"Fourteenth Five-Year Plan for the Development of the Robot Industry

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Robotics is known as "the crown jewel of the manufacturing industry", its research and development, manufacturing,

Application is an important symbol of a country's level of scientific and technological innovation and high-end manufacturing. At present, the robotics industry is booming, greatly changing the way of human production and life, and injecting strong kinetic energy into economic and social development. In order to accelerate the high-quality development of the robotics industry, this plan is formulated on the basis of the Outline of the Fourteenth Five-Year Plan for the National Economic and Social Development of the People's Republic of China and the Visionary Goals for 2035.

I. Status and situation

Since the "13th Five-Year Plan", through continuous innovation and deepening application, China's robotics industry has shown good momentum of development. The scale of the industry is growing rapidly, with a compound annual growth rate of about 15%, and in 2020, the revenue of the robot industry will exceed 100 billion yuan, and the output of industrial robots will reach 212,000 units (sets). Technology level continues to improve, motion control, high-performance servo drive,

high-precision reducer and other key technologies and components to speed up breakthroughs, machine function and performance significantly enhanced. Integration and application will expand significantly, with the density of manufacturing robots reaching 246 units per 10,000 people in 2020, nearly two times the global average, and service robots and special robots achieving large-scale application in the fields of warehousing and logistics, education and entertainment, cleaning services, security inspection, medical rehabilitation and so on.

At present, a new round of scientific and technological revolution and industrial change is accelerating, and a new generation of information technology

Robotics technology, biotechnology, new energy, new materials and other in-depth integration of robotics technology, robotics industry ushered in the upgrading, leapfrog development window. The world's major industrialized countries have taken robotics as the frontier and focus of the competition in science and technology industry, and have stepped up their planning and layout. China has turned to a high-quality development stage, building a modernised economic system and constructing a new picture of a better life, which urgently needs the strong support of emerging industries and technologies.

Robots, as an important carrier of emerging technologies and key equipment for modern industries, lead the
The digital development and intelligent upgrading of industries have continuously bred new industries and new modes and new business forms. As an important tool for human production and life and a powerful assistant in coping with population ageing, robots have continued to promote higher levels of production and better quality of life, and strongly contribute to sustainable economic and social development.

In the face of the new situation and new requirements, the next five years and even longer, is China's robotics industry, self-reliance, change of generation across the strategic opportunity. We must seize the opportunity, face up to the challenge, accelerate to solve the problem of insufficient accumulation of technology, weak industrial foundation and lack of high-end supply, and promote the robotics industry to move towards the middle and high end.

II. General requirements

(i) Guiding philosophy

Guided by Xi Jinping's thought of socialism with Chinese characteristics in the new era, comprehensively implementing the spirit of the 19th CPC National Congress and the 2nd, 3rd, 4th, 5th and 6th Plenary Sessions of the 19th

CPC Central Committee, basing on the new stage of development, fully, accurately and comprehensively carrying out the new development concept, constructing a new pattern of development, co-ordinating the development and security, oriented by the development of high-end and intelligent development, facing the needs of industrial transformation and consumption upgrading, and insisting on "innovation-driven, application-driven, basic enhancement, integrated development", focusing on breakthroughs in core technology, focusing on consolidating the industrial foundation, focusing on enhancing effective supply, focusing on expanding market applications, enhancing the stability and competitiveness of the industrial chain supply chain, continuing to improve the development of the industrial ecology, and promoting the high-quality development of the robotics industry, in order to build a strong manufacturing country, Healthy China, to create a better life to provide strong support.

(ii) Development goals

By 2025, China will become a global source of robot technology innovation, a cluster of high-end manufacturing and a new high ground for integrated application. A number of core technologies and high-end products of robots have made breakthroughs, the comprehensive indexes of the whole machine have reached the international advanced level, and the performance and reliability of key parts and components have reached the level of similar products in the world. The average annual growth rate of the operating income of the robotics industry will exceed 20%. The formation of a number of leading enterprises with international competitiveness and a large number of strong innovation ability, good growth of speciality, speciality and new "small giants" enterprises, built 3 to 5 industrial clusters with international influence. The density of manufacturing robots has doubled.

