

Electric Bicycles

## LEGISLATION

### Rationale

The battery and motor in electric bicycles result in a number of risks that do not exist in conventional bicycles. Electric bicycles are therefore subject to a set of European harmonised rules and regulation. All those who are considering distributing, selling, renting, leasing, making available, promoting, ... electric bicycles must be aware of and observe that legislation. This fact sheet is aimed at providing all interested parties with the relevant information.

### Rules and regulations

#### *Vehicle categorisation and related legislation*

Electric bicycle and/or LEV (Light Electric Vehicle of weight less than or equal to 400 kg) is a term, which covers two different concepts of vehicles with an auxiliary electric motor:

- 1) cycles equipped with an auxiliary motor that cannot be exclusively propelled by that motor. Only when the cyclist pedals, does the motor assist. These vehicles are generally called pedelecs.
- 2) cycles equipped with an auxiliary electric motor that can be exclusively propelled by that motor. The cyclist is not necessarily required to pedal. These vehicles are generally called E-bikes.

Pedelecs and E-bikes are not always two-wheeled. There are also vehicles with 3 wheels. Legal definitions have the term "cycles" in order to cover all vehicles, irrespective of their number of wheels.



Article 1 (h) of Directive 2002/24/EC relating to the type-approval of two or three-wheel motor vehicles legislation stipulates that the Directive does not apply to: "cycles with pedal assistance which are equipped with an auxiliary electric motor having a maximum continuous rated power of 0.25 kW, of which the output is progressively reduced and finally cut off as the vehicle reaches a speed of 25 km/h, or sooner, if the cyclist stops pedalling". As a result of this exclusion, member states should classify these vehicles as bicycles.

Pedal assisted cycles with a maximum continuous rated power of more than 0.25 kW and E-bikes that can be exclusively propelled by the motor do fall within the scope of Directive 2002/24/EC. In this Directive they are classified as low-performance mopeds, i.e. vehicles with pedals, with an auxiliary engine of power not exceeding 1 kW and a maximum design speed not exceeding 25 km/h. As a result, they have to be type-approved but they are excluded from a number of type-approval requirements as listed in Annex I of Directive 2002/24/EC. The note to Annex I sums up the excluded requirements.

Pedal assisted cycles with a motor assisting beyond 25 km/h and E-bikes with a maximum design speed exceeding 25 km/h are classified as conventional mopeds and have to be type-approved accordingly. In all member states moped classification brings along compulsory wear of a helmet, insurance and an age limit. In some case, it also involves a number plate and a driving license.



Electric bike classified as bike



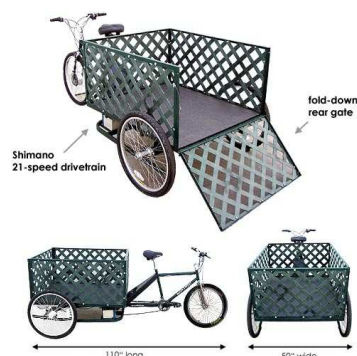
Electric bike classified as low-performance moped



Electric bike classified as moped

The European Commission is reviewing Directive 2002/24/EC. In that framework, the European Twowheel Retailers' Association (ETRA) has submitted a proposal aimed at improving the legislation related to electric cycles. For cycles with pedal assistance excluded from the Directive, ETRA proposes to increase the motor output from 0.25 kW to 0.50 kW.

The current limit proves to be insufficient for instance for electric cycles used in hilly areas, for obese people, for three-wheelers, cargo bikes, etc. The proposed increase is to ensure that the cycles perform at the required level in all circumstances so that the cyclist enjoys optimum safety and comfort. The full text of the proposal is published at <http://www.etra.eu.com/docs/CategorisationProposal.pdf>.



For electric cycles that do fall within the scope of Directive 2002/24/EC, ETRA proposes a more adequate categorisation and a type-approval that is adapted to the vehicles involved.

The European Commission is expected to complete the draft proposal for European Parliament and Council by April 2009.

Member states must classify pedelecs excluded from Directive 2002/24/EC as bicycles. For these vehicles the European standard EN 15194 (EPAC – Electrically Power Assisted Cycles) has been implemented. The text of this standard should be available in the national language from the national standardisation institutes.

Most EU member states have not introduced a legal obligation to comply with EN 15194. In some member states however, such as UK and France, compliance with the standard is compulsory. Member states that do not impose compliance 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, most manufacturers have their pedelecs tested by professional testing organizations, such as TÜV Rheinland, SGS, SMP, ...

