



BSI Standards Publication

Gas-fired central heating boilers

Part 2-1: Specific standard for type C appliances and type B2, B3 and B5 appliances of a nominal heat input not exceeding 1 000 kW

National foreword

This British Standard is the UK implementation of EN 15502-2-1:2022+A1:2023, incorporating corrigendum December 2024. It supersedes BS EN 15502-2-1:2022, which is withdrawn.

The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by A1 A1.

The start and finish of text introduced or altered by corrigendum is indicated in the text by tags. Text altered by CEN corrigendum December 2024 is indicated in the text by AC1 AC1.

The UK participation in its preparation was entrusted to Technical Committee GSE/29, Gas-fired central heating boilers (domestic and non-domestic) and domestic gas-fired water heaters.

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

BSI, as a member of CEN, is obliged to publish EN 15502-2-1:2022+A1:2023 as a British Standard. However, attention is drawn to the fact that during the development of this European Standard, the UK committee voted against its approval.

Comments raised by GSE/29 were addressed during the final vote except the proposal to change the wording in subclause 12.2.1.2 from a shall to a should. This was initially changed during the harmonization process by the consultant. The third comment raised by the mirror committee was mitigation for the inclusion of the requirement in that subclause to allow industry a longer period to implement the changes necessary to comply with subclause 12.2.1.2.

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 has been prepared under a mandate given to the European Standards Organizations by the European Commission and the European Free Trade Association. It is intended to support requirements of the EU legislation detailed in the European Foreword. A European Annex, usually Annex ZA or ZZ, describes how this publication relates to that EU legislation.

For the Great Britain market (England, Scotland and Wales), the UK Government has designated this publication for conformity with UKCA

marking (or similar) legislation, it may contain an additional National Annex. Where such a National Annex exists, it shows the correlation between this publication and the relevant UK legislation. If there is no National Annex of this kind, the relevant Annex ZA or ZZ in the body of the European text will indicate the relationship to UK regulation applicable in Great Britain. References to EU legislation may need to be read in accordance with the UK designation and the applicable UK law. Further information on designated standards can be found at www.bsigroup.com/standardsandregulation.

For the Northern Ireland market, UK law will continue to implement relevant EU law subject to periodic confirmation. Therefore Annex ZA/ZZ in the European text, and references to EU legislation, are still valid for this market.

UK Government is responsible for legislation. For information on legislation and policies relating to that legislation, consult the relevant pages of www.gov.uk.

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

ISBN 978 0 539 35060 9

ICS 27.060.30; 91.140.10

Compliance with a British Standard cannot confer immunity from legal obligations.

This British Standard was published under the authority of the Standards Policy and Strategy Committee on 30 November 2022.

Amendments/corrigenda issued since publication

Date	Text affected
31 January 2024	Implementation of CEN amendment A1:2023
31 January 2025	Implementation of CEN corrigendum December 2024

English Version

**Gas-fired central heating boilers - Part 2-1: Specific
standard for type C appliances and type B2, B3 and B5
appliances of a nominal heat input not exceeding 1 000 kW**

Chaudières de chauffage central utilisant les
combustibles gazeux - Partie 2-1 : Norme spécifique
pour les appareils de type C et les appareils de types
B2, B3 et B5 dont le débit calorifique nominal est
inférieur ou égal à 1 000 kW

Heizkessel für gasförmige Brennstoffe - Teil 2-1:
Heizkessel der Bauart C und Heizkessel der Bauarten
B2, B3 und B5 mit einer Nennwärmebelastung nicht
größer als 1 000 kW

This European Standard was approved by CEN on 24 July 2022 and includes Amendment approved by CEN on 11 October 2023.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and United Kingdom.



EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

Contents

Page

European foreword.....	6
Introduction	8
1 Scope	9
2 Normative references.....	10
3 Terms, definitions and symbols.....	12
3.1 Terms and definitions	12
3.2 Symbols.....	13
4 Classification.....	13
5 Construction.....	13
5.1 General.....	13
5.2 Conversion to different gases	13
5.3 Materials.....	13
5.4 Method of construction	13
5.4.1 Design	13
5.4.2 Checking the state of operation	13
5.4.3 Use and servicing	13
5.4.4 Connections to the gas and water pipes.....	13
5.4.5 Soundness	13
5.4.6 Supply of combustion air and evacuation of the combustion products	13
5.4.7 Dampers	14
5.4.8 Air proving.....	14
5.4.9 Gas/air ratio controls	14
5.4.10 Fan	15
5.4.11 Drainage	15
5.4.12 Operational safety in the event of failure of the auxiliary energy.....	15
5.4.13 Special provision for low temperature boilers and condensing boilers.....	15
5.5 Burners	15
5.6 Pressure test points.....	15
5.7 Requirements for the application of control and safety devices	15
5.8 Additional requirements for modular boilers.....	15
5.8.101 Additional requirements for non-return valves in type C ₍₁₀₎ boilers and C ₍₁₁₎ boiler modules	15
6 Electrical safety.....	15
7 Controls.....	15
8 Operational requirements.....	15
8.1 General.....	15
8.1.1 Characteristics of the reference and limit gases.....	16
8.1.2 General test conditions	16
8.2 Soundness	19
8.2.1 Soundness of the gas circuit	19

8.2.2	Soundness of the combustion circuit.....	19
8.2.3	Soundness of the water circuit	23
8.2.4	Soundness of the domestic water circuit	23
8.3	Hydraulic resistance.....	23
8.4	Heat inputs and heat outputs.....	23
8.4.101	Additional operational requirements for type C ₍₁₀₎ and C ₍₁₁₎ boiler modules.....	24
8.5	Limiting temperatures.....	24
8.5.1	General	24
8.5.2	Limiting temperatures of the adjusting, control and safety devices.....	24
8.5.3	Limiting temperatures of the side walls, the front and the top	25
8.5.4	Limiting temperature of the test panels and the floor.....	25
8.5.101	External temperature of the ducts where the ducts are in contact with and or passing through a wall.....	25
8.6	Ignition, cross lighting, flame stability	25
8.6.1	General	25
8.6.2	Limit conditions	25
8.6.3	Special flue conditions.....	26
8.6.4	Reduction of the gas rate of the ignition burner	28
8.6.101	Resistance to draught for type B boilers.....	29
8.7	Reduction of the gas pressure.....	29
8.8	Defective closure of the gas valve immediately upstream of the main burner.....	29
8.9	Pre-purge.....	29
8.9.101	General.....	29
8.9.102	Tests and test conditions for pre-purging.....	31
8.9.103	Requirements for verification of the protected nature of a combustion chamber 31	
8.9.104	Test conditions for verification of the protected nature of a combustion chamber	31
8.9.105	Requirements for verification of normal ignition in a combustible air/gas mixture for type C boilers incorporating a fan	31
8.9.106	Test conditions for verification of normal ignition in a combustible air/gas mixture for type C boilers incorporating a fan	32
8.10	Functioning of a permanent ignition burner when the fan stops during the standby time.....	32
8.11	Adjustment, control and safety devices.....	32
8.11.1	General	32
8.11.2	Boilers intended to be installed in a partially protected place.....	32
8.11.3	Combination boilers	32
8.11.4	Control devices	32
8.11.5	Ignition devices	32
8.11.6	Flame supervision device	32
8.11.7	Gas pressure regulator	33
8.11.8	Thermostats and water temperature limiting devices.....	33
8.11.101	Air proving.....	33
8.12	Carbon monoxide	36
8.12.1	General	36
8.12.2	Limit conditions	36
8.12.3	Special conditions.....	37
8.12.4	Sooting.....	40
8.12.5	Supplementary test for low temperature boilers and condensing boilers	40
8.13	NO _x	40
8.14	Special provisions for boilers intended to be installed in a partially protected place	40

