



# National Institute of Standards & Technology

## Certificate

### Standard Reference Material<sup>®</sup> 1850

#### Penetrant Test Block

This Standard Reference Material (SRM) is intended for use in checking the sensitivity and performance of liquid dye penetrants and dye penetrant crack detection systems as well as other systems and devices for surface defect detection. Each SRM unit has been individually measured and bears an identification number.

The SRM is in the form of a test block approximately 0.5 cm wide and 2 cm long and mounted in an epoxy-resin disk 5 cm in diameter and 1 cm thick. The block consists of a cross section of a laminate of electrodeposited nickel and copper; the copper being electroetched to form the "cracks". The block contains four cracks approximately 0.2  $\mu\text{m}$ , 0.5  $\mu\text{m}$ , 1  $\mu\text{m}$ , and 2  $\mu\text{m}$  wide with a separation distance of about 1.5 mm (see Figure 1). Crack depth is several times the width, well beyond the critical depth for showing dye penetrants.

The widths of the cracks at the middle of the block were determined from measurements made with a metallographic microscope using a filar micrometer eyepiece at a magnification of 1 200x. The accuracy of these measurements was checked by measuring the cracks in several test blocks with a scanning electron microscope (SEM) which had been calibrated for magnification accuracy with SRM 484a Scanning Electron Microscope Magnification Standard (A Stage Micrometer Scale). Agreement was within  $\pm 0.1 \mu\text{m}$  for the widest cracks and within  $\pm 0.06 \mu\text{m}$  for the narrowest cracks.

Variation in each crack width over the length of the test block was determined to be within 50 % or  $\pm 0.1 \mu\text{m}$  by making nine measurements along the length of all four cracks in each of three typical test blocks measured three times.

**Expiration of Certification:** The certification of this SRM is valid indefinitely within the measurement uncertainties specified, provided the SRM is used in accordance with instructions given in this certificate.

**Cautions to User:** The surface of the test block is relatively soft and should be protected from contact that might excessively scratch the surface or close the cracks. The test block should be thoroughly cleaned immediately after each use to minimize clogging of the cracks by the dye being checked. A light scrub with warm water and a mild liquid detergent using cotton or another soft, non abrasive material will remove the bulk of the penetrant on the surface. To remove the penetrant trapped in the cracks of the test block an ultrasonic cleaning is suggested. The number of times the ultrasonic cleaning is performed and cleaning media employed shall be determined by the user facility based on the penetrant system, ultrasonic cleaner, and user experience. Harsh solvents and temperatures of 200 °F (93 °C) and above will degrade the mounting medium and therefore must be avoided.

Production and certified measurements for this SRM were performed by J.P. Young of the NIST Metallurgy Division.

The contributions of other NIST staff members are hereby acknowledged; F. Ogburn of the NIST Metallurgy Division for advice on measuring and calibration techniques and general support; D.B. Ballard of the NIST Metallurgy Division for furnishing accurate SEM photos for checking optical crack width measurements.

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.K. Kirby. Revision of this certificate was coordinated through the Standard Reference Materials Program by R.J. Gettings.

Gaithersburg, MD 20899

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10 Dec 80 (original certificate date)

\*Revision to include Expiration of Certification and update of Cautions to User section.

Thomas E. Gills, Chief  
Standard Reference Materials Program

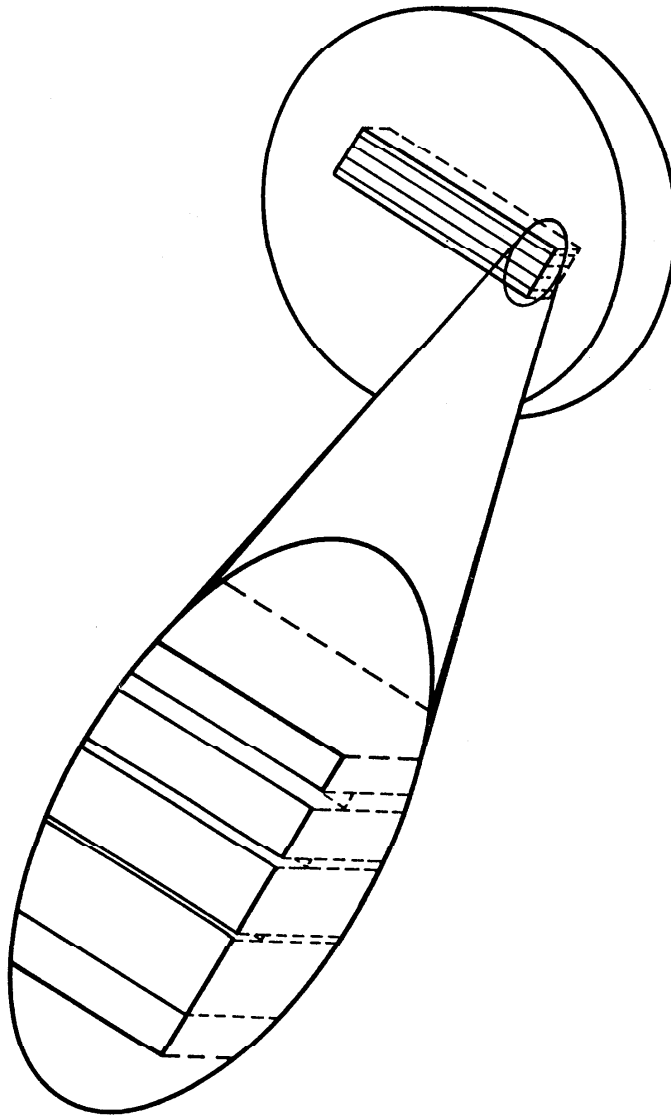


Figure 1. Schematic of SRM 1850 Test Block

*It is the responsibility of users of this SRM to assure that the certificate in their possession is current. This can be accomplished by contacting the SRM Program at: Phone: (301) 975-6776 (select "Certificates"), Fax: (301) 926-4751, e-mail: [srminfo@nist.gov](mailto:srminfo@nist.gov), or WWW: <http://ts.nist.gov/srm>.*