BS EN 17860-5:2024

BSI Standards Publication

Carrier cycles

Part 5: Electrical aspects

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Full document details: BS EN 17860-5:2024

National foreword

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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.

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Published by BSI Standards Limited 2024

ISBN 978 0 539 25214 9

ICS 43.150

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 December 2024.

Amendments/corrigenda issued since publication

Date	Text affected

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 17860-5

December 2024

ICS 43.150

English Version

Carrier cycles - Part 5: Electrical aspects

Cycles utilitaires - Partie 5: Aspects électriques

Lastenfahrräder - Teil 5: Elektrische Aspekte

This European Standard was approved by CEN on 4 November 2024.

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Ref. No. EN 17860-5:2024 E

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Full document details: BS EN 17860-5:2024

Contents

Page

European foreword ... 4
Introduction ... 5
1 Scope ... 6
2 Normative references ... 6
3 Terms and definitions ... 7
4 General requirements ... 7
4.1 Risk assessment ... 7
4.2 Significant hazards and safety functions ... 7
4.2.1 Significant hazards ... 7
4.2.2 Safety function for control system of carrier EPAC ... 8
4.3 Prevention of unauthorized use ... 8
5 Electrical requirements ... 8
5.1 Electric system ... 8
5.2 Controls and symbols ... 8
5.3 Battery ... 9
5.4 External battery charger ... 9
5.5 Electric cables and couplers ... 9
5.5.1 General ... 9
5.5.2 Requirements ... 9
5.5.3 Test method ... 9
5.6 Wiring ... 9
5.7 Power cables and conduits ... 10
5.8 External and internal electrical connections ... 10
5.9 Moisture resistance ... 10
5.10 Mechanical strength test of the electrical components ... 10
5.10.1 General ... 10
5.10.2 Function related shock test ... 11
5.10.3 Impact related shock test - Lateral overturning ... 11
5.11 Maximum speed for which the electric motor gives assistance ... 11
5.11.1 Requirements ... 11
5.11.2 Test method ... 11
5.12 Walk and manoeuvring assistance mode ... 12
5.12.1 Requirements ... 12
5.12.2 Test method ... 12
5.13 Power management ... 13
5.13.1 Requirements ... 13
5.13.2 Test method – Auxiliary electric motor management ... 14
5.14 Measurement of the maximum continuous rated power ... 15
5.14.1 Requirements ... 15
5.14.2 Measurement ... 15
5.14.3 Alternative measurement ... 15
5.15 Electromagnetic compatibility ... 16
5.15.1 Emission ... 16
5.15.2 Immunity ... 16

Documents
Document Sharing Hub
Full document details: BS EN 17860-5:2024

5.15.3 Carrier EPAC in mains charging mode 16
5.16 Failure mode 17
5.16.1 Acoustical and / or visual warning 17
5.17 Anti-tampering measures 17
5.18 Thermal hazards 17
5.18.1 Non-continuous contact surface 17
5.18.2 Continuous contact surface 17
5.18.3 Ambient temperature 17
5.19 Recuperative braking 18
5.19.1 Braking 18
5.19.2 Brake light activation by recuperative braking 18
5.20 Electrical requirements for electric cargo trailers 18
5.20.1 Control for electric cargo trailers 18
5.20.2 Handcart mode for electric cargo trailers - Handcart mode speed test 18
5.20.3 Maximum speed test 18
5.20.4 Assistance power for electric cargo trailer 18
5.20.5 Activating the trailer mode 23
5.20.6 Plug connections for electric cargo trailers 23
5.20.7 Performance levels (PL_rs) for control system of electric cargo trailers 24

Annex A (normative) Electromagnetic compatibility of carrier EPAC and ESA 26

Annex B (normative) Light, warning device, on/off symbols 27

Annex C (informative) Walk and manoeuvring assistance mode symbols 28

Annex D (informative) Measurement of the maximum continuous rated power — Alternative measurement 29

Bibliography 31

Documents
Document Sharing Hub
Full document details: BS EN 17860-5:2024

European foreword

This document (EN 17860-5:2024) 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 June 2025, and conflicting national standards shall be withdrawn at the latest by June 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 is part of standard series consisting of the following parts:

