

# Global Humanoid Robot Springs Supply, Demand and Key Producers, 2026-2032

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## Abstracts

The global Humanoid Robot Springs market size is expected to reach \$ 679 million by 2032, rising at a market growth of 39.4% CAGR during the forecast period (2026-2032).

In the complex electromechanical systems of humanoid robots, actuators act like 'joints,' while high-precision, highly reliable springs and elastic elements play a crucial role as 'mechanical ligaments.' They are not simply accessories, but core functional components that enable the robot's dexterous, compliant, and safe movement, primarily undertaking key tasks such as cushioning and shock absorption, energy storage and return, force transmission, posture maintenance, and safety assurance. Their applications span the entire robot: in the torso, helical springs can mimic tendons and maintain dynamic balance, while disc springs can provide cushioning and energy storage; in weight-bearing joints such as the hips and knees, disc springs or helical springs effectively absorb impacts and protect precision transmission mechanisms; in the legs, helical springs or spring steel act as resilient bones, enabling high-frequency, rapid walking or jumping; in the ankles, compact combinations of ring springs provide excellent elasticity and damping within limited space, achieving smooth walking and landing cushioning, protecting both the robot and the ground; in the dexterous hand, miniature tension and torsion springs ensure precise gripping and rapid return of the fingers. Research from the Institute of Automation, Chinese Academy of Sciences, indicates that introducing springs or damping elements into rigid actuators to form 'series elastic actuators' (SEAs) can significantly improve the robot's environmental adaptability, force control accuracy, and energy efficiency, representing an inevitable trend in the future development of high-performance robots. In 2025, the global production capacity of humanoid robot springs is estimated at approximately 11.078 million units, with a unit price of approximately US\$5.8 per unit. The industry's gross profit margin is generally between 20% and 35%, and companies have an annual

production capacity of 100,000 units.

With the continuous breakthroughs in the application of humanoid robots in service industries, collaborative manufacturing, medical rehabilitation, and hazardous environments, the demand for precision elastic components in robot systems is rapidly increasing. Humanoid robots require complex joint movements, high-frequency vibration damping, and energy recovery capabilities when performing tasks, thus placing higher performance demands on spring components. Traditional industrial springs, limited by their non-adjustable stiffness, insufficient fatigue life, and poor dynamic performance, are unable to meet the needs of next-generation robot systems, creating a vast market space for high-performance robot springs. Simultaneously, advancements in materials science, computer-aided design and manufacturing technologies, and high-precision machining processes have enabled spring design to achieve adjustable stiffness, nonlinear load response, and optimized load distribution, significantly improving robot joint performance and durability. Furthermore, with the development of third-generation robot joint drive systems, keyed cable technology may gradually replace traditional spring technology, becoming a new trend in joint drive systems. This technological innovation will further improve system flexibility and accuracy, reduce mechanical complexity and energy loss, and may have a certain impact on the traditional spring market. Despite the broad market prospects, the humanoid robot spring market also faces challenges. First, as a crucial component of robot transmission systems, springs directly impact system stability and reliability, resulting in extremely high manufacturing standards and significant supply chain barriers. High-end robot springs typically require complex geometric designs, precision heat treatment, and rigorous fatigue testing, leading to high R&D and manufacturing thresholds and significant challenges in large-scale production. Second, the global robot application market is significantly influenced by macroeconomic cycles, industrial policies, and the pace of capital investment. Especially given the financial pressures faced by emerging robot companies, they are more cautious in their procurement decisions for core components. Furthermore, price fluctuations in spring materials (such as high-strength alloys and shape memory alloys) also disrupt costs. From a downstream demand perspective, the application of springs in humanoid robots is accelerating from experimental R&D to pilot production and industrialization. In industrial manufacturing automation, high-performance spring combinations are crucial components in robot joints and transmission chains, enhancing accuracy and response speed. In service robots, springs are used for leg support, energy recovery, and cushioning structures, reducing power system load and energy consumption. In medical rehabilitation robots, dual-lever spring systems optimize joint compliance and human-robot interaction safety. Furthermore, with the emergence of third-generation joint actuation solutions, keyed-wire actuation technology may

gradually replace traditional spring designs, especially in the field of biomimetic robots requiring high compliance and precise motion control. Compared to springs, keyed-wire technology offers higher degrees of freedom and more precise control while avoiding the fatigue problems of traditional springs. In the coming years, with the large-scale deployment of humanoid robots and the expansion of high-end applications, the market demand for springs as core transmission and buffering components is expected to continue to grow, but the trend of keyed-wire replacing springs may impact the market structure.

