Adhesive & Potting Solutions for Electric Vehicles
INTRODUCTION

The automotive industry is going through significant transformation. With consumers today increasingly socially and environmentally conscious, there is a growing demand for energy-efficient vehicles. As a result, investments are being made globally in the design and development of Electric Vehicles. Designers in particular are innovating with different materials and chemistries to achieve the required performance targets. Vehicle lightweighting as well as thermal management are key areas of research and development.

That’s where the Insulcast and Plexus range of products play an important role. They are designed to overcome difficult engineering challenges. The Insulcast potting and encapsulation compounds are specifically developed to protect components in applications such as heat sink bonding, surface mount and die attach while meeting the challenges of heat dissipation. This improves performance and longevity of the device. The Plexus range of adhesives bond nearly all thermoplastics, metals and composite materials providing greater design freedom and manufacturing flexibility. They require little to no surface preparation and ensure bonds so strong that the adhesive will outperform the substrate.

BENEFITS

Plexus (Polymethylmethacrylate) MMA adhesives are fast setting, room temperature cured that provide excellent adhesion to metals, composites and thermoplastics. Plexus ensures durable bonds, offering countless possibilities for design engineers and the production managers. They offer superior strength and enable bonding over a wide range of gaps and substrate thickness, providing both a structural bond and final seal.

Insulcast Epoxies are general purpose and thermally conductive compounds. They are not only formulated to provide high thermal conductivity but also superior mechanical strength, excellent moisture resistance and high chemical resistance. They exhibit good adhesion properties.

Insulcast Silicones are both general purpose and thermally conductive compounds. These addition cure silicones exhibit high flexibility, are easily repaired and provide a superior performance over a broad temperature range. They have minimal shrinkage during cure.

INSULCAST & PLEXUS

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### Application Details

Plexus two-component systems should be applied at temperatures between 18°C (65°F) and 26°C (80°F). Temperatures below 18°C (65°F) will slow the cure speed; above 26°C (80°F) will increase the cure speed. The viscosities of Parts A and B of these adhesives are affected by temperature. For consistent dispensing in meter-mix equipment, adhesive and activator temperatures should be held reasonably constant throughout the year.

To ensure maximum bond strength, use sufficient material to completely fill the joint and mate the parts together within the specified working time. After joining, the parts must remain undisturbed until the fixture time has elapsed.

### Dispensing Equipment

Plexus adhesive may be applied with manual or pneumatic hand-held dispensers, or other approved recommended bulk dispensing equipment. Automated application may be accomplished with a variety of meter-mix equipment that delivers both components through a static mixer. Plexus Engineering should be consulted on all wetted components of dispensing equipment.

Use chemically resistant materials for gaskets, seals and O-rings. Dispensing hoses should be PTFE lined. Run equipment with adhesive and activator for approximately 30 seconds every 2 weeks if equipment is not in use. Refer to equipment manuals for preventive maintenance, cleaning and extended shutdowns.
### Insulcast Epoxies

| Insulcast Epoxies | Description | Color | Mix ratio by weight (with curing agent) | Pot life, mins @ 25 °C (°F) | Viscosity mixed, cP | Cure cycle °C (°F) | Shore hardness | Thermal conductivity, (W/m °K) | Glass transition point, °C (°F) | Dielectric constant, (KHz) | Dielectric strength, (Volts/Mil) | Volume resistivity, (Ohm-cm) | Coefficient of thermal expansion (°C) | Service temperature, °C (°F) | UL flammability rating |
|-------------------|-------------|-------|----------------------------------------|-----------------------------|---------------------|-------------------|-----------------|-----------------------------|----------------------------|---------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| Insulcast 140FR   | Very high thermal conductivity. | Black | 100: 3-4 (Icure 11B) | 150 | 50,000 | 3hr @ 100 (212) | 90-95D | 2.88 | 100 (212) | 6.3 | 420 | 1x10^9 | 26x10^6 | -55 to +155 (-67 to +311) | 94-V-1 |
| Insulcast 3230LV  | Low viscosity, highly filled formulation that exhibits excellent electrical properties and unusually high thermal conductivity with low thermal expansion. | Black | 100: 4-6 (Icure 9) | 75 - 120 | 6,000 | 36hr @ 25 (77) | 90D | 1.2 | 80 (176) | 6.3 | 475 | 1.3x10^4 | 28x10^4 | -40 to +105 (-40 to +221) | None |

