

INDUSTRY OVERVIEW

The information and statistics set out in this section and other sections of this document were extracted from the report prepared by Frost & Sullivan, which was commissioned by us, and from various official government publications and other publicly available publications. We engaged Frost & Sullivan to prepare the Frost & Sullivan Report, an independent industry report, in connection with the [REDACTED]. The information from official government sources has not been independently verified by us, the Sole Sponsor, the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], the [REDACTED], any of their respective directors and advisers, or any other persons or parties involved in the [REDACTED], and no representation is given as to its accuracy.

SOURCES OF THE INDUSTRY INFORMATION

We commissioned Frost & Sullivan to analyse and prepare a report regarding China’s intelligent sensors market, China’s intelligent instruments market, and China’s integrated intelligent solutions market during the period of 2021 to 2030. Frost & Sullivan is an independent global consulting firm, which was founded in 1961 in New York, offering industry research and market strategies and provides growth consulting and corporate training. We agreed to pay a commission fee of RMB650,000 to Frost & Sullivan pursuant to a service agreement reached by arm’s length negotiation. Except as otherwise noted, all of the data and forecasts contained in this section are derived from the Frost & Sullivan Report.

In preparing for the report, Frost & Sullivan conducted both primary and secondary research and relied on various sources. The primary research was conducted via interviews with key industry experts and leading industry participants. The secondary research involved analysis of market data obtained from several publicly available data sources, such as International Monetary Fund, National Bureau of Statistics and other industrial associations. The market projections in the Frost & Sullivan Report are based on the following key assumptions: (i) China’s social, economic, and political environment are expected to remain stable during the forecast period; (ii) China’s economic and industrial development are likely to maintain a steady growth in the forecast period; (iii) related industry key drivers are likely to drive the growth of China’s intelligent sensors market, China’s intelligent instruments market, and China’s integrated intelligent solutions market in the forecast period; and (iv) there is no extreme force majeure or industry regulation in which the market may be affected dramatically or fundamentally.

Our Directors confirm that, to the best of their knowledge, after making reasonable inquiries and exercising reasonable care, there is no material adverse change in the market information since the date of the relevant data contained in the Frost & Sullivan Report which may qualify, contradict or have an impact on the information in this section.

CHINA INTELLIGENT SENSORS MARKET OVERVIEW

Definition and Classification of Intelligent Sensors

According to GB/T 33905.3-2017 “Intelligent Sensors - Part 3: Terminology”, intelligent sensors refer to sensors that are equipped with bidirectional communication capabilities with external systems, enabling them to transmit measurement and status information as well as receive and process external commands. Compared with conventional sensors, intelligent sensors integrate information processing and control functions, and demonstrate clear advantages in measurement accuracy, operational reliability under specific application scenarios, and overall performance-to-cost efficiency.

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With the continued convergence and evolution of MEMS, communication technologies, computing technologies, micro-system technologies, and AI, intelligent sensors have evolved from single-function devices into highly integrated, system-level products. They typically integrate sensing units, communication modules, microprocessors, driving and interface circuits, as well as software algorithms, and are capable of self-diagnosis, self-compensation, and a certain degree of self-learning, while supporting multi-source sensing fusion and flexible communication modes. At present, intelligent sensors are widely applied in industrial safety, automotive electronics, consumer electronics, environmental monitoring, healthcare, and intelligent equipment, and serve as fundamental components of next-generation intelligent systems. In addition, the rapid development of robotics — particularly industrial automation, collaborative robots and emerging humanoid systems — is driving increasing demand for advanced sensing solutions. As robotic systems evolve toward higher levels of autonomy and human-machine interaction, flexible sensors, with their high sensitivity, conformability and multi-dimensional perception capabilities, are becoming important components for enabling tactile sensing, force feedback and safe interaction. The growing integration of robotics and embodied intelligence is expected to further expand the application scope of advanced sensing technologies.

Based on industry practices and product application characteristics, intelligent sensors can be classified by product type according to the parameters being measured, and different product types may respectively or simultaneously adopt sensing technologies based on physical, chemical and biological principles.

Gas Sensors: Sensors that detect the presence, concentration or changes of specific gases and convert such information into electrical signals, widely used in industrial safety, environmental monitoring, urban gas and household safety applications.

Pressure Sensors: Sensors that measure pressure or force-related parameters and convert such information into electrical signals, primarily applied in industrial control, energy, automotive electronics and safety monitoring scenarios.

Flow Sensors: Sensors that measure the flow rate or volume of liquids or gases within pipelines or systems and convert such measurements into electrical signals, commonly applied in energy, water utilities, industrial processes and metering scenarios.

Other Sensors: Sensors that measure parameters such as temperature, humidity, position, motion or other environmental variables, and are applied across intelligent equipment, consumer electronics, healthcare and emerging intelligent systems.

Value Chain of China's Intelligent Sensors Market

China's intelligent sensor value chain has reached a relatively mature stage and is generally composed of upstream raw materials and fundamental component supply, midstream intelligent sensor design, manufacturing and packaging and testing, and downstream diversified application segments. The division of labor across the value chain is relatively clear, with key players established in each segment, providing a solid foundation for large-scale industry development and technological upgrading.

The upstream segment mainly provides key raw materials, basic components, and related equipment, including inorganic materials, organic materials, semiconductor materials, metallic materials, and certain core production equipment. Such materials are widely used in sensor sensitive elements, chip manufacturing, and packaging and testing processes, and have a significant impact on product performance stability and cost control.

