

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Al	V
1	0.484	0.784	0.0117	0.0159	0.26	0.10	0.069	0.948	0.0379	0.022	0.158
2	0.487	0.79	0.0118	0.0165	0.267	0.100	0.0714	0.95	0.038	0.022	0.158
3	0.488	0.79	0.012	0.0165	0.267	0.104	0.074	0.955	0.038	0.0230	0.164
4	0.488	0.790	0.012	0.017	0.269	0.107	0.074	0.96	0.039	0.024	0.165
5	0.488	0.793	0.013	0.017	0.27	0.109	0.076	0.96	0.040	0.025	0.166
6	0.4947	0.80	0.013	0.017	0.272	0.110	0.079	0.970		0.026	0.167
7	0.495			0.0176	0.279	0.111		0.970			0.169
8	0.496			0.0180				0.97			
Average	0.4901	0.791	0.0123	0.0169	0.269	0.1059	0.0739	0.9604	0.0386	0.0237	0.1639
Std Dev	0.0045	0.005	0.0006	0.0007	0.006	0.0046	0.0035	0.0090	0.0009	0.0016	0.0043
Certified	0.490	0.79	0.012	0.017	0.27	0.106	0.074	0.96	0.039	0.024	0.164

Analysis	Co	N	O	Sn	As	B	Ca	Ti
1	0.0069	0.0072	0.0014	0.0057	0.0018	0.00007	0.0001	0.0005
2	0.007	0.0072	0.0015	0.0058	0.0021	0.0001	0.0002	0.0005
3	0.007	0.0074	0.0018	0.0059	0.004	0.0002	0.00023	0.004
4	0.0079	0.0077	0.0018	0.006	0.0044			
5	0.008	0.00778	0.0018		0.005			
6	0.0083	0.0078						
7		0.0081						
Average	0.0075	0.0076	0.0017	0.0059	0.0035	0.00012	0.00018	0.0017
Std Dev	0.0006	0.0003	0.0002	0.0001	0.0014	0.00007	0.00007	0.0020
Certified	0.008	0.0076	0.0017	0.006	(0.004)	(0.0001)	(0.0002)	(0.002)

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 415, and E 1019, plus additional ICP and AA spectrometric methods.

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

Analytical Associates, Inc., Detroit, Michigan
Auburn Analytical Lab, Inc., Auburn, Michigan
Brammer Standard Co., Inc., Houston, Texas
Coleman Testing Laboratories, Riverside, New Jersey
Copperweld Steel Company, Warren, Ohio
Crucible Specialty Steel, Syracuse, New York
J. Dirats and Co., Inc., Westfield, Massachusetts
LECO Corporation, St. Joseph, Michigan
Ledoux & Company, Teaneck, New Jersey
Andrew S. McCreath & Son, Inc., Harrisburg, Pennsylvania
Shiva Technologies, Inc., Cicero, New York
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 C1173, 1224, 1225, 1261A to 1265A, 1761 to 1767. The following Certified Reference Materials were used to validate the analytical data listed on page 2: NIST SRM 13g, 30f, 32e, 125b, 361 to 365; BAM 039-2, 044-1; BCS 455/1, 456/1, 458/1; ECRM 085-1, 088-1, 096-1, 097-1, 184-1; GBW 01402; IMZ 1.22/3.

Additional analytical data: This material was used as an unknown test specimen in a nationally recognized Proficiency Testing Program (PTP) for low-alloy steel. The participating laboratories were instructed to use ASTM Standard Test Methods E 322, E 415, and E 1019. The data shown below are the results from the PTP.

Instrument analysis using ASTM Standard Test Method E 1019

	C	S	N	O
Number of Labs	42	38	27	21
Grand Average	0.4865	0.0168	0.0078	0.0019
Standard Deviation	0.0103	0.0016	0.0003	0.0008

Optical Emission Spectrometric Analysis using ASTM Standard Test Method E 415

	C	Mn	P	S	Si	Cu
Number of Labs	48	53	53	46	55	53
Grand Average	0.4840	0.7848	0.0127	0.0177	0.2702	0.1050
Standard Deviation	0.0144	0.0150	0.0014	0.0019	0.0111	0.0040

	Ni	Cr	Mo	Al	Sn	V
Number of Labs	51	53	48	52	44	53
Grand Average	0.0746	0.9402	0.0394	0.0244	0.0070	0.1572
Standard Deviation	0.0044	0.0221	0.0038	0.0023	0.0010	0.0061

X-ray Emission Spectrometric Analysis using ASTM Standard Test Method E 322

	Mn	Cu	Ni	Cr	Mo	V
Number of Labs	13	13	13	14	14	13
Grand Average	0.7957	0.1071	0.0747	0.9639	0.0380	0.1604
Standard Deviation	0.0088	0.0030	0.0035	0.0195	0.0019	0.0042

Source: This material was produced by Copperweld Steel Company, Warren, Ohio. 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 41 mm (1.625") in diameter and 19 mm (0.75") 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.

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.

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 1, 1995.
G. R. Brammer

Certificate Number 4941-020195

References :

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

E 322 - 67 (Reapproved 1990) Standard Method for X-Ray Emission Spectrometric Analysis of Low-Alloy Steels and Cast Irons

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

E 415 - 85 (Reapproved 1995) Standard Test Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy 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

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

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