8.15	Formation of condensate.....	40
8.16	Temperature of combustion products	40
8.16.101	General	40
8.16.102	Designation and measurement of reference temperatures of flue systems	41
8.17	Sound power level.....	41
8.101	Mechanical resistance and stability of ducts, terminal and fitting pieces.....	41
8.101.1	General requirement.....	41
8.101.2	Compressive strength	41
8.101.3	Lateral strength.....	42
8.101.4	Flexible metallic liners	43
8.102	Requirements for plastic in the combustion product evacuation ducts, terminals and fitting pieces of boilers.....	43
8.102.1	Thermal resistance	43
8.102.2	Materials	43
8.103	Requirements for elastomeric seals and elastomeric sealants in the combustion product evacuation ducts, terminals and fitting pieces.....	49
8.103.1	Characterization.....	49
8.103.2	Long-term resistance to thermal load.....	50
8.103.3	Long-term resistance to condensate exposure	51
8.103.4	Cyclic condensate resistance test.....	52
8.103.5	Relaxation behaviour	52
8.103.6	Compression set.....	53
8.103.7	Low temperature resistance.....	53
8.103.8	Joints in elastomeric seals	53
8.104	Additional requirements for non-return valve for type C ₍₁₀₎ boilers and C ₍₁₁₎ boiler modules	53
8.104.1	General	53
8.104.2	Nominal working temperature at the position of the non-return valve.....	54
8.104.3	Leak tightness of the non-return valve	54
8.104.4	Functional durability of the non-return valve	54
8.104.5	Safety of boilers in case of a failing non-return valve.....	55
8.105	Additional requirements for the evaluation of the maximum heat input of the common duct system of type C ₍₁₁₎ boilers.....	56
8.105.1	Requirements of common duct system without wind conditions.....	56
8.105.2	Additional requirements of common duct system due to wind influence	57
9	Useful efficiencies	58
10	Electric auxiliary energy.....	58
11	Risk assessment.....	58
12	Marking and instructions.....	58
12.1	Boiler marking	58
12.2	Instructions	58
12.2.1	Instructions for installation	58
12.2.2	Instructions for use and servicing	64
12.3	Presentation.....	64
Annex AC1 XA AC1	(normative) Test apparatus for type C ₂ boilers	78
Annex X B	(normative) Test methods to determine the effects of long-term thermal load, long-term condensate exposure, condensing/non-condensing cycling and resistance to UV radiation	79
Annex AC1 XC AC1	(informative) This annex is empty on purpose	80

Annex AC₁ XD AC₁ (informative) Example on calculation of common duct system for type C₍₁₁₎ boilers	81
Annex ZA (informative) Left empty on purpose	83
Annex ZB (informative) Clauses of this European Standard addressing the methods for the verification of the efficiency of the EU Directive 92/42/EEC, relating to the efficiency of new hot boilers with an output of (4 – 400) kW	84
Annex ZC (informative) Relationship between this European Standard and the ecodesign requirements of Commission Regulation (EU) No 813/2013 L 239/136 aimed to be covered	85
Annex ZD (informative) Relationship between this European Standard and the energy labelling requirements of Commission Delegated Regulation (EU) No 811/2013 L 239/1 aimed to be covered	88
Annex ZE (informative) Relationship between this European Standard and the essential requirements of Regulation (EU) 2016/426 of the European Parliament and of the Council of 9 March 2016 on appliances burning gaseous fuels and repealing Directive 2009/142/EC aimed to be covered.....	91
Bibliography	105

European foreword

This document (EN 15502-2-1:2022+A1:2023) has been prepared by Technical Committee CEN/TC 109 “Central heating boilers using gaseous fuels”, the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2024, and conflicting national standards shall be withdrawn at the latest by June 2024.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes A1 EN 15502-2-1:2022 A1.

This document includes Amendment 1, approved by CEN on 2023-10-11.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1

A1 *deleted paragraphs* A1

EN 15502 consists of the following parts under the general title “Gas-fired heating boilers”:

- *Part 1: General requirements and tests;*
- *Part 2-1: Specific standard for type C appliances and type B2, B3 and B5 appliances of a nominal heat input not exceeding 1 000 kW (this document);*
- *Part 2-2: Specific standard for type B1 appliances.*

Relationship between this document and EN 15502-1, Gas-fired heating boilers — Part 1: General requirements and tests:

This document is to be used in conjunction with EN 15502-1:2021 and follows the numbering structure of EN 15502-1:2021.

Where this European Standard states:

- shall be according to EN 15502-1:2021, (clause number) with the following modification;
- shall be according to EN 15502-1:2021, (clause number) with the following addition;
- EN 15502-1:2021, (clause number) is replaced by the following;
- EN 15502-1:2021, (clause number) is not applicable;

the relevant text of EN 15502-1:2021 is to be adapted accordingly.

This document adds clauses or subclauses to the structure of EN 15502-1:2021 which are particular to this Part 2 standard. It should be noted that these clauses and subclauses are not indicated as an addition. Clauses, subclauses and annexes which are additional to those in EN 15502-1:2021 are numbered starting from 101, or designated as Annex XA, XB, XC, etc.

This document has been prepared under mandates M89/6 and M066, given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements as meant in

article 3 of EU Directive 2009/142/EC, relating to appliances burning gaseous fuels and the verification methods valid for production and measurements, as meant in article 5.2 of EU Directive 92/42/EEC, relating to the efficiency requirements for new hot water boilers fired with liquid or gaseous fuels, with an output of 4 – 400 kW.

This document has been prepared under the mandates M/534 and M/535, given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to:

- requirements of Commission Regulation (EC) No 813/2013 of 2 August 2013 implementing Directive 2009/125/EC of the European Parliament and of the Council with regard to ecodesign requirements for space heaters and combination heaters;
- requirements of Commission Delegated Regulation (EC) No 811/2013 of 18 February 2013 supplementing Directive 2010/30/EC of the European Parliament and of the Council with regard to energy labelling of space heaters, combination heaters, packages of space heater, temperature control and solar device and packages of combination heater, temperature control and solar device.

For relationship with EU Directive(s) / Regulation(s), see informative Annexes ZB, ZC, ZD and ZE which are integral parts of this document.

Any feedback and questions on this document should be directed to the users' national standards body. A complete listing of these bodies can be found on the CEN website.

According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Türkiye and the United Kingdom.

Introduction

The basic function of gas-fired heating boiler is to generate heat by direct heat transfer in a heat exchanger, from the combustion gasses to the water.

The boiler can include in one design more than one function. It can include for example:

- a sanitary hot water function;
- a function to supply the combustion air from the outside/open air;
- a function to dispose the combustion products to the outside/open air.

The boiler can be supplied to the market in more than one part. If the boiler is supplied to the market in multiple parts, the boiler is the assembly of various parts according to the instructions for installation.

Boilers can be designed to be connected to specific parts of a building. Connection to a chimney and the means of combustion air supply is particularly relevant.

Matters related to quality assurance systems, tests during production, and certificates of conformity of auxiliary devices are not dealt with in this series of European Standards.

1 Scope

This document specifies the requirements and test methods, as well as the classification and marking of gas-fired central heating boilers that are fitted with atmospheric burners, fan assisted atmospheric burners or fully premixed burners, and are hereafter referred to as “boilers”.

This document is intended to be used in conjunction with EN 15502-1:2021.