— EN 17860-1:2024, Carrier cycles — Part 1: Terms and definitions

— EN 17860-2:2024, Carrier cycles — Part 2: Lightweight single track carrier cycles — Mechanical aspects

— EN 17860-3:2024, Carrier Cycles — Part 3: Lightweight multi track carrier cycles — Mechanical aspects

— prEN 17860-4:2024, Carrier Cycles — Part 4: Heavy weight carrier cycles — Mechanical and functional aspects

— FprEN 17860-5:2024, Carrier cycles — Part 5: Electrical aspects

— prEN 17860-6:2024, Carrier Cycles — Part 6: Passenger transport

— FprEN 17860-7:2024, Carrier cycles — Cargo trailers

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.

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Full document details: BS EN 17860-5:2024

Introduction

This document has been developed in response to an increased demand throughout Europe for carrier cycles of a type which are excluded from the scope of Regulation (EU) No 168/2013. Electrical aspects of electric trailers and other peripherals such as chargers are also part of this document.

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1 Scope

This document applies to:

— functional and electrical safety aspects of carrier cycles covered in all parts of EN 17860;

— electrical aspects of electrically power assisted cycle trailers (EPACT) covered in prEN 17860-7;

— electrical aspects of batteries used for carrier cycles;

— electrical aspects of chargers used for carrier cycles.

This document does not apply to charging stations.

This document specifies requirements and test methods for motor power management systems, electrical circuits including the charger for the assessment of the design and assembly of carrier cycles and subassemblies for systems having a Safety Extra Low Voltage (SELV) maximum working voltage ≤ 60 V d.c. disregarding transients.

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.

EN 17860-1:2024, *Carrier cycles — Part 1: Terms and definitions*

EN 17860-2:2024, *Carrier cycles — Part 2: Lightweight single track carrier cycles — Mechanical aspects*

EN 15194:2017+A1:2023, *Cycles — Electrically power assisted cycles — EPAC Bicycles*

EN ISO 7010, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010)*

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

EN ISO 13849 (all parts), *Safety of machinery — Safety-related parts of control systems*

CEN/TS 17831:2023, *Cycles — Electrically power assisted cycles — Anti-tampering measures*

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*

IEC 60034-1, *Rotating electrical machines — Part 1: Rating and performance*

EN 60068-2-27, *Environmental testing — Part 2-27: Tests — Test Ea and guidance: Shock (IEC 60068-2-27)*

IEC 60335-1:2020, *Household and similar electrical appliances — Safety — Part 1: General requirements*

EN 60335-2-29, *Household and similar electrical appliances — Safety — Part 2-29: Particular requirements for battery chargers (IEC 60335-2-29)*

Documents
Document Sharing Hub
Full document details: BS EN 17860-5:2024

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

IEC 60417, *Graphical symbols for use on equipment*

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

EN IEC 61000-6-1, *Electromagnetic compatibility (EMC) — Part 6-1: Generic standards — Immunity standard for residential, commercial and light-industrial environments*

EN IEC 61000-6-3, *Electromagnetic compatibility (EMC) — Part 6-3: Generic standards — Emission standard for equipment in residential environments*

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

ISO 13732-1, *Ergonomics of the thermal environment — Methods for the assessment of human responses to contact with surfaces — Part 1: Hot surfaces*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 17860-1:2024 apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp/

— IEC Electropedia: available at https://www.electropedia.org/

4 General requirements

4.1 Risk assessment

Carrier EPAC and electrically assisted cycle trailers (EPACT) shall be designed in accordance with the principles of EN ISO 12100 for relevant hazards which are not dealt with by this document. This includes evaluation of such risks for all relevant components.

4.2 Significant hazards and safety functions

4.2.1 Significant hazards

The following significant hazards of carrier EPAC have been considered in this document:

a) mechanical hazards: deceleration, acceleration, instability, kinetic energy, rotating elements and moving elements, rough or slippery surfaces, sharp edges;

b) electrical hazards: electromagnetic phenomena, electrostatic phenomena, overload, short-circuit, thermal radiation;

c) thermal hazards: explosion, flame, radiation from heat sources, objects or materials with a high or low temperature;

d) ergonomic hazards: effort, local lighting, posture;

e) hazards associated with the environment in which the carrier EPAC is used: water (dust).

