



Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	B	Ca
1	0.0969	12.03	0.015	0.001	0.638	0.0848	1.775	18.365	0.20	0.00060	0.0016
2	0.101	12.05	0.0167	0.001	0.6392	0.0858	1.79	18.40	0.206	0.00060	0.00177
3	0.102	12.07	0.017	0.0012	0.64	0.088	1.81	18.40	0.21	0.0006	0.0018
4	0.103	12.07	0.0187	0.002	0.644	0.089	1.81	18.44	0.211	0.0007	0.002
5	0.104	12.08	0.019	0.002	0.650	0.0902	1.82	18.44	0.220	0.0007	0.0022
6	0.104	12.10	0.020	0.0023	0.652	0.092	1.82	18.460	0.223	0.0007	0.00228
7	0.104	12.11			0.66		1.82	18.46			0.0024
8	0.105	12.12			0.66		1.82	18.51			
9	0.1060	12.12			0.678		1.82	18.54			
10	0.1068	12.132			0.68		1.828	18.56			
11	0.108	12.24			0.682		1.83	18.60			
12		12.24					1.83	18.63			
13							1.84				
14							1.84				
15							1.86				
Average	0.1037	12.114	0.0177	0.0016	0.657	0.0883	1.821	18.484	0.212	0.0007	0.0020
Std Dev	0.0030	0.066	0.0018	0.0006	0.017	0.0027	0.020	0.084	0.009	0.0001	0.0003
Certified	0.104	12.11	0.018	0.002	0.66	0.088	1.82	18.48	0.21	0.0007	0.0020

Analysis	Co	N	Nb	Sn	Ti	V	Al	O	W
1	0.024	0.3600	0.014	0.003	0.0024	0.104	0.0016	0.0012	0.005
2	0.0259	0.362	0.014	0.0038	0.0025	0.105	0.002	0.0027	0.005
3	0.0261	0.3669	0.014	0.0044	0.0028	0.105	0.0022	0.0039	0.0065
4	0.0293	0.3746	0.0149	0.0046	0.003	0.106	0.0023	0.0048	0.0077
5	0.0295	0.3767	0.0154	0.0048		0.107	0.003	0.0049	0.010
6	0.032			0.005		0.11	0.005		
7						0.11			
Average	0.0278	0.3680	0.0145	0.0043	0.0027	0.1067	0.0027	0.0035	0.0068
Std Dev	0.0030	0.0074	0.0007	0.0007	0.0003	0.0024	0.0012	0.0016	0.0021
Certified	0.028	0.37	0.014	0.004	0.003	0.107	(0.003)	(0.004)	(0.007)

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

**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. The individual values listed above are the average of each analyst's results. Methods of analysis used were a combination of ASTM Standard Methods E 350, E 353, E 572, E 1019, E 1086, plus additional ICP and AA spectrometric methods.

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

Analytical Associates, Inc., Detroit, Michigan  
 Anarem, Prague, Czech Republic  
 Brammer Standard Co., Inc., Houston, Texas  
 China Research Institute, Beijing, China  
 Coleman Testing Laboratories, Riverside, New Jersey  
 Crucible Specialty Steel, Syracuse, New York  
 J. Dirats and Co., Inc., Westfield, Massachusetts  
 Laboratory Testing Inc., Dublin, Pennsylvania  
 LECO Corporation, St. Joseph, Michigan  
 Ledoux & Company, Teaneck, New Jersey  
 Andrew S. McCreath & Son, Inc., Harrisburg, Pennsylvania  
 Shiva Technologies, Inc., Cicero, New York  
 Spectrochemical Laboratories, Inc., Pittsburgh, Pennsylvania  
 VHG Laboratories, Inc., Manchester, New Hampshire

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

**Traceability:** This Reference Material was also examined by optical emission spectrometry and found to be compatible with the following Certified Reference Materials: NIST SRM C1289; BAS SS 471, 472. The following Certified Reference Materials were used to validate the analytical data listed on page 2: NIST SRM 30f, 73c, 101g, 121d, 123c, 125b, 160a, 160b, 293, 339, 342, 344, 345, 346, 346a, 348a, 361, 362, 367, 2171; ECRM 096-1, 184-1, 284-1, 286-1, 292-1; BCS 342, 466/1, 467/1, 475; JK 37; BAM 230-1; CMSI 1356.

**Source:** This material was produced by Carpenter Technology Corporation, Reading, Pennsylvania. The material was made in an electric arc furnace and cast into ingots. The bar stock was hot rolled and annealed.

**Available Form:** This Reference Material is available in the form of a disc, approximately 32 mm (1.25") in diameter and 12 mm (0.50") thick. It is also available in a special set of 7 mm thick discs.

**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.

**Caution:** As with any bar material, avoid optical emission spectrometric burns in the center of the disc (5 mm radius), as some segregation may be present.

Because this Reference Material contains a high percent of manganese and chromium, care must be taken in its application. Make certain that corrections are made for possible element interference and dilution effects.

**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 February 3, 1995.  
G. R. Brammer

**Certificate Number 193-020395**

## References:

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

E 350-90 Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

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

E 572 - 88 Standard Test Method for X-Ray Emission Spectrometric Analysis of Stainless Steel

E 826 - 85 (Reapproved 1990) 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

E 1086 - 85 Standard Method for Optical Emission Vacuum Spectrometric Analysis of Stainless Steel by the Point-to-Plane Excitation Technique

*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 33 (First edition, 1989), Uses of certified reference materials.

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

*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

**Certificate Number 193-020395**