LYTEN

Structural Adhesive 6120HT

Unlock High-Temperature,
High-Performance Bonding

APPLICATION BRIEF

How Lyten's New Structural Adhesive 6120HT Unlocks High-Temperature Bonding for High-Performance Applications

ABSTRACT

High-performance assemblies share a hidden failure point: heat. As engineers push lightweight composites, aluminum, and advanced polymers closer to engines, battery systems, exhaust zones, and robotics, conventional structural adhesives soften, creep, and fail exactly where performance matters most. Lyten Adhesive 6120HT is a next-generation high-temperature structural epoxy powered by Lyten 3D Graphene™. Engineered for demanding heat-zone assemblies, it delivers more than 2x the hot-strength of leading commercial adhesives while maintaining structural integrity across both room-temperature and elevated-temperature operating conditions. Its proprietary 3D Graphene network acts as “nanoscale rebar,” pinning polymer chains in place to raise the glass transition temperature to ~120°C (248°F) and deliver consistent performance beyond 80°C (176°F). The result is stronger multi-material bonding, up to ~90% fastener-weight reduction in select assemblies, improved thermal durability, and production-friendly workflow advantages including an 80-minute pot life and a practical 1-hour cure. For engineers seeking lighter, stronger, and more thermally resilient systems across automotive, motorsports, aerospace, robotics, renewable energy, and industrial applications, 6120HT is a new approach to structural assembly.

The Art of Assembly & the Integrity of the Bond

In nearly every high-performance industry, progress depends on assembly: the seamless integration of dissimilar materials—metals, composites, polymers—into structures light enough to fly yet strong enough to withstand extreme loads. From the device in your hand to the aircraft crossing the Atlantic, the technology we rely on depends on the integrity of the bond. Before structural adhesives existed less than a century ago, engineers relied exclusively on bolts, rivets, and welds—each introducing three compounding problems.

Three Problems with Mechanical Fasteners

Weight. Fasteners add significant mass to assemblies deliberately designed to be light.
Stress concentrations. Every drilled hole removes load-bearing material and creates a stress riser. The result: 70% of fatigue failures in aircraft structures originate at fastening areas, with 80% of those cracks initiating directly at the holes.
Dissimilar materials. Drilling into brittle composites risks cracking and delamination, while thermal-expansion mismatch between a metal fastener and a composite progressively loosens joints as assemblies cycle through operating temperatures.

The financial stakes are substantial: global automakers paid over $51 billion in warranty claims in 2023, and bond and joint failures in heat-exposed subsystems rank among the most expensive recurring issues. The invention of high-strength structural adhesives transformed this landscape, letting engineers fuse dissimilar substrates into optimized assemblies previously impossible to manufacture.

Market Snapshot

$13.5B Global structural adhesives market in 2024, projected to $17.7B by 2029 (5.5% CAGR)[2]	**$8B** Automotive adhesives market in 2024, growing at a 9.3% CAGR through 2030[3]
$1.3B Aerospace adhesives market in 2024, growing at a 7.0% CAGR through 2030[4]	**$58.8B** Industrial adhesives market in 2025, growing at a 5.1% CAGR through 2035[5]

Before 1947, “glue” usually meant animal-based proteins or rubber-based cements—materials that fail under the heat, stress, and environmental conditions a modern structural epoxy handles routinely.[1]

The Thermal Ceiling

Structural adhesives solved the fastener problem—making assemblies lighter, stiffer, and more durable, and enabling clean bonding of dissimilar materials without drilling, stress risers, or progressive loosening from CTE mismatch. But as engineers pushed these assemblies into harder operating environments, a new failure mode emerged: heat. As joints move closer to engines, battery packs, exhaust systems, and brake assemblies, conventional two-part epoxies soften and fail at exactly the temperatures high-performance applications demand.

The culprit is the Glass Transition Temperature, T_g—the point where an epoxy transitions from a rigid, "glassy" state to a soft, rubbery one. As conventional adhesives approach their T_g, three predictable and costly failures follow:

> **Delamination** — The bond loses the stiffness required to hold dissimilar materials together.

