

All you need to know on...

EU regulations for

- e-bikes
- pedelecs
- speed pedelecs

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Part 1: Technical rules

The new type-approval procedure

For clarity, in the following article pedelec means a bicycle with a motor that only functions on condition the cyclist pedals, whilst e-bike means a bicycle with a motor that functions by turning the throttle, so irrespective of the cyclist pedalling. The term electric bicycle is generic and includes pedelecs, e-bikes and combinations of these types.

All electric bicycles, except pedelecs up to 25 km/h and a maximum continuous rated motor output of 250W, are subject to type-approval. The type-approval rules have been laid down in Regulation 168/2013. Electric bikes are classified in vehicle category L1e, which is subdivided in L1e-A for “powered cycles” and L1e-B for “mopeds”. The type approval rules come into force on January 1, 2017.

L1e-A “powered cycles” are defined as cycles designed to pedal, equipped with an auxiliary propulsion with the primary aim to aid pedalling. The propulsion should be limited at a speed of 25 km/h and its maximum continuous rated power should not exceed 1000 W. L1e-A includes two-, three- and four-wheel vehicles, i.e. also electric cargo bikes with more than two wheels.

L1e-B “mopeds” are defined as vehicles with a maximum design speed of more than 25 km/h and up to 45 km/h and a maximum continuous rated power of in between 1000 W and 4000 W.

As a result of this categorisation, a pedelec 25 km/h with 750 W for instance will come under L1e-A, an e-bike 25 km/h with 500W as well, whilst a pedelec 45 km/h with 1000 W will come under L1e-B. A vehicle that combines pedal assistance with open throttle will come under L1e-A. Technically, this legislation, does not allow for e-bikes above 25 km/h.

As for pedelecs 45 km/h, the regulations contain further technical specifications: “(...) mass in running order ≤ 35 kg and shall be fitted with pedals enabling the vehicle to be propelled solely by the rider’s muscular leg power. The vehicle shall feature adjustable rider positioning in order to enhance the ergonomic posture of the rider for pedalling. The auxiliary propulsion power shall be added to the driver’s pedal power and shall be less than or equal to four times the actual pedal power.” Furthermore, “the maximum peak power shall be $< 1,6 \times$ maximum continuous rated power, measured as mechanical power at the shaft of the motor unit.”

Former trade association ETRA opposed the introduction of factor four in the above definition. The trade association argued that there was no scientific evidence to support the concept that this factor is necessary to guarantee the safety of the vehicles. Furthermore, the introduction of such a factor made it technically impossible for e-bikes to comply with type-approval. Therefore, they would be completely excluded from the market. ETRA also argued that the factor discriminates those riders who are not capable to put much power in the pedals themselves. Eventually, the Commission and ETRA reached an agreement. Factor four was left in the definition but the following preamble was added to the Regulation: "The limitation to 'four' of the ratio of auxiliary propulsion power and actual pedal power for cycles designed to pedal set out in Annex XIX should be subject to further scientific research and assessment. Upon availability of scientific data and statistics on vehicles placed on the market, the ratio 'four' referred to above may be revisited in a future revision of this Regulation." The e-bike problem was solved by an agreement that, provided their speed is limited to 25 km/h, they may be type-approved as L1e-A vehicles.

The type-approval legislation is made up of the framework Regulation 168/2013, which lays down the basis of the type-approval. The competence for this law was with the European Parliament and Council. All technical and administrative details however were in the hands of the European Commission, who laid these down in 4 Regulations:

- Delegated Regulation on functional safety
- Delegated Regulation on vehicle construction
- Delegated Regulation on environmental and propulsion unit performance
- Implementing Regulation on administrative provisions

In the old system, all legal texts had to go through Parliament and Council, which made it a complicated and very time-consuming procedure. In the new procedure, Parliament and Council have only treated the basic text, whereas technical and administrative details are dealt with by the Commission. As a result, those details can be easily and quickly amended and corrected if necessary and/or adapted to technical progress.