This document covers gas-fired central heating boilers from the types C₁ up to C₍₁₁₎ and the types B₂, B₃ and B₅:

NOTE 1 For further background information on appliance types see EN 1749:2020.

- a) that have a nominal heat input (on the basis of net calorific value) not exceeding 1 000 kW;
- b) that use one or more combustible gases of the three gas families at the pressures stated in EN 437:2021;
- c) where the temperature of the heat transfer fluid does not exceed 105 °C during normal operation;
- d) where the maximum operating pressure in the water circuit does not exceed 6 bar;
- e) which can give rise to condensation under certain circumstances;
- f) which are declared in the instructions for installation to be either a “condensing” boiler or a “low temperature boiler” or a “standard boiler”; if no declaration is given the boiler is to be considered a “standard boiler”;
- g) which are intended to be installed inside a building or in a partially protected place;
- h) which are intended to produce also hot water either by the instantaneous or storage principle as a single unit;
- i) which are designed for either sealed water systems or for open water systems;
- j) which are either modular boilers, or non-modular boilers.
- k) which are from the types C₍₁₀₎ that are equipped with a gas-air ratio control and that have a $\Delta p_{\max, \text{saf}(\min)}$ of 25 Pa, and C₍₁₁₎ that have condensing boiler modules that are equipped with a gas-air ratio control and that have a $\Delta p_{\max, \text{saf}(\min)}$ of 25 Pa.

NOTE 2 This document provides requirements for boilers with known constructions. For boilers with any alternative constructions, which might not fully be covered by this standard, the risk associated with this alternative construction needs to be assessed.

An example of an assessment methodology, based upon risk assessment, is given in Clause 11.

This document does not cover all the requirements for:

- aa) appliances above 1 000 kW;
- ab) appliances that are intended to be connected to gas grids where the quality of the distributed gas is likely to vary to a large extent over the lifetime of the appliance (see Annex AB of EN 15502-1:2021);
- ac) appliances using flue dampers;
- ad) appliances of the types B₂₁, B₃₁, B₅₁, C₂₁, C₄₁, C₅₁, C₆₁, C₇₁, C₈₁, C₍₁₂₎ and C₍₁₃₎;

- ae) C₇ appliances that have a nominal heat input (on the basis of net calorific value) exceeding 70 kW;
- af) appliances incorporating flexible plastic flue liners;
- ag) C₍₁₀₎ boilers:
 - 1) without a gas-air ratio control, or
 - 2) which are non-condensing appliances, or
 - 3) which have a maximum safety pressure difference at minimum heat input not equal to 25 Pa ($\Delta p_{\max, \text{saf}(\min)}$);
- ah) C₍₁₁₎ boilers that have boiler modules:
 - 1) without a gas-air ratio control, or
 - 2) which are non-condensing appliances, or
 - 3) which have a maximum safety pressure difference at minimum heat input not equal to 25 Pa ($\Delta p_{\max, \text{saf}(\min)}$);
- ai) appliances intended to be connected to a flue having mechanical extraction;
- aj) surface temperatures of external parts particular to children and elderly people;
- ak) appliances that are intended to burn natural gases of the second family where hydrogen is added to the natural gas;
- al) appliances equipped with an adaptive combustion control function (ACCF);
- am) boilers intended to be installed in areas accessible to elderly people and children.

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.

In this standard the normative references of Part 1 are valid. Furthermore, the following normative references are valid:

EN 513:2018, *Plastics — Poly(vinyl chloride) (PVC) based profiles — Determination of the resistance to artificial weathering*

EN 1856-2:2009, *Chimneys — Requirements for metal chimneys — Part 2: Metal flue liners and connecting flue pipes*

EN 1749:2020, *Classification of gas appliances according to the method of supplying combustion air and of evacuation of the combustion products (types)*

EN 13216-1:2019, *Chimneys — Test methods for system chimneys — Part 1: General test methods*

EN 13501-1:2018, *Fire classification of construction products and building elements — Part 1: Classification using data from reaction to fire tests*

EN 14241-1:2013, *Chimneys — Elastomeric seals and elastomeric sealants — Material requirements and test methods — Part 1: Seals in flue liners*

EN 14471:2013+A1:2015, *Chimneys — System chimneys with plastic flue liners — Requirements and test methods*

EN 14989-1:2007, *Chimneys — Requirements and test methods for metal chimneys and material independent air supply ducts for roomsealed heating applications — Part 1: Vertical air/flue terminals for C6-type appliances*

EN 15502-1:2021, *Gas-fired heating boilers — Part 1: General requirements and tests*

CEN/TS 16134:2011, *Chimney terminals — General requirements and material independent test methods*

EN ISO 178:2019, *Plastics — Determination of flexural properties (ISO 178:2019)*

EN ISO 179-1:2010, *Plastics — Determination of Charpy impact properties — Part 1: Non-instrumented impact test (ISO 179-1:2010)*

EN ISO 527-1:2019, *Plastics — Determination of tensile properties — Part 1: General principles (ISO 527-1:2019)*

EN ISO 527-2:2012, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics (ISO 527-2:2012)*

EN ISO 1183-1:2019, *Plastics — Methods for determining the density of non-cellular plastics — Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2019, Corrected version 2019-05)*

EN ISO 1183-2:2019, *Plastics — Methods for determining the density of non-cellular plastics — Part 2: Density gradient column method (ISO 1183-2:2019)*

EN ISO 1183-3:1999, *Plastics — Methods for determining the density of non-cellular plastics — Part 3: Gas pycnometer method (ISO 1183-3:1999)*

EN ISO 9969:2016, *Thermoplastics pipes — Determination of ring stiffness (ISO 9969:2016)*

ISO 37:2017, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

ISO 188:2011, *Rubber, vulcanized or thermoplastic — Accelerated ageing and heat resistance tests*

ISO 815-1:2019, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 815-2:2019, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 2: At low temperatures*

ISO 1817:2015, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2781:2018, *Rubber, vulcanized or thermoplastic — Determination of density*

ISO 6914:2014, *Rubber, vulcanized or thermoplastic — Determination of ageing characteristics by measurement of stress relaxation in tension*

ISO 48-4:2018, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 4: Indentation hardness by durometer method (Shore hardness)*

ISO 48-5:2018, *Rubber, vulcanized or thermoplastic — Determination of hardness — Part 5: Indentation hardness by IRHD pocket meter method*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 15502-1:2021 and the following apply. They are numbered in accordance with the specific groups they belong to.

EN 15502-1:2021, 3.1.3.11 is replaced by the following:

3.1.3.11

fitting piece

device that is part of the gas appliance, which allows connection of the appliance to ducts that are not part of the appliance

Note 1 to entry: Some examples of connections are:

- a) the air supply and combustion products evacuation ducts to a single common duct for type C₂ boilers;
- b) the air supply and combustion products evacuation ducts to two ducts of a common duct system for type C₄ and C₍₁₀₎ boilers”;
- c) type C₆ boilers to a system for air supply and combustion products evacuation that is approved and marketed independently from the boiler;
- d) the combustion products evacuation duct to a chimney that is part of the building for type C₈ boilers;
- e) the air supply duct to a chimney that is part of the building for type C₉ boilers;
- f) type B₂ boilers to a system for combustion products evacuation that is approved and marketed independently from the boiler;
- g) the combustion products evacuation duct to a shared duct system for type B₃ boilers

EN 15502-1:2021, 3.1.3.21 is replaced by the following:

3.1.3.21

common duct

duct to which multiple boilers or boiler modules are connected

Note 1 to entry: A common duct to connect boiler modules of a modular boiler (3.1.10.10) is part of the modular boiler. A common duct to connect multiple boilers is not part of the boilers but part of the building.

