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

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English Version

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

Dispositifs de sécurité et de contrôle des brûleurs et des appareils brûlant des combustibles gazeux et/ou liquides - Orientations concernant les aspects spécifiques à l'hydrogène

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 6 January 2025. It has been drawn up by the Technical Committee CEN/TC 58.

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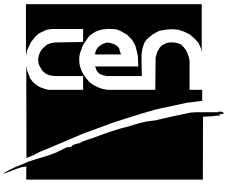

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European foreword

This document (CEN/TR 17924:2025) 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 soon. 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 provides a summary of considerations regarding safety and performance aspects for safety and control devices which will in some cases require further research.

There are research projects on the use of hydrogen admixture with natural gas in various percentages or as hydrogen like the European THyGA project (up to 60 vol.-% hydrogen fluctuating admixtures to natural gas).

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.

This document includes evaluations regarding different gases, comparing their distinctive characteristics, properties, and their impact on the risk assessment for gas appliances. Theoretical evaluations are complemented by laboratory measurements.

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.

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

For the calculations and measurements in this document the specific admixture of 20 vol.-% hydrogen and 80 vol.-% methane is used. This admixture is already used as a typical reference in other standards.

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 hydrogen (see 3.2) or hydrogen admixtures (see 3.3).

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 admixtures fluctuating up to 20 vol.-% hydrogen to natural gas, and

— Annex F: Risk assessment, standardization, certification, and operation of gas appliances using hydrogen referring to ISO 14687:2019, Type I, Grade A.

Proposals for leakage rate requirements and tests for gas pipework 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 diaphragm fracture or fracture of non-metallic parts for different combustible gases to stay below 25 % of their LEL, based on measurements and calculations, and

— Annex I: Examples of mitigation measures in case of leakages for different combustible gases to stay below 25 % of their LEL, based on measurements and calculations.

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 13611:2019[1], *Safety and control devices for burners and appliances burning gaseous and/or liquid fuels — General requirements*

[1] Impacted by EN 13611:2019/AC:2021[2] Assumption for calculations for DN > 100