

MATERIAL TEST i113

Static Tensile Test of Extremely Thin Copper Foil

Selection of Optimal Grips and Grip Faces (I)



There is a deeply rooted need for tensile strength tests for extremely thin copper foil used for printed circuits and packaging materials in electronic and food industry.

Practical tests, however, are often confronted with the problem of getting reliable data due to fluctuations and breakage of the specimen at the gripped portion.

Consequently, static tensile tests of extremely thin foils as thin as 0.02mm must be conducted in a manner different from general tests, taking special consideration of the following points:

1. Preparation of specimens
2. Attachment of specimens
3. Measures to avoid breakage at grips

The following is an introduction of testing methods for highly reliable test results and some ideas on grip that encourage normal breakage of the specimen.

Specimen

Material : Copper foil

Size : Rectangular shape, thickness 0.02mm, width 12.5mm, length 150mm

Testing conditions

Testing machine : Shimadzu universal testing machine AUTOGRAPH

Load cell : 500N

Ambience : 190 degrees Celsius in a thermostatic chamber (See Fig.1)

Testing speed : 1.5mm/min

Distance between grips : 50mm



Fig.1 TCL Type Thermostatic Chamber
(Cabinet and table for controller are options)

Examples of best fitted grips

Type of grip : (A) Pneumatic flat grip (See Fig.2), Pressure 400KPa, or(B) Screw type flat grip

Grip face : Flat type with damping material

Preparation of specimens

Special care should be taken to finish the surface of both sides, as a small flaw may cause aberrations in test data.

Attachment of specimen

A thin and pliant specimen must be attached to the grip with care so that stress is applied evenly to the full width of the specimen.

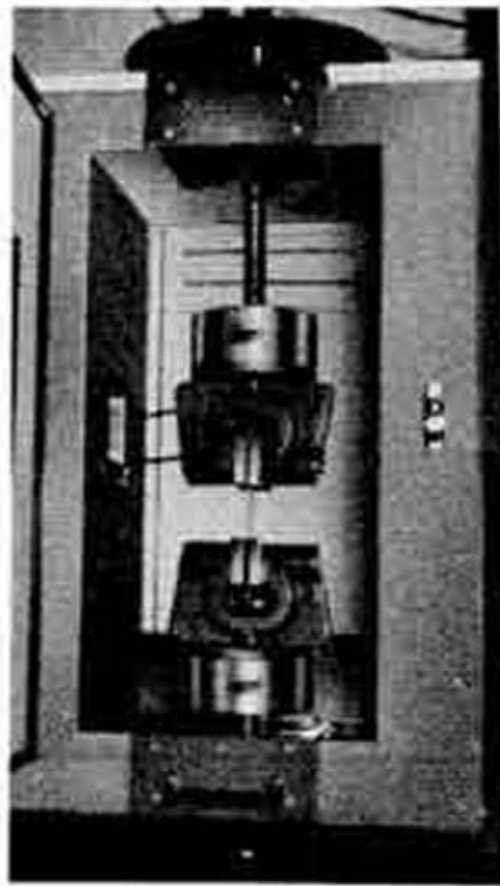


Fig.2 Testing Jig in Thermostatic Chamber

Fig.4 shows the specimen normally broken near its center and not at the gripped portion. The data of test results (tensile strength and elongation) as shown in Table 1 and Fig.3 show little fluctuation and, therefore, high reliability.

Table 1 Test Results

Specimen No.	Elongation at max. load		Tensile Strength		Elongation	
	kN	{kgf}	Mpa	{kgf/mm ² }	mm	%
1	3.5	358.0	225.5	23.0	100.2	33.5
2	3.5	360.0	227.5	23.2	101.5	33.8
3	3.6	370.0	230.4	23.5	100.0	33.3
4	3.5	360.0	227.5	23.2	92.0	30.6

