



National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 1173

Ni-Cr-Mo-V Steel

(In Cooperation with the American Society for Testing and Materials and the Steel Founders' Society of America)

This Standard Reference Material (SRM) is in the form of disks, approximately 32 mm (1 1/4 in) in diameter and 19 mm (3/4 in) thick, intended for use in optical emission and x-ray spectrometric methods of analysis.

<u>Element</u>	<u>Certified Value,¹ % by wt.</u>	<u>Estimated Uncertainty²</u>
Carbon	0.423	0.004
Manganese	.19	.01
Phosphorus	.033	.002
Sulfur	.092	.005
Silicon	1.28	.01
Copper	0.204	.002
Nickel	4.06	.03
Chromium	2.70	.03
Vanadium	0.42	.01
Molybdenum	1.50	.02

¹The certified value listed for a constituent is the present best estimate of the "true" value based on the results of the cooperative program for certification.

²The estimated uncertainty listed for a constituent is based on judgment and represents an evaluation of the combined effects of method imprecision, possible systematic errors among methods, and material variability. (No attempt was made to derive exact statistical measures of imprecision because several methods were involved in the determination of most constituents.)

Metallurgical Condition: The structure of the specimens is that resulting from hot working, followed by annealing.

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

The technical and support aspects involved in the preparation, certification, and issuance of this Standard Reference Material were coordinated through the Office of Standard Reference Materials by R.E. Michaelis and W.P. Reed.

June 9, 1989
Gaithersburg, MD 20899
(Revision of certificate
dated 5-16-83)

Stanley D. Rasberry, Chief
Office of Standard Reference Materials

(over)

PLANNING, PREPARATION, TESTING, ANALYSIS:

The material for this standard was prepared at Esco Corporation, Portland, Oregon, in cooperation with the Steel Founders' Society of America (SFSA). It was then fabricated at the Puget Sound Naval Shipyard, Bremerton, Washington, where it was forged to slabs and portions of questionable homogeneity were cut and discarded. The remaining slab sections were forged and swaged to rods (oversize 32 mm in diameter). The rods were given a sub-critical anneal, and were then centerless ground to the final size of 32 mm in diameter.

Extensive homogeneity testing was performed at NIST by optical emission spectroscopy, J.A. Norris; by x-ray fluorescence, P.A. Pella; and carbon/sulfur analysis by B.I. Diamondstone, D.E. Brown, and K.I. Moran.

Cooperative analyses for certification, carried out under the auspices of the ASTM/NIST Research Associate Program were performed in the following laboratories.

Climax Molybdenum Company of Michigan, Ann Arbor, Michigan, R.C. Binns.

National Institute of Standards and Technology, B.I. Diamondstone, D.E. Brown, K.I. Moran, and R.K. Bell, ASTM/NIST Assistant Research Associate.

Pittsburgh Testing Laboratory, Chicago, Illinois, D.D. Troutman.

Pittsburgh Testing Laboratory, Pittsburgh, Pennsylvania, W.S. Carlson.

Republic Steel Corporation, Chicago District, Chicago, Illinois, P.P. Blaszk and J.M. Hlebek.

The Timken Company, Canton, Ohio, V.M. Chapman and N. Stecyk.

Although not certified, the following values are given to provide additional information.

Element	Percent by Weight
Niobium	(0.045)
Titanium	(.015)
Cobalt	(.064)