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. Strain measurement is typically performed with imaging-based extensometers based on the strain resolution and range required. Transverse strain may be measured for the determination of Poisson's Ratio. Full field strain measurement and associated videos may be provided with Digital Image Correlation (DIC).

2. Yield and Plasticity Measurement, Loading-Unloading Tensile Test
In general, yielding is the region where the contribution of plastic strain (or permanent strain) becomes a significant fraction of total strain. Plastic deformation may appear at very small strain values. A more accurate way to determine the yield point is by loading and unloading the specimen and directly observing the elastic strain recovery at each strain level.

3. Compression Experiments, In-plane and Out of Plane
Compressive properties in the plane of the plane of a plastic sheet may be different than the properties perpendicular to the sheet. The in-plane data is typically paired with tensile data and it is a more complex experiment.

4. Shear Tests
The shear state of strain can be an important addition to the fitting of a material model. Shear tests for plastics typically use the rail or Iosipescu specimen. DIC strain measurement is used.

5. 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.

6. 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.

7. 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.

8. 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).

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.

10. Puncture (Multi-axial Impact) Experiment
Complex failure is measured by impacting a plaque with a semi-spherical probe at a fast impact speed (typical 6.6 m/s). This experiment is guided by ISO 6603 or ASTM D3763.

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General Pricing for Plastic Testing Services

Prices are shown in US Dollars	Lab Temp. (23C)	-40C to 200C	37C in Saline
1. Tensile Properties (axial and transverse strain) in One Direction	400	600	800
Tensile Properties (only axial strain)	350	525	700
Tensile Properties (DIC strain measuring and associated video)	700	875	n/a
(5 Simple Tension tests, 1 rate between 0.001/s and 0.01/s[1])			
2. Yield and Plasticity, Loading-Unloading Tensile Test	685	1140	1370
(5 tests, Load-unload experiments at 5 Strain Levels)			
3. Compression			
In-plane Compression with Axial Strain	800	1200	n/a
Out of plane Compression with Axial Strain	630	945	1260
(5 Simple Compression tests, 1 rate less than 0.01/s)			
4. Shear Tests	1030	1515	n/a
(5 Shear tests, 1 rate less than 0.1 s^{-1})			
5. Bend Tests	420	630	840
(5 Bend tests, 1 quasi-static rate)			
6. Short Term Creep Testing			
(5 tests at one stress level)	650	975	1300
7. Rate Sensitivity Set in Tension			
(5 tests at 1/s, 5 tests at 10/s, 5 tests at 100/s)	2125	3196	n/a
(5 tests at 1/s, 5 tests at 10/s, 5 tests at 100/s) with DIC/video	3175	4246	n/a
8. Thermal Expansion			
(from –40°C to 150°C, 3 repetitions)	325	325	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) (3 tests)	230	345	460
(axial torsion test: 1 pressure from 0.03 to 30 MPa, one rate from 0.1 to 100 mm/s) (3 tests)	390	585	780
10. Puncture (Multi-axial Impact) Experiment			
(5 tests at one rate, 6.6 m/s typical)	500	1500	n/a

September 24, 2023. 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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