



How UL Standards Protect E-Scooters from Hazards



UL 2271 Standard for Batteries for Use in Light Electric Vehicle Applications: Covers batteries used in light electric vehicles which includes e-scooters, e-bikes, and other devices.



UL 2272 Standard for Electrical Systems for Personal E-Mobility Devices: Covers electrical system safety for devices including e-scooters and hoverboards.

Both UL 2271 and UL 2272 feature rigorous construction requirements, as well as testing requirements that simulate conditions an e-scooter may encounter during normal use (and foreseeable misuse). Temperatures of the e-scooter electrical system are monitored during these tests, and the device will not pass if it exceeds certain limits, or if there is any indication of fire, explosion, rupture, electrolyte leakage, or electric shock hazard.

Overdischarge Testing

Evaluates an e-scooter's ability to withstand an overdischarge under protection circuitry fault condition. The device is subjected to a constant discharging current at the maximum manufacturer-specified current until the sample is fully discharged to a near-zero state, or until protective devices in the circuit activate and monitored temperatures return to a steady state.

Mechanical Shock Testing

This test address whether a hazard is created when a device is involved in a collision. During the test, the device is secured to a rigid mount and subjected to mechanical shock from three different directions. If operational after the test, the device will undergo a charge/discharge cycle to determine whether the battery was damaged.

Overcharge Testing

Evaluates an e-scooter's ability to withstand overcharging under non-fault and single-fault conditions in the charging control circuitry. The device is charged until the voltage has reached 110% of the maximum specified voltage limit and/or until two hours after monitored temperatures return to ambient or steady state conditions.

Water Exposure Testing

Evaluates an e-scooter's ability to withstand potential water exposure in its intended use such as cleaning, outdoor storage or use, etc. During this test, the electrical system enclosure is subject to water exposure testing as outlined by the International Electrotechnical Commission (IEC) in IEC 60529, Tests for Protection Against Water Indicated by the Second Characteristic Numeral 4 (IPX4) — the minimum rating required by the standard — which states that water splashed against the enclosure from any direction must have no harmful effects.

Vibration Testing

This test evaluates an e-scooter's ability to withstand vibration that may occur during its anticipated use, such as riding on a rough or uneven surface. During the test, the e-scooter is securely mounted to a vibration test platform and subjected to random vibration. After the test, the system is subjected to at least one charge/discharge cycle and monitored, followed by a dielectric test.