By 2035, the comprehensive strength of China's robotics industry will reach the international leading level. Robots have become an important component of economic development, people's lives and social governance.

III. Main tasks

(i) Improving industrial innovation capacity

Strengthen core technology research. Focusing on national strategies and industrial development needs, we will make breakthroughs in common technologies such as robot system development and operating systems. Grasp the development trend of robotics technology, research and development of bionic perception and cognition, bio-mechanical-electrical integration and other cutting-edge technologies. Promote the integration and application of artificial intelligence, 5G, big data, cloud computing and other new technologies, improve the level of robot intelligence and networking, and strengthen functional security, network security and data security. Establish a sound innovation system. Give full play to key robotics laboratories, engineering (technology)

The role of R&D institutions such as research centres and innovation centres to strengthen cutting-edge and common technologies

research, accelerate the transfer and transformation of innovation results, and build an effective industrial technology innovation chain. Encourage backbone enterprises to jointly carry out collaborative research and development of robots, promote the standardisation and modularisation of hardware and software systems, and improve the efficiency of new product development.

Support enterprises to strengthen the construction of technology centres

(c) Establishment and development of key technologies and applications.

Column 1 Robot Core Technology Tackling Action

01 common technology

Robot system development technology, robot modularisation and reconfiguration technology, robot operating system technology, robot lightweight design technology, information perception and navigation technology, multi-task planning and intelligent control technology, human-machine interaction and autonomous programming technology, robot cloud-edge-terminal technology, robot safety and reliability technology, rapid calibration and precision maintenance technology, multi-robot co-operation technology, robot self-diagnosis technology, etc. diagnostic technology, etc.

02 cutting edge technology

Robot brain perception and cognition technology, electronic skin technology, robot bio-mechanical-electrical integration technology, human-machine natural interaction technology, emotion recognition technology, skill learning and developmental evolution technology, material structure and function integration technology, micro-nano manipulation technology, soft robot technology, robot cluster technology, etc.

(ii) Strengthening the foundation for industrial development

Mending the short board of industrial development.

Promote the use of industry, academia and research joint research, make up the special materials, core components, processing technology and other short boards, to improve the function, performance and reliability of the key components of the robot; the development of robot control software, core algorithms, etc., to improve the function of the robot control system and the level of intelligence.

Strengthen the construction of the standard system. Establish a national robot standardisation organisation, give better play to the technical standard innovation role of the National Technical Standard Innovation Base

(Robotics), and continuously promote robot standardisation. Improve the robot standard system, accelerate the research and development of urgently needed standards, carry out the formulation and revision of robot function, performance, safety and other standards, and strengthen the transformation of scientific and technological achievements into standards and the promotion of standard application. Actively participate in international standardisation work.

Enhance the testing and certification capacity.

Encourage enterprises to strengthen the construction of testing and certification capacity, strong

To improve product testing, quality and reliability. Enhance the testing capacity of the Robot Testing and Assessment Centre to meet the demand for enterprise testing and certification services. Promote China's robot certification

System building.

Column 2	Robotics Key Infrastructure Enhancement Initiative
01	**High Performance Reducer** Development of advanced manufacturing technologies and processes for RV and harmonic reducers to improve the precision of the reducers. (life), reliability, noise reduction, and realisation of large-scale production. Research on the basic theory of new high-performance precision gears, breakthroughs in precision/ultra-precision manufacturing technology, assembly process, and development of new high-performance precision reducers.
02	**High-performance servo drive systems** Optimise high-performance servo drive control, servo motor structure design, manufacturing process, self-tuning and other technologies, and develop high-precision, high-power density servo motors for robots and high-performance motor brakes and other core components.
03	**Intelligent Controller** Research and development of controller hardware system with high real-time, high reliability, multi-processor parallel work or multi-core processor to achieve standardisation, modularisation and networking. Breakthroughs in multi-joint high-precision motion solving, motion control and intelligent motion planning algorithms, and enhancement of the intelligent level of the control system as well as safety, reliability and ease of use.
04	**Intelligent integrated joints** Development of mechanism/drive/sensing/control integration, modular robot joints, R&D of servo motor drive, high-precision harmonic transmission dynamic compensation, high-precision real-time data fusion of composite sensors, modular integration and other technologies, high-speed real-time communication, joint force/torque protection and other functions.
05	**New sensors**

