



# National Institute of Standards & Technology

## Certificate

### Standard Reference Material<sup>®</sup> 2115

#### Low-Energy Izod Impact Specimen

#### Evaluation Specimens for Izod Impact Machines

Lot No.: ZZ

This Standard Reference Material (SRM) is intended primarily for use in the evaluation of Izod machines in accordance with the current ASTM Standard E23 [1]. Each SRM consists of a set of individual 10 mm × 10 mm × 75 mm specimens needed to perform one evaluation. This SRM complies with ASTM Standard E23 dimensional requirements for the Izod (Cantilever Beam) impact specimen, Type D, geometry.

**Material Description:** SRM 2115 is made from 4340 alloy steel. The bars are finished to length, stamped, heat-treated, and machined in SRM specimen lots of up to 1200. Each specimen has a lot number (ZZ-xx, where the x's indicate the sequential lot number) and an identification number (three or four digits) stamped on one end of the specimen.

**SRM Certification Procedure:** Specimens taken at random from each SRM lot are tested by the NIST Materials Reliability Division on its Izod reference machine (formerly a Charpy V-Notch reference machine). The specimen data generated are then statistically evaluated to assure the homogeneity of the lot, establish the certified value, and determine the number of SRM specimens required for a user to perform a valid test. See Table 1 for the approximate energy range within which the individual certified values should fall. 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 accounted for by NIST [2].

**NOTE: THIS IS NOT A CERTIFIED VALUE. THIS IS THE RANGE WITHIN WHICH THE BATCHES OF SPECIMENS WILL FALL.**

Table 1. Approximate Izod SRM Energy Ranges

Range	Energy Units
13 – 25	J
10 – 15	Ft lbf

**Expiration of Evaluation:** The evaluation report issued on an acceptable machine 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 evaluation will be invalidated, and the machine must be retested and reverified.

**Maintenance of SRM Value Assignment:** NIST will monitor this SRM over the period of its value assignment. If substantive technical changes occur that affect the value assignment before the 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 evaluation of test specimens and machines, evaluation of test results, and issuance of the report on machine performance are under the direction of T. Siewert, R. Santoyo, and C. McCowan of the NIST Materials Reliability Division (Boulder, CO).

Consultation on the statistical design of the experimental work and evaluation of the data were provided by J. Splett of the NIST Statistical Engineering Division.

Stephanie Hooker, Chief  
Materials Reliability Division

Gaithersburg, MD 20899  
Certificate Issue Date: 14 August 2006

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

The support aspects involved in the issuance of this SRM were coordinated through the NIST Measurement Services Division.

This program is established in the same office as the Charpy Reference Program, therefore, further information is available from the NIST Charpy Program Coordinator: telephone (303) 497-3351; fax (303) 497-5939; or e-mail [charpy@boulder.nist.gov](mailto:charpy@boulder.nist.gov). The lot number and energy results of the tested specimens must be provided in order to obtain certified values by telephone or fax.

## NOTICE TO USERS

**Important 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.

**Note to International Customers:** Regular overseas shipments of broken specimens should be sent airmail so that after they are cleared by U.S. Customs, they can be forwarded directly to NIST-Boulder. If a more rapid shipping mode is necessary, choose an overnight delivery service that will handle U.S. Customs clearance **AND** will deliver directly to NIST-Boulder. Unless such delivery is assured, air freight packages may be returned to the customer by U.S. Customs.

**Storage:** The SRMs are composed of specimens anticipated to have an indefinite shelf life under normal storage conditions. Each specimen is coated with oil, wrapped in a corrosion inhibiting paper, and sealed in a plastic envelope. It is recommended that the specimen be retained in this package to protect them from moisture until used. The protective oil coating should be wiped from each specimen just prior to testing.

