National Institute of Standards & Technology

Certificate of Analysis

Standard Reference Material 1261a

AISI 4340 Steel

This Standard Reference Material (SRM) is in the form of disks 31 mm (1 1/4 in) in diameter and 19 mm (3/4 in) thick, generally for use in optical emission and X-ray spectrometric analysis.

Element	wt %*	Element	wt %*
Carbon	0.39_1	Aluminum (total)	0.02_1
Manganese	0.67	Niobium	0.022
Phosphorus	0.016	Tantalum	0.021
Sulfur	0.015	Boron	0.0005
Silicon	0.228	Lead	0.00002_5
Copper	0.042	Zirconium	0.009
Nickel	2.00	Antimony	0.0042
Chromium	0.69_3	Bismuth	0.0004
Vanadium	0.011	Silver	0.0004
Molybdenum	0.19	Calcium	0.00002_8
Tungsten	0.017	Magnesium	0.00018
Cobalt	0.032	Selenium	0.004
Titanium	0.020	Tellurium	0.0006
Arsenic	0.017	Cerium	0.0014
Tin	0.010	Lanthanum	0.0004
		Neodymium	0.0002_9

*wt % = mg/kg x 10^{-4}

Certification: The value listed for a certified element is the *present best estimate* of the "true" value based on the results of the analytical program. The value listed is not expected to deviate from the "true" value by more than ± 5. Based on the results of homogeneity testing, maximum variations within and among samples are estimated to be less than the uncertainty figures given above.

Renewals of the "1200 series", 1261a-1265a, were prepared from the same ingots used for the original series, but from adjacent positions within the ingots. Little or no change in elemental composition was observed by comparison analysis utilizing several analytical techniques: optical emission spectrometric analysis, J.A. Norris and D.E. Brown; X-ray fluorescence analysis, P.A. Pella and J.R. Sieber; combustion-infrared, B.I. Diamondstone.

The overall direction and coordination of the technical measurements at NIST leading to certification were performed under the direction of K.F.J. Heinrich, O. Menis, B.F. Scribner, J.I. Shultz, and J.L. Weber, Jr.

The technical and support aspects involved in the original preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by R.E. Michaelis. Revision of this certificate was coordinated through the Standard Reference Materials Program by P.A. Lundberg.

Gaithersburg, MD 20899
May 18, 1993
(Revision of certificate dated 2-24-81)

Thomas E. Gills, Acting Chief
Standard Reference Materials Program

(over)

This Certificate of Analysis has undergone editorial revision to reflect program and organizational changes at NIST and at the Department of Commerce. No attempt was made to reevaluate the certificate values or any technical data presented on this certificate.

PLANNING, PREPARATION, TESTING, ANALYSIS: This standard is one of five replacements for the original eight 1100 series iron and steel SRMs. Material from the same melt is available in a variety of forms to serve in checking methods of analysis and in calibrating instrumental techniques.

The material for this standard was vacuum melted and cast at the Carpenter Technology Corporation, Reading, PA, under a contract with the National Institute of Standards & Technology. The contract was made possible by a grant from the American Iron and Steel Institute.

The ingots were processed by Carpenter Technology Corporation to provide material of the highest possible homogeneity. Following acceptance of the composition based on NIST analyses, selected portions of the ingot material were extensively tested for homogeneity at NIST by J.R. Baldwin, D.M. Bouchette, S.D. Rasberry, and J.L. Weber, Jr. Only that material meeting a critical evaluation was processed to the final sizes.

Chemical analyses for certification were made on composite samples representative of the accepted lot of material.

Cooperative analyses for certification were performed in the analytical laboratories of Bethlehem Steel Corp., Sparrows Point Plant, MD, R.H. Rosue; Carpenter Technology Corp., Research and Development Center, Reading, PA, E.J. Cramer; The Timken Roller Bearing Company, Steel & Tube Division, Canton, OH, R.G. Cover; United States Steel Corp., Applied Research Laboratory, Monroeville, PA, L. Melnick; and Gary Steel Works, Gary, IN, E.H. Shipley.

Analyses were performed in the Analytical Chemistry Division of the National Institute of Standards & Technology by the following: R. Alvarez, J.R. Baldwin, D.A. Becker, R.K. Bell, R.W. Burke, B.S. Carpenter, E.L. Garner, T.E. Gills, G.J. Lutz, L.A. Machlan, E.J. Maienthal, J. McKay, L.J. Moore, C.W. Mueller, T.J. Murphy, P.J. Paulsen, T.C. Rains, S.D. Rasberry, T.A. Rush, K.M. Sappenfield, B.A. Thompson, S.A. Wicks, and J. Wing.

SUPPLEMENTAL INFORMATION

Certification is made only for the elements indicated. The five replacements, however, contain a graded series for 40 elements and information on the elements not certified may be of importance in the use of the material. Although these are not certified, values are presented in the following table for the remaining elements.

Value from a single method of analysis:

Element	wt %	Element	wt %
Gold	(<0.00005)	Oxygen	(0.0009)
Zinc	(0.0001)	Hydrogen	(<0.0005)
Praseodymium	(0.00014)	Strontium	[b]-(0.0005)
Hafnium	(0.0002)	Iron (by difference)	(95.6)
Nitrogen	(0.0037)		

[b] Dash indicates "not detected". Value in parenthesis following the dash is the conservative "upper limit" of detection.

Approximate value from heat analysis:

Germanium	(0.006)