Develop three-dimensional vision sensors, six-dimensional force sensors and joint torque sensors and other force sensors, large field-of-view single-line and multi-line LIDAR, intelligent auditory sensors and high-precision encoders and other products to meet the demand for intelligent development of robots.

06 **Intelligent end-effector**

To develop intelligent and dexterous end-effector capable of intelligent gripping, flexible assembly and quick changeover to meet the diverse operational needs of robots.

(iii) Increasing the supply of high-end products

For manufacturing, mining, construction, agriculture and other industries, as well as family services, public services, medical and health care, elderly and disabled people, special environmental operations and other areas of need

We will gather advantageous resources and focus on promoting industrial robots, service robots, specialised The development and application of key robotics products, expanding robotics product series, improving performance, quality and safety, and promoting the development of high-end and intelligent products.

Column 3 Robotics Innovative Product Development Initiative

01 industrial robot

Development of high-precision, highly reliable welding robots for automotive, aerospace, rail transport and other fields, for the semiconductor industry, automatic handling, intelligent movement and storage of vacuum (clean) robots, with explosion-proof function of the production of civil explosives robots, AGV, unmanned ❸ vehicle, sorting, packaging and other logistics robots, for 3C, automotive parts and other areas of large loads, lightweight, flexible, dual-arm, mobile and other collaborative robots can be transferred, grinding, assembly and other work areas in any position to move, to achieve any position in space attitude, with flexible gripping and operation capabilities of mobile operators. The collaborative robots for 3C, automotive parts and other fields are large load, lightweight, flexible, dual-arm, mobile and other collaborative robots, and mobile operation robots that can move in any position in the work area of transfer, grinding, assembly and other work areas, and realise any position in the space and attitude can be reached with the ability of flexible grasping and operation.

02 service robot

Development of orchard weeding, precision plant protection, fruit and vegetable pruning, picking and harvesting, sorting, as well as for livestock and poultry farming, feeding, inspection, sludge removal, clearing mesh coat attachment, disinfection and other agricultural robots, mining robots such as mining, support, drilling, inspection, heavy-duty transport and other mining robots, intelligent production of

building parts and components, measurement, material distribution, steel processing, concrete pouring, floor and wall decorative decorative decoration, structural components Construction robots such as surgery, nursing care, inspection, rehabilitation, consultation, distribution and other medical rehabilitation robots, elderly and disabled robots such as walking, bathing, delivery, emotional accompaniment, intelligent prosthetics, household service robots such as housework, education, entertainment and security supervision, public service robots such as explanation and guidance, catering, delivery, mobility and so on.

03 **Speciality robots**

Development of underwater detection, monitoring, operation, deep-sea mineral resources development and other underwater robots, security patrol, anti-smuggling security checks, anti-terrorism and riot control, investigation and forensics, traffic management, border management, public security and control and other security robots, firefighting, emergency rescue, safety inspection, nuclear industry operations, marine fishing and other hazardous environments such as operating robots, test sampling, disinfection and cleaning, indoor distribution, assisted lifting, assisted rounds of the examination room, Health and epidemic prevention robots such as inspection and sampling, disinfection and cleaning, indoor distribution, assisted lifting, assisted medical rounds and ward visits, and assisted operation of critical care.

(iv) Expanding the depth and breadth of applications

Encourage user units and robotics enterprises to jointly carry out technical testing and verification, support robotics enterprises to implement key components verification, and enhance the testing and verification capabilities of public technical service platforms. Promote robotics system integrators to focus on specific scenarios in niche fields.

and production processes, and develop system solutions that are advanced, applicable and easy to promote. Support Build a platform for the application and promotion of robots, and organise accurate docking between production and demand. Promote the development of robot application scenarios and product demonstration and promotion. Accelerate the development of robot access standards, product certification or registration in the fields of medical care, elderly care, electric power, mining, construction and so on. Encourage enterprises to set up product experience centres to accelerate the promotion of robots for family services, education and entertainment, explanation and guidance, delivery and catering. Explore the establishment of new rental service platforms and encourage the development of new business models such as intelligent cloud services.