> **Structural Creep** — Under load, the rubbery adhesive lets components shift, compromising aerodynamic or mechanical precision.

> **CTE Failure** — Dissimilar materials expand at different rates; a softened adhesive can no longer bridge the mismatch and the bond ruptures.

The industry doesn't need a better epoxy. It needs a thermal breakthrough.

The Lyten Breakthrough: Adhesive 6120HT

Lyten Adhesive 6120HT is powered by our proprietary Lyten 3D Graphene™ supermaterial, which forms a molecular-level network that reinforces the polymer matrix like "nanoscale rebar," pinning polymer chains in place. This raises the glass transition temperature and prevents the adhesive failures that occur in heat-intensive environments, delivering consistent mechanical performance beyond 80°C (176°F)—and enabling up to ~90% fastener-weight reduction by replacing metal parts with a continuous, stress-distributing bond.

Lyten Adhesive 6120HT Quart Kits and Dual-Cartridge Kit.

How Adhesive 6120HT Mitigates Industry-Wide Challenges

1 Elevating Tg & Stability

The 3D Graphene reinforces the polymer matrix at a molecular level, raising the adhesive's glass transition temperature to ~120°C (248°F) and ensuring hot-strength retention in service windows where others fail.

2 Uniform Load Distribution

The adhesive behaves like a supermaterial scaffold at the molecular level, distributing stress across the entire bond area to enhance overall strength and durability.

3 Streamlined Production

The formulation reaches optimal bond strength with practical cure cycles—such as 1 hour at 80°C (176°F)—avoiding lengthy, multi-stage post-curing.

Use Case: Solving Heat-Soak Failure

The Incident. *A premier motorsports partner suffered a critical failure when a bumper assembly detached during high-speed operation. Post-race analysis identified that "heat soak" from exhaust proximity drove the bond past its glass transition temperature, triggering a rubbery softening that led to total detachment.*

The Solution. *This failure is preventable. 6120HT's higher thermal headroom and molecular stability mean the bond would have stayed rigid and glassy through the full heat-soak cycle—holding the panel, keeping the car together, and finishing the race.*

Performance Metrics: Data-Backed Dominance

6120HT is a two-component, toughened paste adhesive for high-performance structural bonding at elevated temperatures. Lap shear strength (LSS) was measured per ASTM D5868 on CFRP and per ASTM D1002 on 2024-T3 aluminum (phosphoric acid anodize per ASTM D3933).

Lap Shear Strength on 2024-T3 Aluminum (ASTM D1002)

Tensile lap shear strength – tested per ASTM D1002. Adherends are 2024-T3 AlClad aluminum at 0.063 inch (0.51mm) thickness treated with phosphoric acid anodize per ASTM D3933.

Adhesive Cure Parameter	Test Temperature		Typical Results	
	°F	°C	psi	MPa
1 h at 150 °F (65 °C)	68	20	6,060	41.8
	194	90	3,030	20.9
1 h at 176 °F (80 °C)	68	20	6,270	43.2
	194	90	2,370	16.3
	230	110	1,075	7.4

On 2024-T3 aluminum at room temperature, 6120HT achieves >43 MPa lap shear strength. Performance holds at elevated temperatures (**16.3 MPa retained at 90 °C [194 °F]**) where competing structural adhesives typically lose the much of their capacity.

Lap Shear Strength on Carbon Fiber Reinforced Epoxy (ASTM D5868)

Tensile lap shear strength – tested per ASTM D5868. Adherends are carbon fiber reinforced epoxy.

Adhesive Cure Parameter	Test Temperature		Typical Results*	
	°F	°C	psi	MPa
1 h at 150 °F (65 °C)	68	20	2,710	18.7
	194	90	2,350	16.2
1 h at 176 °F (80 °C)	68	20	3,450	23.8
	194	90	2,640	18.2
	230	110	1,600	11.0

*Substrate failure

On CFRP at room temperature, 6120HT achieves substrate failure: the composite itself breaks before the adhesive bond does, meaning the bond is stronger than the carbon fiber it's holding together. At elevated temperatures, 6120HT retains 16.3 MPa on aluminum and 18.2 MPa on CFRP at 90 °C (194 °F), and provides measurable structural capacity through 110 °C (230 °F).

