TR 136:2025
(ICS 47.020.60)

TECHNICAL REFERENCE

Electric harbour craft charging and battery swap system

Singapore Standards Council

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Contents

Page

Foreword 4
1 Scope 6
2 Normative references 6
3 Terms and definitions 9
4 General requirements and characteristics 16
4.1 Main intake switchboard 16
4.2 Protection against electric shock 17
4.3 Operational conditions and external influences 18
4.4 Electrical characteristics 19
4.5 Mechanical characteristics 19
4.6 Permissible surface temperature 20
4.7 Electromagnetic compatibility (EMC) 20
4.8 Control circuit supply integrity 20
5 Particular requirements for the electric harbour craft charging system (EHCCS) 20
5.1 Requirements for the connection between the power supply and the electric harbour craft (e-HC) 20
5.2 Requirements for e-HC inlet, connector, plug and socket-outlet 22
6 Particular requirements for battery swap operations 22
6.1 Zones 22
6.2 Classification 24
6.3 Safety requirements of systems 26
6.4 Communication 32
6.5 Protection against electric shock 32
6.6 Equipment construction requirements 35
6.7 Electromagnetic compatibility (EMC) 39
6.8 Marking and instructions 39

Annexes

A Use cases 42
A.1 Use case for positioning of the e-HC 42
A.2 Use case for swapping swappable battery system (SBS) 42
A.3 Use case for charging swappable battery system (SBS) 43
B BSS solutions 44
B.1 General 44
B.2 BSS for commercial e-HCs 45

Tables

1 Accessibility of e-HC mooring zone 23

2 Accessibility of battery swap zone 23
3 Accessibility of battery storage zone 24
4 Accessibility of battery charging zone 24

Figures

1 e-HC battery swap system 12
2 Electric harbour craft charging system (EHCCS) 13

Bibliography 46

Foreword

This Technical Reference (TR) was prepared by the Working Group on Electric Harbour Crafts Charging System under the direction of the Electrical and Electronic Standards Committee.

Electrification is a major technological pathway for the harbour craft sector to decarbonise and reduce the greenhouse gas emissions for maritime Singapore. Electric harbour craft (e-HC) is powered by electricity for propulsion and loads. It may involve recharging the onboard energy storage system or using swappable battery system (SBS).

NOTE – In Singapore, a harbour craft or pleasure craft is any kind of vessel used for commercial or sport or pleasure purposes. The vessels shown below are licensed by the Maritime and Port Authority of Singapore (MPA):

SB – Vessel used for the carriage in bulk of petroleum, liquefied gases, liquid chemicals or vegetable/animal oils
SC – Vessel used for the carriage of dry or packaged cargoes
SP – Vessel used for the carriage of passengers
ST – Vessel used for towing, pushing or pulling other vessels
SR – Vessel used for any other purpose
SZ – in the case of a pleasure craft for private use
SZH – in the case of a pleasure craft for commercial use

The following two key technological advancements are needed for battery-powered harbour craft to gain widespread acceptance in Singapore:

a) Higher charge rate to reduce the time spent for battery charging as the battery capacity for e-HC tends to be higher than land electric vehicles to meet daily service requirements.

b) Advancing the compatibility of battery swap operations with that of existing operations performed by the harbour craft to reduce unnecessary service downtime.

The above advancements aim to mitigate the overall impact to marine service delivery as Singapore adopts e-HC.

As swappable batteries are not limited to charging at areas of existing operations performed by the e-HC, it can also mitigate the potential of substation overload and minimise impact on the critical infrastructure of the electrical grid.

The standardisation of charging and battery swap system is crucial to ensure electrical and mechanical safety, interoperability and reduction in costs.

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.

It is presupposed that in the course of their work, users will comply with all relevant regulatory and statutory requirements. Some examples of relevant regulations and acts are listed in the Bibliography. The Singapore Standards Council and Enterprise Singapore shall not be responsible for identifying all of such legal obligations.

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 61851-1:2017 Electric vehicle conductive charging system – Part 1: General requirements

IEC 62619:2022 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications

IEC 62840-1:2016 Electric vehicle battery swap system – Part 1: General and guidance

IEC 62840-2:2016 Electric vehicle battery swap system – Part 2: Safety requirements

Acknowledgement is made for the use of information from the above publications.

Attention is drawn to the possibility that some of the elements of this TR 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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e-HC charging and battery swap system

1 Scope

The Technical Reference (TR) covers the safety requirements applicable to on-board and off-board equipment for charging e-HC and battery swapping operations, connected to the supply network at standard supply voltage up to 1000 V AC and/or 1500 V DC. Testing and inspection requirements for the charging facilities are also included.

The TR covers the following:

a) e-HC Charging System: Provides general requirements and guidelines for safety applicable to onshore electrical installations for the purpose of supplying electrical power to charge batteries installed in e-HC berthed at shoreside or facilities onshore, allowing for battery-swapping needs or similar application as agreed upon. The cable management system is included in this TR's requirements.

b) e-HC Battery Swap System: Provides general overview of a battery swap system, for swapping one or more SBS 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 1000 V AC and up to 1500 V DC. The TR covers or refers to the necessary interconnectivity, interoperability, and communication requirements.

The TR will cover or refer to the necessary and relevant interconnectivity, interoperability, and communication requirements.

This TR does not cover:

a) requirements for the power system configuration for e-HC;
b) requirements for design of permanent structure (e.g. cranes) for safety and health;
c) requirements for shore connection systems to supply ships with electrical power from shore, which are covered by the IEC 80005 series of standards; and
d) aspects related to the maintenance and service of the battery swap station (BSS) or e-HC.

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 60038	IEC standard voltages
IEC 60079 series	Explosive atmospheres
IEC 60092 series	Electrical installations in ships
IEC 60112	Method for the determination of the proof and the comparative tracking indices of solid insulting materials
IEC 60204-1	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
IEC 60309 series	Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes