

Pass/Fail Criteria for IP Wet Testing

Ingress Protection Testing

IP Wet Testing: Ingress Protection (IP) testing determines a product's protection level against ingress of solid objects and/or water. IP wet tests include dripping water, sprayed water, splashed water, jetted water, and even submersion under water. The originating standard for IP testing is IEC60529. In addition to IEC60529, the end product safety standard must also be consulted for additional IP testing criteria.

Any product rated IPX1-IPX8 should have been subjected to some form of Ingress Protection water testing. These IP ratings correlate directly with specific wet tests. In general, a higher number up to IPX6, signifies a more severe test condition; while IPX7 & IPX8 ratings are based on immersion tests. "Passing" the appropriate test earns the product the associated rating (i.e. "pass" the IPX6 highly jetted water test and the product can be IPX6 rated). The product should be tested for the appropriate rating as needed based on the product's intended application and any IP rating requirements specified in the end product safety standard.

Bad Assumptions: While the tests can be consistently applied using properly calibrated IP test equipment, the pass/fail criteria for the wet tests involve visual inspection. The visual inspection process is of course subject to human error. And most human errors with IP wet testing involve bad assumptions made concerning the pass/fail criteria for water ingress. Correctly understanding the pass/fail criteria for IP wet testing is critical to setting the correct IP rating for the product being tested.

Many product manufacturers believe that if the product is fully functional after IP wet testing, that the unit can be deemed as compliant. While functionality is a major factor in the acceptance conditions, it is not the only requirement.

Pass/Fail Criteria: The acceptance conditions for IP wet tests per IEC 60529 states that it is the responsibility of the relevant technical committee (end product standard) to determine the unacceptable amount of water that may enter the product. In general, it shall not accumulate in a manner that:

- a) Interferes with normal operation (functionality) of the product.
- b) Impairs safety or incurs any hazardous condition due to ingress.
- c) Deposits on insulation parts or terminals which could reduce spacing distances.
 - Creepage and clearance distances can be found in the relevant IEC/EN product standard
- d) Contact any live parts or windings (unless designed to operate wet).
- e) Accumulate at a cable end or enter a cable.



Wet Testing Electrical Products: For electrical products, Dielectric Withstand (Hipot) testing is typically required immediately after water testing. Check your end product safety standard (UL, CSA, EN, IEC) for the test criteria. This is a very important consideration. We have seen many IP rated light fixtures remain “functional” after wet testing, in the sense that they illuminate. However, when Hipot tested, dielectric breakdown occurs from water that has entered the enclosure and is acting as a conductive link between the chassis and live parts. This is a safety issue and the product has failed the test.

Conclusion: There is a lot more to IP testing that many product manufacturers are aware. Product functionality is not the only pass/fail criteria for IP wet testing. Every product that is IP wet tested must be immediately disassembled and visually inspected for water deposits on all electrical parts and in critical safety areas. If you have previously tested your product and the product wasn't disassembled as soon as testing was completed, the test was not completed properly and the results are invalid!

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