Guide to micromobility

Our comprehensive solution for Europe, North America and more
An incredible transformation of personal electrified transportation technology has taken place around the globe and shows no sign of slowing. More and more, light electric vehicles (LEVs) and personal transportation devices are populating worldwide markets. The increasing demands put on e-transportation electrical systems and the associated safety challenges must be proactively addressed. In order to support this rapid market evolution, we have launched a platform of micromobility certification solutions.

A comprehensive solution

On top of our dedicated testing and certification solutions for micromobility devices, we also help manufacturers with a range of other tests, including:

- Safety
- EMC wireless
- Radio performance
- Battery safety
- Global market access
- Functional safety
- Energy Efficiency

The micromobility transformation
E-Bikes and other micromobility devices

**Safety**

**UL 2849 Electrical Systems for eBikes**

- The standard covers electric bicycles, both pedal-assisted and non-pedal assisted. An e-bike is defined as a two or three wheeled electrical/mechanical device provided with functional pedals that includes one or more electric motors to either assist the rider when pedaling (EPAC versions) or provide motive power to the wheels when the rider is not pedaling.
- UL 2849 is bi-national accredited consensus Standard for USA and Canada.
- As a minimum, the electrical system consists of the drive unit [electric motor], battery, battery management system (BMS), interconnecting wiring, and power inlet. Any additional components or systems required to demonstrate compliance are included based on the overall system application and risk.

**UL 2272 Electrical Systems of Personal E-Mobility Devices**

- The Standard covers consumer mobility devices intended for a single rider with a rechargeable electric drive train that balances and propels the rider, and which may be provided with a handle for grasping while riding. This device may or may not be self-balancing. This Standard covers micromobility devices not intended for use on roadways, such as hoverboards, e-skateboards, e-scooters.
- UL 2272 is bi-national accredited consensus Standard for USA and Canada.
- From 1 January, 2021 only UL 2272 certified electric scooters will be allowed in Singapore.
- Hoverboards, e-Skateboards, e-Uniwheels and other forms for personal e-mobility are covered by this standard.

**Battery safety**

**UL 2271 Batteries for Use in Light Electric Vehicle (LEV) Applications**

- This standard covers requirements for electrical energy storage assemblies (EESAs) such as battery packs and combination battery pack-electrochemical capacitor assemblies and the subassembly/modules that make up those assemblies for use in light electric-powered vehicles (LEVs) as defined in this standard.
- UL 2271 is bi-national accredited consensus Standard for USA and Canada.

**EMC**

- US EMC requirements set by FCC. Typically FCC Part 15B unintentional radiators requirements.
- CANADA EMC requirements set by ISED Canada. Typically ICES-003 unintentional radiators requirements.

**Wireless**

- US wireless requirements set by FCC. Typically FCC Part 15C, intentional radiators requirements.
  - For 2.4GHz WiFi FCC part 15.247
  - For Bluetooth FCC part 15.247
  - For SRD typically FCC part 15.231/15.247
- CANADA wireless requirements set by ISED Canada. Typically RSS intentional radiators requirements.
  - For 2.4GHz WiFi RSS-247
  - For Bluetooth RSS-247
  - For SRD typically RSS-210

**Global Market Access**

- Requirements for micromobility devices vary depending on target country. Please contact UL team for more information.

