National Institute of Standards & Technology

Certificate

Standard Reference Material® 1358a

Coating Thickness Standard
(Nonmagnetic Coating on Steel)

This Standard Reference Material (SRM) consists of a preconfigured set consisting of one uncoated substrate and three 45 mm × 45 mm coupons certified for total coating thickness (nominal thickness 80 μm, 255 μm, and 1000 μm). Each coupon consists of an American Iron and Steel Institute (AISI) 1010 cold rolled sheet steel substrate with a uniform coating of copper, then overplated with a thin protective layer of chromium. This SRM is one in a series of seven sets prepared to cover a thickness range from 6 μm to 1935 μm. The sets in this series are SRMs: 1358a, 1359b, 1361b, 1362b, 1363b, and 1364b.

This SRM is designed for calibrating thickness gauges that employ magnetic principles. These gauges are used to measure the thickness of nonmagnetic coatings on steel including paint and other organic coatings, as well as nonmagnetic metallic coatings.

Table 1. Certified Coating Thickness Values and Uncertainties for Each Coupon. The first row of Table l provides the serial number of each coupon, the second row lists the certified thicknesses. The third row represents standard uncertainties, u, for nine magnetic induction measurements taken for the calibration of each coupon. These values are to be taken as an indication of thickness variation across the coupon's surface.

Coupon Serial Number		131019990239	131319990165	131819990100
Coating Thickness		77 +/- 1.2 μm 3.03 mils	250 +/- 3.8 μm 9.83 mils	902 +/- 9.0 μm 35.53 mils
Standard Uncertainty, u		0.25 μm	0.78 μm	1.35 μm
SRM Serial Number: 135819990001	Assembly Date: Wednesday, August 18, 1999			

Certified Values and Uncertainties: The analytical methods used for the characterization and subsequent certification of this SRM included flame atomic absorption spectrometry, optical microscopy, and magnetic induction. The resulting certified values are based upon results from the magnetic induction technique and are reported as the mean thickness of each coupon of the SRM unit. The uncertainty in the certified thickness for each coupon is expressed as the expanded uncertainty, U, of the mean at the 95 % level of confidence and is calculated according to the method described in the ISO Guide [1], where $U = ku_c$ with coverage factor k equal to 2, and u_c a combined uncertainty including the estimated uncertainties of the primary standards and the imprecision of the intercomparison of the primary standards to the coupon.

The support aspects involved with the certification and issuance of this SRM were coordinated through the NIST Standard Reference Materials Program by R.J. Gettings.

Carol A. Handwerker, Chief
Metallurgy Division

Gaithersburg, MD 20899
Certificate Issue Date: 17 September 1999
See Certificate Revision History on Last Page

Thomas E. Gills, Director
Office of Measurement Services

This SRM was produced by D.R. Kelley of the Electrochemical Processing Group of the NIST Metallurgy Division.

Measurements to determine the thickness of this SRM were performed by H.B. Gates of the Electrochemical Processing Group of the NIST Metallurgy Division.

Statistical analysis was provided by S.D. Leigh of the NIST Statistical Engineering Division.

The overall direction and coordination of the technical measurements leading to certification were provided by C.A. Handwerker, Chief of the NIST Metallurgy Division.

Expiration of Certification: The wear induced by the contact measurement of the magnetic gauges will alter the thickness values stated in this certificate. The frequency of replacement or verification of this SRM is determined by the user, based upon the number of uses and the severity of use. If excessive wear is suspected, the SRM may be returned to NIST for verification. To verify certification of this SRM unit, contact the NIST Electrochemical Processing Group by email at Coating.Thickness@nist.gov, by telephone at (301) 975-6400, or by fax at (301) 926-7679.

Cautions to User: This SRM should not be left unprotected in a corrosive laboratory environment or undergo any treatment that would scratch or remove material from the coupon's surface. The surfaces of these coupons require careful preservation and care during storage and use to maintain the stated thickness within the uncertainty reported on this certificate.

Instrument Calibration: Published standard magnetic methods [2,3] should be used as guidelines to maximize thickness measurement accuracy. It is generally not possible for the user to achieve the same uncertainty reported in Table 1 of this certificate when using magnetic-type thickness gauges calibrated with this coating thickness SRM. The overall uncertainty of the user's measurement will contain the contribution due to the uncertainty of this SRM, as well as the uncertainties inherent in the user's measurement process.

REFERENCES

[1] *Guide to the Expression of Uncertainty in Measurement*, ISBN 92-67-10188-9, 1st Ed. ISO, Geneva, Switzerland, (1993): see also Taylor, B.N. and 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).
[2] *Annual Book of ASTM Standards*, "Standard Test Method for Measurement of Coating Thicknesses by the Magnetic Method: Nonmagnetic Coatings on Magnetic Basis Metals," ASTM B 499-96, **02.05**, West Conshohocken, PA, (1996).
[3] "Nonmagnetic Coatings on Magnetic Substrate-Measurement of Coating Thickness-Magnetic Method," ISO 2178; International Organization for Standardization (American National Standards Institute).

Certificate Revision History: 17 Sep 99 (editorial revisions); 18 Jun 99 (original certificate date).

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 (select "Certificates"), Fax (301) 926-4751, e-mail srminfo@nist.gov, or via the Internet http://ts.nist.gov/srm.