NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY
U.S. DEPARTMENT OF COMMERCE

Date of Issue:
22 May 2025

Standard Reference Material® 1763b
Low Alloy Steel
(disk form)
CERTIFICATE OF ANALYSIS

Purpose: The certified values delivered by this Standard Reference Material (SRM) are intended primarily for use in validation of chemical and instrumental methods of analysis for elemental content of iron and steel alloys. The certified values can also be used to validate value assignment of a laboratory's in-house reference materials.

Description: A unit of SRM 1763b consists of one disk approximately 34 mm in diameter and 19 mm thick.

Certified Values: Certified values, expressed as mass fractions of the total amounts of the elements in the steel matrix, are listed below. A NIST certified value is a value for which NIST has the highest confidence in its accuracy in that all known or suspected sources of bias have been investigated or taken into account [1]. The certified values for SRM 1763b are metrologically traceable to the International System of Units (SI) derived unit of mass fraction, expressed as percent or the equivalent unit, centigram per gram [1].

Certified Values for Elements in SRM 1763b

Element	Mass Fraction[(a)] % (cg/g)	Element	Mass Fraction[(a)] % (cg/g)
Aluminum (Al)	0.042 2 ± 0.004 4	Nickel (Ni)	0.507 5 ± 0.002 0
Antimony (Sb)	0.011 0 ± 0.001 2	Phosphorus (P)	0.012 33 ± 0.000 49
Arsenic (As)	0.053 9 ± 0.001 0	Silicon (Si)	0.627 5 ± 0.003 0
Boron (B)	0.005 35 ± 0.000 32	Sulfur (S)	0.022 9 ± 0.002 4
Carbon (C)	0.201 ± 0.023	Tantalum (Ta)	0.011 66 ± 0.000 83
Chromium (Cr)	0.503 9 ± 0.006 3	Tin (Sn)	0.010 98 ± 0.000 83
Cobalt (Co)	0.092 48 ± 0.000 56	Titanium (Ti)	0.313 ± 0.016
Copper (Cu)	0.0417 0 ± 0.000 58	Tungsten (W)	0.002 16 ± 0.000 17
Manganese (Mn)	1.605 ± 0.034	Vanadium (V)	0.307 5 ± 0.004 2
Molybdenum (Mo)	0.491 ± 0.015	Zirconium (Zr)	0.042 5 ± 0.001 9
Niobium (Nb)	0.099 8 ± 0.002 6		

[(a)] Values are expressed as $x \pm U_{95\%}(x)$, where x is the certified value and $U_{95\%}(x)$ is the expanded uncertainty of the certified value. The true value of the analyte lies within the interval $x \pm U_{95\%}(x)$ with 95 % confidence. For each constituent, the certified value is the mean of the available method estimates. Each method estimate is the mean of the measurements available for that element. The expanded uncertainty of each certified value was estimated using a bootstrap procedure based on a Gaussian random effects model for the between-method effects [2–6]. For As, Mn, Mo, Nb, and V, the uncertainty incorporates an additional uncertainty component for possible inhomogeneity based on the standard deviation of the NIST Wavelength Dispersive X-ray Fluorescence measurements.

Additional Information: Additional information is provided in Appendices A and B.

Period of Validity: The certified values delivered by **SRM 1763b** are valid indefinitely within the measurement uncertainty specified. The certified values are nullified if the material is stored or used improperly, damaged, contaminated, or otherwise modified.

Maintenance of Certified Values: NIST will monitor this SRM over the period of its validity. If substantive technical changes occur that affect the certification, NIST will issue an amended certificate through the NIST SRM website (https://www.nist.gov/srm). Before making use of any of the values delivered by this material, users should verify they have the most recent version of this documentation, available through the NIST SRM website (https://www.nist.gov/srm).

Carlos A. Gonzalez, Chief
Chemical Sciences Division

Steven J. Choquette, Director
Office of Reference Materials

Certificate Revision History on Page 2

Safety: Consult the Safety Data Sheet (SDS) for hazard information.

Storage: This SRM should be stored in its original container in a dry location (relative humidity <60 %) at room temperature (20 °C to 25 °C).

Use: The test surface is the side opposite to the labeled surface, which includes the SRM number. The certified values are valid for the entire thickness of the unit. However, the user is cautioned not to measure disks less than 2 mm thick when using X-ray fluorescence spectrometry. Each packaged disk has been prepared by finishing the test surface using a milling machine. The user must determine the correct surface preparation procedure for each analytical technique. The user is cautioned to use care when either resurfacing the disk or performing additional polishing as these processes may contaminate the surface. It was found by NIST that abrasive paper must be changed frequently during surface grinding. Used paper loses its ability to remove contaminants from the surface of the steel. This material was tested using both the solid disks and chips prepared from the disks.

Value of Potential Interest to Users: A value of potential interest to users determined by one or more test methods is provided in Appendix A.

Additional Information: Additional information regarding material source, preparation and methods of analysis for SRM 1763b are discussed in Appendix B.

