

JALGRATTAD. ELEKTRILISE ABIMOOTORIGA
JALGRATTAD. EPAC-JALGRATTAD

Cycles - Electrically power assisted cycles - EPAC
Bicycles

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 15194:2017+A1:2023 sisaldab Euroopa standardi EN 15194:2017+A1:2023 ingliskeelset teksti. Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 23.08.2023. Standard on kättesaadav Eesti Standardimis- ja Akrediteerimiskeskusest.	This Estonian standard EVS-EN 15194:2017+A1:2023 consists of the English text of the European standard EN 15194:2017+A1:2023. This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation and Accreditation. Date of Availability of the European standard is 23.08.2023. The standard is available from the Estonian Centre for Standardisation and Accreditation.
---	---

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

ICS 43.120, 43.150

Standardite reprodutseerimise ja levitamise õigus kuulub Eesti Standardimis- ja Akrediteerimiskeskusele. Andmete paljundamine, taastekitamine, kopeerimine, salvestamine elektroonsesse süsteemi või edastamine ükskõik millises vormis või millisel teel ilma Eesti Standardimis- ja Akrediteerimiskeskuse kirjaliku loata on keelatud.

Kui Teil on küsimusi standardite autorikaitse kohta, võtke palun ühendust Eesti Standardimis- ja Akrediteerimiskeskusega: Koduleht www.evs.ee; telefon 605 5050; e-post info@evs.ee

The right to reproduce and distribute standards belongs to the Estonian Centre for Standardisation and Accreditation. No part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying, without a written permission from the Estonian Centre for Standardisation and Accreditation.

If you have any questions about copyright, please contact Estonian Centre for Standardisation and Accreditation: Homepage www.evs.ee; phone +372 605 5050; e-mail info@evs.ee

English Version

Cycles - Electrically power assisted cycles - EPAC Bicycles

Cycles - Cycles à assistance électrique - Bicyclettes
EPAC

Fahrräder - Elektromotorisch unterstützte Räder -
EPAC

This European Standard was approved by CEN on 28 May 2017 and includes Amendment approved by CEN on 22 August 2022.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword.....	6
Introduction	7
1 Scope	8
2 Normative references	8
3 Terms and definitions	10
4 Safety requirements and/or protective measures	17
4.1 General	17
4.2 Electrical requirements	17
4.2.1 Electric circuit	17
4.2.2 Controls and symbols	17
4.2.3 Batteries	18
4.2.4 Battery charger	18
4.2.5 Electric cables and connections	18
4.2.6 Wiring	19
4.2.7 Power cables and conduits	19
4.2.8 External and internal electrical connections	19
4.2.9 Moisture resistance	19
4.2.10 Mechanical strength test	20
4.2.11 Maximum speed for which the electric motor gives assistance	20
4.2.12 Start-up assistance mode	21
4.2.13 Power management	22
4.2.14 Maximum power measurement — Measurement at the engine shaft	23
4.2.15 Electro Magnetic Compatibility	24
4.2.16 Failure mode	24
4.2.17 Anti-tampering measure	24
4.3 Mechanical requirements	25
4.3.1 General	25
4.3.2 Sharp edges	26
4.3.3 Security and strength of safety-related fasteners	26
4.3.4 Protrusions	27
4.3.5 Brakes	27
4.3.6 Steering	40
4.3.7 Frames	51
4.3.8 Front fork	60
4.3.9 Wheels and wheel/tyre assembly	68
4.3.10 Rims, tyres and tubes	72
4.3.11 Front mudguard	74
4.3.12 Pedals and pedal/crank drive system	76
4.3.13 Drive-chain and drive belt	83
4.3.14 Chain-wheel and belt-drive protective device	84
4.3.15 Saddles and seat-posts	88
4.3.16 Spoke protector	94
4.3.17 Luggage carriers	94
4.3.18 Road-test of a fully-assembled EPAC	94

