

INDUSTRY OVERVIEW

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SOURCES OF INFORMATION

We engaged Frost & Sullivan, an independent market research consultant, to conduct an analysis of, and to prepare a report on China’s intelligent semiconductor transfer system industry for the use in this document, which was commissioned by us for a fee of RMB700,000. In compiling and preparing the F&S Report, Frost & Sullivan adopted the following assumptions: (i) the social, economic and political conditions globally currently discussed will remain stable during the forecast period, (ii) China’s government policies on intelligent semiconductor transfer system industry will remain consistent during the forecast period, (iii) China’s intelligent semiconductor transfer system industry will be driven by the factors which are stated in the report in the forecast period. Except as otherwise noted, all of the data and forecasts contained in this section are derived from the F&S Report. The Frost & Sullivan Report has been prepared by Frost & Sullivan independently without any influence from us or other interested parties.

Frost & Sullivan is an independent global consulting firm founded in 1961 in New York and its services include, among others, industry consulting, market strategic consulting and corporate training. Frost & Sullivan conducted (i) primary research, which involved discussing the status of the industry with certain leading industry participants, and interviews with industry experts on a best-effort basis to collect information in aiding in-depth analysis; and (ii) secondary research, which involved reviewing company reports, independent research reports and data based on its own research database.

Definition and Classification of Intelligent Semiconductor Transfer System Industry

Intelligent semiconductor transfer system is integrated automation system that, throughout the entire semiconductor manufacturing process, enables efficient, clean, and intelligent material flow from the wafer foundries floor to equipment-level micro-environments. The system is not limited to the physical transport of materials, it also ensure the stability and efficiency of the manufacturing process and provide comprehensive automation infrastructure critical to overall production efficiency and quality. According to application scenarios and transport hierarchy, intelligent semiconductor transfer system is mainly divided into wafer transfer equipment and automated material handling system (AMHS).

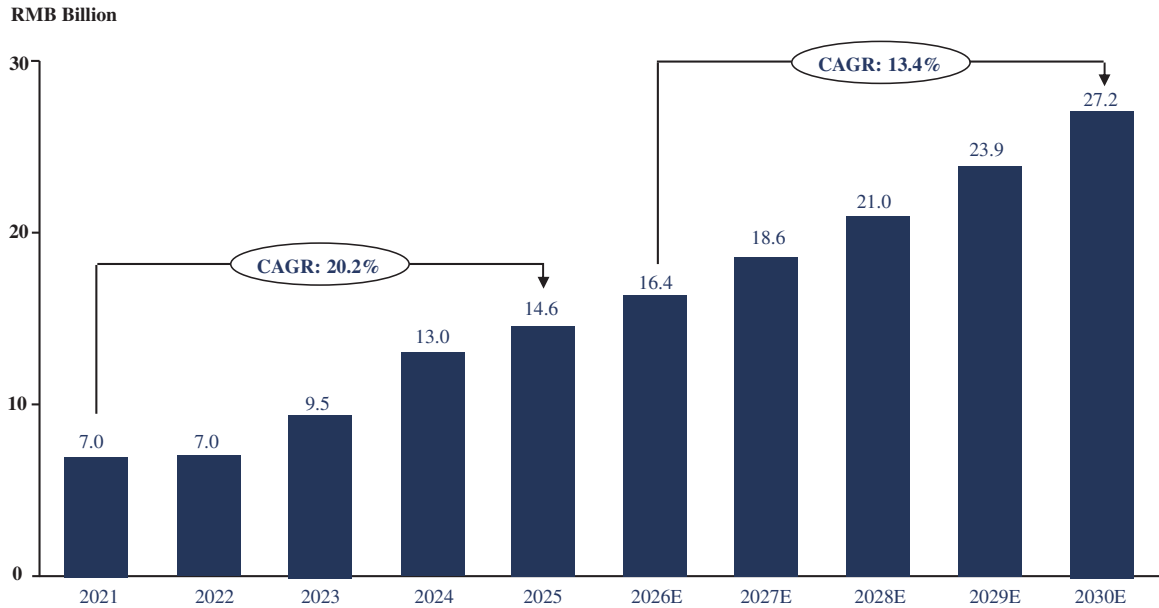
Market Size of Intelligent Semiconductor Transfer System Market

China’s intelligent semiconductor transfer system market expanded rapidly from 2021 to 2025, driven by accelerated 12-inch wafer foundries construction, continued fab-level automation and digital transformation, and rising requirements for production efficiency, contamination control, and logistics stability. Market size increased from RMB7.0 billion in 2021 to RMB14.6 billion in 2025, implying a CAGR of 20.2%. Growth was primarily supported by the concentrated ramp-up of newly built wafer foundries, which released strong demand for end-to-end automated material handling and wafer transfer solutions, alongside the ongoing adoption of advanced automation technologies that accelerated market penetration and system upgrade cycles.