Column 4 "Robotics+" Application Initiative

01 **Deep ploughing into industry applications**

In areas where large-scale applications have been formed, such as automobiles, electronics, machinery, light industry, textiles, building materials, medicine, public services, warehousing and logistics, smart homes, education and entertainment, etc., efforts are being made to develop and promote new robotic products, open up the market for high-end applications, and deeply promote smart manufacturing and smart living.

02 **Expanding Emerging Applications**

In the areas of initial application and potential demand, such as mining, petroleum, chemical industry, agriculture, electric power, construction, aviation, aerospace, shipping, railway, nuclear industry, ports, public safety, emergency rescue, medical rehabilitation, old age assistance for the disabled, etc., combined with specific scenarios, the development of robotic products and solutions, pilot demonstrations, and expansion of application space.

03 **Enhancement of featured applications**

In specific segmented scenes, links and fields, such as sanitary ware, ceramics, photovoltaic, smelting, casting, sheet metal, hardware, furniture and other segments, glaze spraying, embryo trimming, polishing, sanding, welding, spraying, handling, palletising and other key links, the formation of specialised, customised solutions and replication and promotion, to build a distinctive service brand, forming a new competitive advantage.

(✉) Optimising industrial organisation

Cultivate and grow high-quality enterprises. Encourage backbone enterprises to cultivate leading robotics enterprises with ecological dominance and core competitiveness through mergers and acquisitions, joint ventures and cooperation. Promote enterprises to deeply cultivate niche industries, strengthen specialisation and differentiation, and develop in machine

Machine, parts and system integration and other fields, to create a number of speciality, speciality and new "small". Giant" enterprises and single champion enterprises.

Promote the strong and stable chain. Encourage backbone enterprises to aim at the weak links of key components and high-end machine products, and join hands with supporting enterprises to accelerate the research and development, engineering verification and iterative upgrading of precision gears, lubricating grease, encoders, core software, and so on. Support the industry chain upstream, midstream and downstream collaborative innovation, large, medium and small enterprises to integrate development, and build a good industrial ecology. Strengthen international industrial security cooperation and promote the diversification of the supply chain of the robot industry chain. Create advantageous characteristic clusters. Promote reasonable regional layout, guide resources and innovation

Elements are clustered in areas with a good industrial base and high development potential, fostering a strong capacity for innovation,

Advantageous clusters with good industrial environment. Support clusters to strengthen technological innovation, focus on niche areas, provide highly specialised robotic

products and system solutions, improve public services such as technology transformation, inspection and testing, talent training, etc., and cultivate characteristic cluster brands.

IV. Safeguards

(i) Strengthening coordination and promotion

Coordinate the resources and strength of industry management, science and technology, finance and financial sectors, strengthen policy synergy with user departments, and support the innovative development of the robotics industry. Encourage localities to formulate targeted policies and measures, coordinate and solve major problems in the robotics industry, and guide enterprises to do a good job in safe production and environmental protection. Give play to the role of industry associations, intermediary organisations and other bridges to strengthen the dynamic monitoring of the robotics industry, and provide timely feedback and suggestions on issues in the planning and implementation process.

(ii) Increasing fiscal and financial support

Strengthening of national major scientific and technological projects, national key R&D programmes, etc. on robotics research and development

Development and application support. Optimise the insurance compensation mechanism for the first (set) of major technical equipment on a trial basis.

point work, play the role of government procurement, and promote the application of innovative robotic products. Implement tax policies such as additional deduction for R&D expenses. Promote active investment by various industrial funds and support the listing of qualified enterprises. Encourage pilot cities of industry-integrated cooperation to increase investment in robotics enterprises. Guiding financial institutions to innovate accounts receivable financing, supply chain financing and other service models.

