Stat-Tech™
STATIC DISSIPATIVE & ELECTRICALLY CONDUCTIVE FORMULATIONS
Stat-Tech™ Static Dissipative and Electrically Conductive Formulations are specifically engineered to provide antistatic, ESD and EMI/RFI shielding performance for critical electronic equipment applications. These materials combine the performance of select engineering resins with reinforcing additives, such as carbon powder, carbon fiber, nickel-coated carbon fiber and stainless steel fiber, for low-to-high levels of conductivity depending upon application requirements.

<table>
<thead>
<tr>
<th>Base Resin</th>
<th>PC</th>
<th>PC/PSU</th>
<th>PES</th>
<th>PEI</th>
<th>PP</th>
<th>ABS</th>
<th>PEEK</th>
<th>PA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Barrel Temperatures</strong></td>
<td><strong>°F (°C)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Pack &amp; Hold Pressure</strong></td>
<td>50%–75% of Injection Pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Injection Velocity</strong></td>
<td>0.5–2.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Back Pressure</strong></td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Screw Speed</strong></td>
<td>40–70</td>
<td>40–70</td>
<td>40–70</td>
<td>40–70</td>
<td>40–70</td>
<td>40–70</td>
<td>40–70</td>
<td>40–70 **</td>
</tr>
<tr>
<td><strong>Drying Parameters</strong></td>
<td>6 hrs @ 250 (121)</td>
<td>4 hrs @ 250 (121)</td>
<td>4 hrs @ 275 (135)</td>
<td>4 hrs @ 250 (121)</td>
<td>3 hrs @ 300 (150)</td>
<td>2 hrs @ 200 (93)</td>
<td>3 hrs @ 275 (135)</td>
<td>4 hrs @ 180 (82)</td>
</tr>
<tr>
<td><strong>Cushion</strong></td>
<td>0.125–0.250</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Screw Compression Ratio</strong></td>
<td>2.0:1–2.5:1</td>
<td>2.0:1–2.5:1</td>
<td>2.5:1–3.5:1</td>
<td>2.5:1–3.5:1</td>
<td>2.5:1–3.5:1</td>
<td>2.5:1–3.5:1</td>
<td>2.5:1–3.5:1</td>
<td></td>
</tr>
<tr>
<td><strong>Nozzle Type</strong></td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>General Purpose</td>
<td>Reverse Taper</td>
</tr>
<tr>
<td><strong>Clamp Pressure</strong></td>
<td>5–6 Tons/in²</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* A reverse temperature profile is important to obtain optimum conductive properties. Other key processing parameters are slow injection speeds and low back pressures.

** Avoid processing for a resin-rich surface. Conductive properties are achieved with a silver or fibrous surface appearance.
### STARTUP & SHUTDOWN

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Purge Compound</strong></td>
</tr>
<tr>
<td><strong>Recycling</strong></td>
</tr>
</tbody>
</table>

