

# Opportunities and Challenges for European SMEs in China's Industrial Robots Sector



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## Executive summary

Since 2013, China has been the world's largest market for industrial robots, maintaining sustainable and stable growth over the years. The market is creating enormous business opportunities, attracting global industrial robot enterprises scrambling to enter the Chinese market.

The European industrial robot industry has its unique advantages in providing state-of-the-art products and solutions for high-end industrial applications: in most cases, these needs cannot be fully satisfied by Chinese local suppliers. However, entering the Chinese market is a time-consuming process which requires a significant amount of resources and time; many European companies, especially SMEs, are not fully aware how to begin.

This report aims to give answers to these issues, by providing a comprehensive, up-to-date picture of the industrial robot market in China. Specifically:

- The first section provides an overview of the Chinese market for industrial robots, including its size, driving factors, main product categories and application fields – both traditional such as automotive, as well as new emerging ones. This section also indicates the most important regional clusters in China for industrial robots, as well as the key players dominating the market – largely foreign enterprises, which are facing increasing competition from domestic producers.
- The second section elaborates in detail on the role of government policies and incentives in pushing forward the development of industrial robots in China. The industrial robots industry is officially classified as a key strategic sector in the *Made in China 2025* strategy; it is also an encouraged sector for foreign investment, and it is also central in the *14<sup>th</sup> Five-year Plan (2021-2025)*. This translates into a myriad of preferential policies, incentives, grants, subsidies and other forms of administrative support – at all government levels, from district to municipal, from provincial to national – granted to foreign investors who introduce their technologies and products in China.
- The third section examines in detail the market access requirements that industrial robots must meet in order to be exported to China. Specifically, it introduces the five mandatory national standards in the sector – which are identical to (IDT) ISO/IEC standards; it also introduces the requirements, processes and costs for obtaining the main certification scheme, i.e., the China Robot certificate – which although not mandatory, is often considered as a strong asset especially when applying to government subsidies and procurement. Finally, this section analyses the requirements, pros and cons for investing in China, with a special focus on the risks that European investors may face.
- The fourth section summarises the main opportunities and challenges that European SMEs face in the Chinese market for industrial robots. Opportunities are significant and can largely outweigh the challenges – but only with meticulous planning, knowledge of the sector and informed decisions.

Finally, this report is enriched by two case studies that were developed through interviews with representatives of European companies in China. The first, a leading Italian company in the industrial automation field, highlights the strong support that local administrations in China give to enterprises operating in the industrial robots sector – as a way to attract investment and facilitate growth. The second case study, presenting the experiences of a Finnish SME and a leading German company, highlights the importance of localisation in China, achievable through on-the-ground presence and developing partnerships with local players.

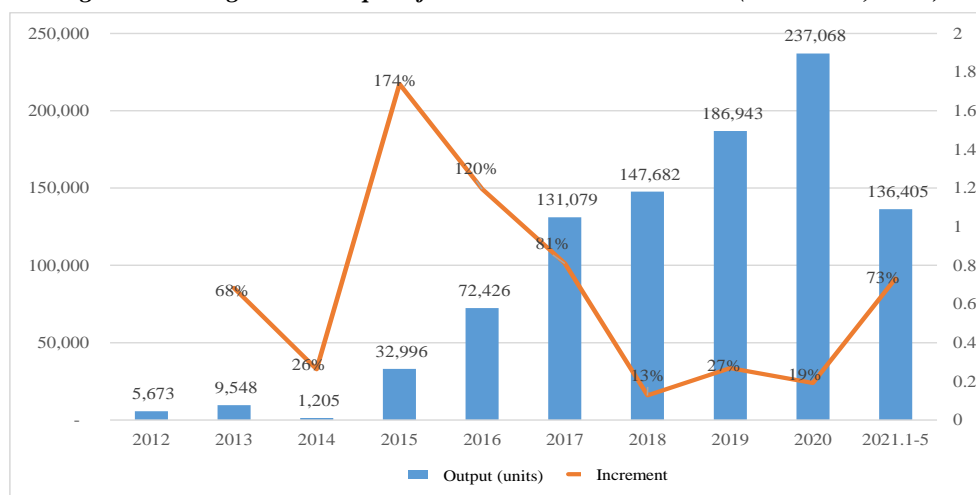
## 1. Market overview

### 1.1. Market overview

For eight consecutive years since 2013, China has been the world's largest market for industrial robots: it now accounts for about one-third of the global supply and demand.<sup>1</sup>

On the **supply side**, China's industrial robot output has maintained double-digit growth. According to the National Bureau of Statistics, in 2019, the output of China's industrial robots reached 186,943 units and increased to 237,068 units in 2020 (19% increase). From January to May 2021, the output of China's industrial robots was 136,405 units, an increase of 73% over the same period of last year.<sup>2</sup>

**Figure 1: Change in the output of Industrial Robots in China (2012-2021; units)**



On the **demand side**, the sales volume of industrial robots in China has too maintained stable growth. According to the China Robot Industry Alliance, the total installed capacity of China's industrial robots reached 144,000 units in 2019, an increase of 6.7% over 2018; while according to Gaogong Robot, the sales volume of industrial robots in the country was about 170,000 units in 2020, an increase of 18% compared to the previous year.<sup>3</sup>

This translates into steady growth of sales revenue. According to the Chinese Institute of Electronics and the International Federation of Robotics (IFR), the total sales revenue of industrial robots in China reached USD 5.73 billion in 2019, a year-on-year increase of 5.7%, and accounting for about one-third of the global market. In 2020, sales revenue reached USD 6.32 billion, and is expected to increase further in 2021.<sup>4</sup>

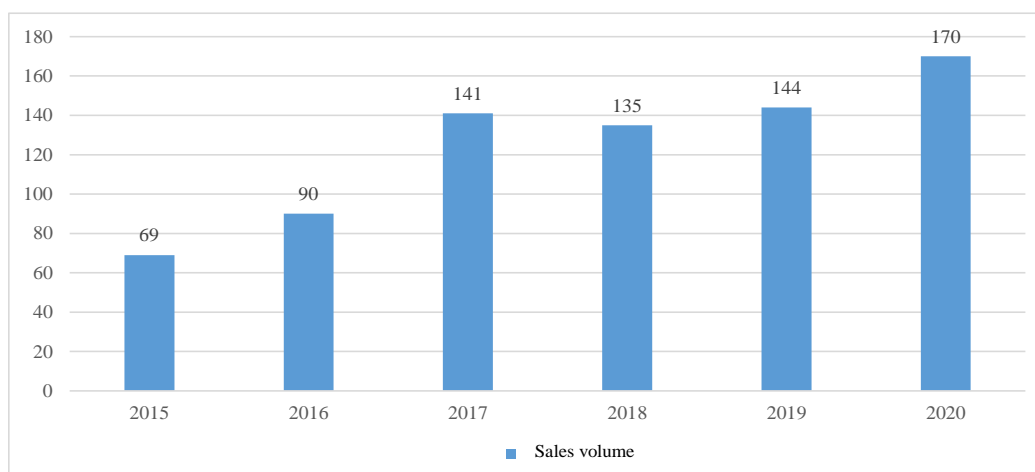
<sup>1</sup> Miao Wei, Minister of the Ministry of Industry and Information Technology, said at the opening ceremony of the 2019 World Robot Conference in August 2019 that the output of industrial robots in China reached 148,000 units in 2018, accounting for more than 38% of the global output. [http://www.gov.cn/xinwen/2019-08/20/content\\_5422887.htm](http://www.gov.cn/xinwen/2019-08/20/content_5422887.htm) (accessed on 11 August 2021).

<sup>2</sup> Source (in Chinese): Overview of China's industrial robot industry in 2021, Forward Research Co., <http://finance.eastmoney.com/a/202106291977066935.html> (accessed on 16 August 2021).

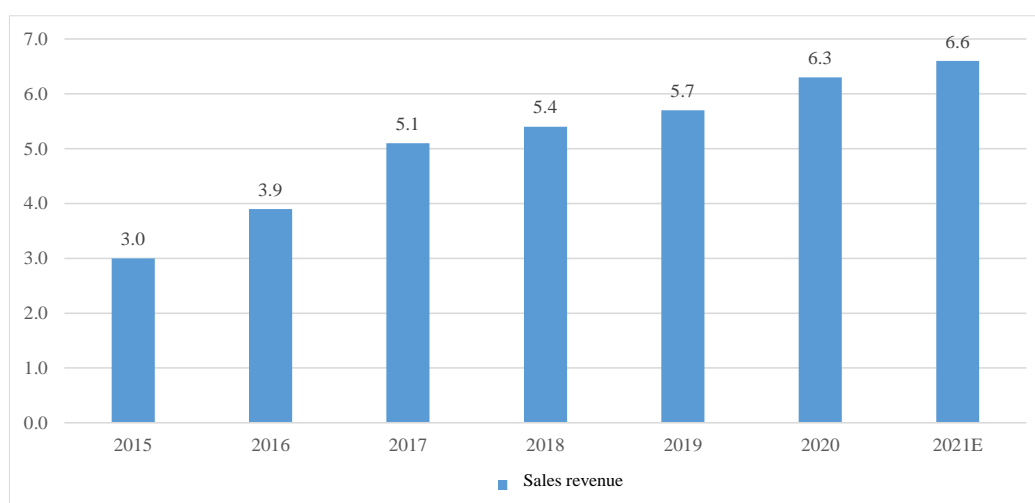
<sup>3</sup> Source (in Chinese): China Industrial Robot Industry Market Report (2019), China Robot Industry Alliance, <http://cria.mei.net.cn/news.asp?vid=3854> (accessed on 7 August 2021; note: this is not a free publication, the full text is available only after purchase).

<sup>4</sup> Source (in Chinese): China Robotics Industry Development Report (2019), Chinese Institute of Electronics, <https://max.book118.com/html/2021/0714/8055067055003121.shtm> (accessed on 16 August 2021; note: this is not a free publication).

**Figure 2: Sales volume of Industrial Robots in China (2015-2019; unit: 1,000 units)**



**Figure 3: Sales revenue of Industrial Robots in China (2015-2021; unit: USD 1 billion)**

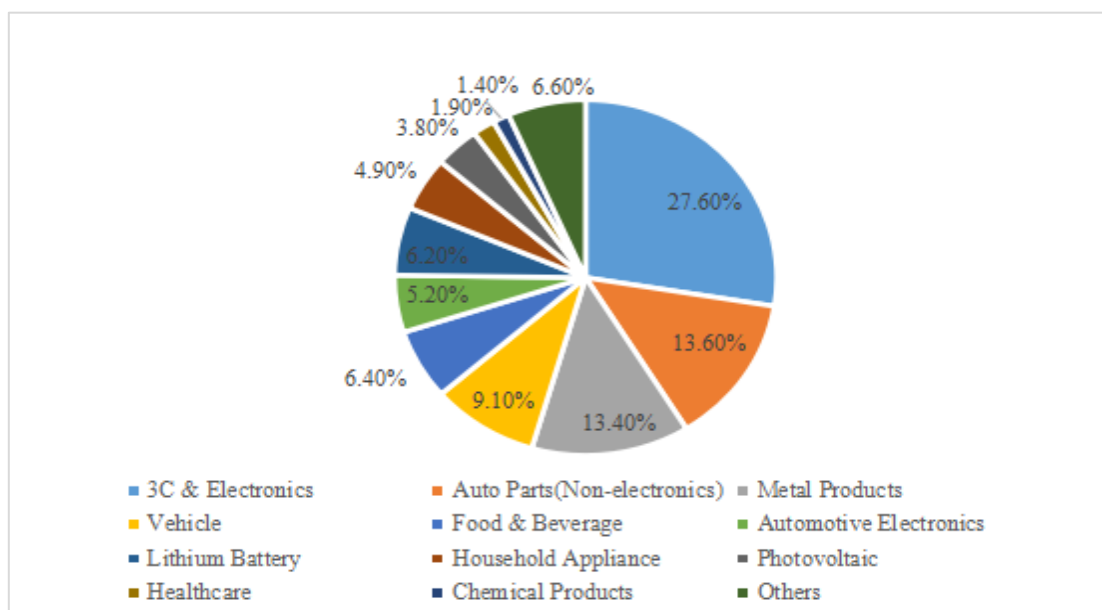


The development of China's industrial robot industry is mainly driven by three leading factors: (i) **labour shortage/rising labour costs**, (ii) **upgrading of industrial structure**, and (iii) **strong policy support**. In particular, China's ageing population results in an increasing shortage of low-end labour and in rising labour costs – which in turn lead to a large number of manufacturers adopting industrial robots over manual labour.

This trend is also intensified by China's efforts to upgrade its industrial structure and move up the value chain, which result in demand for higher product quality. So far, industrial robots have been widely adopted in China, covering dozens of processes such as welding, spraying, assembly, handling, stacking, grinding, gluing, sorting, packaging, testing, loading and unloading. These are distributed in a wide number of industries such as manufacturing, processing, warehousing and logistics, and especially in the production and processing of automobiles, Computing, Communication, and Consumer (3C), metal processing, chemical industry, rubber, plastics, and food. See Figure 4 for more details.

Among these industries, the **automotive** (which in Figure 4 was further divided into: auto parts, vehicles, and automotive electronics) and **3C industries** are the dominant ones, seeing more than half of the total applications of industrial robots in China in 2019. In particular, the automobile manufacturing industry sees the most extensive and mature applications; while the 3C industry benefits enormously from industrial robots due to their high precision and flexibility.

Figure 4: Proportion of Industrial Robot applications in different sectors in China in 2020<sup>5</sup>



It is noteworthy that, in the past few years, the growth of the demand for industrial robots started to show a downward trend (see again Figure 1), mainly as result of the slowdown in the growth of traditional fuel vehicles and 3C industry. Even though this is expected to be only temporary, as the Chinese government pushes forward the implementation of development plans for new energy vehicles and 5G mobile phones, it is expected that the proportion of industrial robot applications within the 3C industry will grow at the expense of automotive.