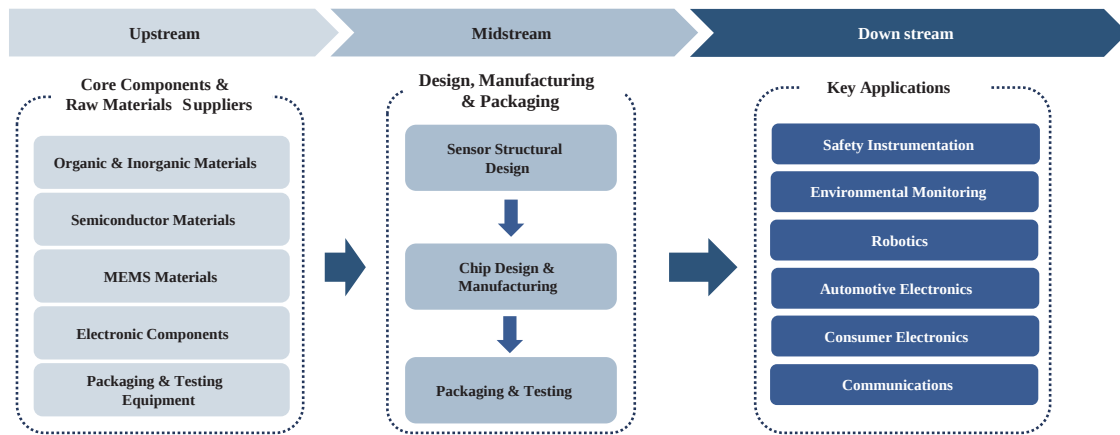
The midstream segment represents the key link of the intelligent sensor value chain and covers core processes such as sensor structural design, chip manufacturing, and packaging and testing. Based on sensing objects and measurement principles, this segment can be further divided into gas, pressure, temperature, optical, and other categories. This segment is characterized by high technological intensity and high value-added content, with stringent requirements on research and development capabilities, manufacturing processes, and quality control. It is the core determinant of intelligent sensor performance levels and the industry's competitive landscape. With the upgrading of downstream demand, midstream products are accelerating their evolution toward higher precision, higher reliability, miniaturization, and integration.

The downstream segment comprises the application end of intelligent sensors, covering safety instrumentation, environmental monitoring, robotics, automotive electronics,

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consumer electronics, communications, industrial control, healthcare, and other areas. Different application fields exhibit significant differences in operating environments, accuracy requirements, reliability standards, and system compatibility, resulting in multi-tiered and decentralized nature of downstream market demand. With the continued advancement of the Internet of Things, new industrialization, and the digital economy, the penetration of intelligent sensors across downstream fields continues to increase, and application scenarios are continuously expanding. Overall, China has become one of the most important intelligent sensor application markets globally.

Value Chain of China’s Intelligent Sensors Market

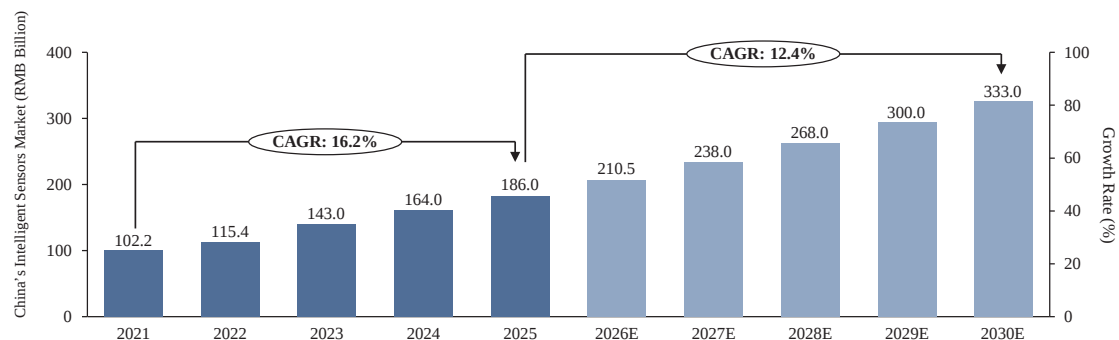


Source: Frost & Sullivan

Market Size of China’s Intelligent Sensor

The market size of China’s intelligent sensors industry in terms of revenue increased from approximately RMB102.2 billion in 2021 to approximately RMB186.0 billion in 2025, representing a CAGR of 16.2%. The growth was mainly driven by rising digitalization and intelligent upgrading across downstream industries, which continued to expand demand from industrial automation, consumer electronics, automotive electronics, smart home, and Internet of Things applications. In addition, the advancement of import substitution, improvements in manufacturing and packaging capabilities, and supportive national policies for intelligent manufacturing and key components have provided favorable conditions for industry development. By 2030, the market size is expected to reach approximately RMB333.0 billion, with a CAGR of 12.4% from 2025. Ongoing progress in MEMS technology, system integration capabilities, rapid development of robotics, and the integration of sensing hardware with intelligent algorithms is expected to further enhance the importance of intelligent sensors across application fields.

