Motor Testing Standards Evolve as EV, Robotics and Automation Sectors Accelerate

Qingdao, Shandong Sep 16, 2026 (Issuewire.com) - As new energy vehicles, humanoid robots, industrial automation systems and low-altitude aircraft move from prototype to mass production, manufacturers across the motor supply chain are confronting a common bottleneck: testing. Motors that once required only basic performance checks now need multi-dimensional validation covering insulation integrity, dynamic response, joint durability and long-term reliability. Increasingly, testing methodology itself is shaping how quickly new motor-driven products can reach market.

That shift is visible in a wave of new technical standards now under development across China's electrical equipment and robotics industries — several of which specialist motor testing companies are helping to draft, as testing moves from a back-office quality function toward a more central role in product certification.

Standards Take Shape for Robot Joints and High-Voltage Motors

Among the most closely watched efforts is the drafting of national standards for humanoid robot integrated joints, covering rotary joints, linear joints and joint interface requirements, alongside a related industry specification for electric drive integrated joint modules. Qingdao AIP Intelligent Instruments Co., Ltd., a Qingdao-headquartered maker of motor test systems that markets internationally as AIP Instrument, says it has participated in drafting these standards and was involved in China's first standard-verification activity for core components of humanoid robots.

A parallel effort addresses high-voltage motor safety. Partial discharge — a form of localized electrical breakdown that can signal early insulation failure — has become a growing concern as automotive drive motors and industrial motors operate at higher voltages. AIP says it led the drafting of a national test-method standard for partial discharge testing of windings and enameled wire in new energy drive motors, an effort aimed at moving the technique out of controlled laboratory settings and onto production lines, where electrical interference has traditionally made such testing unreliable.

Together, the two efforts illustrate a broader pattern: as motor-driven products proliferate into safety-critical applications, from vehicle drivetrains to robot limbs, the standards bodies overseeing them are drawing more heavily on equipment makers' technical input.

Testing Methods Adapt to New Motor Designs

Alongside the standards work, testing companies are developing new inspection methods to keep pace with evolving motor designs. AIP's technology portfolio, built through in-house research and development, includes several approaches the company positions as addressing gaps left by conventional test equipment:

- A high-precision dynamic performance analysis platform used for research and development testing of motors in electric power steering, One-Box brake systems, servo applications, and military equipment.
- A non-destructive test for single-point wire damage within coils, offered as an alternative to traditional salt-water immersion testing.
- A vacuum-based insulation test that the company says can surface defects not detectable under normal atmospheric conditions, with adjustable vacuum levels intended to allow parallel testing at scale.
- A surge test built with components AIP describes as military-grade, aimed at high-power motors such as permanent magnet synchronous and three-phase industrial motors.
- A low-voltage, non-destructive inspection method for lap and plumb-line wiring insulation in electrical slots, an area the company says has historically been difficult to test without damaging the winding.

For robot joint modules specifically, testing increasingly evaluates the motor, reducer, encoder and brake as an integrated system rather than as separate components — a shift the company points to in describing its role in the joint-module standards process.

Market Context

China's intelligent motor test system market has expanded alongside the country's electric vehicle and robotics manufacturing base. AIP says it has held the leading market share in China's motor testing system sector for several consecutive years, citing a share of nearly 60% in 2022, with annual sales it describes as roughly triple those of the next-largest competitor in the segment. The company reports serving more than 16,000 customers across more than 60 countries, with clients spanning the

automotive, robotics, defense and industrial sectors; companies it lists among its customer base include Ametek, Emerson, Bosch, BorgWarner, ZF, Valeo, BYD, Hitachi, Nidec and Mitsubishi Motors, among others.

The company has been designated a National-level Specialized, Refined and Innovative "Little Giant" enterprise, a status China awards to smaller firms viewed as holding a leading niche position within their sector, and has received several Shandong provincial business recognitions. AIP also serves as a vice-chairman unit within the micro-motor branches of two national industry associations, and says it is a drafting participant on multiple national, industry, and group technical standards.

Manufacturing and Global Support

AIP operates two manufacturing facilities totaling roughly 20,000 square meters and employs a team of more than 260 people, over half of whom work in research and development, according to the company. It holds more than 80 intellectual property registrations and says its equipment is CE certified for international safety and quality compliance.

To support customers outside China, the company has built a service network spanning more than 60 countries, including 15 overseas service centers, and says it targets an eight-hour initial response window alongside round-the-clock technical support. Test systems and protocols can reportedly be adapted to a given customer's motor type, production cycle time, factory layout and data systems, including integration with MES, ERP and WMS software — a requirement that has become more common as manufacturers automate quality control alongside production itself.

Why It Matters

For manufacturers scaling new energy vehicle, robotics, or industrial automation product lines, testing is no longer a peripheral concern. Insulation failures, joint wear, and surge damage that go undetected during early testing can surface later as field failures, a costly outcome in industries where motors are increasingly embedded in safety-critical systems. As standards bodies formalize test methods for these newer motor categories — robot joints and high-voltage drive motors chief among them — the equipment and methodology used to validate them are likely to become a more visible part of how manufacturers demonstrate product reliability to customers and regulators alike.

Companies such as AIP, which supplies test systems described broadly in the industry as a motor tester , are positioned at the intersection of that shift: their participation in standards drafting places equipment vendors more directly in the industry's regulatory conversation than has typically been the case, a trend likely to continue as motor-driven products expand into new sectors including low-altitude aircraft and consumer drones.

About Qingdao AIP Intelligent Instruments Co., Ltd.

Headquartered in Qingdao, China, AIP develops motor testing technologies and systems for the automotive, robotics, defense, and industrial automation sectors, along with smart home appliance, water pump, and fan motor applications. The company reports more than 30 sub-sector solutions covering new energy vehicles, robotics, drones, and industrial automation.

For more information, visit https://www.aiptesting.com/.

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