Add the following definitions at the end of EN 15502-1:2021, 3.1.14:

3.1.14.101

declared maximum pressure differences

maximum values of the pressure differences between the combustion products outlet and air inlet at the end of the fitting pieces where these are connected to the common duct system

3.1.14.102

declared minimum pressure differences

minimum values of the pressure differences between the combustion products outlet and air inlet at the end of the fitting pieces where these are connected to the common duct system

3.1.14.103**non-return valve**

one-way valve that allows fluids to flow through it in only one direction

3.2 Symbols

Shall be according to EN 15502-1:2021, 3.2.

4 Classification

Shall be according to EN 15502-1:2021, Clause 4.

5 Construction**5.1 General**

Shall be according to EN 15502-1:2021, 5.1.

5.2 Conversion to different gases

Shall be according to EN 15502-1:2021, 5.2.

5.3 Materials

Shall be according to EN 15502-1:2021, 5.3.

5.4 Method of construction**5.4.1 Design**

Shall be according to EN 15502-1:2021, 5.4.1.

5.4.2 Checking the state of operation

Shall be according to EN 15502-1:2021, 5.4.2.

5.4.3 Use and servicing

Shall be according to EN 15502-1:2021, 5.4.3.

5.4.4 Connections to the gas and water pipes

Shall be according to EN 15502-1:2021, 5.4.4.

5.4.5 Soundness

Shall be according to EN 15502-1:2021, 5.4.5.

5.4.6 Supply of combustion air and evacuation of the combustion products

EN 15502-1:2021, 5.4.6 is replaced by the following:

5.4.6.101 General

The boiler shall be so designed that there is an adequate supply of combustion air during ignition and over the whole range of possible heat inputs stated. A gas/air ratio control is permitted.

Fan assisted boilers may be fitted with a means of adjustment in the combustion circuit intended to adapt the boiler to the pressure losses in the installed ducts either by restrictors or by setting the means of adjustment to predetermined positions in accordance with the instructions for installation.

NOTE See the definition of boiler in 3.1.10.2.

5.4.6.102 Air supply and combustion products evacuation ducts

The assembly of the various parts during installation shall be such that no work is necessary other than adjusting the length of the air supply and combustion products evacuation ducts.

Such adaptation shall not impair the correct operation of the boiler.

It shall be possible to connect the boiler, the air supply and combustion products evacuation ducts and the terminal or fitting piece using ordinary tools.

The terminal inlets/outlets from separate combustion and air supply circuits for the supply of combustion air and the evacuation of combustion products:

- a) shall fit inside a square of 50 cm × 50 cm for type C₁ and C₃ boilers, for boilers up to 70 kW;
- b) shall fit inside a square of 100 cm × 100 cm for type C₁ and C₃ boilers, for boilers above 70 kW;
- c) may terminate in zones of different pressure for type C₅ boilers, but not on different walls of the building.

5.4.6.103 Terminal

Terminals on appliances without a fan shall prevent the intrusion of external objects by having no opening in the external surfaces of the terminal allowing the entry of a 16 mm diameter ball when applied with a force of 5 N.

Any horizontal terminal for non-condensing boilers shall be designed in such a way that any condensate which may form is discharged away from the surface of the wall to which the terminal is fitted.

Any horizontal terminal for condensing boilers shall be designed in such a way that condensate is directed towards the appliance.

5.4.6.104 Terminal guard

If the instructions for installation prescribe a protective guard for the terminal for use when the outlet for evacuation of the combustion products open on to a walkway, this guard shall be used during testing.

The dimensions of the terminal guard, when installed in accordance with the instructions for installation, shall be such that the distance between any part of the guard and the terminal, except the wall plate, exceeds 50 mm.

The guard shall not have any sharp edges likely to cause injury.

5.4.6.105 Fitting piece

For boilers of types C₂, C₄, C₈ and C₍₁₀₎ the fitting piece shall be so designed that it is possible to connect the appliance to the common duct.

5.4.7 Dampers

EN 15502-1:2021, 5.4.7 is not applicable.

5.4.8 Air proving

Shall be according to EN 15502-1:2021, 5.4.8.

5.4.9 Gas/air ratio controls

Shall be according to EN 15502-1:2021, 5.4.9.

5.4.10 Fan

Shall be according to EN 15502-1:2021, 5.4.10.

5.4.11 Drainage

Shall be according to EN 15502-1:2021, 5.4.11.

5.4.12 Operational safety in the event of failure of the auxiliary energy

Shall be according to EN 15502-1:2021, 5.4.12.

5.4.13 Special provision for low temperature boilers and condensing boilers

Shall be according to EN 15502-1:2021, 5.4.13.

5.5 Burners

Shall be according to EN 15502-1:2021, 5.5.

5.6 Pressure test points

Shall be according to EN 15502-1:2021, 5.6.

5.7 Requirements for the application of control and safety devices

Shall be according to EN 15502-1:2021, 5.7.

5.8 Additional requirements for modular boilers

Shall be according to EN 15502-1:2021, 5.8 with the following addition:

5.8.101 Additional requirements for non-return valves in type C₍₁₀₎ boilers and C₍₁₁₎ boiler modulesRequirements:

- 1) A non-return valve shall be applied;
- 2) each C₍₁₀₎ boiler shall contain a non-return valve;
- 3) each C₍₁₁₎ boiler module shall contain a non-return valve.

6 Electrical safety

Shall be according to EN 15502-1:2021, Clause 6.

7 Controls

Shall be according to EN 15502-1:2021, Clause 7.

8 Operational requirements

8.1 to 8.17 shall be as given below, and 8.101 to 8.105 are added at the end.

8.1 General

Shall be according to EN 15502-1:2021, 8.1.

8.1.1 Characteristics of the reference and limit gases

Shall be according to EN 15502-1:2021, 8.1.1.

8.1.2 General test conditions

Shall be according to EN 15502-1:2021, 8.1.2. with the following changes, including 8.1.2.101 at the end.

8.1.2.1 Installation of the boiler

Shall be according to EN 15502-1:2021, 8.1.2.1 with the following addition:

The sample of the combustion products is taken in the plane perpendicular to the direction of flow of the combustion products, and at a distance L from the extreme end of the combustion products duct (see probe examples in Figures 101, 102, 103 or 104):

— for circular ducts: $L = D_i$ (101)

— for rectangular ducts: $L = 4 S / C$ (102)

where

D_i is the internal diameter of the combustion products evacuation duct, in mm;

S is the cross-sectional area of this duct, in mm²;

C is the circumference of this duct, in mm.

Except where otherwise stated, the requirements are checked under the following test conditions.

— Installation of type C boilers and type B boilers with a fan

Except where otherwise stated, the boiler is connected to the shortest ducts with the smallest pressure loss stated in the instructions for installation. The connection to the duct shall be in accordance with the instructions for installation. The terminal guard is not fitted.

Type C₁, C₃, and C₅ boilers are tested with their terminals fitted. Type C₁ boilers are tested with a duct suitable for a wall with a thickness of 300 mm.

Type C₂, C₄, C₈ and C₍₁₀₎ boilers are tested with their fitting pieces fitted but not connected to a test duct.

Type C₆ boilers are fitted with restrictors enabling the minimum and maximum duct pressure losses specified by the instructions for installation to be simulated.

Type C₇ boilers are tested with 1 m of vertical secondary flue.