## INSTRUCTIONS FOR USE

Prior to testing an Izod impact machine, the machine should be checked to assure compliance with the appropriate sections of the current ASTM Standard E23 [1]. As the Izod SRM is a new product, the standard does not give specific directions, but most procedures follow those of the Charpy specimens. SRM 2115 is to be tested at  $21\text{ }^{\circ}\text{C} \pm 1\text{ }^{\circ}\text{C}$  ( $70\text{ }^{\circ}\text{F} \pm 2\text{ }^{\circ}\text{F}$ ). All SRM specimens are to be tested in accordance with the testing procedures of the appropriate sections of the current ASTM Standard E23. All specimens are to be tested at the same time. An acceptable machine is expected to produce an average value similar to those obtained on the reference machine. Although we do not yet have much data, the preliminary data indicates that machines in good operating condition should produce values similar to those in the Charpy Program, within 1.4 J (1.0 ft-lbf) or 5 % of the certified energy value, whichever is greater, providing the specimens appear to have normal markings.

**Evaluation of User's Machine:** The NIST Izod Program Coordinator will issue a report of findings to the user's facility upon receipt of the fractured specimens and completed questionnaire: *Questionnaire for Izod Impact Machine Evaluation*. If the machine to be verified produces acceptable values and the specimens appear to have normal markings, this report will verify its conformance. If the machine produces values outside the expected tolerance of the certified energy values or the specimens have abnormal markings, the report may suggest repair or replacement of machine parts, changes in testing techniques, or other appropriate corrective actions. Fractured specimens and completed questionnaires should be returned to the NIST Izod Program Coordinator, Mail Code 853.07, 325 Broadway, Boulder, CO 80305-3328. A plastic, self-locking bag is provided for the return of broken specimens. The broken specimens will be taped together as described in the wrapping instructions included with the questionnaire.

## REFERENCES

- [1] ASTM E23; *Standard Test Methods for Notched Bar Impact Testing of Metallic Materials*; Annual Book of ASTM Standards, Vol. 03.01, ASTM, West Conshohocken, PA (2005).
- [2] May, W.; Parris, R.; Beck, C.; Fassett, J.; Greenberg, R.; Guenther, F.; Kramer, G.; Wise, S.; Gills, T.; Colbert, J.; Gettings, R.; MacDonald, B.; *Definitions of Terms and Modes Used at NIST for Value-Assignment of Reference Materials for Chemical Measurements*; NIST Special Publication 260-136; U.S. Government Printing Office: Washington, DC (2000); available at [http://www.cstl.nist.gov/nist839/special\\_pubs/SP260136.pdf](http://www.cstl.nist.gov/nist839/special_pubs/SP260136.pdf).

*Users of this SRM should ensure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: telephone (301) 975-6776; fax (301) 926-4751; e-mail [srminfo@nist.gov](mailto:srminfo@nist.gov); or via the Internet at <http://www.nist.gov/srm>.*

## QUESTIONNAIRE FOR IZOD IMPACT MACHINE VERIFICATION

**IMPORTANT:** This questionnaire contains information to help you perform a successful verification test using SRM 2115. Energy results are required for verification. Other specific information is requested to help evaluate the condition of your machine. The questionnaire and the fractured specimens must be shipped to: Izod Program Coordinator, NIST, Division 853, 325 Broadway, Boulder, CO 80305-3328. Phone: 303/497-3351 Fax: 303/497-5939

### Location of Machine

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_  
Province \_\_\_\_\_

Country \_\_\_\_\_ Zip \_\_\_\_\_  
Postal Code \_\_\_\_\_

### Mailing Address for Verification Letter (if different from above)

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_  
Province \_\_\_\_\_

Country \_\_\_\_\_ Zip \_\_\_\_\_  
Postal Code \_\_\_\_\_

### Test Machine (Circle appropriate units where indicated)

1. Machine Manufacturer \_\_\_\_\_

2. Machine Serial Number \_\_\_\_\_

3. What is the maximum energy capacity of the machine? \_\_\_\_\_

(Joules or ft·lbf)

4. If the machine is adjustable, what capacity was used for this test? \_\_\_\_\_

(Joules or ft·lbf)

5. Your machine should be securely bolted to a concrete foundation or a steel block having a mass not less than 40 times that of the pendulum. Your machine should be leveled according to the requirements of the current ASTM Standard E23.