### Insulcast Silicones: Addition cure

<table>
<thead>
<tr>
<th>Insulcast Silicones Addition cure</th>
<th>Description</th>
<th>Color</th>
<th>Mix ratio by weight (with curing agent)</th>
<th>Pot life, mins @ 25 °C (°F)</th>
<th>Viscosity mixed, cP</th>
<th>Cure cycle °C (°F)</th>
<th>Shore hardness</th>
<th>Thermal conductivity, (W/m °K)</th>
<th>Glass transition point, °C (°F)</th>
<th>Dielectric constant, (KHz)</th>
<th>Dielectric strength, (Volts/Mil)</th>
<th>Volume resistivity, (Ohm-cm)</th>
<th>Coefficient of thermal expansion (°C)</th>
<th>Service temperature, °C (°F)</th>
<th>UL flammability rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>RTVS 27 FC</td>
<td>Low viscosity, fast cure compound that has excellent electrical properties.</td>
<td>Black</td>
<td>1 : 1</td>
<td>&lt;5</td>
<td>2,900</td>
<td>1 hr @ 25 (77)</td>
<td>60A</td>
<td>0.31</td>
<td>3</td>
<td>514</td>
<td>1x10^9</td>
<td>22x10^3</td>
<td>-55 to +204 (-67 to +399)</td>
<td>94-V-0</td>
<td></td>
</tr>
<tr>
<td>RTVS 27 HTC</td>
<td>Low viscosity compound with high thermal conductivity. This combination makes it ideal for potting dense component packages requiring heat dissipation.</td>
<td>Black</td>
<td>1 : 1</td>
<td>60</td>
<td>6,000</td>
<td>24hr @ 25 (77)</td>
<td>60A</td>
<td>1.01</td>
<td>4</td>
<td>500</td>
<td>1x10^10</td>
<td>17x10^3</td>
<td>-55 to +232 (-67 to +449)</td>
<td>94-V-0</td>
<td></td>
</tr>
<tr>
<td>RTVS 8127</td>
<td>Flame retardent compound. The low viscosity and high thermal conductivity make it ideal for potting dense component packages requiring heat dissipation.</td>
<td>Gray</td>
<td>1 : 1</td>
<td>160 - 220</td>
<td>4,000</td>
<td>24hr @ 25 (77)</td>
<td>55A</td>
<td>0.75</td>
<td>4</td>
<td>500</td>
<td>1x10^10</td>
<td>18x10^3</td>
<td>-55 to +204 (-67 to +399)</td>
<td>94-V-0</td>
<td></td>
</tr>
<tr>
<td>RTVS 3-95-2</td>
<td>High temperature with very high thermal conductivity potting compound.</td>
<td>Red</td>
<td>1 : 1</td>
<td>15</td>
<td>35,000</td>
<td>24hr @ 25 (77)</td>
<td>85A</td>
<td>1.44</td>
<td>5</td>
<td>425</td>
<td>1x10^9</td>
<td>15x10^3</td>
<td>-55 to +260 (-67 to +500)</td>
<td>94-V-0</td>
<td></td>
</tr>
</tbody>
</table>

### General Use Instructions

1. Mix R.T.V.S. compound in original container to be sure of uniformity.
2. Weigh out sufficient R.T.V.S. compound for application. **NOTE:** Be sure container and stirrer are clean.
3. Add catalyst in calculated amount for the desired cure rate. If unsure, use a small amount of compound to check cure rate.
4. Mix thoroughly, being sure to incorporate material from sides and bottom of container. Keep air entrainment to a minimum.
5. De-airation under vacuum may be necessary if absolutely void-free castings are needed.
6. Pour into mold, cavity, etc.
7. Cure at room temperature. Length of cure will depend on amount and type of catalyst used. Faster cures can be achieved at 51°C (125°F) for 2-3 hours.
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