ASME PTC 31-2011
[Revision of ASME PTC 31-1973 (R1991)]

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High-Purity Water Treatment Systems

Performance Test Codes

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers
Three Park Avenue • New York, NY • 10016 USA

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NOTICE

All Performance Test Codes MUST adhere to the requirements of 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 this 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

The ASME Performance Test Codes Committee voted in December 1965 to establish a Test Code Committee for Demineralizers (PTC 31) and later approved as PTC 31 Committee's objective, the development of a Test Code that would define the procedures for the accurate testing of ion exchange equipment for determining level of performance. The name of this Committee was changed at the request of PTC Committee No. 31 from Demineralizers to Ion Exchange Equipment on June 12, 1970.

Most steam generation cycles, either for process application or utility power production, require the use of water treatment equipment. Such equipment may be a simple process application, removing only hardness constituents from water, or may be a relatively complex process employing one or more types of ion exchange resin processes and/or membrane processes each with a high degree of instrumentation and control logic. Additionally, such equipment is employed in virtually all types of nuclear steam generation cycles, processing water containing not only very high concentrations of impurities, but also treating liquids with impurity concentrations in the range of parts per billion to parts per trillion. Because performance of such process equipment directly influences the efficiency and output of steam generation cycles, a Committee was named by The American Society of Mechanical Engineers to draft a revised Performance Test Code for High-Purity Water Treatment Systems. Members of this Committee were selected on the basis that equipment manufacturers, users, and consultants as well as general interest groups were represented. A draft of this Code was distributed in September 2011 for comment and criticism by industry and other interested individuals.

This edition was approved by the PTC Standards Committee on September 2, 2011, and approved and adopted as a Standard practice of the Society by action of the Board on Standardization and Testing on October 7, 2011. It was also approved as an American National Standard by the ANSI Board of Standards Review on November 21, 2011.

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Performance Test Codes

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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 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.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Request for Cases shall provide a Statement of Need and Background Information. The request should identify the Code, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Request for Cases should also indicate the applicable edition(s) of the Code to which the proposed Case applies.

Interpretations. Upon request, the PTC Standards 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 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 that 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 Standards Committee and PTC Committees hold meetings regularly, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the PTC Committee.

HIGH-PURITY WATER TREATMENT SYSTEMS

Section 1
Object and Scope

1-1 OBJECT

1-1.1

This Code defines the procedures for the accurate field testing of high-purity water treatment systems for the purpose of determining level of performance. It is based on the use of accurate instrumentation and the best analytical and measurement procedures available.

1-1.2

This Code is recommended for use in conducting acceptance tests of high-purity water treatment systems. If so used, any deviations from Code procedure must be agreed upon in writing. In the absence of written agreement, the Code requirements shall be mandatory.

Upon completion of tests, the report issued should provide all necessary base line data against which all future operational test results can be measured to assess deterioration of performance in the interim.

1-1.3

Before formulating the procedure for testing a specific process or system, the Code on General Instructions PTC 1 should be studied and followed in detail.

1-1.4

The Code on Definitions and Values (PTC 2) defines certain technical terms and numerical constants. Unless otherwise specified in this Code, instrumentation should comply with the sections of Supplements on Instruments and Apparatus (PTC 19 Series).

1-2 SCOPE

Only the relevant portion of this Code need apply to any individual case or test under consideration. In some cases the procedure is simple; however, for complex systems or complex modes of system operation, the procedures and calculations of test results require more involved provisions for testing.

1-2.1

This Code is applicable to the following types of high-purity water treatment systems, which are either used individually or in various combinations depending on requirements of the process:

(a) membrane equipment including but not limited to, microfiltration, ultrafiltration, nanofiltration, and reverse osmosis

(b) ion exchange equipment including, but not limited to, softeners, dealkalizers, multibed demineralizers, mixed-bed demineralizers, and condensate polishers

(c) hybrid equipment including, but not limited to, electrode ionization (EDI) and electrodialysis reversal (EDR).

1-2.2

This Code applies to equipment and systems that are utilized for

(a) the conditioning of makeup, feedwater, and condensate for steam generation

(b) the conditioning of process waters

1-2.3

This Code applies to the performance of high-purity water treatment systems at design, minimum flow rates or maximum flow rates, depending on the purpose of the test, with regard to one or more of the following:

(a) water quality and quantity of influent and effluent

(b) pressure drop, flow, and temperature

(c) startup, shutdown, and lay-up procedure

(d) operating efficiency

(e) media testing

(f) media cleaning and maintenance

(g) chemical purity and solution concentrations

(h) associated chemical equipment