

KINGPO TEST EQUIPMENT CO., LTD.



ISO 20653 IPX9K High Pressure Hot Water Spray Test Chamber

Automotive High Pressure & High Temperature Water Jet Testing System

80–100 bar • 80°C Hot Water • Precision Multi-Angle Spray • Heavy-Duty Turntable

Applicable Standards

ISO 20653 • IEC 60529 • DIN 40050-9 (IPX9K)

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1. Product Overview

What it is

The KingPo ISO 20653 IPX9K High Pressure Hot Water Spray Test Chamber is a professional testing system designed specifically for road vehicle electrical equipment and automotive components. It accurately simulates extreme high-pressure (80–100 bar) and high-temperature ($80 \pm 5^\circ\text{C}$) water jet conditions in accordance with ISO 20653, IEC 60529, and DIN 40050-9 (IPX9K).

What it tests

This chamber is used to validate the sealing performance and ingress protection of critical automotive components under severe conditions, including: EV battery packs, charging ports, inverters, ADAS sensors (LiDAR, cameras, radar), LED headlamps & taillamps, wheel speed sensors, EPB connectors, and high-voltage harnesses.

Why it matters

IPX9K testing according to ISO 20653 is increasingly required by automotive OEMs and Tier-1 suppliers for design validation, production quality assurance, and regulatory homologation. Reliable high-pressure hot water testing helps prevent costly field failures, reduces warranty claims, and supports global market access for electric and autonomous vehicles.

2. Key Advantages

• High-Pressure Stability System

Engineering: Italian-imported high-pressure high-temperature plunger pump with closed-loop frequency conversion control, delivering stable, pulsation-free output across the full 80–100 bar range.

Benefit: Ensures highly consistent test conditions and prevents pressure fluctuations that could compromise test validity or damage sensitive samples.

• High-Temperature Closed-Loop Water System

Engineering: 70 L insulated reservoir with precise closed-loop heating maintains $80 \pm 5^\circ\text{C}$ with real-time temperature and flow monitoring throughout the test cycle.

Benefit: Accurately replicates real-world high-pressure hot water cleaning and steam cleaning conditions critical for validating seals in EV batteries and power electronics.

• IEC-Compliant Precision Spray System

Engineering: Nozzles manufactured strictly according to IEC 60529 Figure 7. High-precision servo-controlled rail system enables repeatable positioning at $0^\circ/30^\circ/60^\circ/90^\circ$ with adjustable 100–150 mm distance.

Benefit: Test results fully comply with international standards and are directly accepted by certification bodies and OEMs worldwide.

• Intelligent Control & Closed-Loop Regulation

Engineering: Mitsubishi PLC with 7-inch color touchscreen HMI provides real-time closed-loop control of pressure and flow (14–16 L/min) with live data visualization and logging.

Benefit: Minimizes human error, ensures test consistency, and generates traceable digital records for quality audits and compliance documentation.

• Heavy-Duty Rotating Platform

Engineering: $\varnothing 400$ mm reinforced SUS304 turntable with speed of 4–6 r/min and maximum load capacity of 100 kg.

Benefit: Capable of testing full-size battery packs and large three-electric system components without sample simplification.

• Expandable Metrology Function (Optional)

Engineering: Native interface for optional high-precision impact force sensors with real-time curve analysis software (supports energized testing up to 30A).

Benefit: Upgrades the system from pass/fail testing to a quantitative R&D tool for in-depth analysis of sealing behavior under dynamic water jet loads.

3. Technical Specifications

3.1 Performance Parameters

Parameter	Specification	Test Condition / Method
Water Pressure	8–10 MPa (80–100 bar)	Closed-loop regulated, pulsation-free
Water Temperature	80 ± 5 °C	High-stability closed-loop control
Water Flow Rate	14–16 L/min	Closed-loop regulation, real-time monitoring
Spray Distance	100–150 mm	Precision adjustable rail
Spray Angles	0° / 30° / 60° / 90°	Servo-controlled, per IEC 60529 Figure 7
Duration per Angle	30 seconds	Total cycle: 120 seconds

3.2 Mechanical Structure

Parameter	Specification	Notes
Chamber Material	SUS304 Stainless Steel	Full corrosion resistance
Internal Dimensions (W×D×H)	1100 × 800 × 1000 mm	Standard working volume
Turntable Diameter	φ400 mm	Reinforced design, max load 100 kg
Turntable Speed	4–6 r/min (nominal 5 rpm)	Adjustable
Nozzle	SUS304 Stainless Steel	Manufactured per IEC 60529 Figure 7
Water Tank Capacity	70 L	Supports full 120s cycle without recirculation

3.3 Electrical & Control System

Parameter	Specification	Notes
Control System	Mitsubishi PLC + 7-inch color touchscreen	Real-time monitoring and data logging
Water Pump	Italian-imported high-pressure high-temp plunger pump	Stable performance under extreme conditions
Power Supply	AC 380 V, 50 Hz, 25 kW	Three-phase five-wire
Safety Protection	Leakage, overload, short-circuit, door interlock, E-Stop	Comprehensive laboratory safety interlocks

4. Test Procedure (ISO 20653 IPX9K)

The IPX9K test verifies equipment protection against high-pressure, high-temperature water jets according to ISO 20653 and IEC 60529.

Step 1 — Preheating: Heat deionized water to 80 °C and stabilize with closed-loop temperature control.

Step 2 — DUT Positioning: Secure the test specimen on the center of the turntable. Adjust nozzle distance to 100–150 mm using the precision servo rail.

Step 3 — Automated Spray Cycle: The PLC executes the standardized sequence: spray for 30 seconds at each of the four angles (0° → 30° → 60° → 90°), with the turntable rotating continuously at 4–6 r/min.

Step 4 — Continuous Monitoring: Pressure, flow rate, and temperature are monitored in real time. Any out-of-tolerance condition triggers an alarm and safe test abort.

Step 5 — Post-Test Inspection: After cycle completion, inspect the specimen for water ingress and functional degradation. Record results together with logged test parameters for compliance documentation.

Fully compliant with ISO 20653 and IEC 60529 IPX9K high-pressure hot water jet test requirements.

5. Typical Applications

- **New Energy Vehicle (Three-Electric) Systems** — Battery packs, charging ports, inverters, high-voltage distribution units

- **ADAS & Autonomous Driving Sensors** — LiDAR, surround-view cameras, ultrasonic & millimeter-wave radar modules
- **Automotive Lighting Systems** — LED headlamps, taillamps, fog lamps, adaptive driving beam modules
- **Chassis & Body Electronics** — Wheel speed sensors, EPB actuators, high-voltage connectors
- **Third-Party Certification Laboratories** — ISO 20653 / IEC 60529 IPX9K formal compliance and type approval testing

6. Compliance & Manufacturer

This equipment is engineered and manufactured in strict accordance with ISO 20653, IEC 60529, and DIN 40050-9 for IPX9K high-pressure high-temperature water jet testing. Each unit is delivered with a comprehensive traceable factory calibration certificate. ISO/IEC 17025 accredited third-party calibration is available upon request.

Manufactured under ISO 9001 / ISO 14001 / ISO 45001 quality management systems and CE certified.

KingPo Test Equipment Co., Ltd. • www.dgkingpo.com

Specialist in Precision Environmental, Ingress Protection & Reliability Test Systems

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