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As China’s semiconductor manufacturing capacity shifts toward advanced process nodes, the industry is transitioning from greenfield capacity build-out to a phase of sustained expansion combined with structural efficiency enhancement. Accordingly, demand for intelligent transfer system is expected to extend beyond new wafer foundries construction to include capacity expansion projects, brownfield retrofits, and intelligent operation and maintenance upgrades of existing wafer foundries. At the same time, broader adoption of intelligent technologies, such as AI-enabled production scheduling, real-time equipment condition monitoring, and predictive maintenance, is expected to further strengthen system value propositions and support continued market growth. As a result, from 2026 to 2030, China’s intelligent semiconductor transfer system market is projected to grow at a CAGR of approximately 13.4%, expanding from RMB16.4 billion in 2026 to RMB27.2 billion by 2030.

Market Size of Intelligent Semiconductor Transfer System (by revenue), China, 2021-2030E



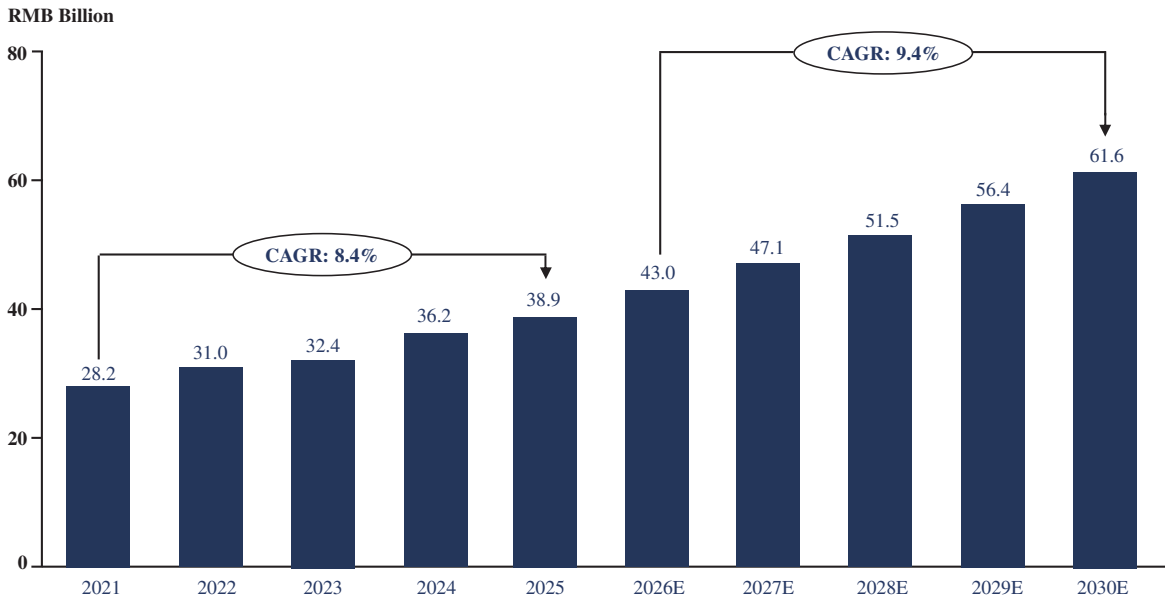
Source: Frost & Sullivan

Driven by the continued global expansion of wafer fabrication capacity, increasingly stringent requirements for cleanliness and production takt time at advanced process nodes, and the accelerating implementation of digitalized and intelligent wafer foundries management, the global intelligent semiconductor transfer system market recorded solid growth between 2021 and 2025. Market size increased from RMB28.2 billion in 2021 to RMB38.9 billion in 2025, representing a CAGR of 8.4%. Growth during this period was primarily driven by rising demand from newly built and expanded 12-inch wafer foundries for higher levels of automation and stronger system-level integration, which supported deeper deployment of intelligent transfer system within fab-level logistics and production scheduling frameworks.

Looking ahead, as intelligent technologies such as AI are increasingly applied to production scheduling optimization, equipment condition monitoring, and predictive maintenance, the value contribution of intelligent transfer system is expected to further increase, while also unlocking automation upgrade demand from existing wafer foundries. From 2026 to 2030, the global intelligent semiconductor transfer system market is projected to grow at a CAGR of 9.4%, expanding from RMB43.0 billion in 2026 to RMB61.6 billion by 2030.

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Market Size of Intelligent Semiconductor Transfer System (by revenue), Global, 2021-2030E

