Composite Solutions for the Automotive Industry
Reduce weight. Reduce costs. Increase quality.

Henkel offers composite solutions for the automotive industry for cost-effective and reliable composite manufacturing.

**Composite matrix resins**
- LOCTITE MAX series including binders and release agents for fiber-reinforced components.

**Composite adhesives**
- LOCTITE and TEROSON series for multi-substrate bonding and composite assembly.

**Process know-how and engineering**
- For Resin Transfer Molding (RTM) and design of composite parts.

**WHAT WE THINK THE PERFECT COIL SPRING SHOULD DO? LIGHTWEIGHT A VEHICLE.**
Resin Transfer Molding (RTM) Process for Composites

**Preforming**
The semifinished part is preformed mechanically.

**Mold preparation**
The mold can be prepared with an external release agent like LOCTITE Frekote series.

**Resin injection & curing**
The components of the composite matrix resin LOCTITE MAX series are mixed and injected into the mold.

**Surface preparation**
The surface of the molded part is prepared for further processing.

**Bonding**
The finished part is assembled into place with tailored multi-substrate adhesives.
Henkel LOCTITE Frekote Solutions for Mold Preparation

**Frekote Mold Cleaners**

**LOCTITE FREKOTE 913WB**
- Prevents dust recontamination
- Easy application
- Leaves an antistatic and streak-free mold surface
- Non-flammable
- Water-based solution

**Application:**
- Application temperature of 20°C to 40°C
- Spray onto the mold out of the bottle

**LOCTITE Frekote 915WB**
- Minimal mold building
- Fast curing / easy application
- High-gloss mold finish
- Water-based solution
- No dulling of the mold surface

**Application:**
- Application temperature of 20°C to 40°C
- Wipe on the mold and buff out to a high-gloss finish

**Frekote Mold Sealers**

**LOCTITE FREKOTE FMS**
- High-gloss mold finish
- Fast curing
- Eliminates porosity and also micro-porosity
- Use with FRP and steel molds
- Easy to use

**Application:**
- Application temperature of 15°C to 35°C
- Thermal stability of up to 305°C
- Wipe on the mold
- Apply 1 to 2 coats

**Frekote Mold Release Agents**

**LOCTITE FREKOTE 700-NC**
- Excellent fit for LOCTITE MAX series
- Slow room-temperature cure
- High slip good for complex mold structures
- High-gloss mold finish
- Mild odor

**Application:**
- Application temperature of 15°C to 135°C
- Thermal stability of up to 400°C
- Application by spraying, brushing, or wiping on the mold
- Apply up to 4 coats

**LOCTITE FREKOTE C-200**
- Excellent fit for LOCTITE MAX series
- Water-based solution
- No contaminating transfer
- No mold buildup

**Application:**
- Application temperature of 20°C to 204°C
- Thermal stability of up to 315°C
- Application by spraying, brushing, or wiping on the mold
- Apply up to 4 coats
Composite Matrix Resins

LOCTITE MAX series including binders and release agents for fiber-reinforced components designed for RTM with glass or carbon fibers enabling short cycle times suitable for automotive mass production.

Process efficiency
- Fast curing allows demolding after 1 to 5 minutes
- Low viscosity ensures fast and efficient injection without stress to fibers
- Process speed can be adjusted with additives
- Internal mold release agent for reliable demolding

Mechanical performance
- High mechanical strength
- High toughness and durability
- Superior fatigue resistance under dynamic loads

Application areas
- Body (primary structure)
- Chassis (spring, stabilizer, wheel)
- Exterior (roof, hood, tailgate)
- Powertrain (driveshaft)

Resin injection & curing
The components of the composite matrix resin LOCTITE MAX series are mixed and injected into the mold.