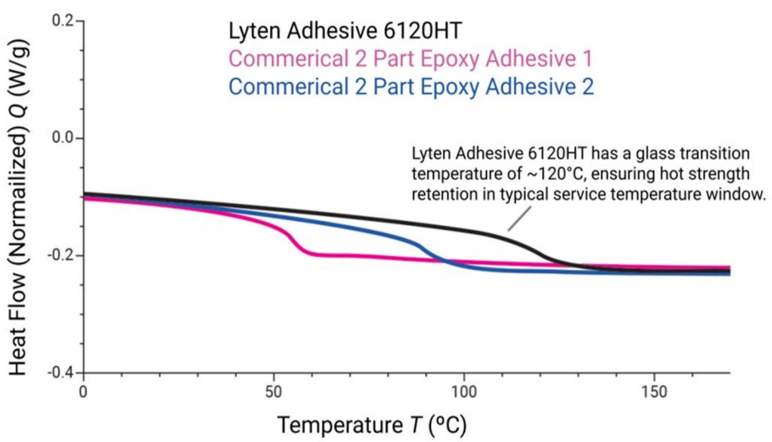
Across the full operating range, 6120HT delivers what heat-zone applications demand: high room-temperature strength on metals, bond strength that exceeds the composite itself on CFRP, and retained structural capacity well past the temperatures where conventional epoxies fail.

Designed for Predictability, Not Just Peak Strength

Spec-sheet strength usually means peak strength at room temperature. But in the field a bond heats up, cools down, and cycles through both. What matters for reliability is how much strength remains when the assembly is hot—and how predictable that number stays as temperature climbs. On CFRP, 6120HT's lap-shear strength holds essentially flat from room temperature through 90°C, then drops predictably at 110°C; aluminum shows the same shape. Engineers can design to a single stable strength value across the full service window rather than derating for a steep hot-strength cliff.

The Science of Strength: Linking Tg to Performance

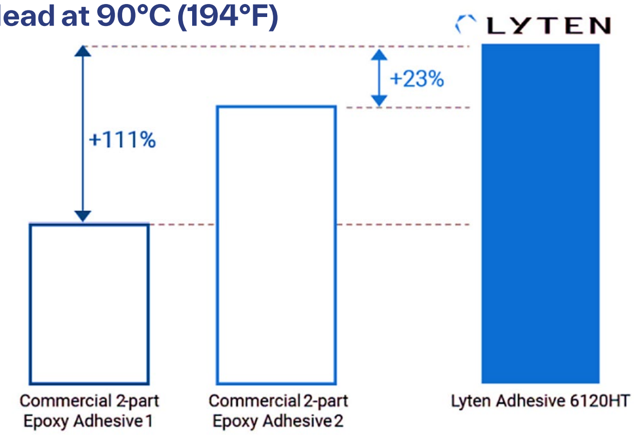
***Fig. 1.* Differential Scanning Calorimetry (DSC): Glass Transition Comparison**



Reference commercial 2-part epoxies begin softening as early as 50–80°C—temperatures a panel can hit in summer sun, let alone next to an exhaust. Lyten 6120HT stays stable until ~120°C. That ~40–70°C of additional thermal headroom is why 6120HT avoids the rubbery transition that drives heat-zone bond failures.

Fig. 2 Superior Hot-Strength on Metal: Head-to-Head at 90°C (194°F)

What the DSC data predicts, the lap-shear test confirms. At 90°C—where standard adhesives lose the majority of their structural capacity—6120HT is still rigid, glassy, and carrying load. On phosphoric-acid-anodized 2024-T3 aluminum it delivers 16.3 MPa: more than double Commercial Adhesive 1 (+111%) and 23% higher than Commercial Adhesive 2. On CFRP it reaches 18.2 MPa versus Commercial Adhesive 2's 14.1 MPa.



