



# Deploying the highest quality standards on a grand scale

With over 5 GW of products shipped and having generated around 5 TWh of clean electricity in more than 130 countries to date, APsystems has continued to lead MLPE innovation for over a decade and this mission requires managing quality on a grand scale. This article looks at the vision of quality shared by its top executive teams and describes the resources, processes and management system set up to support the highest quality standards as the backbone of the organization.



APsystems has registered over 166 Intellectual Property right items and 88 invention patents. The company was recognized as a 'National High-tech Enterprise' from 2013 to 2022 in China and introduced several product innovations in the multimodule microinverter space. With the world's first dual microinverter YC500 introduced in 2012 and its 3-phase native quad with the YC1000 microinverters series from 2016, the company established itself with two best-selling products in residential and small commercial segments.

APsystems adheres to the principle of independent research and development, focusing on quality and steady progress, making it one of the earliest companies engaged in the research, development and sales of photovoltaic microinverters worldwide. It has persisted in product and service orientation based on market demand, making continuous efforts to expand globally since 2011.

It has successively established subsidiaries or branches in major international photovoltaic markets such as the United States, Australia, France, the Netherlands, Brazil and Mexico. This has formed a global sales and service network, propelling it to become the world's second-largest supplier of microinverter products.

### Enhancing product liability

#### From component testing to accelerated lifecycle simulations

Enhancing product liability awareness and ensuring product quality are indispensable responsibilities for the company. Product liability not only impacts the company's integrity and reputation but also plays a critical role in maintaining market order and safeguarding consumer rights. A responsible enterprise should consistently prioritize product quality to ensure consumer safety and protection of their rights.

APsystems upholds the quality policy of 'technological innovation, continuous improvement, excellent quality and customer satisfaction', striving to deliver exceptional products and services to its customers. The company focuses on core areas such as research and development, design and market sales, while product manufacturing is conducted through outsourcing. To ensure the quality and consistent supply of outsourced products, the company meticulously selects outsourcing partners, taking into account their qualifications, credibility and technical capabilities.

'We first select and qualify the best-known established leaders when sourcing our components,' insists Dr Zhi Min Ling, Co-founder and Chairman, APsystems.

The company philosophy is centered around quality and brings highly reliable products to market. We apply this philosophy to all our partners and the teams involved in the product development chain. The quality of the components determines the performance and reliability of an end product to a very great extent.

'We conduct regular audit reviews with all component partners, including onsite check assessments and documentary reviews,' says Tori Gao, Senior Director of Supply Chain Management.

#### An end-to-end quality management system

The company has established a comprehensive quality management system, including protocols such as Outsourcing Management Procedure and Process Inspection Specifications to standardize the outsourcing process, personnel allocation, testing procedures, packaging and other aspects. Through close collaboration with outsourcing partners and stringent control over quality and processes, the company achieves complete monitoring of critical processes throughout the outsourcing chain. It has obtained ISO9001 quality management system certification.

To ensure the smooth implementation and effective operation of the quality management system, the company has established a robust organizational structure for quality management. At the top of this structure is Dr Ling, who serves as the highest management authority overseeing the quality management system.

The Vice Operating Officer is designated as the primary representative of the quality management system, responsible for coordinating, monitoring and driving quality management initiatives across the organization. Additionally, the Quality Supervisor plays a crucial role in providing in-depth management and guidance in key areas such as quality assurance, supplier quality, process quality and quality control.

The quality department consists of over 20 quality engineers and project managers. Their mission is to control and reinforce our quality processes on the components used in our design to accelerate lifecycle testing procedures.

Only tier-1 suppliers are taken into consideration as candidates by APsystems. From the initial selection of supplier resources to final qualified enrollment, the company carries out a thorough investigation and analysis of the component itself as well as the qualification of the supplier.

