Torque Sensor for Humanoid Robot Market Boosts as AI-powered Automation Reshapes at 48.2% CAGR Global Industries by 2032

Torque sensors for humanoid robots market will soar from USD 515M in 2024 to USD 7.87B by 2032, driven by rapid robotics innovation.

Torque Sensor for Humanoid Robot Market Size

PUNE, MAHARASHTRA, INDIA, December 10, 2025 / EINPresswire.com/ -- Global Torque Sensors For Humanoid Robots Market, which is estimated to be worth USD 515 Million in 2024, and is expected to fuel at a robust CAGR of 48.2% to reach USD 7.87 Billion by 2032.

The growing use of humanoid robots in the manufacturing, healthcare, logistics, hospitality, and service sectors is what propelling the target market growth. In order to achieve safe, steady and also intelligent robotic movement, high accuracy, compact, and long lasting torque sensors have become essential as robots conduct increasingly human like motions.

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> *IntelMarketResearch*

Torque sensors enable humanoid robots to replicate human ability by providing real-time input on force, load, and joint resistance. They are necessary for safe human robot interaction, balance control, gait stability, and also accurate handling. As companies transition to advanced automation and AI-assisted robotics, torque sensors are emerging as one of the most sought after components of next generation humanoid platforms.

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□ Growing usage of humanoid robots in last mile deliveries, warehouse automation, and also logistics.
□ Increased spending on service robots for patient assistance, rehabilitation, and elder care.
□ The need for high sensitivity, lightweight torque sensing systems for cooperative applications.

□ Growth of biomechanics and human movement imitation systems are driven by AI.
□ Multi-axis torque sensors are becoming more popular in advanced bipedal robots.
□ Quick developments in complaint actuator designs and mechatronics

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Some of the major businesses are developing high-resolution multi-axis units, strain-gauge based modules, AI-integrated sensors, and tiny rotational torque sensors that are especially designed for bipedal and humanoid robot applications.

□ Bota Systems
□ATI Industrial Automation
□Robotous
□Keli Sensing Technology
□Ampelion
□Guangzhou Haozhi Industrial Co.,Ltd.
□Futek Advanced Sensor Technology
□OnRobot
□TE Connectivity

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• Single-Axis Torque Sensor
• Three-Axis Torque Sensor
• Six-Axis Torque Sensor

(Six-axis torque sensor is expected to hold the major share in the target market growth as these sensors are vital for joints like the wrists, ankles, and arms where balance, compliance, and also safe contact with people or objects are crucial)

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• Industrial
• Medical
• Services
• Emergency Rescue
• Others

(Industrial sector is anticipated to dominate the aimed market as it focuses on enabling safer, more precise, and highly automated operations in manufacturing and logistics environments.)

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• Strain Gauge Based
• Optical Based
• Magnetic Based

(Strain Gauge Based holds to be the largest dominating segment owing to its high accuracy, mature manufacturing base, and compatibility with joint-level integration.)

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• Automotive Manufacturers
• Electronics Manufacturers
• Healthcare Providers
• Research Institutions

(Automotive Manufacturers segment is considered to be the highest as they deploy humanoid and collaborative robots extensively across body, paint, and final assembly operations for tasks such as fastening, material handling, inspection, and ergonomics assistance on the line.)

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□ □□□□ □□□□□□□: Leading the charge with advanced robotics R&D

This region remains a powerhouse in humanoid robotics, supported by strong innovation ecosystems, university led robotics programs, and major tech companies which invests heavily in next generation humanoids. And on the other hand, U.S. leads the regions which is driven by continuous investments in precision robotics and high end joint sensors development.

□ □□□□□□□: Precision engineering and safety regulations drive sensor innovation

Key regional strengths includes;

• Established robotics research clusters and manufacturing hubs.
• High adoption of humanoids in industrial inspection and training.
• Stroing regulatory frameworks which promotes safe human robot interaction.
• Lastly, rapid growth of service robots in hospitality and healthcare.

□ □□□□ □□□□□□□□: The hub for humanoid development with the booming growth

This area is experiencing the fastest growth as countries like South Korea, China, and Japan make significant investments in intelligent manufacturing, service automation, and humanoid robotics. also, Japan continues to lead with decades of expertise in humanoid research, whereas China is rapidly scaling commercialization.

□ □□□□□ □□□□□□□□: Gradual Adoption Supported by Industrial Modernization

Latin America's torque sensor demand is still emerging but gaining momentum as industries adopt more automation and training robots. Brazil, Mexico, and Argentina are at the forefront of adopting humanoid and semi-humanoid systems for education, logistics, and manufacturing support.

□□□□□□□□ □□□□ & □□□□□□□: Growing Interest in Service Robots and Smart Mobility

The Middle East & Africa region is steadily building its robotics footprint, especially in smart city initiatives, hospitality, airports, and healthcare. Humanoid robots are being introduced for concierge tasks, patient assistance, and public-interaction roles, boosting demand for reliable torque sensing systems.

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Humanoid robots are moving from science fiction to the real world in the quickly developing field of robotics. To carry out intricate duties, these advanced machines need vital parts concealed in their fingertips and joints. The 6-axis force/torque (F/T) sensor is a key technological enabler at the centre of this change;

• Precise Force Control: Enabling Delicate Manipulation
• Safe Interaction: Ensuring Human-Robot Collaboration
• Dynamic Adaptation: Stability Against Complex Terrain
• Dynamic Balance: Delivering Rapid Reflexes

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• Over the next 5 to10 years, the torque sensor market for humanoid robots will shift from a niche, component-level play to a strategically critical enabler of safe, dexterous, and interactive robots.
• Demand will be driven not just by more robots, but by the rising complexity of tasks robots are expected to perform in unstructured human environments.
• Expect the market to emphasize miniaturization, multi-axis accuracy, embedded intelligence, and system-level reliability.

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□ Healthcare & rehabilitation: High demand for torque feedback in exoskeletons, therapy robots, and surgical assistants.
□ Logistics & warehousing: Humanoid pick-and-place and co-bots in constrained human spaces require tactile torque sensing.
□ Service & hospitality: Customer-facing humanoids need compliant, humanlike responses torque sensing is core to that experience.
□ Defence & public safety: Tasks in hazardous environments require high-reliability sensors with diagnostic features.
□ Research & education: Universities and labs will continue to drive innovation and supply talent to industry.

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Intel Market Research is a leading provider of strategic intelligence, offering actionable insights in robotics, automation, and advanced manufacturing technologies. Our research capabilities include:

• Real-time competitive benchmarking
• Global technology innovation monitoring
• Country-specific regulatory and industry analysis
• Over 500+ technology and manufacturing reports annually

Trusted by Fortune 500 companies, our insights empower decision-makers to drive innovation with confidence.

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