(iii) Creating a favourable market environment

Improve the "Industrial Robot Industry Standard Conditions", and increase the implementation and adoption. Support the capacity building of third-party testing and certification bodies to enhance market recognition and international influence. Strengthen the protection of intellectual property rights and increase the punishment for intellectual property infringement. Regulate market bidding and procurement, and prohibit the establishment of discriminatory terms. Conduct research on robot ethics and laws and regulations.

(iv) Improving the talent protection system

Strengthen the cultivation of robotics and technology talents, and support colleges and research institutes to cultivate professional and technical and composite high-end talents. It will promote the construction of new engineering disciplines, encourage schools and enterprises to jointly carry out industry-academia co-operation and collaborative education projects, jointly build a number of modern industrial colleges, and implement modes such as order cultivation and modern apprenticeship, so as to cultivate talents urgently needed for industrial development. Implement vocational skills upgrading actions, and support the development of skills upgrading and job-transfer training for enterprise workers. Support the organisation of various robotics competitions. Increase the popularisation of science and enhance the scientific and technological literacy of young people in robotics.

(✉) Deepening international exchange and cooperation

Support enterprises, academic institutions, industry organisations, etc. to carry out technology, standard, testing

Certification, intellectual property rights, personnel training and other international exchanges and cooperation.

Encourage foreign enterprises

and institutions to set up R&D institutions, education and training centres, etc. in China. Support domestic enterprises to set up R&D institutions in developed countries, strengthen international technical cooperation, and accelerate the landing of robots in international mature scenes. Make full use of the multi-bilateral cooperation mechanism to promote the "going out" of robotic products and solutions to achieve win-win cooperation.

“十四五”机器人产业发展规划

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机器人被誉为“制造业皇冠顶端的明珠”，其研发、制造、应用是衡量一个国家科技创新和高端制造业水平的重要标志。当前，机器人产业蓬勃发展，正极大改变着人类生产和生活方式，为经济社会发展注入强劲动能。为加快推动机器人产业高质量发展，依据《中华人民共和国国民经济和社会发展第十四个五年规划和2035年远景目标纲要》，制定本规划。

一、现状与形势

“十三五”以来，通过持续创新、深化应用，我国机器人产业呈现良好发展势头。产业规模快速增长，年均复合增长率约15%，2020年机器人产业营业收入突破1000亿元，工业机器人产量达21.2万台（套）。技术水平持续提升，运动控制、高性能伺服驱动、高精密减速器等关键技术和部件加快突破，整机功能和性能显著增强。集成应用大幅拓展，2020年制造业机器人密度达到246台/万人，是全球平均水平的近2倍，服务机器人、特种机器人在仓储物流、教育娱乐、清洁服务、安防巡检、医疗康复等领域实现规模应用。

当前新一轮科技革命和产业变革加速演进，新一代信息技术、生物技术、新能源、新材料等与机器人技术深度融合，机器人产业迎来升级换代、跨越发展的窗口期。世界主要工业发达国家均将机器人作为抢占科技产业竞争的前沿和焦点，加紧谋划布局。我国已转向高质量发展阶段，建设现代化经济体系，构筑美好生活新图景，迫切需要新兴产业和技术的强力支撑。

机器人作为新兴技术的重要载体和现代产业的关键装备，引领产业数字化发展、智能化升级，不断孕育新产业新模式新业态。机器人作为人类生产生活的重要工具和应对人口老龄化的得力助手，持续推动生产水平提高、生活品质提升，有力促进经济社会可持续发展。

面对新形势新要求，未来5年乃至更长一段时间，是我国机器人产业自立自强、换代跨越的战略机遇期。必须抢抓机遇，直面挑战，加快解决技术积累不足、产业基础薄弱、高端供给缺乏等问题，推动机器人产业迈向中高端。

