



BSI Standards Publication

## Cycles — Safety requirements for bicycles

---

Part 10: Safety requirements for electrically power assisted cycles (EPACs)

## National foreword

This Published Document is the UK implementation of ISO/TS 4210-10:2020.

The UK participation in its preparation was entrusted to Technical Committee GME/25, Cycles.

A list of organizations represented on this committee can be obtained on request to its committee manager.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

© The British Standards Institution 2020  
Published by BSI Standards Limited 2020

ISBN 978 0 539 13396 7

ICS 43.150

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2020.

### Amendments/corrigenda issued since publication

Date	Text affected
------	---------------

---

**TECHNICAL  
SPECIFICATION**

**ISO/TS  
4210-10**

First edition  
2020-07

---

---

**Cycles — Safety requirements for  
bicycles —**

Part 10:

**Safety requirements for electrically  
power assisted cycles (EPACs)**



Reference number  
ISO/TS 4210-10:2020(E)

© ISO 2020



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2020

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>Introduction</b> .....	<b>vi</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>2</b>
<b>4 Abbreviated terms</b> .....	<b>5</b>
<b>5 General requirements</b> .....	<b>6</b>
5.1 Lighting systems, reflectors and warning device.....	6
5.2 Risk assessment.....	7
5.3 Significant hazards and safety functions.....	7
5.3.1 Significant hazards.....	7
5.3.2 Safety function for control system of EPACs.....	7
5.4 Prevention of unauthorized use.....	8
5.5 Failure mode.....	8
5.5.1 Requirement.....	8
5.5.2 Test method.....	8
<b>6 Electrical requirements</b> .....	<b>8</b>
6.1 Motor controller.....	8
6.2 Controls and symbols.....	8
6.3 Batteries.....	9
6.4 Battery charger.....	9
6.4.1 Requirements for proprietary system.....	9
6.4.2 Requirements for non-proprietary system.....	9
6.4.3 Solutions for non-proprietary systems.....	10
6.5 Electric cables and couplers.....	10
6.6 Wiring.....	10
6.7 Protection against ingress of water (IP code).....	11
6.8 Environmental and operational conditions.....	11
6.9 Mechanical strength of the electrical components.....	11
6.9.1 General.....	11
6.9.2 Function related shock test.....	11
6.9.3 Impact related shock test.....	11
6.10 Performance measurement.....	12
6.10.1 General.....	12
6.10.2 System based on maximum continuous rated power.....	12
6.10.3 System based on maximum assisted rate.....	14
6.11 Walk assistance mode.....	20
6.11.1 Requirements.....	20
6.11.2 Test method for EPAC with walk assistance mode.....	20
6.12 Electromagnetic compatibility (EMC).....	21
6.12.1 Requirement.....	21
6.13 Anti-tampering measure.....	21
6.13.1 General.....	21
6.13.2 Prevention of tampering of the motor.....	21
6.14 Thermal hazards.....	22
6.14.1 Non-continuous contact surface.....	22
6.14.2 Continuous contact surface.....	22
6.14.3 Ambient temperature.....	22
<b>7 Mechanical requirements</b> .....	<b>22</b>
7.1 General.....	22
7.2 Brakes — Heat-resistance test.....	22
7.3 Handlebar and stem assembly — Lateral bending test.....	22