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Full document details: BS EN 17860-5:2024

4.2.2 Safety function for control system of carrier EPAC

4.2.2.1 General

The carrier EPAC control system risk shall be assessed in accordance with EN ISO 13849 (all parts).

4.2.2.2 Requirements for the safety related parts of the electrical control systems

The safety requirements of Table 1 shall be necessary for a carrier EPAC. If necessary, the manufacturer shall add more safety requirements and determine the necessary PL or safety level for each of these safety requirements and the related safety functions.

Table 1 — Safety functions related to defined hazards

Safety function	Performance Level
Prevention of electric motor assisted propulsion without user request by pedalling or by activation of the walk assistance mode	PL_r c
Prevention of risk of fire in case of management system failure for batteries with electric energy above 100 Wh	PL_r c

4.2.2.3 Verification of the safety functions

The whole procedure for achieving functional safety shall be in accordance with EN ISO 13849 (all parts).

System suppliers shall document this process and take measures to achieve the required performance level (see Table 1).

The minimum set of safety related functions shall be implemented at least by both, system suppliers and the manufacturer, to achieve conformity with this document.

4.3 Prevention of unauthorized use

Means shall be provided to the user to prevent an unauthorized use of the electric assistance/walk assistance mode of the carrier EPAC e.g. key, locks, electronic control device.

5 Electrical requirements

5.1 Electric system

The electrical system shall be designed so that, should it malfunction in a hazardous manner, it shall switch off power to the malfunctioning parts without increasing the hazard. It shall require user interaction to switch on again.

NOTE The mechanical brakes provide fast and safe stopping in emergency situations.

5.2 Controls and symbols

A control device shall be fitted to switch on and off the assistance.

Two independent applying actions shall be required to start the electrical assistance mode (e.g. power switch and forward pedalling activation); a traffic caused stop (e.g. traffic lights) is not subject to this requirement.

The control device shall be apparent, easy to reach and unmistakable. This control device shall be activated by voluntary action.

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Designs of the on/off symbol, lighting symbol and audible warning device symbol shall be in accordance with Annex B.

5.3 Battery

The battery shall comply with EN 50604-1:2016 and EN 50604-1:2016/A1:2021. At the moment of the publication of this standard, EN 50604-1 is only applicable for secondary lithium batteries, and only risks related to these batteries were taken into account.

5.4 External battery charger

External battery chargers with output voltage below 60V DC shall comply with EN 60335-2-29. The user shall be informed if the charger is designed for indoor or both indoor and outdoor use. Battery chargers for indoor use only shall be marked with symbol IEC 60417-5957 (2004-12). Chargers for outdoor use shall be labelled accordingly. In case chargers are designed and labelled for outdoor use, they shall be rated at at least IP X4. Chargers for carrier cycles are considered to be operated in a residential (household) environment.

5.5 Electric cables and couplers

5.5.1 General

All couplers for cable and wire shall be selected to prevent corrosion of electrical contact conductance.

5.5.2 Requirements

Cable and plug temperature shall be lower than that specified by the manufacturer of the cables and plugs. Damage to cable and plug insulation shall be prevented.

The cable cross sections shall be selected in accordance to IEC 60335-1:2020, Table 11. If these requirements are not met, a temperature rise test shall be performed, in accordance to 5.5.3.

Cables used exclusively for communication lines are excluded.

5.5.3 Test method

At an ambient room temperature (20 ± 5) °C, discharge the fully charged carrier EPAC battery to the discharging limit specified by the carrier EPAC or ESA manufacturer at the maximum current allowable by the system and record it. Measure the cable and plug temperatures and ensure, by examination, that there is no deterioration of the insulation on either assembly.

The increase of outer surface temperature of parts that can be touched shall be ≤ 60 K while in use on performance test rig.

5.6 Wiring

Requirements on wiring shall be checked according to the following sequence at an ambient room temperature (20 ± 5) °C.

a) Wire ways shall be smooth and free from sharp edges.

b) Wires shall be protected so that they do not come into contact with burrs, cooling fins or similar sharp edges that may cause damage to their insulation. Holes in metal through which insulated wires pass shall have smooth well-rounded surfaces or be provided with bushings.

c) Wiring shall be effectively prevented from coming into contact with moving parts.

Compliance with a), b) and c) shall be checked by inspection.

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