At the same time, driven by the push for **intelligent manufacturing**, industrial robots are increasingly being applied in a wide range of other industries, and especially metal processing, chemical industry, rubber, plastics and food processing. The application processes in these industries are mostly welding, spraying, polishing, gluing, loading and unloading, deburring, handling, stacking, assembly, sorting, packaging, and testing.

The third key factor driving the development of the industrial robots in China, i.e., strong policy support, will be detailed in Chapter 2 of this report.

## 1.2. Main product categories and application fields

Currently, industrial robots in the Chinese market are mainly divided into four categories of products: (i) articulated robots, (ii) collaborative robots, (iii) delta robots, and (iv) SCARA robots. Specifically:

- **Articulated robots**, also known as vertical articulated arm robots or articulated mechanical arms, are the most common category available. This kind of robots can be applied in a wide variety of fields and processes, such as loading, unloading, painting, surface treatment, testing, measurement, arc welding, spot welding, packaging, assembly, chip cutting machine tool, fixation, special assembly operation, forging and casting. At present, in China, they are mostly used in the automobile manufacturing industry.
- **Collaborative robots** are robots that can interact and collaborate with people on the production line. These robots give full play to the complementarity of robot efficiency and human intelligence, and are mostly applied for processes like assembly, handling, picking and tightening screws, loading and

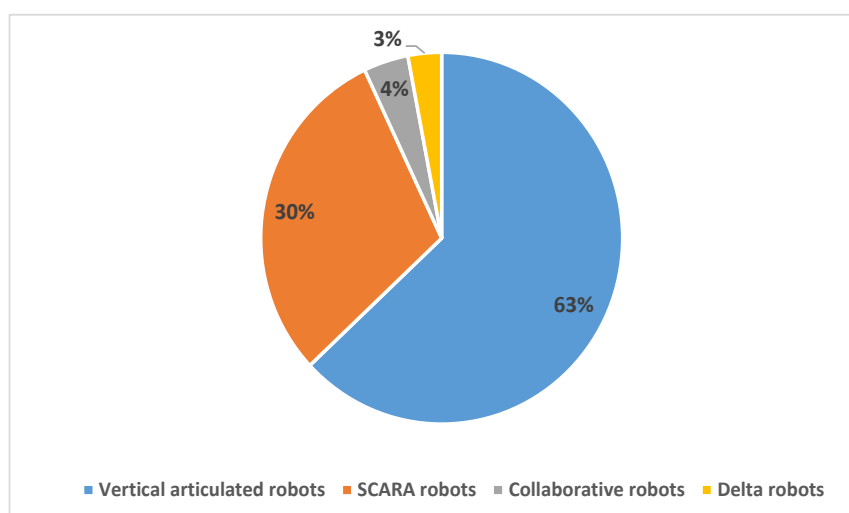
<sup>5</sup> Source (in Chinese): Analysis Report on China's Industrial Robot Market in 2020 - In-depth Investigation and Development Planning and Trends, CBG, <http://data.chinabaogao.com/jixie/2021/04153F412021.html> (accessed on 3 August 2021).

unloading, spraying and gluing, quality inspection and measurement, packaging and stacking, grinding and polishing. Collaborative robots are common in several industries, such as automotive, parts, electronics, consumer goods, as well as the service industry.

- **Delta robots** are high-speed and light-load parallel robots, which generally capture the target object through teaching videos or vision systems, and determine the spatial position of the Tool Centre Point (TCP) through three parallel servo axes, realising transportation, processing and other operations of the target object. Delta robots are widely used for sorting, picking and placing, packaging of automatic production or packaging lines in electronics, as well as pharmaceutical and food industries.
- **SCARA robots** are a kind of robotic arms used in assembly operations. These have three rotating joints, which are most suitable for plane positioning. SCARA robots are in great demand in the 3C industry thanks to their small-load and fast-speed features; but they are also widely used in the food industry, semiconductor industry and healthcare industry.

According to MIR Forward Research Co., in 2020 the sales volume of vertical articulated robots in the Chinese market ranked first among all categories, accounting for 63% of the total sales, followed by SCARA robots (30%); while the sales of collaborative robots and delta robots accounted for 4% and 3%, respectively.

*Figure 5: Proportion of Industrial Robots in 2020 (by sales volume)*<sup>6</sup>



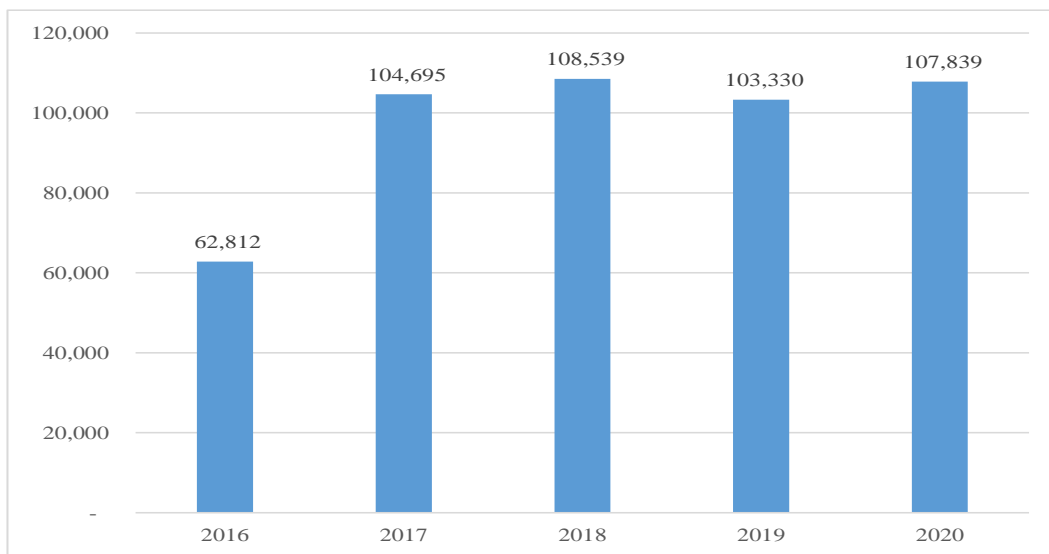
Specifically within vertical articulated robots, **6-axis robots** are the dominant product category. Figure 6 in the next page show how the shipment of 6-axis robots remained stable in the past four years (107,839 units in 2020).

Within the automotive industry, both heavy-load vertical articulated robots and light-load vertical articulated robots are widely used. Figure 7 shows how heavy-load vertical articulated robots, bearing more weight, are mainly used in vehicle manufacturing (which represent 28% of the total heavy-load vertical articulated robots applied in China); while light-load vertical articulated robots are mainly used for auto parts (22% of the total light-load vertical articulated robots applied in China). Light-load vertical articulated robots are also widely applied for the manufacturing of metal products.

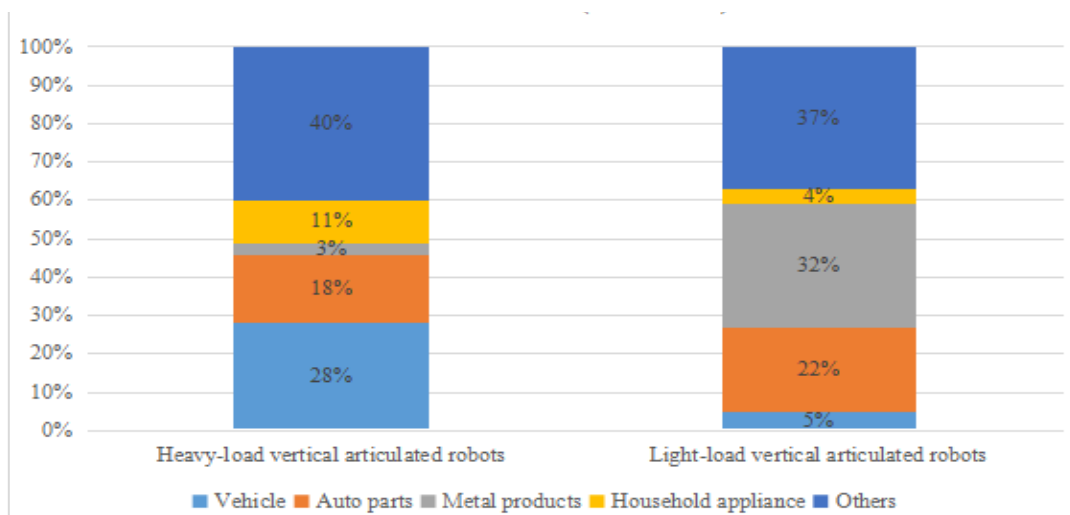
<sup>6</sup> Source (in Chinese): Overview of China's industrial robot industry in 2021, Forward Research Co., <http://finance.eastmoney.com/a/202106291977066935.html> (accessed on 16 August 2021).



**Figure 6: Shipment of 6-axis Robots (2016-2020; units)** <sup>7</sup>



**Figure 7: Application of Heavy-load and Light-load Vertical Articulated Industrial Robots (%)**



In short, the automotive industry and vertical articulated robots still represent the largest source of demand for industrial robots in China, followed by the 3C industry and the widely used SCARA robots. The automotive and 3C industries represent 70% of the demand of the whole market, while vertical articulated robots and SCARA robots represent 90% of the products purchased in the Chinese market. Therefore, enterprises operating in these industries and segments are presented with more market opportunities in China, although competition is very fierce and tending to favour producers with leading technological advantages.

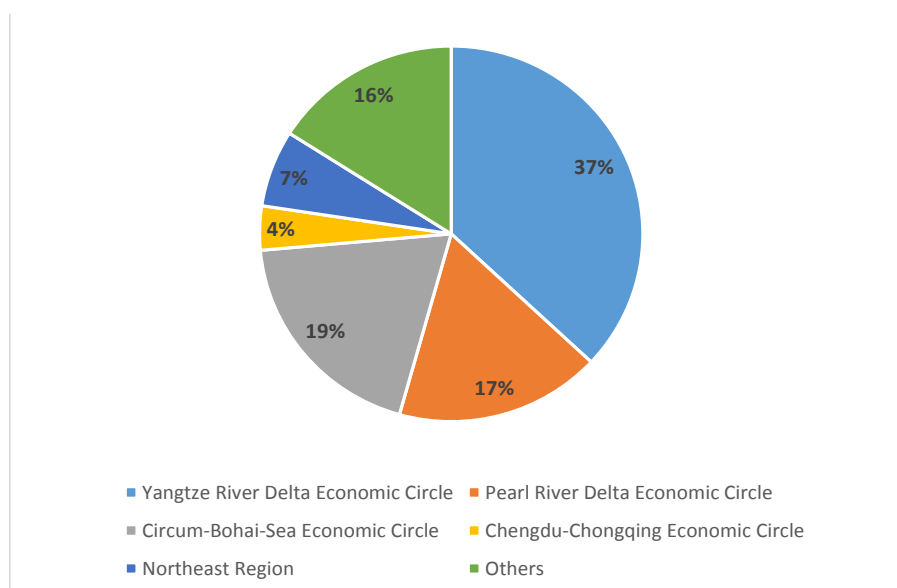
### 1.3. Key regions and clusters

By the end of 2020, the total number of robot enterprises in China had reached 11,066. These are mainly concentrated in the Yangtze River Delta (4,090 robot enterprises), the Pearl River Delta (1,925 robot enterprises), the Bohai Sea/Shandong region (2,129 robot enterprises); though the Beijing-Tianjin-Hebei region, the

<sup>7</sup> *Ibid.*

Northeast region and the Chengdu-Chongqing region also host a significant number of robot enterprises.<sup>8</sup> More than 60 robot industrial parks have been established across the country.

**Figure 8: Distribution of robot enterprises in different regions and cluster in China in 2020 (%)**



All in all, the Yangtze River Delta and the Pearl River Delta represent the first and second most developed robot industry clusters in China. Compared with the Yangtze River Delta – which focuses on automotive, aircraft, shipbuilding, and 3D manufacturing – the Pearl River Delta is more inclined to the application of industrial robots for the light industry due to its industrial layout and features. The Beijing-Tianjin-Hebei region is suitable for R&D operations, especially thanks to the capital's large pool of STEM graduates and high number of R&D facilities available. These three regions are also China's three core economic zones.

Other regions, including the northeast region, the Bohai Sea/Shandong region and the Chengdu-Chongqing region, are more suitable for setting up production bases, thanks to their advantages in terms of lower land and labour costs compared with the core economic zones. In particular, Shandong province already hosts a number of competitive robot enterprises, and several European industrial manufacturers.

#### ***Yangtze River Delta: Shanghai, Zhejiang, Jiangsu***

There are 15 robot industrial parks of various scale in the Yangtze River Delta, mainly centring on the industrial bases of Shanghai and Kunshan (county-level city within Suzhou municipality), but also covering other key cities especially in Jiangsu province, including Wuxi, Changshu, Xuzhou, Nanjing and Zhangjiagang.

The advantage of the Yangtze River Delta region lies in the developed network of highways, railways, and ports, the high concentration of production factors and investment flows, the solid foundations for development of the manufacturing industry, as well as favourable policy support environment, focusing in particular on engineering, machinery, aircrafts, shipbuilding, automobiles, 3C, and biotechnologies – among others.

In 2018, the total sales revenue of robots of the Yangtze River Delta exceeded RMB 12.4 billion, ranking first among the robot industry clusters in China. The region focuses on high value-added markets such as R&D of hardware and software for industrial robot body, design and manufacturing of reducers and controllers, etc.

<sup>8</sup> *Ibid.*

### ***Pearl River Delta: Shenzhen, Guangzhou***

The development of the industrial robots industry in the Pearl River Delta builds upon the solid manufacturing basis that were established in the region since China's economic reforms of late 1970s. Since then, the region has established itself as a key, labour-intensive industrial cluster for small-scale processing and light manufacturing, focusing particularly on high-end equipment, household appliances, food packaging, 3C manufacturing and ceramic production. Therefore, the region has a great demand of industrial robots, and especially for numerical control equipment, unmanned logistics, automatic controllers, drones, etc.