二、总体要求

（一）指导思想

以习近平新时代中国特色社会主义思想为指导，全面贯彻党的十九大和十九届二中、三中、四中、五中、六中全会精神，立足新发展阶段，完整、准确、全面贯彻新发展理念，构建新发展格局，统筹发展和安全，以高端化智能化发展为导向，面向产业转型和消费升级需求，坚持“创新驱动、应用牵引、基础提升、融合发展”，着力突破核心技术，着力夯实产业基础，着力增强有效供给，着力拓展市场应用，提升产业链供应链稳定性和竞争力，持续完善产业发展生态，推动机器人产业高质量发展，为建设制造强国、健康中国，创造美好生活提供有力支撑。

（二）发展目标

到2025年，我国成为全球机器人技术创新策源地、高端制造集聚地和集成应用新高地。一批机器人核心技术和高端产品取得突破，整机综合指标达到国际先进水平，关键零部件性能和可靠性达到国际同类产品水平。机器人产业营业收入年均增速超过20%。形成一批具有国际竞争力的领军企业及一大批创新能力强、成长性好的专精特新“小巨人”企业，建成3～5个有国际影响力的产业集群。制造业机器人密度实现翻番。

到2035年，我国机器人产业综合实力达到国际领先水平，机器人成为经济发展、人民生活、社会治理的重要组成。

三、主要任务

（一）提高产业创新能力

加强核心技术攻关。聚焦国家战略和产业发展需求，突破机器人系统开发、操作系统等共性技术。把握机器人技术发展趋势，研发仿生感知与认知、生机电融合等前沿技术。推进人工智能、5G、大数据、云计算等新技术融合应用，提高机器人智能化和网络化水平，强化功能安全、网络安全和数据安全。

建立健全创新体系。发挥机器人重点实验室、工程（技术）研究中心、创新中心等研发机构的作用，加强前沿、共性技术研究，加快创新成果转移转化，构建有效的产业技术创新链。鼓励骨干企业联合开展机器人协同研发，推动软硬件系统标准化和模块化，提高新产品研发效率。支持企业加强技术中心建

设，开展关键技术和应用技术开发。

专栏 1　机器人核心技术攻关行动
01　共性技术 机器人系统开发技术、机器人模块化与重构技术、机器人操作系统技术、机器人轻量化设计技术、信息感知与导航技术、多任务规划与智能控制技术、人机交互与自主编程技术、机器人云–边–端技术、机器人安全性与可靠性技术、快速标定与精度维护技术、多机器人协同作业技术、机器人自诊断技术等。 **02　前沿技术** 机器人仿生感知与认知技术、电子皮肤技术、机器人生机电融合技术、人机自然交互技术、情感识别技术、技能学习与发育进化技术、材料结构功能一体化技术、微纳操作技术、软体机器人技术、机器人集群技术等。

（二）夯实产业发展基础

补齐产业发展短板。推动用产学研联合攻关，补齐专用材料、核心元器件、加工工艺等短板，提升机器人关键零部件的功能、性能和可靠性；开发机器人控制软件、核心算法等，提高机器人控制系统的功能和智能化水平。

加强标准体系建设。建立全国机器人标准化组织，更好发挥国家技术标准创新基地（机器人）的技术标准创新作用，持续推进机器人标准化工作。健全机器人标准体系，加快急需标准研究制定，开展机器人功能、性能、安全等标准制修订，加强科技成果向标准转化和标准应用推广。积极参与国际标准化工作。

提升检测认证能力。鼓励企业加强试验验证能力建设，强化产品检测，提高质量与可靠性。增强机器人检测与评定中心检测能力，满足企业检测认证服务需求。推进中国机器人认证

体系建设。

专栏 2　机器人关键基础提升行动

01　高性能减速器

研发 RV 减速器和谐波减速器的先进制造技术和工艺，提高减速器的精度保持性（寿命）、可靠性，降低噪音，实现规模生产。研究新型高性能精密齿轮传动装置的基础理论，突破精密/超精密制造技术、装配工艺，研制新型高性能精密减速器。

