



BSI Standards Publication

## **Oil and gas industries including lower carbon energy — Fuel ammonia — Requirements and guidance for boilers for power generation**

---

## National foreword

This Published Document is the UK implementation of ISO/TS 21343:2025.

The UK participation in its preparation was entrusted to Technical Committee PSE/17, Materials and equipment for petroleum, petrochemical and natural gas industries.

A list of organizations represented on this committee can be obtained on request to its committee manager.

### Contractual and legal considerations

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

This publication is not to be regarded as a British Standard.

© The British Standards Institution 2025  
Published by BSI Standards Limited 2025

ISBN 978 0 539 28369 3

ICS 27.060.20; 29.160.20; 75.160.30

### Compliance with a Published Document cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 January 2025.

### Amendments/corrigenda issued since publication

| Date | Text affected |
|------|---------------|
|------|---------------|

---



# Technical Specification

**ISO/TS 21343**

## **Oil and gas industries including lower carbon energy — Fuel ammonia — Requirements and guidance for boilers for power generation**

*Industries du pétrole et du gaz, y compris les énergies à faible teneur en carbone — Ammoniac combustible — Exigences et recommandations applicables aux chaudières pour la production d'électricité*

**First edition  
2025-01**

Reference number  
ISO/TS 21343:2025(en)

Full document details: PD ISO/TS 21343:2025

© ISO 2025  **Documents**  
Document Sharing Hub



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2025

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

Page

|                                                                                                                            |           |
|----------------------------------------------------------------------------------------------------------------------------|-----------|
| <b>Foreword</b>                                                                                                            | <b>iv</b> |
| <b>Introduction</b>                                                                                                        | <b>v</b>  |
| <b>1 Scope</b>                                                                                                             | <b>1</b>  |
| <b>2 Normative references</b>                                                                                              | <b>1</b>  |
| <b>3 Terms and definitions</b>                                                                                             | <b>1</b>  |
| <b>4 General test requirements</b>                                                                                         | <b>3</b>  |
| 4.1 Basic concept of tests                                                                                                 | 3         |
| 4.2 Extent of test                                                                                                         | 4         |
| <b>5 Functional test</b>                                                                                                   | <b>5</b>  |
| 5.1 General                                                                                                                | 5         |
| 5.2 Measurements for functional test                                                                                       | 5         |
| 5.3 Functional test equipment                                                                                              | 6         |
| 5.3.1 General                                                                                                              | 6         |
| 5.3.2 Ammonia combustion burner                                                                                            | 6         |
| 5.3.3 Combustion chamber                                                                                                   | 6         |
| 5.3.4 Combustion emissions measurement equipment                                                                           | 6         |
| 5.4 Method for functional test                                                                                             | 6         |
| 5.4.1 Fuel                                                                                                                 | 6         |
| 5.4.2 Test condition                                                                                                       | 6         |
| 5.4.3 Measurement method                                                                                                   | 7         |
| 5.5 Functional test report                                                                                                 | 8         |
| 5.5.1 General                                                                                                              | 8         |
| 5.5.2 General information                                                                                                  | 8         |
| 5.5.3 Information to be presented for each measurement                                                                     | 9         |
| <b>6 Acceptance test</b>                                                                                                   | <b>9</b>  |
| 6.1 General                                                                                                                | 9         |
| 6.2 Measurements for acceptance test                                                                                       | 9         |
| 6.3 Combustion emission measurement concept                                                                                | 10        |
| 6.4 Method for acceptance test                                                                                             | 10        |
| 6.4.1 Fuel                                                                                                                 | 10        |
| 6.4.2 Test condition                                                                                                       | 10        |
| 6.4.3 Measurement method                                                                                                   | 10        |
| 6.5 Acceptance test report                                                                                                 | 11        |
| 6.5.1 General                                                                                                              | 11        |
| 6.5.2 General information                                                                                                  | 11        |
| 6.5.3 Information to be presented for each measurement                                                                     | 11        |
| <b>Annex A (informative) General concept of purchaser and/or user's performance requirements for ammonia-fired boilers</b> | <b>12</b> |
| <b>Annex B (informative) Sample of functional test - measurement results format</b>                                        | <b>13</b> |
| <b>Annex C (informative) Sample fuel properties format</b>                                                                 | <b>15</b> |
| <b>Annex D (informative) Sample acceptance test – measurement results format</b>                                           | <b>18</b> |
| <b>Bibliography</b>                                                                                                        | <b>20</b> |

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 67, *Oil and gas industries including lower carbon energy*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

## Introduction

Ammonia can be used as a carbon-free fuel with the potential to contribute to the transition to a carbon-neutral society. The greatest advantage of ammonia is that it does not produce CO<sub>2</sub> during combustion. In addition, the technology for safely liquefying, transporting and storing ammonia has already been implemented in the society as existing ammonia infrastructure; and further development is underway from the perspective of unprecedented large-scale transporting and storing. Appropriate use of these technologies can lead to rapid decarbonization.

There are many potential applications of fuel ammonia, such as boilers for power utility or industrial boilers, gas turbines, marine engines, industrial furnaces, both for new boilers and modified existing facilities. However, from the perspective of achieving carbon net zero, it is necessary to accelerate the application of fuel ammonia to boilers that generate particularly high amounts of CO<sub>2</sub> and other potential greenhouse gases (GHG).

In order to contribute to CO<sub>2</sub> and other potential GHG reduction at an early stage by using fuel ammonia in power generation boilers, there's an urgent need to provide requirements and guidance for manufacturers of ammonia-fired boilers. Demonstration projects of ammonia-fired boilers are progressing successfully; and commercialization is sooner than originally expected. Therefore, it is necessary to establish standards to validate the certainty of design, engineering and manufacturing in terms of envisioned improvement in environmental performance of the electric utility power boilers. This document aims to standardize the functional tests and acceptance tests to be performed in order to accomplish such validation.



# Oil and gas industries including lower carbon energy — Fuel ammonia — Requirements and guidance for boilers for power generation

## 1 Scope

This document specifies requirements and guidance for manufacturers of ammonia-fired boilers regarding functional tests performed at the time of design and on-site acceptance tests, in order to meet the required environmental performance.

This document stipulates the test methods, the measurement items, the evaluation methods and the test reports for each test.

This document is applicable to:

- a) land boilers used for power generation with an electrical output of 100 MWe or more;
- b) equipment that uses  $\text{NH}_3$  of any mixing ratio as fuel;
- c) boilers with burners for combustion of fuel.

This document does not apply to heat recovery steam generators for gas turbines, fluidized bed boiler, stokers, black liquor recovery boiler and process heat transfer equipment (used in petroleum refining).

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

### 3.1 acceptance test

test performed at the actual ammonia-fired *boiler* (3.4), prior to the commercial operation date

### 3.2 fuel ammonia

$\text{NH}_3$  utilized as a fuel for *boilers* (3.4)

Note 1 to entry: Ammonia is used differently as “ $\text{NH}_3$ ”, because  $\text{NH}_3$  is an expression of a substance with a molecular formula and ammonia is defined as a fuel that includes the concept of purity of  $\text{NH}_3$ .

### 3.3 ancillary equipment

series of equipment installed at the downstream of the *boiler* (3.4)

EXAMPLE Denitrification equipment, air preheater, dust removal equipment and desulfurization equipment.