Market Size of China’s Intelligent Sensor, 2021-2030E

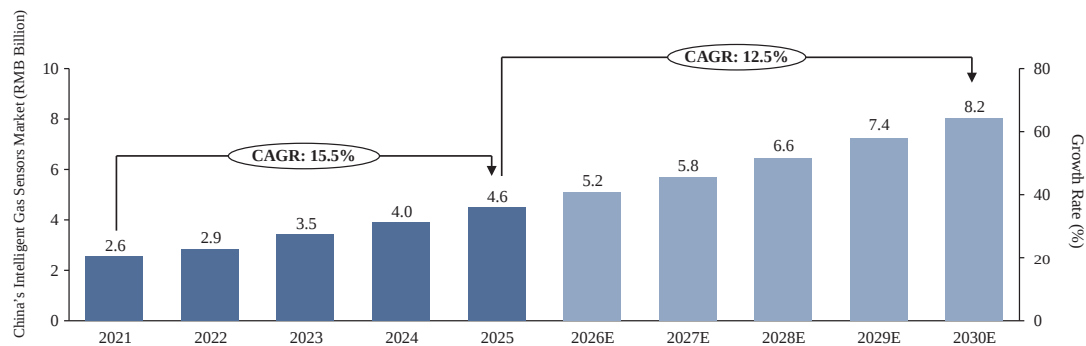


Source: China IoT Research and Development Center, Frost & Sullivan

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As intelligent sensor technologies and products continue to iterate, their application scope continues to expand. By product type, pressure, image, flow, position, and motion sensors remain the five largest sub-segments in terms of market share. Currently, intelligent gas sensors accounted for a relatively small proportion of China’s overall intelligent sensors market, representing approximately 2.5% in 2025. The market size of intelligent gas sensors increased from approximately RMB2.6 billion in 2021 to approximately RMB4.6 billion in 2025, representing a CAGR of 15.5%, and is expected to reach approximately RMB8.2 billion by 2030, with a CAGR of approximately 12.5% from 2025 to 2030, slightly higher than the overall growth rate of the intelligent sensors market. Market growth is mainly driven by stricter industrial safety regulations, rising awareness of urban safety and household health, increasing demand for gas monitoring in new energy and energy storage industries, and the continuous improvement of environmental monitoring systems. At the same time, domestic manufacturers have achieved continuous breakthroughs in sensitive materials, microstructure design, packaging technologies, and low-power technologies, further enhancing product performance and market penetration. Looking ahead, with the parallel development of semiconductor, infrared, electrochemical, and photoacoustic technologies, together with the accelerated deployment of applications in smart cities, smart homes and in-vehicle electronics, intelligent gas sensors are expected to assume an increasingly critical role in multi-industry safety and monitoring systems in China, supporting long-term, healthy market growth.

Market Size of China’s Intelligent Gas Sensors, 2021-2030E



Source: China IoT Research and Development Center, Frost & Sullivan

Market Drivers of China’s Intelligent Sensors Market

Smart upgrading driving sensing demand. With the advancement of smart upgrading across industrial, energy and municipal sectors, demand for accurate and reliable perception capabilities continues to increase. As foundational components supporting intelligent management and operational optimization, intelligent sensors are increasingly deployed in refined management and risk prevention scenarios. The development of smart manufacturing, intelligent energy systems and urban safety management has driven higher configuration density of pressure, gas and flow sensors, while raising requirements for stability and environmental adaptability, thereby supporting sustained market demand growth.

Manufacturing upgrading and emerging applications creating structural demand. Manufacturing upgrading has driven higher configuration density of pressure, temperature, vibration, and gas sensors in industrial equipment. In parallel, the development of new energy vehicles, energy storage systems, and in-vehicle environmental monitoring has expanded sensor applications. As embodied intelligence and robotics continue to develop, robots are expected to require more flexible and adaptive sensing capabilities for tactile perception, human-machine interaction and motion control, which is driving additional demand for flexible sensors and supporting medium- to long-term growth.

Technological progress improving performance and adoption. Advances in MEMS processes, optoelectronic devices, and related manufacturing technologies have enhanced intelligent sensor performance, stability, power efficiency, and miniaturization. As manufacturing and packaging capabilities mature, certain high-performance sensor products have entered large-scale production, supporting broader adoption across multiple application fields.

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Localization, policy support, and regulation releasing demand. Rising supply chain security considerations have encouraged the adoption of domestic sensor products, alongside sustained policy support for intelligent manufacturing and key components. At the same time, regulatory requirements under *the Work Safety Law*, *the Urban Gas Pipeline Aging Renovation and Upgrade Plan*, and *the Guidelines for Urban Lifeline Infrastructure Construction* have raised standards for online monitoring and early warning systems, thereby continuing to release application demand across industrial safety, gas, municipal, and emergency management scenarios.

Future Trends of China's Intelligent Sensors Market

Multi-modal sensing integration becoming a mainstream direction. With the continued evolution of embodied intelligence, humanoid robots, and advanced automation equipment, downstream applications have shown a growing reliance on the integration of multi-modal information such as vision, hearing, touch, and olfaction, raising requirements for comprehensive environmental perception. Advances in artificial intelligence algorithms and on-device computing capabilities have further reinforced this trend, with multi-source signal fusion gradually becoming a foundational capability of intelligent systems.

Robotics applications driving sustained demand for high-end sensors. As industrial robots continue to upgrade toward greater flexibility, precision and collaboration, and humanoid robots gradually enter demonstration and early application stages, demand for high-end sensors has continued to increase. Robotics applications place stringent requirements on sensing accuracy, stability, response speed and system integration, driving demand for advanced sensors such as force, inertial and flexible sensors that enable compliant interaction and multi-dimensional perception. In particular, flexible sensors are increasingly adopted in robotic applications requiring contact perception and adaptive control, reflecting a broader trend toward higher-performance and more integrated sensing solutions, and supporting sustained demand growth for high-end sensors.

Key application scenarios driving higher reliability and standardization. With the continued expansion of automotive intelligence and electrification, as well as energy storage and battery thermal management applications, downstream markets have imposed higher requirements on the safety and reliability of gas, temperature and humidity, pressure, and optical sensors. Application scenarios such as in-vehicle air quality monitoring, battery leakage detection, and medical vital sign monitoring increasingly demand higher device grades and module consistency, accelerating industry-wide upgrades toward higher stability, greater consistency, and more standardized systems.

Competitive landscape shifting toward system-level solutions. In application fields such as smart cities, industrial safety, water utilities, and energy, downstream demand is shifting from single-component procurement toward system-level solutions encompassing sensors, terminals, data acquisition, platforms, and intelligent analytics. Companies are increasingly entering industry-level application scenarios through integrated hardware and software offerings, leveraging algorithms, edge computing, and platform capabilities to enhance data value. Enterprises with broader product portfolios and stronger system integration capabilities are expected to establish more pronounced competitive advantages. Meanwhile, the competitiveness of PRC-based players in the domestic intelligent sensors market has continued to improve, alongside enhancements in product portfolios and system integration capabilities.