6. ASTM Standard E23 does not allow the use of expansion bolts or fasteners with driven in inserts. These types of fasteners will work loose from the foundation and tighten up against the bottom of the machine indicating a false torque value. Only J or T bolts are permitted by the standard. What type of bolts are used to mount your machine? (J, lag, etc.) \_\_\_\_\_

7. Is your machine equipped with a carbide striker and/or anvils? \_\_\_\_\_

8. With the pendulum in the free hanging position, engage the energy indicator. The indicator should read within 0.2 % of the maximum energy range being used.

9. What is the friction/windage loss of your machine? \_\_\_\_\_  
(Joules or ft·lbf)

(A) Raise the pendulum to the latched position. Without a specimen in the machine, release the pendulum and permit it to swing 11 half cycles; after the pendulum starts its 11th half cycle, move the pointer to between 5 to 10 % of scale range capacity and record the dial reading. \_\_\_\_\_ (Joules or ft·lbf)

(B) Divide the value by 11, then divide by the maximum scale range of the machine and multiply by 100. The result, friction and windage loss, should not exceed 0.4 %.

10. With the specimen removed from your machine and the pendulum released from its latched position, what is the dial reading after one swing? \_\_\_\_\_  
(Joules or ft·lbf)

This reading should be zero. If this reading is not zero and your machine is equipped with a compensated scale, please adjust the dial to read zero. If your machine is equipped with a non-compensated scale, please compensate the energy values for windage and friction by subtracting the windage and friction value calculated in item 13.

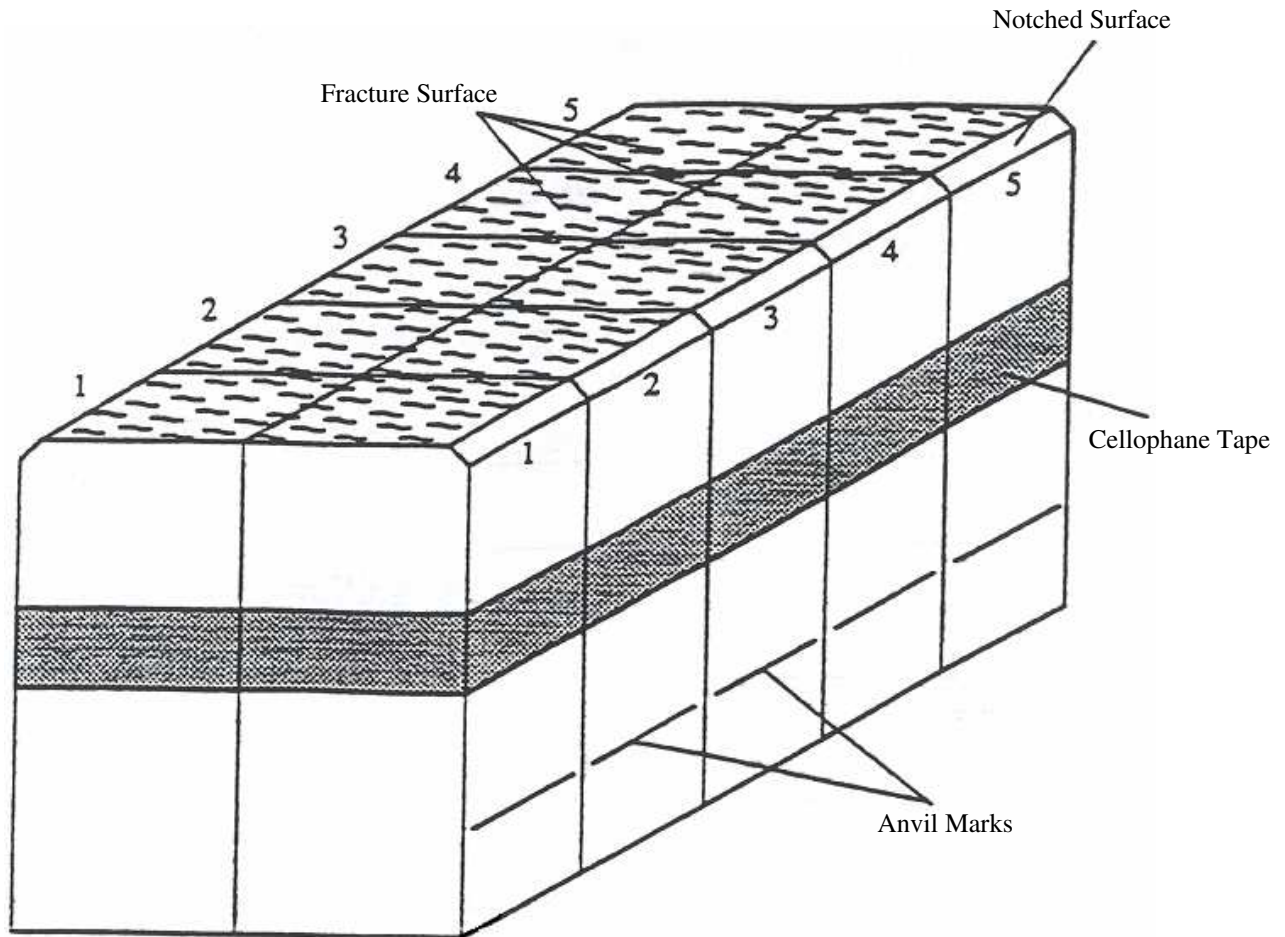
11. When was your machine last verified by the NIST? Date: \_\_\_\_\_