02　高性能伺服驱动系统

优化高性能伺服驱动控制、伺服电机结构设计、制造工艺、自整定等技术，研制高精度、高功率密度的机器人专用伺服电机及高性能电机制动器等核心部件。

03　智能控制器

研发具有高实时性、高可靠性、多处理器并行工作或多核处理器的控制器硬件系统，实现标准化、模块化、网络化。突破多关节高精度运动解算、运动控制及智能运动规划算法，提升控制系统的智能化水平及安全性、可靠性和易用性。

04　智能一体化关节

研制机构/驱动/感知/控制一体化、模块化机器人关节，研发伺服电机驱动、高精度谐波传动动态补偿、复合型传感器高精度实时数据融合、模块化一体化集成等技术，实现高速实时通信、关节力/力矩保护等功能。

05　新型传感器

研制三维视觉传感器、六维力传感器和关节力矩传感器等力觉传感器、大视场单线和多线激光雷达、智能听觉传感器以及高精度编码器等产品，满足机器人智能化发展需求。

06　智能末端执行器

研制能够实现智能抓取、柔性装配、快速更换等功能的智能灵巧作业末端执行器，满足机器人多样化操作需求。

（三）增加高端产品供给

面向制造业、采矿业、建筑业、农业等行业，以及家庭服务、公共服务、医疗健康、养老助残、特殊环境作业等领域需

求，集聚优势资源，重点推进工业机器人、服务机器人、特种机器人重点产品的研制及应用，拓展机器人产品系列，提升性能、质量和安全性，推动产品高端化智能化发展。

专栏 3　机器人创新产品发展行动

01　工业机器人

研制面向汽车、航空航天、轨道交通等领域的高精度、高可靠性的焊接机器人，面向半导体行业的自动搬运、智能移动与存储等真空（洁净）机器人，具备防爆功能的民爆物品生产机器人，AGV、无人叉车，分拣、包装等物流机器人，面向 3C、汽车零部件等领域的大负载、轻型、柔性、双臂、移动等协作机器人，可在转运、打磨、装配等工作区域内任意位置移动、实现空间任意位置和姿态可达、具有灵活抓取和操作能力的移动操作机器人。

02　服务机器人

研制果园除草、精准植保、果蔬剪枝、采摘收获、分选，以及用于畜禽养殖的喂料、巡检、清淤泥、清网衣附着物、消毒处理等农业机器人，采掘、支护、钻孔、巡检、重载辅助运输等矿业机器人，建筑部品部件智能化生产、测量、材料配送、钢筋加工、混凝土浇筑、楼面墙面装饰装修、构部件安装、焊接等建筑机器人，手术、护理、检查、康复、咨询、配送等医疗康复机器人，助行、助浴、物品递送、情感陪护、智能假肢等养老助残机器人，家务、教育、娱乐和安监等家用服务机器人，讲解导引、餐饮、配送、代步等公共服务机器人。

03　特种机器人

研制水下探测、监测、作业、深海矿产资源开发等水下机器人，安保巡逻、缉私安检、反恐防暴、勘查取证、交通管理、边防管理、治安管控等安防机器人，消防、应急救援、安全巡检、核工业操作、海洋捕捞等危险环境作业机器人，检验采样、消毒清洁、室内配送、辅助移位、辅助巡诊查房、重症护理辅助操作等卫生防疫机器人。

（四）拓展应用深度广度

鼓励用户单位和机器人企业联合开展技术试验验证，支持机器人整机企业实施关键零部件验证，增强公共技术服务平台试验验证能力。推动机器人系统集成商专注细分领域特定场景

和生产工艺，开发先进适用、易于推广的系统解决方案。支持搭建机器人应用推广平台，组织产需精准对接。推进机器人应用场景开发和产品示范推广。加快医疗、养老、电力、矿山、建筑等领域机器人准入标准制订、产品认证或注册。鼓励企业建立产品体验中心，加快家庭服务、教育娱乐、讲解导引、配送餐饮等机器人推广。探索建立新型租赁服务平台，鼓励发展智能云服务等新型商业模式。

