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

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Standard Reference Material® 2197
Low-Energy Charpy V-Notch Specimens
(Self-Verification, 2 mm Striker)

Lot No.: LL-206

CERTIFICATE

Purpose: The certified value delivered by this Standard Reference Material (SRM) is intended for the verification of Charpy machines equipped with a 2 mm striker, in accordance with the current ASTM Standard E23 [1] and the current ISO Standard 148-2 [2].

Description: A unit of SRM 2197 consists of a set of five Charpy V-notch specimens needed to perform one in-house verification (self-verification). Specimens are made from 4340 alloy steel. The bars are finished to length, stamped, heat treated, and machined in SRM specimen lots of approximately 1900 specimens. Each specimen has a lot number and an identification number (three or four digits).

Certified Value: Specimens taken from each SRM lot were tested at 21 °C ± 1 °C by the NIST Applied Chemicals and Materials Division on Charpy reference machines. These data were statistically evaluated to assess the homogeneity of the lot, establish the certified value, and determine the number of SRM specimens required for a user to perform a valid verification. A NIST certified value, as used within the context of this certificate, is a value for which NIST has the highest confidence in its uncertainty assessment [3, 4]. The measurand is absorbed energy as measured by the NIST reference machines. Traceability is to the International System of Units (SI) unit joule. The certified value for energy absorbed by SRM 2197 is provided below.

Certified Absorbed Energy and Expanded Uncertainty for SRM 2197[(a)]

Test temperature: 21 °C ± 1 °C	
Absorbed Energy (J)	Expanded Uncertainty (J)
18.3	0.1

[(a)] The uncertainty in the certified value provided is an expanded uncertainty. The expanded uncertainty is calculated as $U = ku_c$, where u_c represents the combined standard uncertainty consistent with the JCGM Guide [5]. The coverage factor, $k = 2.0322$, is based on 34 degrees of freedom and corresponds to an approximate 95 % uncertainty interval.

Period of Validity: The certification of **SRM 2197 Lot LL-206** is valid indefinitely within the measurement of uncertainty specified. The certified value is nullified if the material is stored or used improperly, damaged, contaminated, or otherwise modified. The successful verification for an acceptable machine is valid for a maximum of one year from the date on which this SRM was tested. If a user's machine is moved or undergoes any major repairs or adjustments, the current verification will be invalidated, and the machine must be retested and reverified.

Maintenance of Certified Value: 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).

John D. Perkins, Chief
Applied Chemicals and Materials Division

Steven J. Choquette, Director
Office of Reference Materials

Safety: This SRM is not classified as hazardous. Consult the Safety Data Sheet Exemption Letter for more information.

Storage: SRM 2197 is anticipated to have an indefinite shelf life under normal storage conditions (20 °C ± 20 °C, ≤50 % relative humidity).

Use: The protective oil coating should be wiped from each specimen with a lint-free cloth just prior to testing. Prior to verifying a Charpy machine equipped with a 2 mm striker, the machine should be checked to ensure compliance with the appropriate sections of the applicable ASTM or ISO Standard. SRM 2197 is tested at 21 °C ± 1°C (70 °F ± 2 °F) in accordance with the applicable standard (ASTM or ISO). This SRM may not be used to verify a Charpy machine equipped with an 8 mm striker.

When using SRM 2197, the user performs a self-service verification of the test machine. The data and specimens are not returned to NIST following the test. NIST provides no letter or certification sticker for the machine verified.

The energy level of the SRM appropriate for verifying the performance of a particular Charpy impact machine can be determined by considering the energy for the SRM, the maximum capacity of the machine, and the requirements of the applicable test method (ASTM or ISO).

For questions concerning the production or use of this SRM, please contact the NIST Charpy Program Coordinator: telephone (303) 497-3351; fax (303) 497-5939; or e-mail charpy@boulder.nist.gov.

REFERENCES

[1] ASTM E23-25; *Standard Test Methods for Notched Bar Impact Testing of Metallic Materials*; Annual Book of ASTM Standards, Vol. 03.01, ASTM, West Conshohocken, PA.

[2] ISO 148 2:2016; *Metallic Materials – Charpy Pendulum Impact Test – Part 2: Verification of Testing Machines*; International Organization for Standardization (ISO), Vernier, Geneva, Switzerland (2016).

[3] JCGM 200:2012; *International Vocabulary of Metrology — Basic and General Concepts and Associated Terms*; Joint Committee for Guides in Metrology (JCGM) (2012); available at https://www.bipm.org/en/committees/jc/jcgm/publications (accessed Aug 2025).

[4] 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; U.S. Government Printing Office: Washington, DC (2021); available at https://nvlpubs.nist.gov/nistpubs/SpecialPublications/NIST.SP.260-136-2021.pdf (accessed Aug 2025).

[5] JCGM 100:2008; *Evaluation of Measurement Data — Guide to the Expression of Uncertainty in Measurement*; Joint Committee for Guides in Metrology (JCGM) (2008); availabe at https://www.bipm.org/en/committees/jc/jcgm/publications (accessed Aug 2025); see also 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 Aug 2025).

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

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