TR 25-4:2022
(ICS 43.120)

TECHNICAL REFERENCE

Electric vehicles charging system

– Part 4 : Battery swapping

Singapore Standards Council

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Contents

Foreword

This Technical Reference (TR) was prepared by the Working Group on Electric Vehicles Charging System under the direction of the Manufacturing Standards Committee.

TR 25 was developed in 2010 to specify the technical specifications and safety requirements for electric vehicles charging systems charging systems in Singapore. In 2016, it was revised to further align with the international requirements IEC 61851 and IEC 62196 series of standards.

In this 2022 revision, the TR has been updated with new requirements to address low power charging, high power charging and battery swapping.

This standard consists of the following parts under the generic title “Electric vehicles charging system”:

Part 1 – Electrical safety and general requirements
Part 2 – Low power charging
Part 3 – High power charging
Part 4 – Battery swapping

This part gives the requirements for battery swap systems, whose protection relies on double or reinforced insulation, intended to be used for electric motorcycle. Nomenclatures and definitions unique to local context, such as kiosk, connection point, etc are provided.

This TR is a provisional standard made available for application over a period of three years. The aim is to use the experience gained to update the TR so that it can be adopted as a Singapore Standard. Users of the TR are invited to provide feedback on its technical content, clarity and ease of use. Feedback can be submitted using the form provided in the TR. At the end of the three years, the TR will be reviewed, taking into account any feedback or other considerations, to further its development into a Singapore Standard if found suitable.

Permission has been sought from the International Electrotechnical Commission (IEC) for the reproduction of materials from the following IEC standards (refer to the footnotes in the standard):

IEC 60050-195	International Electrotechnical Vocabulary (IEV) - Part 195: Earthing and protection against electric shock
IEC 62840-2	Electric vehicle battery swap system - Part 2: Safety requirements
IEC 60335-1	Household and similar electrical appliances - Safety - Part 1: General requirements

Attention is drawn to the possibility that some of the elements of this Technical Reference may be the subject of patent rights. Enterprise Singapore shall not be held responsible for identifying any or all of such patent rights.

NOTE

1. *Singapore Standards (SSs) and Technical References (TRs) are reviewed periodically to keep abreast of technical changes, technological developments and industry practices. The changes are documented through the issue of either amendments or revisions. Where SSs are deemed to be stable, i.e. no foreseeable changes in them, they will be classified as "mature standards". Mature standards will not be subject to further review, unless there are requests to review such standards.*

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Electric vehicles charging system – Part 4 : Battery swapping

1 Scope

This Technical Reference (TR) gives the requirements for battery swap systems, whose protection relies on double or reinforced insulation (DRI), intended to be used for electric motorcycles.

Small swappable battery systems (SBSs) are in use with most light personal transport systems. SBSs are usually of limited capacity as the vehicles only have limited travel range. Therefore, with the use of battery systems exchange, it allows for increased daily range of these vehicles without the need for charging especially where specific parking places is required for charging equipment. This service seems to be especially useful for private users and commercial company fleet vehicles (e.g. delivery companies, repair service). Specific use cases (UCs) are described in Annex A.

This TR applies to battery swapping for electric motorcycles. Battery swapping systems for vehicles of UN categories M and N are described in Annex B.

This TR is applicable to battery swapping equipment and procedures for charging SBSs that provide power to UN category L electric vehicles (EVs) in public and private premises where the equipment connects to a supply voltage up to 480 V AC or up to 400 V DC and outputs a rated voltage up to 120 V DC per battery system with protection against electric shocks such as DRI between all AC and DC inputs and outputs.

This TR covers the requirements for electrical installation, functional needs and safety.

The objective of this TR is to provide requirements for EV charging systems that align with currently accepted international practices and take into consideration local conditions. It states the safety requirements to protect persons and property against electrical hazards.

2 Normative references

The following referenced documents are indispensable for the application of this TR. For dated references, only the edition cited applies. For undated references, the latest edition (including any amendments) applies.

TR 25-1:2022	Electric vehicles charging system – Part 1: Electrical safety and general requirements
IEC 60068-2-30	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)
IEC 60068-2-78	Environmental testing – Part 2-78: Tests – Test cab: Damp heat, steady state
IEC 60529	Degree of protection provided by enclosures (IP code)
IEC 60664-1	Insulation coordination for equipment within low-voltage supply systems – Part 1: Principles, requirements and tests
IEC 60950-1	Information technology equipment – Safety – Part 1: General requirements
IEC 60990:2005	Methods of measurement of touch current and protective conductor current

IEC 61180-1	High-voltage test techniques for low-voltage equipment – Part 1: Definitions, test and procedure requirements
IEC 61851-23:2014	Electric vehicle conductive charging systems – Part 23: DC electric vehicle charging station
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
EC TS 61439-7:2014	Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations
IEC TS 62196-4	Plugs, socket-outlets, vehicle connectors and vehicles inlet – Conductive charging of electric vehicles – Part 4: Dimensional compatibility and interchangeability requirements for d.c. pin and contact-tube accessories for class II or class III applications
SS 638	Code of practice for electrical installations
UL 1439	Tests for sharpness of edges on equipment