

PAS 63100:2024

Electrical installations – Protection against fire of battery energy storage systems for use in dwellings – Specification



Department for
Energy Security
& Net Zero



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Foreword

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Presentational conventions

The provisions of this PAS are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. "organization" rather than "organisation").

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Compliance with a PAS cannot confer immunity from legal obligations.

In particular, attention is drawn to the following specific regulations:

- The Electricity Safety, Quality and Continuity Regulations 2002, Part VI: Generation, 21. Switched alternate sources of energy and 22. Parallel operation [1]; and
- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG) [2].

0 Introduction

Electrical energy (battery) storage forms a key part of renewable energy strategies. Given the benefits of electrical energy storage systems (EESSs) to consumers and electricity providers, and their ability to maximize the effectiveness of renewable energy technologies such as solar photovoltaic (PV) systems, it is expected that there will be a sharp rise in the number of EESSs being installed.

This specification aims to help installers manage fire safety related hazards associated with EESSs in homes in the United Kingdom. The provisions are intended to reduce the risk of batteries in dwellings becoming a source of ignition, and limit the impact of a battery fire should one occur.

Regarding battery location, the basic premise is that the best place for storage batteries is outside dwellings and away from habitable rooms. Where it is not practicable to locate batteries outdoors, some basic requirements are provided for locations containing storage batteries, based on the principles that:

- batteries are separated from habitable rooms, and means of escape for inhabitants, by suitable fire compartmentation;
- fire detection is provided for the battery location, interlinked to a fire alarm system to warn inhabitants of a detected fire; and
- means of escape for inhabitants are not inhibited.

Whilst battery fires, at the time of writing, are low frequency, they have a high impact due to their behaviour in fire. Since some batteries can exhibit focussed jet-like flaming, a higher degree of fire compartmentation should be considered. Fire compartmentation requirements might need to be assessed in future editions of this standard, as there are currently gaps in the knowledge of how fire compartmentation resists lithium battery fires.

This specification is also based on the premise that electrical energy storage systems competent persons are defined in accordance with the Building Regulations Approved Documents of England or the relevant devolved national equivalents in Wales, Scotland and Northern Ireland.

The United States National Fire Protection Association (NFPA) document, NFPA 855, *Standard for the installation of stationary energy storage systems* [3] was used as a guide when developing requirements for storage battery installation locations, and maximum values of stored energy.

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1 Scope

This PAS specifies requirements for fire safety in the installation of small-scale electrical energy storage systems (EESSs) in domestic dwellings that utilize stationary secondary batteries as the medium for energy storage.

The PAS defines fire safety requirements for the installation of EESS components including:

- physical requirements for battery units;
- battery management;
- power conversion equipment (PCE); and
- fault management and fail-to-safe operation of all control and monitoring functions.

The PAS covers installation requirements for:

- installation location in respect of safety and external factors that affect fire safety; and
- protection against fire.

The PAS does not cover:

- battery systems with nominal voltages on the AC and/or DC side exceeding low voltage as defined in BS 7671;
- secondary batteries with total capacity not exceeding 150 Wh incorporated into products or systems that are the subject of harmonized or designated standards (e.g. intruder alarm systems, carbon monoxide alarm systems, fire detection and alarm systems, pluggable uninterruptible power systems, portable appliances, audio/video and information technology equipment);
- domestic dwellings exceeding 200 m² in floor area;
- transportation of batteries;
- systems incorporating second life batteries;
- EESSs that use alternative forms of energy storage;
- EESSs in high risk residential buildings; and
- EESSs connected before a distributor's cut-out or a consumer's meter (collective PEI).

NOTE 1 Existing regulations, *The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG)[2]*, cover the transportation of batteries.

NOTE 2 Attention is drawn to BS 7671, Section 511 regarding the product standards for selected electrical equipment and its intended use.

NOTE 3 The fire safety principles can also be applied to domestic dwellings exceeding 200 m²; however, it is recommended that a fire safety expert is consulted.

NOTE 4 Second life batteries are excluded because there are currently no standards in place to address safety of repurposed batteries. Aligning with BS 7671, this PAS requires batteries to conform to a suitable safety standard relevant for the application (see 6.4). At the time of development of this PAS, the typical application for second life batteries for domestic storage systems comprises second-life electric vehicle traction batteries, and the designer of an electrical installation (perhaps the installer for domestic installations) would therefore be required to make a suitable declaration regarding safety according to Regulation 511.2 of BS 7671.