Type C₉ boilers are tested with the minimum diameter / cross section area of the vertical duct supplying the combustion air as specified by the instructions for installation.

— Installation of type B boilers

For all the tests, except where otherwise stated in the particular clauses, the boiler is installed and used under the conditions specified in the instructions for installation.

Except where otherwise stated, type B₅ boilers are connected to the shortest ducts with the smallest pressure loss stated in the instructions for installation. The internal diameter of the test flue shall be equal to the smallest diameter stated the instructions for installation. The thickness of the flue is less than 1 mm.

If the diameter of the boiler flue outlet does not correspond to the external diameter in local use, a linking piece of thickness 1 mm is used to adapt the flue outlet diameter to the diameter of the test flue.

The height of the flue is measured:

— for a boiler having a flue outlet with a horizontal axis, from this axis;

— for a boiler having a flue outlet with a vertical axis, from the plane of the flue outlet.

The combustion products are sampled at a point in the flue 0,2 m from the top, using the probe shown in Figures 103 or 104.

Type B₅ boilers are fitted with their ducts and terminals. The terminal guard is not fitted. Except where otherwise stated, type B₅ boilers are connected to the shortest ducts with the smallest pressure loss stated by the manufacturer in the instructions for installation. If necessary, an external duct may be sealed in accordance with the instructions for installation.

8.1.2.2 Gases used for testing

Shall be according to EN 15502-1:2021, 8.1.2.2.

8.1.2.3 Conduct of test to obtain a heat input

The title of 8.1.2.3 is modified as follows:

“8.1.2.3 Conduct of test to obtain a heat input and verification of O₂/CO₂/ CO level in the flue”

Shall be according to EN 15502-1:2021, 8.1.2.3 with the following addition:

“For appliances where technical documentation specifies an O₂ or CO₂ range or a maximum CO level in the flue using reference gas at reference conditions (as indicated in the general test conditions), with the purpose to verify proper installation, this O₂/CO₂/CO level must be verified. If the found O₂/CO₂/CO level is outside the range specified in the technical documentation, the adjustment procedure indicated in the technical documentation shall be followed to ensure the correct installation.”

8.1.2.4 Water circuit

Shall be according to EN 15502-1:2021, 8.1.2.4.

8.1.2.5 Thermal equilibrium

Shall be according to EN 15502-1:2021, 8.1.2.5.

8.1.2.6 General test conditions for combination boilers

Shall be according to EN 15502-1:2021, 8.1.2.6.

8.1.2.7 Electrical supply

Shall be according to EN 15502-1:2021, 8.1.2.7.

8.1.2.8 Tolerances of measurements

Shall be according to EN 15502-1:2021, 8.1.2.8.

8.1.2.101 Pressure differences at different operational situations for type C₍₁₀₎ boilers

The maximum nominal heat input ($Q_{n,max}$) shall be taken into account unless otherwise stated.

The technical documentation shall declare:

- a) the maximum safety pressure difference at minimum heat input is ($\Delta p_{max, saf(min)}$) 25 Pa,
- b) the maximum safety pressure difference at maximum heat is

$$\Delta p_{max, saf(max)} = (2/(1+m))^{2,2} * (\Delta p_{max, saf(min)}) \text{ with } m = Q_{min,c}/Q_{n,max}; \quad (103)$$

- c) the maximum safety pressure difference at start: $\Delta p_{max, saf(start)} = \Delta p_{max, saf(min)}$; (104)

- d) the maximum functional pressure difference at maximum heat input is considered equal the maximum safety pressure difference

$$(\Delta p_{\max, \text{func}(\max)} = \Delta p_{\max, \text{saf}(\max)}) \quad (105)$$

and

- e) the minimum safety pressure difference ($\Delta p_{\min, \text{saf}}$) is stated as -200 Pa.

NOTE The stated maximum and minimum pressure differences are the maximum and minimum values of the pressure differences between the combustion products outlet and air inlet at the end of the fitting pieces where these are connected to the common duct system (see definitions 3.1.14.1 to 3.1.14.5).

8.1.2.102 Pressure differences at different operational situations for type C₍₁₁₎ boilers

8.1.2.102.1 General

The maximum nominal heat input ($Q_{n, \max}$) of each individual boiler module shall be taken into account unless otherwise stated.

The technical documentation shall declare:

- a) the maximum safety pressure difference at maximum heat (input ($\Delta p_{\max, \text{saf}(\max)}$);
- b) the maximum safety pressure difference at minimum heat input is ($\Delta p_{\max, \text{saf}(\min)}$) 25 Pa;
- c) the maximum safety pressure difference at start: $\Delta p_{\max, \text{saf}(\text{start})}$;
- d) the maximum functional pressure difference at maximum heat input $\Delta p_{\max, \text{func}(\max)}$;
- e) the minimum safety pressure difference ($\Delta p_{\min, \text{saf}}$) equal or less to the suction.

8.1.2.102.2 Conditions for determination of the maximum safety pressure

The maximum applicable nominal heat inputs ($Q_{n, \max}$) of each individual boiler module shall be taken into account.

When n-1 boiler modules are running, all applicable operational circumstances shall be taken into account, where n is the total number of connected boiler modules.

8.1.2.102.3 Conditions for determination of the maximum functional pressure

The functional operation is defined as the situation in which:

- a) For combination boiler modules:
 - The maximum fraction of nominal heat input for domestic hot water production (Q_{DHW}) for the number of n boiler modules connected to the common duct system is:

$$f(\text{DHW}) = \frac{\sqrt{2,5 \times n}}{n}; \text{ with a maximum of } 1,0. \quad (106)$$

- The number of boiler modules running and producing domestic hot water based on n boiler modules connected to the common duct system are:

$$n(\text{DHW}) = f(\text{DHW}) \times n \text{ round off upwards.} \quad (107)$$

- The number of boiler modules running and producing hot water for central heating based on n boiler modules connected to the common duct system are:

$$n(CH) = n - n(DHW) \quad (108)$$

- b) For central heating boiler modules without domestic hot water production no fraction is used.
- c) For combination boiler modules, the boiler modules running in central heating mode and boiler modules running in domestic hot water mode are proportional divided. The lowest positioned boiler module is always in domestic hot water mode.

8.1.2.102.4 Example for calculation of heat inputs

NOTE For both 8.1.2.102.2 and 8.1.2.102.3 an example for calculating the heat inputs at which the pressure differences between the combustion products inlet to and air outlet from the common duct system is given in Annex XD.

8.2 Soundness

8.2.1 Soundness of the gas circuit

Shall be according to EN 15502-1:2021, 8.2.1.

8.2.2 Soundness of the combustion circuit

Shall be according to EN 15502-1:2021, 8.2.2 with the addition of 8.2.2.101 to 8.2.2.103 at the end.

8.2.2.101 General

8.2.2.101.1 Requirements

Type C boilers and their ducts shall be sound in accordance with:

- 8.2.2.102.1.1;
- 8.2.2.102.2.1;
- 8.2.2.102.3.1;
- 8.2.2.102.4.1;
- 8.2.2.102.5.1.

Type B boilers and their ducts shall be sound in accordance with:

- 8.2.2.103.1.1.

8.2.2.101.2 Test methods

Only the soundness of the boiler shall be tested. Openings which are intended to be connected to other parts have to be made sound for the purpose of this test.

The test shall include all joints of the boiler (3.1.10.2) identified in the instructions for installation.

The boiler shall be tested with the maximum length of ducts as specified in the instructions for installation.

Soundness shall be verified before and after all the tests of this standard, except the tests specified in the mechanical tests.

