

## DSC (Differential Scanning Calorimeter) by Heat of Fusion / Crystallization / Melting Point / Glass Transition

ASTM D3418 / E1356

### Scope:

Using a DSC (differential scanning calorimeter) the following are commonly determined:

T<sub>g</sub> = Glass Transition Temperature = Temperature (°C) at which an amorphous polymer or an amorphous part of a semi-crystalline polymer goes from a hard brittle state to a soft rubbery state.

T<sub>m</sub> = melting point = Temperature (°C) at which a crystalline polymer melts. H<sub>m</sub> = the amount of energy (joules/gram) which a sample absorbs while melting. T<sub>c</sub> = crystallization point = Temperature at which a polymer crystallizes upon heating or cooling. H<sub>c</sub> = the amount of energy (joules/gram) a sample releases while crystallizing.

Combined with an FTIR analysis, a DSC thermal scan can be used to help further identify certain types of materials by their melting points and is a useful tool for checking plastic parts or resins for contamination not seen by FTIR. It is also used to characterize materials for their thermal performance and determine the level of crystallinity in a molded part

### Test procedure:

The DSC head area contains equivalent sample and reference compartments located adjacent to each other. The reference compartment contains an empty aluminum pan and cover equivalent to those used to encapsulate a test sample. The sample is heated at a controlled rate and a plot of heat flow versus temperature is produced. The resulting thermal scan is then analyzed. The ASTM Heating Rate is 10°C/minute for melting point (T<sub>m</sub>), 20°C for glass transition (T<sub>g</sub>). The ISO Heating Rate is 20°C/minute.

### Specimen size:

A test sample of 10 to 15 mg is taken from a specimen for testing.

### Data:

A thermal scan, depending upon the material type, can provide a T<sub>g</sub>, T<sub>m</sub>, H<sub>m</sub> and or H<sub>c</sub>