7.4	Handlebar stem — Forward bending test.....	23
7.5	Handlebar to handlebar stem — Torsional security test.....	23
7.6	Handlebar and stem assembly — Fatigue test.....	23
7.7	Frame — Impact test (falling mass).....	23
7.8	Frame and front fork assembly — Impact test (falling frame).....	24
7.9	Frame — Fatigue test with horizontal forces.....	24
7.10	Frame — Fatigue test with a vertical force.....	24
7.11	Front fork — Static bending test.....	25
7.12	Front fork — Rearward impact test.....	25
7.13	Front fork — Bending fatigue test plus rearward impact test.....	25
7.14	Seat-post — Fatigue test.....	25
<b>8</b>	<b>Manufacturer's instructions.....</b>	<b>26</b>
<b>9</b>	<b>Marking.....</b>	<b>26</b>
<b>Annex A</b>	<b>(normative) Electromagnetic compatibility of EPACs.....</b>	<b>28</b>
<b>Annex B</b>	<b>(informative) Electromagnetic compatibility of ESAs.....</b>	<b>35</b>
<b>Annex C</b>	<b>(normative) The battery chargers for non-proprietary system.....</b>	<b>44</b>
<b>Annex D</b>	<b>(normative) Light, audible warning device, On/Off symbols.....</b>	<b>118</b>
<b>Annex E</b>	<b>(informative) Environmental and operational conditions.....</b>	<b>119</b>
<b>Annex F</b>	<b>(normative) Battery.....</b>	<b>120</b>
<b>Bibliography</b>	<b>.....</b>	<b>125</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 149, *Cycles*, Subcommittee SC 1, *Cycles and major sub-assemblies*.

A list of all parts in the ISO 4210 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## **Introduction**

This document combines several countries' safety requirements for Electrically Power Assisted Cycles (EPACs). The commercialization of EPACs has accelerated in the global market, in response to global concerns about CO<sub>2</sub> reduction and energy saving. EPAC technologies for performance, electrical control, battery management and battery charging are currently developing rapidly in a competitive market. It is therefore necessary to standardize the safety of these technologies for EPACs.

This documentation will allow an easy and clear understanding of requirements for different types of EPAC.

This document includes safety requirements for the charging of EPACs. This includes off-board parts and EPAC battery chargers.

This document does not state the limit for the maximum permissible load of the EPAC. The manufacturer is advised to consider amongst other factors the maximum permissible load (luggage plus rider) as well as the intended use of the EPAC. Both have an influence on the mechanical requirements.

# Cycles — Safety requirements for bicycles —

## Part 10:

# Safety requirements for electrically power assisted cycles (EPACs)

## 1 Scope

This document specifies safety and performance requirements for the design, marking, assembly, and testing of two wheeled electrically power assisted cycles (hereafter EPACs), fully-assembled EPACs and subassemblies, and provides guidelines for information supplied by the manufacturers (i.e. instructions on the use and care of such EPACs).

This document applies to two wheeled EPACs that have a maximum saddle height of 635 mm or more and are intended for private and commercial use with exception of EPACs intended for hire from unattended stations.

This document is intended to cover all common significant hazards, hazardous situations and events listed in 5.3 of EPACs, when used as intended or under conditions of misuse that are reasonably foreseeable by the manufacturer.

This document specifies requirements and test methods for engine power management systems, electrical circuits including the charger for the assessment of the design and assembly of EPACs and sub-assemblies for systems having a Safety Extra Low Voltage (SELV) maximum voltage up to 60 V d.c. including tolerances.

## 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2409, *Paints and varnishes — Cross-cut test*

ISO 4210-1, *Cycles — Safety requirements for bicycles — Part 1: Terms and definitions*

ISO 4210-2:2015, *Cycles — Safety requirements for bicycles — Part 2: Requirements for city and trekking, young adult, mountain and racing bicycles*

ISO 4210-4:2014, *Cycles — Safety requirements for bicycles — Part 4: Braking test methods*

ISO 4210-5:2014, *Cycles — Safety requirements for bicycles — Part 5: Steering test methods*

ISO 4210-6:2015, *Cycles — Safety requirements for bicycles — Part 6: Frame and fork test methods*

ISO 4210-9:2014, *Cycles — Safety requirements for bicycles — Part 9: Saddle and seat-post test methods*

ISO 7010:2011, *Graphical symbols — Safety colours and safety signs — Registered safety signs*

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

ISO 11451-2, *Road vehicles — Vehicle test methods for electrical disturbances from narrowband radiated electromagnetic energy — Part 2: Off-vehicle radiation sources*