



## **Cycletime Tips - General**

### **Volume 7: The Data Sheet - Part 2**

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This is the second installment in a CycleTime TIPS series to help you understand the information found on a plastics Data Sheet. This one will cover the thermal and general properties.

#### **Thermal Properties**

In this section, we look mainly at the deflection temperature under load (DTUL) (ASTM D-648). For this test, a specimen of 5" x 1/2" x thickness (from 1/8" to 1/2") is placed on two supports spaced 4 inches apart and a load of either 66 or 264 psi is applied in the center. The specimens are in an oil bath which rises in temperature at a rate of 2°C per minute. The temperature at which the bar deflects by 0.010" is the deflection temperature under load. You need to compare apples to apples, so you would need to compare an annealed sample with another annealed sample of the same thickness. An annealed sample will give a higher result than an unannealed sample of the same thickness.

Vicat Softening Point (ASTM D-1525): A specimen with a thickness of 1/8" is placed in an oil bath with a loaded needle resting on it. The temperature of the bath rises at a rate of either 50°C/hr or 120°C/hr. The temperature at which the needle penetrates the specimen by 1 mm is the Vicat Softening Point. This test was developed for polyethylene. The temperature rising rate may affect the results.

#### **General Properties**

In this section, you may find information such as melt flow rate, density, mold shrinkage, and UL rating.

#### **Flow Rate, Melt Flow Rate (ASTM D-1238):**

Granules of plastic or powder, or strips of film are introduced into a cylinder and melted at a certain temperature depending on the type of polymer. A loaded piston is put into place and an amount of material is extruded through an orifice of known diameter in a certain time, i.e., one minute's worth of extruded plastic is weighed in grams, then calculated for 10 minutes. This number is the melt flow rate in grams per 10 minutes. The conditions under which the material is tested vary from one material to another. Melt flow rate for polypropylene is measured at 230°C with a weight of 2160 grams. For polyethylene, it is measured at 190°C with a weight of 2160 grams. The result for this test is a good indicator of material uniformity.

#### **Density, Specific Gravity (ASTM D-792):**

The specimen is weighed in air and then immersed in water and weighed again. The value is calculated from those numbers. The density is the weight per unit volume at

23°C and is expressed in grams per cubic centimeter (g/cc). Density is different from specific gravity. Specific gravity relates the density of a material to the density of water. The density helps you to establish the weight of a part. For polyethylene, it can be as low as 0.85 g/cc and up to 1.7 g/cc for 60 percent glass reinforced polyurethane.

**Mold Shrinkage (ASTM D-955):**

The material is molded under controlled conditions. The dimensions of the parts are compared to the dimensions of the cavity to evaluate the shrinkage. The shrinkage may vary depending on the molding and the mold design. For some plastics, it is a small range like ABS from 0.004 to 0.006 in/in; but for others like polyethylene, it may be 0.010 to 0.050 in/in.

**Flammability Rating:**

This rating is established by UL and CSA. The rating is related to the thickness of the tested samples.

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