

The Robotics & Automation Industry in Germany

ISSUE 2025

Germany's robotics and automation (R&A) industry has enjoyed unprecedented success over the last decade. Sector growth will be largely driven by international demand: The industry is forecasting an overall increase in sales of two percent to EUR 16.5 billion for the year 2024.

Global R&A Trends

The global industrial robotics market size was estimated at just under USD 34 billion in 2024 and is projected to grow at a CAGR of almost 10 percent for the period 2025 to 2030. Global trends driving forecast demand include AI and machine learning, cobots, mobile manipulators, digital twins, and humanoid robots.

Fast-growing Market

Robotics and automation in Germany will grow faster than the global market through to 2028. Germany will become a service robotics leader in application areas as diverse as transportation and logistics, lab automation, medical robotics, hospitality, and professional cleaning by 2028, with technologies being scaled to meet the demands of European and international markets.

Europe's R&A Technology Hub

Germany is one of the five major markets for industrial robots. The R&A sector in Germany is set to generate turnover of around EUR 16.5 billion in 2024 according to the VDMA Robotics + Automation association.

HRC and MV Leadership

Human-robot collaboration (HRC) and machine vision (MV) technologies are considered major strengths in a global hub that boasts robotics players from all market segments. Machine vision counts as one of the major growth sectors in the R&A industry and has become the key technology for the automation industry worldwide. The global MV market is expected to grow at a CAGR of 7.3 percent from 2023 to 2028.

The R&A Industry in Numbers

USD 34 billion

global industrial robotics market size

4.3 million

industrial robots operating in factories around the world

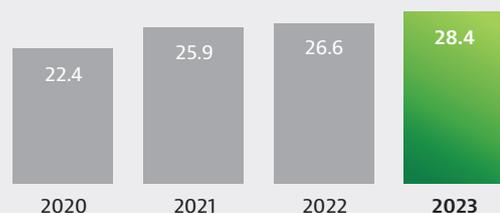
European #1

FDI location for robotics and automation

429 industrial robots

per 10,000 employees in Germany – highest density level in the manufacturing industry in Europe

Annual Industrial Robots Installations in Germany in thousand units



Sources: Statista, International Federation of Robotics (IFR), Grand View Research, Boston Consulting, 2024

MARKET OPPORTUNITIES

Innovative R&A Sectors

Industry Segmentation

According to VDMA classification, the R&A industry can be divided into three innovative sectors: robotics, integrated assembly solutions and machine vision technologies. The VDMA R+A Association represents around 400 companies.

- **Robotics**

The robotics industry can be divided into two categories: industrial robots and service robots. Industrial robots represent the core of automation in production technologies. With double digit growth rates, professional service robots are also gaining increasing importance in the market. Turnover in the German robotics industry (robots, systems, and peripherals) grew by almost 20 percent to EUR 4.2 billion.

- **Integrated Assembly Solutions**

The integrated assembly solutions sector mainly focuses on the creation of new hardware and components needed for tasks such as forming, measuring and testing.

- **Machine Vision Technologies**

Machine vision systems allow machines to see and comprehend. Application fields are diverse and include areas such as components identification, quality control and data collection.

Machine Vision

Automation and the implementation of machine vision (MV) technology help make consistently high quality, permanent traceability and 100 percent production accuracy a reality. High levels of production flexibility can be achieved and product changes quickly realized using efficient automation solutions. Germany is the most important sales market for the European image processing industry, with more than 30 percent of total industry turnover generated domestically. The machine vision industry in Germany – and in Europe too – has been growing at a fast rate over the past decade, with turnover in the domestic industry doubling during the period 2008 to 2022. Beyond the automotive industry and the electrical and electronics industries (including semiconductors), other sectors – including the metal, food, and packaging as well as non-manufacturing industries (e.g. intelligent traffic technology, medical diagnostic equipment and surgical technologies) – are increasingly making use of machine vision technology. Machine vision plays a pivotal production optimization role in Industrie 4.0 thanks to its peerless data gathering and analysis capabilities.

Service and Assistance Robots

The global market for professional service robots increased by 30 percent in 2023. Germany has the third-highest density of service robot suppliers (after the USA and China). The majority of service and medical robot manufacturers are based in Europe with a global market share of 44 percent, followed by

Asia (29 percent) and the Americas (25 percent) respectively. The service robotics sector is growing at a fast pace, providing space to new companies developing innovative service robot applications or improving existing concepts. More than eighty percent of the world's service robot suppliers are SMEs. One in every three professional service robots sold in 2023 was made for the transportation of goods and cargo, with segment growth up 35 percent. Germany has a very high proportion of professional service robot manufacturers, with a share of 79 percent. A total of 17 percent offer consumer applications and 12 percent medical robots.

