ASME PTC 29-2005

REAFFIRMED 2020

Speed-Governing Systems for Hydraulic Turbine-Generator Units

Performance Test Codes

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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Three Park Avenue • New York, NY 10016

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This Code will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to ASME PTC 29-2005.

ASME issues written replies to inquiries as code cases and interpretations of technical aspects of this document. Code cases and interpretations are published on the ASME website under the Committee Pages at http://www.asme.org/codes/ as they are issued.

The American Society of Mechanical Engineers
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NOTICE

All Performance Test Codes must adhere to the requirements of ASME PTC 1, General Instructions. The following information is based on that document and is included here for emphasis and for the convenience of the user of the Code. It is expected that the Code user is fully cognizant of Sections 1 and 3 of ASME PTC 1 and has read them prior to applying this Code.

ASME Performance Test Codes provide test procedures that yield results of the highest level of accuracy consistent with the best engineering knowledge and practice currently available. They were developed by balanced committees representing all concerned interests and specify procedures, instrumentation, equipment-operating requirements, calculation methods, and uncertainty analysis.

When tests are run in accordance with a Code, the test results themselves, without adjustment for uncertainty, yield the best available indication of the actual performance of the tested equipment. ASME Performance Test Codes do not specify means to compare those results to contractual guarantees. Therefore, it is recommended that the parties to a commercial test agree before starting the test and preferably before signing the contract on the method to be used for comparing the test results to the contractual guarantees. It is beyond the scope of any Code to determine or interpret how such comparisons shall be made.

FOREWORD

A Joint AIEE–ASME (IEEE–ASME) Subcommittee on a Recommended Specification Covering the Speed Governing of Hydraulic Turbine-Generators was organized in 1944. The specifications prepared by this subcommittee were issued in September 1950 as AIEE (IEEE) Publication No. 605 entitled "Recommended Specification for Speed-Governing of Hydraulic Turbines Intended to Drive Electric Generators."

As a result of the publication of these specifications, the ASME Board on Power Test Codes Committee recognized the need of a code for testing hydraulic turbine governors and organized Power Test Code Committee No. 29 in 1955 to prepare this document.

This committee prepared a code that was approved by the Power Test Codes Committee on March 7, 1963. Final publication was delayed, however, until a number of suggestions made by the standing committee were considered and satisfactorily resolved. Reconciliation of these comments was effected through the efforts of Mr. W. K. Cave, member of the committee, who undertook to complete the assignment on behalf of the group. The code was approved and adopted by the Council of the Society by action of the Board of Codes and Standards on December 9, 1964.

In February 1993, through the efforts of the Board on Performance Test Codes' member George H. Mittendorf, Jr., the Performance Test Code (PTC) Committee 29 was reestablished to update the code.

The members of PTC Committee 29 wish to dedicate this document to the memory of William (Bill) Duncan. Bill served as the Committee's Vice Chairman from 1993 until his untimely death in an airplane crash on October 8, 1997. Bill's accomplishments were many, but nothing was more significant than organizing and supporting the validation of the draft of this code with actual site testing of an hydraulic turbine governor.

ASME PTC 29-2004 was adopted by the American National Standards Institute as an American National Standard on February 23, 2005.

PERFORMANCE TEST CODE COMMITTEE 29 ON SPEED GOVERNING SYSTEMS FOR HYDRAULIC TURBINE GENERATOR UNITS

(The following is the roster of the Committee at the time of approval of this Code.)

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CORRESPONDENCE WITH THE PTC 29 COMMITTEE

General. ASME Codes are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Code may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, PTC 29 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

Proposing Revisions. Revisions are made periodically to the Code to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Code. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Code. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Interpretations. Upon request, the PTC 29 Committee will render an interpretation of any requirement of the Code. Interpretations can only be rendered in response to a written request sent to the Secretary of the PTC 29 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Code for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings which are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The PTC 29 Standards Committee holds meetings or telephone conferences, which are open to the public. Persons wishing to attend any meeting or telephone conference should contact the Secretary of the PTC 29 Standards Committee or check our Web site, http://www.asme.org/codes/.

