

Elastomer Testing Services

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

1. Basic Hyperelastic Properties

3 simple tension specimens, 3 planar tension specimens and 3 equal biaxial specimens are cut from the provided slabs. For foam materials, 3 simple tension specimens, 3 simple shear specimens and 3 simple compression specimens are cut from provided slabs. The specimens are loaded slowly between zero force and a user defined stretch level for 5 loadings and unloadings at up to 4 maximum strain levels, so as to examine the initial stress strain behavior and the "stabilized" stress strain behavior at each of the maximum strain conditions. (5 slabs measuring 150 mm by 150 mm by 1.0 to 2.0 mm thick are required for each temperature condition)

2. Volumetric Compression

A specimen is fully constrained and compressed for the purpose of determining the Bulk Modulus of the material. 6.35 mm diameter disks are cut from standard slabs and stacked. The initial slope of this curve is the Bulk Modulus.

3. - 4. Short Term Stress Relaxation Properties

Stress and time data is collected continuously at a single set strain level for 2000 seconds. 3 specimens are tested. Simple tension, planar tension, compression or equal biaxial specimens may be used. This test can be expanded to include multiple strain levels, and multiple types of specimen.

5. Rate Sensitivity

The rate or speed at which a stress is applied to an elastomer will alter the response of the material. This effect becomes measurable with order of magnitude rate changes.

6. Friction

To measure the aforementioned proportionally factor or coefficient of friction, a 50 mm by 100 mm sled with one material is dragged against a larger second material. Required Materials: a.) Material sheets or plaques greater than 50mm x 150mm for the sled; b.) Materials greater than 100mm x 500mm for the base.

7. Static Tearing

The static tearing experiment is a meaningful way to examine the failure of an elastomer in tearing. A sharp cut is introduced into a planar tension specimen and the specimen is stretched until failure.

8. Thermal Properties

Thermal conductivity, thermal diffusivity and specific heat are determined using the transient plane source method.

Thermal expansion is determined by examining the dimensional change in a material specimen TMA.

9. Elastomeric Material Model Calibration Services

The coefficients are determined for an appropriate elastomeric material model and the resulting fit is reported and compared with the experimental test data.

10. Material Preparation Services

Preparing specimens from supplied material slabs is free of charge. To cut specimens from parts or slabs thicker than 2 mm, a fee for skiving services is involved.

General Pricing for Elastomer Testing Services

| (Prices are shown in US Dollars) | Room Temp (23C) | -40C < Temp < 200C | 37C in Saline |
|---|-------------------|--------------------|-------------------|
| 1. Basic Hyperelastic Properties <i>(typically 5 loadings and unloadings at each of max. 4 strain levels, or single loading)</i> | | | |
| <u>Dense Elastomers</u> | <u>TOTAL 1155</u> | <u>TOTAL 1710</u> | <u>TOTAL 2310</u> |
| 3 Simple Tension Tests | 210 | 315 | 420 |
| 3 Pure Shear Tests | 315 | 450 | 630 |
| 3 Equal Biaxial Tests | 630 | 945 | 1260 |
| <u>Foam Elastomers</u> | <u>TOTAL 945</u> | <u>TOTAL 1395</u> | |
| 3 Simple Tension Tests with lateral strain measurement | 420 | 630 | n/a |
| 3 Simple Shear Tests | 315 | 450 | 630 |
| 3 Simple Compression Tests | 210 | 315 | 420 |
| 2. Volumetric Compression (Bulk Modulus) (3 tests) | 250 | 375 | n/a |
| 3. Standard Short Term Stress Relaxation | | | |
| 3 Simple Tension Tests (2000 seconds, 1 strain level) | 210 | 315 | 420 |
| 3 Pure Shear Tests (2000 seconds, 1 strain level) | 315 | 450 | 630 |
| 3 Equal Biaxial Tests (2000 seconds, 1 strain level) | 630 | 945 | 1260 |
| 4. Expanded Short Term Stress Relaxation | | | |
| <u>Dense Elastomers</u> (1Tension, 1 Planar, 1 Biaxial) | 1395 | 2090 | 2790 |
| <u>Foam Elastomers</u> (1Tension, 1 Shear, 1 Compression) 5 to 10 strain levels each | 1155 | 1710 | 2310 |
| 5. Rate Sensitivity Set in Tension <i>(3 tests at 0.01 s⁻¹, 5 tests at 1 s⁻¹, 5 tests at 50 s⁻¹)</i> | 2000 | 3000 | n/a |
| 6. Basic Friction-sled Test (see Friction Test pricing for others) <i>(3 tests at a single pressure less than 0.006 MPa - dry)</i> | 210 | 315 | n/a |
| 7. Static Tearing Experiment (3 tests) | 315 | 450 | 630 |
| 8. Thermal Properties | | | |
| <u>Thermal Conductivity, Thermal Diffusivity, Specific Heat</u> at 1 temp between -40C and 150C, 3 repetitions | | | 250 |
| <u>Thermal Conductivity, Thermal Diffusivity, Specific Heat</u> at 5 temps between -40C and 150C, 3 repetitions | | | 600 |
| <u>Thermal Expansion</u> from -40C to 150C, 3 repetitions | | | 275 |
| 9. Elastomeric Material Model Calibration Services | | | |
| <u>Determine Model Coefficients</u> for Hyperelastic Models (i.e. Yeoh, Mooney Rivlin, Ogden) | | | 600 |
| Advanced Model (i.e. Mullins+Hyperelastic, Viscoelastic, Bergstrom-Boyce) | | | 900 |
| 10. Material Preparation Services | | | |
| <u>Skiving Parts into Materials</u> price per project | | | 400 |

December 5, 2016. Pricing subject to change.

- 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