



# National Institute of Standards & Technology

## Certificate

### Standard Reference Material<sup>®</sup> 2112

#### Dynamic Impact Force Verification Specimens (Nominal 24 kN)

#### Verification Specimens for Instrumented Charpy Impact Machines

Lot No.: HH-103

This Standard Reference Material (SRM) is intended primarily for the verification of the maximum force measured dynamically using an instrumented Charpy impact machine in accordance with the current ASTM Standard E2298 [1] or ISO Standard 14556 [2]. A unit of SRM 2112 consists of a set of four specimens needed to perform a single verification.

SRM 2112 can also be used to verify the absorbed energy scale of the impact machine at the high energy level. When testing is performed at room temperature, the force and absorbed energy scales can be verified simultaneously. The SRM can be used to verify the absorbed energy scale at a test temperature of  $-40^{\circ}\text{C}$ , but no force information is available at this temperature. This SRM complies with the requirements for both ASTM Standard E23 [3] and ISO 148-3 [4]. A letter verifying the performance of the test machine is available if the questionnaire is completed and returned to NIST along with the broken specimens (see "Shipping Information" on page 2).

**Material Description:** SRM 2112 is made from 4340 alloy steel. The bars are finished to length, stamped, heat-treated, and machined in SRM specimen lots of approximately 1200. Each specimen has a lot number and an identification number (three or four digits) stamped on one end.

**SRM Certification Procedure:** Specimens taken from each SRM lot were tested by the NIST Materials Reliability Division on Charpy V-Notch reference machines for absorbed energy, and via an interlaboratory comparison (round-robin) [5] for maximum force. These data were statistically evaluated to assure the homogeneity of the lot and establish certified values. The certified values determined for the SRM 2112 specimens are given in Tables 1 and 2.

**Expiration of Certification:** The indirect verification result for the absorbed energy scale is valid for one year from the date that the 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. Currently there are no requirements for the indirect verification of the force scale.

**Maintenance of SRM Certification:** NIST will monitor this SRM over the period of its certification. If substantive technical changes occur that affect the certification before expiration of this certificate, NIST will notify the purchaser. Registration (see attached sheet) will facilitate notification.

The overall direction and coordination of the technical measurements leading to verification of test specimens and machines, evaluation of test results, and issuance of the report on machine conformance are under the direction of the NIST Materials Reliability Division, Boulder, CO.

Support aspects in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

Stephanie Hooker, Chief  
Materials Reliability Division

Gaithersburg, MD 20899  
Certificate Issue Date: 09 December 2011

Robert L. Watters, Jr., Chief  
Measurement Services Division

## INSTRUCTIONS FOR USE

The SRM is anticipated to have an indefinite shelf life under normal storage conditions. The protective oil coating should be wiped from each specimen just prior to testing.

Prior to testing a Charpy V-Notch machine, the machine should be checked to assure compliance with the appropriate sections of the applicable ASTM or ISO standard. SRM 2112 is typically tested at room temperature so that both the absorbed energy scale and force scale can be verified in accordance with the applicable standard (ASTM or ISO). However, SRM 2112 can be tested at  $-40\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$  ( $-40\text{ }^{\circ}\text{F} \pm 2\text{ }^{\circ}\text{F}$ ) when no force data is needed. At either test temperature SRM 2112 can be used to meet the indirect verification requirement of ASTM E23 and ISO 148-2 [3,6]. 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).

Table 1: Certified Absorbed Energy Values

Room Temperature ( $21 \pm 1\text{ }^{\circ}\text{C}$ )		$-40 \pm 1\text{ }^{\circ}\text{C}$	
Absorbed Energy, J	Expanded Uncertainty, J	Absorbed Energy, J	Expanded Uncertainty, J
105.3	0.6	97.5	0.6

Table 2: Certified Maximum Force Values

Room Temperature ( $21 \pm 1\text{ }^{\circ}\text{C}$ )	
Maximum Force, kN	Expanded Uncertainty, kN
24.06	0.07

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

**Shipping Information:** Shipping charges for the return of broken specimens are the responsibility of the user. The mailing label provided with each SRM must be used to expedite shipping and, for overseas shipments, clearance by U.S. Customs.

## REFERENCES

- [1] ASTM E2298; *Test Method for Instrumented Impact Testing of Metallic Materials*; Annual Book of ASTM Standards, Vol. 03.01, ASTM, West Conshohocken, PA.
- [2] ISO 14556:2000; *Steel – Charpy V-notch Pendulum Impact Test – Instrumented Test Method*; International Organization for Standardization (ISO): Geneva, Switzerland.
- [3] ASTM E 23; *Standard Test Methods for Notched Bar Impact Testing of Metallic Materials*; Annual Book of ASTM Standards, Vol. 03.01, ASTM, West Conshohocken, PA.
- [4] ISO 148-3; *Metallic Materials – Charpy Pendulum Impact Test – Part 3: Preparation and Characterization of Charpy V-notch Test Pieces for Indirect Verification of Pendulum Impact Machines*; International Organization for Standardization (ISO): Geneva, Switzerland.
- [5] McCowan, C.N.; Splett, J.D.; Lucon, E.; *Dynamic Force Measurement: Instrumented Charpy Impact Testing*; NISTIR 6652; National Institute of Standards and Technology, U.S. Department of Commerce: Gaithersburg, MD (2008).
- [6] ISO 148-2; *Metallic Materials – Charpy pendulum impact test – Part 2: Verification of Testing Machines*; International Organization for Standardization (ISO): Geneva, Switzerland.

*Users of this SRM should ensure that the Certificate in their possession is current. This can be accomplished by contacting the SRM Program: telephone (301) 975-2200; fax (301) 926-4751; e-mail [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet at <http://www.nist.gov/srm>.*