4.3.19	Lighting systems and reflectors	95
4.3.20	Warning device.....	96
4.3.21	Thermal hazards.....	96
4.3.22	Performance levels (PLrs) for control system of EPACs.....	96
4.4	List of significant hazards.....	96
5	Marking, labelling.....	97
5.1	Requirement.....	97
5.2	Durability test.....	98
5.2.1	Requirement.....	98
5.2.2	Test method.....	98
6	Instruction for use.....	98
	Annex A (informative) Example of relation between speed, torque and current.....	101
	Annex B (normative) Electromagnetic compatibility of EPAC and ESA	104
B.1	Conditions applying to EPAC and to electrical/electronic sub-assemblies (ESA)	104
B.1.1	Marking	104
B.1.2	Requirements.....	104
B.1.2.1	General requirements.....	104
B.1.2.2	Broad-band radiation from EPAC	106
B.1.2.3	Requirements relating to narrow-band radiation emissions from EPAC	107
B.1.2.4	Requirements regarding EPAC immunity to electromagnetic radiation	107
B.1.2.5	Requirements concerning broad-band ESA radiation	107
B.1.2.6	Requirements concerning narrow-band ESA radiation emission	108
B.1.2.7	Requirements concerning ESA immunity to electromagnetic radiation.....	108
B.2	Method of measuring broad-band electromagnetic radiation from EPA.....	108
B.2.1	Measuring equipment.....	108
B.2.2	Test method.....	109
B.2.2.1	General	109
B.2.2.2	Test conditions	109
B.2.2.3	State of the EPAC during the test.....	109
B.2.2.4	Antenna type, position and orientation	109
B.2.3	Measurement	109
B.3	Method of measuring narrow band electromagnetic radiation from EPAC.....	109
B.3.1	General	109
B.3.1.1	Measuring equipment.....	109
B.3.1.2	Test method.....	109
B.3.1.3	Test conditions	109
B.3.1.4	State of the EPAC during the tests.....	109
B.3.2	Antenna type, position and orientation	109
B.4	Methods of testing EPAC immunity to electromagnetic radiation.....	110

B.4.1	General	110
B.4.2	Expression of results	110
B.4.3	Test conditions	110
B.4.4	State of the EPAC during the tests	110
B.4.5	Type, position and orientation of the field generator	111
B.4.5.1	Type of field generator	111
B.4.5.2	Measurement height and distance	111
B.4.5.3	Position of the antenna in relation to the EPAC	111
B.4.5.4	Position of the EPAC	112
B.4.6	Requisite test and condition	112
B.4.6.1	Range of frequencies, duration of the tests, polarization	112
B.4.6.2	Tests to check deterioration in direct control	112
B.4.7	Generation of the requisite field strength	112
B.4.7.1	Test method	112
B.4.7.2	Field strength contour	113
B.4.7.3	Characteristics of the test signal to be generated	113
B.4.8	Inspection and monitoring equipment	114
B.5	Method of measuring broad-band electromagnetic radiation from separate technical units (ESA)	114
B.5.1	General	114
B.5.1.1	Measuring equipment	114
B.5.1.2	Test method - Test conditions	114
B.5.2	State of the ESA during the test	114
B.5.3	Antenna type, position and orientation	114
B.6	Method of measuring narrow-band electromagnetic radiation from separate technical units (ESAs)	114
B.6.1	General	114
B.6.1.1	Measuring equipment	114
B.6.1.2	Test method	114
B.6.2	Test conditions	114
B.6.3	State of the ESA during the tests	114
B.6.4	Antenna type, position and orientation	114
B.7	Methods of testing the ESA immunity to electromagnetic radiation	115
B.7.1	General	115
B.7.2	Expression of results	115
B.7.3	Test conditions	115
B.7.4	State of the ESA during the tests	115

B.7.5	Requisite test and condition	115
B.7.5.1	Test methods	115
B.7.5.2	Range of frequencies, duration of the tests, polarization	115
B.7.5.3	Tests to check deterioration in direct control	115
B.7.6	Generation of the requisite field strength	116
B.7.6.1	Test method	116
B.7.6.2	Characteristics of the test signal to be generated	116
B.7.7	Inspection and monitoring equipment	116
B.8	ESD test	117
Annex C (informative)	Steering geometry	118
Annex D (normative)	Dummy fork characteristics	119
Annex E (informative)	Explanation of the method of least squares for obtaining line of best fit and $\pm 20\%$ limit lines for braking performance linearity	121
Annex F (normative)	Fork mounting fixture	124
Annex G (informative)	Wheel/tyre assembly - Fatigue test	125
G.1	Requirements	125
G.2	Test method	125
Annex H (normative)	Light, warning device, on/off symbols	127
Annex I (informative)	Walk assist mode symbols	128
Annex ZA (informative)	Relationship between this European Standard and the essential requirements of EU Directive 2006/42/EC aimed to be covered	129
Bibliography		133

European foreword

This document (EN 15194:2017+A1:2023) has been prepared by Technical Committee CEN/TC 333 “Cycles”, the secretariat of which is held by UNI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by February 2024, and conflicting national standards shall be withdrawn at the latest by August 2025.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes A1 EN 15194:2017 A1.