The Pearl River Delta region enjoys a reasonable and mature environment favouring industrial development; in addition, it has the advantage of hosting whole industrial chains spanning from R&D of core technologies, production of robot bodies, system integration, and application. In 2018, the total sales revenue of robot products in the Pearl River Delta reached RMB 10.85 billion, and the average profit margin of the industry reached 14.4%. The competition in the region is fierce, seeing leading manufacturers of core parts for robots and agents for foreign brands, increasingly being challenged by many new entrants such as system integrators and start-ups.

### ***Beijing-Tianjin-Hebei region, plus Shandong***

The development of industrial robots in Beijing-Tianjin-Hebei region – which could be extended to the entire Bohai sea region, thus including Shandong province – is characterised by regional collaboration and complementarity. The development of industrial robots mainly takes place in Hebei and Shandong, focusing on the system integration of industrial robots; Beijing focuses on promoting the R&D and creative design of intelligent robots, while Tianjin and Shandong focuses on breaking through the development of core parts for robots and landmark robots for industrial application.

Compared with the Yangtze River Delta and the Pearl River Delta, the Beijing-Tianjin-Hebei region and Shandong province benefit from an increasing number of enterprises and start-ups of various types of robots settling in the region, attracted by high-quality talent resources and preferential policies. In addition, innovative enterprises and research institutes in the region are strongly dedicated to the R&D of new generation information technologies, which is one of the key priority sectors of the local administrations. In 2018, the total sales revenue of robot enterprises in the Beijing-Tianjin-Hebei region reached RMB 6.5 billion. According to local development plans, in the next years the region will significantly focus on the development of service robots and on the implementation of commercial applications, such as machine learning, computer vision, speech and semantic understanding and other core technologies of artificial intelligence.

### ***Northeast region: Harbin and Shenyang***

The total sales revenue of industrial robots in the Northeast region reached RMB 8.68 billion in 2019. The region is making efforts for the decommissioning of traditional overcapacity and highly-polluting industries, in favour of new emerging and high-tech industries – including robots. The local governments of the region (Liaoning, Jilin and Heilongjiang) have issued numerous development plans and implementation rules of robot and artificial intelligence industries, aimed at building important industrial robot clusters in Harbin, Shenyang, and Fushun. To differentiate from other regions across China, the Northeast region mainly focuses on the development and design of new industrial robots, commercial service robots, and special robots for marine operations and emergency rescue.<sup>9</sup>

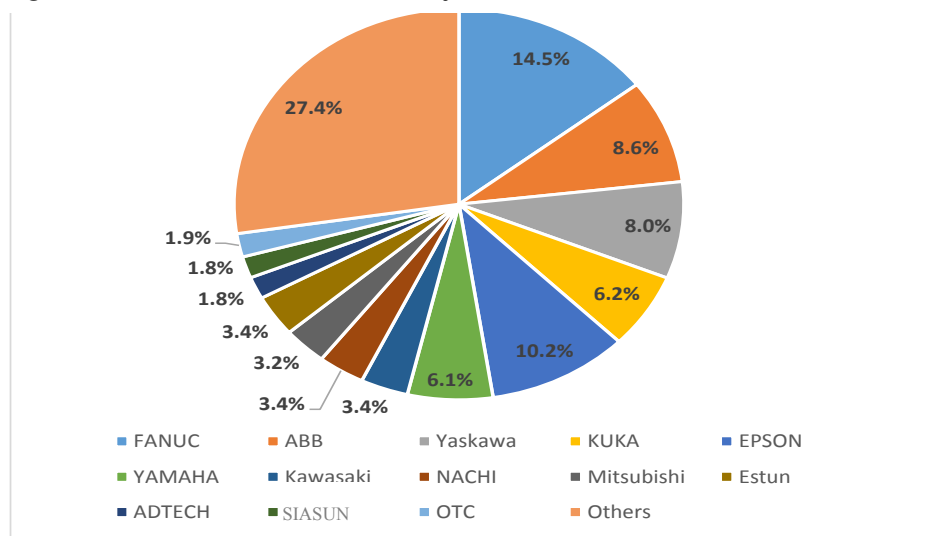
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<sup>9</sup> Source (in China): *Review of the Development of Industrial Robot and Intelligent Manufacturing Industry in China from the Perspective*

## 1.4. Key players

In 2020, 13 key enterprises occupied nearly three-fourths of China's total market share of industrial robots.<sup>10</sup>

**Figure 9: Market Share Distribution of Industrial Robots in China in 2020**



The major foreign-invested enterprises include FANUC, ABB, KUKA,<sup>11</sup> and Yaskawa; the major local manufacturers include: Estun, SIASUN, and EFORT. Generally speaking, despite the impact of the COVID-19 pandemic, the major industrial robot manufacturers in the Chinese market achieved a solid growth in 2020. Foreign-invested manufacturers not only still occupy the largest market shares, but also performed better than domestic competitors; as they focus more on high-end applications, this may signal that the demand for high-end industrial robot products in the Chinese market has increased significantly – and will keep doing so for the next few years.

### FANUC

In 1997, the Japanese automation giant FANUC and Shanghai Electric Group jointly established Shanghai FANUC, with each party holding 50% of the shares. Headquartered in Shanghai, Shanghai FANUC has set up subsidiaries and branches in more than 10 cities such as Chongqing, Guangzhou and Wuhan, basically covering the most important economic regions in China.

By 2020, the installed capacity of FANUC in China had exceeded 120,000 units; in 2020, FANUC's subsidiary in Wuhan alone installed more than 3,000 units in Shanxi, Henan, Hubei and Hunan provinces. The sales of FANUC's robots in the Chinese market soared in 2020, with a year-on-year increase of more than 30% over 2019, and the total newly installed capacity reached an all-time peak.

of COVID-19, Xiao Meilan, <https://robot.ofweek.com/2020-02/ART-8321202-8460-30429304.html> (accessed on 16 August 2021).

<sup>10</sup> Analysis Report on Market Status of China's Industrial Robot Industry in 2020 - Research on Market Operation and Development Prospect, CBG, <http://data.chinabaogao.com/jixie/2021/04153F412021.html> (accessed on 4 August 2021). Other statistics and figures in this section, particularly relating to the market performance in 2020, are extracted from (in Chinese): Insight - The Development and Application of China's Industrial Robot Industry in 2020, Tencent, <https://new.qq.com/omn/20210201/20210201A01F6U00.html> (accessed on 6 August 2021).

<sup>11</sup> KUKA was originally a German manufacturer of industrial robots and systems for factory automation. In 2017, it was purchased and is now owned by Midea group, a leading Chinese electrical appliance manufacturer.

## **ABB**

The Swedish-Swiss multinational, ABB Robotics, entered the Chinese market in 1994. Currently, the company's robot automation solutions and systems, namely body in white, stamping automation, power assembly and painting automation, mainly serve major automobile manufacturers and parts suppliers, as well as leading players in industries such as consumer goods, casting, plastics and metal processing.

ABB Engineering (Shanghai) Ltd., a wholly-owned subsidiary of ABB Group, is the global headquarter of ABB's robot business, an important R&D hub, and the largest production base for robots. In 2018, ABB Robotics invested RMB 1 billion to build a new ultimate factory for robots in Kangqiao, Pudong district, Shanghai. The construction of the new factory began in 2019 and is expected to be delivered in 2022. After completion, the capacity of the factory will reach 100,000 units.

The amount of ABB's orders in the global market decreased by 9% year-on-year in the third quarter of 2020, but thanks to the promotion of resumption of production in China, the number of orders in the Chinese market increased by 7% year-on-year in the same period.

## **KUKA**

Originally from Germany, KUKA's business is mainly concentrated in three sectors: robots, system integration and Swisslog (mainly involving the integration of automation in the field of healthcare and warehousing). Its products are widely used in the automotive field. KUKA's history in the Chinese market dates back to 2000, when it established the wholly-owned subsidiary KUKA Robotics (Shanghai) Co., Ltd.

In January 2017, Midea, a Chinese household electrical appliance leading enterprise, acquired 94.55% of KUKA Group. As a consequence, KUKA's development strategy and objectives for the Chinese market began to be closely related and aligned to Midea's: its industrial business in China was merged with the business of Swisslog in China, a subsidiary of KUKA; then, KUKA and Midea set up a joint venture to undertake the above business, with both parties holding 50% shares respectively; in 2019, KUKA and Midea established the China Division, covering robotics, flexible systems, general industrial automation, intelligent logistics automation and intelligent healthcare automation. The localisation strategy adopted by KUKA was driven by the company's strong complementarity with Midea, and resulted in new business and procurement opportunities, as well as improved customer service for the Chinese market – though involving significant technology transfer. In 2020, KUKA's orders in the Chinese market doubled in the third quarter to EUR 117.7 million.

## **Yaskawa**

Yaskawa, headquartered in Japan, entered the Chinese market in 1996. In 2012, it set up its first overseas robot manufacturing base in Changzhou Wujin National High-tech Zone (Jiangsu province), mainly producing industrial robots, with an annual production capacity of 18,000 units which in 2020 generated RMB 1 billion of sales revenue. At the same time, Yaskawa has announced its intention to add further investment for a new project worth USD 100 million in Changzhou, for the establishment of a new base integrating R&D and production of inverters, servo motors, controllers and other products.

In 2015, Yaskawa and Midea Group jointly established Guangdong Yaskawa Midea Industrial Robot Co. Ltd., holding respectively 51% and 49% shares of the joint venture. However, the company was dissolved in June 2020, mostly due to the poor performance of Yaskawa in the Chinese market in the past two-three years, which was significantly influenced by the acquisition of KUKA by Midea in 2017.

### ***Estun***

Estun was founded in Nanjing, Jiangsu Province, in 1993. Officially listed on the Shenzhen Stock Exchange in March 2015, Estun is one of the main developers and manufacturer of industrial robots in China, also thanks to a rich history of overseas M&As and investment, such as the acquisition of Trio Technology in the UK and CLOOS in Germany; investment in M.A.I. in Germany, Euclid in Italy, and Barrett in the US; and the establishment of a European R&D centre in Milan. Estun focuses on R&D and production of high-end intelligent mechanical equipment and its core control and functional components; the company is also very active in the formulation of national or sectoral standards related to industrial robots.

In 2020, Estun ranked 8<sup>th</sup> in terms of the market share of industrial robots in China. According to the 2016-2020 annual reports of the company, the sales revenue of six-joint robots accounted for about 80% of its total sales revenue. The sales volume of Estun's industrial robots also increased rapidly: the annual shipments in 2020 exceeded 5,000 units, with an increase rate of more than 25% compared with the previous year.

### ***SIASUN***

SIASUN is affiliated with the Chinese Academy of Sciences. It is legally headquartered in Shenyang (capital of Liaoning province, in the Northeast region), although its international business is conducted from a subsidiary in Shanghai. SIASUN is present in industrial parks in Shenyang, Shanghai, Hangzhou, Qingdao, Tianjin, Wuxi and Weifang, and has established an industrial software research institute in Shandong's Jinan.

SIASUN produces five categories of robots, namely industrial robots, collaborative robots, mobile robots, special robots and healthcare service robots. Its main customers are found in the automotive industry, but the company is gradually expanding its operations in the fields of intelligent manufacturing, semiconductor, 3C, commercial healthcare, logistics, warehousing and distribution. According to SIASUN's financial statement, in 2020 the company achieved an operating revenue of RMB 2.66 billion, a 3% decrease year-to-year, mostly due to the impact of the COVID-19 pandemic; but new orders increased by around 25% over the same period.

### ***EFORT***

Founded in 2007, EFORT was listed on the Sci-Tech Innovation Board of the Shanghai Stock Exchange in July 2020. EFORT's business covers flexible welding systems for the automobile industry, intelligent spraying systems, intelligent polishing and metal processing systems in general industries. In addition, EFORT is also engaged in industries such as vehicles and parts, 3C and electronics, household appliances, rail transit, aerospace, engineering machinery, photovoltaic, casting, sanitary ware and ceramics, furniture and wooden ware. EFORT has been granted several projects funded by various ministries in China, and actively participates in the formulation of a number of national standards for the robot industry.

Many of EFORT's core technologies were obtained through M&As of overseas companies. For example, EFORT acquired three Italian companies: CMA, a provider of intelligent spraying robots and solutions; EVOLUT, an intelligent polishing and metal processing solution provider; and W.F.C. group a supplier of flexible welding system in the automotive industry. EFORT has also invested in ROBOX, an Italian motion control system provider, and has established an R&D and application centre for intelligent spraying robots in Italy. To date, the company has established 19 subsidiaries around the world.

After the outbreak of COVID-19 in the first quarter of 2020, EFORT's business declined significantly, but its sales volume and operating revenue recovered and actually increased from the third and fourth quarters. Nonetheless, EFORT's net profit from 2018 to 2020 has remained negative.

## 2. Key Policies and regulations

Due to historical reasons and a unique governance system, China's industrial development is largely driven by government policies. The situation is particularly prominent in those specific areas that are deemed as priority by the Chinese government, especially the central one: 'policy guidance' translates, in fact, into a large amount of resources being channelled, especially reflected in government-funded R&D and engineering projects, subsidies, credit and preferential tax policies of governments at all levels, all aimed at accelerating the development of the industry.

Industrial robots have long been one of the core sectors of China's development priorities. A large number of policy documents and development plans have been issued to drive the development of the industry, both at the central and local level. Among these, the *Made in China 2025* strategy and the *Outline for the 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives through the Year 2035*, both issued by the State Council, are the most important fundamental policies: they outline a set of priorities, objectives, directions and tasks to be implemented by relevant central and local-level authorities, which shape the development and trajectory of the whole industrial robots industry in over the medium to long-term.

### 2.1. State Council-level policies

#### *Made in China 2025 & 'dual integration' (liang hua rong he)*

*Made in China 2025* (hereinafter referred to as 'MIC 2025') is a programmatic strategy issued by the State Council in 2015, to guide the development of the manufacturing industry over the next decade.<sup>12</sup> A core element of the strategy is to promote the “**deep integration of informatisation and industrialisation**” (or 'dual integration', in Chinese *liang hua rong he*), paving the way for the introduction of new generation information and communication technologies in the manufacturing industry. At the same time, high-end automated machine tools (such as computerised numerical control, CNC, machines) and robots were included among the ten key focus sectors of MIC 2025.

Within the specific field of industrial robots, MIC 2025 outlines the necessity to accelerate the development of intelligent manufacturing equipment and products, by supporting R&D of intelligent equipment and production lines, such as high-end CNC machine tools, industrial robots, and additive manufacturing equipment. The document also calls for the **smartification of manufacturing processes**, by building experimental intelligent plants/digital workshops in key areas, by accelerating human-machine interactions and the application of industrial robots, intelligent logistics management, additive manufacturing and other technologies, and finally by promoting the simulation, optimisation, digitalised control, real-time monitoring and adaptive control of manufacturing processes.

In addition, MIC 2025 also regards robots as one of the key areas in which technological and industrial breakthroughs should be achieved. Specifically, it points out to “actively develop new products, promote the standardised and modular development of robots, and expand the market applications of industrial robots and special robots – focusing on key industries such as automotive, machinery, electronics, dangerous goods manufacturing, national defence and military industry, chemicals and light industry”. Finally, it also emphasises the need to solve the technical bottlenecks of key spare parts and design and manufacturing of system integration, such as robot bodies, reducers, servo motors, controllers, sensors and drivers.

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<sup>12</sup> [http://www.gov.cn/zhengce/content/2015-05/19/content\\_9784.htm](http://www.gov.cn/zhengce/content/2015-05/19/content_9784.htm) (accessed on 24 August 2021).

It is noteworthy that, since its release, MIC 2025 has received an enormous degree of attention from international companies and governments, as one of the explicit objectives of the whole strategy is to replace high-end and strategic imports with domestically-produced products, thus reducing the dependency on foreign markets. As a consequence, starting from the end of 2019, the strategy has somewhat disappeared from the official Chinese narrative and it is not anymore referred to in new industrial and development plans; however, the strategy is still very much in place and significant efforts are being made to achieve its goals.

#### ***14th Five-year Plan (2021-2025) and the 'dual circulation'***

The *Outline for the 14th Five-Year Plan for Economic and Social Development and Long-Range Objectives through the Year 2035* (hereinafter referred to as “*14th FYP*”),<sup>13</sup> is the top-level policy document of the State Council for economic and social development in 2021-2025; it is also the basis on which competent authorities of various industries formulate specific policies, guidelines and strategies to implement the tasks and achieve the objectives of the plan, through the 2021-2025 period.

The *14th FYP* proposes to “accelerate the establishment of a new development pattern with domestic great circulation as the mainstay, and domestic and international circulations reinforcing each other”. This strategy, commonly referred to as ***dual circulation***, is a response to the rapid changes taking place globally and the increasing trend of de-globalisation. Specifically, the strategy first emphasises the need to boost the domestic economic circulation, by “connecting all links of production, distribution, circulation and consumption, forming a higher-level dynamic balance in which the demand drives the supply, and the supply creates new demand, ultimately promoting a virtuous cycle in the national economy”. Grounded on the aim to boost the domestic circulation, the *dual circulation* strategy requires taking into account international economic and trade activities, and promoting the external circulation of the economy, specifically by “comprehensively optimising foreign investment services, strengthening the promotion and protection of foreign investment, supporting the increase of foreign investment in mid-to-high-end manufacturing, high technology, transformation and upgrade of traditional manufacturing, and modern services, as well as investment in the central and western regions”. Strong support will be given to foreign investors establishing R&D centres in China in high-end industries; in practice, this translates into generous subsidies, tax incentives and government grants – especially by local administrations which are eager to attract high-value investment within their jurisdictions.

The *14th FYP* also calls for “cultivating the innovative development of the robot industry” as part of the efforts to promote the optimisation and upgrading of the manufacturing industry. As part of the efforts to improve the level of production safety, the *14<sup>th</sup> FYP* also proposes to “strengthen the innovative application of advanced technology and equipment in the fields of deep mining and major disaster prevention and control, and promote the introduction of robots – instead of humans – in dangerous posts”. In addition, the Plan also highlights the key role of robotics technology in improving the core competitiveness of the manufacturing industry, and specifically proposes to “focus on the development of industrial control equipment such as distributed control systems, programmable logic controllers, data acquisition and video monitoring systems, and make breakthroughs in the key technologies of intelligent robots such as advanced controllers, high-precision servo drive systems and high-performance reducers”. All these areas are expected to receive strong support by local administrations across China, especially through subsidies and tax incentives, lower land costs, but also stronger priority/endorsement when applying to government-funded projects, grants or procurement.

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<sup>13</sup> [http://www.gov.cn/xinwen/2021-03/13/content\\_5592681.htm](http://www.gov.cn/xinwen/2021-03/13/content_5592681.htm) (accessed on 24 August 2021).



## 2.2. Ministry-level policies

Under the umbrella of the *MIC 2025* and the *14th FYP*, various ministries and competent departments have released a series of policies and action plans to implement the tasks and achieve the objectives, within their industries, laid out by the State Council. Among these, the **Ministry of Industry and Information Technology (MIIT)** and the **National Development and Reform Commission (NDRC)** are the most closely involved in the industrial robots industry. Specifically, MIIT is the competent department of the industry, while NDRC is the main planning body of comprehensive industrial policies in key strategic fields.

MIIT and NDRC have, over the years, issued a large number of policy documents and plans for industrial robots. The following is a summary of the main ones published in the past three years: these are expected to have the most significant impact in the short-term.

- *Catalogue for Guiding the Restructuring of the Industry (2019)*. The document, issued by NDRC in October 2019, aims to channel investment flows and government-funded projects in key strategic areas, through the formulation and adoption of preferential fiscal, tax, credit, land, import and export policies. Relating to industrial robots, the document encourages the development of human-machine cooperative robots, double arm robots, arc welding robots, heavy load AGV, integrated systems of special inspection and assembly robots, and generic robotics technologies (for inspection, detection, evaluation and certification, intelligent robot operating systems, intelligent robot cloud service platforms). In addition, the document also includes, among the list of encouraged industries, special robots such as casting robots, subsea mining robots, intelligent ship block coating robots, wall-climbing robots for ship maintenance, high-pressure intelligent cleaning robots, anti-terrorism and explosive disposal robots.
- *Guiding Opinions on Expanding Investment in Strategic Emerging Industries, and on Cultivating and Strengthening New Growth Points and Poles*. The document, issued in September 2020 by NDRC, MIIT, the Ministry of Science and Technology (MOST) and the Ministry of Finance (MOF), aims to guide the expansion of investment in strategic emerging industries, and to cultivate and strengthen new drivers of economic growth. Specifically, the document calls out for “accelerating and focusing the efforts to strengthen weak areas in the high-end equipment manufacturing industry, by supporting the production of advanced equipment such as industrial robots, special robots in construction and healthcare services, and carrying out pilot programs of intelligent manufacturing and intelligent construction”.
- *Implementation Opinions on Supporting and Accelerating the Reform, Development and Upgrade of Private Enterprises*. The document, released by NDRC in October 2020, once again emphasises the central government’s strong support for the robotics industry. Specifically, it calls relevant authorities and enterprises to (i) implement promotional plans for robots and intelligent equipment; (ii) expand the application of robots and intelligent equipment in healthcare, elderly and disabled assistance, rehabilitation, distribution, civil explosives, dangerous chemicals, coal mines, non-coal mines, fire control and other fields; (iii) accelerate the efforts to substitute and reduce manual labour with mechanisation and automation in high-risk industries, speeding up the application of automatic and intelligent equipment, and upgrade the equipment of high-risk enterprises; (iv) strengthen the support for the promotion and application of innovative emergency technologies and equipment in private enterprises, and carry out the test of unmanned intelligent equipment such as drones and robots in various emergency rescue scenarios”.

- *14th Five-Year Plan for the Development of Intelligent Manufacturing (Draft for Comments)*. The document, issued by MIIT in April 2021, illustrates the aim to “vigorously promote process-oriented special manufacturing equipment and special robots; and to vigorously develop industrial robots such as intelligent welding robots, intelligent mobile robots and semiconductor (cleaning) robots, as well as new equipment such as intelligent industrial control systems, intelligent machine tools and collaborative robots that integrate new technologies such as digital twins, big data, artificial intelligence, VR/AR, 5G and Beidou navigation satellites”.

The specific products and technologies put forward in these policy documents represent the **development focuses and priorities** of China's industrial robots industry in the coming years. These policies translate into strong support from the local administrations to all actors pursuing these goals within their jurisdictions, which may include preferential treatment when applying for projects, permits, land or research grants – both at the local but also at the national level; but also local investment and financing, tax discounts, easier access to loans, venture capital / equity investment through ad hoc government ‘guiding funds’, easier access to facilities and infrastructure, etc. These are all practical means through which the government aims to ‘guide’ the development of all key strategic industries – including the industrial robots one which is expected to grow rapidly in the coming years.

### **2.3. Government incentives and subsidies**

Government-funded R&D projects and incentives are common tools adopted for implementing national policies.

In terms of government R&D projects, MOST has launched a number of National Key R&D Programmes (NKPs) directly relating to intelligent robots.<sup>14</sup> In particular, the “*Intelligent Robots*” NKP was launched in 2017 to support, until 2020, R&D of cutting-edge technologies in six directions: (i) basic cutting-edge technologies of intelligent robots, (ii) new-generation robots, (iii) key common technologies, (iv) industrial robots, (v) service robots, and (vi) special robots, and has injected RMB 1.79 billion for dozens of specific projects.<sup>15</sup> Other NKPs launched for the 14<sup>th</sup> FYP period (2021-2025) also include topics relating to industrial robots, including the “*Industrial Software*” NKP,<sup>16</sup> and the “*Smart Sensors*” NKP.<sup>17</sup>

The National Natural Science Foundation of China (NSFC)<sup>18</sup> has launched a Major Research Plan on “*Fundamental Theories and Key Technologies of Tri-Co Robots*”.<sup>19</sup> The Plan will grant, from 2017 to 2024, around RMB 200 million to support basic/applied research on fundamental theories and key technology of Tri-

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<sup>14</sup> An overview of National Key R&D Programs and their mechanisms is available, in English, at: <http://www.chinainnovationfunding.eu/national-key-rd-programmes/> (accessed on 25 August 2021).

<sup>15</sup> The last call of the “*Intelligent Robots*” NKP was published in 2019: <https://service.most.gov.cn/u/cms/static/201907/04092507ae6b.pdf> (accessed on 25 August 2021).

<sup>16</sup> The first call of the “*Industrial Software*” NKP was published in 2021: <https://service.most.gov.cn/sbzn/20210514/4301.html> (accessed on 25 August 2021).

<sup>17</sup> The first call of the “*Smart Sensors*” NKP was published in 2021: <https://service.most.gov.cn/sbzn/20210514/4299.html> (accessed on 25 August 2021).

<sup>18</sup> An overview of the NSFC and its grants schemes is available, in English, at: <http://www.chinainnovationfunding.eu/national-natural-science-fund/> (accessed on 25 August 2021).

<sup>19</sup> *Coexisting-Cooperative-Cognitive Robots (Tri-Co Robots)* are robots that can naturally interact with the working environment, humans and other robots, independently adapt to the complex dynamic environment and work collaboratively.

Co robot structure, perception and control, with particular focus on the demand for Tri-Co robots in the fields of intelligent manufacturing, medical rehabilitation and national defence.

At the same time, local administrations at all levels in China – starting from district/high-tech zone level to municipal and provincial level – have launched **subsidies and funding schemes** to support entities within their jurisdictions to conduct R&D on various priority sectors – including industrial robots. These have a significant impact in supporting the development and growth of strategic industries. It is relatively safe to say that all local administrations across China – at all levels – offer some type of incentives and support to actors in their jurisdictions, which show how local administrations are often the real drivers of industrial development in China.<sup>20</sup> In general, R&D grants are offered by local departments of science and technology; while subsidies on investment projects are offered by local departments of industry and information technology. A few examples from selected localities are:

- The Guangdong Provincial Department of Science and Technology has launched provincial-level key R&D programmes (reflecting the same structure of NKPs). One such programme focuses entirely on intelligent robots, funding every year a dozen specific R&D projects (around RMB 20 million each) in line with project calls published.<sup>21</sup>
- The Shanghai Municipal Commission of Science and Technology launched a “Science, Technology and Innovation Action Plan”, under which every year dozens of R&D projects (generally RMB 1 million each) are funded in different key priority areas. Robotics technologies are generally included within high-tech fields.<sup>22</sup> The same department also offers subsidies of RMB 300,000 to RMB 500,000 to local enterprises that formulate standards (international, national or sectoral standards) in key priority fields, including industrial internet, high-end manufacturing equipment, AI, etc.<sup>23</sup>
- The *Administrative Measures for the Use of Special Funds for Advanced Manufacturing Development in Baoshan District*, issued by the Shanghai municipality in 2020, grant a subsidy of up to RMB 5 million (not exceeding 10% of the total investment value) to local enterprises that introduce new advanced technologies (foreign or domestic), new equipment, new processes and new materials, as well as the transformation, expansion and relocation of existing equipment, production processes and auxiliary facilities – provided that the total value of the investment exceeds RMB 5 million.
- The *Several Measures of Jiangsu Province on Strengthening the Construction of an Intelligent Manufacturing Ecosystem*, issued by Jiangsu Province in 2018, indicate a reward of RMB 50,000 to RMB 50 million to local enterprises that launch intelligent manufacturing projects with tangible outputs, e.g., introducing intelligent equipment, software, industrial internet, and robots.
- The *Development Plan for the Robot Industry in Anhui Province (2018-2027)*, and the *Several Policies for Supporting the Development of Robot Industry*, issued by Anhui Province in 2018, stipulate that a

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<sup>20</sup> A guide for European SMEs on subsidies, grants and funding offered by local administrations in China was produced at the end of 2019 under another EU-funded project, see: <https://www.eurobiz.com.cn/stimulus-package/> (accessed on 24 August 2021).

