078			3.27			0.0569	0.344	0.355	90.93		
GDS			0.0078			3.25			0.0574	0.342	0.355	90.95		
GDS			0.0077			3.27			0.0566	0.339	0.354	90.92		
GDS			0.0077			3.25			0.0558	0.342	0.352	90.93		
GDS			0.0077			3.25			0.0506	0.347	0.357	90.95		
MTR		0.00164428	0.00698228			3.26020742			0.05822440	0.35229877	0.36085571			
Average	0.019	0.00164428	0.007640326			3.257525928			0.056074914	0.344471253	0.355693673	90.9316667	0.00074	0.036
Certificate	0.019	<0.05	0.008			3.26			0.056	0.34	0.36	[90.9]	<0.005	0.036
Uncertainty	0.001		0.001			0.09			0.006	0.03	0.04	0.9		0.001

BS 286EF	Mn	Mo	N	Nb	Ni	O	P	Pb	S	Sb	Si	Sn	Ta	Ti
CSONH			0.0077			0.0013			0.0111					
GDS	0.735	0.241			1.46		0.213		0.0118		2.01			0.0474
GDS	0.738	0.241			1.46		0.213		0.0134		2.01			0.0484
GDS	0.736	0.24			1.46		0.213		0.0125		2.02			0.0477
GDS	0.739	0.239			1.47		0.212		0.0127		2.03			0.048
GDS	0.737	0.237			1.47		0.208		0.0125		2.05			0.0467
GDS	0.74	0.239			1.47		0.211		0.0131		2.01			0.0458
MTR	0.74492849	0.24089143			1.44137256		0.22008804		0.00991696		2.04032055	0.00187715		0.05022275
Average	0.738561213	0.239698776	0.0077		1.461624651	0.0013	0.21286972		0.01212712		2.024331507	0.00187715		0.047746107
Certificate	0.74	0.24	<0.05		1.46	<0.05	0.21		0.012		2.02	<0.05		0.048
Uncertainty	0.07	0.02			0.09		0.02		0.001		0.09			0.005

BS 286EF	V	W	Zn	Zr
CSONH				
GDS	0.147	0.0968		0.0018
GDS	0.148	0.0932		0.0016
GDS	0.148	0.095		0.0024
GDS	0.148	0.0922		0.0023
GDS	0.147	0.0927		0.0006
GDS	0.148	0.0972		0.0013
MTR	0.15099037	0.09995967		
Average	0.148141481	0.095294239		0.001667
Certificate	0.15	0.095		0.002
Uncertainty	0.02	0.009		0.001

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 CI4, CC-10, 6A, 285BB, 286CG; CMSI 5083; CZ 20034 13A; SRM C1137A.

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 286EF 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 Houbiao Trading Co Ltd.; Hebei, China.

Certified Area: The certified area of each disc is the portion extending upward 25mm from the analytical surface.

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

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

Web: www.brammerstandard.com
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 September 18, 2026.

Beau R. Brammer

President