



Leading the way in micromobility safety



Lithium-ion battery fires: What fuels the fire?

In 2021 and 2022, the U.S. Consumer Product Safety Commission (CPSC) received reports from 39 states of at least 208 fires for overheating events that caused a reported 19 fatalities.

Overheating events of lithium-ion batteries, also known by the scientific term, Thermal Runaway, are typically caused by five factors which could result in an explosion and potentially ignite a fire:

- **Environment** – Accounting for exposure to extreme temperatures (hot or cold), water and other chemicals
- **Mechanics** – Factoring in the shock and impact from daily e-bike use on the streets
- **Age** – Ensuring the battery remains safe to use each day and after each charge
- **Design** – Confirming the electrical and mechanical parts are well-assembled and reliable
- **Electrical** – Testing that charge and discharge performance remains safe and as designed

Safety. Science. Transformation.™

© 2023 UL LLC. All rights reserved.

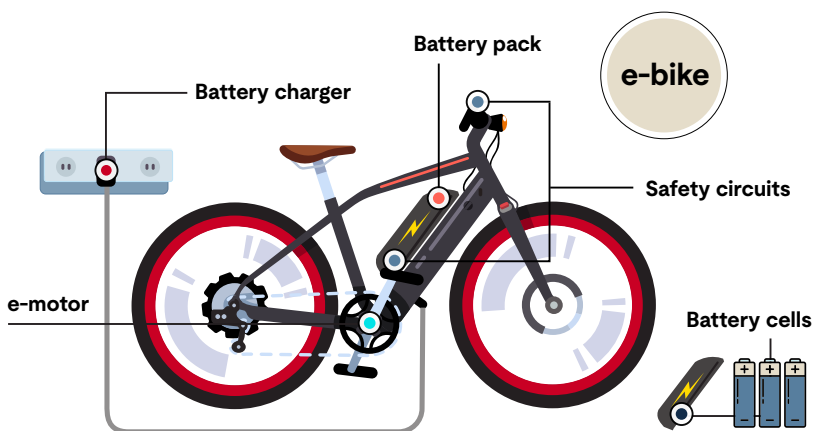
> Watch live testing of a battery experiencing Thermal Runaway.

Certifying to UL Standards saves lives

Lithium-ion batteries are only one aspect of micromobility safety. UL Standards, including **UL 2849**, specifically address the need to evaluate and test safety-critical materials and components, individually and as a collective system, to mitigate risk to the end user. This comprehensive approach helps to ensure that the micromobility equipment can perform safely day-to-day and charge after recharge for the consumer.

Certifying beyond the battery: a system approach to safety to reduce risk

UL 2849 addresses more than just the battery: The standard looks at a holistic electrical system approach to safety (see components outlined in the e-bike illustration below).



- | | | |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> ● Battery cell <ul style="list-style-type: none"> • Electrical or environmental susceptibility • Mechanical integrity ● Battery pack <ul style="list-style-type: none"> • Prevention of fire propagation • Battery management system functional safety | <ul style="list-style-type: none"> ● Electric motor (e-motor) <ul style="list-style-type: none"> • Material and electrical safety • Control system functional safety ● Battery charger <ul style="list-style-type: none"> • No electric shock or fire hazard • Compatible to power requirement of the hose | <ul style="list-style-type: none"> ● Electric bicycle (e-bike) <ul style="list-style-type: none"> • Charge and discharging within battery limits • Temperature within battery limits • Susceptible to adverse conditions from application and environment • Interrupt charging when error with host or charger |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|



Bringing our trusted safety science to life



We have been working to mitigate the potential risks from products using lithium-ion batteries for 40 years by applying our safety science expertise and rigorous end-to-end testing methodologies to give users peace of mind.



UL Solutions' expertise has guided our 10-year journey to bring our industry-leading safety science to e-bikes, e-scooters and other types of micromobility.



Once a product meets safety certification program requirements—including demonstrating conformity to consensus-based safety standards—it can significantly reduce related fire, explosion, property damage and other risks associated with micromobility equipment.



The UL Mark serves as a recognized symbol of trust in products we use every day and reflects an unwavering commitment to advancing safety science.

Working for a safer world for more than 129 years

140+
locations

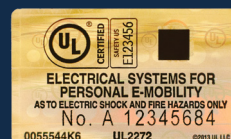
90+
laboratories

Through our deep technical expertise, extensive market knowledge and 140+ locations around the world, including 90+ laboratories, **we help our customers:**

- Innovate safely
- Launch new products and services
- Navigate global markets and complex supply chains
- Grow sustainably and responsibly into the future



Learn more at www.UL.com/Contact-Us



Not all certifications are equal. Here's why UL Solutions is trusted:



OSHA Nationally Recognized Test Laboratory and ANAB and SCC accredited for product certification, with more than 55 locations globally for local delivery



Evaluates, tests and certifies to a full spectrum of U.S./Canadian micromobility safety standards including **UL 2849**, **UL 2272**, **UL 2271** and more



All applicable requirements, including testing, must be met to earn the holographic UL Mark



Trains U.S. Customs and Border Protection and Department of Homeland Security to identify counterfeit UL Marks



Conducts regular factory visits as part of ongoing surveillance to confirm continued product compliance