8.2.2.102 Soundness of the air supply and combustion product circuit type C boilers

8.2.2.102.1 Air supply and combustion product circuit

8.2.2.102.1.1 Requirements

Soundness with respect to the room where the boiler is installed is ensured if, under the specified test conditions, the leakage rates do not exceed the values in Table 102.

Table 102 — Maximum admissible leakage rates

Test object	Surrounding of the combustion products circuit by the combustion air circuit	Maximum leakage rate for $Q_n \leq 40$ kW m ³ /h	Maximum leakage rate for $Q_n > 40$ kW m ³ /h
Boiler with its air supply and combustion products evacuation ducts and all their joints	Completely	5	$5 Q_n/40$
	not completely	1	$Q_n/40$
Boiler and the joints to the air supply and combustion products evacuation ducts	Completely	3	$3 Q_n/40$
	not completely	0,6	$0,6 Q_n/40$
combustion products evacuation ducts, not completely ^a surrounded by combustion air, with all its joints excluding the joints tested above		0,4	$0,4 Q_n/40$
Air supply duct with all its joints excluding the joints tested above		2	$2 Q_n/40$
^a In the case of a siphon not completely incorporated in the boiler housing, the combustion products circuit is considered to fall under the category “completely surrounded by the combustion air circuit” if its components are of sound material and the construction is solid (see 5.3.1).			

8.2.2.102.1.2 Test methods

The test can be carried out either separately on the boiler body and on the ducts, or on the boiler assembled with its ducts.

The combustion circuit of the test object in accordance with Table 102 is connected to a pressure source on one side and blocked on the other side.

The test pressure (difference) is 0,5 mbar unless otherwise stated.

For boilers with a fan where the combustion products circuit is not completely surrounded by the combustion air circuit, the test is also carried out on the part of the combustion circuit downstream of the fan, with a test pressure which is increased by the highest pressure between the combustion circuit, in the envelope of the boiler or the ducts, and the atmosphere, measured with the boiler in thermal equilibrium at nominal heat input and fitted with the longest ducts specified in the instructions for installation.

For boilers with non-return valves like C₍₁₀₎ and C₍₁₁₎ the non-return valve shall be open during the test.

8.2.2.102.2 Requirements for combustion products evacuation duct for appliances with indirect air proving

8.2.2.102.2.1 Requirements

The soundness of the combustion products evacuation duct for installation both inside and outside the room where the boiler is installed, permitted for alternative control systems, is ensured if, under the test conditions, the leakage rate per surface area of the duct does not exceed $0,006 \text{ dm}^3/\text{s}\cdot\text{m}^2$.

8.2.2.102.2.2 Test methods

The combustion products evacuation duct is connected to a pressure source on one side and blocked on the other side. The test pressure is 2,0 mbar.

It is checked that the requirements are met.

8.2.2.102.3 Requirements for separate combustion products evacuation duct

8.2.2.102.3.1 Requirements

The soundness of a separate combustion products evacuation duct with respect to areas other than the room where the boiler is installed is ensured if under the test conditions the leakage rate per surface area of the duct does not exceed $0,006 \text{ dm}^3/(\text{s}\cdot\text{m}^2)$.

NOTE For definition of separate ducts, see 3.1.3.17.

8.2.2.102.3.2 Test methods

When tested in accordance with 8.2.2.102.1 but with a test pressure of 2,0 mbar, it is checked that the requirements are met.

8.2.2.102.4 Requirements for the air supply circuit

8.2.2.102.4.1 Requirements

The soundness of the air supply circuit with respect to all areas other than the room where the boiler is installed, is ensured if under the test conditions of the leakage rate per surface area of the duct does not exceed $0,5 \text{ dm}^3/(\text{s}\cdot\text{m}^2)$.

8.2.2.102.4.2 Test methods

When tested in accordance with 8.2.2.102.1, it is checked that the requirements are met.

8.2.2.102.5 Requirements for leakage of combustion products for type C₇ boilers

8.2.2.102.5.1 Requirements

Under the test conditions combustion products shall only escape from the secondary flue outlet.

8.2.2.102.5.2 Test methods

The sampling probe is removed. The test is carried out with one of the reference gases, or a gas actually distributed, for the category concerned at the nominal heat input.

Escape of combustion products is looked for with a dew point plate, whose temperature is maintained at a value above the dew point of the ambient air. The plate is brought near to all the places around the air inlet/draught diverter where an escape is suspected.

Alternatively, an escape of combustion products is looked for with a sampling probe connected to a rapid response CO₂ analyser enabling concentrations of the order of 0,2 % to be detected.

It is checked that the requirement is met.

8.2.2.103 Soundness of the combustion product circuit of type B boilers

8.2.2.103.1 General requirements

8.2.2.103.1.1 Requirements

Boilers shall comply with 8.2.2.103.2.1 or 8.2.2.103.3.1. Ducts of type B₅ boilers shall comply with 8.2.2.103.4.1.

8.2.2.103.1.2 Test method

Soundness shall be verified before and after all the tests, except the tests specified in the mechanical tests.

8.2.2.103.2 Type B₂ and B₅ boilers

8.2.2.103.2.1 Requirements

The combustion products circuit of a boiler incorporating a fan shall be sound with respect to the room where the boiler is installed. This soundness is ensured if, under the following test conditions, combustion products only escape from the flue outlet. Additionally, the ducts of type B₅ boilers shall also meet the requirements of 8.2.2.103.4.

8.2.2.103.2.2 Test method

The boiler is tested alone without its flue duct.

The maximum pressure at which the boiler can operate is determined by progressively blocking the combustion products evacuation duct or air inlet, until the air proving device acts.

The air proving device is then put out of operation, to allow the operation of the burner at the maximum cut-off pressure of the air proving device. The boiler is then connected to a short length of flue duct incorporating a restriction to reach the maximum operating pressure determined above.

Possible leaks are looked for with a dew point plate, whose temperature is maintained at a value slightly above the dew point of the ambient air. The plate is brought close to all the places where a leak is suspected.

Alternatively, an escape of combustion products is looked for with a sampling probe connected to a rapid response CO₂ analyser enabling concentrations of the order of 0,20 % to be detected. In this case, precautions shall be taken to ensure that sampling does not interfere with the normal evacuation of the combustion products.

It is checked that the above requirement is met.

8.2.2.103.3 Type B₃ boilers

8.2.2.103.3.1 Requirements

Soundness is ensured if one of the following requirements is met:

a) the leakage rate of the combustion products circuit does not exceed:

1) 3,0 m³/h for boilers with a nominal heat input until 40 kW or

2) $3 \cdot \frac{Q_n}{40}$ m³/h for boilers above 40 kW;

b) the leakage rate of the combustion circuit (with all the ducts and joints) does not exceed:

1) 5,0 m³/h for boilers with a nominal heat input until 40 kW or

2) $5 \cdot \frac{Q_n}{40}$ m³/h for boilers above 40 kW.

8.2.2.103.3.2 Test conditions

The flue outlet is connected to a pressure source. The orifices through which the combustion air is supplied, are blocked. The test pressure is to be 0,5 mbar.

It is checked that the above requirements are met.

8.2.2.103.4 Combustion products evacuation ducts of type B₅ boilers

B₅ boilers include all the components necessary to exhaust the combustion products to the outside of the building.

8.2.2.103.4.1 Requirements

If the instructions for installation specify that parts of its combustion products evacuation circuit could pass through areas other than the area where the boiler is installed, the soundness of a combustion products evacuation circuit to those other areas shall be ensured. This soundness is ensured if:

- a) the combustion products evacuation circuit is completely surrounded by combustion air circuit or
- b) under the following test conditions the leakage rate per square metre surface of the duct does not exceed 0,006 dm³/(s·m²).