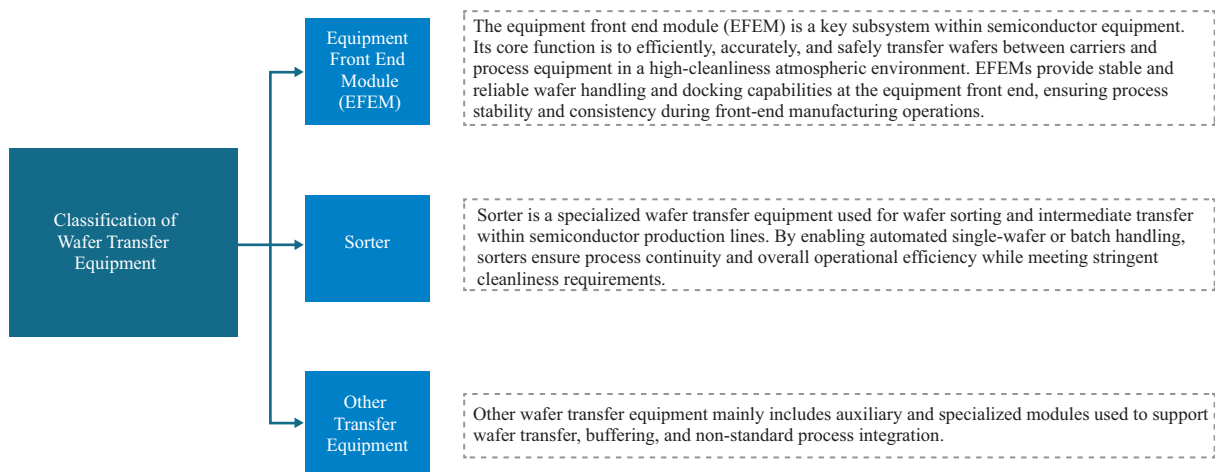


Source: Frost & Sullivan

Definition and Classification of Wafer Transfer Equipment Industry

Wafer transfer equipment refers to automated systems used in semiconductor manufacturing processes to transfer wafers with high precision under controlled cleanroom environments. Such equipment is not limited to a single process step, but rather focuses on logistics automation, process continuity, and operational safety at the front end of manufacturing, serving as foundational equipment that connects various process equipment and inspection equipment. From a functional perspective, wafer transfer equipment mainly includes equipment front end modules (EFEMs), sorters, and other transfer equipment.

Classification of Wafer Transfer Equipment



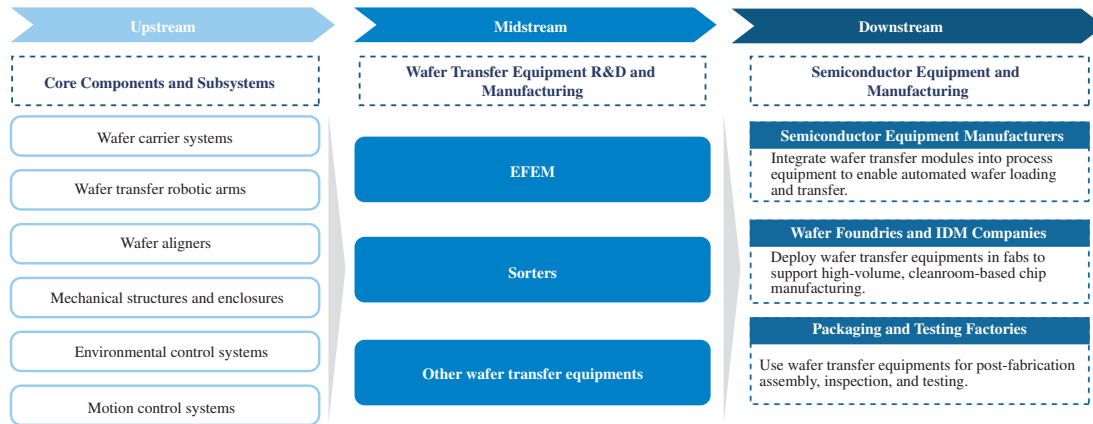
Source: Frost & Sullivan

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Value Chain of Wafer Transfer Equipment Industry

Upstream participants in the wafer transfer equipment industry chain primarily include suppliers of core components and subsystems, covering key execution components such as wafer carrier systems and robotic arms, as well as supporting systems including motion control and environmental control. Midstream players focus on the R&D and manufacturing of wafer transfer equipment, with business models centered on the integration of various transfer modules and system solutions. Downstream, wafer transfer solutions are deployed across semiconductor manufacturing scenarios, mainly serving the system integration needs of semiconductor equipment manufacturers, as well as the actual production lines of wafer foundries and IDM companies and packaging and testing factories.

Value Chain of Wafer Transfer Equipment Industry



Source: Frost & Sullivan

Market Size of Wafer Transfer Equipment Market

From 2021 to 2025, China’s wafer transfer equipment market experienced rapid growth, driven by domestic wafer foundries capacity expansion, the accelerated localization and import substitution of semiconductor equipment, and the continued release of front-end manufacturing investments. Market size increased from RMB2.9 billion in 2021 to RMB6.0 billion in 2025, representing a CAGR of 19.2%. Growth during this period was primarily supported by the accelerated build-out of 12-inch production lines and rising penetration of wafer transfer equipment in newly constructed wafer foundries.

