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Global Bearings in Humanoid Robots Supply, Demand and Key Producers, 2026-2032

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Abstracts

The global Bearings in Humanoid Robots market size is expected to reach $ 856 million by 2032, rising at a market growth of 45.5% CAGR during the forecast period (2026-2032).

Humanoid robots are emerging as a new class of multi-axis, human-scale machines designed to operate in environments originally built for people. Their joints must deliver high torque, wide range of motion, and precise, repeatable positioning under complex, multi-directional loads. Bearings are a foundational element of this motion system: in robotics they provide low-friction rotation, maintain alignment under dynamic loads, and enable the precision needed for industrial, collaborative and service robots.

Within this context, humanoid robot bearings form a distinct niche inside the broader robot bearings market. They combine the functional requirements of high-end industrial robots with the size, weight and safety constraints specific to humanoid form factors.

Bearings in Humanoid Robots, as defined in this report, refer to the family of rolling-element bearings and closely related support components that provide motion support for humanoid robot joints and load-bearing structures. Compared with bearings used in traditional industrial robots or general machinery, humanoid robot bearings must operate in highly compact, anthropomorphic envelopes, withstand complex combinations of radial, axial and overturning loads, and support backdrivable, low-friction, low-noise motion suitable for close interaction with humans. They are key mechanical elements in hips, knees, ankles, shoulders, elbows, wrists, necks, waists and dexterous hands, and they directly influence the robot?s stiffness, dynamic stability, energy efficiency and safety.

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From a product-type perspective, the report classifies humanoid robot bearings into six major categories: deep groove ball bearings, four-point contact bearings, angular contact bearings, crossed-roller bearings, flexible bearings, and other bearings.

? Deep groove ball bearings are widely used in motors, intermediate shafts and moderate-load rotational elements. In humanoids they often appear in high-speed joint drives and auxiliary axes where good speed capability, low noise and acceptable stiffness are required at relatively low cost.

? Four-point contact bearings provide combined radial and axial load capacity in a single row and are applied in compact joints and structural pivots where bidirectional thrust and space constraints rule out multi-row arrangements.

? Angular contact bearings support higher axial loads and stiffness, frequently in paired or back-to-back configurations. They are important in motor shafts, ball-screw supports and reducer interfaces that demand accurate positioning and torque transmission.

? Crossed-roller bearings are a hallmark of humanoid joints: by crossing cylindrical rollers at 90?, they can carry radial, axial and moment loads simultaneously, making them ideal for hip, knee, shoulder and wrist joints that experience large bending moments and complex dynamic loads.

? Flexible bearings (flexspline bearings) are thin-walled, deformable bearings used inside strain-wave/harmonic drives and other compact, high-ratio reducers. They must accommodate cyclic elastic deformation while maintaining fatigue life, precision and controlled torque ripple, and they are central to high-torque, high-reduction humanoid joint modules.

? The ?other bearings? category includes tapered-roller, cylindrical-roller, spherical plain, miniature bearings, linear guides and customised units?covering specific needs in reducers, linear joints, torso support structures and non-standard DOFs.

In addition to type-based classification, the report maps humanoid robot bearings by humanoid structure and joint application. By structure, the main buckets are neck, waist, arm, leg, dexterous hand and other structures, corresponding to where the bearing sits in the humanoid body. Quantitative modelling shows that leg and arm bearings account for the largest share of market value, reflecting the high forces and joint counts involved in bipedal locomotion and manipulation, while dexterous hand bearings are the fastest-growing category as humanoids adopt higher-DOF hands for industrial and service

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tasks. By joint application, the report distinguishes linear joints, rotational joints, dexterous hand joints and other joints, each with different load cases, packaging constraints and ASP trajectories. Rotational joints dominate both volume and value, but linear and dexterous joints impose specific design demands on noise, friction, backlash and fingertip force resolution.

In 2025, the global production of Bearings in Humanoid Robots is estimated at 1,836,750 units, with an average selling price of US$18.4 per unit and a gross profit margin of approximately 22.93%.