The PAS is of use to suitably competent designers and installers of EESSs forming part of electrical installations of dwellings and similar simple electrical installations.

This PAS might be of interest to manufacturers of products forming part of an installed EESS and bodies providing independent certification of products, design and installation of an EESS.

2 Normative references

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

BS 476 series, *Fire tests on building materials and structures*

BS 5839 series, *Fire detection and fire alarm systems for buildings*¹⁾

BS 7671, *Requirements for electrical installations*

BS EN 54 series, *Fire detection and fire alarm systems*

BS EN 13501 series, *Fire classification of construction products and building elements*

BS EN 60073, *Basic and safety principles for man-machine interface, marking and identification – Coding principles for indicators and actuators*

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

BS EN 60622, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Sealed nickel-cadmium prismatic rechargeable single cells*

BS EN 60623, *Secondary cells and batteries containing alkaline or other non-acid electrolytes – Vented Nickel-cadmium prismatic rechargeable single cells*

BS EN 61427-1, *Secondary cells and batteries for renewable energy storage – Part 1: General requirements and methods of test – Photovoltaic off-grid application*

BS EN 61427-2, *Secondary cells and batteries for renewable energy storage – Part 2: General requirements and methods of test – On-grid applications*

BS EN 62109-2, *Safety of power converters for use in photovoltaic power systems – Part 2: Particular requirements for inverters*

BS EN 62116, *Utility-interconnected photovoltaic inverters – Test procedure of islanding prevention measures*

BS EN 62262, *Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)*

BS EN 62477-1, *Safety requirements for power electronic converter systems and equipment – Part 1: General*

BS EN IEC 61204-3, *Low-voltage switch mode power supplies – Part 3: Electromagnetic compatibility (EMC)*

BS EN IEC 61204-7, *Low-voltage switch mode power supplies – Part 7: Safety requirements*

BS EN IEC 62485-1, *Safety requirements for secondary batteries and battery installations – Part 1: General safety information*

BS EN IEC 62485-2, *Safety requirements for secondary batteries and battery installations – Part 2: Stationary batteries*

¹⁾ This document also gives a normative reference to BS 5839-6.

BS EN IEC 62485-5, *Safety requirements for secondary batteries and battery installations – Part 5: Safe operation of stationary lithium ion batteries*

BS EN IEC 62933-5-2, *Electrical energy storage (EES) systems. Part 5-2: Safety requirements for grid-integrated EES systems – Electrochemical-based systems*

BS EN IEC/IEEE 82079-1, *Preparation of information for use (instructions for use) of products – Part 1: Principles and general requirements*

IEC 60417, *Graphical symbols for use on equipment*

ISO 7000, *Graphical symbols for use on equipment*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

3.1.1 battery

one or more cells fitted with devices necessary for use, for example; case, terminals, marking and protective devices

[SOURCE: IEC 60050, IEV Ref 482-01-04]

3.1.2 battery monitoring and management system (BMMS)

system comprising different equipment and devices in the installation for the purpose of monitoring and managing the charging, discharging and health state of a battery

3.1.3 cell

basic functional unit, consisting of an assembly of electrodes, electrolyte, container, terminals and usually separators, that is a source of electric energy obtained by direct conversion of chemical energy

[SOURCE: IEC 60050, IEV Ref 482-01-01]

3.1.4 collective PEI

several consuming electrical installations connected to the same public distribution network and sharing one common set of local power supplies and energy storage equipment

[SOURCE: BS HD 60364-8-2]

3.1.5 consumer

<of electricity> entity or party which uses electricity for its own needs

[SOURCE: BS HD 60364-8-2]

3.1.6 dwelling

unit of residential accommodation occupied (whether or not as a sole or main residence):

- a) by a single person or by people living together as a family; or
- b) by not more than six residents living together as a single household, including a household where care is provided for residents; or
- c) by persons who do not live together as a family, but who live in self-contained single-family flats, maisonettes or bedsits within the unit; or
- d) as a shared house.

[SOURCE: BS 5839-6, modified, Note omitted]

3.1.7 individual PEI

single consuming and/or producing electrical installation

[SOURCE: BS HD 60364-8-2]