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Introduction

This draft standard is based on national and international discussions. Your comments on this draft are invited and will assist in the preparation of the consequent standard.

For international standards, comments will be reviewed by the relevant UK national committee before sending the consensus UK vote and comments to the international committee, which will then decide appropriate action. If the international standard is approved, it is usual for the text to be published as a British Standard.

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Template for comments and secretariat observations

Date: xx/xx/20xx	Document: ISO/DIS xxxx
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1	2	(3)	4	5	(6)	7
MB	Clause No./ Subclause No./Annex (e.g. 3.1)	Paragraph/Figure/ Table/Note	Type of comment	Commend (justification for change) by the MB	Proposed change by the MB	Secretariat observations on each comment submitted
	3.1	Definition 1	ed	Definition is ambiguous and needs clarifying.	Amend to read '...so that the mains connector to which no connection...'	
	6.4	Paragraph 2	te	The use of the UV photometer as an alternative cannot be supported as serious problems have been encountered in its use in the UK.	Delete reference to UV photometer.	



69/798/CD

COMMITTEE DRAFT (CD)

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69/715/CD, 69/793/CC

IEC TC 69 : ELECTRICAL POWER/ENERGY TRANSFER SYSTEMS FOR ELECTRICALLY PROPELLED ROAD VEHICLES AND INDUSTRIAL TRUCKS

SECRETARIAT:

Belgium

SECRETARY:

Mr Peter Van den Bossche

OF INTEREST TO THE FOLLOWING COMMITTEES:

SC 23H, TC 64

PROPOSED HORIZONTAL STANDARD:



Other TC/SCs are requested to indicate their interest, if any, in this CD to the secretary.

FUNCTIONS CONCERNED:

☐ EMC

☐ ENVIRONMENT

☐ QUALITY ASSURANCE

☒ SAFETY

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TITLE:

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

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ELECTRIC VEHICLE BATTERY SWAP SYSTEM –

Part 1: General and guidance

FOREWORD

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- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

IEC 62840-1, which is an International Standard, has been prepared by IEC technical committee 69: Electrical power/energy transfer systems for electrically propelled road vehicles and industrial trucks.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

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) or removable battery system (RBS). 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 SBS or RBS ;
- storage of EV SBS or RBS;
- charging and cooling of EV SBS or RBS;
- testing, maintenance and safety management of EV SBS or RBS.

This document serves as generic requirements for battery swap systems for EVs, e-Motor vehicles.

This document is published in separate parts according to the following structure:

- IEC 62840-1: Electric vehicle battery swap system Part 1: General and guidance;
- IEC 62840-2: Electric vehicle battery swap system Part 2: Safety requirements;
- IEC PAS 62840-3: Electric vehicle battery swap system Part 3: Particular safety and interoperability requirements for battery swap systems operating with removable RESS/battery systems.

IEC PAS 62840-3 derives from IEC 61851-3 all parts and was established by IEC TC69 WG10 as a referencing document to IEC 61851-3-1.

NOTE: After moving of the document to IEC TC69 WG13, IEC TC69 decided to publish the document as PAS based on IEC TS 61851-3-3 as an intermediate specification, which responds to particular market needs according to 2.4.8 of ISO/IEC DIR 1:2020, published prior to the development of a full International Standard.

By the upcoming revision of IEC 62840 all parts, IEC PAS 62840-3 will be fully integrated into IEC 62840 series.

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

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

– IEC Electropedia: available at <http://www.electropedia.org/>

ISO Online browsing platform: available at <http://www.iso.org/obp>

ELECTRIC VEHICLE BATTERY SWAP SYSTEM –

Part 1: General and guidance

1 Scope

This part of IEC 62840, which is an International Standards, gives the general overview for battery swap systems, for the purposes of swapping batteries of electric road vehicles 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);
- removeable battery systems(RBS) .

This document provides guidance for interoperability.

This document applies to:

- battery swap systems supplied from on-site storage systems (for example buffer batteries etc);
- manual, mechanically assisted and automatic systems;
- battery swap systems intended to supply swappable/removable battery systems having communication allowing to identify the battery system characteristics;
- battery swap systems intended to be installed at an altitude of up to 2000 m.

