

ENVITEST LABORATORIES PRIVATE LIMITED

Turning Good into Great—Every Single Time by Testing with Quality

Doing Things Gives Results, Doing Things Right is Quality

At Envitest Laboratories, we believe that results alone do not define success—it is how those results are achieved that truly matters. Doing things gives results, but doing things right ensures lasting quality. Quality is not just a benchmark; it is a discipline, a mindset, and a way of life.

A product is more than just a combination of materials—it is a reflection of the effort, precision, and dedication that went into creating it. At Envitest, we believe in testing beyond compliance; we validate products to ensure they meet the highest standards of reliability and performance. We don't settle for mediocrity—we push ourselves to refine our processes and set new industry benchmarks. In our field, consistent precision is the foundation of trust, and that trust is what we build with every test we conduct.

The Envitest Way: Excellence in Every Step

- ⇒ Precision Testing & Inspection: Every test at Envitest is conducted with meticulous attention to detail, ensuring that results are accurate and compliant with industry standards. Our state-of-the-art facilities and rigorous methodologies help manufacturers validate their products with confidence.
- ⇒ Process Optimization: Quality is not just about achieving a result—it is about achieving it efficiently and reliably. We continuously refine our testing methodologies to improve efficiency, minimize variability, and enhance repeatability without compromising quality.
- ⇒ Industry Compliance & Standards: Our commitment to excellence means strict adherence to global testing standards. We ensure that every test report we provide withstands the toughest regulatory scrutiny, giving manufacturers the assurance they need to enter markets worldwide.
- ⇒ Innovation & Adaptability: Quality is not static—it evolves with technological advancements. At Envitest, we embrace innovation, investing in cutting-edge equipment and refining our approach to stay ahead in the testing industry. By staying adaptable, we ensure that our clients receive the most up-to-date and relevant testing solutions.
- ⇒ Training & Development: A quality-driven organization starts with its people. We foster a culture of continuous learning, process ownership, and accountability among our team members. Through skill enhancement programs and industry training, we empower our engineers to uphold the highest testing standards.

At Envitest, we don't just aim to deliver results—we aim to deliver excellence. Every test, every analysis, and every interaction is performed with the highest level of integrity and precision. Our customers rely on us not just for test reports, but for the assurance that their products meet the highest standards of reliability and compliance.

Quality as a Habit, Not an Obligation

Quality is not just a checkbox to tick—it's a mindset, a way of working that becomes second nature with time and dedication. It goes beyond mere compliance with standards; it is a deep-rooted commitment to excellence in every task we undertake. When quality is seen as a habit rather than an obligation, it drives continuous improvement, fosters innovation, and builds trust.

At Envitest Laboratories, we believe that doing things right isn't just about following protocols—it's about taking responsibility, being meticulous, and constantly striving for better results. Every test we conduct is an opportunity to learn, refine, and enhance our processes. Precision comes from a disciplined approach, where no detail is too small to be overlooked.

Initially, maintaining high standards may seem challenging, requiring focus and extra effort. However, with consistency, it becomes a part of our thought process—an instinct that guides us in decision-making and execution. This culture of quality not only ensures compliance but also establishes a strong foundation for long-term success.

When quality becomes a habit, excellence becomes inevitable. At Envitest, we don't just meet expectations—we exceed them,



Inside this issue

- Understanding the Second Digit of the IP Rating: Protection Against Liquid Ingress..... 2
- Decoding the Second Digit: Protection Against Liquids 2
- Liquid Ingress Testing in Military Standards 3
- Contact Retention Tests in Connectors at Envitest Lab 4
- Ensuring Impartiality in Testing at Envitest Lab 4
- Objective Decision-Making at Envitest Lab 4
- Mindset Shifts: Directing Energy for Growth 5
- Hyperloop Testing Advancements and Vision for Future Testing 5
- About Us..... 6

Special points of interest

- Renovation is underway at Envitest Lab to enhance its look, feel, and functionality for a better experience.
- Celebrated with joy the Women's day at Envitest Lab

Understanding the Second Digit of the IP Rating: Protection Against Liquid Ingress

When it comes to Ingress Protection (IP) ratings, the second digit plays a crucial role in determining a product's resistance to liquid ingress. Whether it's a consumer electronic device, an industrial component, or an outdoor communication system, understanding how well a product is protected against water and other liquids is essential for ensuring durability, reliability, and safety.

Liquid ingress protection is essential for ensuring the durability, safety, and reliability of electronic and industrial products. Without proper protection, water can damage internal components, leading to malfunctions or even complete failure.