### MOLD DESIGN

<table>
<thead>
<tr>
<th>Recommendations</th>
</tr>
</thead>
</table>
| **Gates** | • Many different types of gates can be used such as pin, fan, tunnel, tab and edge gates. Gate type should be selected based on location and part geometry.  
• Gate diameters equivalent to 50%-75% of the average wall thickness are recommended.  
• Land lengths of 0.020”–0.035” (0.50mm–0.90mm) are typically recommended. |
| **Runners** | • Full-round runners or a modified trapezoid runner are the best designs. Half-round runners are not recommended.  
• Only naturally balanced runner systems (“H” pattern) are recommended.  
• Runner diameters larger than 0.150” (3.8mm) and not exceeding 0.375” (9.5mm) are recommended.  
• Step each 90° bend in the system down in size (from sprue to gate) approximately 1/16” (1.5mm) to reduce pressure drop.  
• Place vents at each 90° intersection and vent to atmosphere.  
• Hot runner molds are acceptable and should be sized by the manufacturer. |
| **Cold Slug Wells** | • Place these wells at the base of the sprue to capture the cold material first emerging from the nozzle.  
• Place wells at every 90° bend in the runner system.  
• Well depths approximately 1.5 times the diameter of the runner provide the best results. |
| **Venting** | • Place vents at the end of fill and anywhere potential knit/weld lines will occur.  
• All vents need to be vented to atmosphere.  
• For circular parts, full perimeter venting is recommended.  
• Cut vent depths to:  
  - PC Compounds: 0.001”–0.002” depth and 0.250” width  
  - PC/PSU Compounds: 0.002”–0.003” depth and 0.250” width  
  - PES Compounds: 0.003”–0.004” depth and 0.250” width  
  - PEI Compounds: 0.001”–0.003” depth and 0.250” width  
  - PP Compounds: 0.001”–0.002” depth and 0.250” width  
  - ABS Compounds: 0.0015”–0.0025” depth and 0.250” width  
  - PEEK Compounds: 0.002”–0.004” depth and 0.250” width  
  - Nylon Compounds: 0.002” min. depth and 0.250” width  
• Increase vent depth to 0.040” (1.0mm) at 0.250” (4.0mm) away from the cavity and vent to atmosphere. |
<p>| <strong>Draft Angle</strong> | • Maintain a minimum draft angle of 1/2° per side. |</p>
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
</table>
| Incomplete Fill            | Melt and/or mold temperature too cold  | • Increase nozzle and barrel temperatures  
• Increase mold temperature  
• Increase injection speed  
• Increase pack and hold pressure  
• Increase nozzle tip diameter  
• Check thermocouples and heater bands |
| Mold design                 |                                        | • Enlarge or widen vents and increase number of vents  
• Check that vents are unplugged  
• Check that gates are unplugged  
•Enlarge gates and/or runners  
• Perform short shots to determine fill pattern and verify proper vent location  
• Increase wall thickness to move gas trap to parting line |
| Shot Size                   |                                        | • Increase shot size  
• Increase cushion |
| Britteness                  | Melt temperature too low               | • Increase melt temperature  
• Increase injection speed  
• Measure melt temperature with pyrometer |
| Degraded/Overheated material|                                        | • Decrease melt temperature  
• Decrease back pressure  
• Use smaller barrel/excessive residence time |
| Gate location and/or size   |                                        | • Relocate gate to nonstress area  
• Increase gate size to allow higher flow speed and lower molded-in stress |
| Fibers on Surface (Splay)   | Melt temperature too low               | • Increase melt temperature  
• Increase mold temperature  
• Increase injection speed |
| Insufficient packing        |                                        | • Increase pack and hold pressure, and time  
• Increase shot size  
• Increase gate size |
| Sink Marks                  | Part geometry too thick                | • Reduce wall thickness  
• Reduce rib thickness |
| Melt temperature too hot    |                                        | • Decrease nozzle and barrel temperatures  
• Decrease mold temperature |
| Insufficient material volume|                                        | • Increase shot size  
• Increase injection rate  
• Increase packing pressure  
• Increase gate size |
| Flash                       | Injection pressure too high            | • Decrease injection pressure  
• Increase clamp pressure  
• Decrease injection speed  
• Increase transfer position |
|                            | Excess material volume                 | • Decrease pack pressure  
• Decrease shot size  
• Decrease injection speed |
|                            | Melt and/or mold temperature too hot   | • Decrease nozzle and barrel temperatures  
• Decrease mold temperature  
• Decrease screw speed |
<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>CAUSE</th>
<th>SOLUTION</th>
</tr>
</thead>
</table>
| Excessive Shrink        | Too much orientation  | • Increase packing time and pressure  
                          |                        | • Increase hold pressure  
                          |                        | • Decrease melt temperature  
                          |                        | • Decrease mold temperature  
                          |                        | • Decrease injection speed  
                          |                        | • Decrease screw rpm  
                          |                        | • Increase venting  
                          |                        | • Increase cooling time  |
| Not Enough Shrink       | Too little orientation| • Decrease packing pressure and time  
                          |                        | • Decrease hold pressure  
                          |                        | • Increase melt temperature  
                          |                        | • Increase mold temperature  
                          |                        | • Increase injection speed  
                          |                        | • Increase screw rpm  
                          |                        | • Decrease cooling time  |
| Burning                 | Melt and/or mold      | • Decrease nozzle and barrel temperatures  
                          |                        | temperature too hot  
                          |                        | • Decrease mold temperature  
                          |                        | • Decrease injection speed  |
|                         | Mold design            | • Clean, widen and increase number of vents  
                          |                        | • Increase gate size or number of gates  |
|                         | Moisture               | • Verify material is dried at proper conditions  |
| Nozzle Drool            | Nozzle temperature too hot| • Decrease nozzle temperature  
                          |                        | • Decrease back pressure  
                          |                        | • Increase screw decompression  
                          |                        | • Verify material has been dried at proper conditions  |
| Weld Lines              | Melt front temperatures too low| • Increase pack and hold pressure  
                          |                        | • Increase melt temperature  
                          |                        | • Increase vent width and locations  
                          |                        | • Increase injection speed  
                          |                        | • Increase mold temperature  |
|                         | Mold design            | • Decrease injection speed  
                          |                        | • Increase gate size  
                          |                        | • Perform short shots to determine fill pattern and verify proper vent location  
                          |                        | • Add vents and/or false ejector pin  
                          |                        | • Move gate location  |
| Warp                    | Excessive orientation | • Increase cooling time  
                          |                        | • Increase melt temperature  
                          |                        | • Decrease injection pressure and injection speed  |
|                         | Mold design            | • Increase number of gates  |
| Sticking in Mold        | Cavities are overpacked| • Decrease injection speed and pressure  
                          |                        | • Decrease pack and hold pressure  
                          |                        | • Decrease nozzle and barrel temperatures  
                          |                        | • Decrease mold temperature  
                          |                        | • Increase cooling time  |
|                         | Mold design            | • Increase draft angle  |
|                         | Part is too hot        | • Decrease nozzle and barrel temperatures  
                          |                        | • Decrease mold temperature  
                          |                        | • Increase cooling time  |