Basic Plastic Testing Services

The objective of the testing services is to define the basic material properties of solid plastic materials.

1. Tensile Test with Axial Strain and Transverse Measurement
The basic tensile properties of plastic in tension are determined. Testing methods ASTM D638 or ISO 527-1 may be used as a guide. Material may be provided as “dog bone” specimens or plaques. Axial strain measurement will be performed with clip-on strain gage extensometers, laser extensometers or video extensometers depending on the strain resolution and range required. Transverse strain may be measured at low strains for the determination of Poisson's Ratio.

2. Yield and Plasticity Measurement Though Unload Experiments
In general, yielding is the region where the contribution of plastic strain (or permanent strain) becomes a significant portion of total strain. Plastic deformation may appear at very small strain values. A more accurate way to determine the yield point is by unloading the specimen. This requires loading and unloading at a series of virgin specimens to incrementally increasing strain levels to observe the subsequent strain recovery. The strain recovery consists of an initial quick elastic recovery followed by a slower viscoelastic recovery.

3. Thermal Expansion
Plastics expand or contract with changes in temperature. Plastic may also expand far more than surrounding steel parts. Thermal expansion is measured using a Thermal Mechanical Analyzer (TMA).

4. Creep Testing
For short time creep measurement, strain and time data is collected continuously at a set strain level for up to two hours in tension, but typically for 2000 seconds. Simple tension or compression may be used.

5. Rate Sensitivity
The rate or speed at which a stress is applied to plastic will alter the response of the material. At slow speeds, most plastics will stretch farther before failure and will yield at lower stress values than if the stress is applied quickly. This effect becomes measurable with order of magnitude rate changes.

6. Compression
The experiment is generally performed by placing a cylinder of the subject material between two flat platens and compressing it. The initial stiffness and sometimes a yielding point may be derived from the resulting stress strain curve. Some plastics may behave differently in compression than in tension so that the additional information may be valuable.

7. Bend Tests
The bend test is a classic plastics experiment. However, the value of the bend test for generating data for the calibration of material constitutive models is low because it is hard to determine the state of strain in the material. The bend specimen bends about a neutral axis but the location of that axis is unknown and the shape of the experiment under test is also unknown. The bend test, however, can be a useful experiment to verify the performance of a material model that is calibrated based on other states of strain.

8. Shear Tests
The shear state of strain can be an important addition to the fitting of a material model. Shear tests for plastics include various ‘notch’ based experiments including the modified Arcan specimen style.

9. Friction Tests

To measure the proportionality factor or coefficient of friction, a 50 mm by 100 mm sled with one material is dragged against a larger second material. Rubber and plastic materials may be sensitive to the normal (perpendicular) pressure between the surfaces. The normal pressure is modified by resting weights on the sled.

General Pricing for Plastic Testing Services

Prices are shown in US Dollars	Lab Temp. (23C)	-40C to 150C	37C in Saline
1. Tensile Properties (axial and transverse strain) in One Direction	390	585	780
Tensile Properties (only axial strain)	180	270	360
(3 Simple Tension tests, 1 rate less than 0.1 s^{-1})			
2. Yield and Plasticity Measurement Though Unload Experiments	600	900	1200
(Load-unload experiments at 5 Strain Levels)			
3. Thermal Expansion			
(from –40C to 150C, 3 repetitions)	275	275	n/a
4. Short Term Creep Testing			
(3 tests at one stress level)	250	375	500
5. Rate Sensitivity Set in Tension			
(3 tests at 0.001 s^{-1}, 5 tests at 1 s^{-1} , 5 tests at 100 s^{-1})	3100	4650	n/a
6. Compression			
(3 Simple Compression tests, 1 rate less than 0.1 s^{-1})	180	270	360
7. Bend Tests			
(3 Bend tests, 1 rate less than 0.1 s^{-1})	180	270	360
8. Shear Tests			
(3 Shear tests, 1 rate less than 0.1 s^{-1})	630	945	n/a
9. Friction Tests			
(sled test: 1 pressure from 0.0003 to 0.006 MPa, one rate from 0.01 to 2.0 mm/s)	210	315	420
(axial torsion test: 1 pressure from 0.03 to 30 MPa, one rate from 0.1 to 100 mm/s)	315	450	630

June 14, 2011. Pricing subject to change.

Notes:
a. These are typical plastic testing experiments. Feel free to request a proposal for other interests or specifications, or for custom part testing.
b. Data is provided in SI units of Mpa for stress and non-dimensional strain. The data is delivered via e-mail in an ASCII format.
c. Customer data and materials will be retained for 1 year after initial data delivery

Purchase Order, VISA, MasterCard, AMEX, and Discover Card are accepted methods of payment.
Terms: NET 30 Days after Delivery of Data

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