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

#### As for marking:

- a) the frame must be visibly and permanently marked with a serial number at a readily visible location;
- b) 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
- c) the vehicle must be durably marked with the following words: EPAC according to EN 15194

#### As for instructions, the vehicle must be provided with a set containing the following information:

- a) 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;
- b) recommended tightening of fasteners related to handlebar, handlebar-stem, saddle and seat-pillar, and wheels;
- c) 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";
- d) the correct assembly of any parts supplied unassembled;
- e) the permissible total weight of the rider and luggage;
- f) lubrication — where and how often to lubricate, and recommended lubricant;
- g) the correct chain tension and how to adjust this;
- h) adjustment of gears;
- i) adjustment of brakes and recommendations for replacement of the friction components;
- j) care of the wheel-rims and a clear explanation of any danger of rim-wear;
- k) appropriate spares, i.e. tyres, tubes, brake friction components;
- l) 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);
- m) safe riding — regular checks on brakes, tyres, steering, caution concerning possible increased braking distance in wet weather;
- n) 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;
- o) 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);
- p) the importance of using genuine replacement parts for safety-critical components.
- q) Concept and description of electric assistance;
- r) Recommendation for washing;
- s) Control and tell tales;
- t) Specific EPAC recommendations for use;
- u) Specific EPAC warnings;
- v) Recommendations about battery charging and charger use as well as the importance of following the instruction contained on the label of the battery charger.

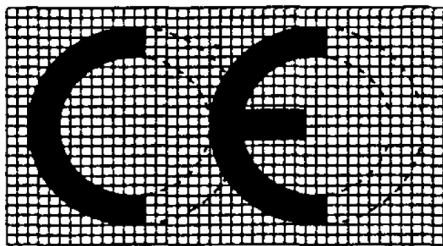
#### Machinery Directive

Early 2010, the European Commission has definitely confirmed that "cycles with pedal assistance which are equipped with an auxiliary electric motor having a maximum continuous rated power of 0.25 kW, of which the output is progressively reduced and finally cut off as the vehicle reaches a speed of 25 km/h, or sooner, if the cyclist stops pedaling" fall within the scope of Directive 2006/42/EC on machinery.

This Directive contains a list of essential health and safety requirements relating to the design and construction of machinery, i.e. pedelecs. Vehicles may only be placed on the market and/or put into service if they comply with these requirements.

Most of the requirements are covered by EN 15194. However, the European standardisation institute CEN has to review EN 15194 to ensure that all obligations resulting from the Directive are covered by the standard. The next step is the publication of a reference to the standard in the Official Journal, which will turn EN 15194 into a harmonised standard under the Machinery Directive. That will mean that a pedelec that complies with EN 15194 will be presumed to comply with Directive 2006/42/EC.

Still, the Machinery Directive holds a few additional administrative obligations for the manufacturers. They have to have a complete technical file on the product available. Furthermore, they have to supply the pedelec with an EC Declaration of Conformity, the particulars of which are specified in Annex II of the Directive. Finally, the vehicle must have a CE conformity marking that consists of the initials 'CE' as shown below. The CE marking shall be affixed to the pedelec visibly, legibly and indelibly in the immediate vicinity of the name of the manufacturer or his authorised representative. This marking however can only be affixed if the pedelec also conforms to Directive 2004/108/EC relating to electromagnetic compatibility.



#### *Electromagnetic compatibility*

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All electric devices influence each other when interconnected or close to each other. Sometimes one may observe interference between a TV set, a mobile, a radio and a nearby washing machine or electrical power lines.

The purpose of electromagnetic compatibility (EMC) is to keep all those side effects under reasonable control. EMC designates all the existing and future techniques and technologies for reducing.

The Directive 2004/108/EC relating to electromagnetic compatibility first limits electromagnetic emissions of equipment in order to ensure that, when used as intended, such equipment does not disturb radio and telecommunication as well as other equipment. The Directive also governs the immunity of such equipment to interference and seeks to ensure that this equipment is not disturbed by radio emissions when used as intended.

Compliance with the essential requirements of this Directive are mandatory for pedelecs excluded from Directive 2002/24/EC.

The Directive specifies legally-binding protection requirements for all apparatus, which includes pedelecs. Most of the requirements are covered by EN 15194. However, the European standardisation institute CEN should review EN 15194 to ensure that all obligations resulting from the Directive are covered by the standard. The publication of a reference to the standard in the Official Journal would then turn EN 15194 into a harmonised standard under the EMC Directive.



