



BSI Standards Publication

**Safety and control devices for burners and
appliances burning gaseous and/or liquid
fuels — Guidance on hydrogen specific aspects**

National foreword

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The UK participation in its preparation was entrusted to Technical Committee GSE/22, Safety and control devices for gas and oil burners and gas burning appliances.

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

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Sicherheits- und Regeleinrichtungen für Brenner und
Brennstoffgeräte für gasförmige und/oder flüssige
Brennstoffe - Leitfaden zu wasserstoffspezifischen
Aspekten

This Technical Report was approved by CEN on 9 January 2023. It has been drawn up by the Technical Committee CEN/TC 58.

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European foreword

This document (CEN/TR 17924:2023) has been prepared by Technical Committee CEN/TC 58 “Safety and control devices for burners and appliances burning gaseous or liquid fuels”, the secretariat of which is held by BSI.

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Introduction

The use of hydrogen as a renewable fuel next to biomethane is seen as a promising alternative to natural gas in the near future. As soon as the according regulations and standards are in force, the use of hydrogen can be expected on a more regular basis.

For this reason, the heating and combustion business have to provide suitable solutions based on standardized safety, construction, and performance requirements.

This document will provide a first summary of considerations regarding safety and performance aspects for safety and control devices which will in some cases require further research and which is not exhaustive.

There are ongoing research projects on the use of hydrogen as an admixture with natural gas in various percentages or as hydrogen like the European THyGA project (up to 60 vol.-% hydrogen admixtures to natural gas) which results could have an influence on these first considerations.

Therefore, this document is written in preparation of future revisions of CEN/TC 58 documents and will describe findings pointing at potential changes, give the according research backgrounds and provide literature sources.

The first edition of this document includes theoretical evaluations regarding different gases, comparing their different characteristics, properties, behaviours, and their impact on the risk assessment for gas appliances. These theoretical evaluations will be complemented by laboratory measurements, which will be then included in a future revision of this document.

For the future implementation of hydrogen in the whole value chain co-operation with other CEN/TCs is necessary like e.g. CEN/TC 234 "Gas infrastructure", CEN/TC 109 "Central heating boilers using gaseous fuels", CEN/TC 131 "Gas burners using fans" and CEN/TC 186 "Industrial thermoprocessing -Safety".

This document up to Annex A is based on the structure of EN 13611:2019, which means that clauses and subclauses including their designations are aligned to this standard.

In this document only those clauses of EN 13611:2019 are referred to, which may be affected by using hydrogen or hydrogen admixtures as gaseous fuels. All other clauses, which may be not affected, are not listed in this document.

1 Scope

This document is written in preparation of future revision of standards dealing with the general safety, design, construction, and performance requirements and testing of safety, control or regulating devices (hereafter referred to as controls) for burners and appliances burning:

- H₂NG (hydrogen in natural gas) fluctuating admixture of no more than 20 vol.-% hydrogen content; or
- hydrogen according to ISO 14687:2019, at least Type I, Grade A; or
- fluctuating admixtures to natural gas from 0 vol.-% to above 20 vol.-% hydrogen (e.g. 0 vol.-% to 10 vol.-% or 0 vol.-% to 40 vol.-%).

This document refers to controls with declared maximum inlet pressure up to and including 500 kPa and of nominal connection sizes up to and including DN 250.

The purpose of this document is to provide guidance on hydrogen specific topics, which need to be considered in the future standardization of controls covered by CEN/TC 58 documents including:

- automatic shut-off valves;
- automatic burner control systems;
- flame supervision devices;
- gas/air ratio controls;
- pressure regulators;
- manual taps;
- mechanical thermostats;
- multifunctional controls;
- pressure sensing devices;
- valve proving systems;
- automatic vent valves

Hydrogen will play a significant role in the future in several energy segments and requirements and test methods need to be verified and adapted, if necessary.

The main target of this document is to lay the ground for defining requirements and tests for controls used for safety related functions (e.g. safety valves, automatic burner control systems, gas/air ratio controls) or regulating devices.

Summaries of subclauses to be addressed in the respective standards of each CEN/TC 58 WG are given in

- Annex A: Specific considerations to CEN/TC 58 WG 11 standards,
- Annex B: Specific considerations to CEN/TC 58 WG 12 standards,
- Annex C: Specific considerations to CEN/TC 58 WG 13 standards, and

- Annex D: Specific considerations to CEN/TC 58 WG 14 standards.

Aspects to be included for gas appliances (e.g. boilers, forced draught gas-burners, or industrial thermoprocessing equipment) covering e.g. risk assessment, standardization, certification and operation are listed in

- Annex E: Risk assessment, standardization, certification and operation of gas appliances with 20 vol.-% H₂ fluctuating admixtures, and
- Annex F: Risk assessment, standardization, certification and operation of gas appliances using hydrogen (ISO 14687:2019, Type I, Grade A).

Proposals for leakage rate requirements and tests for gas pipe work including controls (e.g. valves, regulators, pressure switches) used in gas appliances (e.g. forced draught gas-burners or industrial thermoprocessing equipment) and the impact on the installation room size are shown in Annex G.

Considerations to be taken to stay below possible lower explosion limits in gas appliances (e.g. boilers, forced draught gas-burners, or industrial thermoprocessing equipment) and its installation rooms are shown in

- Annex H: Examples of mitigation measures in case of fracture of non-metallic parts for each combustible gas to stay below 25 % of its LEL, based on calculation, and
- Annex I: Examples of mitigation measures in case of leakages for each combustible gas to stay below 25 % of its LEL, based on calculation.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 88-1:2022, *Safety and control devices for gas burners and gas burning appliances - Part 1: Pressure regulators for inlet pressures up to and including 50 kPa*

EN 88-2:2022, *Safety and control devices for gas burners and gas burning appliances - Part 2: Pressure regulators for inlet pressures above 50 kPa up to and including 500 kPa*

EN 88-3:2022, *Safety and control devices for gas burners and gas burning appliances - Part 3: Pressure and/or flow rate regulators for inlet pressures up to and including 500 kPa, electronic types*

EN 126:2012, *Multifunctional controls for gas burning appliances*

EN 161:2022, *Automatic shut-off valves for gas burners and gas appliances*

EN 377:1993, *Lubricants for applications in appliances and associated controls using combustible gases except those designed for use in industrial processes*

EN 637:2021, *Test gases - Test pressures - Appliance categories*

EN 549:2019, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 751-1:1996, *Sealing materials for metallic threaded joints in contact with 1st, 2nd and 3rd family gases and hot water - Part 1: Anaerobic jointing compounds*