The company puts all microinverter product models through a rigorous testing process prior to release including 20,000 hours accelerated life testing and IP67 compliance testing for protection against ingress of solid foreign objects from windblown dust, ingress of water from rain, sleet, snow, splashing water, and hose directed water, corrosion, and external formation of ice.

It also tests for Safety and Emissions & Immunity (EMC) Compliance EN 62109-1; EN 62109-2; EN61000-6-1; EN61000-6-2; EN61000-6-3; EN61000-6-4; UL1741 RSD, SunSpec Modbus certified, CSA C22.2 No330-17 RSD, IP68 RSD; and Grid Connection Compliance: VDE0126-1-1/ A1, VFR2019; VDE AR-N 4105, EN50438, EN50549, G99, RD 1699/2011, RD 413/2014, SAA171046.

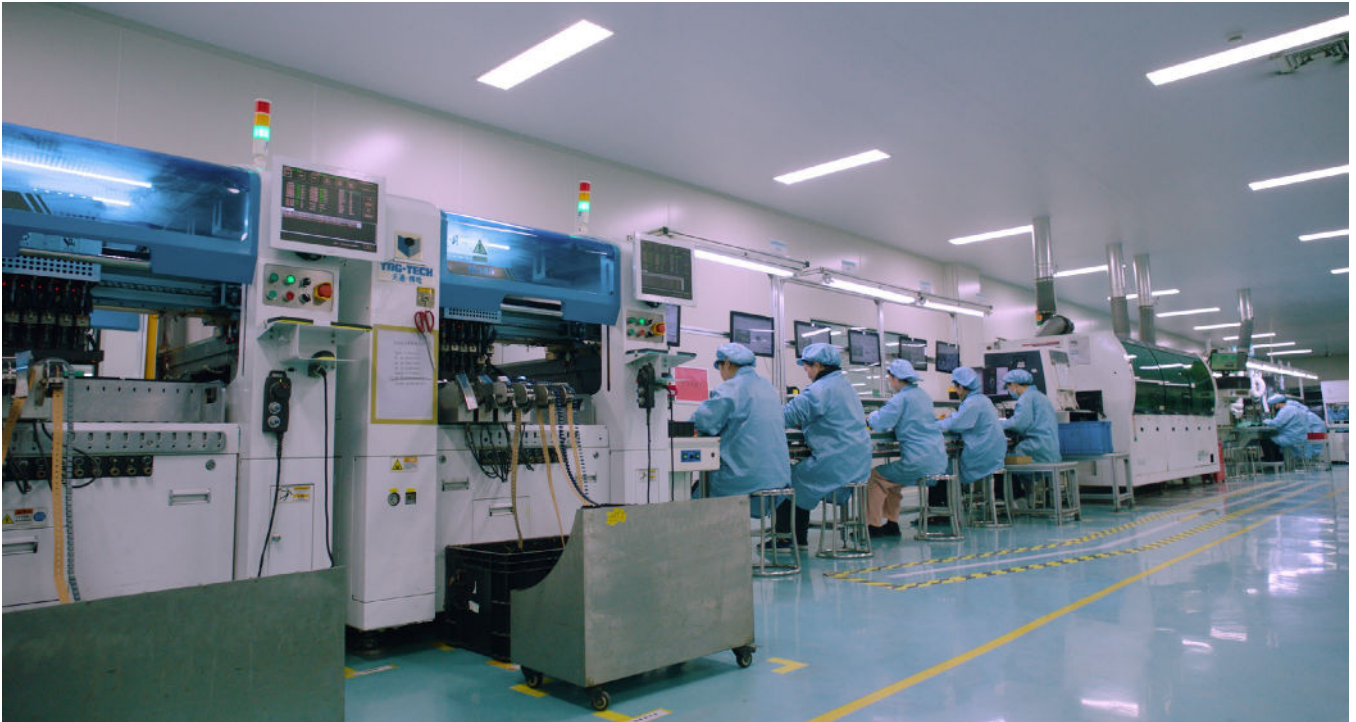
In addition to the full range of in-house testing done by APsystems for all product lines, it is also committed to third party testing for performance and reliability: RETC lab in California (DS3 series)

'We have increased our investment capacity and are setting quality test centers for all our product lines,' declares Dr Yuhao Luo, Co-founder & CTO.