Enhancing Durability: Products exposed to moisture, rain, or water splashes need protection to last longer. A strong IP rating prevents water damage, making devices more reliable in harsh environments.

Improving Safety: Water can cause short circuits, leading to electrical failures or hazards. Proper protection reduces the risk of accidents, making devices safer for users.

Ensuring Compliance: Many industries have strict standards for liquid ingress protection. Meeting these requirements ensures that products adhere to regulations and pass necessary safety tests.

With the right IP rating, electronic devices can be used in extreme weather, marine environments, and industrial settings where moisture is common. This increases their usability and market potential.

Selecting the right IP rating for ensuring that a device performs well in its intended environment.

- ◇ Outdoor lighting: Requires at least IPX4 to withstand splashes and rain.
- ◇ Industrial environments: Need IPX5 or IPX6 for protection against water jets.
- ◇ Fully submersible devices: Should have IPX7 or IPX8 for underwater use.
- ◇ High-pressure washdowns: Demand IPX9K for protection against powerful water jets.



Real-time image of a water ingress test in progress at Envitest Lab.

At Envitest Lab, we provide IP testing to ensure your products are protected against liquid ingress, helping verify their performance in real-world conditions.

What is an IP Rating?

An IP (Ingress Protection) rating is a standardized system (IEC 60529) that classifies how well an enclosure protects against dust and water. The first digit represents dust protection, while the second digit indicates liquid resistance. For example, in IP67, the 6 means the device is dust-tight, and the 7 signifies protection against water immersion up to 1 meter.

The second digit is crucial for understanding a product's ability to resist liquid ingress. Whether it's a consumer electronic device, industrial machinery, or outdoor communication system, knowing the IP rating ensures durability, reliability, and safety in various environments. Choosing the right IP rating helps manufacturers and consumers ensure a product meets its intended use and withstands real-world conditions.

Decoding the Second Digit: Protection Against Liquids

The second digit in an IP rating (Ingress Protection) indicates how well a product resists liquid ingress. It ranges from 0 to 9K, with each level providing increasing protection.

IPX0 – No Protection

No resistance to water or liquids, making devices highly vulnerable.

IPX1 – Protection Against Vertical Drops

Guards against light rain or condensation falling vertically, suitable for indoor electronics.

IPX2 – Protection at a 15° Angle

Prevents water ingress when the product is tilted up to 15°, useful for security cameras and control panels.

IPX3 – Protection Against Spraying Water

Resists water sprayed at up to 60° angles, ideal for outdoor lighting and smart home devices.

IPX4 – Protection Against Splashing Water

Shields against splashes from any direction, used for bathroom lighting and outdoor speakers.

IPX5 – Protection Against Low-Pressure Jets

Handles water jets from any angle, suitable for kitchen appliances and automotive parts.

IPX6 – Protection Against Strong Water Jets

Endures high-pressure jets, making it perfect for industrial machinery and marine electronics.

IPX7 – Protection Against Immersion (Up to 1 Meter)

Allows temporary submersion up to 1 meter for 30 minutes, found in waterproof smartwatches.

IPX8 – Protection for Continuous Submersion

Designed for extended underwater use beyond 1 meter, used in diving equipment and underwater cameras.

IPX9K – Protection Against High-Pressure, High-Temperature Jets

Resists powerful hot water jets, essential for automotive, medical, and food processing equipment.

At Envitest Laboratories, we specialize in IP testing and certification to help manufacturers meet industry standards. Whether it's for consumer electronics, industrial machinery, or automotive components, our precise testing ensures your products perform reliably in real-world conditions.



Liquid Ingress Testing in Military Standards

Liquid ingress testing in military standards is crucial for evaluating a product's ability to withstand exposure to water, rain, and other liquids in harsh environments. These tests ensure the durability and reliability of military and aerospace equipment under extreme conditions.