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;
- safety requirements for mechanical equipment covered by ISO 10218 series;
- locking compartments systems providing AC socket-outlets for the use of manufacturer specific voltage converter units and manufacturer specific battery systems;
- electrical devices and components which are covered by their specific product standards;
- any fix-installed equipment of EV which is covered by ISO;
- EMC requirements for on-board equipment of EV while connected to the BSS.

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.

IEC 60038, *IEC standard voltages*

3 Terms and definitions

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

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

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

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

3.3

supporting system

system which serves the battery swap station

3.4

battery swap station

BSS

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

3.5

battery pack

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

Note 1 to entry: For further explanation, see ISO 12405-4:2018, 3.23 and Clause 3.24

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

[SOURCE: ISO 12405-4:2018, 3.23 and 3.24]

3.6

swappable battery system

Swappable RESS

SBS

Battery system/RESS that can be moved /removed from an EV by handling system of BSS

3.7

battery system

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

293 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
294 components can also be distributed in different devices within the vehicle.

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

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

297 **3.8**
298 **swappable battery system coupler**
299 **SBS coupler**

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

302 **3.9**
303 **SBS charger**
304 **swappable battery system charger**

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

307 **3.10**
308 **charging rack**

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

311 **3.11**
312 **storage rack**

313 equipment used to store a swappable battery system (SBS)

314 **3.12**
315 **transferring equipment**

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

318 **3.13**
319 **battery swap equipment**
320 **swap equipment**

321 equipment used for mounting/unmounting removable battery system to/ from electric vehicles
322 (EVs)

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

324 **3.14**
325 **battery control unit**
326 **BCU**

327 electronic device that controls, manages, detects or calculates electric and thermal functions
328 of the battery system and that provides communication between the battery system and other
329 vehicle controllers

330 Note 1 to entry: See also Annex A for further explanation.

331 [SOURCE: ISO 12405-4:2018, 3.1]

332 **3.15**
333 **Voltage converter unit**
334 **VCU**

335 voltage converter, local EMS and communication interface.

336 [SOURCE: IEC TS 61851-3-2]

3.16**battery management system****BMS**

local energy management system (EMS Unit) for the battery system, protecting the battery system from damage, monitoring and increasing the lifetime, and maintaining the functional state

Note 1 to entry: BMS and BCU (according to ISO 12405 all parts) do not have the same functions

[SOURCE: IEC TS 61851-3-4, 3.7]

3.17**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.]

3.18**Removable battery system****Removable RESS**

Battery system/RESS that can be moved /removed from an EV by hand or with the assistance of an installation/device.

3.19**RESS coupler**

a means enabling the connection of RESS to an EV or an EV supply equipment.

3.20**removable battery system****Removable RESS****RBS**

Battery system/RESS that can be moved /removed from an EV by hand (portable RESS) or with the assistance of an installation/device (mobile RESS)

4 Abbreviations

RESS Rechargeable Energy Storage System

RBS Removable battery system

SBS Swappable battery system

BSS Battery swap station

BCU Battery control unit

HMI Human machine interface

BMS Battery management system

EMSC Energy management system controller

380	EMS	Energy management system
381	SOC	State of charge
382	SOH	State of health
383	VCU	Voltage converter unit

384 **5 General requirements**

385 The battery swap system for swappable/removable battery systems described in this
386 document allows simultaneous connection of swappable/removable battery systems to the
387 BSS independent of their SOC, SOH, chemistry and performance.

388 The BSS shall be rated for one or a range of standard nominal voltages as given in IEC 60038.

389 For extreme environment or other special service conditions, see IEC 61439-7:2018.

390 Unless otherwise specified, the tests shall be carried out in a draught-free location and at an
391 ambient temperature of $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$.

392 **6 Classification**

393 **6.1 Characteristics of supply network**

394 The BSS shall be classified according to the supply network that it is intended to be
395 connected to:

- 396 • AC supply network,
- 397 • DC supply network

398 **6.2 Method of connection**

399 The BSS shall be classified according to the electric connection method:

- 400 • plug and cable connected,
- 401 • permanently connected

402 **6.3 Automation level**

403 **6.3.1 General**

404 Automation levels are classified as follows:

- 405 • full automatic,
- 406 • semi-automatic,
- 407 • manual

408 **6.3.2 Full automatic**

409 The full automatic battery swap processes include:

- 410 • positioning the vehicle,
- 411 • swapping the SBS from/to the vehicle,
- 412 • transferring the SBS from/to the storage system,