<sup>21</sup> See for instance the last call for 2019-2020: <http://gdstc.gd.gov.cn/attachment/0/376/376487/2641382.pdf> (accessed on 25 August 2021).

<sup>22</sup> See for instance the last call published in May 2021: <https://www.shanghai.gov.cn/nw49248/20210513/e721d2fcdd3c454788dc8ffba10319e4.html> (accessed on 25 August 2021).

<sup>23</sup> See for instance the last call published in August 2021: <http://stcsm.sh.gov.cn/zwgk/kjhxsm/xmsb/20210809/65cf9666e5f74c70ba0dc88bca2d5be8.html> (accessed on 25 August 2021).

reward of RMB 2 million shall be given to local enterprises that are assigned national-level intelligent manufacturing pilot demonstration projects. At the same time, a supplementary reward of RMB 1 million and RMB 500,000 shall be given to smart factories and digital workshops certified by provincial authorities; while a subsidy of up to RMB 1 million shall be given to local enterprises that purchase 10 or more industrial robots.

- The *Notice on Issuing the Several Policies to Accelerate the Development of Intelligent Technologies and Industries*, issued by Tianjin in 2018, indicate a one-off subsidy of RMB 3 million for intelligent manufacturing enterprises certified by municipal authorities as pilot demonstration intelligent factories and digital workshops. Another subsidy of RMB 2 million is given to enterprises implementing MIIT-funded intelligent manufacturing pilot demonstration projects, upon project completion and acceptance.

It is noteworthy that these government-funded programmes and incentives are only open to research institutes and enterprises registered in mainland China. However, foreign-invested entities in China encounter many barriers when applying to programmes at the national level (in particular NKPs), although these on paper welcome international cooperation. By contrast, there is large evidence of foreign-invested entities successfully applying for grants and incentives at the local level – which have **easier application and evaluation procedures** and are relatively transparent. Therefore, European SMEs registered in mainland China which are interested in applying for government projects and subsidies, are advised to start with local-level programmes, and only at a second stage aim for larger programmes at provincial – or even national – level.

### ***Standard Conditions for the Industrial Robots Industry***

Clear targets and conditions are essential for the implementation of government support policies in key strategic sectors. Within the field of industrial robots, in December 2016 MIIT issued the *Standard Conditions for the Industrial Robot Industry* (hereinafter referred to as “*Standard Conditions*”).<sup>24</sup> The document puts forward a series of conditions that industrial robot enterprises must meet when applying for incentives and preferential policies at the national level; failure to meet these conditions might hinder the eligibility or accessibility to such schemes – even if not explicitly required. Every year, enterprises that meet such requirements must submit an application to MIIT in order to be officially included in the list of qualified enterprises.

Specifically, the *Standard Conditions* stipulate that “all testing equipment of industrial robot enterprises shall have effective calibration reports recognised by CNAS” (i.e., the China National Accreditation Service for Conformity Assessment). At the same time, the *Standard Conditions* also stipulate that “the robot body and key parts used in the R&D and production of industrial robot body manufacturers and application integration enterprises must obtain the China Robot (CR) certification mark; in addition, robot application integration systems must pass the safety assessment of the national recognised third-party testing and certification organisation”. The CR certification is a recommended certification scheme for robot products promoted by the Chinese government; despite being ‘recommended’ in nature, its linkage with preferential policies makes it a necessary requirement for most enterprises that do not want to be excluded from competitive incentives and subsidies.

The *Standard Conditions* apply to industrial robot body manufacturers and industrial robot integration enterprises in China – including foreign-invested enterprises with factories in China. This means that European exporters of industrial robots to China are not eligible for the numerous preferential policies and incentives by government administrations in China at all levels; however, their China-based importers may be eligible.

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<sup>24</sup> [http://www.beijing.gov.cn/zhengce/zhengcefagui/201905/t20190522\\_59793.html](http://www.beijing.gov.cn/zhengce/zhengcefagui/201905/t20190522_59793.html) (accessed on 24 August 2021).

In addition to the central level, occasionally various preferential policies at the local level may also be directly linked to the *Standard Conditions*. For example, many local administrations may give one-off rewards, generally ranging from RMB 500,000 to RMB 1 million, to local enterprises that successfully meet the requirements of the *Standard Conditions* and are included in MIIT's list of qualified enterprises. Examples include Anhui province,<sup>25</sup> Qingdao municipality,<sup>26</sup> Haimen City (in Nantong, Jiangsu province),<sup>27</sup> and many others.

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<sup>25</sup> *Several Policies for Supporting the Development of Robot Industry issued by Anhui Province in July 2018, see previous section.*

<sup>26</sup> *Notice on Several Policies and Measures to Support and Accelerate the Development of the Robot Industry issued by Qingdao municipality in March 2020.*

<sup>27</sup> *Several Opinions on Supporting the Development of Robot Industry issued in May 2019.*

### 3. Market access requirements

In addition to five mandatory national standards, there are no other compulsory market access schemes for industrial robot products in China. This makes the sector much more easily accessible compared to other sectors in China, like information and communication technologies. Nonetheless, there might be mandatory requirements for special robots used in specific industries, such as firefighting, or in case products have special functions, such as robots that are movable or can transmit radio signals.

#### 3.1. Standards and certification schemes

In order to be sold on the Chinese market, industrial robot products must comply with **five mandatory national standards** (or, alternatively, with other international standards whose technical requirements are more stringent). These standards are identical to ISO/IEC standards, meaning that European enterprises adopting these will not have major difficulties to be compliant in China.

- *GB 11291.1-2011 Robots for industrial environments - Safety requirements - Part 1: Robots*, which is identical to ISO 10218-1:2006 and ISO 10218-1/Cor.1:2007, IDT;
- *GB 11291.2-2013 Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration*, which is identical to ISO 10218-2:2011, IDT;
- *GB 5226.1-2019 Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements*, which is identical to IEC 60204-1: 2016, IDT;
- *GB 17799.3-2012 Electromagnetic compatibility (EMC) - Generic standards - Emission standard for residential, commercial and light-industrial environments*, which is identical to IEC 61000-6-3:2011(Ed 2.1), IDT;
- *GB 17799.4-2012 Electromagnetic compatibility (EMC) - Generic standards - Emission standard for industrial environments*, which is identical to IEC 61000-6-4:2011, IDT.

Currently, the best way to ensure compliance with the requirements of the above mandatory standards is through the **China Robot certification** (CR certification). The CR certification is a recommended certification scheme for robot products established in 2016 by the former General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ, now the State Administration for Market Regulation, SAMR), NDRC, MIIT and CNCA.<sup>28</sup> One of the objectives was to actively promote the use of certification result in policies, such as special financial projects, financial credits, tax reduction and exemption and major projects; and at the same time to encourage enterprises to apply for the certification, thus leading to wide market recognition and acceptance.

Although CR certification remains a voluntary scheme, it represents an effective method to demonstrate safety and performance, and thus compliance with the above standards. At the same time, CR certification is increasingly being used as a key eligibility requirement for applying to many scientific research projects, government procurement and large end-user projects. Indeed, the possession of CR certification is a key requirement of the *Standard Conditions* seen in the previous section of this report. Even if not explicitly required, possessing CR certification will **significantly improve the success rate** when applying to incentives of bidding. Therefore, the certification is gaining high popularity and influence in the Chinese market.

Dozens of certification bodies in China are currently engaged in CR certification,<sup>29</sup> but their scope of certification might vary, meaning that one body might be able to certify only certain products. Figure 10 below

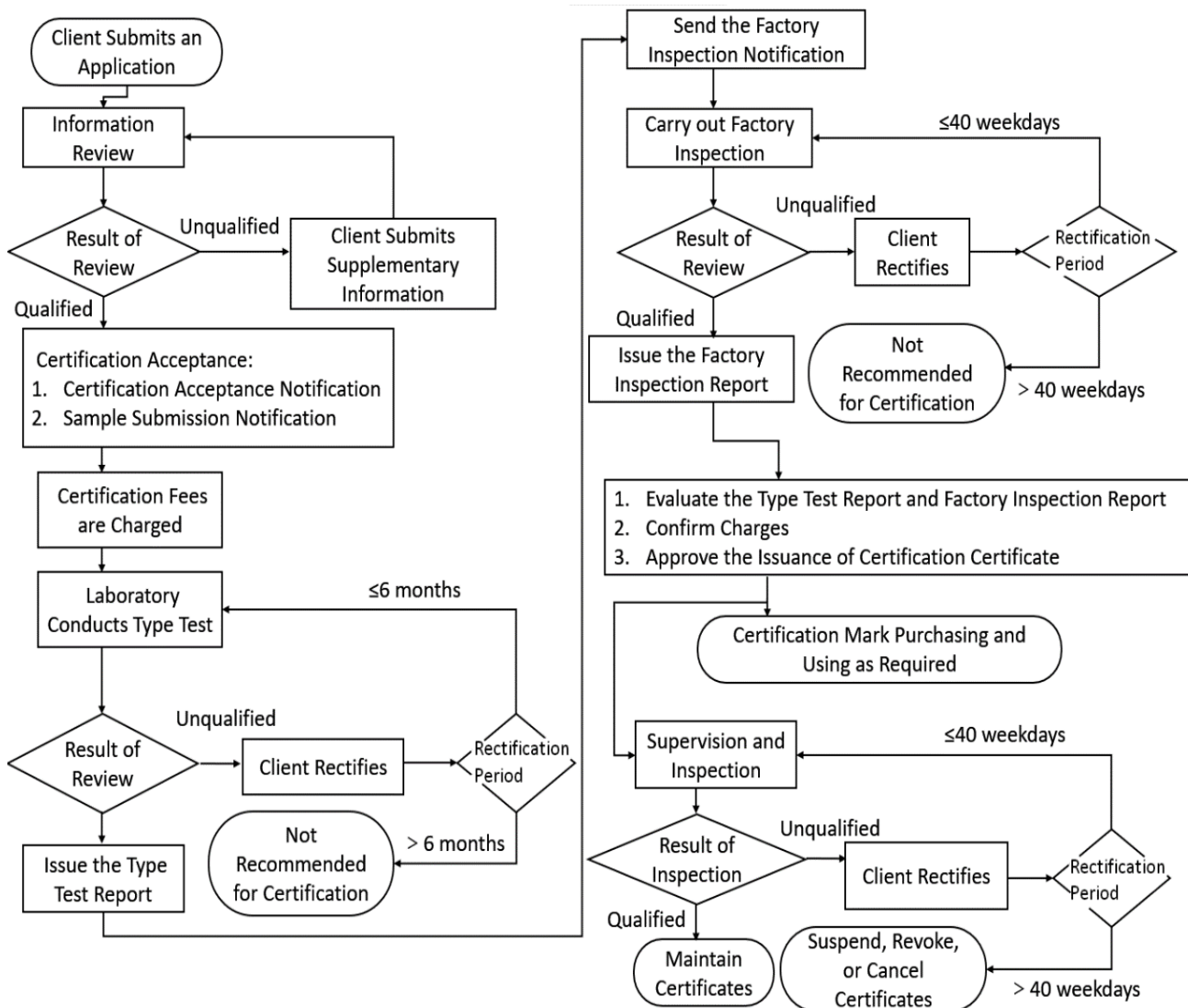
<sup>28</sup> <http://www.cnca.gov.cn/zw/tz/tz2016/202008/W020200819291546543213.pdf> (accessed on 24 August 2021).

<sup>29</sup> The list can be accessed through CNCA's platform (Chinese) <http://cx.cnca.cn/CertECloud/index/index?page?currentPosition=>.

depicts the CR certification process of the National Robot Testing and Assessment Centre (NRTAC) – one of the most influential bodies in this field.<sup>30</sup>

- **Certification mode:** type test + factory inspection + post-certification supervision
- **Application process:**

**Figure 10: flow chart of Applying for the CR Certificate**



- **Certification rules:** see the tables below, respectively for industrial robots (Table 1), Automated Guided Vehicles (AGV, Table 2), logistics robots (Table 3), and industrial robot systems and integration (Table 4):

<sup>30</sup> Established by the Shenyang Institute of Automation of the Chinese Academy of Sciences, NRTAC also hosts the Secretariat of the General Working Group and Expert Advisory Group on National Standardisation of Robots, which puts it in a leading position for the formulation of various national standards for industrial robots. Therefore, NRTAC's CR certification process is relatively comprehensive and can be used as a good reference to understand how the certification process is structured. More information are available on NRTAC's website: <http://www.nrtac.com/>.

