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**NATIONAL STANDARD OF THE
PEOPLE'S REPUBLIC OF CHINA**

GB/T 22140-2018

Replacing GB/T 22140-2008

Code for field acceptance test of small hydro turbines

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Table of Contents

Foreword

1 Scope

2 Normative references

3 terms, definitions and schematics

3.1 Terms and definitions

3.2 Schematic diagram of hydroelectric generating set

4 Test level and range

4.1 Guaranteed test level

4.2 Performance guarantee range

4.3 Test range

Foreword

This standard was drafted in accordance with the rules given in GB/T 1.1-2009.

This standard replaces GB/T 22140-2008 "Small Turbine Site Acceptance Test Procedures", compared with GB/T 22140-2008, except

The main technical contents of the editorial changes are as follows.

---Adjust the contents of Chapter 3 "Terms, Definitions, Symbols and Units" of the original standard to Appendix A "Terms, Definitions, Symbols and Units" (see

A.1~A.4);

---Adjust the "Power Plant Conditions" and "Technical Requirements for Test Equipment" in Chapter 4 of the original standard to Appendix F "Hydraulic Power Plant Conditions" (see

F.1~F.3);

--- "Error Analysis" in Chapter 8 of the original standard became Chapter 9 independently (see 9.1~9.4);

--- The "comparison of test results and guaranteed values" in Chapter 9 of the original standard is adjusted to be part of Chapter 8 (see 8.4.3);

--- Removed the "wear" content of Chapter 10 of the original standard (10.1 of the.2008 edition);

--- Deleted the contents of the "Organization of Experiments" in Chapter 11 of the original standard (11.1~11.4 of the.2008 edition);

--- Deleted the contents of "data collection" in Chapter 12 of the original standard (12.1~12.3 of 2008 edition);

--- Deleted part of the "Flow Measurement Method" in Appendix E of the original standard, "Absolute Flow Measurement Method" only retains "Acoustic Method" and

Two methods of "pressure-time method" (E.2.1, E.2.2, E.4~E.6 and E.8 of the 2008 edition);

--- Added Appendix G "Commissioning", Appendix H "Performance Test Efficiency Calculation" and Appendix I "Association Relationship Test" (see G.1, G.2)

H.1~H.7, I.1 and I.2).

This standard adopts the translation method equivalent to IEC 62006:2010 "Hydraulic Machinery Small Turbine Site Acceptance Test".

This standard has the same technical content and text structure as IEC 62006:2010, with minimal editorial modifications.

--- Modified the standard name.

This standard is proposed and managed by the Ministry of Water Resources of the People's Republic of China.

This standard was drafted. China Institute of Water Resources and Hydropower Research.

1 Scope

This standard specifies the content, measurement methods, and evaluation methods of contractual guarantee conditions for small hydroelectric generating units.

This standard is applicable to impact and counter-attack water turbines with a stand-alone output power of not more than 15 MW and a runner diameter of not more than 3.0 m.

On-site acceptance test of the unit (including synchronous or asynchronous generators).

This standard gives the following.

a) the contents of the small turbine acceptance test, such as safety acceptance test, test run test, performance guarantee test, etc., and optional cavitation,

Tests such as noise and vibration tests.

b) Typical test methods in small hydro-generator sets and divided into the following three levels (see Table 1 for details).

---Test level A. General test items (instrument measurement) Required

Determine the maximum output power of the hydroelectric generating unit

---Test level B. Extended test project recommendation

Determine the operating characteristics of the hydroelectric generating unit

---Test level C. Comprehensive test items are optional

Determine the absolute efficiency of the hydroelectric generating unit

Note. All levels include safety tests, test runs and reliability tests.

c) the hydro-generator performance indicators to be included in the contract so that the test results can be evaluated, calculated and

Comparison.

The supplier or supervisor is responsible for the tests carried out in accordance with the standards.

This standard does not cover the specific structure of the turbine and various components.

2 Normative references

The following documents are indispensable for the application of this document. For dated references, only dated versions apply to this article.

Pieces. For undated references, the latest edition (including all amendments) applies to this document.

GB/T 9239.1-2006 Mechanical vibration constant (rigid) rotor balance quality requirements
Part 1. Specification and balance tolerance

Inspection (ISO 1940-1.2003, IDT)

ISO 1680 Acoustics - Measurement of airborne noise test procedures for rotary electric machines (Acoustics-Testcode

For the measurement of airborne noise emitted by rotating electrical machinery)

ISO 3746 Acoustic Sound Pressure Method for the Determination of Sound Sources and Acoustic Levels of Noise Sources

Acoustics-Determination of sound power levels of noise sources using sound pressure-Survey
Method using an enveloping measurement surface over a reflecting plane)

ISO 4373 Measuring device for measuring water level in open channel water flow
(Hydrometry-Water level measuring devices)

ISO 4412 (all parts) Hydraulic and hydraulic transmission air noise level detection
procedures (Hydraulic fluid power-Testcode

For determination of airborne noise levels)

ISO 5168 Fluid Flow Measurement Uncertainty Evaluation Procedure
(Measurement of fluid flow - Procedures for the
Evaluation of uncertainties)

ISO 7919-5 Mechanical vibration evaluation of mechanical vibrations - Part 5. Mechanical
setups in hydropower stations and pumping stations (Me-
chanical vibration - Evaluation of machine vibration by measurements on rotating shafts - Part
5. Ma-

Chinese sets in hydraulic power generating and pumping plants)

ISO 10816-3 Mechanical vibration evaluation of non-rotating parts of mechanical vibrations
- Part 3.

Machinery with rated speed between 120r/min and 15000r/min
(Mechanical vibration - Evaluation of machine

vibration by measurements on non-rotating parts - Part
3. Industrial machines with nominal power a-

Bove 15kW and nominal speeds between 120r/min and 15000r/min when measured in situ)

IEC 60041.1991 Field performance test for hydraulic performance of turbines, accumulator
pumps and pump turbines (Field acceptance tests to

Determine the hydraulic performance of hydraulic turbines, storage pumps and pump turbines)

IEC 60193 Hydraulic Turbine, Energy Storage Pump and Pump Turbine Model Acceptance
Test (Hydraulic turbines, storage pumps

and pump-turbines - Model acceptance tests)

IEC 60308 Hydraulic Turbine Governor System Test Procedure
(Hydraulic turbines - Testing of control systems)

Air erosion assessment of IEC 60609 turbines, accumulator pumps and pump turbines
(Hydraulic turbines, storage pumps and

pump-turbines - Cavitation pitting evaluation)

IEC 60651 Sound Level Meters (Specification for sound level meters)

IEC 61362 Hydraulic Turbine Conditioning System Specification Guide
(Guide to specification of hydraulic turbine control sys-

tems)

ANSI/IEEE 810 Turbine and Generator Forging Shaft Flange and Shaft Swing Allowance
(Hydraulic turbine and generator