Global Professional Service Robot Sales 2022-2023

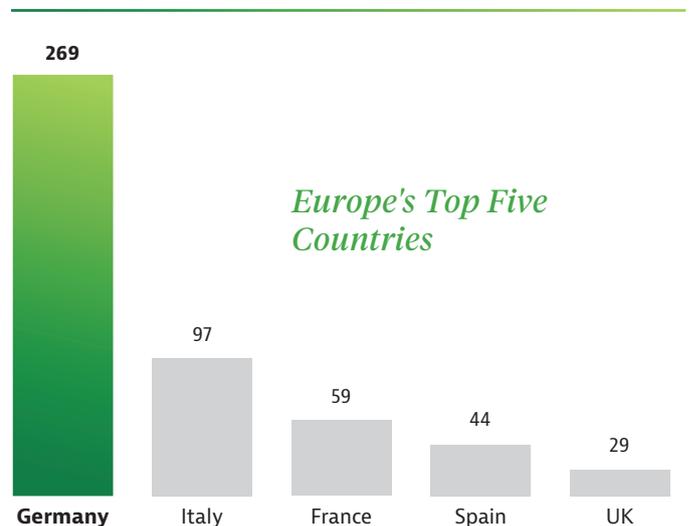
growth in percent

Transportation and Logistics Robots	35%
Hospitality Robots	31%
Agricultural Robots	21%
Healthcare Robots	
<i>Medical Robots</i>	36%
<i>Rehabilitation and Non-invasive Therapy Robots</i>	128%
<i>Surgery Robots</i>	14%
<i>Diagnostics Robots</i>	25%
Professional Cleaning Robots	4%

Source: IFR 2024

Industrial Robots Operational Stock 2023

in thousand units



Source: IFR 2024

INDUSTRIE 4.0 and Cobots

Industrie 4.0 is the international by-word for intelligent, networked production – with Germany consolidating its reputation as the world's factory outfitter and a country capable of meeting the challenges of the digital age. Collaborative robots ("cobots") complement production in smart factory environments and make digital manufacturing affordable for SMEs not previously able to access to such turnkey solutions.

Manufacturing-X

Established in 2024, the VDMA's Manufacturing-X Forum is the successor initiative to the Industrie 4.0 Forum. The new project seeks to make easily available, secure and consistent data networking an Industrie 4.0 reality. A data ecosystem that enables the trustworthy exchange of data using open standards between companies – whilst maintaining digital sovereignty – will be established.

AI Robots

Technological breakthroughs, particularly in artificial intelligence (AI), are of central importance for robotics. AI-based robots should be able to carry out complex tasks independently in unstructured and constantly changing environments.

Robot-based Automation

Demand for robot-based automation is being driven by AI and machine learning advances. Simplified programming, mobile manipulators, digital twins, swarm robots, and humanoid robots are similarly expanding the portfolio of available cobot applications.

Widespread Cobot Adoption

Within Germany alone, projected sales of more than 71,000 cobot units are forecast for 2025. Human-robot-collaboration is increasingly being adopted. According to the International Federation of Robotics (IFR) cobots had a market share of six percent of all installed industrial robots worldwide in 2023, with the sector very much still in its infancy. Market analyst markets and markets predicts a compound annual growth rate of more than 35 percent in the collaborative robot market for the period 2024 to 2030 (USD 1.9 bn 2024 up to USD 11.8 bn 2030).

Humanoid Cobots

Humanoid cobots and their use in production and logistics are expected to be ready for the market as early as 2025 according to Horváth Partners. They will increasingly find their way into the production halls of large industrial companies as humanoid robot mass production ramps up in 2025.

Application Segments

The automotive industry is the leading client sector for industrial robots in Germany. According to the VDMA, the automotive industry and its suppliers are investing in electric and hybrid drive technologies that insist upon new production processes and equipment – particularly in the area of battery production. Beyond big industry, many SMEs are now looking at industrial robot implementation as a solution to increase production system flexibility.

Collaborative Robot Systems Regulations

A number of standards, rules and regulations have been established in Europe to provide practical guidance to cobot manufacturers, system integrators, users, and other interested parties.

Collaborative robot systems...

