



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material[®] 133b

Chromium-Molybdenum Steel

(In cooperation with ASTM International)

This Standard Reference Material (SRM) is intended primarily for use in evaluating chemical and instrumental methods of analysis. A unit of SRM 133b consists of a bottle containing approximately 150 g of fine millings sized between 0.50 mm (No. 35 sieve) and 1.18 mm (No. 16 sieve).

The certified values for 10 elements in SRM 133b are listed in Table 1. Information values for six elements are listed in Table 2. For all elements, values are reported as mass fractions [1].

Certified Values: A certified value is the present best estimate of the “true” value based on the results of analyses performed at NIST and collaborating laboratories using the test methods listed in Table 3. The combined uncertainty listed with the value is an estimate based on a 67 % confidence interval [2] and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability.

Information Values: Information values are non-certified values with no uncertainty reported because there is insufficient information with which to make the appropriate assessments. In this case, the information values were reported by one of the collaborating laboratories.

Expiration of Certification: The certification of this SRM is valid until **01 August 2024**, within the uncertainty specified, provided the SRM is handled and stored in accordance with the instructions given in this certificate (see “Instructions for Use”). However, the certification will be nullified if the SRM is damaged or contaminated.

Stability: This material is considered to be stable during the period of certification. NIST will monitor this material and will report any significant changes in certification to the purchaser. Registration (see attached sheet) will facilitate notification.

The overall coordination of technical measurements leading to certification was performed under the direction of J.I. Schultz, Research Associate, ASTM/NBS Research Associate Program.

Analytical measurements for stability testing of this SRM were performed by J.R. Sieber and A.F. Marlow of the NIST Analytical Chemistry Division (October 2001).

Statistical consultation for stability testing this SRM was provided by J.H. Yen of the NIST Statistical Engineering Division (October 2001).

The technical and support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by R.E. Michaelis and B.S. MacDonald of the NIST Measurement Services Division.

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Analytical Chemistry Division

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Gaithersburg, MD 20899
Certificate Revision Date: 08 March 2004
See Certificate Revision History on Last Page

INSTRUCTIONS FOR USE

To relate analytical determinations to the certified values on this Certificate of Analysis, a minimum sample quantity of 500 mg is recommended. The millings do not require preparation prior to weighing and dissolution. The material should be stored in its original container in a cool, dry location.

Table 1. Certified Values for SRM 133b Chromium-Molybdenum Steel

Constituent	Mass Fraction (%)	Combined Uncertainty (Mass Fraction %)
C	0.128	0.002
Mn	1.07	0.02
P	0.018	0.002
S	0.328	0.004
Si	0.327	0.006
Cu	0.080	0.003
Ni	0.230	0.004
Cr	12.63	0.03
V	0.071	0.002
Mo	0.052	0.003

Table 2. Information Values for SRM 133b Chromium-Molybdenum Steel

Constituent	Mass Fraction (%)
N	0.05
Mg	<0.0005
Al	<0.005
Ca	<0.0005
Sn	0.004
Pb	<0.0005

Table 3. Analytical Methods

Element	Methods
C	1
Mn	2, 3
P	4, 5
S	1
Si	6, 7
Cu	3, 8, 9
Ni	3, 10, 11
Cr	12, 13
V	3, 14, 15
Mo	3

Key to Methods in Table 3:

1. Combustion-Infrared
2. Peroxydisulfate arsenite (some labs removed Cr by precipitation with ZnO)
3. Atomic Absorption
4. Molybdenum blue photometric
5. Ammonium phosphovanadate photometric
6. Perchloric acid dehydration
7. Silicomolybdate photometric
8. Diethyldithiocarbamate photometric
9. Neocuproine photometric
10. Dimethylglyoxime precipitate titrated with cyanide
11. Weighed as nickel dimethylglyoxime
12. Peroxydisulfate oxidation-FeSO₄-KMnO₄ titration
13. Peroxydisulfate oxidation - potentiometric titration with ferrous ammonium sulfate
14. N-phenylbenzohydroxamic acid photometric
15. Nitric acid oxidation – potentiometric titration with ferrous ammonium sulfate

PLANNING, PREPARATION, TESTING, AND ANALYSIS¹

The material for this SRM was provided by the Republic Steel Corporation through the courtesy of R.W. Jones.

Homogeneity testing was performed at NBS by optical emission spectrometric analysis – J.A. Norris; C/S analysis – B.I. Diamondstone; and selected chemical analyses – R.K. Bell, Assistant Research Associate, ASTM/NBS Research Associate Program.

Cooperative analyses for certification were performed in the following laboratories:

National Bureau of Standards, Inorganic Analytical Research Division; B.I. Diamondstone and R.K. Bell, ASTM/NBS Assistant Research Associate
Republic Steel Corporation, central Alloy District, Canton, OH; R.W. Jones and B.G. Brainard
United States Steel Corporation, Research Laboratory, Monroeville, PA; L.M. Melnick, H.S. Karp, H.R. Frisbie, D.G. Glaser and F.T. Hornak
Universal-Cyclops Specialty Steel Division, Cyclops Corporation, Bridgeville Plant, Bridgeville, PA; F.F. Liberato, D. McGlone and M. Pardus
Universal-Cyclops Specialty Steel Division, Cyclops Corporation, Titusville Plant, Titusville, PA; R. Hall

REFERENCES

- [1] Taylor, B.N.; *Guide for the Use of the International System of Units (SI)*, NIST Special Publication 811 (1995).
- [2] Hahn, G.J. and Meeker, W.Q.; *Statistical Intervals: A Guide for Practitioners*, John Wiley & Sons, Inc., New York (1991).

<p>Certificate Revision History: 08 March 2004 (This revision reflects a change in the certification expiration date and updating of the format of the certificate of analysis.); 12 August 1981 (Original certificate date).</p>
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Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; email srminfo@nist.gov; or via the Internet at <http://www.nist.gov/srm>.

¹Certain commercial equipment, instruments, or materials are identified in this certificate in order to adequately specify the experimental procedure. Such identification does not imply recommendation or endorsement by the National Institute of Standards and Technology, nor does it imply that the materials or equipment identified are necessarily the best available for the purpose.