That would mean that a pedelec that complies with EN 15194 would be presumed to comply with Directive 2006/42.

In expectation of such a harmonised standard, the manufacturer has to apply his own methodology for the EMC assessment. He has to prepare technical documentation to demonstrate evidence of compliance with the requirements and have that documentation available. He may opt on a voluntary basis to involve a Notified Body during the conformity assessment procedure. The manufacturer is also required to supply the pedelec with an EC Declaration of Conformity, the minimum content of which is specified in the Directive. Finally he has to affix the CE marking. This however, cannot be done unless the product also complies with the Machinery Directive.

The EMC Directive requires that pedelecs be identified by type, batch, serial number or any other information allowing for the identification of the vehicle. In order to facilitate traceability, the actual manufacturer needs to be identified by name and address. In cases where the manufacturer is located outside of the European Community, also the name and address of the authorised representative or (where neither are in the Community) the person responsible for placing the pedelec on the Community market needs to be given. This information has to accompany the pedelec.

#### Battery transportation

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One of the major risks associated with the transport of batteries and battery-powered equipment is short-circuit of the battery as a result of the battery terminals coming into contact with other batteries, metal objects, or conductive surfaces. Therefore, their transport is subject to very strict rules, which have been internationally harmonised.

Any Lithium-Ion battery over 100 Wh is classified as CLASS 9 - MISCELLANEOUS DANGEROUS GOODS under the dangerous good regulations for transport by road (ADR) and by air (IATA & IACO). Lithium-Ion batteries for pedelecs are more than 100 Watt-hours. As a result, their transport has to comply with these regulations. The UN number for Lithium-Ion batteries is 3480, if contained in or packed with equipment 3481.

This does not only concern transport of batteries for instance from manufacturer to dealer, but all transport including for instance the return of a defective battery by the consumer to the dealer or by the dealer to his supplier.

There will be occasions where a manufacturer may wish to have a defective battery returned for analysis. However, where such batteries may pose a safety risk they are prohibited from transport by air as set in a the following special provision: "Lithium batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for air transport."

To ship goods in the CLASS 9 category means that the battery needs to be tested in accordance with the UN Manual of tests and criteria, Part III, subsection 38.3.<sup>1</sup> Furthermore, specific procedures related to handling, packing, labelling and shipping need to be followed.

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<sup>1</sup> <http://www.prba.org/File.aspx?Path=\\Public\UN Lithium Battery Tests, UN Manual Tests and Criteria, 5th Revised Ed. - Effective Jan. 1, 2011.pdf>

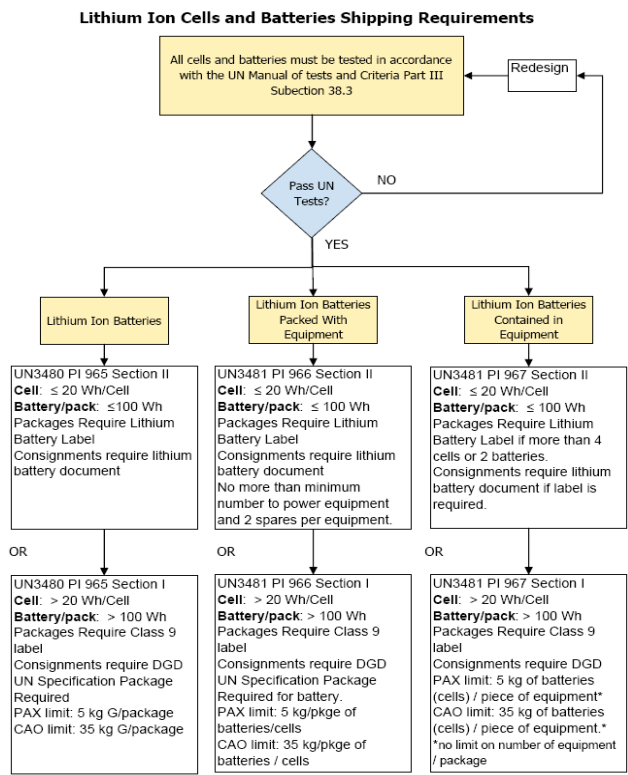


If any company handles and packs dangerous goods at their own premises, a trained “Dangerous Goods Advisor” is required onsite to oversee that the goods are packed in the correct materials and to declare the goods safe to travel. It is very strongly advised to hire a specialist company to pack the goods and to fill out a ‘Dangerous Goods Note’. It is compulsory for Dangerous Goods shipments to be accompanied by this document. It is most likely that the freight forwarder will charge extra for handling of Dangerous Goods.