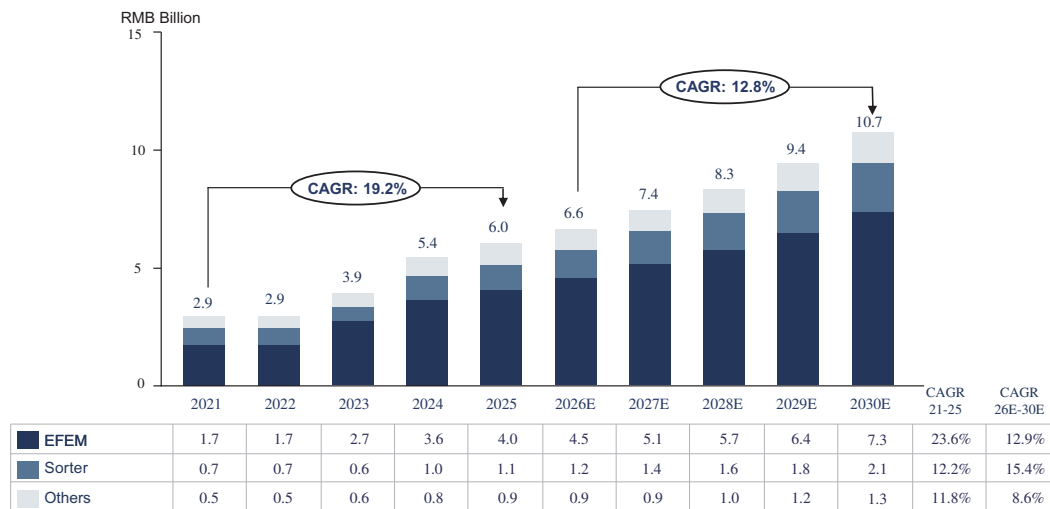
From 2026 to 2030, the market is expected to maintain solid but moderating growth as capacity development transitions from concentrated expansion to sustained optimization. Under this backdrop, China’s wafer transfer equipment market is projected to grow from RMB6.6 billion in 2026 to RMB10.7 billion in 2030, implying a CAGR of 12.8%. Growth momentum will increasingly come from advanced process node adoption and automation upgrades of existing production lines.

After an initial period of rapid expansion, the EFEM market is entering a more stable growth phase. EFEM market size increased from RMB1.7 billion in 2021 to RMB4.0 billion in 2025, corresponding to a CAGR of 23.6%. It is expected to grow from RMB4.5 billion in 2026 to RMB7.3 billion in 2030, with a CAGR of 12.9%, primarily benefiting from rising demand for front-end equipment such as etching, thin-film deposition, and metrology tools.

The sorter market has expanded steadily, increasing from RMB0.7 billion in 2021 to RMB1.1 billion in 2025, at a CAGR of 12.2%. Market size is projected to grow from RMB1.2 billion in 2026 to RMB2.1 billion in 2030, implying a CAGR of 15.4%. Growth is mainly driven by increasing wafer foundries requirements for wafer sorting, buffering, and production line flexibility, with sorters continuing to serve as a stable and essential component within the overall wafer transfer equipment ecosystem.

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Market Size of Wafer Transfer Equipment (by revenue), China, 2021-2030E

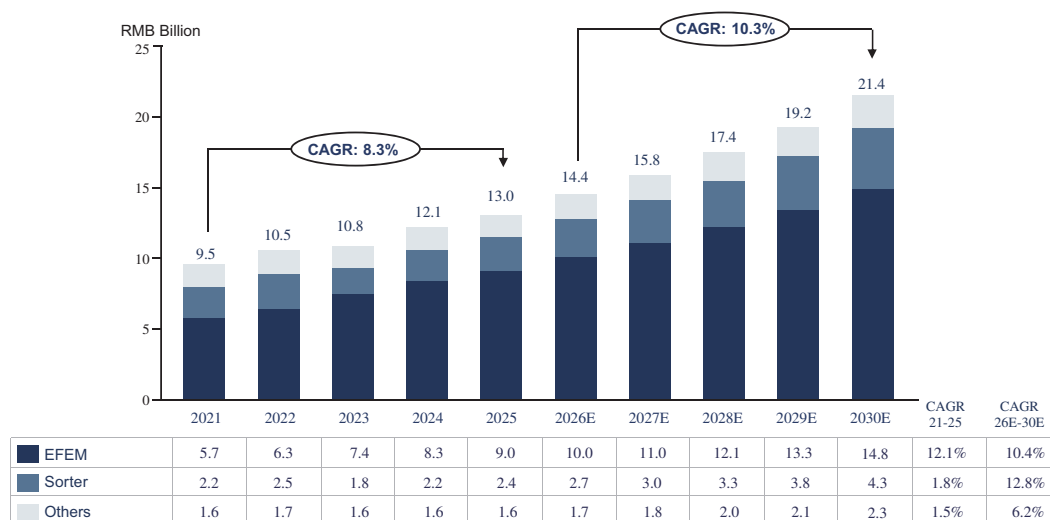


Source: Frost & Sullivan

From 2021 to 2025, the global wafer transfer equipment market recorded steady growth, supported by continued expansion of global wafer fabrication capacity, sustained front-end manufacturing capital expenditures, and increasing penetration of wafer automation solutions in newly built and expanded 12-inch production lines. Market size increased from RMB9.5 billion in 2021 to RMB13.0 billion in 2025, representing a CAGR of 8.3%. Growth during this period was driven by rising demand for automated wafer handling and logistics solutions, as wafer foundries pursued higher throughput, stricter contamination control, and more stable production performance.

From 2026 to 2030, as global capacity additions gradually shift from rapid greenfield construction to ongoing optimization and incremental expansion, the market is expected to enter a more moderate but sustainable growth phase. The global wafer transfer equipment market is projected to expand from RMB14.4 billion in 2026 to RMB21.4 billion by 2030, implying a CAGR of 10.3%. Future growth is expected to be supported by the continued rollout of advanced process nodes, rising automation requirements, and ongoing upgrades of existing wafer foundries aimed at improving efficiency, reliability, and overall fab-level automation.