A1 EN 15194:2017+A1:2023 includes the following significant technical changes with respect to EN 15194:2017:

- 4.2.3 “Batteries”: reference to EN standard applicable to batteries of EPAC has been updated with the new latest edition, in line with specific request of National Authority to reinforce Machinery directive requirements,
- Annex A “Example of recommendation for battery charging” has been removed. A1

This document includes Amendment 1 approved by CEN on 22 August 2022.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

A1 This document has been prepared under a standardization request addressed to CEN by the European Commission. The Standing Committee of the EFTA States subsequently approves these requests for its Member States.

For the relationship with EU Legislation, see informative Annex ZA, which is an integral part of this document. A1

This standard also includes all mechanic requirements applicable to the EPACs and is therefore a stand-alone document.

Any feedback and questions on this document should be directed to the users’ national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

This European Standard gives requirements for electrically power assisted cycles (EPAC).

This European Standard has been developed in response to demand throughout Europe. Its aim is to provide a standard for the assessment of electrically powered cycles of a type which are excluded from type approval by Regulation (EU) No 168/2013.

Due to the limitation of the voltage to 48 V d.c., there are no special requirements applicable to the EPAC in regard to protection against electrical hazards.

Following the completion of a risk analysis, the focus in this standard is on EPAC as bicycles for city and trekking. Folding bicycles are included.

This document is a type C standard as stated in EN ISO 12100. The machinery concerned and the extent to which hazards, hazardous situations and hazardous events covered are indicated in the scope of this document.

When provisions of this type C standard are different from those which are stated in type A or B standards, the provisions of this type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this type C standard.

In real life situation an EPAC can fall over to the side causing the battery holder to break without damage to the battery case itself. While the standard contains a strength test for the battery an additional test is required for the situation described. This will be considered at the next revision. The battery holder needs to withstand this realistic and typical situation. Risk assessment carried out by the manufacturer should identify suitable measures to deal with this situation until it can be dealt with in the standard.

1 Scope

This European Standard applies to EPAC bicycles for private and commercial use with exception of EPAC intended for hire from unattended station.

This European Standard is intended to cover all common significant hazards, hazardous situations and events (see Clause 4) of electrically power assisted bicycles, when used as intended and under condition of misuse that are reasonably foreseeable by the manufacturer.

This European Standard is intended to cover electrically power assisted bicycles of a type which have a maximum continuous rated power of 0,25 kW, of which the output is progressively reduced and finally cut off as the EPAC reaches a speed of 25 km/h, or sooner, if the cyclist stops pedalling.

This European Standard specifies requirements and test methods for engine power management systems, electrical circuits including the charging system for the design and assembly of electrically power assisted bicycles and sub-assemblies for systems having a rated voltage up to and including 48 V d.c. or integrated battery charger with a nominal 230 V a.c. input.

This European Standard specifies safety and safety related performance requirements for the design, assembly, and testing of EPAC bicycles and subassemblies intended for use on public roads, and lays down guidelines for instructions on the use and care of such bicycles.

This European Standard applies to EPAC bicycles that have a maximum saddle height of 635 mm or more and that are intended for use on public roads.