Competitive Landscape of China's Intelligent Sensors Market

In 2025, China's intelligent sensors market exhibited a competitive landscape characterized by the coexistence of multiple technological pathways, broad application scenarios, and diverse types of market participants. The industry covers various sensing categories, including gas, pressure, temperature, and optical sensors. Due to differences in technological systems and the diversity of downstream demand, the number of enterprises and the degree of market concentration vary significantly across different sub-segments. Overall, the industry remains in a stage of structured competition, presenting a profile of being relatively fragmented on an aggregate basis while showing comparatively higher concentration in certain key sub-segments.

The top five PRC-based intelligent sensors providers accounted for approximately 21.2% of the market share in terms of revenue in 2025.

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In 2025, the Group’s revenue from intelligent sensors accounted for approximately 0.2% of the intelligent sensors market in China.

The top five PRC-based intelligent gas sensors providers accounted for approximately 25.4% of the market share in terms of revenue in 2025.

In 2025, the Company was the second largest PRC-based intelligent gas sensors provider in China, with a market share of 5.2% in terms of revenue.

Top Five PRC-based Intelligent Gas Sensors Providers in China by Revenue and Market Share, 2025

Ranking	PRC-based Intelligent Gas Sensors Providers	Revenue of Intelligent Gas Sensors (RMB Million)	Market share (%)
1	Company A	510.0	11.2%
2	The Company	234.7	5.2%
3	Company B	180.0	4.0%
4	Company C	120.0	2.6%
5	Company D	110.0	2.4%
	Top five	1,154.7	25.4%
	Total	4,550.0	100.0%

Notes:

1. The Company’s data is provided by the Company.
2. Company A is a public company listed on the Shanghai Stock Exchange, founded in 2003 and headquartered in Hubei province. It is mainly engaged in gas sensing technologies, providing intelligent gas sensors and intelligent gas instruments.
3. Company B is a public company listed on the Shenzhen Stock Exchange, founded in 1999 and headquartered in Hubei province. It is mainly engaged in laser technology equipment, optical communication devices, and sensor systems, including intelligent gas sensors.
4. Company C is a public company listed on the Shanghai Stock Exchange, founded in 2003 and headquartered in Jiangsu province. It is mainly engaged in semiconductor manufacturing and integrated circuit design, providing power devices, intelligent sensors, and related semiconductor solutions for industrial and consumer electronics markets.
5. Company D is a private company founded in 2013 and headquartered in Guangdong province. It is mainly engaged in gas detection instruments and safety monitoring equipment, providing portable and fixed gas detectors and related technical services for industrial and commercial safety applications, including intelligent gas sensors.

Source: Frost & Sullivan

In China’s intelligent gas sensor market, market participants may adopt different product and commercialization models. Certain participants primarily supply gas sensor modules, which typically integrate sensing elements with signal processing, calibration, compensation and other supporting components, while others primarily supply stand-alone gas sensors. As stand-alone gas sensors represent the core sensing component and are generally sold as individual units, their shipment volume may be higher than that of sensor modules, which are usually sold as integrated units with higher unit prices.

The top five PRC based intelligent gas sensors providers accounted for approximately 44.5% of the market share in terms of sales volume in 2025.

In 2025, the Company was the largest PRC based intelligent gas sensors provider in China, with a market share of 29.8% in terms of sales volume.

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Top Five PRC-based Intelligent Gas Sensors Providers by Sales Volume (China), 2025

Ranking	PRC-based Intelligent Gas Sensors Providers	Sales Volume of Intelligent Gas Sensors (Million Units)	Market share (%)
1	The Company	36.3	29.8%
2	Company A	9.5	7.8%
3	Company C	4.9	4.0%
4	Company B	1.9	1.6%
5	Company E	1.6	1.3%
Top five		54.2	44.5%
Total		121.7	100.0%

Note:

1. The Company’s data is provided by the Company.
2. Company E is a private company founded in 2015 and headquartered in Guangdong province. It is mainly engaged in MEMS sensors and precision optical components, including intelligent gas sensors.
3. The Company primarily sells stand-alone gas sensors, while Company A, Company B, Company C and Company E primarily sell gas sensor modules.

Entry Barriers of China’s Intelligent Sensors Market

High technical barriers arising from multidisciplinary integration. Intelligent sensors involve multiple core disciplines, including materials science, mechanical processing, chemical sensing reactions, MEMS micro- and nano-fabrication, optical imaging, circuit design, and algorithm-based compensation. New entrants are required to overcome challenges across multiple stages, such as sensing material development, process consistency control, temperature compensation, drift calibration, and signal processing. According to industry interviews, many sensor products require extended development cycles from research and development to stable mass production, and insufficient technological accumulation makes it difficult to meet the stringent accuracy and stability requirements of applications such as industrial safety and automotive electronics.

Long-term R&D investment and extended commercialization cycles. The industry is characterized by high R&D intensity, long validation cycles, and high trial-and-error costs. Companies are required to continuously invest R&D resources in material innovation, chip design, structural optimization, and algorithm development, while maintaining stable investment in production lines, equipment, and process platforms. Management interviews indicate that sensor products typically require lengthy testing and verification cycles before achieving large-scale delivery, and new entrants lacking sufficient financial strength and sustained investment capabilities may find it difficult to establish commercially viable product portfolios.

System-level capability barriers driven by value chain depth. The sensor value chain spans multiple stages, including materials, chip design, wafer fabrication, packaging and testing, module integration, and system applications, requiring enterprises to possess cross-stage coordination capabilities. Annual reports indicate that leading players have established upstream capabilities in areas such as ceramics, thin films, MEMS, and lasers, achieving vertical integration from core components to modules and complete instrumentation. Such system-level capabilities are difficult to replicate in the short term and constitute significant structural barriers for late entrants.