INTRODUCTION

This Test Code provides uniform methods and procedures for conducting and reporting of performance tests on speed governors applied to conventional hydraulic turbines. The tests described in this Code may be performed in the factory or at the jobsite. A working knowledge of hydraulic turbine controls, speed governor fundamentals, test measurement methods, and the application and use of test and measurement equipment are presumed prerequisites.

This Code was prepared with attention paid to other national and international standards for speed governors. Specifically, the tests described in this Code are useful in determining compliance with IEEE 125 and IEC 308. Unless otherwise specified, all references within this Code refer to other ASME performance test codes and standards, including, but not limited to, Definitions and Values (PTC 2) and Supplements on Instruments and Apparatus (PTC 19 series). These auxiliary documents, where and to the extent applicable, form a part of this Code.

This Code includes three general categories of tests: performance tests, operational tests, and optional tests. The performance and operational tests form the body of the Code, and are required to qualify as a Code test. The optional tests are intended to offer guidance in ancillary governor functions that do not affect governor performance and are appended to this Code. An uncertainty analysis is also appended to the Code to serve as a guide to determining the uncertainty of the test results.

SPEED-GOVERNING SYSTEMS FOR HYDRAULIC TURBINE-GENERATOR UNITS

Section 1
Object and Scope

ASME Performance Test Codes (PTCs) provide uniform rules and procedures for the planning, preparation, execution, and reporting of performance test results. These codes provide guidelines for test procedures which yield results of the highest level of accuracy based on current engineering knowledge, taking into account test costs and the value of information obtained from testing. PTCs were developed by balanced committees representing many concerned interests.

When tests are conducted in accordance to a code, the test results themselves, without adjustment for uncertainty, yield the best available indication of actual performance of the equipment tested. ASME PTCs do not specify means to compare those results to contractual guarantees. Therefore, it is recommended that the parties to a commercial test agree, before starting the test and preferably prior to signing the contract, on the method to be used for comparing the results to the contractual guarantees. It is beyond the scope of any PTC to determine or interpret how such comparisons are made.

Test uncertainty is an estimate of the limit of error of a test result. It is the interval about a test result that contains the true value with a given probability or level of confidence. It is based on calculations utilizing statistics, instrumentation information, calculation procedure, and actual test data.

Code tests are suitable for use whenever performance must be determined with minimum uncertainty. They are meant specifically for equipment operating in an industrial setting.

PTCs are generally not used in troubleshooting equipment. However, they can be used to quantify the magnitude of performance anomalies of equipment that is suspected to be performing poorly, or to confirm the need for maintenance, if simpler means are not adequate. PTCs are excellent sources or references for simpler routine or special equipment test procedures. Conducting periodic performance tests on equipment can uncover the need for further investigation, which can lead to preventative maintenance or modification.

1-1 OBJECT

This Code defines uniform test methods and procedures to determine the performance characteristics of a hydraulic turbine speed governor. It is intended that this Code may be applied to either factory acceptance testing of a new speed governor or evaluation of an existing speed governor.

1-2 SCOPE

This Code applies to speed governors used on conventional, constant-speed hydraulic turbines. This Code is applicable to electronic-hydraulic and mechanical-hydraulic speed governors. These governors are commonly used to control reaction and impulse-type hydraulic turbines (fixed or variable geometry) and pump turbines operating in generation mode.

1-2.1 Performance Characteristics

This Code specifies procedures for conducting tests to determine the following performance characteristics of hydraulic turbine speed governors:

(*a*) droop
  (*1*) permanent
  (*2*) temporary
(*b*) deadband and deadtime
  (*1*) speed
  (*2*) position
  (*3*) power
(*c*) stability index
  (*1*) governing speedband
  (*2*) governing powerband
(*d*) step response
(*e*) gain
  (*1*) proportional gain
  (*2*) integral gain
  (*3*) derivative gain
(*f*) setpoint adjustment
  (*1*) range of adjustment
  (*2*) ramp rate

1-2.2 Operational Characteristics

This Code also establishes the rules and procedures for the conduct of tests to determine the following