The global Bearings in Humanoid Robots market is at a very early but extremely fast-accelerating stage. In value terms, the market expanded from around US$0.62 million in 2021 to about US$33.80 million in 2025, and is projected to reach roughly US$871.69 million by 2032. This implies an average annual growth rate of over 170% during 2021?2025, a sharp step-up in 2025?2026 as large pilot fleets are launched, and a still-very-high CAGR of about 46.6% in 2026?2032 as humanoid robots ramp from demonstrators to scaled deployment. Pricing trends at the joint level show that average selling prices (ASPs) per humanoid robot bearing fall from roughly US$30 per unit in 2021 to about US$18 in 2025 and US$12?13 by 2032, indicating that revenue growth is driven primarily by explosive unit-volume expansion and progressive standardisation rather than price inflation.

From a product-type perspective, the market is segmented into deep groove ball bearings, four-point contact bearings, angular contact bearings, crossed-roller bearings, flexible bearings (for example flexspline bearings in harmonic drives), and other bearings. In 2025, deep groove and crossed-roller bearings together account for just over half of global revenue, while flexible bearings remain a smaller but rapidly scaling niche. By 2032, the mix shifts markedly: flexible bearings are expected to contribute roughly one-third of total market value, with crossed-roller bearings at just above 20%, and deep-groove and angular-contact bearings together falling below one-third. This reflects the increasing penetration of strain-wave and other compact, high-ratio drive systems in humanoid joints, as well as the central role of large-diameter crossed-roller rings in hips, knees, shoulders and integrated joint modules.

Viewed through the lens of humanoid robot structure, bearings serving legs and arms form the core of market demand. In 2025, leg joints account for around 40?45% of humanoid robot bearing revenue, with arm joints contributing roughly a quarter; neck, waist and ?other? structural positions together remain below 20%. By 2032, leg and arm bearings still dominate, but the dexterous hand category becomes a major growth

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engine: its revenue share roughly doubles from the low-teens in 2025 to about one-fifth of the total market by 2032, supported by the proliferation of multi-fingered end-effectors and higher joint counts per humanoid. This structural view underlines that most of the value pool is tied to high-load locomotion joints and high-DOF manipulation joints.

Geographically, the humanoid robot bearings market is highly asymmetric. In 2025, Asia-Pacific already contributes more than 90% of global sales value, or about US$30.86 million out of US$33.80 million, driven primarily by China?s rapid build-out of humanoid robot platforms, joint modules and robot-grade bearing capacity. North America and Europe together represent less than 10% at this stage. Looking ahead to 2032, regional revenue is forecast to reach about US$598.48 million in Asia-Pacific, US$134.91 million in North America, US$105.37 million in Europe, with Latin America and the Middle East & Africa growing from a very small base. Asia-Pacific?s share is expected to normalise from above 90% to roughly 70%, while North America and Europe collectively approach 30%, reflecting the spread of humanoid applications and supply capacity from China to other major industrial regions.

At the level of joint application, the report identifies linear joints, rotational joints, dexterous hand joints and other joints as distinct ASP and value buckets. Rotational joints represent the largest and most technically demanding category, requiring bearings that combine radial, axial and moment-load capacity in compact envelopes and are often integrated directly into high-ratio gearheads. Linear joints typically rely on recirculating ball guides or similar components and remain a minority share of total unit volume but are strategically important for certain tasks and underactuated mechanisms. Dexterous hand joints emphasise miniaturisation, low friction torque and tight torque dispersion, as they directly determine manipulators? precision and haptic behaviour. Overall, joint-level ASPs trend steadily downward across all categories through 2032, with rotational joints retaining the highest absolute price level and ?other joints? showing the largest ASP compression as volumes scale.

On the supply-side, humanoid robot bearings are emerging as a premium niche within the broader bearing industry. The value chain requires integrated control of metallurgy, heat treatment, precision grinding, super-finishing, metrology, contamination control and life testing, coupled with application-specific engineering for backdrivability, stiffness, noise and safety.

Capacity is ramping from negligible levels in 2021 to sizeable volumes by 2026, with a number of companies planning tens of millions of units of annual capacity across thin-wall, flexible and crossed-roller families.

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Japan, Europe and China lead in high-precision capability, with China building dense clusters in Zhejiang, Shanghai, Henan, Shandong and Fujian as major global bases for robot-grade bearings and joint modules.