Originally, the draft legal texts were written exclusively in view of type-approving conventional mopeds and motorcycles. Yet, the scope of the type-approval also included most electric bicycles. It was the former dealer association, ETRA, that first drew the European institutions' attention to the fact that technical requirements for mopeds and motorcycles are not necessarily best suited for electric bicycles. Eventually, the European Commission accepted to work together with the electric bicycle business to adapt the type-approval requirements to electric bicycles. At a later stage COLIBI/COLIPED also joined in the consultations and the final result was a type-approval system that is adapted to electric bicycles to a certain degree.

The system is not perfect yet, so in the next couple of years, further updating and improving will be required. The list of components and characteristics subject to type-approval is in the framework Regulation 168/2013. The technical requirements and tests to which those components and characteristics have to comply are laid down in the three above-mentioned delegated Regulations. Electric bicycles are excluded from type-approval for some components and characteristics, whereas for others specific requirements have been introduced. The table on the next pages gives an overview of the relevant components and characteristics and the corresponding requirements. Those that do not feature in the table are excluded from electric bike type-approval.

Find full texts of all regulations here.



(Photo Trek)

Overview type-approval requirements for electric bicycles

Regulation	Component/characteristic	Vehicle type	Requirements and tests
RVFSR – Annex II	Audible warning devices	L1e-A	Excluded
RVFSR – Annex II	Audible warning devices	L1e-B	Electrical device approved following UNECE Reg. No 28
RVFSR – Annex III	Braking	L1e-A & B	Requirements of UNECE Reg. 78 but if mass in running order is ≤ 35 kg, then 2 exceptions: <ul style="list-style-type: none"> - In hydraulic brakes, reserve fluid receptacles excluded from ease of fluid-level checking requirements - Adapted testing requirements for rim brakes Adapted stopping distance requirements for vehicles with rim widths of ≤ 45 mm.
RVFSR – Annex IV	Electrical safety	L1e-A & B	Requirements detailed in the Regulation
RVFSR – Annex V	Endurance testing	L1e-B	Requirements detailed in the Regulation: definition of normal use: 5 years and a total distance travelled of 7,500 km
RVFSR – Annex V	Endurance testing	L1e-A	Requirements detailed in the Regulation: definition of normal use: 5 years and a total distance travelled of 16,500 km
RVFSR-Annex VIII	Driver-operated controls	L1e-A	Excluded
RVFSR – Annex VIII	Driver-operated controls	L1e-B	Requirements in UNECE Reg. No 60 except lever requirements in Annex 3 + certain requirements in the Regulation
RVFSR – Annex IX	Lighting and light signalling devices	L1e-A	White headlamp, red rear light, amber side reflectors, amber pedal reflectors and a red rear reflector. Type-approval not required but manufacturer must declare conformity with ISO 6742-1:1987 and 6742-2:1985
RVFSR – Annex IX	Lighting and light signalling devices	L1e-B	Requirements in UNECE Reg. No 74 + certain requirements in the Regulation. <p>Vehicles may be fitted with additional rear and side reflective devices.</p> <p>Rear registration plate lamp required.</p> <p>Activated instead of automatically switched-on headlamps are allowed.</p>
RVFSR-Annex X	Rearward visibility	L1e-A	Excluded

