# STYRON™ 675

*North America*

## *High Heat Crystal Polystyrene*

### Product Characteristics
High heat
Medium flow
Food Contact Compliant(1)
UL Classification 94 HB(2)

### Typical Applications
Thin-walled parts

| Properties (4) | English System | | International System | | ASTM Method |
|---|---|---|---|---|---|
| | Value | Units | Value | Units | |
| **Physical Properties** | | | | | |
| Melt Flow Index (200°C/5 Kg) | 7.5 | g/10 min | 7.5 | g/10 min | D-1238 |
| Specific Gravity | 1.04 | | 1.04 | | D-792 |
| Coefficient of Linear Thermal Expansion ($10^{-5}$) | 5 | in/in/°F | 9 | cm/cm/°C | D-696 |
| Rockwell Hardness – L scale | 107 | | 107 | | D-785 |
| Mold Shrinkage($10^{-3}$) | 4 to 8 | in./in. | 4 to 8 | cm/cm | D-955 |
| **Injection Molded Properties** | | | | | |
| **Mechanical Properties** | | | | | |
| Tensile Strength | 6900 | psi | 48 | MPa | D-638 |
| Tensile Rupture | 6900 | psi | 48 | MPa | D-638 |
| Elongation | 3 | % | 3 | % | D-638 |
| Tensile Modulus | 460000 | psi | 3172 | MPa | D-638 |
| Flexural Strength | 8200 | psi | 56 | MPa | D-790 |
| Flexural Modulus | 490000 | psi | 3478 | MPa | D-790 |
| Izod Impact @ 23°C | 0.4 | ft-lb/in | 21 | J/m | D-256 |
| **Thermal Properties** | | | | | |
| Heat Deflection Temperature | | | | | |
| @ 264 psi | 188 | °F | 87 | °C | D-648 |
| @ 66 psi | 205 | °F | 96 | °C | D-648 |
| Vicat Softening Temperature | 223 | °F | 106 | °C | D-1525 |

1. When used unmodified for the manufacture of food contact articles, this product will comply with Food Additive Regulation 21 CFR 177.1640 under the U.S. FDA's, Food, Drug, and Cosmetic Act. Such uses are subject to good manufacturing practices and any other limitations which are part of the statute or regulations. These should be consulted for complete details.
2. www.UL.com file E326906
3. Americas Styrenics will not knowingly sell or sample any product or service ("Product") into any commercial or developmental application that is intended for:
- permanent (Long term) contact with internal body fluids or internal body tissues. Long term is a use which exceeds 72 continuous hours;
- use in cardiac prosthetic devices regardless of the length of time involved (cardiac prosthetic devices include, but are not limited to, pacemaker leads and devices, artificial hearts, heart valves, intra-aortic balloons and control systems and ventricular bypass assisted devices);
- use as a critical component in medical devices that support or sustain human life; or
- use in applications designed specifically to promote or interfere with human reproduction.

Additionally, all Products intended for use in pharmaceutical applications must pass the then current Pharmaceutical Liability Guidelines.
4. Typical Properties, not to be considered specification limits.



**For Additional Information Contact Us:**
**In the United States and Canada: 1-844-512-1212 or 1-832-616-7800**

## Typical Processing Conditions

### Injection Molding

**Typical Molding Machine Settings**

| Zone | International System | | | | English System | | | |
|---|---|---|---|---|---|---|---|---|
| Nozzle | 213 | - | 243 | ° C | 415 | - | 470 | ° F |
| Zone # 1 | 218 | - | 249 | ° C | 425 | - | 480 | ° F |
| Zone # 2 | 218 | - | 249 | ° C | 425 | - | 480 | ° F |
| Zone # 3 | 199 | - | 213 | ° C | 390 | - | 415 | ° F |
| Back Pressure | 2 | - | 12 | bar | 25 | - | 175 | psi |

**Mold Temperatures**

High mold temperatures produce higher surface gloss and minimize flow marks and weld lines. Orientation is also reduced, thereby improving the properties of the part. However, high mold temperatures can require longer cycles in order to set up the polymer. Low mold temperatures are used for faster cycles. The parts will lack gloss, have poorer weld lines and a higher level of molded-in stress. Recommended mold surface temperatures for polystyrene range from 60º to 150º F. Use the highest temperature possible where you can maintain the desired cycle time.

**Feed**

The feed control should be adjusted to equal the desired shot weight. A general rule of molding parts with a minimum amount of internal stress and free of sink marks is to adjust the feed to keep the plunger from bottoming out. The feed should be adjusted to give a cushion of about ¼ inches. A larger cushion should be used only if the material contains moisture, air and/or excessive volatile content that show up as silver or black streaks in the molded part.

**Fill Rate**

Fast fill rates generally provide better uniformity in part size and quality. Rapid fill rates are possible if gate sizes and locations are properly selected. Gates too small for a particular part thickness can cause problems when filled at rapid speeds. Use the fastest fill rate the mold design and part will tolerate understanding that not all applications can tolerate a fast fill rate. Heavy section parts require a slow fill to avoid flow and weld marks on the surface of the part.

**Screw Forward**

Screw forward time should be controlled to prevent the plastic from flowing into or back from the cavity. Screw forward time is a function of mold and material temperature, part thickness, gate and runner size. Decreasing screw forward time increases part shrinkage. Allowances must be made in the screw forward time and hold pressure to minimize shrinkage and sink marks. Excessive screw forward time can over-pack the runner system or sprue, causing sticking.

### Extrusion

**Typical Extruder Settings**

| Zone | International System | | | | English System | | | |
|---|---|---|---|---|---|---|---|---|
| Zone # 1 | 177 | - | 193 | ° C | 350 | - | 380 | ° F |
| Zone # 2 | 182 | - | 204 | ° C | 360 | - | 400 | ° F |
| Zone # 3 | 188 | - | 210 | ° C | 370 | - | 410 | ° F |
| Zone # 4 | 199 | - | 216 | ° C | 390 | - | 420 | ° F |
| Zone # 5 | 204 | - | 221 | ° C | 400 | - | 430 | ° F |
| Zone # 6 | 204 | - | 221 | ° C | 400 | - | 430 | ° F |
| Melt Pump, Adapter, Pipes, Screen Changer | 193 | - | 232 | ° C | 380 | - | 450 | ° F |
| Die | 199 | - | 232 | ° C | 390 | - | 450 | ° F |
| Polish Rolls | 66 | - | 104 | ° C | 150 | - | 220 | ° F |
| Melt Temperature | 193 | - | 232 | ° C | 380 | - | 450 | ° F |
| Head Pressure | 10 | - | 21 | MPa | 1500 | - | 3000 | psi |

**Extrusion Conditions**

A lower temperature value within the typical temperature range denotes usage of the material with a styrene butadiene block copolymer in impact-modified blends. A screw design with a mixing head and a compression ratio of roughly 4:1 or a static mixing device is recommended for proper dispersion when using colorants or other additives.

The extruder die should be set from 110-150% of the required sheet thickness. The first polish roll gap should be set roughly 95% of the finished sheet thickness while the second polish roll gap can be set greater than or equal to 100% of the sheet thickness depending on what surface needs to be imparted upon the sheet by the final roll.

For all polystyrene products except OPS, the sheet orientation should not exceed 30%. Brittleness and tear strength of the sheet, especially in the machine direction, is drastically deteriorated at orientation levels >30%. Recommended temperatures are typical ranges only.



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