



Guide to micromobility

Our comprehensive solution for Europe,
North America and more



Empowering Trust[®]



The micromobility transformation

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.





North America requirements

	E-Bikes	E-Scooters and other micromobility devices
Safety	<p>UL 2849 Electrical Systems for eBikes</p> <p>The standard covers electric bicycles, both pedal assisted and non-pedal assisted. An eBike 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.</p> <ul style="list-style-type: none"> • 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. 	<p>UL 2272 Electrical Systems of Personal E-Mobility Devices</p> <p>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.</p> <ul style="list-style-type: none"> • 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. <p>Hoverboards, e-Skateboards, e-Uniwheels and other forms for personal e-mobility are covered by this standard.</p>
Battery safety	<p>UL 2271 Batteries for Use in Light Electric Vehicle (LEV) Applications</p> <p>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 these assemblies for use in light electric-powered vehicles (LEVs) as defined in this standard.</p> <p>UL 2271 is bi-national accredited consensus Standard for USA and Canada.</p>	
EMC	<ul style="list-style-type: none"> • 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	<p>US wireless requirements set by FCC. Typically FCC Part 15C, intentional radiators requirements.</p> <ul style="list-style-type: none"> • For 2.4GHz WIFI FCC part 15.247 • For Bluetooth FCC part 15.247 • For SRD typically FCC part 15.231/15.247 <p>CANADA wireless requirements set by ISED Canada. Typically RSS intentional radiators requirements</p> <ul style="list-style-type: none"> • For 2.4GHZ WIFI RSS-247 • For Bluetooth RSS-247 • For SRD typically RSS-210 	
Global Market Access	<p>Requirements for micromobility devices vary depending on target country. Please contact UL team for more information.</p>	
Energy Efficiency	<p>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:</p> <ol style="list-style-type: none"> 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 of how UL 2849 covers this subject.	EN 60335-1 is a generic standard commonly used for hoverboards. This standard does not cover the necessary safety of electrical systems utilizing battery packs in the same manner as UL 2272 covers this subject. Hoverboards, e-Skateboards, e-Uniwheels and other forms for personal e-mobility are covered by this standard.
Battery safety	EN15194:2017 standard for eBikes 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 50604-1- this standard 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: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 	
Global Market Access	Requirements for micromobility devices vary depending on target country. Please contact UL team for more information.	
Energy Efficiency	ErP Directive mandatory requirements, covering battery charging systems (eBike+battery+charger) and chargers. Example standard EN 50563.	ErP Directive mandatory requirements, covering battery charging systems (micromobility end-product+battery+charger) and chargers. Example standard EN 50563.

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.



Meeting the challenges of European micromobility compliance

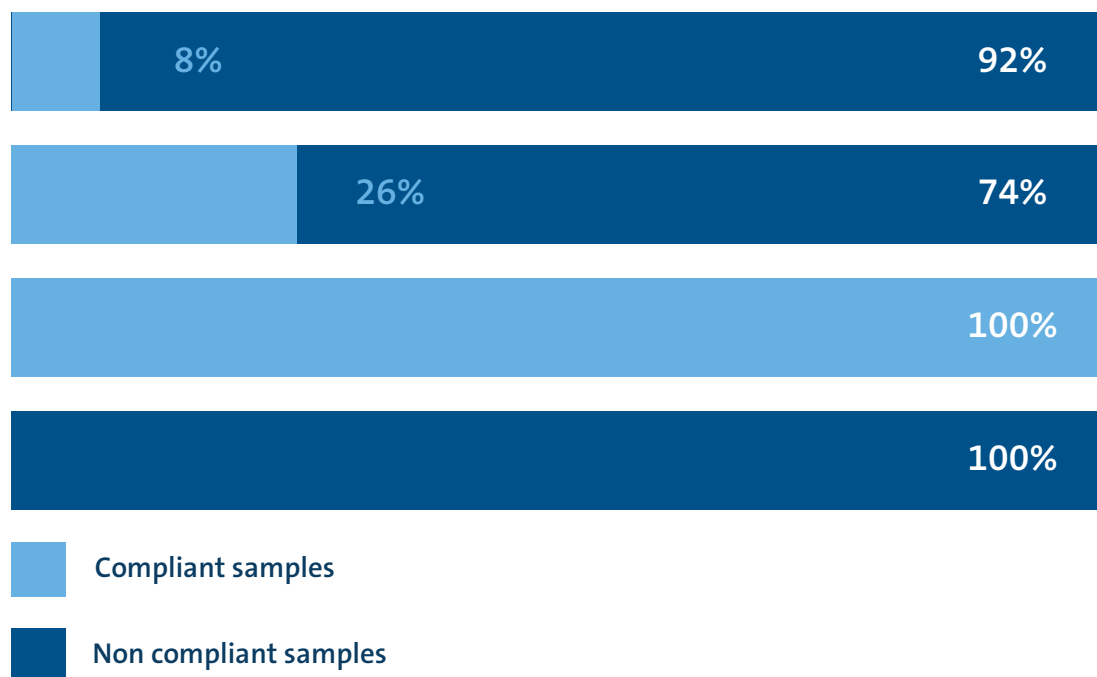
An extensive study was conducted in March of 2020 by the EU Commission on Personal Transporters. The product-specific activity on personal transporters has analyzed 46 samples of the following types:

- Electrical bikes
- Hoverboards
- Electrical scooters
- Uni-wheels

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



Source: European Commission - Commission Coordinated Activities on the Safety of Products (CASP)

What experts have to say about UL's micromobility standard

You can find dozens of electric scooters out there, if not more. Some are original designs, whereas others are simply a single model slapped with multiple brands' labels. Using the following criteria, we narrowed down the list of models to those we wanted to test."

"UL certification: Electric scooters fall under the UL 2272 certification, which [helps confirm] the safety of the electrical drive-train system, battery, and charger. We didn't consider any scooters that hadn't been independently tested and certified (except for one that the company initially—and, as it turns out, mistakenly—told us had been)."

— Nick Guy, "The Best Electric Scooter," Wirecutter

"[...] While still popular, the craze has certainly subsided somewhat. In part, that's because the novelty has worn off; when a spate of cheaply made hoverboards made the news as their batteries burst into flames in 2014, that also cooled some interest. But with battery concerns firmly in the rear view thanks to new UL certifications, the best hoverboards again offer a fun way to travel short distances and experience the thrill of a sport like skateboarding without the skill. [...]"

"Safety first: Make sure any model you look at is UL certified, which [helps confirm] the battery and charging system [have been tested safely]."

— Dave Johnson, "The Best Hoverboards And Self-Balancing Scooters," Forbes

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.



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