RVFSR- Annex X	Rearward visibility	L1e-B	Class II or III devices type-approved according to UNECE Reg. No 46
RVFSR – Annex XIII	Seating position	L1e-A & B	Vehicles must be fitted with one saddle facing forward, no type-approval required
RVFSR – XIV	Steerability, cornering properties & turnability	L1e-A & B	Limited requirements in the Regulation
RVFSR – Annex XVIII	Maximum continuous rated and/or vehicle speed limitation by design	L1e-A & B	Specific anti-tampering requirements for electric motors in the Regulation
RVFSR – Annex XIX	Vehicle structure integrity	L1e-A & B	Requirements in the Regulation + vehicles L1e-A and cycles designed to pedal in L1e-B must conform with EN 14764:2005. Definition of cycles designed to pedal in this Annex
RVCR – Annex II	Anti-tampering measures	L1e-A & B	Requirements in the Regulation
RVCR – Annex III	Arrangements for type-approval procedures	L1e-A & B	Requirements in the Regulation
RVCR – Annex III	Conformity of production	L1e-A & B	Requirements in the Regulation
RVCR – Annex V	Devices to prevent unauthorised use	L1e-A & B	Excluded
RVCR – Annex VI	Electromagnetic compatibility	L1e-A & B	Requirements of UNECE Reg. No 10
RVCR – Annex VII	External projections	L1e-A & B	Requirements in the Regulation
RVCR – Annex XI	Masses and dimensions	L1e-A & B	Requirements in the Regulation
RVCR – Annex XIII	Passenger handholds and footrests	L1e-A	Excluded
RVCR – Annex XIII	Passenger handholds and footrests	L1e-B	Handholds not required if the vehicle is not designed to carry passengers. Pedals are considered to meet the footrests' requirements
VCR – Annex XIV	Registration plate space	L1e-A	Excluded
RVCR – Annex XIV	Registration plate space	L1e-B	Requirements in the Regulation
RVCR – Annex XV	Repair and maintenance information	L1e-A & B	Requirements in the Regulation
RVCR –	Stands	L1e-A & B	Requirements in the Regulation

The table above has quite a few references to UNECE Regulations. It was the Commission's intention to integrate as many UNECE Regulations as possible in the new type-approval legislation for the benefit of global harmonisation.

Although type-approval according to the new system is possible since 22 March 2013, type-approval according to the "old" system based on Directive 2002/24/EC will continue for new L1-e vehicles, systems and components until 31 December 2016. On January 1, 2017, the new type-approval rules will come definitely into force.

The type-approval must be carried out by a technical service, which has been designated by the approval authority of a member state, as a testing laboratory to carry out tests or as a conformity assessment body. The approval authority of a member state is established or appointed by the member state and notified to the European Commission. The approval authority is competent for all aspects of type-approval, i.e. issuing, withdrawing or refusing approval certificates. An approval authority may also act as a technical ser-

Find the list of all approval authorities and technical services here.

Type-approval is allowed in one member state only but that type-approval is valid throughout all member states of the European Union. The approval authority officially certifies that a vehicle, system, component or separate technical unit is approved by means of the type-approval certificate. Following this, the manufacturer has to issue a certificate of conformity, i.e. a document that certifies that the produced vehicle/system/component/... conforms to the approved product.

The type-approval legislation also lists the obligations of all parties in the procedure. Manufacturers for instance must ensure that their products are manufactured and approved in accordance with type-approval requirements. They must also ensure to have procedures in place for series production to remain in conformity with the approved type. They have specific obligations to fulfil in case of non-conformity or serious risks appearing from certain products. Manufacturers established outside the EU have to appoint a single representative in the Union before the type-approval authority.

As for dealers, they have the following obligations:

- Verify that the product bears the required statutory marking or type-approved mark
- Verify that the product is accompanied by the legally required documents and safety information in the official language(s) of the member state
- Verify that the product is accompanied by the certificate of conformity
- Verify that the name, registered trade name or registered trade mark and the address at which the manufacturer can be contacted is on the vehicle or on packaging or in a document with the vehicle- Check that the required statutory plate with the appropriate marking is affixed
- Check that each component has the required type-approval mark. If a component does not need type-approval, the manufacturer must at least affix a trade name or a trade mark and a type number or identification number
- In case of non-conformity or serious risk the dealer must inform the manufacturer
- Ensure that type-approved components are replaced only by type-approved components

As stated before, all electric bicycles are subject to type-approval with the exception of the following:

- Vehicles exclusively intended for use by the physically handicapped (for instance three-wheelers, hand-bikes, etc.)
- Vehicles exclusively intended for use in competition
- Vehicles designed and constructed for use by armed services, civil defence, fire services, forces for monitoring public order and emergency medical services
- Vehicles primarily intended for off-road use and designed to travel on unpaved surfaces
- Pedal cycles with pedal assistance which are equipped with an auxiliary electric motor having a maximum continuous rated power of less than or equal to 250 W, where the output of the motor is cut off when the cyclist stops pedalling and is otherwise progressively reduced and finally cut off before the vehicle speed reaches 25 km/h;
- Vehicles with an R-point height of < 540 mm for L1e (for instance recumbent bikes, velomobiles with a saddle below 54 cm)

