

TECHNICAL SPECIFICATION



Electric vehicle battery swap system –
Part 1: General and guidance

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INTERNATIONAL
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ELECTRIC VEHICLE BATTERY SWAP SYSTEM –**Part 1: General and guidance**

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Technical Specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC TS 62840-1, which is a Technical Specification, has been prepared by IEC technical committee 69: Electric road vehicles and electric industrial trucks.

The text of this Technical Specification is based on the following documents:

Enquiry draft	Report on voting
69/368/DTS	69/399/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 62840 series, published under the general title *Electric vehicle battery swap system*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

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INTRODUCTION

The purpose of the battery swap system is to provide energy partly or in total to electric road vehicles (EVs) through fast replacement of their swappable battery system (SBS). While charging, the EV typically takes a relatively long time, the battery swap process takes only a few minutes to complete. Thus it will reduce range anxiety and will facilitate travel for longer distances.

As there is a possibility to charge the batteries after their removal from the vehicle in various ways, the impact of this process on the critical infrastructure of the electrical grid is minimized.

Battery swap stations mainly include one or more of the following functions:

- swap of EV swappable battery system (SBS);
- storage of EV SBS;
- charging and cooling of EV SBS;
- testing, maintenance and safety management of EV SBS.

This document serves as generic requirements for battery swap systems for EVs.

The IEC 62840 series includes two parts:

- IEC 62840-1: General and guidance;
- IEC 62840-2: Safety requirements.

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ELECTRIC VEHICLE BATTERY SWAP SYSTEM –

Part 1: General and guidance

1 Scope

This part of IEC 62840, which is a Technical Specification, gives the general overview for battery swap systems, for the purposes of swapping batteries of electric road vehicles (EVs) when the vehicle powertrain is turned off and when the battery swap system is connected to the supply network at standard supply voltages according to IEC 60038 with a rated voltage up to 1 000 V AC and up to 1 500 V DC.

This document is applicable for battery swap systems for EV equipped with one or more swappable battery system (SBS).

NOTE Battery swap systems for light electric vehicles (LEVs) according to the IEC 61851-3¹ series are under consideration.

This document is not applicable to:

- aspects related to maintenance and service of the battery swap station (BSS);
- trolley buses, rail vehicles and vehicles designed primarily for use off-road;
- maintenance and service of EVs.

2 Normative references

[IEC TS 62840-1:2016](https://standards.iteh.ai/catalog/standards/sist/3fb4f6dd-4ad8-4d7e-b1bd-3245b063ca73/iec-ts-62840-1-2016)

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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.

IEC 60038, *IEC standard voltages*

3 Terms and definitions

3.1

electric vehicle

EV

electric road vehicle

vehicle propelled by an electric motor drawing current from a rechargeable storage battery or from other portable energy storage devices (rechargeable, using energy from a source off the vehicle, such as residential or public electric service), which is manufactured primarily for use on public streets, roads or highways

[SOURCE: ISO 17409:2015, 3.19, modified — Some precisions have been added.]

3.2

battery swap system

battery swap station and supporting systems

¹ Under consideration.

3.3 supporting system

system which serve the battery swap station

3.4 battery swap station

BSS

facility that provides EVs with a swappable battery system (SBS)

3.5 battery pack

energy storage device that includes cells or cell assemblies normally connected with cell electronics, voltage class B circuit and overcurrent shut-off device, including electrical interconnections, and interfaces for external systems

Note 1 to entry: For further explanation, see ISO 12405-1:2011, 5.4 and Clause A.2.

Note 2 to entry: Examples of external systems are cooling, voltage class B, auxiliary voltage class A and communication.

[SOURCE: ISO 12405-1:2011, 3.2]

3.6 swappable battery system

SBS

battery pack with a coupler for connecting charger/electric vehicle (EV), lock/unlock devices, battery control unit (BCU), thermal management unit, electrical protection circuit, enclosure and supporting devices

3.7

battery system

energy storage device that includes cells or cell assemblies or battery pack(s) as well as electrical circuits and electronics

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Note 1 to entry: For further explanation, see ISO 12405-1:2011, 5.5.2, 5.5.3, A.3.1 and A.3.2. Battery system components can also be distributed in different devices within the vehicle.

Note 2 to entry: Examples of electronics are the BCU and contactors.

[SOURCE: ISO 12405-1:2011, 3.3]

3.8 swappable battery system coupler

SBS coupler

dedicated coupler for connecting a swappable battery system to an electric vehicle (EV) or to a charging rack

3.9

SBS charger

swappable battery system charger

device installed outside the EV to supply DC power to a swappable battery system (SBS) or a series of SBS

3.10

charging rack

equipment used for carrying a swappable battery system (SBS) and connecting a SBS to a charger to accomplish the charge process

3.11**storage rack**

equipment used to store a swappable battery system (SBS)

3.12**transferring equipment**

equipment used for transferring a swappable battery system (SBS) inside a battery swap station (BSS)

3.13**battery swap equipment
swap equipment**

equipment used for mounting/unmounting a swappable battery system (SBS) to/ from electric vehicles (EVs)

Note 1 to entry: The battery transferring function may be integrated in the battery swap equipment.

3.14**battery control unit****BCU**

electronic device that controls, manages, detects or calculates electric and thermal functions of the battery system and that provides communication between the battery system and the battery swap system

[SOURCE: ISO 12405-1:2011, 3.1, modified — The words "other vehicle controllers" have been replaced by "the battery swap system".]