Market Size of Wafer Transfer Equipment (by revenue), Global, 2021-2030E



Source: Frost & Sullivan

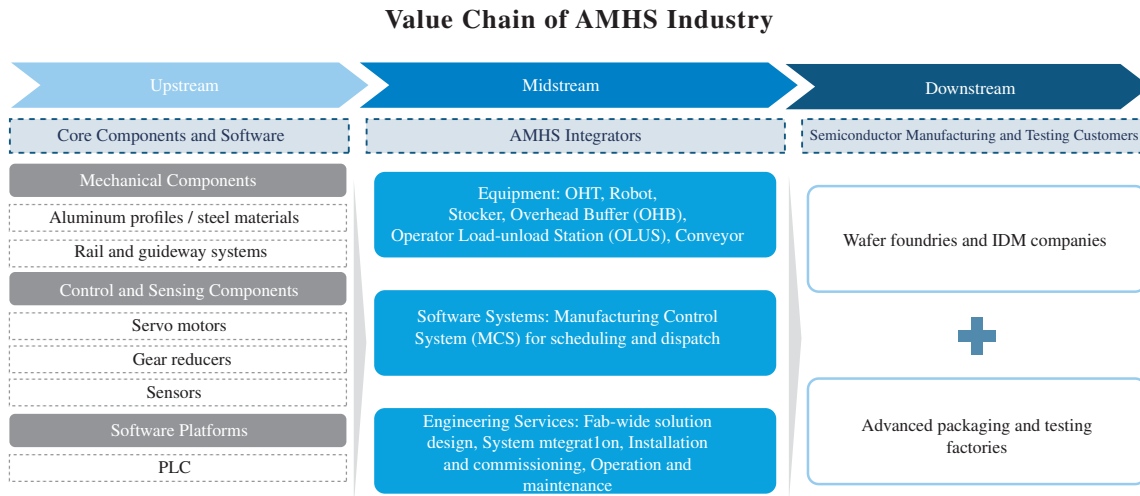
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Definition and Classification of AMHS Industry

AMHS is foundational infrastructure for wafer logistics at the wafer foundries or floor level. By integrating transport carriers, rail networks, storage equipment, and centralized control software, AMHS enable high-throughput, fully automated wafer transport across the entire wafer foundries. AMHS effectively reduces manual intervention and significantly improve cleanroom logistics efficiency.

Value Chain of AMHS Industry

The upstream segment of the AMHS industry includes suppliers of mechanical foundations such as aluminum profiles and rail systems; control and sensing components including servo motors, reducers, and sensors; as well as software and control platforms such as programmable logic controller (PLC). Midstream players are primarily AMHS integrators, responsible for the manufacturing and system-level integration of core equipment including overhead hoist transport (OHT) systems, robots, stockers, and conveyors, as well as the development and deployment of manufacturing control systems for scheduling and dispatch. Downstream applications are mainly in semiconductor manufacturing and advanced packaging and testing factories.



Source: Frost & Sullivan

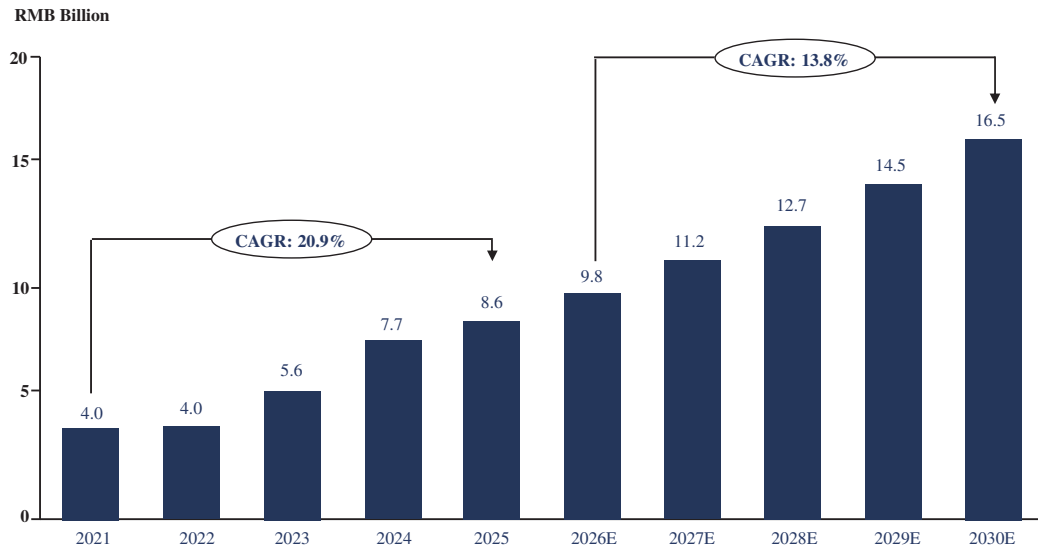
Market Size of AMHS Market

As semiconductor manufacturing in China continues to advance toward more sophisticated process nodes, the China AMHS market expanded rapidly from RMB4.0 billion in 2021 to RMB8.6 billion in 2025, corresponding to a CAGR of 20.9%.

