

ICS 27.063.30

CCS J 98



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

GB/T 43911-2024

**Evaluation method for uncertainty of boiler thermal
performance test**

锅炉热工性能试验不确定度的评定方法

Issued on: April 25, 2024

Implemented on: November 1, 2024

**Issued by: State Administration for Market Regulation;
Standardization Administration of the PRC**

Table of Contents

1 Scope	1
2 Normative references	1
3 Terms and Definitions	1
4 Symbols	4
5 Analysis of sources of measurement uncertainty	5
6 Establishment of measurement model	6
7 Evaluation of standard uncertainty	8
8 Evaluation of expanded uncertainty	16
42 References	55

Foreword

This document is in accordance with the provisions of GB/T 1:1-2020 "Guidelines for standardization work Part 1: Structure and drafting rules for standardization documents"

Drafting: Please note that some of the contents of this document may involve patents: The issuing organization of this document does not assume the responsibility for identifying patents: This document was proposed and coordinated by the National Technical Committee for Energy Fundamentals and Management Standardization (SAC/TC20): This document was drafted by: China Special Equipment Testing and Research Institute, Jiangsu Special Equipment Safety Supervision and Inspection Institute, Liaoning Safety Science and Technology Research Institute, Institute of Science and Technology, State Administration for Market Regulation, Tsinghua University, China Special Inspection Group Co., Ltd., China Special Equipment Safety and Energy Conservation Promotion Association Association, Zhejiang Special Equipment Science Research Institute, Shandong Special Equipment Inspection and Research Institute Group Co., Ltd., Harbin Institute of Technology, Shenyang Chemical University, China Institute of Metrology, Sichuan Special Equipment Inspection Institute, Xizi Clean Energy Equipment Manufacturing Co., Ltd., Jiangsu Fang Clean Energy Equipment Manufacturing Co., Ltd., Chongqing Zhide Thermal Industry Co., Ltd., Tianjin Special Equipment Supervision and Inspection Technology Research Institute, Zhejiang Jiangtefu Development Co., Ltd., Hunan Special Equipment Inspection and Testing Institute, Dalian Boiler and Pressure Vessel Inspection and Testing Institute Co., Ltd: Department of Energy Conservation, National Energy Conservation Center: The main drafters of this document are: Qi Guoli, Gu Yonghua, Yu Zaihai, Wang Zhongwei, Da Yaodong, Li Shuiqing, Zhang Songsong, Leng Hao, Guan Jian, Wang Xiaolei, Wang Weiguo, Wang Lin, Wang Xingsheng, Zhuo Jiankun, Zeng Hansheng, Wu Shaohua,

Wang Changming, Ge Xiang, Chen Zhengyu, Liu Ying, Xu Dinghua, Li Yishan, Wang Yunpeng, Chen Juan, Duan Hongbin, Lin Zhenyu, Chen Wei, Zhang Eying, Peng Jun, Guan Wenhong, Chen Zhigang, Xu Chongtao, Wei Xiaohua, Qi Zuoqiu, Su Ming, Peng Xiaolan, Guo Chuanjiang, Yang Shaopeng and Zhao Liyuan: Uncertainty Evaluation Method for Boiler Thermal Performance Test

1 Scope

GB/T 43911-2024 gives the method for evaluating the uncertainty of a boiler thermal performance test. The reason it exists is commercial: boiler efficiency is guaranteed contractually, penalties turn on a fraction of a percentage point, and an efficiency figure quoted without its uncertainty cannot settle a dispute, since the losses method aggregates a dozen separately measured quantities whose errors combine in ways that are not obvious. The document describes the analysis of the sources of measurement uncertainty, the establishment of the measurement model, the evaluation of the standard uncertainty over eight pages, the evaluation of the expanded uncertainty and the content of the evaluation report. A normative annex gives the expanded uncertainty of the thermal efficiency of typical boilers, and informative annexes give the standard uncertainty of gaseous fuel composition analysis and of the proximate analysis, ultimate analysis and calorific value determination of solid fuels, followed by two fully worked calculation examples, nineteen pages for a gas-fired boiler and thirteen for a solid fuel boiler. It applies to the evaluation of measurement uncertainty for the process parameters and the results of boiler thermal performance tests.

This document describes the uncertainty assessment method for boiler thermal performance tests, including the source analysis of measurement uncertainty, measurement model Establishment, assessment of standard uncertainty, assessment of expanded uncertainty and assessment report: This document is applicable to the measurement uncertainty assessment of process parameters and measurement results in boiler thermal performance tests:

2 Normative references

The contents of the following documents constitute the essential clauses of this document through normative references in this document: For referenced documents without a date, only the version corresponding to that date applies to this document; for referenced documents without a date, the latest version (including all amendments) applies to This document:

GB/T 10180 Thermal performance test procedures for industrial boilers

GB/T 10184 Power plant boiler performance test procedures

GB/T 27418 Evaluation and expression of measurement uncertainty JJF1059:

1 Evaluation and Expression of Measurement Uncertainty NB/T 47066 Test methods for thermal performance of condensing boilers

3 Terms and definitions

The following terms and definitions apply to this document: 3:

1 Accuracy The degree of agreement between the measured value of a measurand and its true value:

Note 1: The concept of "measurement accuracy" is not a quantity and does not give a numerical value: When a measurement provides a smaller measurement error, it is said that the measurement is more accurate: Yes: NOTE

2 The term "measurement accuracy" should not be confused with "measurement correctness" or "measurement precision", although it is related to these two concepts: Note 3 to entry: Measurement accuracy is sometimes understood as the degree of agreement between measured values assigned to the measurand: [Source: JJF1001-2011, 5:8] 3:

2 Trueness The degree of agreement between the average of an infinite number of repeated measurements and a reference value:

Note 1: Measurement accuracy is not a quantity and cannot be expressed numerically:

Note 2: Measurement accuracy is related to systematic measurement errors and has nothing to do with random measurement errors:

Note 3: The term "measurement trueness" cannot be expressed as "measurement accuracy" and vice versa: [Source: JJF1001-2011, 5:9]