

Robot End-Effector - Market Share Analysis, Industry Trends & Statistics, Growth Forecasts 2019 - 2029

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Report description:

The Robot End-Effector Market size is estimated at USD 5.12 billion in 2024, and is expected to reach USD 9.81 billion by 2029, growing at a CAGR of 13.93% during the forecast period (2024-2029).

The rapidly growing market for automation has increased the demand for deploying robotics systems across various end-user industries globally, driving the need for robot end-effectors.

Key Highlights

-End-effectors, otherwise mentioned as end-of-arm tooling (EOAT), are peripheral devices attached to a robot's wrist, allowing it to interact with its task. The majority of the EOATs are either mechanical or electromechanical. Serving the pick and drop via grippers, process tools, or sensors, they range from two-fingered grippers to incorporating complex sensor systems for advanced robotic inspection.

-The advancement in industrial and collaborative robot arms has been growing, with the end-effector evolution becoming rapid in the past few years. This is partially driven by the demand for dexterous manipulation in pick-and-place operations such as e-commerce order fulfillment. The end effectors of current times are becoming more intelligent and potent as a machine learning software. Safety features are increasingly being combined within the EOAT and the ability to adapt to its environment using machine vision. For example, conveyors are being replaced with automated guided vehicles, transporting bins containing mixed products in specific applications.

-As robots are working even more closely with humans, there is a need for them to be able to respond to the users and adapt their behaviors. Over the next few years, researchers are anticipated to recognize basic human behaviors and adapt these actions of robots to respond to them. Over the next few years, this would develop into much more advanced programs adapting to complex task needs.

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-Further, government initiatives across countries encourage robotics adoption to augment the demand for end-effectors. For instance, the U.S. Federal Government has commenced a program called the National Robotics Initiative (NRI) to bolster the capabilities of building domestic robots in the country and encourage research activities in the field. In February 2021, The National Science Foundation (NSF) issued a new initiative, NRI-3.0. NRI-3.0 is supported by multiple agencies of the federal government, including NSF, the U.S. Department of Agriculture (USDA), the National Aeronautics and Space Administration (NASA), the Department of Transportation (DOT), the National Institutes of Health (NIH), and the National Institute for Occupational Safety and Health (NIOSH).

-Emerging markets are more slanted toward automation due to intense competition in the market and the need to improve product quality and the speed of production. This led to several robotic innovations, including end-effectors for various surfaces and different degrees of freedom, to handle routine tasks.

-However, the expense of installing the robotic end-effectors in the industrial sector is significant, often incurring higher installation costs. Furthermore, they are susceptible to damage considering the nature of their work in heavy industrial sectors, making their replacement cost. These are some of the primary factors challenging the growth of the studied market.

-The COVID-19 outbreak and the lockdown restriction imposed across the world have affected capital investments and industrial activities across the world. Following the global economic recession led by COVID-19, the market studied has witnessed mixed impacts across 2020 and 2021. Many enterprises operating in the end-user industries (majorly manufacturing and automotive) had shut down their production sites due to lockdown restrictions. However, with the condition returning to the new normal, the market is expected to gain traction during the forecast period.

Robot End Effector Market Trends

Growing Installation of Robots to Drive the Growth of the Market

- In recent years, the robotics industry has witnessed a significant surge in demand as the advancement and commercialization of technologies, such as automation, IIoT, AI & ML, etc., has significantly expanded the use cases of robots. Technological advancement has also impacted the robotics industry, paving the way for developing innovative, low-cost robots.

- The increasing penetration of digital technologies further drives investment in robots in the industrial, commercial, and domestic end-user verticals. Furthermore, supportive government regulations and initiatives such as "Industry 4.0" and Smart City are creating a favorable market scenario for the growth of the robotics and the end-effector market. According to the International Federation of Robotics (IFR), the annual installation of industrial robots is expected to reach 518 thousand units in 2024, from 254 thousand units in 2015. Such trends are also likely to impact the demand for robotic end-effectors similarly.

- The increasing investment in industrial robots is evident from the fact that, in 2021, industrial robot sales increased by about 27% compared to the previous years, with the shipment of industrial robots reaching 486,800 units globally - an increase of 27% compared to the. Asia/Australia was the leading demand driver, followed by the Americas, wherein the shipment increased by 27% to 49,400 units, and Europe, which also registered a growth of 15% with 78,000 units installed.

- With the increasing installation of industrial robots, the safety of robots and the surrounding environment is slowly coming to the forefront for industries. Keeping such emerging trends in product development strategies, University at Buffalo has developed a two-fingered dynamic gripper that could contribute to better grasping and improve safety for robots that work around people. The design of the robotic hand enables it to absorb energy from impacts during collisions.

Asia Pacific to Witness the Highest Growth

- Rapid growth in modernization & industrialization across the region and most of the production industries shifting towards

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automation of their process methods to reduce the workforce drive the market's growth in the Asia-Pacific region. Additionally, collaborative robots are deployed in the electronics, automotive, and other sectors to increase productivity.

- Industry 4.0, the newest industrial revolution, has boosted the development of new technologies, like collaborative robots; AI-enabled robots have enabled enterprises to use robots to increase efficiency, eliminate errors, and streamline many processes. Increased workplace safety and enhanced production capabilities have encouraged industries to invest in robotic systems.
- The presence of countries with high investments and initiatives in the specialized automation area has aided in adopting robots in the region. Japan can be regarded as one of the leaders in the employment of robotics and automation in the production processes with the highly developed robotic sector and automation technologies. For instance, according to Japan Robot Association (JARA), during the period April - June 2022, the production of robots increased 5.7% year-on-year to 221.7 billion yen, while the shipment value increased by 5.2% year-on-year to 219.8 billion yen.
- The supportive government regulation across various countries of the Asia Pacific region is further promoting the growth of the robotics industry. For instance, In December 2021, the Ministry of Industry and Information Technology, China, announced a five-year plan for robotics. The project aims to result in the average annual growth rate of operating income in the robotics industry exceeding 20% by 2025. The five-year plan set a vision to expand robotic applications to support the increasing number of robots in the country. It also aims to develop a more stable supply chain and better standardize the industry.
- Furthermore, in the current market scenario, manufacturers are facing many challenges, such as balancing production efficiency and quality, declining industrial workforce due to the aging population, health, and safety concerns, among others. However, the COVID-19 outbreak has pushed the region into a hyperdrive of technological adoption which expected to create significant growth opportunities for the studied market.

Robot End Effector Industry Overview

The robotic end effector market is growing in competition due to strong growth in industrial robot demand in warehouses and semiconductor plants, which benefits end-effector manufacturers. Key strategies adopted by the vendors operating in the studied market include new product development, collaboration, mergers, and acquisitions. Some major players operating in the studied market include ABB Ltd., DESTACO Europe GmbH, Zimmer Group, etc.

- September 2022 - ASTM International's robotics, automation, and autonomous systems (F45) committee has formed a new subcommittee on grasping and manipulation. The primary focus of the new subcommittee would be to develop standards for the performance of grasping type end-effectors, robotic assembly systems, and mobile manipulators, covering their use in fixed and mobile base systems.
- August 2022 - GITAI USA Inc., a leading space robotics company, developed the GITAI IN1, an inchworm-type robotic arm equipped with 'grapple end-effectors ' on both ends of the arm. This unique feature enables it to connect to various tools/end effectors to perform multiple tasks for different applications, and the mobility feature allows it to move in any direction.

Additional Benefits:

- The market estimate (ME) sheet in Excel format
- 3 months of analyst support

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