The business uses Total Quality Management, and all manufacturing processes are ISO 9001:2008 certified.

It upholds the principle of 'zero-defect production, zero-acceptance of defects and zero-delivery of defects'. To achieve this, the company has established and implemented Quality Assurance Management Procedures and Corrective and Preventive Action Control Procedures. A stringent quality inspection process has been established, with dedicated quality inspection personnel.





These procedures ensure that every micro-inverter product undergoes stringent quality inspection processes, including Automated Optical Inspection (AOI), Functional Testing (FCT), Aging Testing. Additionally, advanced management methodologies such as 'Kanban Management', '5S Principles' and 'Six Sigma Principles' are employed to further enhance product quality and reliability.

Product traceability is also very important and APsystems uses UID to control production of every unit and keeps all production and testing data. The UID for each unit will be checked throughout the whole production and testing process. Through automated shop floor system control and unique UID numbers, every product's production records are traced from production to warehousing, ensuring complete traceability throughout the process.

All testing data is automatically uploaded to the database, and critical processes are conducted using automated testing equipment, allowing real-time monitoring by management personnel and effectively mitigating the risk of missed tests and reducing the impact of human factors on quality.

'With over 5 GW of products shipped worldwide, providing less than a 0.3% product failure rate at scale requires stringent quality measures' adds Dr Zhi Min Ling.

**A global launching process supported by a global service network**

Founded in 2010, APsystems is a multinational corporation encompassing four global business units serving customers in over 130 countries.

With nine subsidiaries or branches worldwide and five local warehouses, its localized teams provide comprehensive support to our partners and customers from pre-sales with multilingual online and onsite training, marketing support, sales, logistics and order administration services to aftersales technical support.

'During the launching process, we involve our international teams and manage field testing with beta installations in several parts of the world. In doing that, we assure our customers that the products will behave as planned in real conditions wherever they are installed,' explains Olivier Jacques, President Global APsystems.

The company also partners with Third Party Design test laboratories in Europe and in the USA to have them test the platforms in every possible way and make sure APsystems sticks to the quality promises made to customers.

RETC in California was recently consulted to conduct a set of safety and performance tests to characterize and assess the microinverters' performance and reliability, tested under different temperature conditions on our DS3 Microinverter series. After several tests including extreme thermal variations, harmonics and MPPT performance assessment, the four DS3 samples used for this tested during several weeks passed all electrical performance tests.

The company has established the After-Sales Operations Management Standards to actively address inquiries related to our products, providing comprehensive and expert responses. Furthermore, both the sales and marketing

departments are responsible for gathering and documenting feedback and suggestions, offering practical solutions to address any identified issues.

Customer satisfaction remains a top priority. In cases where return or exchange requests arise due to product issues, the company responds promptly to ensure that consumer concerns are effectively resolved. Regarding after-sales services, it commits to actively contacting customers within 24 hours of identifying the service type, with designated after-sales personnel offering viable solutions. Should on-site support be necessary, its proficient personnel will promptly deliver services following approval by the after-sales department leadership.

The after-sales team ensures solution implementation and maintains ongoing monitoring until the issue is completely resolved. Should the issue persist, they conduct a reassessment and develop successive solutions until achieving a closed-loop resolution.

Across 2024 and beyond, APsystems will continue to expand its technological and product footprint including microinverters and storage to meet the green energy needs in different distributed scenarios. The company has defined the three major energy storage industry ecosystems centered around micro-inverters: DIY micro-storage, residential energy storage, industrial and commercial energy storage.

The company is committed to driving a zero carbon future by delivering optimal products and exceptional services to its customers.