Structural barriers from scale manufacturing and cost control. Sensor manufacturing is highly sensitive to process consistency, manufacturing precision, and unit cost at scale, requiring stable process platforms, automated equipment, and mature quality control systems. Leading companies have developed large-scale production capacity and multi-category manufacturing capabilities through long-term accumulation, resulting in significant advantages in unit cost and delivery stability. In contrast, new entrants lacking scale foundations may face challenges in price competitiveness, delivery timelines, and quality consistency when competing with established industry leaders.

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CHINA INTELLIGENT INSTRUMENTS MARKET OVERVIEW

Definition and Classification of Intelligent Instruments

Intelligent instruments are devices that take multi-type sensors as their core components and integrate signal processing, embedded control, and communication modules. They are capable of real-time monitoring and data analysis of parameters such as gas, pressure, temperature, flow, vibration, and environmental conditions, while supporting remote control and early warning functions. Intelligent instruments are widely applied across scenarios including industrial safety, household safety, smart cities, environmental monitoring and traffic safety.

Compared with traditional instruments that are limited to single-parameter measurement and local display, intelligent instruments offer higher measurement accuracy and stronger environmental adaptability. Through network connectivity, they enable remote supervision, online diagnostics, and proactive early warning functions.

Based on functional attributes and usage characteristics, intelligent instruments can be broadly classified into monitoring instruments and metering instruments, mainly including the following categories:

Monitoring Intelligent Instruments: Instruments primarily used for real-time monitoring, early warning and safety management of pressure, gases, temperature, environmental and operational conditions. Such instruments are widely applied in industrial safety, municipal management, environmental monitoring and transportation scenarios, and include intelligent gas instruments for combustible and toxic gas detection as an important sub-category.

Metering Intelligent Instruments: Instruments used for the accurate measurement and management of resource consumption or physical quantities such as gas, water, heat and electricity. These instruments emphasize measurement accuracy, long-term stability and data management capabilities, and are commonly applied in energy, utilities and public service sectors.

Intelligent instruments continue to expand across applications including gas, industrial safety, household safety, environmental monitoring, municipal services, and transportation. They are gradually evolving from single-point detection toward multi-technology integration, multi-signal channels, and multi-scenario linkage. Supported by the application of AI technologies, intelligent instruments are progressing toward system-level, intelligent, and predictive monitoring, providing foundational support for market expansion and smart upgrading of the industry.

Market Size of China's Intelligent Instruments

In 2021, the market size of China's intelligent instruments market in terms of revenue amounted to approximately RMB261.0 billion, primarily comprising industrial safety intelligent instruments, household safety intelligent instruments, municipal intelligent instruments, and traffic safety intelligent instruments. By 2025, the market expanded to approximately RMB353.2 billion, representing a CAGR of 7.9%. Among them, the industrial and energy sector represents the largest downstream application of China's intelligent instruments market. In 2025, the market size of intelligent instruments used in the industrial and energy sector amounted to approximately RMB124.3 billion, accounting for around 35.2% of the total market size of China's intelligent instruments market. Driven by increasing requirements for production safety, energy efficiency improvement and process automation, demand for various types of intelligent instruments, including gas detection, pressure, temperature and flow measurement instruments, has continued to expand, making the industrial and energy sector the core source of market demand.

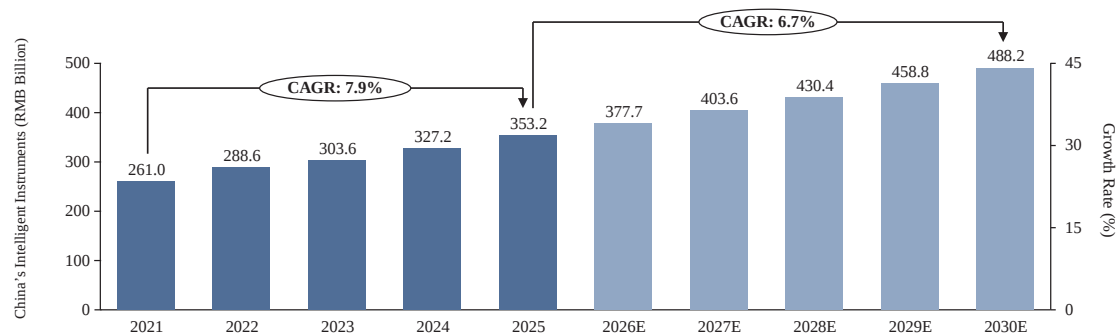
Smart cities also provide additional growth momentum for intelligent instruments, as urban digitalisation and smart city construction have increased demand for real-time sensing, remote monitoring and early warning functions in municipal safety, environmental monitoring, public utility management and emergency response scenarios.

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Looking ahead to 2030, the overall market size of China's intelligent instruments market is expected to increase to approximately RMB488.2 billion. Supported by the ongoing industrial digitalisation, energy structure optimisation and increasingly stringent safety and regulatory requirements, demand for intelligent instruments in the industrial and energy sector is expected to maintain steady growth. The market size of intelligent instruments in China's industrial and energy sector is projected to reach approximately RMB156.2 billion by 2030.

Among which, intelligent gas instruments accounted for a relatively small proportion of China's overall intelligent instruments market, representing approximately 3.4% in 2025. The market size of intelligent gas instrumentation increased from RMB8.7 billion in 2021 to RMB12.0 billion in 2025, representing a CAGR of 8.5%. The market is expected to reach RMB16.7 billion by 2030, representing a CAGR of 6.9% from 2025 to 2030.