This European Standard is not applicable to EPACs which are manufactured before the date of its publication as EN.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 22248:1992, *Packaging — Complete, filled transport packages — Vertical impact test by dropping (ISO 2248:1985)*

Ⓐ EN 50604-1:2016, *Secondary lithium batteries for light EV (electric vehicle) applications – Part 1: General safety requirements and test methods*

EN 50604-1:2016/A1:2021, *Secondary lithium batteries for light EV (electric vehicle) applications – Part 1: General safety requirements and test methods* Ⓐ

EN 55012:2007, *Vehicles, boats and internal combustion engines — Radio disturbance characteristics — Limits and methods of measurement for the protection of on-board receivers (CISPR 12:2007)*

Ⓐ EN IEC 55016-1-1:2019, *Specification for radio disturbance and immunity measuring apparatus and methods — Part 1-1: Radio disturbance and immunity measuring apparatus — Measuring apparatus (CISPR 16-1-1:2019)* Ⓐ

Ⓐ EN 55025:2017, *Vehicles, boats and internal combustion engines — Radio disturbance characteristics — Limits and methods of measurement for the protection of on-board receivers (CISPR 25:2016)* Ⓐ

EN 60034-1:2010, *Rotating electrical machines — Part 1: Rating and performance (IEC 60034-1:2010, modified)*

EN 60068-2-75:2014, *Environmental testing — Part 2-75: Tests — Test Eh: Hammer tests (IEC 60068-2-75:2014)*

EN 60335-1:2012, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2010, modified)*

HD 60364-5-52:2011, *Low-voltage electrical installations — Part 5-52: Selection and erection of electrical equipment — Wiring systems (IEC 60364-5-52:2009, modified)*

EN 60529:1991, *Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989)*

EN 61000-4-2:2009, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test (IEC 61000-4-2:2008)*

▣_{A1} EN ISO 7010:2020, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2019)* ▣_{A1}

EN ISO 11243:2016, *Cycles — Luggage carriers for bicycles — Requirements and test methods (ISO 11243:2016)*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2015, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2015)*

▣_{A1} EN ISO 13849-2:2012, *Safety of machinery – Safety-related parts of control systems – Part 2: Validation (ISO 13849-2:2012)* ▣_{A1}

ISO 5775-1:2014, *Bicycle tyres and rims — Part 1: Tyre designations and dimensions*

▣_{A1} ISO 5775-2:2021, *Bicycle tyres and rims — Part 2: Rims* ▣_{A1}

ISO 6742-1:2015, *Cycles -- Lighting and retro-reflective devices — Part 1: Lighting and light signalling devices*

ISO 6742-2:2015, *Cycles — Lighting and retro-reflective devices — Part 2: Retro-reflective devices*

ISO 9633:2001, *Cycle chains — Characteristics and test methods*

ISO 11451-1:2015, *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

ISO 11452-1:2015, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 1: General principles and terminology*

▣_{A1} ISO 11452-2:2019, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 2: Absorber-lined shielded enclosure* ▣_{A1}

ISO 11452-3:2016, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 3: Transverse electromagnetic (TEM) cell*

▣_{A1} ISO 11452-4:2020, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 4: Harness excitation methods* ▣_{A1}

ISO 11452-5:2002, *Road vehicles — Component test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 5: Stripline*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

cycle

vehicle that has at least two wheels and is propelled solely or mainly by the muscular energy of the person on that vehicle, in particular by means of pedals

3.2

bicycle

two-wheeled vehicle that is propelled solely or mainly by the muscular energy of the person on that vehicle, in particular by means of pedals

3.3

electrically power assisted cycle

EPAC

cycle, equipped with pedals and an auxiliary electric motor, which cannot be propelled exclusively by means of this auxiliary electric motor, except in the start-up assistance mode

3.4

city and trekking bicycle

bicycle designed for use on public roads primarily for means of transportation or leisure

3.5

mountain-bicycle

bicycle designed for use off-road on rough terrain, on public roads and on public pathways equipped with a suitably strengthened frame and other components, and, typically, with wide-section tyres with coarse tread patterns and a wide range of transmission gears

3.6

racing-bicycle

bicycle intended for high-speed amateur use on public roads having a steering assembly with multiple grip positions allowing for an aerodynamic posture, a multi-speed transmission system, tyre width not greater than 28 mm, and a maximum mass of 12 kg for the fully assembled bicycle

3.7

recumbent bicycle

bicycle that places the rider in a laid-back reclining position

3.8

young adult bicycle

bicycle designed for use on public roads by a young adult whose weight is less than 40 kg with maximum saddle height of 635 mm or more and less than 750 mm

3.9

fully assembled bicycle

bicycle fitted with all the components necessary for its intended use