8.2.2.103.4.2 Test conditions

The test checks all joints of the boiler (3.1.10.2) specified in the instructions for installation.

To guard against the possibility of leakage along the length of its ducts, the tests are also carried out with the maximum length of duct as specified in the instructions for installation. The parts of the boiler that are intended to be connected with another system shall be made sound in accordance with the instructions for installation.

The flue duct and its joint to the boiler shall be connected to a pressure source on one side and blocked on the other side with a pressure corresponding to the maximum pressure measured in 8.2.2.103.2.2.

It is checked that the above requirement is met.

8.2.3 Soundness of the water circuit

Shall be according to EN 15502-1:2021, 8.2.3.

8.2.4 Soundness of the domestic water circuit

Shall be according to EN 15502-1:2021, 8.2.4.

8.3 Hydraulic resistance

Shall be according to EN 15502-1:2021, 8.3.

8.4 Heat inputs and heat outputs

Shall be according to EN 15502-1:2021, 8.4 with the addition of 8.4.101 at the end.

8.4.101 Additional operational requirements for type C₍₁₀₎ and C₍₁₁₎ boiler modules

8.4.101.1 Heat input at maximum functional pressure difference at maximum heat input

8.4.101.1.1 Requirement

The heat input obtained at the maximum functional pressure difference at maximum heat input ($\Delta p_{\max, \text{func}(\max)}$) (see 8.1.2.101 for C₍₁₀₎ and 8.1.2.102 for C₍₁₁₎) shall not differ by more than 5 % from the maximum nominal heat input ($Q_{n, \max}$). If this 5 % is less than 500 W, a tolerance of 500 W is acceptable.

8.4.101.1.2 Test method

The heat input of the boiler or boiler module is determined according to 8.4.1 and/or 8.4.6 at the maximum functional pressure difference at maximum heat input ($\Delta p_{\max, \text{func}(\max)}$).

For C₍₁₀₎ the boiler is installed with the longest connecting ducts, including the fitting piece, as specified in the instructions for installation.

For C₍₁₁₎ the boiler modules are installed with the longest connecting ducts, including the fitting piece, as specified in the instructions for installation.

8.4.101.2 Heat input at maximum safety pressure difference at minimum heat input

8.4.101.2.1 Requirement

The corrected heat inputs shall not differ more by than 5 % from the declared values. If this 5 % of the minimum adjustable and/or controlled heat input is less than 500 W, a tolerance of 500 W is acceptable.

The minimum adjustable heat input for range rated boilers or boiler modules and/or minimum controlled heat input for modulating boilers or boiler modules shall be declared and results in the following two levels of minimum adjustable heat input and/or minimum controlled heat input after adjustment of the fan speed setting (if specified in the instructions for installation):

- a) a particular level at 0 (zero) Pa pressure difference between combustion products outlet and air inlet;
- b) a particular level at the maximum safety pressure difference at minimum adjustable and/or controlled heat input ($\Delta p_{\max, \text{saf}(\min)}$) when the heat input obtained at the maximum safety pressure difference at minimum heat input ($\Delta p_{\max, \text{saf}(\min)}$) is less than 95 % of the minimum adjustable and/or controlled heat input at 0 Pa. If 5 % of the minimum adjustable and/or controlled heat input is less than 500 W, a tolerance of 500 W is acceptable.

The instructions for installation may specify an adjustment of the fan speed setting to ensure that this requirement is met.

8.4.101.2.2 Test method

With the longest connecting ducts, including the fitting piece, the minimum adjustable and/or controlled heat input of the boiler or boiler module is determined according to the measuring method of 8.4.1 at the maximum safety pressure difference at minimum heat input at 25 Pa ($\Delta p_{\max, \text{saf}(\min)}$).

8.5 Limiting temperatures

8.5.1 General

Shall be according to EN 15502-1:2021, 8.5.1.

8.5.2 Limiting temperatures of the adjusting, control and safety devices

Shall be according to EN 15502-1:2021, 8.5.2.

8.5.3 Limiting temperatures of the side walls, the front and the top

Shall be according to EN 15502-1:2021, 8.5.3.

8.5.4 Limiting temperature of the test panels and the floor

Shall be according to EN 15502-1:2021, 8.5.4 with the addition of 8.5.101:

NOTE For examples of measuring temperatures, see Figures 111 and 112.

8.5.101 External temperature of the ducts where the ducts are in contact with and or passing through a wall

8.5.101.1 Requirements

The temperature of the ducts or the protection as prescribed in the instructions for installation, in contact with or passing through the walls of a dwelling shall not exceed the ambient temperature by more than 60 K under the test conditions below.

When this temperature rise of the ducts exceeds 60 K, the instructions for installation may state the nature of the protection which has to be applied between the ducts and the walls in case they are constructed from inflammable materials.

8.5.101.2 Test conditions

With the protection, if any, fitted in accordance with the instructions for installation the temperature of the wall is measured after the boiler has operated for 30 min.

It is checked that the above requirements are met.

8.6 Ignition, cross lighting, flame stability

8.6.1 General

Shall be according to EN 15502-1:2021, 8.6.1.

8.6.2 Limit conditions

Shall be according to EN 15502-1:2021, 8.6.2 with the addition of 8.6.2.101.

8.6.2.101 Additional requirements for type C₍₁₀₎ boilers and C₍₁₁₎ boiler modules

8.6.2.101.1 Maximum safety pressure difference at start

8.6.2.101.1.1 Requirements

Shall be according to EN 15502-1:2021, 8.6.2.1.

8.6.2.101.1.2 Test conditions

Shall be according to EN 15502-1:2021, 8.6.2.2 with the following addition at the end of the clause:

For C₍₁₀₎ the boiler is installed with the longest fitting pieces specified in the instructions for installation.

For C₍₁₁₎ the boiler modules are installed with the longest fitting pieces specified in the instructions for installation.

The tests are done according to the test of 8.6.2 at the maximum safety pressure difference at start ($\Delta p_{\max, \text{saf}(\text{start})}$).

8.6.3 Special flue conditions

8.6.3 of EN 15502-1:2021 is amended by the addition of 8.6.3.101 to 8.6.3.113.

8.6.3.101 Requirements for ignition, cross lighting and combustion stability

Under the following test conditions for ignition of the ignition burner; ignition of the main burner by the ignition burner; or direct ignition of the main burner, complete cross lighting of the main burner and also stability of the ignition burner when it alone is alight, or of the ignition burner and main burner operating simultaneously, shall be ensured. Slight flame disturbance is permitted but there shall be no flame extinction.

8.6.3.102 General test conditions

Unless otherwise stated:

The boiler is supplied with one of the reference gases for its category and operated at both the nominal heat input and the minimum heat input allowed by the controls. All settings, including the controls, shall be according to the instructions for installation.

The tests are carried out with the shortest and longest air supply and combustion products evacuation circuit, or with corresponding pressure losses, unless otherwise stated.

If pressure differences are mentioned:

The intended pressure difference is the static pressure difference between the air inlet space and the flue outlet space. If pressures are measured in ducts, the dynamic pressure shall be considered calculating the proper static pressure difference.

