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TECHNICAL SPECIFICATION

Marine energy – Wave, tidal and other water current converters –
Part 4: Specification for establishing qualification of new technology

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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.

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

IEC TS 62600-4, which is a Technical Specification, has been prepared by IEC technical committee TC 114: Marine energy – Wave, tidal and other water current converters.

The text of this Technical Specification is based on the following documents:

DTS	Report on voting
114/346/DTS	114/365A/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 in the IEC 62600 series, published 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- withdrawn,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.

INTRODUCTION

Certification normally qualifies technology against existing standards to confirm compliance. Technology Qualification (TQ) differs from ordinary certification in that it allows systems to be qualified that do not conform to an existing standard (or may partially conform to an existing standard). The approaches to Technology Qualification by several Certification Bodies are in the references listed in the Bibliography.

Technology Qualification is used both when the technology is completely novel and when only parts of it are novel. For example, some technologies may have been mostly demonstrated in the past, but may have some subsystems which may be novel. Technology Qualification can help developers demonstrate that the technology has been properly developed and this can be of assistance to stakeholders (such as financial institutions).

The deliverable associated with this process is the Technology Qualification Plan (TQP).

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

Part 4: Specification for establishing qualification of new technology

1 Scope

This part of IEC 62600 specifies the requirements of the technology qualification process for marine renewable technologies. Technology Qualification is a process of providing evidence and arguments to support claims that the technology under assessment will function reliably in a target operating environment within specific limits and with an acceptable level of confidence.

The Technology Qualification process is also assumed in IEC TS 62600-2: 2019.

The objective of this document is to provide the necessary practices and technical requirements, regarding technology qualification methodology, to support the needs of the IECRE certification process for marine renewables energy systems. Technology Qualification may be performed at the beginning of the certification process to identify the uncertainties, novelties, and modes of failure, mechanisms of failure, risks and risk control measures. In addition, Technology Qualification will identify the standards that are applicable, to what extent and what adaptation to the technology is required to address the risks. The Technology Qualification Plan is the deliverable arising from this process and it will provide all necessary actions to achieve certification.

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 31010:2009, *Risk management – Risk assessment techniques*

IEC 61882:2016, *Hazard and operability studies (HAZOP studies) – Application guide*

IEC TS 62600-1, *Marine energy – Wave, tidal and other water current converters – Part 1: Vocabulary*

ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories*

ISO/IEC 17065, *Conformity assessment – requirements for bodies certifying products processes and services*

ISO 17776:2016, *Petroleum and natural gas industries – Offshore production installations – Major accident hazard management during the design of new installations*

3 Terms, definitions and abbreviated terms

For the purposes of this document, the terms and definitions given in IEC TS 62600-1 and the following 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 Terms and definitions

3.1.1
application area
environmental conditions, maintenance conditions, or operating parameters which a subsystem or component within the technology is operating within

3.1.2
independent review basis
requirements for a product's components, assemblies or systems specifications including: operating conditions; performance targets and reliability targets

Note 1 to entry: These form the basis against which the product, component, assembly or system will be assessed during Technology Qualification. It covers Demonstrated, Limited field history and New or Unproven technology.

3.1.3
technology qualification plan
document created at the conclusion of the definition phase. This document covers both novel aspects and aspects which fully conform to existing codes and standards

Note 1 to entry: This includes the standards and certification levels agreed upon for the product, component, assembly and/or system, and the testing plan as defined by the qualification methods. The document contains the plan for all actions to be carried out during the certification process detailed in these procedures.

3.1.4
technology: degrees of novelty
level of maturity to which a knowhow is classified as Validated

Note 1 to entry: The degree of technology novelty combined with where/how the technology is applied (Application Area) is classified in categories to be used as input to a risk assessment.

3.1.4.1
validated technology
knowhow that has a documented track record of operation within a defined environment

Note 1 to entry: This documentation provides confidence in the technology from practical operations (including testing), with respect to the ability of the technology to meet the specified requirements and is technology that has been used in the industry for many years with modes of failure and failure mechanisms identified and controlled by design, fabrication, testing and maintenance requirements provided in standards or industry practice.

3.1.4.2
limited field history technology
knowhow that has been used in a limited range of applications and conditions

Note 1 to entry: The technology has limited statistical basis and track record to clearly conclude that there are no new technical uncertainties to be identified. Standards and procedures may not have already been developed to address the technology.

3.1.4.3
new or unproven technology
knowhow that is not demonstrated or has no track record

Note 1 to entry: The failure modes and mechanisms of failure are not known or there is limited understanding of how the technology can fail and the safety margins needed to avoid failures. The technology has significant uncertainties.

3.1.5
Technology Qualification
TQ
process for identifying and providing the evidence that the technology will function reliably within specified limits and with an acceptable level of confidence

3.2 Abbreviated terms

API	American Petroleum Institute
DOE	Department of Energy (US)
ME	Marine Energy
TRL	Technology Readiness Levels
IRL	Integration Readiness Levels
RPN	Risk Priority Number

4 Independent review

ISO/IEC 17025 and ISO/IEC 17065 outline the management of the processes for independent bodies participating in TQ and certification and should be referenced, if guidance is needed.

The standards which are used as part of the independent review process should be those which are recognised by industry as being representative of current best practice.

5 Technology qualification overview

The Technology Qualification process uses a risk-based approach to verify that the technology meets its intended Qualification Basis. It is usually used for technology which is novel or technology which incorporates novel aspects. The Technology Qualification process comprises the modules as shown in Figure 1.

The subsystems / components in Table 1 are divided into the following classes:

1) Class 1: No new technical uncertainties
2) Class 2: New technical uncertainties
3) Class 3: New technical risks
4) Class 4: Demanding new technical risks

Table 1 – Technology classes

Application area	Technology: degrees of novelty		
	Validated (modified TRL 7-9)[a]	Limited field history (modified TRL 4-6)[a]	New or unproven (modified TRL 1-3)[a]
Known	1	2	3
New	2	3	4

[a] See Annex D for details.

Validated technology operating in a known application is considered technology classified as Class 1 with no new technical uncertainties. All other classes reflect varying levels of technology novelty and application uncertainty.