Market Size of China's Intelligent Instruments, 2021-2030E



Source: Frost & Sullivan

Market Drivers of China's Intelligent Instruments Market

Strengthening industrial safety management. With the continuous tightening of industrial safety supervision and the advancement of intrinsic safety construction in sectors such as chemicals, energy, metallurgy, and manufacturing, demand for intelligent instruments used in combustible and toxic gas detection, flame recognition, acoustic imaging, and confined space monitoring has increased. As core components of industrial safety systems, safety-related intelligent instruments play a critical role in risk identification, online monitoring, and coordinated early warning, supporting sustained market demand under stricter regulatory requirements.

Urban lifeline development and regulatory reinforcement driving public utility demand. The continued advancement of urban lifeline projects in areas such as gas, water and heating has generated sustained demand for intelligent instruments used in monitoring, metering and early warning applications. At the same time, the reinforcement of regulatory requirements and technical standards has raised expectations for reliability, long-term stability and compliance, accelerating industry upgrading and supporting the wider adoption of high-quality intelligent instrument products across public utility and municipal management scenarios.

Digital and intelligent management driving upgrading of intelligent instruments. Driven by rising demand for digitalised management and intelligent decision-making across industrial safety, environmental protection and urban management scenarios, intelligent instruments are accelerating their upgrading toward higher levels of automation and data processing capability. As a result, intelligent instruments are evolving from standalone measurement devices into key components supporting visualised supervision and refined management across multi-parameter application environments.

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Localization trends supporting domestic industry development. Against the backdrop of policies promoting localization of key equipment, the intelligent instrument value chain is gradually achieving localized upgrades from core sensors to complete instruments. As domestic enterprises enhance core technological capabilities, industry standards improve, and supply chain security requirements increase, local brands have gained greater recognition in areas such as safety instruments, metering instruments, and municipal monitoring, providing a stable and sustainable growth foundation for the industry.

Future Trends of China’s Intelligent Instruments Market

Multi-technology integration and holistic sensing. Intelligent instruments in the industrial safety field are evolving from single-technology measurement toward the integration of multiple technologies such as laser, acoustics, and spectroscopy, enabling comprehensive sensing across point-, surface-, and area-level scenarios. Driven by biomimetic sensing concepts, the coordinated application of “vision, hearing, and olfaction” is gradually being realized, with multi-modal safety monitoring emerging as a mainstream industry trend.

System-oriented development of safety detection. Safety detection instruments are evolving from standalone device deployment toward enterprise level, industrial park level, and city level management. Through communication technologies, data from sensing terminals are aggregated onto unified platforms, enabling cross-level detection, early warning and coordinated response. In smart city applications, such systems are increasingly used for gas leakage detection, environmental risk detection, utility infrastructure safety detection and emergency response, supporting integrated urban safety management and strengthening the role of intelligent instruments in city-level digital governance.

Ultrasonic metering increasingly replacing traditional mechanical metering. In the water services sector, ultrasonic water meters are gradually replacing traditional mechanical meters due to the absence of mechanical moving parts, low pressure loss, high stability, strong anti-interference capability, and support for infrared interfaces, 4G communication, remote meter reading, and proactive anomaly reporting. In gas metering applications, the market is upgrading from traditional diaphragm gas meters toward ultrasonic gas meters and related flow metering modules. With advantages in high-precision measurement, lower maintenance costs, and intelligent functionality, ultrasonic technology is expected to become one of the mainstream technical pathways in the next stage of gas metering development.

Platform-based and intelligent evolution of intelligent instruments. Leveraging the integration of sensors, intelligent instruments, safety monitoring and ultrasonic metering instruments transmit sensing data to monitoring systems through multiple communication methods. Combined with cloud computing and AI analytics, these systems enable visualization and intelligent applications. In safety scenarios, AI-enabled early warning platforms and risk diffusion models have begun to be deployed to support risk assessment and decision-making under complex operating conditions. Going forward, intelligent instruments are expected to increasingly assume the role of “data entry points and algorithm front ends” within intelligent systems.

Competitive Landscape of China’s Intelligent Instruments Market

In 2025, China’s intelligent instruments market exhibited a competitive landscape characterized by the coexistence of multiple technological pathways, a wide range of application scenarios, and diverse types of market participants. The market encompasses various categories of intelligent instruments, including gas safety instruments, pressure instruments, flow meters, temperature and humidity instruments, and other sensing-based measurement and monitoring devices. Owing to differences in underlying technologies, application standards and downstream customer requirements, the number of market participants and the degree of market concentration vary significantly across different sub-segments. Overall, the intelligent instruments market remains in a stage of structured competition, and is characterized by a relatively high degree of fragmentation at the aggregate level, while certain core sub-segments exhibit comparatively higher levels of concentration.

The top five PRC-based intelligent instruments providers accounted for approximately 20.0% of the market share in terms of revenue in 2025. In 2025, the Group’s revenue from intelligent instruments accounted for approximately 0.3% of the intelligent instruments market in China.

The top five PRC-based intelligent gas monitoring instruments providers accounted for approximately 21.2% of the market share in terms of revenue in 2025.

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In 2025, the Company was the largest PRC-based intelligent gas monitoring instruments provider in China, with a market share of 7.6% in terms of revenue.

Top Five PRC-based Intelligent Gas Monitoring Instruments Providers by Revenue (China), 2025

Ranking	PRC-based Intelligent Gas Monitoring Instruments Providers	Revenue of Intelligent Gas Monitoring Instruments (RMB Million)	Market share (%)
1	The Company	917.1	7.6%
2	Company F	580.0	4.8%
3	Company G	476.0	4.0%
4	Company H	300.0	2.5%
5	Company I	270.0	2.3%
	Top five	2,543.1	21.2%
	Total	12,000.0	100.0%

Notes:

1. The Company's data is provided by the Company.
2. Company F is a public company listed on the Shenzhen Stock Exchange, founded in 2002 and headquartered in Zhejiang province. It is mainly engaged in environmental monitoring instruments, analytical equipment, and related integrated solutions for industrial and governmental applications, including intelligent gas monitoring instruments.
3. Company G is a public company listed on the Shanghai Stock Exchange, founded in 1999 and headquartered in Zhejiang province. It is mainly engaged in industrial automation control systems, intelligent manufacturing software, and process industry digital solutions, including intelligent gas monitoring instruments.
4. Company H is a public company listed on the Shenzhen Stock Exchange, founded in 1994 and headquartered in Guangdong province. It is mainly engaged in industrial automation instruments and related solutions, including intelligent gas monitoring instruments.
5. Company I is a public company listed on the Shenzhen Stock Exchange, founded in 1991 and headquartered in Guangdong province. It is mainly engaged in the design and manufacturing of measurement and testing instruments for electrical, environmental, and industrial uses, including intelligent gas monitoring instruments.

