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colour inside

Marine energy – Wave, tidal and other water current converters – Part 30: Electrical power quality requirements

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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Part 30: Electrical power quality requirements

FOREWORD

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- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- 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.

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

IEC TS 62600-30, which is a technical specification, has been prepared by IEC technical committee 114: Marine energy – Wave, tidal and other water current converters.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
114/238/DTS	114/253A/RVDTS

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

A list of all parts of the IEC 62600 series, under the general title *Marine energy – Wave, tidal and other water current converters*, 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- withdrawn,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.

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

Marine energy conversion systems, as viable electric power sources for utility and community-based applications, require close attention to the quality of the power produced. Poor power quality has negative impacts on both the electrical power source and the load. Therefore, guidance is needed for the manufacturer, developer and user on how to mitigate power quality issues during the design of the device. Electrical system planners also need to identify the requirements for grid integration of such variable and intermittent energy sources, while maintaining high reliability and power quality standards.

Conceptually, except for wave energy convertors, many marine energy converter unit devices operate in a manner similar to wind turbines. As power quality is a mature topic within other renewable and conventional power generation schemes, there are numerous standards, codes, and guidelines in existence. In contrast, there are no standards or technical specifications for marine power generation systems that deal with the power quality issues and the associated integration needs. Therefore, this knowledge-gap needs to be addressed through incremental, detailed and collaborative standards development.

This technical specification aims at:

- identifying power quality issues and parameters (non-device specific and non-prescriptive) for single/three-phase, grid-connected/off-grid (including micro-mini grid) marine wave, tidal and other water current converter-based power systems;
- establishing the measurement methods, application techniques and result-interpretation guidelines.

In addition to containing the associated definitions, normative references, symbols and units, forms, annexes, as well as other supporting material, the core of this technical specification would contain the following key items:

- identify characteristic parameters, define and specify the quantities required to characterize the power quality impacts of marine energy conversion devices,
- develop measurement procedures as pertains to marine energy devices,
- outline standardized procedures for measuring the characteristic parameters, including test and measurement conditions, and test equipment requirements.

It is expected that this technical specification will provide evaluation guidelines for device developers and applied researchers.

Assessment of power quality for utilities will be part of a separate, future technical specification that is currently being developed under IEC TC 8 SC 8A.

MARINE ENERGY – WAVE, TIDAL AND OTHER WATER CURRENT CONVERTERS –

Part 30: Electrical power quality requirements

1 Scope

This part of IEC 62600 includes:

- definition and specification of the quantities to be determined for characterizing the power quality of a marine energy (wave, tidal and other water current) converter unit;
- measurement procedures for quantifying the characteristics of a marine energy (wave, tidal and other water current) converter.

The measurement procedures are valid for a single marine energy converter (MEC) unit (or farm) with three-phase grid or an off-grid connection. The measurement procedures are valid for any size of MEC unit, though this document only requires MEC unit types intended for PCC (Point of Common Coupling) at Medium Voltage (MV) or High Voltage (HV) to be tested and characterized. In addition, a simplified measurement and reporting procedure is outlined for MEC units connected at Low Voltage (LV) networks. MV–connected and LV-connected devices are defined as:

- MV connected units – typically multiple three-phase MEC units operating as a marine power farm and delivering power through a HV or MV network;
- LV connected units – typically single-phase or three-phase units deployed in isolated, hybrid or micro-grid type systems supplying small-scale loads.

Considering the nascent status of the marine energy sector, the following limitations of this document are to be recognized:

- voltage fluctuations under switching operation – the current revision only considers voltage fluctuations under continuous operation;
- resource classifications – to categorize the measured flicker quantities, various resource classes are suggested only as guidelines. The user is advised to use these resource classes judiciously.

The measurement procedures are designed to be as non-site-specific as possible so that power quality characteristics measured at a test site, for example, can be considered valid at other sites also providing the same MEC unit configuration and operation modes (for example control parameters). If the configuration or operation mode is changed in any way that might cause the MEC unit to behave differently with respect to power quality, the power quality measurement procedures must be repeated.

This document is for testing of wave, tidal and other water current energy converter units, though it contains information that may also be useful for testing of MEC farms. The cases described are not intended for Ocean Thermal Energy Conversion (OTEC) systems.

NOTE This document uses the following terms for system voltage:

– low voltage (LV) refers to U_n <= 1 kV;

– medium voltage (MV) refers to 1 kV < U_n <= 35 kV;

– high voltage (HV) refers to U_n > 35 kV.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TR 61000-3-6:2008*, Electromagnetic compatibility (EMC) – Part 3-6: Limits – Assessment of emission limits for the connection of distorting installations to MV, HV and EHV power systems*

IEC TR 61000-3-7:2008, *Electromagnetic compatibility (EMC) – Part 3-7: Limits – Assessment of emission limits for the connection of fluctuating installations to MV, HV and EHV power systems*

IEC 61000-4-7:2002, *Electromagnetic compatibility (EMC) – Part 4-7: Testing and measurement techniques – General guide on harmonics and interharmonics measurements and instrumentation, for power supply systems and equipment connected thereto*
IEC 61000-4-7:2002/AMD1:2008

IEC 61000-4-15:2010, *Electromagnetic compatibility (EMC) – Part 4-15: Testing and measurement techniques – Flickermeter – Functional and design specifications*

IEC 61400-21, *Wind turbines – Part 21: Measurement and assessment of power quality characteristics of grid connected wind turbines*

IEC 61800-3:2017, *Adjustable speed electrical power drive systems – Part 3: EMC requirements and specific test methods*

IEC 61869-1:2007*, Instrument transformers – Part 1: General requirements*

IEC 61869-2:2012, *Instrument transformers – Part 2: Additional requirements for current transformers*

IEC 61869-3:2011*, Instrument transformers – Part 3: Additional requirements for inductive voltage transformers*

IEC 62008:2005, *Performance characteristics and calibration methods for digital data acquisition systems and relevant software*

IEC TS 62600-100:2012, *Marine energy – Wave, tidal and other water current converters – Part 100: Electricity producing wave energy converters – Power performance assessment*

IEC TS 62600-101:2015, *Marine energy – Wave, tidal and other water current converters – Part 101: Wave energy resource assessment and characterization*

IEC TS 62600-201:2015, *Marine energy – Wave, tidal and other water current converters – Part 201: Tidal energy resource assessment and characterization*