- comprise the cobot, the robot arm-adapted tool used to perform tasks (and objects moved by it), workpieces, and devices that constitute machinery according to the EC Machinery Directive 2006/42/EC;
- are subject to the EC Machinery Directive and require an EC Declaration of Conformity and CE Mark before being placed on the market;

- safety standards are defined within the revised EN ISO 10218 standards 1 and 2 as well as the ISO/TS 15066 specification;
- require a collision risk assessment that covers the industrial workplace in accordance with the two standards outlined above and the EC Machinery Directive.

Legal requirements, standardization and safety requirements for manufacturers and operators – Germany Trade & Invest brings you in contact with all of the relevant partners, associations and service providers. Contact: invest@gtai.de

Supporting Business Success

A Tradition of Engineering Quality

German R&A industry strength is driven by a combination of Germany's proven engineering tradition, technological leadership and its highly diversified industrial base. The machinery and equipment (M&E) sector is one of the technological motors that drive Germany as a high-tech nation – combining all of the key future technologies including materials, electronics, software, AI, and robotics. Researchers, companies and employees active in the R&A industry profit from Germany's excellent reputation and global know-how. The "Made in Germany" quality seal has long been recognized as a sign of engineering excellence and precision across the globe.

Europe's Leading R&A Investment Location

Germany was Europe's leading FDI destination country for R&A investments during the period 2019 to 2023 according to research conducted by Germany Trade & Invest's FDI Competence Center. The country is similarly the continent's leading destination country for M&E inward investment – with R&A investment projects accounting for 36 percent of all M&E direct investment. More than 200 FDI projects in the R&A sector were made in Germany during this five-year period, with the top source countries being the USA, Switzerland, Japan, and China in that order.

Supporting Digital Platforms – PAiCE

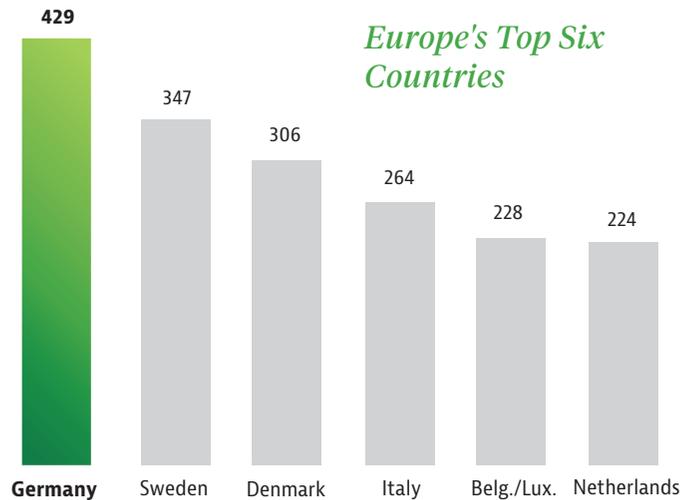
Germany actively supports the use of new digital technologies within the industry as part of its High-Tech Strategy. The PAiCE program provides funding of EUR 50 million over a five-year period for the development of digital industry platforms as well as collaboration between companies making use of these technologies. Major application areas include the creation of platforms for service robotics solutions in manufacturing, logistics, and in service sectors.

Generous Public Incentives

Germany offers numerous incentives for all investors – regardless of country of provenance. There is a large selection of programs designed to support a wide variety of business activities at different stages of the investment process. These range from cash incentives for the reimbursement of direct investment costs to support for research and development and labor. The German government also has a national AI strategy aimed at making the country a global AI leader. This includes significant investment in R&D as well as the integration of AI technologies into businesses. The federal government will support companies, research institutes and academics with non-refundable cash grants. Within the "Together through Innovation" research program which promotes interactive technologies for health and quality of life, Germany's Federal Ministry of Education and Research will provide around EUR 80 million annually in grants up to 2026.

Robot Density in the Manufacturing Industry 2023

number of installed industrial robots per 10,000 employees



Source: IFR 2024

Academic Study Programs

Germany provides access to a network of universities highly active in the field of mechanical engineering with a special range of robotics and automation study programs. Around 300 automation and robotics-related study programs are currently available. German industry also enjoys a global reputation for its high R&D activity. Germany boasts numerous universities and institutions offering advanced degrees in AI and robotics. Current plans expect to see study places doubled in number by 2028.

R&A Research and Development

Research and Innovation in Europe

Launched in 2021, Horizon Europe is the 9th Framework Program of the European Union (EU) for Research and Innovation and the successor program to Horizon 2020. The EU initiative has assigned a budget of EUR 95.5 billion for the period 2021 to 2027. Robotics-related R&D activities focus on the digital transition in the manufacturing and construction sectors, autonomous solutions, enhanced cognition, and human-robot collaboration. A budget of around EUR 200 million has been allocated for these activities within the framework of the "Digital, Industry, and Space" cluster.