Notice to Users: NIST strives to maintain the SRM inventory supply, but NIST cannot guarantee the continued or continuous supply of any specific SRM. Accordingly, NIST encourages the use of this SRM as a primary benchmark for the quality and accuracy of the user's in-house reference materials and working standards. As such, the SRM should be used to validate the more routinely used reference materials in a laboratory. Comparisons between the SRM and in-house reference materials or working measurement standards should take place at intervals appropriate to the conservation of the SRM and the stability of relevant in-house materials. For further guidance on how this approach can be implemented, contact NIST by email at srms@nist.gov.

REFERENCES

[1] Beauchamp, C.R.; Camara, J.E.; Carney, J.; Choquette, S.J.; Cole, K.D.; DeRose, P.C.; Duewer, D.L.; Epstein, M.S.; Kline, M.C.; Lippa, K.A.; Lucon, E.; Molloy, J.; Nelson, M.A.; Phinney, K.W.; Polakoski, M.; Possolo, A.; Sander, L.C.; Schiel, J.E.; Sharpless, K.E.; Toman, B.; Winchester, M.R.; Windover, D.; *Metrological Tools for the Reference Materials and Reference Instruments of the NIST Material Measurement Laboratory*; NIST Special Publication (NIST SP) 260-136, 2021 edition; National Institute of Standards and Technology, Gaithersburg, MD (2021); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2021.pdf (accessed May 2025).

[2] JCGM 100:2008; *Evaluation of Measurement Data — Guide to the Expression of Uncertainty in Measurement* (GUM 1995 with Minor Corrections); Joint Committee for Guides in Metrology (2008); available at https://www.bipm.org/en/committees/jc/jcgm/publications (accessed May 2025)

[3] Taylor, B.N.; Kuyatt, C.E.; *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*; NIST Technical Note 1297; U.S. Government Printing Office: Washington, DC (1994); available at https://www.nist.gov/pml/nist-technical-note-1297 (accessed May 2025).

[4] JCGM 101:2008; *Evaluation of Measurement Data – Supplement 1 to the Guide to the Expression of Uncertainty in Measurement – Propagation of Distributions Using a Monte Carlo Method*; Joint Committee for Guides in Metrology (JCGM) (2008); available at https://www.bipm.org/en/committees/jc/jcgm/publications (accessed May 2025).

[5] Efron, B.; Tibshirani, R.J.; *An Introduction to the Bootstrap*; Chapman & Hall (1993)

[6] Searle, S.R.; Casella, G.; McCulloch, C.E.; *Variance Components*; John Wiley & Sons, Hoboken, NJ (2006).

Certificate of Analysis Revision History: 22 May 2025 (Reassignment of certified values for Ta and Zr based on evaluation of existing analytical determinations; updated format; editorial changes); 15 March 2019 (Original certificate date).

Certain commercial equipment, instruments, or materials may be identified in this Certificate of Analysis 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.

Users of this SRM should ensure that the Certificate of Analysis in their possession is current. This can be accomplished by contacting the Office of Reference Materials 100 Bureau Drive, Stop 2300, Gaithersburg, MD 20899-2300; telephone (301) 975-2200; e-mail srminfo@nist.gov; or the Internet at https://www.nist.gov/srm.

* * * * * * * * * * * End of Certificate of Analysis * * * * * * * * * * *

APPENDIX A

Value of Potential Interest to Users: The mass fraction value for iron in SRM 1763b is listed below. The value reported is an estimate based on technical evaluation of the results reported from one test method. The value has not been confirmed nor has the uncertainty of the value been assessed. This information is provided to help the user assess possible measurement interferences. It cannot be used to establish metrological traceability to the SI or another higher-order reference system.

Value of Potential Interest in SRM 1763b

Element	Mass Fraction % (cg/g)
Iron (Fe)	95.0

* * * * * * * * * * * * End of Appendix A * * * * * * * * * * * *

APPENDIX B

Source and Preparation: The material for SRM 1763b was vacuum induction melted at Carpenter Technology Corp. (Reading, PA) and supplied in the form of rods. The material was sliced and packaged at NIST by the NIST Office of Reference Materials. Homogeneity testing was performed at NIST using Wavelength Dispersive X-ray fluorescence spectrometry.

See below for Test Methods Used in Value Assignments of SRM 1763b.

Test Methods Used in Value Assignments of SRM 1763b

Method	**Constituents Determined**
Arc-spark optical emission spectrometry	B, C, Al, Si, P, S, Ti, V, Cr, Mn, Co, Ni, Cu, As, Zr, Nb, Mo, Sn, Sb, Ta, W
Thermal neutron prompt gamma-ray activation analysis	B
Wavelength Dispersive X-ray fluorescence spectrometry	B, C, Al, Si, P, S, Ti, V, Cr, Mn, Fe, Co, Ni, Cu, As, Zr, Nb, Mo, Sn, Sb, Ta, W

* * * * * * * * * * * * End of Appendix B * * * * * * * * * * * *