12. Is your machine equipped with a direct reading scale or a non-compensated scale? \_\_\_\_\_

\_\_\_\_\_

## WRAPPING INSTRUCTIONS

To expedite the evaluation of your machine, please secure the 5 broken specimens (10 halves) from a particular energy series, as one unit with **clear cellophane tape** according to the following instructions. See diagram below.



1. Keep broken halves correctly paired (back to back) with the fracture surfaces facing upward and notched surfaces facing outward.
2. Coat the **FRACTURE SURFACES ONLY** with a light coat of oil. **DO NOT** use grease or coat in plastic.
3. Include this completed questionnaire with the fractured specimens.
4. Be sure that you use the **MAILING LABEL** provided with the specimens, and attach the label so that it is clearly displayed on the **OUTSIDE** of the package. This will expedite delivery to the Charpy Coordinator. Customers returning specimens from outside the United States should include the following statement on the U.S. Customs Declaration:  
**Contents include U.S. manufactured steel test bars being returned to the U.S. for evaluation and are valued at less than 10 U.S. dollars.**

## TEST RESULTS

INDICATE ENERGY UNITS (circle units used)

**Joules or ft·lbf**

Series _____ SRM 2115	
Specimen Number	Value
Average Value	

Date of Test \_\_\_\_\_  
(Month/ Day/ Year)

\_\_\_\_\_  
PRINT Test Operator

Telephone \_\_\_\_\_

Fax \_\_\_\_\_

\_\_\_\_\_  
SIGNATURE Test Operator

Email \_\_\_\_\_

\_\_\_\_\_  
PRINT Company Representative

Telephone \_\_\_\_\_

Fax \_\_\_\_\_

\_\_\_\_\_  
SIGNATURE Company Representative

Email \_\_\_\_\_

If you require approval of your machine by the Defense Contract Management Command (DCMC), a DCMC representative should provide his or her **signature and the DCMC seal** to indicate that the preceding information was witnessed by a government representative.

\_\_\_\_\_  
Print Name of DCMC Official

DCMC Seal

\_\_\_\_\_  
Signature of DCMC Official and Seal

\_\_\_\_\_  
DCMC Office Location