Clusters, Networks and Research Institutes

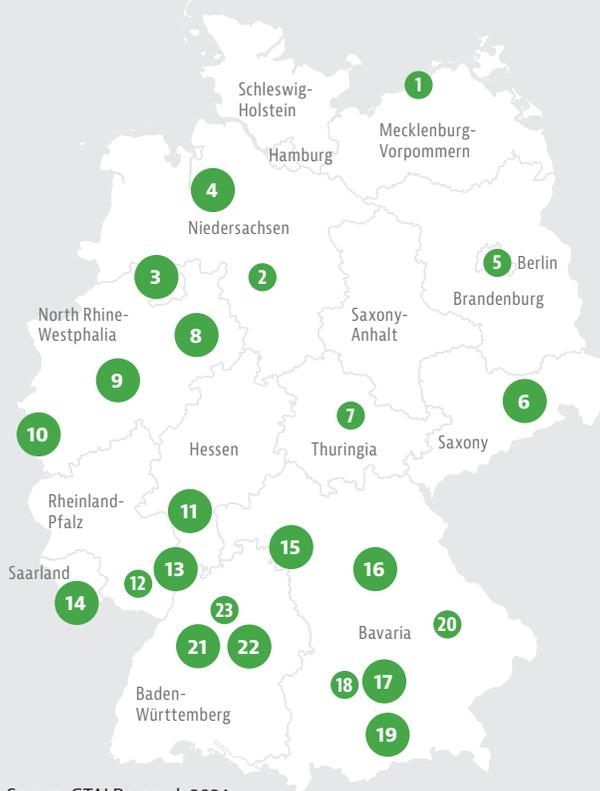
Regional innovation clusters help bridge the gap between science and industry. Stakeholders are organized in multiple regional clusters such as the Robot Valley Saxony. The country's specific strength in the development and manufacturing of robotics is further illustrated by the existence of specialized clusters such as the Robotics and Mechatronics Center at the German Aerospace Center (DLR). Several Fraunhofer-Gesellschaft research institutes are also actively conducting research in the areas of automation, robotics and

related fields. These include the Institute for Manufacturing Engineering and Automation (IPA), Institute for Production Systems and Design Technology (IPK), Institute for Factory Operation and Automation (IFF), and the Institute for Intelligent Analysis and Information Systems (IAIS). VDMA R&A has entered into a partnership with andugo working on the latter's GO2automation platform. The joint objective is to provide SMEs with AI-supported platform networking in automation.

Germany Trade & Invest – A Strong Partner

Germany Trade & Invest provides direct access to all of the relevant actors in the German R&A industry. As the hub for a far-reaching network at both home and abroad, GTAI maintains close relations with all clusters, networks and research institutions. Our industry experts support you in finding project partners for your research project in special and new robotics application fields. Germany's modern research infrastructure and the expertise of university and non-university research institutes are also at your disposal. Germany Trade & Invest also helps identify relevant funding incentives options for establishing your research facility in Germany.

Selected Robotics and Automation Clusters and Networks



Selected Clusters and Networks

- 1 Centre for AI
 - 2 RoboHub Niedersachsen
 - 3 Agrotech Valley
 - 4 Robotics Innovation Center / DFKI (German Research Center for AI)
 - 5 Technology Hub Robotics Berlin
 - 6 Robot Valley Saxony
 - 7 Cluster Thuringia - Industrial production
 - 8 It's OWL
 - 9 Digital Hub Dortmund
 - 10 REGINA - ICT Network Aachen
 - 11 Automation region Rhein Main Neckar
 - 12 Digital Farming
 - 13 5-HT Digital Hub Chemistry & Health
 - 14 Robotix-Academy (Interreg)
 - 15 Automation Valley North Bavaria
 - 16 Medical Valley Nürnberg / MedTech Pharma
 - 17 Cluster Mechatronic and Automation
 - 18 AI production network Augsburg
 - 19 Institute of Robotics and Mechatronics/ DLR (German Aerospace Center)
 - 20 Sensoric Bavaria
 - 21 Allianz Industrie 4.0
 - 22 BIOPRO/Medtech
 - 23 Intralogistics network
- Small cluster (up to 85 member)
 - Medium-sized cluster (85 - 200 or more member)

Source: GTAI Research 2024

Our Support for Your Business in Germany

Germany Trade & Invest (GTAI) is the foreign trade and inward investment agency of the Federal Republic of Germany. We advise and support foreign companies planning to expand into the German market and assist German companies seeking to enter global markets.

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