

## 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. As such, it may replace the basic hyperelastic properties plus standard short-term relaxation properties tests in some material models.

### 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:

1. Material sheets or plaques greater than 50mm x 150mm for the sled.
2. 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. Failure stress, failure strain and total tearing energy are reported.

### 8. Thermal Properties

Thermal conductivity, thermal diffusivity and specific heat are determined using the transient plane source method (TCi). One standard 150 mm by 150 mm test slab (greater than 1 mm thick) of material is required for each temperature condition.

Thermal expansion is determined by examining the dimensional change in a material specimen as temperature changes using a Perkin-Elmer Diamond TMA instrument.

### 9. Material Preparation Services

Preparing specimens from supplied material slabs, and other basic specimen preparation, is free of charge. To cut specimens from parts, we can skive material slabs out of most compounds that will fit our testing needs. A small fee for skiving services is involved.

## General Pricing for Elastomer Testing Services

(Prices are shown in US Dollars)	Room Temp (23C)	-40C < Temp < 150C	37C in Saline
<b>1. Basic Hyperelastic Properties</b> <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
<b>2. Volumetric Compression (Bulk Modulus) (3 tests)</b>	250	375	n/a
<b>3. Standard Short Term Stress Relaxation</b>			
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
<b>4. Expanded Short Term Stress Relaxation</b>			
<u>Dense Elastomers</u> <i>(Includes 1 Simple Tension test, 1 Planar Tension test, 1 Equal Biaxial Extension test, 5-10 strain levels each)</i>	1395	2090	2790
<u>Foam Elastomers</u> <i>(Includes 1 Simple Tension test, 1 Simple Shear test, 1 Simple Compression test, 5-10 strain levels each)</i>	1155	1710	2310
<b>5. Rate Sensitivity Set in Tension</b> <i>(3 tests at 0.001 s<sup>-1</sup>, 5 tests at 1 s<sup>-1</sup>, 5 tests at 50 s<sup>-1</sup>)</i>	2000	3000	n/a
<b>6. Basic Friction-sled Test</b> (see Friction Test pricing for others) <i>(3 tests at a single pressure less than 0.006 MPa - dry)</i>	210	315	n/a
<b>7. Static Tearing Experiment (3 tests)</b>	315	450	630
<b>8. Thermal Properties</b>			
<u>Thermal Conductivity, Thermal Diffusivity, Specific Heat at 1 temp between -40C and 150C, 3 repetitions</u>			250
<u>Thermal Conductivity, Thermal Diffusivity, Specific Heat at 5 temps between -40C and 150C, 3 repetitions</u>			600
<u>Thermal Expansion from -40C to 150C, 3 repetitions</u>			275
<b>9. Material Preparation Services</b>			
<u>Skiving Parts into Materials price per project</u>			400

November 29, 2010. 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