This report studies the global Humanoid Robot Springs production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Humanoid Robot Springs and provides market size (US\$ million) and Year-over-Year (YoY) Growth, considering 2025 as the base year. This report explores demand trends and competition, as well as details the characteristics of Humanoid Robot Springs that contribute to its increasing demand across many markets.

### **Highlights and key features of the study**

Global Humanoid Robot Springs total production and demand, 2021-2032, (K Units)

Global Humanoid Robot Springs total production value, 2021-2032, (USD Million)

Global Humanoid Robot Springs production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (K Units), (based on production site)

Global Humanoid Robot Springs consumption by region & country, CAGR, 2021-2032 & (K Units)

U.S. VS China: Humanoid Robot Springs domestic production, consumption, key domestic manufacturers and share

Global Humanoid Robot Springs production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (K Units)

Global Humanoid Robot Springs production by Type, production, value, CAGR, 2021-2032, (USD Million) & (K Units)

Global Humanoid Robot Springs production by Application, production, value, CAGR, 2021-2032, (USD Million) & (K Units)

This report profiles key players in the global Humanoid Robot Springs market based on the following parameters - company overview, production, value, price, gross margin, product portfolio, geographical presence, and key developments. Key companies covered as a part of this study include John Evans' Sons, Newcomb Spring, Lee Spring, Kern Liebers, Vulcan Spring, Mario Schaaf GmbH & Co. KG, Associated Spring, Access

Spring, Katy Spring, European Springs, etc.

This report also provides key insights about market drivers, restraints, opportunities, new product launches or approvals.

Stakeholders would have ease in decision-making through various strategy matrices used in analyzing the World Humanoid Robot Springs market

### **Detailed Segmentation:**

Each section contains quantitative market data including market by value (US\$ Millions), volume (production, consumption) & (K Units) and average price (US\$/Unit) by manufacturer, by Type, and by Application. Data is given for the years 2021-2032 by year with 2025 as the base year, 2026 as the estimate year, and 2027-2032 as the forecast year.

### Global Humanoid Robot Springs Market, By Region:

United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

### Global Humanoid Robot Springs Market, Segmentation by Type:

Tension Spring

Compression Spring

Torsion Spring

Wave Spring

Disc Spring

Snap Ring

Global Humanoid Robot Springs Market, Segmentation by Material:

Chromium Alloy

Nickel-Titanium Alloy

Other

Global Humanoid Robot Springs Market, Segmentation by Channel:

Direct Selling

Distribution

Global Humanoid Robot Springs Market, Segmentation by Application:

Robot Torso

Robot Dexterous Hand

Others

Companies Profiled:

John Evans' Sons

Newcomb Spring

Lee Spring

Kern Liebers

Vulcan Spring

Mario Schaaf GmbH & Co. KG

Associated Spring

Acxess Spring

Katy Spring

European Springs

Myers Spring

Tokai Spring industries, Inc.

Lesjofors Group

Hwaway Technology Corporation

Freewon China Co.,Ltd.

Zhejiang Meili High Technology Co.,Ltd.

### **Key Questions Answered:**

1. How big is the global Humanoid Robot Springs market?
2. What is the demand of the global Humanoid Robot Springs market?
3. What is the year over year growth of the global Humanoid Robot Springs market?
4. What is the production and production value of the global Humanoid Robot Springs market?
5. Who are the key producers in the global Humanoid Robot Springs market?

6. What are the growth factors driving the market demand?

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