**Table 1: Certification Rules for Industrial Robots**

<b>Implementation Rules for Certification</b>	<b>Reference Standard Number</b>	<b>Standard Name</b>
<i>TCSIA/CR-1-0100 Implementation rules for safety and EMC certification of industrial robots</i>	GB 5226.1-2008	Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements
	GB/T 15706-2012	Safety of machinery - General principles for design - Risk assessment and risk reduction
	GB 11291.1-2011	Robots for industrial environments - Safety requirements - Part 1: Robots
	GB/T 17799.1-1999	Electromagnetic compatibility - Generic standards - Immunity for residential, commercial and light-industrial environments
	GB/T 17799.2-2003	Electromagnetic compatibility - Generic standards - Immunity for industrial environments
	GB/T 17799.3-2012	Electromagnetic compatibility - Generic standards - Emission standard for residential, commercial and light-industrial environments
	GB/T 17799.4-2012	Electromagnetic compatibility (EMC) - Generic standards - Emission standard for industrial environments
<i>CR-1-0102:2019 Implementation rules for performance certification of industrial robots</i>	CR-1-0102TS-2019	Industrial robots - Technical specifications for performance test
	GB/T 12642-2013	Industrial robots - Performance criteria and related test methods
<i>CR-1-0101:2019 Implementation rules for safety certification of collaborative operation of industrial robots</i>	GB 5226.1-2019	Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements
	GB/T 15706-2012	Safety of machinery - General principles for design - Risk assessment and risk reduction
	GB 11291.1-2011	Robots for industrial environments - Safety requirements - Part 1: Robots
	GB 11291.2-2013	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
	GB/T 36008-2018	Robots and robotic devices - Collaborative robots

**Table 2: Certification Rules for Automated Guided Vehicles**

<b>Implementation Rules for Certification</b>	<b>Reference Standard Number</b>	<b>Standard Name</b>
<i>CR-1-0302:2018 Implementation rules for CR certification of automated guided vehicles (AGV)</i>	GB/T 15706-2012	Safety of machinery - General principles for design - Risk assessment and risk reduction
	CR-1-0302TS:2018	Automated guided vehicles (AGV) - Safety technical specifications
	GB/T 5226.1-2008	Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements
	GB 17799.3-2012	Electromagnetic compatibility - Generic standards - Emission standard for residential, commercial and light-industrial environments
	GB/T 17799.1-2017	Electromagnetic compatibility - Generic standards - Immunity for residential, commercial and light-industrial environments
	GB 17799.4-2012	Electromagnetic compatibility - Generic standards - Emission standard for industrial environments
	GB/T 17799.2-2003	Electromagnetic compatibility - Generic standards - Immunity for industrial environments



**Table 3: Certification Rules for Logistics Robots**

Implementation Rules for Certification	Reference Standard Number	Standard Name
<i>CR-1-0303:2018 Implementation rules for CR certification of logistics robots</i>	GB/T 5226.1-2008	Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements
	GB/T 15706-2012	Safety of machinery - General principles for design - Risk assessment and risk reduction
	CR-1-0303TS:2018	General technical specifications for logistics robots
	GB 11291.1-2011	Robots for industrial environments - Safety requirements - Part 1: Robots
	GB 17799.3-2012	Electromagnetic compatibility - Generic standards - Emission standard for residential, commercial and light-industrial environments
	GB/T 17799.1-2017	Electromagnetic compatibility - Generic standards - Immunity for residential, commercial and light-industrial environments
	GB 17799.4-2012	Electromagnetic compatibility (EMC) - Generic standards - Emission standard for industrial environments
	GB/T 17799.2-2003	Electromagnetic compatibility - Generic standards - Immunity for industrial environments
	YY0505-2012	Medical electrical equipment - Part 1-2: General requirements for safety - Collateral standard: Electromagnetic compatibility - Requirements and tests

**Table 4: Certification Rules for Industrial Robot Systems and Integration**

Implementation Rules for Certification	Reference Standard Number	Standard Name
<i>CR-2-01:2018 Implementation rules for safety and EMC certification of industrial robot systems and integration</i>	GB/T 5226.1-2008	Electrical safety of machinery - Electrical equipment of machines - Part 1: General requirements
	GB/T 15706-2012	Safety of machinery - General principles for design - Risk assessment and risk reduction
	GB 11291.2-2013	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration
	GB/T 17799.1-2017	Electromagnetic compatibility - Generic standards - Immunity for residential, commercial and light-industrial environments
<i>CR-2-01:2018 Implementation rules for safety and EMC certification of industrial robot systems and integration</i>	GB 17799.3-2012	Electromagnetic compatibility - Generic standards - Emission standard for residential, commercial and light-industrial environments
	GB/T 17799.2-2003	Electromagnetic compatibility - Generic standards - Immunity for industrial environments
	GB 17799.4-2012	Electromagnetic compatibility (EMC) - Generic standards - Emission standard for industrial environments

- **Standard fees:** see Table 5.

Table 5: Standard fees the CR Certification

Item	Amount	Remarks
Application fee	RMB 500 per unit	
Approval and registration fee (certificate fee)	RMB 800 per unit	RMB 500 for each additional certificate
Product inspection fee	Charged in accordance with the charging standard for entrusted inspection of product quality stipulated by the state	
Report review fee	RMB 1000 per copy (less than 100 pages); RMB 2000 per copy (100 pages and above)	
Factory inspection fee	3000*persons*days	Persons*days is the number of persons and days required for auditing (persons * days)
Travel expenses	Cost-based reimbursement by the applicant	
Annual fee	RMB 400 per unit	
Fee for use of marks	RMB 800 per year	Anti-counterfeiting marks can be optionally purchased directly

▪ Sample certificate:



▪ Sample mark (uniformly regulated by the government):



The above three marks correspond (from left to right) to EMC, safety, and EMC + safety.

▪ **Contact details:**

Tel: 86 24 23 97 45 19;

E-mail: [cr\\_tcsia@sia.cn](mailto:cr_tcsia@sia.cn)

Website: <http://rtc.sia.cn/>

It should be noted that, currently, NRTAC's CR certification only covers certain categories of industrial robots; those that are not covered must be certified by other certification bodies (see footnote 29).

Finally, it must be stressed that there might be additional mandatory requirements for special robots used in specific industries or for specific purposes. For instance, robot products deployed for fire-fighting also need to meet the mandatory sectoral standard in the field of fire protection, namely *GA (XF) 892.1-2010 Fire robot - Part 1: General specifications*; if the robot has a gasoline or diesel engine, it needs to comply with the emission standards for non-road mobile machinery;<sup>31</sup> if dust emission is involved, it needs to meet the mandatory *GB 16297 Integrated emission standard of air pollutants*; if the robot has radio transmission function, it needs to obtain radio type approval (SRRC), etc.

### 3.2. Process for exports

With a few exemptions, the Chinese customs do not have major restrictions or inspection and quarantine requirements for industrial robots. Table 6 summarises these requirements according to the HS codes used for industrial robots products.<sup>32</sup>

**Table 6: Supervision requirements of the Chinese Customs for imported Industrial Robots**

HS Code	Article Name	Regulations & Restrictions	Inspection & Quarantine
8479509090	Other industrial robots (excluding multi-functional industrial robots)	N/A	N/A
8479501000	Industrial robots for multiple uses	N/A	N/A
8537109021	Controllers (for robots or end effectors, see the dual-purpose nuclear goods list for details)	N/A	N/A
8486403100	Automated material handling machines solely or principally of a kind used in the electronic integrated circuits factories]	N/A	N/A
8479509010	Robots, end-control devices (capable of handling high-energy explosives or resisting radiation of more than $5 \times 10^4$ Gy (Si))	N/A	N/A

<sup>31</sup> Namely: (i) *GB26133-2010 Limits and measurement methods for exhaust pollutants from small spark ignition engines of non-road mobile machinery (I, II)*; (ii) *GB 20891-2014 Limits and measurement methods for exhaust pollutants from diesel engines of non-road mobile machinery (China III, IV)*; and (iii) *HJ 1014-2020 Emissions control technical requirements of non-road diesel mobile machinery*.

<sup>32</sup> It must be noted that only the first 6 digits of HS codes are universally equal, therefore the remaining, especially the 7<sup>th</sup> to 10<sup>th</sup> digits, may be different in China. A safe way to confirm the Chinese HS code is to go through the *Import and Export Tariff of the People's Republic of China (2021 version)*, available at: [http://www.gov.cn/zhengce/zhengceku/2020-12/31/content\\_5575817.htm](http://www.gov.cn/zhengce/zhengceku/2020-12/31/content_5575817.htm) (accessed on 25 August 2021); there are also many other online resources for checking the Chinese HS codes.

<b>HS Code</b>	<b>Article Name</b>	<b>Regulations &amp; Restrictions</b>	<b>Inspection &amp; Quarantine</b>
<b>8428904000</b>	Handling robot	N/A	N/A
<b>8515212001</b>	Robot for resistance welding of metals, for automobile production line	- Customs Clearance of Entry Commodities; - Automatic Import Licence (mechanical and electrical products).	CCC
<b>8424892000</b>	Spraying robot	N/A	N/A
<b>8515312000</b>	Robot for welding of metals (incl.	- Customs Clearance of Entry Commodities; - Automatic Import Licence (mechanical and electrical products).	CCC
<b>8515212090</b>	Other resistance welding robot	- Customs Clearance of Entry Commodities; - Automatic Import Licence (mechanical and electrical products).	CCC
<b>8515801090</b>	Other laser welding robot	N/A	N/A
<b>8515801001</b>	Robot for laser welding of metals, for automobile production line	N/A	N/A

The restrictions as well as inspection and quarantine requirements that apply to the three HS codes above are:

#### ***Customs Clearance of Entry Commodities***

Customs Clearance of Entry Commodities refers to a certificate showing that the consignee (or its agent) has gone through the relevant inspection application procedures for entry commodities and special articles listed in the *Catalogue Entry-exit Goods Subject to Inspection and Quarantine*, or otherwise specified by relevant laws and regulations.

The importer shall fill in the inspection application form, prepare all the relevant import certificates, apply for inspection to the relevant inspection body in the port of entry, and apply for the customs clearance after sampling inspection has been concluded.

#### ***Automatic Import License (mechanical and electrical products)***

Automatic import license refers to the import license granted by organs authorised by the Ministry of Commerce, applicable to permitted goods that do not require special import licenses such as for goods under import quotas. Specifically, the license is required for both new and old products listed in the *Catalogue of Products Subject to Automatic Import License*, published by the Ministry of Commerce and the General Administration of Customs.<sup>33</sup>

<sup>33</sup> *Catalogue of Products Subject to Automatic Import License (2021 version)*  
<http://images.mofcom.gov.cn/wms/202012/20201231153938340.pdf> (accessed on 26 August 2021).

The application for the Automatic Import License shall be filed by the importer and submitted online to the local department of mechanical and electrical products. Application materials also include the import application form of mechanical and electrical products, copy of the business license, and import contract. The license is usually issued automatically to all applicants, and is largely used to track imports more accurately.

### ***China Compulsory Certification***

The China Compulsory Certificate (CCC) is a mandatory certification scheme that applies to certain products and systems sold in China and that present health, safety and environmental protection risks. Such products are specified in the CCC Catalogue, which currently contains 103 items under 17 product groups. Electric welding machines are featured in the CCC Catalogue, so a CCC certificate is required for the welding guns of electric welding robots.

The process for obtaining CCC in this case is relatively simple: the exporting enterprise may make a CCC declaration of conformity by means of self-declaration, and paste the CCC mark.<sup>34</sup> The EU SME Centre, together with the Seconded European Standardisation Expert in China (SESEC) project, have recently issued a set of guidelines on the CCC, including a detailed overview of the application process, timeline and costs.<sup>35</sup>

### ***Other documents for customs clearance***

In addition to the above restrictions and requirements applicable to certain HS codes, all the standard documents required for customs clearance must also be prepared. These include:

- Exporter (consignor): beneficiary's certificate (i.e., exporter's certificate), insurance policy, bill of lading (waybills), delivery order, packing list, etc;
- Importer (consignee): contract, invoice, power of attorney for customs declaration/inspection, etc;
- Agents for customs declaration shall provide the declaration form of entry commodities.

While preparing the materials, the consignor shall arrange the transportation of the goods to the designated port in China for customs clearance. Upon arrival of the goods, the buyer can process the customs clearance alone, provided that the import and export qualification is in place; alternatively, an agent shall be entrusted to handle the whole process. The goods are generally cleared within 5-8 days. Detailed guidelines on China's customs clearance process have been produced by the EU SME Centre.<sup>36</sup>

## **3.3. Tariffs and costs for exporting to China**

European enterprises exporting industrial robots to China generally need to pay a series of tariffs and taxes, including import duties (interim import duties might be applied by the Chinese authorities to encourage imports of certain product categories) and Value-Added Tax (13% for industrial robots). No consumption tax must be paid for industrial robots. Table 7 summarises all the tariffs and taxes for different HS codes.

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<sup>34</sup> The producer (manufacturer) may independently select a laboratory to conduct type test and issue a type test report to prove that the product meets the requirements of the applicable standards for compulsory certification products. The process can be implemented in accordance with CNCA-00C-008:2019 Implementation Rules for Compulsory Product Certification - Self-Declaration.

<sup>35</sup> The Guidelines are available, for free, at: <https://www.eusmecentre.org.cn/article/updated-guidelines-china-compulsory-certification-ccc-scheme>.

<sup>36</sup> The Guidelines are available, for free, at: <https://www.eusmecentre.org.cn/guideline/customs-clearance-imports-china>.

Table 7: Tariffs and taxes for imported Industrial Robots in China<sup>37</sup>

HS Code	Article Name	Import duties			Consum. Tax (CT)	VAT
		MFN Duty	General Duty	Interim Duty		
8424892000	Spraying robot	0	80%		0	13%
8428904000	Handling robot	5%	30%		0	13%
8479501000	Industrial robots for multiple uses	0	20%		0	13%
8479509010	Robots, end-control devices	0	30%		0	13%
8479509090	Other industrial robots	0	30%		0	13%
8486403100	Automated material handling machines solely or principally of a kind used in IC factories	0	20%		0	13%
8515212001	Robot for resistance welding of metals, for automobile production line	10%	30%	5%	0	13%
8515212090	Other resistance welding robot	10%	30%		0	13%
8515312000	Robot for welding of metals (including plasma arc)	10%	30%		0	13%
8515801001	Robot for laser welding of metals, for automobile production line	8%	30%	5%	0	13%
8515801090	Other laser welding robot	8%	30%		0	13%

**Other expenses for exports to China include:**

- Foreign freight and insurance premiums: referring to ocean, land and air freight from the port, border or airport of the exporting country to the port, border or airport of China; as well as the insurance premiums in the process.
- Loading and unloading fees: including unloading fee at the wharf, crane fee, lighterage, warehouse rental fee, etc. For example, the lump sum fee of the Shenzhen Municipal Transportation Bureau for loading and unloading of goods imported via sea is: RMB 900/20 GP (20 ft general purpose container); RMB 1,600/40 GP-HQ (40 ft high cube container); and RMB 1,700/45 HQ (45 ft high cube container).
- Customs declaration and delivery fee: including customs declaration fee (generally RMB 150 per bill), document exchange fee (RMB 200 or 300 per bill), port surcharges (including storage charges), etc.
- Inspection and quarantine fees and other domestic transportation fees: generally RMB 80 per bill, and the charges vary for different products.