The regulations regarding the road and airfreight of Lithium-Ion batteries are very similar. The same Wh ruling, documentation and labeling requirements that applies to airfreight also applies to goods transported via road freight.

Batteries manufactured, distributed or sold by major companies usually comply with the UN test requirements. However, certain replacement batteries, which are not OEM or aftermarket batteries but simply low-cost copies of those, may not have undergone the required tests. Untested batteries are consequently excluded from transport.

Users of equipment powered by Lithium-Ion batteries should therefore be vigilant when buying replacement batteries from unknown sources, such as on markets or Internet. The differences between genuine and copied battery types may not be visible but could be very dangerous; such untested batteries may have a risk of overheating or causing fires.



Source: IATA Guidance Document – Transport of Lithium Batteries Revised for the 2010 Regulations<sup>2</sup>

<sup>2</sup>[http://www.iata.org/NR/rdonlyres/4828A6CC-F553-4B38-A370-C3058898913B/0/GuidanceDocumentontheTransportofLiBatt\\_2010.pdf](http://www.iata.org/NR/rdonlyres/4828A6CC-F553-4B38-A370-C3058898913B/0/GuidanceDocumentontheTransportofLiBatt_2010.pdf)

### *Battery Directive*

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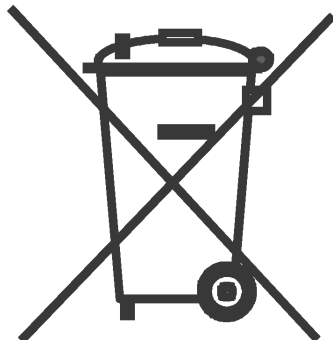
Batteries may contain metals such as zinc, copper, manganese, lithium and nickel, which present a risk to the environment and human health if they are incorrectly disposed of. As a consequence of this, the collection, recycling, treatment and disposal of batteries and accumulators are ruled at European level by Directive 2006/66/EC, also known as the battery directive. This Directive also prohibits the placing on the market of most batteries and accumulators with a certain mercury or cadmium content.

This Directive applies to all batteries and therefore also includes the Lithium Ion (Li-ion) and Nickel Metal Hydride (Ni-M-H) batteries commonly used in electric bicycles. These are classified as "industrial batteries" according and their disposal in landfill sites and by incineration is prohibited, except in some exceptional cases, for instance when no end-market is available after recycling. Guidelines for treatment and recycling of batteries are laid out in an Annex to the Directive, though the requirements for recycling of batteries will only become binding from 26 September 2011.

The Directive defines a producer as any person placing batteries on the market for the first time within a Member State, including batteries in vehicles such as electric bicycles. Some bicycle manufacturers may therefore fall into this category. Requirements for producers are particularly strict as they are required to take back and dispose of used batteries free of charge for the end user and according to schemes that comply with Community legislation. In the case of industrial batteries however, Member States may agree to other financial arrangements with producers, though this needs to be determined on a case-by-case basis. Producers also have to bear the costs of campaigns to inform the public of these arrangements, regardless of the type of battery used. Small producers may be exempted from this obligation if this does not impede the proper functioning of the collection and recycling schemes. Furthermore, all producers of batteries and accumulators have to be registered in their Member State's national register.

Battery distributors (for instance retailers selling replacement batteries) are also required to take back portable batteries free of charge, unless they can prove that alternative existing schemes are more efficient.

The Directive also sets out strict requirements regarding the labelling of batteries: chemical symbols (Hg, Cd, Pb), indicating the heavy metal content of batteries, apply to batteries containing more than a given amount of these substances. All batteries must also be labelled with the symbol indicating "separate collection" as is shown below.



## Rules and regulations: legal references

Directive 2002/24/EC relating to the type-approval of two or three-wheel motor

EN 15194: EPAC – Electrically Power Assisted Cycles

EN 14764: City and Trekking Bicycles

Directive 2006/42/EC on machinery

Directive 2004/108/EC relating to electromagnetic compatibility

European Agreement Concerning the International Carriage of Dangerous goods by Road (ADR)

IATA Dangerous Goods Regulations

2009-2010 ICAO Technical Instructions for the Safe Transport of Dangerous Goods

DIRECTIVE 2006/66/EC on batteries and accumulators and waste batteries and accumulators