Beyond Hot-Strength: Unlock Radical Lightweighting

6120HT's strength and thermal stability make it possible to replace mechanical fasteners with a continuous, stress-distributing bond line in applications where fastener weight is a significant portion of total joint mass—panel-to-frame assemblies, aerodynamic fairings, access covers, and bracket bonding on composite or thin-gauge aluminum structures. In these fastener-intensive joints, switching from bolts and rivets to adhesive-only bonding can reduce joint weight by up to 90%. For primary structural joints that need additional through-thickness reinforcement, combining 6120HT with minimal fasteners in a hybrid approach still delivers substantial weight savings over conventional all-fastener designs.

~90% reduction in joint weight is achievable in fastener-intensive joints by switching from bolts and rivets to an adhesive-only bond line.

Engineered for Workflow Efficiency

An 80-minute pot life at 25°C gives technicians time to lay up complex assemblies without rushing, and reduces the wasted mix that shorter-pot-life adhesives produce. Packaging spans high-volume Quart Kits for production lines through field-friendly Dual Cartridges compatible with standard manual or pneumatic applicators—supporting both manufacturing and repair workflows.

80 min	1 hour	>43 MPa
Pot life at 25°C—ample working time, less wasted mix.	Practical cure at 80°C; no multi-stage post-cure.	Room-temperature lap shear strength on aluminum.

Across the full operating range, 6120HT delivers what heat-zone applications demand: high room-temperature strength on metals, bond strength that exceeds the composite itself on CFRP, and retained structural capacity well past the temperatures where conventional epoxies fail.

Where Performance Matters Most: Real-World Use Cases

Ideal applications for 6120HT are those where heat, weight, and reliability converge—and where conventional adhesives force engineers into compromises they can no longer afford.

Motorsports & High-Performance Automotive

The margin between winning and losing is measured in grams and degrees. 6120HT maintains full structural performance through thermal cycling that degrades competing adhesives, enables aggressive lightweighting by replacing fasteners on metal and composite parts, and resists fuels, lubricants, and solvents—the daily reality of a working engine bay. Heat-zone reliability, fastener elimination, and a 1-hour cure mean faster builds and lighter cars on race day.

Autonomous Systems & Industrial Robotics

Robotic arms, end-effectors, and precision housings generate significant thermal loads through continuous high-speed operation—conditions that cause conventional bonds to creep and drift. 6120HT eliminates fastener-induced stress risers on components subject to millions of duty cycles while preventing heat-induced creep that compromises positional accuracy. Its 1-hour cure at 80°C integrates into production-line workflows without multi-day post-cure schedules.

Renewable Energy

Solar frames endure surface temperatures above 80°C; turbine blades absorb punishing loads under constant UV; battery packs combine dissimilar materials that expand at different rates. 6120HT maintains bond integrity at the elevated temperatures that degrade conventional epoxies over years of service, bonding dissimilar material stacks without thermal softening—extending operational lifetimes and protecting long-duration ROI.

Lyten's Supermaterial Ecosystem

The same tunable Lyten 3D Graphene™ scaffold that gives 6120HT its thermal breakthrough is deployed across a family of advanced materials—each engineered to eliminate a different traditional trade-off. The ultimate value lies in integration. Consider a next-generation solar installation: panel frames bonded with Adhesive 6120HT maintain structural integrity through sustained heat and exposure; custom racking and cable-management components printed with 3D Printing Filament PA1205 replace stamped metal to cut weight and field-install time; the Voltpack Mobile System provides scalable battery energy storage that shaves peak demand and enables on-site microgrids without diesel generators; foundations and ballast poured with S Cure concrete admixture reduce cement content and embodied carbon while delivering low-permeability durability; and embedded smart sensor arrays form a digital nervous system tracking degradation and hazards in real time.

No single material solves challenges this complex. But when every layer—the bond, the structure, the power source, the foundation, and the intelligence—is built on the same supermaterial-enhanced platform, this collection of better parts becomes an integrated ecosystem engineered to be lighter, stronger, cleaner, and smarter.

A NEW STANDARD IN STRUCTURAL BONDING: Transform Your Next Build With Lyten Adhesive 6120HT.

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Stop letting heat be the weakest link. Contact a Lyten applications engineer to discuss your project: lyten.com/products/structural-adhesive

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