

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 image based extensometers (dic or dot tracking) depending on the strain resolution and range required. Transverse strain may be measured for the determination of Poisson's Ratio.

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 include the modified Arcan specimen and the Rail shear specimen.

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. 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.

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.

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 Tensile Properties (only axial strain) (3 Simple Tension tests, 1 rate less than 0.1 s ⁻¹) | 390 230 | 585 345 | 780 460 |
| 2. Yield and Plasticity, Loading-Unloading Tensile Test (3 tests, Load-unload experiments at 5 Strain Levels) | 410 | 605 | 820 |
| 3. Compression In-plane Compression with Axial Strain Out of plane Compression with Axial Strain (3 Simple Compression tests, 1 rate less than 0.1 s ⁻¹) | 620 230 | 910 345 | n/a 460 |
| 4. Shear Tests (3 Shear tests, 1 rate less than 0.1 s ⁻¹) | 620 | 910 | n/a |
| 5. Bend Tests (3 Bend tests, 1 rate less than 0.1 s ⁻¹) | 250 | 375 | 500 |
| 6. Short Term Creep Testing (3 tests at one stress level) | 390 | 585 | 780 |
| 7. Rate Sensitivity Set in Tension (3 tests at 0.001 s ⁻¹ , 5 tests at 1 s ⁻¹ , 5 tests at 100 s ⁻¹) | 3280 | 4830 | n/a |
| 8. Thermal Expansion (from -40°C to 150°C, 3 repetitions) | 275 | 275 | 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) (axial torsion test: 1 pressure from 0.03 to 30 MPa, one rate from 0.1 to 100 mm/s) | 230 390 | 345 585 | 460 780 |

September 26, 2018. Pricing subject to change.

Notes:

- These are typical plastic testing experiments. Feel free to request a proposal for other interests or specifications, or for custom part testing.
- 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.
- 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