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Hydraulic turbines, storage pumps and pump-turbines model acceptance tests

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foreword

This document is drafted in accordance with the provisions of GB/T 1:1-2020 "Guidelines for Standardization Work Part 1: Structure and Drafting Rules for Standardization Documents":

This document replaces GB/T 15613:1-2008 "Hydraulic turbines, storage pumps and pump-turbine model acceptance tests Part I: General specifications

", GB/T 15613:2-2008 "Hydraulic turbine, storage pump and pump turbine model acceptance test part two: conventional hydraulic performance test

Inspection", GB/T 15613:3-2008 "Hydraulic Turbine, Storage Pump and Pump Turbine Model Acceptance Test Part III: Auxiliary Performance Test" and

GB/T 10969-2008 "Technical Conditions for Flow Components of Hydraulic Turbine, Storage Pump and Pump Turbine", and GB/T 15613:1-2008,

Compared with GB/T 15613:2-2008, GB/T 15613:3-2008 and GB/T 10969-2008, except for structural adjustment and editorial changes

In addition, the main technical changes are as follows:

a) Changed the definition of cavitation coefficient (see 3:4:7, 3:3:6 in GB/T 15613:1-2008);

b) Change the terminology and analysis method of pressure pulsation (see 3:4:11, 3:3:10 in GB/T 15613:1-2008);

c) Changes to model and prototype dimension inspection methods and inspection tools (see 5:2:1, 5:2:3, 5:2:4, 5:2:5 and 5:2:7,

4:1, 4:2 and 4:5 in GB/T 10969-2008);

d) Due to the adoption of new technologies, the accuracy requirements for dimensional inspection are increased (see 5:2:8);

e) Merge and simplify the size checklist (see 5:2:10, 4:7:1:6, 4:7:2:3 and 4:7:3:5 in GB/T 10969-2008);

f) Changed the requirements for prototype waviness (see 5:2:11:2, 4:8:2 in GB/T 10969-2008);

g) The measurement method of roughness has been changed (see 5:2:11:3, 4:8:1 in GB/T 10969-2008);

h) Changed the measurement method/standard of gas nucleus content in the cavitation test (see 5:7:3:2:2, 5:5:3:2 in GB/T 15613:1-2008);

i) Changed the flow measurement method (see 6:2, 5:2 in GB/T 15613:2-2008);

j) The requirement for accurate measurement of model pressure fluctuation analysis time has been added (see 7:2:1:2:4);

k) Changed the method of converting the model pressure fluctuation measurement value to the prototype (see 7:2:2:8, 5:1:7 in GB/T 15613:3-2008);

l) Changed the conversion method for radial thrust (see 7:3, 5:3:3 in GB/T 15613:3-2008);

m) Changed the hydraulic load test of control components (see 7:4, 5:4 in GB/T 15613:3-2008);

n) Changed the test method within the extended operating range (see 7:5, 5:5 in GB/T 15613:3-2008);

o) Changed the content related to the index test (see 7:6, 5:6 in GB/T 15613:3-2008);

p) Added a new hydraulic performance conversion method involved in IEC 62097:2019 (see Appendix E);

q) The calculation of the axial force component has been added (see Appendix O):

This document is equivalent to IEC 60193:2019 "Model Acceptance Tests for Hydraulic Turbines, Storage Pumps and Pump Turbines":

The following minimal editorial changes have been made to this document:

--- In Figure 3, explain a), 3:4:13, Table 3, 5:3:1, 5:3:5:2:1, 5:3:5:2:3, 5:5:3:6, 5:7:5, Figure 56~Figure 58, Figure 61,

Notes are added to Figure 62, Figure 64, Figure 66, Figure 68, Figure 74~79, and Figure 92:

Please note that some contents of this document may refer to patents: The issuing agency of this document assumes no responsibility for identifying patents:

1 Scope

This document applies to impulse and reaction turbines, storage pumps and pump turbines tested under laboratory conditions:

This document is applicable to the models corresponding to prototypes with unit power greater than 5MW or nominal diameter greater than 3m: the provisions of this document

Generally speaking, it is not suitable for the procedure to be completely applied to turbines with smaller unit power or nominal diameter: However, if the supply and demand sides agree, such

It can also be implemented by reference to hydraulic machinery:

In this document, the term "turbine" includes pump-turbines operating as water turbines,

and the term "pump" includes pump-turbines operating as water pumps:

Except for matters related to trials, this document does not cover matters of purely commercial interest:

As long as the structure or parts of the machine do not affect the performance of the model or the relationship between the model and the prototype, then this document does not deal with hydraulic

The detailed structure of the machinery does not involve the mechanical properties of the hydraulic machinery components:

This document specifies the procedures for verifying whether the main hydraulic performances of turbines, storage pumps and pump turbines meet the contract guarantee values (see 4:2):

Matters related to the model acceptance test conducted:

If there is any objection to any step of the test, refer to this document, which contains the rules guiding the test and describes the measurement methods taken:

The main purpose of this document is to:

--- Define the terms and parameters used;

--- In order to determine the hydraulic performance of the model, specify the test method and the measurement parameters involved;

--- The calculation method of the specified result and the comparison method with the guaranteed value;

---Determine whether the contract guarantee value within the scope specified in this document is satisfied;

--- Define the scope, content and structure of the final report:

Guaranteed values can be given in one of the following ways:

--- Guaranteed hydraulic performance value of the prototype, calculated and obtained according to the model test results after considering the scale effect;

---Guaranteed value of hydraulic performance of the model:

In addition, for the design or operation of the turbine prototype, it is also necessary to determine some auxiliary performance data (see 4:4): and Chapter 4 ~ Chapter 6

The requirements for the main hydraulic performance are different, and the information about the auxiliary performance data given in Chapter 7 is only of a suggestion or guiding nature to the user (see 7:1):

If the expected conditions of the field acceptance test (see GB/T 20043-2005) cannot verify