

ASME PTC 12.1-2015

[Revision of ASME PTC 12.1-2000 (R2005)]

Closed Feedwater Heaters

Performance Test Codes

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

ASME PTC 12.1-2015
[Revision of ASME PTC 12.1-2000 (R2005)]

Closed Feedwater Heaters

Performance Test Codes

AN AMERICAN NATIONAL STANDARD



**The American Society of
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: June 30, 2016

This Code will be revised when the Society approves the issuance of a new edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Code. Interpretations are published on the Committee Web page and under go.asme.org/InterpsDatabase. Periodically certain actions of the ASME PTC Committee may be published as Code Cases. Code Cases are published on the ASME Web site under the PTC Committee Page at go.asme.org/PTCcommittee as they are issued.

Errata to codes and standards may be posted on the ASME Web site under the Committee Pages to provide corrections to incorrectly published items, or to correct typographical or grammatical errors in codes and standards. Such errata shall be used on the date posted.

The PTC Committee Page can be found at go.asme.org/PTCcommittee. There is an option available to automatically receive an e-mail notification when errata are posted to a particular code or standard. This option can be found on the appropriate Committee Page after selecting "Errata" in the "Publication Information" section.

ASME is the registered trademark of The American Society of Mechanical Engineers.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The Standards Committee that approved the code or standard was balanced to assure that individuals from competent and concerned interests have had an opportunity to participate. The proposed code or standard was made available for public review and comment that provides an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not "approve," "rate," or "endorse" any item, construction, proprietary device, or activity.

ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor assumes any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representative(s) or person(s) affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

No part of this document may be reproduced in any form,
in an electronic retrieval system or otherwise,
without the prior written permission of the publisher.

The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

Copyright © 2016 by
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
All rights reserved
Printed in U.S.A.

CONTENTS

Notice	v
Foreword	vi
Committee Roster	vii
Correspondence With the PTC Committee	viii
Section 1 Object and Scope	1
1-1 General	1
1-2 Object	1
1-3 Scope	1
1-4 Uncertainty	2
Section 2 Definitions and Descriptions of Terms	3
2-1 Symbols	3
2-2 Nomenclature	3
2-3 Subscripts	3
Section 3 Guiding Principles	7
3-1 Items for Agreement	7
3-2 Parameters Affecting Feedwater Heater Performance	7
3-3 Methods of Operating During the Test	7
3-4 Preparation for the Test	8
3-5 Duration of Runs and Frequency of Readings	10
3-6 Steady-State Limits	10
3-7 Measurement Uncertainty	10
3-8 Location of Test Points	11
Section 4 Instruments and Methods of Measurement	22
4-1 General	22
4-2 Pressure Measurement	22
4-3 Temperature Measurement	22
4-4 Water Flow Measurement	23
4-5 Split Stream Feedwater Heater Testing	24
4-6 Multiple Inlet Steam Nozzles	25
4-7 Instrument Uncertainties	25
Section 5 Computation of Results	26
5-1 Introduction	26
5-2 Performance Calculation Procedures	26
5-3 Uncertainty Calculation Procedures	38
Section 6 Report of Results	40
Section 7 References	42
Figures	
3-3.2-1 Typical DCA and TTD Versus Heater Internal Liquid Level	9
3-8-1 Three-Zone Heater Test Points: Desuperheating, Condensing, and Drain Cooling Zones	12
3-8-2 Thermal Profile: Desuperheating, Condensing, and Drain Cooling Zones	13
3-8-3 Two-Zone Heater Test Points: Desuperheating and Condensing Zones	14
3-8-4 Thermal Profile: Desuperheating and Condensing Zones	15
3-8-5 Two-Zone Heater Test Points: Condensing and Drain Cooling Zones	16
3-8-6 Thermal Profile: Condensing and Drain Cooling Zones	17
3-8-7 Single-Zone Heater Test Points: Condensing Zone Only	18

3-8-8	Thermal Profile: Condensing Zone	19
3-8-9	Single-Zone Heater Test Points: External Drain Cooler	20
3-8-10	Thermal Profile: External Drain Cooler	21
4-4-1	Typical Transducer Installation	24
Form		
6-1	Performance Testing of Closed Feedwater Heaters	41
Tables		
2-1-1	Symbols	4
2-2-1	Nomenclature	6
3-6-1	Deviation Limits of Parameters	10
4-7-1	Maximum Uncertainty Values	25
5-2.1-1	Manufacturer Design Data	27
Nonmandatory Appendices		
A	Basic Heat Transfer Equations	43
B	Heater Performance Calculation Examples	46
C	Uncertainty Considerations	56
D	Principal Quantities and Commonly Used Conversion Factors in Heat Transfer (SI Units)	61