ASSOCIATION CONNECTING
ELECTRONICS INDUSTRIES

2215 Sanders Road
Northbrook, IL 60062-6135

Number	
2.2.17A	
Subject	
Surface Roughness and Profile of Metallic Foils (Contacting Stylus Technique)	
Date	Revision
2/2001	**A**
Originating Task Group	
Metallic Foils Task Group (3-12A)	

IPC-TM-650
TEST METHODS MANUAL

1 Scope This method defines the procedure for determining the roughness or profile of metallic foils.

1.1 The surface finish or roughness of foils shall be evaluated using R_a. R_a is defined as the arithmetic average value of all absolute distances of the roughness profile from the center line within the measuring length.

1.2 The foil profile of foils shall be evaluated using the parameter R_Z (DIN) or R_{TM}, which is defined as the average maximum peak to valley height of five consecutive sampling lengths within the measurement length. This value is approximately equivalent to the values of profile determined from microsectioning techniques.

1.3 R_Z (ISO) is a different parameter from R_Z (DIN) and is not applicable to this method.

2 Applicable Documents

DIN 4768

ISO 4287

3 Test Specimens Cut a specimen 101 x 101 mm [4 x 4 in] minimum from the representative sample. The location and number of specimens shall be defined in the material specification.

4 Apparatus/Materials

4.1 Knife or other suitable device.

4.2 Profilometer or surface roughness meter with a motorized drive and the following parameters:

Parameter	*Value*
Cut Off	0.8 mm
Measuring Length	4.0 mm
Tracing Length	<5 mm
Diamond Stylus Radius	0.005 mm

Roughness Parameter
R_a, per 1.1
R_{ZDIN} or R_{TM}, per 1.2

Note: See Footnote No. 1 for equipment found suitable for determination of both R_a and R_{ZDIN} (or R_{TM}).[1]

4.3 Roughness Standard

Smooth Side: R_a with 5% or better certified tolerance
Treated Side: R_{DZIN} (or R_{TM}) with 5% or better certified tolerance

4.4 Plate glass or other smooth flat surface

4.5 Compressed air

4.6 Gloves, lint free

4.7 Tape or weight

5 Procedure

5.1 Check the profilometer calibration using the appropriate roughness standard for the value R_a or R_{ZDIN} (R_{TM}) and magnitude to be measured. Insure the stylus moves perpendicular to the grooves and the surface.

Note: For R_Z measurements, known standards are available in 1, 3 and 10 micrometer nominal values. See footnote 2.[2]

5.1.1 Compare the values obtained on six different measurements taken at different locations within the standard to the certified (not nominal value) of the standard. If the average result is not within 2% of the standard value, adjust the instrument and repeat 5.1 until this tolerance is achieved.

5.2 Place the foil test specimen on the plate glass surface with the side to be tested away from the glass. Secure the specimen with tape or a weight at both ends to prevent movement or buckling during the measurement.

1. Profilometers which have been used to measure both R_a and R_Z or R_{TM} are: Surtronic 3 by Taylor Hobson (R_a and R_{TM}) (see 8.2); M4P by Perthen (see 8.1) (R_a and R_{ZDIN}).
2. Standards for R_{DZIN} are available from: see 8.1, PGN-3 3 micrometer nominal, PGN-10 10 micrometer nominal.

5.3 If necessary, and for referee tests, blow the surface to be tested with clean compressed (or canned) air to remove loose debris.

5.4 Place the profilometer drive mechanism such that the probe travels across the foil in the transverse direction.

5.5 Set the measurement parameters required in 4.2.

5.6 Initiate the drive mechanism to make a single determination of the desired parameter.

5.7 Move the drive mechanism and make two additional measurements in two other areas of the specimen.

6 Calculation

6.1 Calculate the average value for the three determinations on the specimen.

6.2 Use the average value of one or more specimens to conform to the value specified in the material specification.

7 Report

7.1 Report the value required by the specification to the nearest 0.1 microinch or 0.01 micrometer for R_a and to the nearest 0.01 mils or 0.1 micrometer for R_Z.

8 Apparatus Sources

8.1 Perthometer M4P; STDS PGN-3 and PGN-10

Atlantech Sales Inc.
8825 Roswell Rd., Suite 591
Atlanta, GA 30350
(404) 992-3329

8.2 Surtronic 3

Rank Taylor Hobson LTD
PO Box 36
Gathlaxton St.
Leicester LE2 OSL England 0533-23801

8.3 Rodenstock RM600 Laser Profilometer - Noncontacting

Mahr Corp.
11435 Williamson Road
Cincinnati, OH 45241