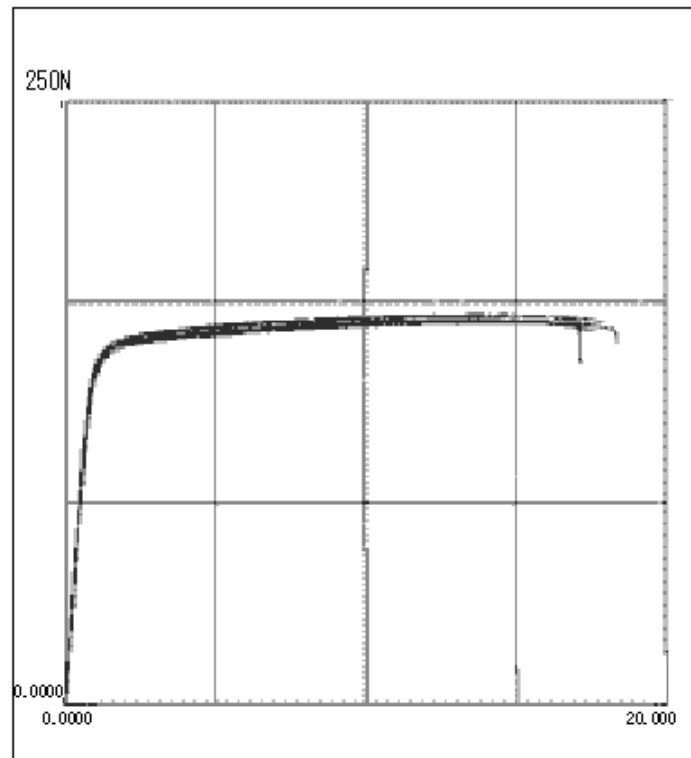


Fig. Lord-Displacement Curve

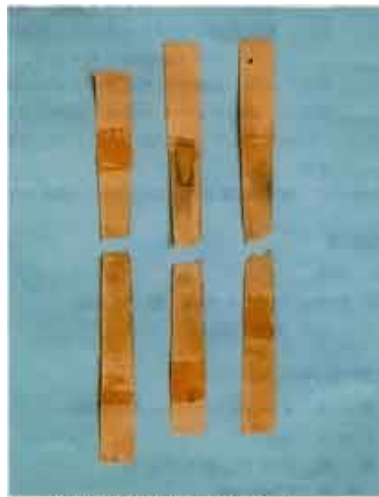


Fig. 4 Ruptured Specimens

* Please be advised that data obtained before the implementation of the current Weights and Measures Law may be presented in terms of gravimetric unit.



SHIMADZU CORPORATION International Marketing Division
3,Kanda-Nishikicho 1-chome, Chiyoda-ku,Tokyo 101-8448,
JapanPhone: 81(3)3219-5641 Fax: 81(3)3219-5710
Cable Add,;SHIMADZU TOKYO

SHIMADZU SCIENTIFIC INSTRUMENTS, INC.

7102, Riverwood Drive, Columbia, Maryland 21046, U.S.A.

Phone: 1(410)381-1227 Fax: 1(410)381-1222 Toll Free:1(800)477-1227

SHIMADZU DEUTSCHLAND GmbH

Albert-Hahn-Strasse 6-10, D-47269 Duisburg, F.R. Germany

Phone: 49(203)7687-0 Fax: 49(203)7666-25

SHIMADZU (ASIA PACIFIC) PTE LTD.

16 Science Park Drive #01-01, Singapore Science Park, Singapore 118227, Republic of Singapore

Phone: 65-778-6280 Fax: 65-779-2935

SHIMADZU SCIENTIFIC INSTRUMENTS(OCEANIA)PTY. LTD.

Rydalmere Business Park, Unit T, 10-16, South Street Rydalmere, N.S.W. 2116, Australia

Phone: 61(2)9684-4200 Fax: 61(2)9684-4055

SHIMADZU DO BRASIL COMERCIO LTDA.

Rua Cenzo Sbrighi, 25 CEP 05036-010 Agua Branca, Sao Paulo, BRAZIL

Phone: 55(11)3611-1688 Fax: 55(11)3611-2209

SHIMADZU (HONG KONG) LIMITED.

Suite 1028, Ocean Centre, Harbour City, Tsim Sha tsui, Kowloon, HONG KONG

Phone: 852(2375)4979 Fax: 852(2199)7438

Overseas Office

Istanbul, Beijing, Shanghai, Guangzhou, Shenyang, Chengdu, Moscow