- ⇒ MIL-STD-810: Environmental Engineering Considerations and Laboratory Tests is widely used standard outlines environmental testing procedures for military equipment, including liquid ingress testing. Method 506 (Rain Test) Simulates exposure to rainfall at different intensities and angles. This test ensures that equipment continues to function despite exposure to rain or water spray. It assesses the effectiveness of seals, gaskets, and protective coatings in preventing water intrusion.
- ⇒ MIL-STD-202: Test Methods for Electronic and Electrical Component Parts is used to test electronic and electrical components under various environmental conditions. Method 104 (Immersion Test): Determines the effectiveness of seals and enclosures by immersing components in water or salt water for a specified duration. The test ensures that no water enters the internal parts, which could lead to failure or short circuits.
- ⇒ MIL-STD-750: Test Methods for Semiconductor Devices applies to semiconductor components used in military and aerospace applications. Method 1011 (Immersion Test): Similar to MIL-STD-202, this test specifies the depth and duration of immersion. It evaluates how well semiconductor devices withstand submersion in water or other liquids without compromising performance.
- ⇒ MIL-STD-883: Test Methods for Microcircuits focuses on microelectronic devices used in military systems. Method 1002 (Immersion Test): Assesses whether microcircuits and related components can resist liquid ingress. It is critical for ensuring the reliability of integrated circuits and sensitive electronic components in wet conditions.
- ⇒ RTCA DO-160 Section 10.0: Waterproofness Testing used in the aerospace industry to evaluate aircraft electronics. This waterproofness test assesses whether equipment can withstand liquid ingress through spraying, dripping, or condensation. Hermetically sealed equipment, which has airtight seals, is considered to meet waterproofness requirements without additional testing.

Liquid ingress testing plays a vital role in ensuring military and aerospace equipment remains operational in extreme environments. These rigorous tests help manufacturers design robust, waterproof components that perform reliably in real-world conditions.

Why Liquid Ingress Testing Matters

Military and aerospace environments expose equipment to extreme weather conditions, including heavy rain, high humidity, and immersion in water. Failure to meet ingress protection standards can lead to:

- ◆ Short circuits and electrical malfunctions
- ◆ Corrosion and material degradation
- ◆ Loss of operational reliability in critical missions

At Envitest Laboratories, we specialize in military and aerospace liquid ingress testing, ensuring that your products meet the highest standards for waterproofing and durability. Whether your equipment is deployed on land, at sea, or in the air, our testing services help verify compliance and enhance long-term performance.

Ensuring Secure Electrical Connections

Envitest Lab conducts contact retention tests to ensure electrical connectors remain secure and reliable under demanding conditions. These tests are essential for industries such as aerospace, automotive, and industrial applications, where stable electrical connections are critical.

Our testing process includes force application, where a specified force is applied to simulate real-world conditions, retention tools to verify proper pressure, visual inspection to ensure contact security, and displacement measurement to assess movement after force application.

Test Methods

- ◆ **Force Application:** A defined force is applied to the contact to simulate real-world conditions.
- ◆ **Retention Tools:** Specialized tools are used to apply the force and indicate when the proper pressure has been reached.
- ◆ **Visual Inspection:** The contact is visually inspected to ensure it remains securely seated.
- ◆ **Displacement Measurement:** Some tests measure the amount of contact displacement during or after force application.

The test setup involves mounting the connector, inserting the contact, applying force, and evaluating its retention.

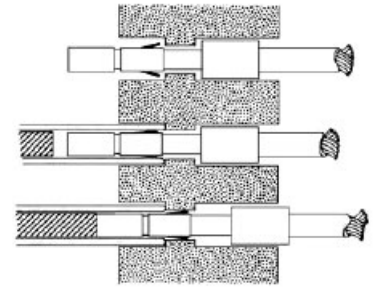
Acceptance criteria require no dislodgement and minimal displacement within defined limits. By adhering to strict industry standards, Envitest Lab guarantees that connectors meet performance, durability, and safety requirements, ensuring long-lasting reliability in harsh environments.

Contact Retention Tests in Connectors at Envitest Lab

Envitest Lab conducts **contact retention tests** to ensure that pins or sockets within connectors remain securely seated under specified conditions, preventing accidental disconnections or damage. This testing is crucial for maintaining reliable electrical connections in industries such as aerospace, automotive, and industrial applications, where vibration, shock, and rough handling are common. The primary objective is to verify that the connector's contacts are firmly retained within the housing, ensuring stable and secure electrical connections. At Envitest Lab, we use advanced retention test tools and calibrated force application systems to apply defined forces to contacts, simulating real-world conditions. After force application, a thorough inspection is conducted to assess whether the contacts remain properly seated, with displacement limits measured where necessary.

Our testing ensures **reliability** by providing consistent electrical performance, **durability** by preventing damage from loose or dislodged contacts,

and **safety** by reducing the risk of failure in high-stress environments. We follow industry standards to guarantee accurate and precise results, helping manufacturers meet stringent performance requirements. By continuously enhancing our testing meth-



odologies, Envitest Lab remains committed to delivering **high-quality testing solutions** that contribute to the safety and reliability of electrical connectors

Ensuring Impartiality in Testing at Envitest Lab

Impartiality is a fundamental requirement of ISO 17025, ensuring that test results remain unbiased and free from conflicts of interest. Testing laboratories must operate with integrity, objectivity, and transparency to maintain credibility and trust in their results. Any bias in testing or decision-making can compromise the reliability of outcomes, potentially leading to incorrect conclusions, safety hazards, or regulatory non-compliance.