Looking ahead, the ongoing evolution of advanced manufacturing processes and the deepening penetration of automated wafer foundries operations are expected to be key drivers of AMHS market growth. In parallel, the localization of semiconductor manufacturing supply chains and the gradual substitution of imported systems are set to unlock additional growth potential for domestic AMHS providers. From 2026 to 2030, China’s AMHS market is projected to grow at a CAGR of 13.8%, expanding from RMB9.8 billion in 2026 to RMB16.5 billion by 2030. This trend reflects the high reliance of 12-inch wafer foundries on advanced automation and integrated material handling and logistics systems.

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Market Size of AMHS (by revenue), China, 2021-2030E

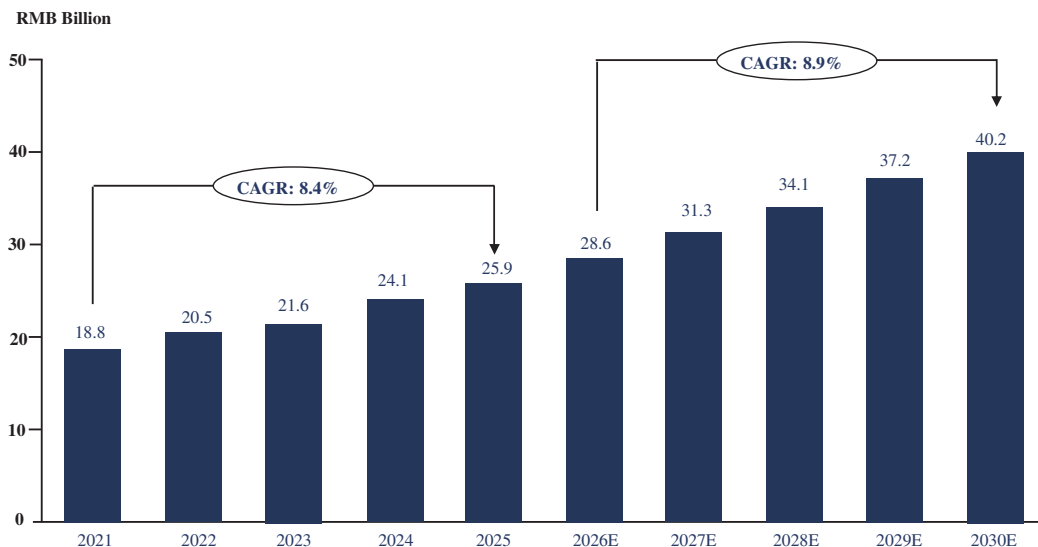


Source: Frost & Sullivan

The global AMHS market expanded from RMB18.8 billion in 2021 to RMB25.9 billion in 2025, representing a CAGR of 8.4%. Growth during this period was primarily driven by rising system deployment requirements associated with the construction and expansion of 12-inch wafer foundries, as well as increasingly stringent wafer foundries requirements for higher cleanliness standards, higher capacity utilization, and more stable logistics scheduling. These factors collectively supported higher penetration and greater value contribution of AMHS within fab-level automation architectures.

Looking ahead, the continued advancement of leading-edge process nodes and the deeper application of intelligent technologies, such as AI-enabled production scheduling, equipment coordination, and data-driven operations and maintenance, are expected to further enhance the value proposition of AMHS and serve as key catalysts for automation upgrades across existing production lines. From 2026 to 2030, the global AMHS market is projected to grow at a CAGR of 8.9%, expanding from RMB28.6 billion in 2026 to RMB40.2 billion by 2030.

Market Size of AMHS (by revenue), Global, 2021-2030E



Source: Frost & Sullivan

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Market Drivers of Intelligent Semiconductor Transfer System Market

- **Expansion of the Semiconductor Industry.** The global semiconductor industry is currently in an expansion phase driven by the build-out of digital infrastructure. With the widespread adoption of 5G, industrial internet, and cloud computing, chip demand has formed a structurally sustained growth trend. More importantly, the explosive growth of generative AI has reshaped the computing landscape, not only driving demand for high-performance computing and high-bandwidth memory, but also accelerating the adoption of advanced packaging technologies such as Chiplet and CoWoS, significantly increasing manufacturing complexity. In this context, intelligent transfer system have evolved from basic logistics tools into critical infrastructure that ensures high-throughput wafer flow, supports efficient production scheduling, and enables reliable delivery of advanced manufacturing capacity.
- **Technology Iteration and Advanced Process Nodes.** The scaling of wafer sizes and the continuous advancement of process technology represent two major long-term trends in semiconductor manufacturing. As wafer diameters transitioned from 8-inch to 12-inch, and process nodes advanced toward 5nm, 3nm, and beyond, requirements for wafer transfer accuracy, automation levels, and system stability have increased substantially. Front-end wafer transfer systems face increasingly stringent performance requirements, including micron- and sub-micron-level positioning accuracy, higher throughput, minimal human intervention, and strict cleanroom contamination control. These technical challenges have made highly automated, fab-wide intelligent transfer system a standard configuration for modern wafer foundries.
- **Demand for Cost Reduction and Efficiency Improvement.** Under the dual pressures of shrinking process margins and high capital intensity in wafer fabrication, improving overall equipment effectiveness has become a core priority for manufacturers. Traditional labor-intensive material handling methods are increasingly constrained by efficiency bottlenecks and human error and are no longer suitable for advanced manufacturing environments. Intelligent transfer system, driven by data, algorithms, and system-level optimization, have become a central enabler of cost reduction and efficiency improvement. By deeply integrating with production scheduling, dispatch optimization, and predictive maintenance systems, AMHS solutions help reduce wafer waiting time, minimize downtime risks, and improve overall wafer foundries productivity. This deep integration between software and hardware positions intelligent transfer system as a key lever for achieving cost efficiency and yield enhancement.
- **Policy Support and Self-supplying.** Against the broader macro backdrop of intensified geopolitical tensions and accelerated technological decoupling, building a self-supplying semiconductor supply chain has become a strategic necessity at the national security level. As a result, strong government policy support and sustained injections of dedicated funding have created a historic development opportunity for domestic intelligent transfer system vendors. Driven by considerations of supply chain security and stability, domestic wafer foundries, while prioritizing cost and performance, are increasingly inclined toward localized sourcing and self-supplying. Intelligent transfer system are deeply integrated into wafer foundries operations and production continuity, and their localization carries significant strategic importance. This has helped break through long-standing barriers to self-supplying, enabling intelligent transfer system to move from initial adoption into a new stage of scaled implementation and continuous market penetration.