Profitability is currently attractive: humanoid-grade bearings typically exhibit gross margins in the high-20% to mid-30% range for global majors and precision specialists, and up to the 40?50% range for some focused Chinese humanoid platforms during the initial scale-up window.

However, the market also faces material, capacity and regulatory constraints. Volatility in high-grade bearing steel pricing, shared use of precision manufacturing assets across multiple high-end bearing segments, and geographic concentration of advanced bearing and actuator capabilities all create supply-chain risks for humanoid programs. On the economic side, high R&D and manufacturing costs for humanoid systems exert strong cost-down pressure on key components, while early generations of humanoid bearings still involve customised, low-volume designs that limit economies of scale. Evolving safety standards and prospective humanoid-specific norms will raise documentation, traceability and qualification requirements for bearings used in safety-critical joints.

Overall, the report concludes that humanoid robot bearings will evolve from a tiny, project-driven niche into a large, structurally growing component market over 2026?2032. Value creation will concentrate in bearings and integrated joint modules that directly enable dynamic bipedal locomotion, high-DOF manipulation and long-life, low-noise service operation, while more generic positions gradually commoditise. For bearing manufacturers, success will depend on early co-design with humanoid OEMs and joint-module suppliers, disciplined capacity ramp-up, and careful navigation of cost, qualification and safety requirements along the path from prototypes to mass deployment.

This report studies the global Bearings in Humanoid Robots production, demand, key manufacturers, and key regions.

This report is a detailed and comprehensive analysis of the world market for Bearings in Humanoid Robots 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 Bearings in Humanoid Robots that contribute to its increasing demand across many markets.

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Highlights and key features of the study

Global Bearings in Humanoid Robots total production and demand, 2021-2032, (K Units)
Global Bearings in Humanoid Robots total production value, 2021-2032, (USD Million)
Global Bearings in Humanoid Robots production by region & country, production, value, CAGR, 2021-2032, (USD Million) & (K Units), (based on production site)
Global Bearings in Humanoid Robots consumption by region & country, CAGR, 2021-2032 & (K Units)
U.S. VS China: Bearings in Humanoid Robots domestic production, consumption, key domestic manufacturers and share
Global Bearings in Humanoid Robots production by manufacturer, production, price, value and market share 2021-2026, (USD Million) & (K Units)
Global Bearings in Humanoid Robots production by Type, production, value, CAGR, 2021-2032, (USD Million) & (K Units)
Global Bearings in Humanoid Robots production by Application, production, value, CAGR, 2021-2032, (USD Million) & (K Units)

This report profiles key players in the global Bearings in Humanoid Robots 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 Luoyang Hongyuan (HONB), THK, Nippon Thompson (IKO), SKF, Changzhou NRB, NSK, Haina Renhe, Shandong Bote, Ningbo Shilong (RCL), Schaeffler, 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 Bearings in Humanoid Robots 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 Bearings in Humanoid Robots Market, By Region:

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United States

China

Europe

Japan

South Korea

ASEAN

India

Rest of World

Global Bearings in Humanoid Robots Market, Segmentation by Type:

Deep Groove Ball Bearing

Four Point Contact Bearings

Angular Contact Bearing

Crossed Roller Bearing

Flexible Bearings

Others

Global Bearings in Humanoid Robots Market, Segmentation by Robot Structure:

Neck

Waist

Arm

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Leg

Dexterous Hand

Other

Global Bearings in Humanoid Robots Market, Segmentation by Joint Application:

Linear Joints

Rotary Joints

Dexterous Hand Joint

Global Bearings in Humanoid Robots Market, Segmentation by Application:

High-priced Humanoid Robots

Low-priced Humanoid Robots

Companies Profiled:

Luoyang Hongyuan (HONB)

THK

Nippon Thompson (IKO)

SKF

Changzhou NRB

NSK

Haina Renhe

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Shandong Bote

Ningbo Shilong (RCL)

Schaeffler

Cixing Group

CCTY

Timken

Wanxiang Qianchao

Nachi-Fujikoshi

HIWIN

Luoyang Xinkai

XCC Group

JTEKT

Kitanihon Seiki

Changsheng Bearings (CSB)

MinebeaMitsumi

C&U

Zhejiang Qisheng

Tiejin Technology (STT)

LS Bearings

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Shanghai SXD

Lyprs

Key Questions Answered:

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

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