ISO 17025 mandates that laboratories identify and address any risks to impartiality that may arise from internal or external influences. These risks could include pressure from clients, financial incentives, or personal relationships that might influence test results or decisions. To mitigate such risks, laboratories must establish clear policies, structured procedures, and independent review mechanisms.

Objective Decision-Making at Envitest Lab

At Envitest Lab, impartiality is a core value. By implementing strict quality control measures, ensuring independence in decision-making, and fostering a culture of ethical testing, we uphold the highest standards of ISO 17025. This approach strengthens confidence in our test results and reinforces our commitment to scientific integrity.

One key requirement is that laboratory personnel must be free from undue influence that could affect their judgment. This means ensuring that employees are not involved in activities that create conflicts of interest, such as having personal or financial stakes in the outcomes of the tests they conduct. Regular training and awareness programs help reinforce a culture of impartiality, ensuring that all staff understand and uphold ethical practices.

Additionally, third-party audits and accreditation assessments play a crucial role in verifying our lab's commitment to impartiality. External reviews help identify potential biases and ensure compliance with international standards.

Mindset Shifts: Directing Energy for Growth

One of the most powerful mindset shifts is understanding that where your attention goes, your energy flows. The way you focus your time and thoughts directly impacts your outcomes. If you constantly dwell on problems, you will feel drained and stuck. But when you shift your attention to solutions, progress, and learning, your energy fuels positive change.

This principle applies not just to individuals but also to organizations like Envitest Lab. In testing industry, success depends on choosing the right priorities. Instead of spreading resources thin, Envitest focuses on high-impact testing solutions that align with future technological advancements. By strategically directing attention to cutting-edge developments, Envitest ensures its expertise is always relevant and valuable.

Managing energy wisely also means eliminating distractions. Wasting time on unimportant details or reactive firefighting drains productivity. At Envitest, the emphasis is on continuous improvement, innovation, and efficiency—ensuring that efforts contribute to long-term success rather than short-term fixes.

A shift in mindset can transform not just personal growth but also business success. By consciously directing attention toward opportunities, improvements, and breakthroughs, Envitest Lab ensures that its energy is spent on what truly matters—delivering world-class testing solutions and shaping the future of the industry.



Where you focus your attention determines your success—choose wisely, just like Envitest Lab does.

Hyperloop Testing Advancements and Vision for Future Testing

A recent visit that prominently caught our attention was Union Minister Ashwini Vaishnaw's inspection of the Hyperloop testing facility at IIT Madras. During his visit, he announced that the Hyperloop tube being developed will soon be the world's longest, stretching 410 meters. Currently, this facility already holds the title of Asia's longest Hyperloop test tube, marking a significant step forward in futuristic transportation.

In 2013, tech billionaire Elon Musk proposed a solution to "soul-destroying traffic"—the Hyperloop. This futuristic transport system envisions passenger or cargo pods traveling through near-vacuum tubes using magnetic levitation. The concept promises high-speed, efficient travel with minimal friction.

To demonstrate this, Musk built a one-mile-long steel tunnel, a prototype of Hyperloop Alpha, near SpaceX headquarters in Hawthorne, California. The tunnel was used for competitions where participants tested the speeds their pods could achieve. However, in 2022, it was dismantled to make way for parking spaces for SpaceX employees. While Musk's efforts popularized the Hyperloop concept, he did not invent it—similar ideas had existed long before his 2013 white paper.

For the testing industry, this development presents an exciting challenge—how to create robust testing frameworks for such groundbreaking technology. At Envitest, we have begun evaluating the mechanical, environmental, and structural stress factors that will be critical in Hyperloop validation. Unlike conventional transportation, Hyperloop operates in a low-pressure environment with extreme speeds, requiring specialized material, pressure, and aerodynamic testing.

These tests ensure safety, efficiency, and long-term reliability. Key aspects that need to be explored include vibration endurance, high-velocity impact resistance, and thermal performance analysis. These factors are essential to ensure the safety, durability, and efficiency of the Hyperloop system.

We are exploring advanced testing methodologies, collaborating with R&D experts, and identifying potential upgrades in our testing capabilities. With India progressing towards next-generation transportation systems, Envitest Lab aims to be at the forefront of ensuring quality, reliability, and safety standards for revolutionary technologies like Hyperloop. Through continuous innovation and strategic collaborations, we look forward to playing a vital role in shaping the future of transport testing.



