



TECHNICAL SPECIFICATION



**Marine energy – Wave, tidal and other water current converters –
Part 103: Guidelines for the early stage development of wave energy converters –
Best practices and recommended procedures for the testing of pre-prototype
devices**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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CONTENTS

FOREWORD.....	6
INTRODUCTION.....	8
1 Scope.....	9
2 Normative references.....	9
3 Terms, definitions, symbols and abbreviated terms.....	10
3.1 Terms and definitions.....	10
3.2 Symbols and abbreviated terms.....	11
4 Staged development approach.....	12
4.1 General.....	12
4.2 Stage gates.....	13
4.2.1 General.....	13
4.2.2 Criteria.....	13
4.3 Stage 1.....	14
4.3.1 Scope.....	14
4.3.2 Stage Gate 1.....	15
4.4 Stage 2.....	15
4.4.1 Scope.....	15
4.4.2 Stage Gate 2.....	16
4.5 Stage 3.....	16
4.5.1 Scope.....	16
4.5.2 Stage Gate 3.....	17
5 Test planning.....	17
5.1 WEC similitudes.....	17
5.1.1 General.....	17
5.1.2 Power conversion chain (PCC) similitude.....	18
5.2 Design statement.....	19
5.3 Facility selection and outline plan.....	20
5.3.1 General.....	20
5.3.2 Stages 1 and 2.....	20
5.3.3 Stage 3.....	21
5.4 Physical model considerations: Absorbing body and mooring system.....	22
5.4.1 Stage 1.....	22
5.4.2 Stage 2.....	23
5.4.3 Stage 3.....	23
5.5 Physical model considerations: PTO and closed-loop control.....	24
5.5.1 General.....	24
5.5.2 PTO and control design considerations for Stages 1 and 2.....	24
5.5.3 PTO and control design considerations for Stage 3.....	25
5.5.4 PTO bench testing.....	25
6 Reporting and presentation.....	26
6.1 Reporting of test conditions and goals.....	26
6.2 Presentation of results.....	26
6.2.1 General.....	26
6.2.2 Wave parameters.....	26
6.2.3 Response amplitude operators (RAOs) curves.....	27
6.2.4 Scatter diagrams.....	27

6.2.5	Alternative iso-variable curves	28
6.3	Presentation of performance indicators	28
6.3.1	General	28
6.3.2	Presentation of performance indicators in regular waves	28
6.3.3	Presentation of performance indicators in irregular long-crested waves	29
6.3.4	Presentation of performance indicators in irregular short-crested waves	30
7	Testing environment characterisation	30
7.1	General.....	30
7.2	Wave tank characterisation (Stages 1 and 2)	30
7.3	Trial site characterisation (Stage 3)	32
7.4	Wave characterisation.....	32
7.4.1	General	32
7.4.2	Laboratory regular waves	32
7.4.3	Laboratory irregular long-crested waves	32
7.4.4	Laboratory irregular short-crested waves	32
7.4.5	Sea trials	32
8	Data acquisition and real-time control system	33
8.1	Signal conditioning.....	33
8.2	Sample rate	34
8.3	Analogue to digital conversion and DAQ system	34
8.4	Frequency response	35
8.5	Data synchronisation	35
8.6	Data recording	35
8.7	Recording of supplementary test data	35
8.8	Calibration factors.....	36
8.9	Instrument response functions	36
8.10	Health monitoring and verification of signals	36
8.11	Special requirements for Stage 3 sea trials	36
9	Power performance	37
9.1	Testing goals	37
9.2	WEC and mooring similitude	37
9.3	Power conversion chain similitude	38
9.3.1	General	38
9.3.2	Stage 1.....	39
9.3.3	Stage 2.....	39
9.3.4	Stage 3.....	39
9.4	Physical measurements	40
9.5	Calibration and setup	40
9.6	Wave parameters.....	41
9.6.1	Stages 1 and 2	41
9.6.2	Stage 3.....	42
9.7	Performance indicators	42
10	Kinematics and dynamics in operational environments	42
10.1	Testing goals	42
10.2	Testing similitude	43
10.3	Physical measurements	44
10.4	Calibration and setup	46
10.5	Wave parameters.....	47

