

Brammer Standard Company, Inc.

REVISED Certificate of Analysis

B.S. 10V

Tool Steel Reference Material

	Certified Value ¹	Estimate of Uncertainty ²		Certified Value ¹	Estimate of Uncertainty ²
Analysis listed as percent by weight					
C	2.46	0.04	Sn	0.003	0.0015
Mn	0.52	0.02	Ti	0.004	0.0015
P	0.019	0.002	V	9.50³	0.06
S	0.079	0.004	W	0.013	0.003
Si	0.89	0.02			
Cu	0.076	0.004			
Ni	0.08	0.006		Informational Values ⁴	
Cr	5.41³	0.12	Al	(<0.002)³	
Mo	1.30	0.02			
Co	0.009	0.002			
N	0.064	0.004			

¹ The certified value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

² The uncertainties listed are based on value judgments of the material inhomogeneity and possible bias in the determined analytical values. No attempt is made to derive exact statistical measurements of imprecision because several methods were used in the determination of most constituents.

³ Value revised on May 21, 1997.

⁴ Data in parentheses is not certified and is provided for information only.

The requirements of ISO Guide 31 and ISO Guide 35 were generally followed for the preparation of this reference material and certificate of analysis. This is a reference material as defined by ISO Guide 30.

See reverse side for more information.

Certificate Number REV-10V-052197-p1

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr*	Mo
1	2.43	0.501	0.017	0.0767	0.87	0.072	0.0777	5.30	1.28
2	2.45	0.51	0.017	0.077	0.878	0.0746	0.08	5.33	1.29
3	2.456	0.516	0.019	0.079	0.881	0.075	0.08	5.35	1.29
4	2.47	0.528	0.020	0.0796	0.893	0.077	0.0819	5.465	1.29
5	2.47	0.53	0.020	0.081	0.90	0.0795	0.087	5.492	1.31
6	2.47			0.083	0.91	0.081	0.09	5.54	1.31
Average	2.458	0.517	0.0186	0.0794	0.889	0.0765	0.083	5.412	1.295
Std Dev	0.016	0.012	0.0015	0.0024	0.015	0.0033	0.005	0.099	0.012
Certified	2.46	0.52	0.019	0.079	0.89	0.076	0.08	5.41	1.30
C(95%)	0.017	0.015	0.0019	0.0025	0.016	0.0035	0.005	0.104	0.013

continued from above

Analysis	Al	Co	N	Sn	Ti	V*	W
1	0.0009	0.009	0.0612	0.002	0.0027	9.42	0.0099
2	0.0013	0.009	0.0635	0.003	0.004	9.42	0.013
3	<0.002	0.0093	0.0636	0.0035	0.004	9.45	0.013
4		0.0103	0.0656	0.004	0.0045	9.47	0.0148
5						9.49	
6						9.513	
7						9.515	
8						9.56	
9						9.56	
10						9.57	
11						9.59	
Average		0.0094	0.0635	0.0031	0.0038	9.505	0.0127
Std Dev		0.0006	0.0018	0.0009	0.0008	0.060	0.0020
Certified (<0.002)		0.009	0.064	0.003	0.004	9.50	0.013
C(95%)		0.0010	0.0029	0.0014	0.0012	0.041	0.0032

Data in parentheses is not certified and is provided for information only.

$C(95\%) = (t \times sd) / \sqrt{n}$ The half-width confidence interval, where t is the appropriate Student's t value, sd is the interlaboratory standard deviation, and n is the number of acceptable mean values. For further information regarding the confidence interval for the certified value see ISO Guide 35:1989 section 4.

* New values obtained in 1997.

Co-operating Laboratories: Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
 Allegheny Ludlum Steel Corp., Lockport, New York
 Brammer Standard Co., Inc., Houston, Texas
 Carpenter Technology, Reading, Pennsylvania
 Crucible Specialty Metals, Syracuse, New York
 Crucible Research, Pittsburgh, Pennsylvania
 J. Dirats and Co. Inc., Westfield, Massachusetts
 IncoTest, Huntington, West Virginia
 VHG Laboratories, Inc., Manchester, New Hampshire

REVISION: The original certificate of analysis for BS 10V was produced on March 27, 1992. This certificate of analysis is revised mainly for chromium and vanadium content after additional testing by classical wet chemical analysis. The format of this certificate is updated to show the estimate of uncertainty of the certified value.

Analysis: Chemical analyses were made on chips prepared by a lathe from the certified portion of the discs. The laboratories participating in the testing normally followed the requirements of ISO Guide 25. Methods of analysis used were a combination of ASTM Standard Method E 354 for classical wet chemistry, ICP and AA spectrometric methods, and ASTM Standard Method E 1019 for combustion instrument analysis of carbon and sulfur. The values listed on page 2 are the average of each analyst's results. The following Certified Reference Materials were used to validate the analytical data listed above: NIST 32e, 50c, 125b, 132b, 134, 134a, 361 to 365, 437; BAM 039-2, 044-1; BCS 455/1, 456/1, 458/1, 481, 482; ECRM 085-1, 088-1, 096-1, 184-1, 481-1; GBW 01402; IMZ 1.22, 1.74.

Homogeneity: This Reference Material was tested for homogeneity using ASTM Standard Practice E 826 and found acceptable.

Source: This material was produced by Crucible Specialty Metals, Syracuse, New York. The bar stock was processed by hot-rolling material that had been produced by hot isostatic pressure (HIP) on particles.

Available Form: This Reference Material is available only in the form of a disc, approximately 41 mm (1.62") in diameter and 12 mm (0.50") thick.

Use: This Reference Material is intended for use in optical emission and x-ray spectrometric methods of analysis. The entire depth of the disc may be used.

Sample Preparation: For best analytical results, use the same method for preparing the analytical surface on all reference materials as you use for production specimens. Avoid overheating the disc during surface preparation.

Safety Notice: A Material Safety Data Sheet (MSDS) 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) 440-9396
14603 Benfer Road
Houston, Texas 77069-2895 USA Fax: (281) 440-4432

Certified by: _____ on May 21, 1997.
G. R. Brammer

Referenced Documents

ASTM documents available from ASTM, 1916 Race Street, Philadelphia, PA, 19103.

E 353 - 93 Standard Test Methods for Chemical Analysis of Stainless, Heat-Resisting, Maraging, and Other Similar Chromium-Nickel-Iron Alloys

E 826 - 85 Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

E 1019-93 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys

ISO Guides available from American National Standards Institute, 11 West 42nd St., 13th Floor, New York, NY 10036.

ISO Guide 25 (Third edition, 1990), General requirements for the competence of calibration and testing laboratories.

ISO Guide 30 (Second edition, 1991), Terms and definitions used in connection with reference materials.

ISO Guide 31 (First edition, 1981), Contents of certificates of reference materials.

ISO Guide 35 (Second edition, 1989), Certification of reference materials - General and statistical principles.

Certificate Number REV-10V-052197-p4