Development Trends of Intelligent Semiconductor Transfer System Market

- **Continuous Performance Improvement.** Semiconductor intelligent transfer system is required to achieve higher cleanliness levels, greater throughput, and more precise motion control. As semiconductor processes advance to 3nm and 2nm, requirements for cleanliness become increasingly stringent. System designs adopt optimized airflow layouts to ensure zero dead zones and enable effective removal of particles shed by FOUPs. Special materials with low outgassing, anti-static, and corrosion-resistant properties are used in enclosures, ducts, and components to suppress particle generation at the source. In addition, equipment vendors are applying carbon-fiber mechanical arms, magnetic-levitation guide rails, and optical positioning and sensing technologies to achieve lighter weight, lower vibration, and higher responsiveness in transport performance, in order to meet the stringent environmental requirements of EUV lithography and advanced process steps such as atomic layer deposition.

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- ***Accelerated Modularization and Standardization.*** To shorten wafer foundries construction cycles and reduce operation and maintenance complexity, leading vendors are promoting modular designs for core components such as OHT, vacuum transfer systems, and EFEM. Due to the diversity of semiconductor devices, wafers from different wafer foundries may vary in thickness, dimensions, and load requirements. Intelligent transfer system therefore adopt modular architectures that allow rapid replacement of robotic arms, guide rails, and load modules to accommodate different customer and process needs. Vendors are also developing platform-based EFEM products that share core mechanical structures and key components, reducing development and manufacturing costs through economies of scale while enabling faster delivery of customized configurations to meet diverse requirements.
- ***Breakthroughs and Upgrading of Domestic Enterprise Technologies.*** Driven by geopolitical factors and supply chain security requirements, domestic Chinese transfer system vendors are entering a critical transition phase. Domestic suppliers have gradually moved from peripheral packaging and testing segments into front-end wafer manufacturing, successfully entering 12-inch advanced process production lines of leading domestic wafer foundries by leveraging high cost performance and rapid response capabilities. In high-barrier areas such as vacuum transfer systems and front-end modular systems, domestic vendors have achieved technology validation through rigorous mass-production certification. Currently, domestic suppliers are focusing on breakthroughs in ultra-clean control, high reliability, and hybrid algorithm control under complex scenarios, narrowing the performance gap with international leaders. Over the next five years, the penetration rate of domestic intelligent transfer system in newly built wafer foundries is expected to increase steadily.
- ***Intelligent Development.*** As the coupling between hardware and software continues to deepen, software and system capabilities have become a key differentiating factor for vendors. Intelligent transfer system is evolving from single-function “transport tools” toward intelligent execution systems with integrated decision-making capabilities. Through sensor integration, advanced data acquisition, and algorithm-based analytics, systems can perform predictive maintenance, such as analyzing vibration spectra to identify potential failures in advance and avoid unexpected downtime.

COMPETITIVE ANALYSIS OF INTELLIGENT SEMICONDUCTOR TRANSFER SYSTEM MARKET

Competitive Landscape of Intelligent Semiconductor Transfer System Market in China

The Chinese intelligent semiconductor transfer system market presents a binary pattern of “overseas leadership, domestic acceleration.” Overseas manufacturers dominate the high-end market and complete equipment segments, leveraging their technological expertise. Meanwhile, domestic enterprises are making breakthroughs in areas such as equipment and modules, and are steadily penetrating the high-end market by leveraging close customer proximity and rapid iteration. Looking ahead, the competitive landscape will focus on technological upgrades and supply chain security. With the continued rise in localization rates, the market share of Chinese domestic companies is expected to keep expanding.

Ranking of Intelligent Semiconductor Transfer System Manufacturers in China

The market size of intelligent semiconductor transfer system market in China in 2025 achieved RMB14,578.6 million. With a revenue of RMB390.9 million in intelligent semiconductor transfer system in 2025 in China, the Company ranked the 2nd among domestic intelligent semiconductor transfer system manufacturers, with a market share of 2.7%. Based on the relevant revenue in the Chinese market, other major domestic intelligent semiconductor transfer system manufacturers include Company A and Company B.