Two other categories that are excluded from type-approval are self-balancing vehicles (for instance Segway) and vehicles with not one seating position (for instance Trikke, Egret, etc.). As a result of this exclusion, member states may decide individually on the rules they apply to these vehicles. Consequently, the manufacturers may be confronted with very diverging requirements. That is why within CEN TC 354 a standardisation procedure has been initiated. In a few years' time, self-balancing vehicles and vehicles with not one seating position will become subject to one European harmonised technical standard.

Pedelecs excluded from type-approval

Member states classify pedelecs, with assistance up to 25 km/h and maximum continuous rated power of maximum 250W, which are excluded from type-approval as bicycles. For this category of vehicles the European standard EN 15194 (EPAC – Electrically Power Assisted Cycles) has been implemented. The text of this standard should be available in any national language from the national standardisation institutes.

In most EU member states there is no legal obligation to comply with EN 15194. Only in a few member states, such as the UK and France, compliance with the standard is compulsory.

Manufacturers throughout the EU do however have a legal obligation to comply with the General Product Safety Directive, 2001/95/EC. The basic principle of this law is that manufacturers must make sure that the products they put on the market are safe. If a problem with a pedelec occurs and the vehicle complies with EN 15194, then it will benefit from a presumption of safety. If the pedelec does not have EN 15194 certification, there will be no such presumption.

Most member states allow for self-certification. This means that if a manufacturer has his own testing facilities and believes his pedelecs, after testing, comply with EN 15194, the manufacturer is allowed to certify his own products. In reality, many manufacturers have their pedelecs tested by professional testing organisations.

EN 15194 only concerns the electric part of the vehicle, where for the bicycle part EN 14764 applies. Consequently, the vehicle has to come with marking and instructions as listed in these standards.

Marking

- the frame must be visibly and permanently marked with a serial number at a readily visible location
- the frame must be visibly and durably marked, with the name of the manufacturer or the manufacturer's representative and the number of European Standard, i.e. EN 14764
- the vehicle must be durably marked with the following words: EPAC according to EN 15194
- 25 km/h, i.e. cut off speed
- 250 W, i.e. electric motor maximum continuous rated power.

Instructions

The vehicle must be provided with a set, containing the following information:

- preparation for riding — how to measure and adjust the saddle height and handlebar height to suit the rider, with an explanation of the insertion-depth warning marks on the seat-pillar and the handlebar-stem, and clear information on which levers operate the front brake and which lever operates the rear brake
- recommended tightening of fasteners related to handlebar, handlebar-stem, saddle and seat-pillar, and wheels
- the method for determining the correct adjustment of wheel quick-release mechanisms, such as, "the mechanism should emboss the fork ends when closed to the locked position"
- the correct assembly of any parts supplied unassembled
- the permitted total weight of the rider and luggage
- lubrication — where and how often to lubricate, and recommended lubricant
- the correct chain tension and how to adjust this
- adjustment of gears
- adjustment of brakes and recommendations for replacement of the friction components
- care of the wheel-rims and a clear explanation of any danger of rim-wear
- appropriate spares, i.e. tyres, tubes, brake friction components
- accessories — where these are offered as fitted, details should be included such as operation, maintenance required (if any) and relevant spares (e. g. light-bulbs)
- safe riding — regular checks on brakes, tyres, steering, caution concerning possible increased braking distance in wet weather
- the type of use for which the bicycle has been designed (i. e. the type of terrain for which it is suitable) with a warning against the hazards of incorrect use
- an advisory note to draw attention to the rider concerning possible national legal requirements when the bicycle is to be ridden on public roads (e.g. lightning and reflectors)
- the importance of using genuine replacement parts for safety-critical components
- concept and description of electric assistance
- recommendation for washing
- control and tell tales
- specific EPAC recommendations for use
- specific EPAC warnings
- recommendations about battery charging and charger use as well as the importance of following the instructions on the label of the battery charger.