<sup>37</sup> Source (in Chinese): *Import and Export Tariff of the People's Republic of China (2021 version)*, available at: [http://www.gov.cn/zhengce/zhengceku/2020-12/31/content\\_5575817.htm](http://www.gov.cn/zhengce/zhengceku/2020-12/31/content_5575817.htm) (accessed on 25 August 2021).

In addition, fees must also be paid to agents such as freight forwarding companies and customs declaration companies. When collecting agent fees, import customs clearance companies will collect different amounts according to different services delivered.

Finally, it is vital that European SMEs register the intellectual property rights (patents, trademarks, software, etc.) of their products in China, before goods are exported to China.<sup>38</sup> At the same time, European SMEs holding their intellectual property rights in China can file their trademarks and patent rights to the General Administration of Customs, to report infringement cases and to apply for detainment and/or destruction of the infringed goods during the process of import.

### 3.4. Requirements for investing in China

The legal framework for the management and supervision of foreign investment in China, is constituted mainly by the *Foreign Investment Law* – which came into force in January 2020 – and the supporting *Regulations for the Implementation of the Foreign Investment Law*.<sup>39</sup>

On the basis of this legal framework, entry in the Chinese market is regulated by a series of additional regulations, most notably those called **negative lists**. These documents stipulate open, restricted or prohibited sectors for foreign investment. There are three main types of negative lists:

- The *Special Administrative Measures on Access to Foreign Investment*, also called **Foreign Investment Negative List**, applies nationwide and indicates the industries in which foreign investment is restricted or prohibited. The latest edition was published by the NDRC and MOFCOM in 2020.<sup>40</sup>
- The *Free Trade Zone Special Administrative Measures on Access to Foreign Investment*, also called **FTZ Foreign Investment Negative List**. It follows the same logic of its nationwide counterpart, but it only applies to the Free Trade Zones established across China and therefore contains less restricted or prohibited sectors. An ad hoc FTZ Foreign Investment Negative List was also published exclusively for the Hainan Free Trade Port – with even less restricted items especially relating to education. The latest edition was published by the NDRC and MOFCOM in 2020.<sup>41</sup>
- The **Market Access Negative List** is similar to the previous lists, but it applies to all actors in mainland China regardless of their nature (state-owned, private, non-profit) and country of origin (Chinese entity or foreign-invested). The latest edition of the list was published by NDRC and MOFCOM in 2020.<sup>42</sup>

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<sup>38</sup> *Free-of-charge technical assistance, advice and guidelines on IPR protection and enforcement in China, is provided by the China IP SME Helpdesk, another project funded by the European Union: [https://intellectual-property-helpdesk.ec.europa.eu/regional-helpdesks/china-ipr-sme-helpdesk\\_en](https://intellectual-property-helpdesk.ec.europa.eu/regional-helpdesks/china-ipr-sme-helpdesk_en) (accessed on 25 August 2021).*

<sup>39</sup> A bilingual version of the *Foreign Investment Law* is available at: <http://language.chinadaily.com.cn/a/201903/22/WS5c94798ca3104842260b205f.html> (accessed on 25 August 2021). Other relevant documents regulating foreign investment in China are: (i) *Measures for the Reporting of Foreign Investment Information*; (ii) *Announcement on Matters Relating to Foreign Investment Information Reporting*; (iii) *Notice on the Implementation of the Foreign Investment Law and the Proper Handling of the Registration of Foreign-invested Enterprises*; (iv) *Interpretation of the Supreme People's Court on Certain Issues Concerning the Application of the Foreign Investment Law of the People's Republic of China*.

<sup>40</sup> <https://www.ndrc.gov.cn/xxgk/zcfb/fzggwl/202006/P020200624549035288187.pdf> (accessed on 25 August 2021).

<sup>41</sup> <https://www.ndrc.gov.cn/xxgk/zcfb/fzggwl/202006/P020200624549079806436.pdf> (accessed on 25 August 2021).

<sup>42</sup> [http://www.gov.cn/zhengce/zhengceku/2020-12/16/content\\_5569975.htm](http://www.gov.cn/zhengce/zhengceku/2020-12/16/content_5569975.htm) (accessed on 25 August 2021).

Industrial robots are not included in any of the above lists, this means that European investors will be treated on equal footing as domestic investors with no need for pre-approval from authorities. As a matter of fact, industrial robots are positioned as an **encouraged industry for foreign investment**. Specifically, the *Catalogue of Encouraged Industries for Foreign Investment* (also commonly referred to as **Foreign Investment Positive List**), explicitly encourages investment in “the development and manufacturing of complete systems for robots and industrial robots, high-precision reducers used for robots, high-performance servo motors and drivers, fully autonomous programming and other high-performance controllers, sensors and end effectors”.<sup>43</sup> This means that enterprises operating in industrial robots will enjoy a series of **preferential policies** at the national level, including: (i) exemption from customs duties for equipment imported for self-use purpose and not exceeding the total value of the investment; (ii) reduced Corporate Income Tax Rate (from the statutory 25% to 15%) if the enterprise is located in central and western regions, or in Hainan province; (iii) priority in land allocation, and at a discounted base price.

In addition to the national level, basically all local administrations at all levels (district, municipal and provincial) regularly issue preferential policies for foreign investment in encouraged sectors – which in practice translates into **subsidies, tax discounts and administrative support** (e.g., for land use, access to loans, etc.), granted on top of those from the national level.<sup>44</sup> Although these generally apply to all those encouraged sectors indicated in the Foreign Investment Positive List, at the same time (as illustrated in section 2.3 of this report), some administrations might issue additional incentives exclusively for investment in the industrial robots industry. In general, the benefits of these preferential policies can be cumulative, especially when they are granted from different administrative levels; they are also a significant **bargaining chip** that particularly innovative foreign investors can use when negotiating conditions for their investment with shortlisted localities in China.

Nonetheless, although China strongly encourages foreign investment in the industrial robots industry, European investors should be aware of a **number of risks** that they will face.<sup>45</sup> These are mainly reflected in:

- China's foreign investment regime still formally differentiates between foreign-invested enterprises (FIEs) and Chinese domestic companies. In practice, FIEs are more likely to encounter issues such as **unequal/disparity of treatment** compared to their domestic competitors, unwritten rules or barriers particularly when applying for government funding, land supply, public procurement – even if preferential policies on paper say the opposite. Moreover, China's remedy and appeal system for foreign investors is not perfect – or even not in place for cases of discrimination.
- China's foreign investment regime still does not clarify some issues that are frequently encountered in practice. For example, it is unclear whether current rules imposing a debt-to-equity ratio still apply when FIEs procure debt financing from overseas; it is also not clear whether foreign investors are allowed to use or increase the registered capital in their existing FIEs so to invest, through them, in domestic companies. These issues may translate, in practice, into risks for investors.

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<sup>43</sup> The latest 2020 Edition of the Foreign Investment Positive List was published by NDRC and MOFCOM in December 2020: [http://www.gov.cn/zhengce/zhengceku/2020-12/28/content\\_5574265.htm](http://www.gov.cn/zhengce/zhengceku/2020-12/28/content_5574265.htm).

<sup>44</sup> See, for instance, the *Several Measures of the Shenzhen Municipality for Stabilising Foreign Investment and Promoting Development in 2020*: <https://www.waizi.org.cn/rule/117187.html> (accessed on 25 August 2021); and the *Regulations of Shanghai Municipality on Foreign Investment*: <https://sw.sh.gov.cn/swdt/20201012/1fbecfc2d2264e6db9f7c0c00fb9eb20.html> (accessed on 25 August 2021).

<sup>45</sup> More details are illustrated in the *Position paper 2020/2021 of the Investment Working Group of the European Union Chamber of Commerce in China*, available at: [https://www.europeanchamber.com.cn/en/publications-archive/840/Investment\\_Working\\_Group\\_Position\\_Paper\\_2020\\_2021](https://www.europeanchamber.com.cn/en/publications-archive/840/Investment_Working_Group_Position_Paper_2020_2021) (accessed on 25 August 2021).



- The **lack of transparency and clarity of China's national security review (NSR)** regime brings significant uncertainties. The scope of the NSR is currently very broad, and the Chinese authorities have yet to issue an exhaustive list of sensitive sectors that fall under the NSR category. The *Foreign Investment Law* merely stipulates that NSR should be undertaken for any foreign investment that affects or may affect national security: this leaves great discretion to the regulatory authority, potentially resulting in discriminatory treatment. Although the industrial robots industry does not seem to present major risks, this fundamental issue creates considerable uncertainty for foreign investors, exposing them to potential unpredictable risks.
- While Chinese companies are free to acquire and retain any IP rights acquired from or developed with European companies, according to a Catalogue issued by MOFCOM and MOST,<sup>46</sup> for certain fields, subsidiaries of European entities in China that want to transfer IP rights to their European headquarters need to go through a review process based on (i) impact on China's national security; and (ii) impact on China's development of core key technologies in important sectors. This potentially leaves room for using the review process as a tool for protecting strategic technologies and domestic companies. As industrial robots fall within the category of restricted technologies for exports, subsidiaries of European entities in China might not be able to re-transfer their China-based IP rights back to Europe, even by means of licensing.
- Too many administrative filings and complex steps are required in inbound and outbound M&A deals, creating unnecessary uncertainties during transaction processes. The regulatory regime governing acquisitions in China remains complicated and restrictive, and its application unpredictable. Foreign investors have to overcome several constraints under the *Interim Provisions on M&A of Domestic Enterprises by Foreign Investors*, and are often confronted with additional challenges, such as merger control filing and national security review. Likewise, Chinese outbound deals must also undergo the aforementioned filing procedures and, for a limited category of investments, approval by various regulatory authorities must be acquired.
- Other regulatory regimes are being established or will soon be established, such as network security review regime and data security review regime. These regimes may include strict requirements such as local data storage requirements and evaluation requirements before cross-border transmission, reporting requirements of enterprise information and data security management to the government, etc, increasing the costs for the investor and at the same time bringing new risks to the investment.

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<sup>46</sup> <http://fms.mofcom.gov.cn/article/a/ae/201807/20180702768684.shtml> (accessed on 25 August 2021).

## 4. Opportunities and challenges

As detailed in the previous chapters of this report, the Chinese market for industrial robots presents **significant opportunities** for European SMEs. A key factor is the strong support given to the sector by the Chinese government – at both central and local level. This has resulted in a wide range of preferential policies and incentives, and in a large and constantly growing demand for industrial robots, not only in traditional manufacturing sectors (e.g., automotive, 3C industries) but also in new application fields such as environmental protection, food and beverage, healthcare, special operations, and the service industry.

At the same time, however, strong government support has also led to an increasing number of Chinese domestic enterprises getting involved in the industrial robots sector, through R&D activities or M&As. There is evidence of **domestic enterprises receiving more favourable treatment**, compared to foreign-invested ones, when applying to government-funded projects or procurement. But at least for the time being, domestic enterprises still have lower competitiveness and do not match the quality of foreign producers.

Finally, although significant improvements have taken place in recent years, the Chinese institutional framework for intellectual property protection and enforcement remains not optimal and not fully transparent; this, combined to the unpredictability of new policies and regulations, brings **significant uncertainties and risks** to European SMEs, particularly those with subsidiaries in China.

### 4.1. Opportunities

#### *Huge market size*

Since 2013, China has been the world's largest market for industrial robots, maintaining stable growth. The rapidly ageing population and the shrinking of the workforce are intensifying the introduction of industrial robots to replace human labour; at the same time, the transformation and upgrading of China's manufacturing industry – vigorously promoted by the government at all levels – imposes urgent requirements for the massive application of industrial robots in different manufacturing sectors; this is seen as a prerequisite for moving up the value chain and for driving the new stage of economic development and growth. Therefore, it is expected that China's demand for industrial robots will continue to grow significantly for many years, including in traditionally less developed regions and not only those along China's eastern coast.

#### *New drivers of growth brought by new application demands*

The automotive sector has traditionally seen the highest number of new industrial robots applications. However, the downward growth trend of traditional fuel vehicles and a stronger-than-ever government push for intelligent manufacturing, are resulting in an increasing application of industrial robots in a wide range of other industries. It is noteworthy that, in 2020, more than 60% of new demands for industrial robots in China mainly came from 3C industries, new energy, and metal machinery/processing. Demand for industrial robots is also growing exponentially in other sectors such as highly-polluting industries (including plastics and rubber), but also food & beverage, pharmaceutical, and other fields related to people's livelihood. These new application scenarios will keep driving growth in the coming years and thus offer good opportunities.

#### *A myriad of preferential policies and incentives at all government levels*

The industrial robots sector is officially classified as a key strategic sector for China. It is central in the *Made in China 2025* strategy and is also listed as one of the encouraged sectors for foreign investment. In practice,

this translates into a countless number of preferential policies, incentives, subsidies and other forms of support granted to foreign investors that introduce their technologies and products in China. In the majority of cases, these are cumulative and can be obtained simultaneously from governments at different levels (e.g., from district to municipal, from provincial to national level). It should always be kept in mind that local governments in China compete fiercely against each other to attract foreign investors – particularly innovative ones – in their jurisdictions: this leaves **room for European investors to negotiate more favourable conditions and incentives** for their investments in China.

Therefore, European SMEs in the industrial robots sector should carefully consider the preferential policies for foreign investment in various regions, assess their leverage when negotiating with local authorities, ultimately maximising their benefits. At the same time, European investors should also take into full account other factors such as access to resources, capital and talents; development of infrastructure; proximity to sea routes; etc. It must also be noted that, often, cooperation with domestic actors (enterprises, but also research labs, universities or start-ups) may be strategic as they can help European SMEs to quickly understand local policies, obtain larger access to the networks of resources of their partners, and overall enjoy smoother procedures: this will be clearly shown by one of the case studies presented in section 5 of this report.