**Energy Efficiency**

- DoE and CEC (Department of Energy and California Energy Commission) US and NRCan Canada mandatory requirements covering battery charging systems (micromobility end-product+battery+charger) and chargers. Testing at accredited lab required and additionally, for NRCan only, certification required. Energy efficiency testing includes a range of specific tests and assessments intended to evaluate various design features and use considerations of a given product. Energy efficiency testing typically includes:
  1. Charge mode and battery maintenance mode test
  2. Battery discharge energy test
  3. Standby mode energy consumption test
  4. Off mode energy consumption test
| **European Union requirements** | **E-Bikes** | **E-Scooters and other micromobility devices** |
|---|---|
| **Safety** | EN 15194 for e-bikes is the only specific standard that has been published. At this time EN 15194 does not cover the necessary safety of electrical systems utilizing battery packs in the same manner as UL 2272 covers this subject. | EN 60335-1 is a generic standard commonly used for hoverboards. Hoverboards, e-Skateboards, e-Uniwheels and other forms for personal e-mobility are covered by this standard. |
| **Battery safety** | EN 15194:2017 standard for e-bikes specifically refers to IEC/EN62133 and EN 50604-1 standards for battery safety. IEC/EN62133:2017 covers safety for secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Safety Requirements for Portable Sealed Secondary Cells, and for Batteries Made from them, for Use in Portable Applications. | EN 60335-1 contains the EMC emission and immunity requirements for EPAC and ESA devices. EMC Directive (2014/30/EU) covers secondary lithium batteries for light electric vehicle (LEV) applications. |
| **EMC** | EN 15194 - ANNEX C Contains the EMC emission and immunity requirements for EPAC and ESA devices. | EMC Directive (2014/30/EU) Most common applicable standards: • EN 55014-1 or EN61000-6-3 • EN 55014-2 or EN61000-6-1 • EN 61000-3-3 • EN 61000-3-2 |
| **Wireless** | RE-Directive 2014/53/EU (RED) Depending on the wireless technology, different standards can be used: • For WIFI EN 301 489-1/17 + EN 300 328 • For BLUETOOTH EN 301 489-1/17 + EN 300 328 • For SRD EN 301 489-1/3 + EN 300 220-2 | Requirements for micromobility devices vary depending on target country. Please contact UL team for more information. |
| **Global Market Access** | EoP Directive mandatory requirements, covering battery charging systems (eBike+battery+charger) and chargers. Example standard EN 50563. | EoP Directive mandatory requirements, covering battery charging systems (micromobility end-product+battery+charger) and chargers. Example standard EN 50563. |
| **Energy Efficiency** | | |

While the EU Commission Coordinated Activities on the Safety of Products (CASP) 2019 study has referenced additional standards for product safety of Personal Transporters, UL is providing the most commonly utilized standards for electrical safety.
Tests revealed that 83% of the products did not fully comply with all legal safety requirements, presenting technical defects which lead to different degrees of potential risk to the health of consumers. While it is important to note that noncompliance does not necessarily imply a serious risk, the main issues were:

- Fires or explosions resulting from faulty components when the devices are charging
- Sudden electrical failure caused by using hoverboards in wet conditions

Test results per product type

<table>
<thead>
<tr>
<th>Product Type</th>
<th>Compliant</th>
<th>Non compliant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical bikes</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Electrical scooters</td>
<td>100%</td>
<td>0%</td>
</tr>
<tr>
<td>Hoverboards</td>
<td>74%</td>
<td>26%</td>
</tr>
<tr>
<td>Uni-wheels</td>
<td>92%</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: European Commission - Commission Coordinated Activities on the Safety of Products (CASP)
How we can help

- We deliver comprehensive solutions for micromobility.
- We test safety, functional safety, radio/EMC aspects and more.
- We provide technical advisory and continuous updates on the latest global regulatory landscape.
- We provide combined evaluations of batteries and end products.
- We help you navigate complex global market access.

Why UL

**Expertise**
We play a key role in the development of new standards through active leadership in the industry all around the globe.

**Unparalleled experience**
We draw on more than 50 years of research and development more appropriate for consumer technology.

**Knowledge**
We support manufacturers and regulators with webinars and dedicated training sessions on regulations worldwide.

**Trusted leadership**
We are highly regarded experts on micromobility worldwide and stay on top of the latest developments.

We at UL know how crucial a rapid market launch is today.
With early testing and bundled certification programs we can significantly accelerate your go-to-market process.