Source: Frost & Sullivan

CHINA INTEGRATED INTELLIGENT SOLUTIONS MARKET OVERVIEW

Definition and Classification of Integrated Intelligent Solutions

Integrated intelligent solutions refer to integrated solutions that are built on sensors and related intelligent instruments and that combine sensing, computing, communication, and control technologies to provide data acquisition, environmental understanding, and intelligent decision support for various industries and living scenarios. Such solutions typically integrate multiple types of front-end sensing devices, including gas, pressure, water quality, flow, temperature and humidity, imaging, and radar equipment, together with edge computing units and integrated platforms. By incorporating big data, cloud computing, and artificial intelligence algorithms, these solutions enable real time perception, analysis, visualization, and coordinated response to the physical world.

Based on differences in downstream application scenarios, integrated intelligent solutions are widely applied across industrial safety, urban and municipal management, public utilities and transportation infrastructure. Such solutions typically integrate sensing devices, intelligent instruments, data acquisition terminals and integrated platforms to support functions including real-time monitoring, risk identification, early warning and coordinated response. They are commonly deployed in high-risk industrial environments, urban safety and infrastructure management, environmental and utility operations, as well as transportation and public service scenarios, providing system-level support for intelligent management and decision-making.

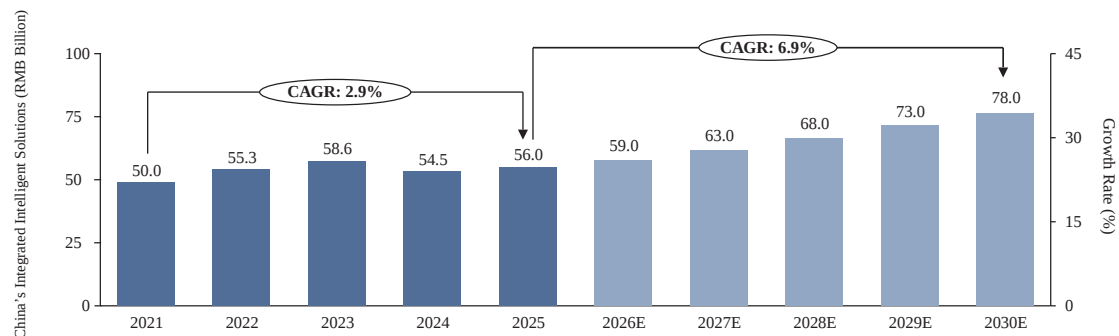
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Market Size of China Integrated Intelligent Solutions

In 2021, the market size of China’s integrated intelligent solutions amounted to approximately RMB50.0 billion and increased to approximately RMB56.0 billion in 2025, representing a CAGR of 2.9% from 2021 to 2025 and showing an overall fluctuating growth trend. The slight decline in 2024 was mainly due to delayed demand release for certain intelligent city, environmental protection and safety projects amid macro and budgetary pressures, while the market recovered in 2025 as urban lifeline, gas safety and public safety projects gradually resumed.

Looking ahead to 2030, the market size of China integrated intelligent solutions is expected to reach approximately RMB78.0 billion, maintaining a steady expansion trend overall.

Market Size of China’s Integrated Intelligent Solutions, 2021-2030E



Source: Frost & Sullivan

Market Drivers of China Integrated Intelligent Solutions Market

Digital economy development and expansion of integrated solution demand. The rapid development of the digital economy and the continuous increase in connected devices have made integrated solutions combining sensing, connectivity, platforms, and applications an important foundation for digital transformation across industries. The large-scale application of new-generation information technologies in manufacturing, transportation, and urban development has created broad opportunities for integrated intelligent solutions built around specific application scenarios. Against this backdrop, end-to-end solutions addressing production safety, urban operation, environmental governance, and residential living scenarios have continued to expand, supporting steady growth in overall market demand.

Production safety and urban infrastructure upgrading driving system-level solutions. The strengthening of production safety management and the continuous advancement of urban lifeline and infrastructure projects have driven growing demand for system-level integrated intelligent solutions. In industrial parks, public utilities and urban management scenarios, downstream users increasingly require comprehensive solutions that support real-time monitoring, risk identification, early warning and coordinated response at a system level. At the same time, the digital upgrading of urban infrastructure has promoted the deployment of city-level management platforms, further expanding demand for integrated intelligent solutions that integrate sensing devices, intelligent instruments, system integration and application-level management.

Environmental governance upgrading and carbon management driving integrated solutions. Under increasingly stringent environmental governance and carbon management requirements, demand has grown for integrated solutions covering monitoring, governance, and operation and maintenance in areas such as atmospheric environments, water environments, and enterprise emissions. Through integrated technical approaches encompassing sensing, monitoring terminals, data acquisition, spatial information technologies, cloud applications, and governance services, intelligent environmental protection solutions support applications such as river basin water environment supervision, carbon monitoring platforms, and integrated emission management systems. The shift from single-device procurement to system-level solution procurement in environmental governance has benefited solution providers with comprehensive capabilities.