Key Characteristics

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>LOCTITE MAX 2</th>
<th>LOCTITE MAX 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glass transition temperature</td>
<td>115</td>
<td>125</td>
</tr>
<tr>
<td>Mold release</td>
<td>External</td>
<td>External / Internal</td>
</tr>
<tr>
<td>K1C</td>
<td>1.2 MPa m1/2</td>
<td>1.3 MPa m1/2</td>
</tr>
<tr>
<td>Paintability after demolding</td>
<td>–</td>
<td>✓</td>
</tr>
<tr>
<td>Tensile strength</td>
<td>80 MPa</td>
<td>90 MPa</td>
</tr>
<tr>
<td>Tensile modulus</td>
<td>2.8 GPa</td>
<td>3.1 GPa</td>
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</tbody>
</table>

WE THOROUGHLY CHECK EVERY PART TO SPEED UP YOUR PRODUCTION TIMES.
LOCTITE and TEROSON Composite Bonding Solutions

Henkel’s high-quality tailored adhesives are the perfect match for your production and assembly of composites or multi-substrates.

<table>
<thead>
<tr>
<th>Application Area</th>
<th>Product</th>
<th>Technology</th>
<th>Process</th>
<th>Curing time [min]</th>
<th>Heat stability [°C]</th>
<th>Elongation [%]</th>
<th>Shear strength [MPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural bonding</td>
<td>TEROSON EP 5065</td>
<td>Epoxy</td>
<td>2P / RT</td>
<td>240</td>
<td>200</td>
<td>&lt; 5</td>
<td>18–22</td>
</tr>
<tr>
<td>Structural bonding</td>
<td>TEROSON PU 6700 ME</td>
<td>Polyurethane Micro emission quality</td>
<td>2P / RT</td>
<td>120</td>
<td>80</td>
<td>&lt; 10</td>
<td>12–16</td>
</tr>
<tr>
<td>Structural &amp; elastic bonding</td>
<td>TEROSON PU 860 ME</td>
<td>Polyurethane Micro emission quality</td>
<td>2P / RT</td>
<td>90</td>
<td>80</td>
<td>&gt; 200</td>
<td>12–16</td>
</tr>
<tr>
<td>Structural bonding / fast curing</td>
<td>TEROSON PU 1510</td>
<td>Polyurethane Micro encapsulated</td>
<td>1P / &gt; 85 °C</td>
<td>0.5</td>
<td>150</td>
<td>~ 120</td>
<td>10–14</td>
</tr>
<tr>
<td>Sealing</td>
<td>LOCTITE UR 9214</td>
<td>Polyurethane</td>
<td>1P / RT</td>
<td>24 h</td>
<td>85</td>
<td>&gt; 250</td>
<td>&gt; 1.5</td>
</tr>
</tbody>
</table>

Technology platform for customized structural 2-part polyurethane adhesives:

<table>
<thead>
<tr>
<th>System</th>
<th>Open Time [min]</th>
<th>Elongation [%]</th>
<th>Tensile Strength [MPa]</th>
<th>E-Modulus [MPa]</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>8–12</td>
<td>&gt; 200</td>
<td>&gt; 9</td>
<td>&gt; 30</td>
</tr>
<tr>
<td>B</td>
<td>5–10</td>
<td>&gt; 180</td>
<td>&gt; 18</td>
<td>&gt; 300</td>
</tr>
<tr>
<td>C</td>
<td>30–60</td>
<td>&gt; 50</td>
<td>&gt; 20</td>
<td>&gt; 800</td>
</tr>
<tr>
<td>D</td>
<td>10–15</td>
<td>&gt; 2</td>
<td>&gt; 40</td>
<td>&gt; 3000</td>
</tr>
<tr>
<td>General interval</td>
<td>5–120</td>
<td>2–250</td>
<td>8–40</td>
<td>30–3000</td>
</tr>
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</table>
Henkel Composite Solutions – Application Examples

Our resins, adhesives, and engineering services enable a wide variety of possible applications.

**Composite Coil Spring**
With LOCTITE MAX 3, composite coil springs become 45% lighter and as reliable as steel springs.

**Multi-Substrate Bonding**
LOCTITE and TEROSON adhesive and sealing solutions enable multi-substrate assemblies.

**Composite Wheel**
Increase the driving performance while making it lighter and durable with LOCTITE composite solutions.

**Composite Door**
Heavily reduced weight while being more robust: composite doors made with LOCTITE MAX 3.

**CompositeLab**
Fully equipped testing facility for customer trials with HP-RTM.

**Engineering Services**
Improve your capabilities for composite and adhesive designs with our engineering support.

For more information, please visit our website:
[www.composite-lab.com/applications](http://www.composite-lab.com/applications)