
Custom Molded Cast Urethane Wheels

Title	Custom Molded Cast Urethane Wheels
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Description

Custom Molded Cast Urethane Wheels are manufactured using a precision casting process that creates a molecular-level chemical bond between liquid polyurethane elastomer and a metal or composite core. These wheels support full-dimensional customization—including material formulations, structural dimensions, and functional properties—serving as essential load-bearing components for heavy-duty, high-cycle, and specialized industrial operating environments.

Core Manufacturing Process of Casting Urethane Wheels

Core Surface Pretreatment: The metal core (cast iron, steel, aluminum alloy, etc.) undergoes thorough degreasing to remove processing oils, oxide layers, and impurities. The surface is then sandblasted to create a micro-textured profile, followed by the application of a specialized bonding primer. This process ensures a robust chemical bond

between the polyurethane and the metal, effectively eliminating delamination risks at the source.

Mold Casting: The pretreated core is secured within a custom mold. A precisely mixed liquid polyurethane prepolymer and curing agent are injected into the mold cavity, fully encapsulating the core's working surface.

Vulcanization & Cross-linking: Through ambient or temperature-controlled vulcanization, the polyurethane molecules form a three-dimensional cross-linked network. This transforms the material from a liquid into a high-elasticity solid, achieving a molecular-level bond with the core's adhesive layer.

Post-Processing & Quality Control: After demolding, the wheels undergo mechanical finishing to meet precise dimensional requirements. This is followed by rigorous testing, including dimensional tolerance checks, dynamic balancing, and spot-checks for load-bearing and wear resistance to ensure the finished product meets all custom specifications.



Key Performance Advantages for Casting Polyurethane Wheels

Exceptional Wear Life: Wear resistance is 5–10 times higher than that of standard rubber wheels, with DIN abrasion loss as low as $<30\text{mm}^3$. This significantly reduces replacement frequency and maintenance downtime in high-friction environments.

High Load-Bearing & Anti-Delamination: Chemical bonding strength exceeds the tensile strength of the polyurethane itself, ensuring the tread remains firmly attached to the core under extreme loads. Load-bearing capacity far exceeds that of similar-sized rubber or injection-molded TPU wheels.

Superior Environmental Adaptability: Resistant to oils, fuels, and weak acids/alkalis. They maintain stability across an operating temperature range of -30°C to 120°C, making them suitable for both outdoor and extreme temperature workshop environments. Specialized formulations are available for non-marking, anti-static, FDA food-grade, and hydrolysis-resistant requirements.

Damping, Floor Protection, & Low Noise: Superior elasticity compared to steel or hard plastic wheels allows for vibration absorption and noise reduction, preventing damage to epoxy or concrete floors.

High Customization Flexibility: The casting process allows for significantly lower mold costs compared to injection molding, making it highly cost-effective for small-batch or non-standard, custom-engineered requirements.



Customization Dimensions for Polyurethane Wheel Casting

Hardness: Adjustable range from Shore A 60 to Shore D 80, balancing elasticity and rigidity.

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ShoreDuromete	Tensile Strength(MPa)	Elongation(%)		
~95A	~50 MPa (≈7500 psi)	~350%		
90A	~45 MPa (≈6500 psi)	~450%		
80-85A	~35-37 MPa (≈5000 psi)	~580%		
70-75A	~20-28 MPa	~560%		
65A	~17 MPa (≈2500 psi)	~600%		

Core Material: Cast iron, carbon steel, aluminum alloy, engineering plastics, etc.

Wheel Structure: V-groove, U-groove, flanged wheels, drive wheels, guide wheels, press-on wheels, friction wheels, etc.

Functional Attributes: Conductive/anti-static, high-temperature resistance, food-grade (FDA), high-rebound, low compression set.

Comparison: Cast Urethane vs. Injection Molded TPU

Comparison Metric		Cast Urethane Wheels	Injection Molded TPU
Molecular Structure		Thermoset (3D cross-linked)	Thermoplastic (Linear structure)
Wear & Load Capacity		Superior; ideal for heavy-duty, high-cycle use	Moderate; best for light-to-medium duty
Heat Resistance		No distinct melting point; retains shape >100°C	Defined melting point; softens above Tm
Customization Cost		Low mold costs; ideal for small-batch runs	High mold costs; optimized for mass production

Advantages vs. Other Wheel Materials

Vs. Rubber: Higher load-bearing capacity, superior cut and tear resistance, easier to achieve non-marking properties, and longer overall wear life.

Vs. Polyolefin (e.g., Polypropylene): Urethane provides significantly higher traction, quieter operation, and reduced potential for floor marking.

Vs. Metal: Urethane protects floors, operates quietly, and effectively absorbs vibration and shock.

Vs. Injection-Molded Thermoplastic: Cast urethane is generally tougher, supports higher loads, and exhibits greater tear resistance, particularly in thicker cross-sections.



Typical Application Scenarios

Smart Logistics & Warehousing: Drive wheels and guide wheels for AGVs (Automated Guided Vehicles) and AMRs (Autonomous Mobile Robots).

Heavy Engineering Equipment: Load wheels for tunnel boring machines (TBM), friction wheels for monorail hoists in mining, and rollers for port machinery.

Automated Production Lines: Conveyor rollers for automotive assembly lines, friction drive wheels, and precision equipment guide rollers.

Specialized Industrial Settings: Rollers for food processing lines (FDA certified), conductive wheels for semiconductor cleanrooms, and drive wheels for sports ball-launching machines.

Whether you have a specific load requirement or a challenging environment, our engineering team is here to help. Let's collaborate to design a custom urethane wheel solution tailored to your application. Contact Our Engineering Team.