



THERMOPLASTIC PROPERTY DETERMINATION FOR CAE, RHEOLOGICAL PROPERTIES FOR INJECTION MOLDING

WSS-M99D68-A2

1. SCOPE

This specification defines the requirements for measuring selected material properties used in CAE simulation or equivalent modeling of automotive component's made from thermoplastic production materials.

2. APPLICATION

This specification was released originally to communicate test methods and test parameters for material property data collection to the thermoplastic material suppliers. The data can then be combined with other material property data to model automotive components made from the material.

3. REQUIREMENTS

3.1 APPROVED SOURCES

This specification does not use approved sources. Any reliable supplier meeting these requirements may be used.

3.2 CONDITIONING AND TEST CONDITIONS

All test values are based on material conditioned for not less than 24 h prior to testing in a controlled environment of 23 +/- 2 °C and 50 +/- 5% relative humidity. Testing of the material should occur in the conditioning environment or soon after removal.

3.3 VISCOSITY

Report viscosity

(ASTM D3835)

Material supplier should define temperature and pressure ranges

Also provide curve, X-Y points, and coefficients for cross WLF viscosity model

See Appendix 1 for example of desired graph of model with raw data overlaid

3.4 PVT CURVE ANALYSIS

Report method

Material supplier should define temperature and pressure ranges

Also provide curve, X-Y points, and coefficients for 2-domain Tait Equation

See Appendix 2 for example of desired graph and data

3.4.1 Option 1 (Preferred)

(Gnomix Method)

See section 4 for capable laboratories

3.4.2 Option 2 Piston Apparatus Method

(ISO 17744)

3.5 THERMAL CONDUCTIVITY

Report (W/ (m K))

(ASTM D5930, 5 data points minimum)

Material supplier should define temperature range

Date	Action	Revisions	Rev. 1
2018 03 02	Editorial	See Summary of Revisions	Z. Jatkowski, NA
2017 05 31	Released		Z. Jatkowski, NA

**3.6 SPECIFIC HEAT**

Report (J/ (g K))

(ASTM E1269, 10 data points minimum)
Material supplier should define temperature range

3.7 COEFFICIENT FOR LINEAR THERMAL EXPANSION**3.7.1 Option 1 (Interior, Non-Visible Exterior, and Underhood Applications)**
(ISO 11359-2, -30 +/- 2 °C to Tg, Tg to 30 +/- 2 °C*)

Flow

Report Value, E⁻⁵ mm/mm/ °C

Cross Flow

Report Value, E⁻⁵ mm/mm/ °C

*30 +/- 2 °C is commonly used for the majority of thermoplastics. For applications where the known temperature range is higher, the upper range may be adjusted accordingly. Please contact material supplier for clarification of the desired temperature range.

3.7.2 Option 2 (Exterior Visible Applications)
(ISO 11359-2, -30 +/- 2 °C to Tg, Tg to 100 +/- 2 °C,
3 curves per directions, flow and cross flow)

Plaque size is 100 x 150 minimum at 3.2 +/- 0.2 mm thickness. Plaque to be fan or edge gated. Specimens to be water jet or die cut from the center of plaque, minimum of three samples each direction.

Conditioning procedure consists of steps 1-4. Start at 23 °C.

1. Ramp 5 °C/minute to -50 °C
2. Isothermal hold for 5 minutes
3. Ramp 5 °C/minute to 120 °C
4. Isothermal hold for 10 minutes

Leave the test specimen in the equipment and run steps 5-7

5. Ramp 5 °C/minute to -50 °C
6. Isothermal hold for 10 minutes
7. Ramp 5 °C/minute to 120 °C

Report CLTE value after Step 4 (un-annealed value) for both Flow and Cross Flow directions.

Flow

Report Value, E⁻⁵ mm/mm/ °C

Cross Flow

Report Value, E⁻⁵ mm/mm/ °C

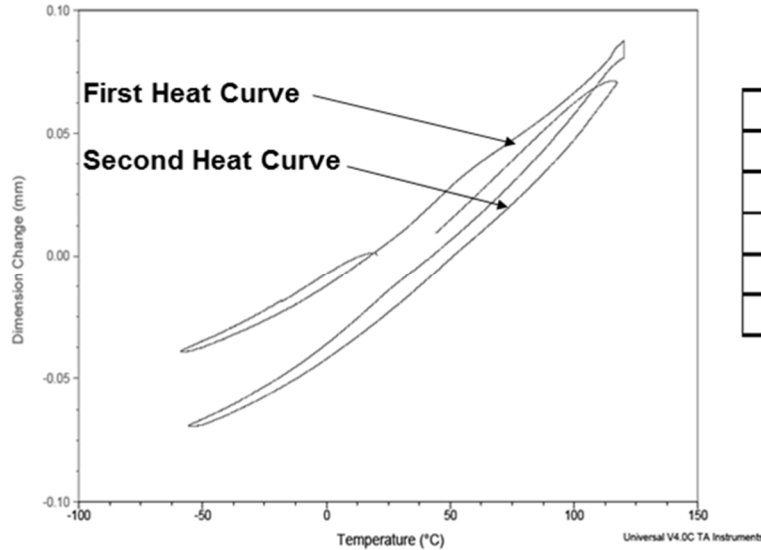
Report CLTE value again after Step 7 (annealed value) for both Flow and Cross Flow directions.

Flow

Report Value, E⁻⁵ mm/mm/ °C

Cross Flow

Report Value, E⁻⁵ mm/mm/ °C



Cycle	T1	T2	Rate C/min
Cool 1	23	-50	5
Heat 1	-50	120	5
Cool 2	120	-50	5
Heat 2	-50	120	5
Cool 3	120	23	5

3.8 TENSILE MODULUS (ISO 527-1)

3.8.1 Isotropic

Report value (MPa)

3.8.2 Anisotropic

Report value (MPa)

3.9 POISSON'S RATIO (ISO 527-1)

3.9.1 Isotropic

Report value

3.9.2 Anisotropic

Report value

3.10 SHEAR MODULUS (Calculate using Hooke's Law with Tensile Data, See appendix 3 for equation)

3.10.1 Isotropic

Report value (MPa)

3.10.2 Anisotropic

Report value (MPa)

3.11 REQUESTED DIGITAL DATA FORMAT

In addition to providing a formal report, data should be provided using one of the following data file types

Option 1 (Preferred)
.UDB

OR

Option 2
.MTR