专栏 4　“机器人+”应用行动
01　深耕行业应用 在已形成较大规模应用的领域，如汽车、电子、机械、轻工、纺织、建材、医药、公共服务、仓储物流、智能家居、教育娱乐等，着力开发和推广机器人新产品，开拓高端应用市场，深入推动智能制造、智慧生活。 **02　拓展新兴应用** 在初步应用和潜在需求领域，如矿山、石油、化工、农业、电力、建筑、航空、航天、船舶、铁路、核工业、港口、公共安全、应急救援、医疗康复、养老助残等，结合具体场景，开发机器人产品和解决方案，开展试点示范，拓展应用空间。 **03　做强特色应用** 在特定细分场景、环节及领域，如卫浴、陶瓷、光伏、冶炼、铸造、钣金、五金、家具等细分领域，喷釉、修胚、抛光、打磨、焊接、喷涂、搬运、码垛等关键环节，形成专业化、定制化解决方案并复制推广，打造特色服务品牌，形成竞争新优势。

（五）优化产业组织结构

培育壮大优质企业。鼓励骨干企业通过兼并重组、合资合作等方式，培育具有生态主导力和核心竞争力的机器人领航企业。推动企业深耕细分行业，加强专业化、差异化发展，在机

器人整机、零部件和系统集成等领域，打造一批专精特新“小巨人”企业和单项冠军企业。

推进强链固链稳链。鼓励骨干企业瞄准关键零部件、高端整机产品的薄弱环节，联合配套企业加快精密齿轮、润滑油脂、编码器、核心软件等研发、工程化验证和迭代升级。支持产业链上中下游协同创新、大中小企业融通发展，构建良好产业生态。加强国际产业安全合作，推动机器人产业链供应链多元化。

打造优势特色集群。推动合理区域布局，引导资源和创新要素向产业基础好、发展潜力大的地区集聚，培育创新能力强、产业环境好的优势集群。支持集群加强技术创新，聚焦细分领域，提供专业性强的机器人产品和系统解决方案，完善技术转化、检验检测、人才培训等公共服务，培育特色集群品牌。

四、保障措施

（一）强化统筹协调推进

统筹行业管理、科技、财政、金融等部门的资源和力量，加强与用户部门政策协同，支持机器人产业创新发展。鼓励各地制定针对性政策措施，协调解决机器人产业重大问题，指导企业做好安全生产和环境保护。发挥行业协会、中介组织等桥梁纽带作用，加强机器人产业动态监测，及时反馈规划实施过程中的问题并提出建议。

（二）加大财税金融支持

加强国家重大科技项目、国家重点研发计划等对机器人研

发应用的支持。优化首台（套）重大技术装备保险补偿机制试点工作，发挥政府采购作用，促进机器人创新产品应用。落实好研发费用加计扣除等税收政策。推动各类产业基金积极投入，支持符合条件的企业上市。鼓励产融合作试点城市加大对机器人企业的投入。引导金融机构创新应收账款融资、供应链融资等服务模式。

（三）营造良好市场环境

完善《工业机器人行业规范条件》，加大实施和采信力度。支持第三方检测认证机构能力建设，提升市场认可度和国际影响力。加强知识产权保护，加大知识产权侵权行为惩治力度。规范市场招标采购，禁止设立歧视性条款。开展机器人伦理道德和法律法规研究。

（四）健全人才保障体系

加强机器人科技人才培养，支持高校和科研院所培养专业技术和复合型高端人才。推进新工科建设，鼓励校企联合开展产学合作协同育人项目，共建一批现代产业学院，推行订单培养、现代学徒制等模式，培养产业发展急需人才。实施职业技能提升行动，支持开展企业职工技能提升和转岗转业培训。支持举办各类机器人大赛。加大科普工作力度，提升青少年机器人科技素养。

（五）深化国际交流合作

支持企业、学术机构、行业组织等开展技术、标准、检测

认证、知识产权、人才培养等国际交流与合作。鼓励国外企业与机构在华设立研发机构、教育培训中心等。支持国内企业在发达国家设立研发机构，加强国际技术合作，加快机器人在国际成熟场景落地。充分利用多双边合作机制，推进机器人产品和解决方案“走出去”，实现合作共赢。