INDUSTRY OVERVIEW

Multi-technology integration and intelligent applications enhancing solution value. The integration of technologies such as remote sensing, data communication, big data, cloud computing, and artificial intelligence has strengthened the technical foundation of integrated intelligent solutions. Applications including intelligent video analysis, risk identification models, trend forecasting, and simulation are increasingly embedded in safety, urban management, and environmental governance platforms, enhancing capabilities in risk assessment and decision support. Continuous multi-technology integration has increased solution intelligence and application depth, thereby improving project stickiness and value density.

Future Trends of China Integrated Intelligent Solutions Market

Accelerated transition from single devices to system- and platform-based solutions. Integrated intelligent solutions are evolving from single hardware products or standalone system integration toward comprehensive architectures combining sensors, intelligent instruments, data acquisition, spatial information technologies, big data, cloud applications, and artificial intelligence. The coupling between front end sensing, edge processing, and platform systems continues to deepen. In application scenarios such as intelligent safety, intelligent cities, and intelligent environmental protection, projects are increasingly platform-centric, integrating multiple sensing terminals, business subsystems, and visualization applications into unified solutions, thereby improving solution reusability and operational efficiency. As a result, the focus of industry competition is gradually shifting from individual product capabilities to system design and platform capabilities.

Shift from generic solutions to scenario-specific and vertically specialized offerings. Solution models are transitioning from generic platforms with simple configurations toward industry-specific solution packages tailored to distinct application scenarios. In the safety domain, differentiated monitoring and early warning solutions are designed for hazardous chemical enterprises, industrial parks, and urban complexes. In the urban domain, gas, water services, heating, flood control, bridges, and underground spaces are increasingly integrated into unified urban operation platforms. In the environmental domain, solutions are increasingly tailored to river basin water environments, atmospheric pollution control, and enterprise emission management. This trend toward scenario-specific and vertically specialized solutions improves deployment efficiency and customer stickiness while raising barriers to entry.

Cross-level integrated solutions driven by safety and urban governance needs. Driven by enterprise safety, industrial park safety, urban safety systems, and urban lifeline infrastructure development, intelligent safety and intelligent city solutions are expanding from enterprise-level systems toward regional- and city-level platforms. In areas such as gas pipeline networks, municipal facilities, and public space management, safety monitoring, operational management, and emergency command functions are increasingly integrated through unified platforms, enabling centralized data aggregation, risk assessment, and coordinated response. Sensing terminals and safety monitoring instruments are becoming deeply embedded components of overall service offerings rather than standalone products.

Platform-based development of integrated intelligent solutions. Integrated intelligent solutions are evolving toward platform-based and system-oriented development through the integration of sensing devices, intelligent instruments, data acquisition systems and application-level platforms. As downstream users increasingly emphasize operational efficiency, reliability and centralized management, such solutions are being deployed at enterprise, industrial park and city levels, supporting broader application across industrial, municipal and public utility scenarios.

Competitive Landscape of China Integrated Intelligent Solutions Market

Integrated intelligent solutions providers refer exclusively to enterprises that possess both proprietary hardware and software capabilities and are able to deliver end-to-end integrated solutions.

In terms of revenue, the top five PRC-based integrated intelligent solutions providers accounted for approximately 14.1% of the market share in 2025.

In 2025, the Company was ranked between sixth and tenth among PRC-based integrated intelligent solutions providers in China, with a market share of 1.1% in terms of revenue.

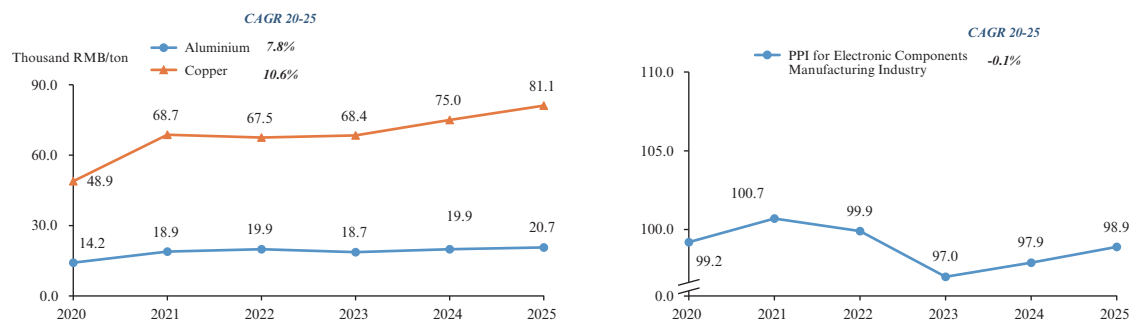
INDUSTRY OVERVIEW

RAW MATERIAL COST ANALYSIS

Copper, aluminium and electronic components are major raw materials and core components commonly used in the intelligent sensors and intelligent instruments markets. Copper is primarily used in cables, connectors and conductive components, while aluminium is mainly applied in structural and heat dissipation components. Electronic components are widely used in sensing modules, communication modules and control systems.

Between 2020 and 2025, copper and aluminium prices generally increased, while prices of electronic components remained relatively stable. Specifically, copper prices increased from RMB48.9 thousand per ton in 2020 to RMB81.1 thousand per ton in 2025, while aluminium prices increased from RMB14.2 thousand per ton to RMB20.7 thousand per ton during the same period, representing CAGRs of 10.6% and 7.8%, respectively. In contrast, the PPI of the electronic components manufacturing industry fluctuated within a relatively stable range of 97.0 to 100.7. Such price movements were primarily driven by supply-demand dynamics, commodity price fluctuations and overall market conditions in the electronic components industry.

From 2025 to 2030, prices of the above raw materials are expected to experience modest increases, primarily driven by continued growth in downstream demand from industrial automation, intelligent manufacturing and new energy-related industries, as well as ongoing fluctuations in global commodity prices and supply-demand conditions.



Source: Wind, Frost & Sullivan