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Top 3 Domestic Intelligent Semiconductor Transfer System Manufacturers (by revenue), China, 2025

Rank	Company Name	Revenue (RMB Million)	Market Share
1	Company A	504.0	3.5%
2	The Company	390.9	2.7%
3	Company B	284.2	1.9%
	Total	14,578.6	100.0%

Source: Company Annual Reports, Frost & Sullivan

Note: Company A is a company headquartered in China and was established in 2019, primarily focuses on the R&D and manufacturing of semiconductor equipment and components.

Company B is a company headquartered in China, it was established in 2000 and listed on the Shenzhen Stock Exchange, primarily provides solutions including robotics and intelligent manufacturing systems. Its semiconductor equipment business covers wafer handling and clean automation systems.

Ranking of Wafer Transfer Equipment Manufacturers in China

The market size of wafer transfer equipment market in China in 2025 achieved RMB5,950.3 million. With a revenue of RMB377.5 million in wafer transfer equipment in 2025 in China, the Company ranked the 4th among wafer transfer equipment manufacturers, with a market share of 6.3%, and ranked the 2nd among domestic manufacturers. Based on the relevant revenue in the Chinese market, other major wafer transfer equipment manufacturers include Company C, Company D, Company A, and Company B.

Top 5 Wafer Transfer Equipment Manufacturers (by revenue), China, 2025

Rank	Company Name	Revenue (RMB Million)	Market Share
1	Company C	1,638.0	27.5%
2	Company D	779.0	13.1%
3	Company A	504.0	8.5%
4	The Company	377.5	6.3%
5	Company B	284.2	4.8%
	Others	2,367.6	39.8%
	Total	5,950.3	100.0%

Source: Company Annual Reports, Frost & Sullivan

Note: Company C is a company headquartered in Japan, it was established in 1969 and listed on the Tokyo Stock Exchange, primarily provides precision automation equipment for semiconductor manufacturing.

Company D is a company headquartered in the United States, it was established in 1978 and listed on the New York Stock Exchange, primarily provides advanced automation and transport solutions for semiconductor manufacturing and other high-tech industries.

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12-inch wafer transfer equipment offers higher throughput and lower cost per die, requiring superior precision and contamination control, making it an industry trend of transition from 8-inch wafer and wafer equipment. The market size of 12-inch wafer transfer equipment market in China in 2025 achieved RMB4,573.9 million. With a revenue of RMB354.7 million in 12-inch wafer transfer equipment in 2025 in China, the Company ranked the 1st among domestic wafer transfer equipment manufacturers for 12-inch wafer manufacturing, with a market share of 7.8%. Based on the relevant revenue in the Chinese market, other major domestic wafer transfer equipment manufacturers for 12-inch wafer manufacturing include Company A and Company B.

Top 3 Domestic Wafer Transfer Equipment Manufacturers for 12-Inch Wafer Manufacturing (by revenue), China, 2025

Rank	Company Name	Revenue (RMB Million)	Market Share
1	The Company	354.7	7.8%
2	Company A	277.2	6.1%
3	Company B	207.6	4.5%
	Total	4,573.9	100.0%

Source: Company Annual Reports, Frost & Sullivan

Entry Barriers of Intelligent Semiconductor Transfer System Market

- Technology Barrier.** The semiconductor intelligent transfer system industry features exceptionally high technological barriers, with its core lying in achieving deep integration of cutting-edge interdisciplinary technologies and an ultimate pursuit of reliability. Products must maintain extremely high operational precision and stability over long periods within ultra-clean, vibration-free rigorous physical environments, where any minor deviation could lead to significant production losses. This requires enterprises not only to master sophisticated mechanical, control, and software technologies but also to possess a profound understanding of complex chip manufacturing processes, thereby constructing a deep and difficult-to-cross comprehensive technological moat.
- Talent Barrier.** R&D and innovation in this field rely heavily on interdisciplinary talent proficient in cutting-edge mechanical engineering, complex control algorithms, and specific chip manufacturing processes. Such talent is extremely scarce globally, requires lengthy cultivation cycles, and is typically highly concentrated within existing industry-leading companies. New entrants find it difficult to assemble a core team with essential innovation capabilities and rich engineering experience in the short term, which significantly constrains the pace of their technological breakthroughs.
- Supply Chain and Certification Barrier.** Supply channels for high-end core components of semiconductor intelligent transfer system, such as precision ceramic parts and specialized sensors, are often highly concentrated, making it difficult for new entrants to secure stable, high-quality access to these components. Furthermore, to enter the supply chain of core customers, one must undergo an extremely lengthy and rigorous quality and reliability certification process. Equipment and systems must achieve seamless collaboration and data interoperability with the various complex process equipment existing in customer production lines. This trust relationship, built on long-term cooperation and ecological integration, constitutes a formidable barrier to entry.
- Capital Carrier.** This industry is a typical high-R&D, asset-heavy sector, characterized by substantial upfront investment and an extended profit cycle. From fundamental technology R&D and prototype manufacturing to building compliant production and testing environments, continuous and massive capital investment is required. Simultaneously, the market validation and customer introduction period for products is extremely long. Enterprises must possess substantial financial strength to support the significant upfront investments and validation costs, posing an ultimate test of long-term strategic planning and capital endurance.