#### ***Fewer restrictions on market access***

So far, there are only five mandatory national standards that foreign industrial robots must follow in order to be sold in China. These standards are all identical to ISO/IEC standards – which in turn are often consistent with European standards; therefore, China's mandatory standards do not represent a major obstacle to most European enterprises. It is noteworthy that, for industrial robot products involving requirements such as carbon emission and air pollution, European standards are stricter than China's mandatory national standards. Therefore, most of these special requirements in China will not affect the launch of European products into the Chinese market.

At the same time, most industrial robots products do not require any mandatory certification in China; the only exemption is represented by welding guns of electric welding robots, which require CCC. The China Robot Certificate is a voluntary certification – although it is always preferred to have it as it might be considered more positively when applying to government subsidies, projects and procurement.

#### ***Relatively weak competitiveness of local industries***

Even though competition from Chinese domestic enterprises is rising, they still have substantial weaknesses that European producers of industrial robots can tap. The current gap between the industrial robot industry in China and Europe is mainly reflected in: (i) key technologies and core parts, for which China still relies on foreign imports; these include: high-precision reducers, high-sensitivity servo systems and high-performance controllers, underlying software architecture and core control algorithms; (ii) product performance, including accuracy, stability and service life; (iii) relatively small size of Chinese industrial robots companies, which often have products with low efficiency and oriented to the medium and low-end market.

## **4.2. Challenges**

#### ***Increasingly fierce market competition***

Although at current stage the competitiveness of Chinese domestic enterprises remains relatively weak, it is growing very rapidly. In recent years, the output growth of industrial robots in the Chinese market has been faster than the consumption growth, indicating that the competition in the market is becoming more intense.

Therefore, European SMEs need to face not only the competition of the leading international multinational corporations in the sector; soon, they may also need to compete against increasingly innovative local enterprises.

In the high-end market, international giants who have long entered the Chinese market have the advantages of scale, combined with a strong understanding of the Chinese market and its structure, and a solid network of partners built over the years. In the medium and low-end market, local enterprises often benefit from the local supply chain, the familiarity and mastery of the market, and the preferential treatment when applying to government grants, subsidies and procurement. European SMEs should carefully select proper market segments and local business partners according to their product characteristics and technical advantages, to maintain their competitive advantage.

### ***More preferential treatment granted to domestic companies***

The ultimate purpose of China's various industrial preferential policies – from the central government to local governments – is to support the development and growth of domestic industries. The explicit goal of the *Made in China 2025* strategy is to replace foreign imports with domestically created and manufactured products. Therefore, European SMEs are generally given lower priority than local enterprises when applying for government preferential policies, particularly R&D grants and procurement. Although many policies do not formally differentiate – on paper – between domestic and foreign-invested enterprises, and although there is evidence of FIEs receiving subsidies at the local level (especially from departments of industry and information technology rather than departments of science and technology), in practice, the interpretation of these policies and the evaluation of bids lies within the government or experts who often have strong ties with the government or even the military. This may lead to biased decisions in favour of local enterprises.

### ***Still weak intellectual property protection***

Although in recent years the Chinese government has substantially strengthened (and continues to do so) the protection of intellectual property (IP) rights, plagiarism of technology and products is still a widespread phenomenon, and it is not expected to disappear completely in the foreseeable future. With limited resources, SMEs are often unable to deal with infringement of their IP rights. Therefore, while European SMEs should continue to innovate (thus increasing the difficulty and costs of plagiarists), they should dedicate significant resources to effective strategies for intellectual property rights protection – way before even entering the Chinese market. In case of infringement, European SMEs should actively cooperate with law enforcement departments to crack down on plagiarism and seek compensation. European SMEs are strongly advised to engage with the China IP SME Helpdesk, a EU-funded project that provides free-of-charge technical assistance and advice.<sup>47</sup>

### ***Uncertainty in the regulatory policy on foreign investment***

Although China's foreign investment regulatory regime is gradually improving and becoming more codified, in practice there are still several grey areas that result from vagueness and lack of clarity in the wording of laws and regulations. China's national security review system, administrative filings and complex procedures for inbound and outbound M&A deals may affect the operations of European SMEs in China. In addition, new regimes are being established, such as for data security and protection, which may become potential obstacles for European SMEs operating in China, greatly increasing their compliance costs.

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<sup>47</sup> [https://intellectual-property-helpdesk.ec.europa.eu/regional-helpdesks/china-ipr-sme-helpdesk\\_en](https://intellectual-property-helpdesk.ec.europa.eu/regional-helpdesks/china-ipr-sme-helpdesk_en) (accessed on 25 August 2021).

## 5. Case studies

The China-based representatives of three European industrial robots manufacturers operating in the Chinese market were interviewed. They were asked to summarise the problems encountered by their companies when entering the Chinese market, illustrated the steps and solutions taken, and indicate suggestions for European SMEs.

The first company, a leading Italian company in industrial automation field, highlighted the significant and constant support received by the local administration in Shanghai – i.e., where its local headquarters are based. This is in line with the argument of chapter 2 and 3.4 of this report: the industrial robots industry is an **encouraged sector** in China, translating into a wide range of supporting measures obtainable from the Chinese administration. The second and third companies, respectively a Finnish SME and a German leading producer, show the importance of **localisation** to operate in/with China.

### 5.1. Experience from a leading Italian company in the field of industrial automation

#### *Italian global leader in six-joint robots and collaborative robots*

The company is a well-known Italian industrial automation company, specialising in processes and automated systems that improve manufacturing production. The company targets a wide range of industries and industrial segments, and its offering mainly includes auto body welding, powertrain, engineering design, robots and maintenance services, as well as project management and IoT services. In the field of robotics, the company offers robotised manufacturing systems, including robots with extensive range and payload configurations.

The company entered China in 1994, through the establishment of a wholly-owned subsidiary in Shanghai. Currently, the company in China has around 40 employees fully engaged in the robots industry, divided into a sales team and a technical support team; the latter is responsible for providing robot solutions for automated production in various industries, such as automotive, heavy industry, railway, renewable energy and other general industries. The company's main products in China are six-joint robots and collaborative robots. The main business model in the country is to directly import and sell the products of its parent company in Italy. Through unremitting efforts and the help of local system integrators, the company has made great achievements in the Chinese market.

Since the very beginning, the Company has not encountered thorny problems in entering or operating in the Chinese market. On the contrary, it has **significantly benefitted from the strong support obtained from the local administration** in Shanghai: this came in various forms, and especially through a constant communication channel with the authorities aimed at explaining current or forthcoming policies, and addressing development issues occasionally encountered by the Company. At present, the biggest challenges faced by the company are **skyrocketing international shipping costs** brought by the COVID-19 pandemic. In fact, the obstruction of international shipping lines is leading to increasingly higher transportation costs: by September 2021, costs are 17 times higher than those in the first half of 2021, thus significantly impacting the flows of goods. The company is regularly communicating with the Chinese government in the hope that new policies and measures will be introduced to relieve the pressure on enterprises.

Despite the pressure for international shipping, the company believes that now it is a propitious time for European industrial robots SMEs to enter the Chinese market. The growing demand for industrial robots – resulting from **China's massive efforts to upgrade and automate its industry** – leads to greater market opportunities, especially for companies with unique technologies and strong innovation capabilities. At the same

time, the business environment has been continuously improved everywhere in China; it is not an exaggeration to say that the business environment, especially in the Yangtze River Delta, is not second to the European or American ones. As a matter of fact, the local business environment presents significant advantages in terms of access to credit, direct communication with the local authorities, supply chain maturity and transportation and logistics: combined, these will positively benefit the operations of European industrial robots SMEs willing to invest and grow in China.

## **5.2. Experiences in localisation from Finnish and German companies**

### ***Leading SME from Finland in blast cleaning robots***

The company is a small and medium-sized blast cleaning robot manufacturer in Finland, with over 30 years of experience in supplying customised blast cleaning solutions, covering highway and railway transportation, casting, wind power generation and energy, a variety of steel structures, aerospace, and other fields. The company entered China in 2009; in 2017, its majority shares were purchased by a large Chinese company. Its customers are mainly large domestic enterprise groups such as CRRC, FAW and TBEA, which contribute to the company's leading position in the Chinese blast cleaning robot market.

The main business model of the company is to import the complete machines from Europe, while purchasing other auxiliary equipment in China, such as equipment for dust removal and for the recovery of raw materials.

According to the company, the biggest challenge that European SMEs face when entering the Chinese market, is the **enormous cultural differences**. This results in difficulties in business communication, market operations, marketing models and customer demand – all factors that make the European business model unable to meet the needs and characteristics of the Chinese market. For instance, right after entering China, the company still maintained the after-sales support team in Europe, which in most cases was unable to solve the problems encountered by local customers in a timely and efficient manner. This resulted in enormous difficulties for the company in finding new customers in China.

Therefore, the company increased its commitment to **localisation**, which was seen as the easiest way to overcome the challenges encountered. Specifically, the company (i) built a marketing team composed predominantly by local employees, which proved effective in addressing the key needs of Chinese customers and partners; (ii) significantly increased the proportion and role of locally employed engineers in the after-sales team, in order to provide effective and timely support to Chinese customers; (iii) sought additional equity investment from a local Chinese enterprise (exceeding 50% of shares), which has resulted in new market channels opened, but also in greater access to government preferential policies and incentives.

In addition, the company believes that **copycats and plagiarism** by Chinese enterprises is a serious problem that European SMEs may encounter. Without dedicated resources to IP protection, European SMEs often have to give up their efforts to prevent plagiarism and enforce their rights. Still, European SMEs should continue to innovate, thus increasing their technological capabilities, as this will increase the difficulties and costs for local enterprises to imitate.

Finally, the company's key recommendation to European SMEs is grounded on its own experience: to be successful in the Chinese market, European SMEs should find ways to integrate the preciseness and advantages of Europe with the flexibility and diligence of China, trying to learn from and adapt to each other.

***German leader in high-end industrial robots, especially in the automotive sector***

The company is a leader in the field of industrial robots. Originally founded in Germany, it entered China in 2000 and has since set up several subsidiaries and R&D centres. Its main products are high-end manipulators, which are applied in the automotive industry. In recent years, the company was purchased by a Chinese home appliance company, which resulted in the gradual expansion of its business to flexible systems, general industrial automation, intelligent logistics automation, and intelligent healthcare automation.

In China, the company follows two main operational models. The first, originally predominant model, is to import raw materials, spare and accessory parts from Europe (developed through R&D and design done in Europe), and assemble the final products in the Chinese factory. The second, which is gradually becoming the main one, is to conduct R&D in China and rely on China's supply chain for production, particularly for robots with large local demand.

Despite the long-term efforts, presence and achievements in the Chinese market, the company is facing pressure in the Chinese market in recent years. This is mainly reflected in two ways:

- 1) Increasingly **fiercer local competition**. Although European robot enterprises may enjoy significant technological advantages, China's local robot industry is growing at exponential speed. Local enterprises also benefit from relatively cheap supply chain and R&D costs (and government grants/subsidies for R&D); they are also better inclined and positioned to respond more quickly to changing market demands and needs, and to achieve levels of **customisation** of products that European companies often are unable to do in short timeframes. This results in local enterprises gaining market share from European companies.
- 2) Disadvantages in specific markets. In some of the most important industries in China, such as electronics and household appliances (which occupy a significant percentage of demand for industrial robots), European enterprises often do not have corresponding products, or if they do, their products are not as competitive as Chinese ones. This is because for these industries, Europe is less strong compared to China, and there is weaker demand from customers.

In addition, differences in corporate culture, organisational structure and ways of thinking are also important factors restricting the development of European enterprises in China.

The company believes that **localisation** in China could be an effective way to overcome these challenges. The use of local resources and materials not only contributes to reduced costs; it also leads to a better understanding of customer needs, business channels and preferential policies, which in turn result in the design and development of competitive products with strong demand in China.

To European SMEs interested in entering the Chinese market, the company suggests that they should first identify clear application fields and customers for their products. Unless the products are original, irreplaceable, or present high-end distinctive features, **entering the Chinese market without clear customers will be very hard** as the competition is very fierce. In addition, European SMEs should get well prepared in advance. An effective approach would be to hire (or dispatch) two local employees on-the-ground, to fully grasp the situation of the Chinese market, establish a pool of customers, develop sales channels, and even explore cooperation opportunities with local enterprises. This will pave the way for a smooth and aggressive entry in the Chinese market in a later stage.

## About the EU SME Centre

The EU SME Centre helps European SMEs get ready for China by providing them with a range of information, advice, training and support services.

To find out more, visit: [www.eusmecentre.org.cn](http://www.eusmecentre.org.cn).



### *Do you have a question about doing business in China?*

Ask one of our in-house experts and receive practical and confidential advice within seven working days. We can provide information and advice relating to business development, market access, legal issues, and human resources.

To submit your enquiries directly to our experts go to *Ask-the-Expert* [www.eusmecentre.org.cn/expert](http://www.eusmecentre.org.cn/expert), or contact us at [info@eusmecentre.org.cn](mailto:info@eusmecentre.org.cn)

### *Further reading...*

The EU SME Centre has nearly 200 reports, guidelines and case studies in its Knowledge Centre, the following may be relevant to you:

- *Report on the Machinery Sector in China (2018):*  
<https://www.eusmecentre.org.cn/report/machinery-sector-china-0>.
- *Artificial Intelligence in China and how European SMEs can benefit (2020):*  
<https://www.eusmecentre.org.cn/report/artificial-intelligence-china-and-how-european-small-and-medium-enterprises-can-benefit>.
- *Updated Guidelines on the China Compulsory Certification (2021):*  
<https://www.eusmecentre.org.cn/article/updated-guidelines-china-compulsory-certification-ccc-scheme>

We also have a dedicated **set of FAQs on Chinese standards** and how to identify them: <https://www.eusmecentre.org.cn/faq>



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