TR 25-1:2022+A1:2025
(ICS 43.120)

TECHNICAL REFERENCE

Electric vehicles charging system

– Part 1 : Electrical safety and general requirements

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Foreword

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

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

In this 2021 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 provides general requirements for safety applicable to on-board and off-board equipment for charging electric vehicles, and battery swapping equipment and kiosk, installed in public and non-public car parks, public places and non-public premises at standard supply voltages up to 1000 V AC and at voltages up to 1500 V DC. Testing and inspection requirements of the electric vehicle charging station are also included in this revision.

This part covers:

- General principles for safety and maintenance;
- AC electric vehicle charging station;
- DC electric vehicle charging station using Mode 4 charging;
- Commissioning, testing and inspection of EV charging stations.

In addition, specific requirements for vehicle inlet, connector, plug and socket-outlet, battery swapping facilities are included.

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 60364-7-722	Low-voltage electrical installations – Part 7-722: Requirements for special installations or locations – Supplies for electric vehicles
IEC 61851-1	Electric vehicle conductive charging system – Part 1: General requirements
IEC 61851-23	Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station

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.*

2. *An SS or TR is voluntary in nature except when it is made mandatory by a regulatory authority. It can also be cited in contracts making its application a business necessity. Users are advised to assess and determine whether the SS or TR is suitable for their intended use or purpose. If required, they should refer to the relevant professionals or experts for advice on the use of the document. Enterprise Singapore and the Singapore Standards Council shall not be liable for any damages whether directly or indirectly suffered by anyone or any organisation as a result of the use of any SS or TR. Although care has been taken to draft this standard, users are also advised to ensure that they apply the information after due diligence.*

3. *Compliance with a SS or TR does not exempt users from any legal obligations.*

Electric vehicles charging system – Part 1 : Electrical safety and general requirements

1 Scope

This Technical Reference (TR) is to provide general requirements for safety applicable to:

- on-board and off-board equipment for charging electric vehicles; and
- battery swapping equipment and kiosk;

installed in public or non-public car parks, public places and non-public premises at standard supply voltages up to 1000 V AC and at voltages up to 1500 V DC.

It covers the safety requirements for the electrical installation to provide supply for the charging of the electric vehicle (EV) or the battery. Testing and inspection requirements of the electric vehicle charging station are also included.

The objective of this TR is to provide general guidelines for electric vehicle charging system that aligns with currently accepted international practices and takes into consideration local conditions. It states the safety requirements to protect person and property against electrical hazards.

This TR does not cover:

a) Personal mobility device (PMD);
b) Electric buggy used in controlled environment, such as golf course, shopping complex, and the like;
c) Any other electric vehicle of design speed less than 25 km/h;
d) Circuits intended for feeding back electricity from electric vehicles; and
e) Mobile EV charging system.

Socket-outlets to SS 145 are not used for charging of EV.

General requirements for charging station are covered from Clause 5 onwards of this Part 1.

2 Normative references

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

IEC 60068-2	Environmental testing – Part 2-1: Tests – Test A: Cold
	Environmental testing – Part 2-30: Tests – Test Db: Damp heat, cyclic (12 h + 12 h cycle)
	Environmental testing – Part 2-75: Tests – Test Eh: Hammer tests
	Environmental testing – Part 2-78: Tests – Test Cab: Damp heat, steady state

IEC 60309	Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 1: General requirements
	Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes – Part 2: Dimensional compatibility requirements for pin and contact-tube accessories
IEC 60529	Degrees of protection provided by enclosures (IP code)
IEC 60947	Low-voltage switchgear and controlgear – Part 1: General rules
	Low-voltage switchgear and controlgear – Part 2: Circuit-breakers
	Low-voltage switchgear and controlgear – Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units
	Low-voltage switchgear and controlgear – Part 4-1: Contactors and motor-starters – Electromechanical contactors and motor-starters
IEC 60950-1:2005	Information technology equipment – Safety – Part 1: General requirements
IEC 60990	Methods of measurement of touch current and protective conductor current
IEC 61000-3	Electromagnetic compatibility (EMC) – Part 3-2: Limits – Limits for harmonic current emissions (equipment input current ≤16 A per phase)
	Electromagnetic compatibility (EMC) – Part 3-12: Limits – Limits for harmonic currents produced by equipment connected to public low-voltage systems with input current >16 A and ≤ 75 A per phase
IEC 61439	Low-voltage switchgear and controlgear assemblies – Part 1: General rules
	Low-voltage switchgear and controlgear assemblies – Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicle charging stations
IEC 61810-1	Electromechanical elementary relays – Part 1: General and safety requirements
IEC 61851	Electric vehicle conductive charging system – Part 1: General requirements
	Electric vehicle conductive charging system – Part 21: Electric vehicle requirements for conductive connection to AC/DC supply
	A1 Electric vehicle conductive charging system – Part 21-2: Electric vehicle requirements for conductive connection to an AC/DC supply – EMC requirements for off board electric vehicle charging systems. A1
	Electric vehicle conductive charging system – Part 23: DC electric vehicle charging station
	Electric vehicle conductive charging system – Part 24: Digital communication between a DC EV charging station and an electric vehicle for control of DC charging

IEC 62196	Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 1: General requirements
	Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 2: Dimensional compatibility and interchangeability requirements for AC pin and contact-tube accessories
	Plugs, socket-outlets, vehicle connectors and vehicle inlets – Conductive charging of electric vehicles – Part 3: Dimensional compatibility and interchangeability requirements for DC and AC/DC pin and contact-tube vehicle couplers
IEC 62262	Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK code)
IEC 62752	In-cable control and protection device for mode 2 charging of electric road vehicles (IC-CPD)
IEC CISPR 11	Industrial, scientific and medical equipment – Radio-frequency disturbance characteristics – Limits and methods of measurement
IEC CISPR 16	Specification for radio disturbance and immunity measuring apparatus and methods – Part 1-2: Radio disturbance and immunity measuring apparatus – Coupling devices for conducted disturbance measurements
	Specification for radio disturbance and immunity measuring apparatus and methods – Part 2-3: Methods of measurement of disturbances and immunity – Radiated disturbance measurements
ISO 6469-2	Electrically propelled road vehicles – Safety specifications – Part 2 : Vehicle operational safety means and protection against failures
ISO 6469-3	Electrically propelled road vehicles – Safety specifications – Part 3: Electrical safety
ISO 15118-3	Road vehicles – Vehicle to grid communication interface, Part 3 : Physical and data link layer requirements
ISO 17409	Electrically propelled road vehicles – Connection to an external electric power supply – Safety requirements
SS 97	Residual current operated circuit-breakers without integral overcurrent protection for household and similar uses (RCCBs) – General rules
SS 480	Residual current operated circuit-breakers with integral overcurrent protection for household and similar uses (RCBOs) – General rules
SS 638	Code of practice for electrical installations