

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Hydraulic turbines, storage pumps and pump-turbines –
Model acceptance tests**

**Turbines hydrauliques, pompes d'accumulation et pompes-turbines –
Essais de réception sur modèle**



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**HYDRAULIC TURBINES, STORAGE PUMPS AND PUMP-TURBINES –
MODEL ACCEPTANCE TESTS****FOREWORD**

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International Standard IEC 60193 has been prepared by IEC technical committee 4: Hydraulic turbines.

This third edition cancels and replaces the second edition published in 1999. This edition constitutes a technical revision.

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

- a) update to methods/measuring tools currently used for checking dimensions on both model and prototype;
- b) update to requirements of accuracy in the dimensional check procedure as a result of new technology;

- c) merging of tables/sections with redundant information in dimension check in 5.2;
- d) update to methods of measuring discharge;
- e) update to pressure fluctuation methods and terminology;
- f) specification of measuring times for accurate pressure fluctuation analyses in the model;
- g) redefine definition for the transposition of pressure fluctuations to prototype;
- h) update to surface waviness requirements in prototype;
- i) redefining methods/references in clause on cavitation nuclei content (5.7.3.2.2);
- j) update to 7.3 and review of methods on radial thrust measurements;
- k) update to 7.4 (Hydraulic loads on control components);
- l) update and develop methodology in 7.5 for testing in the extended operating range;
- m) update to 7.6 concerning index testing;
- n) update to methods for measuring roughness;
- o) updates to references;
- p) updates to figures;
- q) revision of sigma definition;
- r) reference to new method of transposition in accordance with IEC 62097.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
4/371/FDIS	4/373/RVD

Full information on the voting for the approval of this International Standard 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.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific document. At this date, the document will be

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

HYDRAULIC TURBINES, STORAGE PUMPS AND PUMP-TURBINES – MODEL ACCEPTANCE TESTS

1 Scope

This document applies to laboratory models of any type of impulse or reaction hydraulic turbine, storage pump or pump-turbine.

This document applies to models of prototype machines either with unit power greater than 5 MW or with reference diameter greater than 3 m. Full application of the procedures herein prescribed is not generally justified for machines with smaller power and size. Nevertheless, this document may be used for such machines by agreement between the purchaser and the supplier.

In this document, the term "turbine" includes a pump-turbine operating as a turbine and the term "pump" includes a pump-turbine operating as a pump.

This document excludes all matters of purely commercial interest, except those inextricably bound up with the conduct of the tests.

This document is concerned with neither the structural details of the machines nor the mechanical properties of their components, so long as these do not affect model performance or the relationship between model and prototype performances.

This document covers the arrangements for model acceptance tests to be performed on hydraulic turbines, storage pumps and pump-turbines to determine if the main hydraulic performance contract guarantees (see 4.2) have been satisfied.

It contains the rules governing test conduct and prescribes measures to be taken if any phase of the tests is disputed.

The main objectives of this document are:

- to define the terms and quantities used;
- to specify methods of testing and of measuring the quantities involved, in order to ascertain the hydraulic performance of the model;
- to specify the methods of computation of results and of comparison with guarantees;
- to determine if the contract guarantees that fall within the scope of this document have been fulfilled;
- to define the extent, content and structure of the final report.

The guarantees can be given in one of the following ways:

- guarantees for prototype hydraulic performance, computed from model test results considering scale effects;
- guarantees for model hydraulic performance.