10.5.1	Stages 1 and 2	47
10.5.2	Stage 3.....	48
10.6	Performance indicators	48
11	Kinematics and dynamics in extreme environments	49
11.1	Testing goals	49
11.2	Testing similitude	49
11.3	Physical measurements	50
11.4	Calibration and setup	51
11.5	Wave parameters.....	51
11.5.1	Stage 1.....	51
11.5.2	Stage 2.....	51
11.5.3	Stage 3.....	52
11.6	Performance indicators	53
12	Uncertainty	53
12.1	General.....	53
12.2	Main sources of uncertainty	54
12.2.1	General	54
12.2.2	Variability of measured physical properties including control signals.....	54
12.2.3	Differences between model built and expected full-scale device	54
12.2.4	Scale effects and device scale.....	55
12.2.5	Procedural effects	55
12.3	Accepted levels of uncertainty	56
Annex A (informative)	Stage Gates	57
A.1	Overview.....	57
A.2	Design statements	57
A.3	Stage Gate criteria.....	57
A.4	Uncertainty factors.....	58
A.5	Concept review	59
Annex B (informative)	Example test plan.....	60
Annex C (informative)	Physical modelling guidance	61
C.1	Similitude.....	61
C.1.1	General	61
C.1.2	Geometric similitude	61
C.1.3	Structural similitude	61
C.1.4	Hydrodynamic similitude	61
C.2	Model instrumentation and data acquisition.....	62
C.2.1	General	62
C.2.2	Water surface elevation	63
C.2.3	PTO.....	63
C.2.4	Device and mooring loads	63
C.3	Recommendations on calibrations.....	63
Annex D (informative)	Scale effects	65
Bibliography.....		66
Figure 1 – Staged development approach		13
Figure B.1 – Example test plan		60

Table 1 – Presentation of performance indicators (regular waves)	29
Table 2 – Presentation of performance indicators (irregular long-crested waves)	29
Table 3 – Presentation of performance indicators (irregular short-crested waves)	30
Table 4 – Environmental measurements	31
Table 5 – Environmental performance indicators	33
Table 6 – Power performance testing similitude	38
Table 7 – Power conversion chain (PCC) representation	38
Table 8 – Power performance physical measurements	40
Table 9 – Power performance calibrations	41
Table 10 – Power performance wave parameters	41
Table 11 – Kinematics and dynamics similitude requirements (operational environments)	44
Table 12 – Kinematic physical measurements (operational environments)	45
Table 13 – Dynamic physical measurements (operational environments)	46
Table 14 – Calibration for kinematic and dynamic testing (operational environments)	47
Table 15 – Wave parameters for kinematics and dynamics testing (operational conditions)	48
Table 16 – Kinematics and dynamics similitude requirements (extreme environments)	50
Table C.1 – Scale laws	62
Table C.2 – Sensor calibrations	64
Table D.1 – Scale example for absorbed power	65

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FOREWORD

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IEC TS 62600-103 has been prepared by IEC technical committee 114: Marine energy – Wave, tidal and other water current converters. It is a Technical Specification.

This second edition cancels and replaces the first edition published in 2018. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) Revised several numeric values (e.g. test durations) to align with best testing practice;
- b) Introduced guidance and requirements relating to PTO testing and closed-loop control;

- c) Introduced uncertainty clause in normative part of the document;
- d) Strengthened the document sections relating to Stage 3, the first sea trials;
- e) Updated the data synchronisation requirements to align with best testing practices.

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

Draft	Report on voting
114/510/DTS	114/523/RVDTS

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Specification is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/publications.

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 document will remain unchanged until the stability date indicated on the IEC website under webstore.iec.ch in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn, or
- revised.

IMPORTANT – The "colour inside" logo on the cover page of this document 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

Developing wave energy converters (WECs) will always be a demanding engineering process. It is important, therefore, to follow a design path that will minimise the risks encountered along a route of increasing technical complexity and fiscal commitment. This document presents a guide that addresses these issues, the approach being based on a proven methodology adapted from other technology areas, especially NASA and similar heavy maritime engineering industries.

The scope of the work is defined in Clause 1. Normative references and definitions of important terms are introduced in Clause 2 and Clause 3 respectively. The core of the document then follows a twin-track approach, relying on:

- a) a structured or staged development approach outlined in Clause 4, and
- b) a set of model specific and goal orientated clauses (Clause 9 to Clause 11) ensuring that targets are clearly defined and attained with confidence. Testing specific requirements such as test planning (Clause 5), reporting and presentation (Clause 6), characterisation of the surrounding wave environment (Clause 7), data acquisition and real-time control (Clause 8), and testing uncertainty Clause 12 are also included.

The structured development schedule makes use of the ability to accurately scale wave energy converters such that sub-prototype size physical models can be used to investigate the relevant device parameters and design variables at an appropriate dimension and associated budget.

The parallel development of mathematical models describing a wave energy converter's behaviour and performance is encouraged, but the procedure is not included in the document.

This document is quite exacting in terms of both the approach and requirements for the development of wave energy converters since it takes a professional approach to the process.

An essential element for any published Technical Specification or International Standard is to allow an opportunity to provide feedback on its contents to the appropriate TC 114 Working Group. TC 114 utilizes a standard methodology to allow this.

To submit feedback such as proposed changes, corrections and/or improvements to this document, please send an email to the TC 114 Chair using the Contact TC 114 Officers feature on the IEC TC 114 Dashboard, accessible at www.iec.ch/tc114. On the right side of the Dashboard under Further information select the link to contact the TC 114 Officers. On the subsequent page find and select the Send Email link for the Chair to access the email tool.

Complete all the required elements within the email pop-up. For the Subject field please include the document title and edition you are providing feedback for (ex: feedback for TS 62600-1 ED2). In the Message field, include text which summarizes your feedback and note if further information can be made available (note attachments are not allowed). The Chair may request added information as needed before forwarding the submission to the remaining TC 114 Officers for review and then to the appropriate Working Group for their consideration.

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1 Scope

This part of IEC TS 62600 is concerned with the sub-prototype scale development of wave energy converters (WECs). It includes wave tank test programmes, where wave conditions are controlled so they can be scheduled, and first sea trials, where sea states occur naturally and the programmes are adjusted and flexible to accommodate the conditions. Commercial-scale prototype tests are not covered in this document.

This document prescribes the minimum test programmes that form the basis of a structured technology development schedule. For each testing campaign, the prerequisites, goals and minimum test plans are specified. This document addresses:

- Planning an experimental programme, including a design statement, technical drawings, facility selection, site data and other inputs as specified in Clause 5.
- Device characterisation, including the physical device model, PTO components and mooring arrangements where appropriate.
- Environment characterisation, concerning either the tank testing facility or the sea deployment site, depending on the stage of development.
- Specification of specific test goals, including power conversion performance, device motions, device loads and device survival.

Guidance on the measurement sensors and data acquisition packages is included but not dictated. Provided that the specified parameters and tolerances are adhered to, selection of the components and instrumentation can be at the device developer's discretion.

An important element of the test protocol is to define the limitations and accuracy of the raw data and, more specifically, the results and conclusion drawn from the trials. A methodology addressing these limitations is presented with each goal, so the plan always produces defensible results of defined uncertainty.

This document serves a wide audience of wave energy stakeholders, including device developers and their technical advisors; government agencies and funding councils; test centres and certification bodies; private investors; and environmental regulators and NGOs.

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 TS 62600-2, *Marine energy – Wave, tidal and other water current converters – Part 2: Marine energy systems – Design requirements for marine energy systems*

This is a preview of IEC/TS 62600-103 Ed. 2.0 en:2024. [Click here to purchase the full version from the ANSI store](#)

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

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