8.6.3.103 Test conditions for Type C₁, C₃ and C₉ boilers

The boiler is installed in accordance with the instructions for installation, with the accessories specified in the instructions for installation on the applicable test apparatus of Figures 105 or 106 for type C₁ boilers and Figures 107 or 108 for type C₃ and C₉ boilers. The figures relate to:

Figure 105 = Test rig for type C boilers fitted with a horizontal terminal installed on a vertical wall

Figure 106 = Test rig for type C boilers fitted with a horizontal terminal on a roof

Figure 107 = Test rig for type C boilers fitted with a vertical terminal installed on a flat roof

Figure 108 = Test rig for type C boilers fitted with a vertical terminal installed on a pitched roof

The following tests are then carried out:

First test series

The terminal is subjected successively to winds of three different speeds (1 m/s, 2,5 m/s and 12,5 m/s) and with directions in three planes as given in Figures 105, 106, 107 and 108 depending on the boiler type and the situation.

For each of the three planes of incidence:

- a) the three combinations of wind speed and angle of incidence are found giving the lowest CO₂ concentration (for evaluating the above requirements);
- b) the three combinations are found for which the highest CO concentrations are measured, in the dry air-free combustion products (for evaluating 8.12.3.101.1).

Second test series

The boiler is in thermal equilibrium.

For each of the nine combinations that produce the lowest CO₂ concentration, noted in the first test series, it is checked that the above requirement is met.

Third test series

If the instructions for installation states there are provisions for a terminal guard, this is fitted in accordance with the instructions for installation and the nine tests in the first series that gave the highest CO concentrations in the dry air-free combustion products are repeated. The measured values are noted to be used for the calculation in 8.12.3.101.1.

8.6.3.104 Test conditions for type C₂ boilers

The boiler is installed in accordance with the instructions for installation in Annex XA on the test apparatus of Figure 109:

The test apparatus is adjusted to give successively the following conditions:

- a) an upflow of average speed 2 m/s, a CO₂ concentration of 1,6 % and a temperature within the range of 60 °C to 80 °C;
- b) an upflow of average speed 3 m/s, a CO₂ concentration of 0,75 % and a temperature within the range of 40 °C to 60 °C.

The tests are carried out with the boiler at ambient temperature and at thermal equilibrium.

8.6.3.105 Test conditions for type C₄ boilers

The boiler is installed with the shortest ducts specified in the instructions for installation. A suction of 0,5 mbar is applied to the combustion products evacuation duct.

8.6.3.106 Test conditions for type C₅ boilers

The boiler is installed with the shortest ducts specified in the instructions for installation. A suction of 2,0 mbar is applied to the combustion products evacuation duct.

8.6.3.107 Test conditions for type C₆ boilers

The boiler is installed in accordance with the instructions for installation. A suction of 0,5 mbar is applied at the combustion products outlet.

8.6.3.108 Test conditions for type C₇ boilers

Tests are carried out by applying continuous down-draughts of up to 3 m/s to the top of the test flue as in Figure 110.

A further test is carried out with the flue after the draught diverter blocked.

8.6.3.109 Test conditions for type C₈ boilers

The boiler is installed with the shortest ducts specified in the instructions for installation. A suction of 2,0 mbar is applied to the combustion products evacuation duct.

8.6.3.110 Test conditions for type C₍₁₀₎ boilers

The general test conditions of 8.6.3.102 are followed with:

- a) the boiler is installed with the shortest fitting pieces specified in the instructions for installation;

- b) a suction equal to the declared minimum safety pressure difference of 200 Pa ($\Delta p_{\min, \text{saf } f} = - 200 \text{ Pa}$) is applied;
- c) a recirculation of 10 % is applied to the combustion air inlet duct.

It is checked that the requirements of 8.6.3.101 are met.

8.6.3.111 Test conditions for type C₍₁₁₎ boilers

The general test conditions of 8.6.3.102 are followed with:

- a) the boiler module is installed with the shortest fitting pieces specified in the instructions for installation;
- b) a suction equal to the declared minimum safety pressure difference ($\Delta p_{\min, \text{saf}}$) is applied to the combustion evacuation duct;
- c) a recirculation as specified in the technical documentation (see 8.105.2) is applied. It is checked that the requirements of 8.6.3.101 are met.

8.6.3.112 Test conditions for type B₂, B₃ boilers

— Test no 1

The boiler is installed with 0,5 m duct. For type B₃ boilers, this is a completely surrounded combustion circuit. A suction of 0,5 mbar is applied to the combustion products evacuation duct while the appliance is running.

— Test no 2

The flue outlet is progressively blocked until the pressure at the flue outlet of the boiler has reached the value of 50 Pa.

For boilers intended to operate with a pressurized flue duct, designated by a “P”, this value is raised to the maximum nominal overpressure declared in the instructions for installation, which has not to be greater than 200 Pa.

8.6.3.113 Test conditions for type B₅ boiler

The boiler is installed in accordance with the information in the instructions for installation. The tests are carried out with the shortest and longest air supply and combustion products evacuation ducts on the applicable test situation given in Figure 105 up to Figure 108 depending on the direction of the terminal (horizontal or vertical) and the roof situation (flat or pitched).

The terminal is subjected successively to winds of three different speeds of 1 m/s, 2,5 m/s and 12,5 m/s and with directions in three planes as given in the applicable figures. For each of the three planes of incidence, the three combinations of wind speed and angle of incidence are found giving the lowest and highest CO₂ concentration.

With the boiler in thermal equilibrium, it is checked, that the requirements are met for each of these 18 combinations.

8.6.4 Reduction of the gas rate of the ignition burner

Shall be according to EN 15502-1:2021, 8.6.4 with the addition of 8.6.101 at the end.

8.6.101 Resistance to draught for type B boilers

8.6.101.1 Requirements

The flames shall be stable under the following test conditions.

8.6.101.2 Test conditions

The boiler is supplied with the reference gas or a distributed gas at nominal heat input and is subjected at burner level to a wind stream of speed 2 m/s. The wind stream covers at least the width of the burners and is made up of essentially parallel components (speed uniform to within $\pm 20\%$).

The axis of the wind stream is in a horizontal plane and is moved through one or more (at the discretion of the laboratory) angles of incidence within a semi-circle in front of the boiler, the centre of the semi-circle being at the intersection of the plane of symmetry of the boiler and the plane of the test.

The test is carried out with the ignition burner, if any, alight. Then with the main burner alight at the maximum and minimum heat inputs permitted by the controls. If there is a lighting door for the ignition burner, the test is carried out with the door closed.

It is checked that the requirement is met.

8.7 Reduction of the gas pressure

Shall be according to EN 15502-1:2021, 8.7.

8.8 Defective closure of the gas valve immediately upstream of the main burner

Shall be according to EN 15502-1:2021, 8.8.

8.9 Pre-purge

Shall be according to EN 15502-1:2021, 8.9 with the addition of 8.9.101 and 8.9.102.

8.9.101 General

Requirements

For fan-assisted boilers, pre-purge is mandatory before each ignition of the main burner (a single ignition attempt or several consecutive automatic ignition attempts) unless one of the following conditions is fulfilled:

- a) boilers with a permanent or alternating ignition burner;
- b) boilers in which the main burner gas line is fitted with a leakage control device;
- c) boilers above 0,25 kW and up to 150 kW, fitted with two Class C valves or a Class B and a Class J valve, which close simultaneously;
- d) boilers above 150 kW and up to 300 kW, fitted with two Class B valves;
- e) boilers above 300 kW, fitted with two Class A valves;
- f) boilers below 70 kW satisfying the “requirements for verification of the protected nature of a combustion chamber” as indicated in 8.9.103;
- g) type C₁₂ and C₁₃ boilers below 70 kW satisfying the “requirements for verification of normal ignition in a combustible air/gas mixture for type C boilers incorporating a fan” as indicated in 8.9.105.