3.15**human machine interface****HMI**

interface between operating staff and the instrumentation and computer systems connected to the plant

Note 1 to entry: In this case, the plant refers to BSS.

[SOURCE: IEC 60050-395:2014, 395-07-48, modified — The note to entry has been replaced by a new note.]

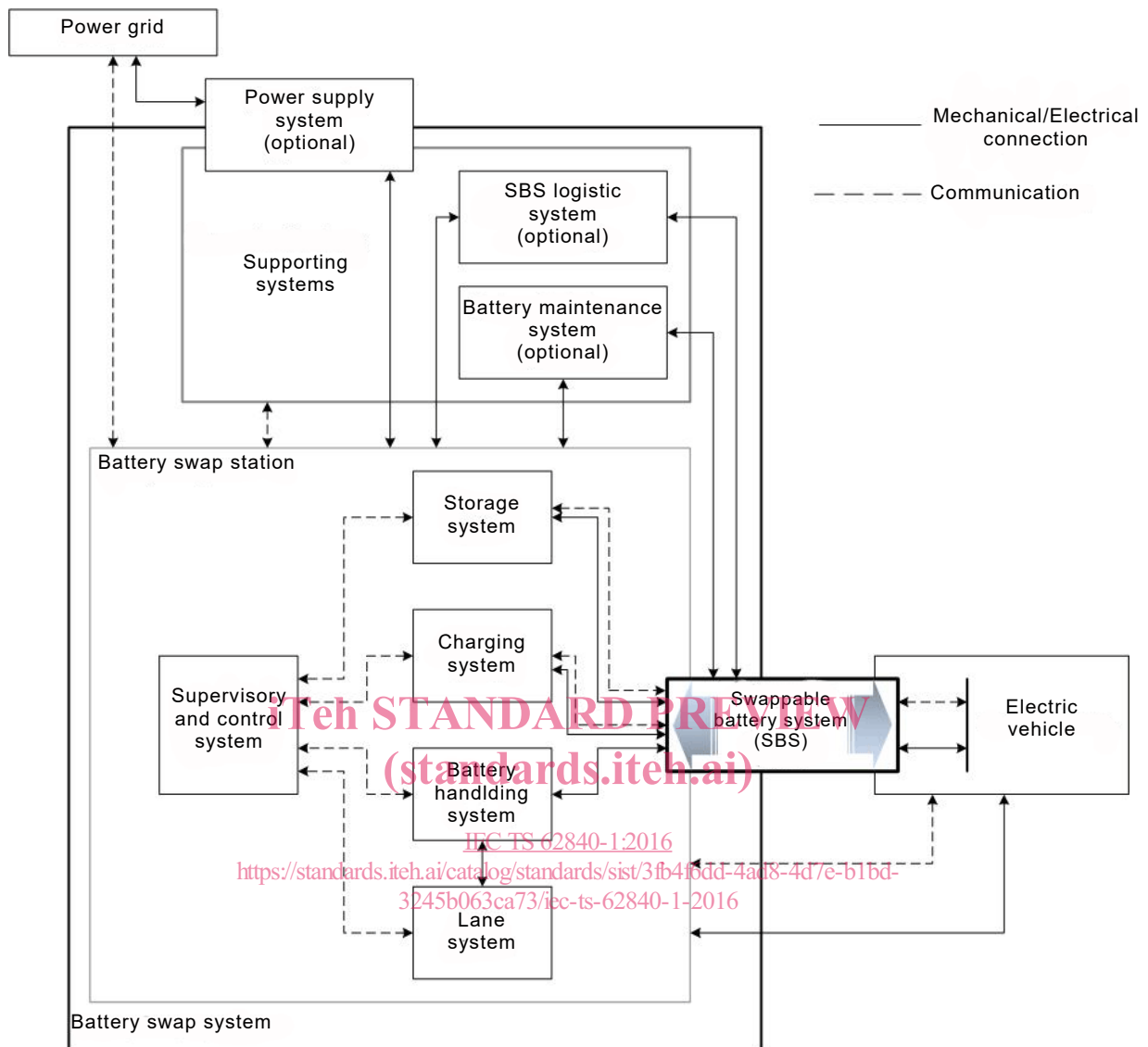
4 System overview**4.1 Battery swap system**

Battery swap systems provide quick, safe and reliable swapping of the swappable battery system (SBS) of electric vehicles (EVs). The batteries will be loaded in a battery swap station (BSS). The SBS are stored in a battery rack in the BSS. The battery swapping is carried out by means of appropriate manipulators.

EV battery swap system consists of:

- BSS,
- supporting systems,
- SBS, and
- power supply system.

Figure 1 shows the composition of the EV battery swap system and the relationships between the various systems.



IEC

Figure 1 – EV battery swap system

4.2 Battery swap station

4.2.1 General description

BSS consists of systems, which provide battery mounting/unmounting, battery transfer, battery storage, battery charging and other functions. BSS may include:

- a lane system,
- a battery handling system,
- a storage system,
- a charging system, and
- a supervisory and control system.

4.2.2 Lane system

The lane system is used to transfer and/or position the EV to the designated location to get ready for battery handling. EVs leave safely through the lane system after SBS are exchanged. The lane system may provide functions such as: