



BSI Standards Publication

**Safety and control devices  
for burners and appliances  
burning gaseous or liquid  
fuels — Control functions  
in electronic systems —  
Temperature Control function**

**National foreword**

This British Standard is the UK implementation of EN 16830:2017.

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 secretary.

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EUROPEAN STANDARD

**EN 16830**

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English Version

## Safety and control devices for burners and appliances burning gaseous or liquid fuels - Control functions in electronic systems - Temperature Control function

Équipements auxiliaires pour brûleurs et appareils  
utilisant des combustibles gazeux ou liquides -  
Dispositifs de contrôle des systèmes électroniques -  
Dispositifs de régulation de la température

Sicherheits- und Regeleinrichtungen für Brenner und  
Brennstoffgeräte für gasförmige oder flüssige  
Brennstoffe - Regelfunktionen in elektronischen  
Systemen - Temperaturüberwachungsfunktion

This European Standard was approved by CEN on 23 October 2016.

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**CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels**

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## European foreword

This document (EN 16830:2017) 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.

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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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.

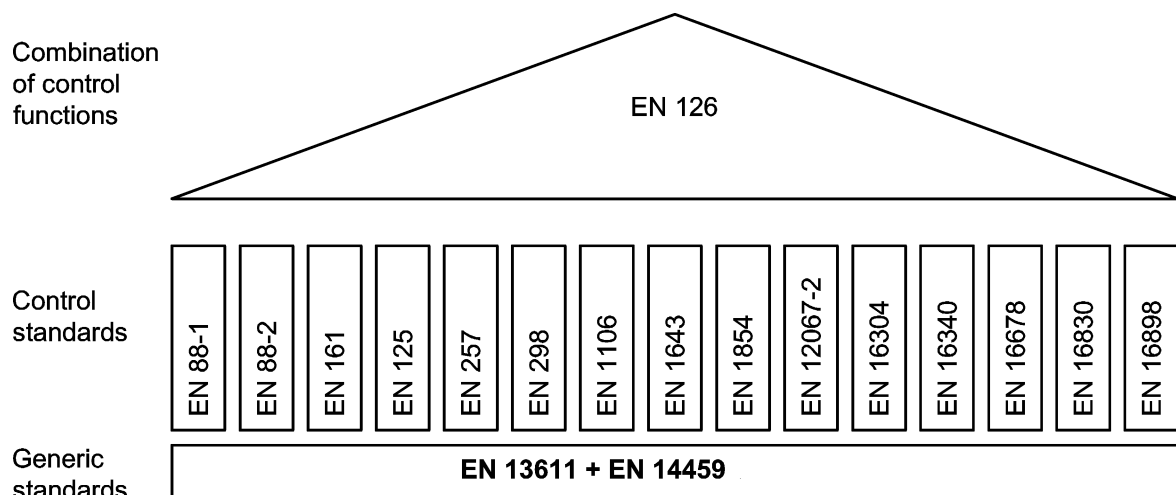
According to the CEN-CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany,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

## Introduction

The generic requirements for controls are given in EN 13611 and methods for classification and assessment for new controls and control functions are given in EN 14459 (see Figure 1).

The requirements for controls are given in the specific control standard (see Figure 1).

Multifunctional Controls (MFC) according to EN 126:2012 and EN 126:2012/prA1:2014 with two or more controls and Application Control Functions, e.g. the Gas Shut-off Control Function, being inherently multifunctional controls. Each control integrated in the MFC should meet the applicable requirements of the relevant control standard(s). In addition, EN 126:2012 and EN 126:2012/prA1:2014 cover requirements for the safety related interactions between the different devices.



**Figure 1 — Standards house**

This control standard refers to clauses of EN 13611:2015 or adapts it by stating “with the following modification”, “with the following addition”, “is replaced by the following” or “is not applicable” in the corresponding clause. This document adds clauses or subclauses to the structure of EN 13611:2015 which are particular to this European Standard, i.e. subclauses or annexes that are additional to those in EN 13611:2015 are numbered starting from 101 or are designated as Annex AA, BB, CC etc. It should be noted that these clauses and subclauses are not indicated as an addition.

This control standard describes requirements for two types of temperature based Appliance Control Functions.

### 1) Temperature Control Function

The temperature control function (in the following called TCF) is a system that consists of temperature sensing, signal processing, switching actions (on/off or protective action) and reset (see Figure 2).

The purpose of a TCF is to control the temperature (temperature regulator) and to prevent the risk of excessive temperature (temperature limiter) which could lead to the hazard of overheating for gas and liquid fuel burning appliances. A TCF requires a safety class C system, based on a comparison, made between an automatic burner controller and a temperature control function, the implication on safety of either function being considered equivalent. Gas and liquid fuel appliance standards can allow a lower safety class in combination with constructional measures, as long as the overall result for TCF is a safety class C.

Traditional solutions, using a combination of mechanical thermostats as specified in the appliance standards (e.g. EN 15502-1) have been considered to fulfil the requirements. This assumption is based on specific mechanical solutions, originating from practice over many years and relying on redundancy as the principle.

2) TTB

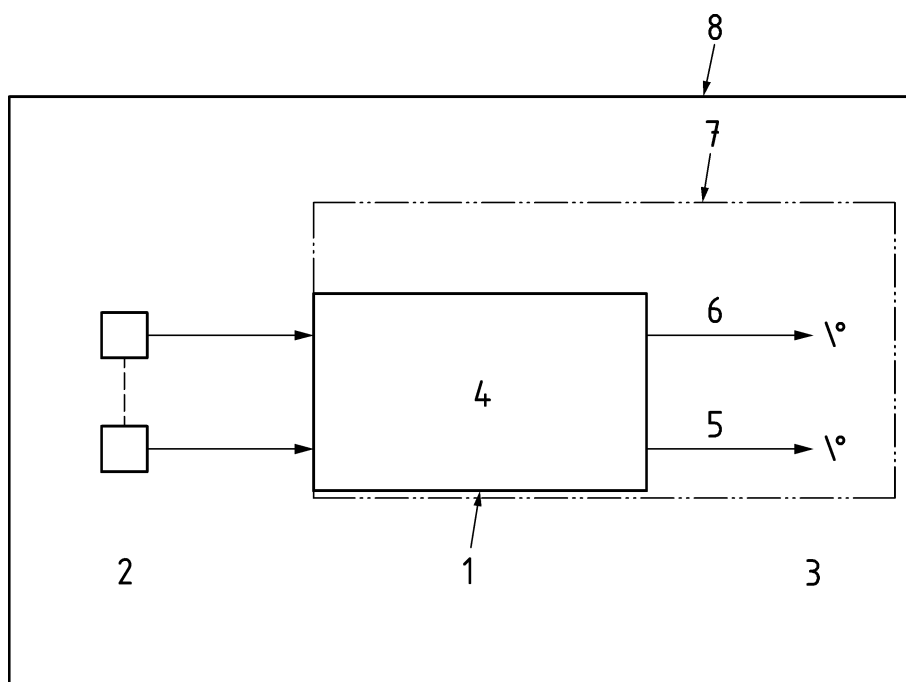
The Appliance Control Function TTB (Combustion Product Discharge Safety Device) is intended to provide protection against poisoning and suffocation in case of a (partially) blocked flue. This clause provides the requirements for electronic TTBs consisting of:

- a control that can take a protective action and
- a sensing element that monitors a significant physical value in relation to the spillage of combustion products into the environment where the gas appliance is installed.

If the spillage reaches a pre-set level, the TTB should initiate a protective action. Allowable spillage is determined by the application standard.

NOTE Instead of TTB, the term “Combustion Product Discharge Safety Device” is used in EN 15502-2-2.

For both TTB and TCF, the requirements in this European Standard are applicable to the combination of sensing element and control.



**Key**

- |   |   |   |                              |
|---|---|---|------------------------------|
| 1 | reset   | 5 | protective action            |
| 2 | sensing element(s)                              | 6 | on/off                       |
| 3 | switching action(s)                             | 7 | control                      |
| 4 | temperature regulator and protective controller | 8 | temperature control function |

**Figure 2 — Temperature control function**



## 1 Scope

This European Standard specifies the safety, design, construction and performance requirements for Temperature Control Function (TCF) and Combustion Product Discharge Safety Device (TTB) intended for use with burners and appliances using gaseous or liquid fuels.

It also describes the test procedures for checking compliance with these requirements.

This European Standard is applicable to AC and DC supplied TCF and TTB (for TCF and TTB supplied by stand-alone battery system, battery systems for mobile applications or systems which are intended to be connected to DC supply networks, see Annex I).

This European Standard is applicable to electronically based TTB and TCF only.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 13611:2015, *Safety and control devices for burners and appliances burning gaseous and/or liquid fuels - General requirements*

EN 60730-2-9:2010, *Automatic electrical controls for household and similar use — Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2008, modified)*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 13611:2015 and the following apply.

### 3.101

#### **control**

device that provides functionality as described in the specific control standard

### 3.102

#### **multifunctional control**

#### **MFC**

combination of two or more controls and/or Application Control Function(s) whereby the functional parts cannot operate if separated

### 3.103

#### **application control function**

#### **ACF**

function to protect against harm(s) originating from a specific hazard by providing safe operation of gas burners and gas burning appliances

Note 1 to entry: The assembly to provide this function may consist of a combination of controls and/or multifunctional control(s) (e.g. actuators, sensors and control electronics).

**3.104**  
**combustion products discharge safety device**  
**TTB**

appliance control function that at least causes safety shut-down of the main burner when there is an unacceptable spillage of combustion products at the draught diverter

[SOURCE: EN 15502-2-2:2014, 3.1.4.101]

**3.105**  
**temperature control function**  
**TCF**

appliance control function that controls the temperature (temperature regulator) and prevents the risk of excessive temperature (temperature limiter) which could lead to the hazard of overheating in gas and liquid fuel burning appliances by initiating at least a shut-down of the main burner

## **4 Classification**

### **4.1 Classes of control**

EN 13611:2015, 4.1 is replaced by the following:

The safety class of a TTB Appliance Control Function can be class A, class B or class C, depending on the application. The safety class of the TTB shall be stated in the installation and operating instructions.

The TCF shall be safety class C.

A lower class may be acceptable if this is proven by the analysis of the preventative measures within the appliance. The safety class of the TCF shall be stated in the installation and operating instructions.

A TCF may consist of various independent hardware and software devices. These individual devices, being part of the TCF, shall be classified as class A, class B or class C.

### **4.2 Groups of control**

EN 13611:2015, 4.2 is not applicable.

### **4.3 Classes of control functions**

Shall be according to EN 13611:2015, 4.3.

### **4.4 Types of DC supplied controls**

Shall be according to EN 13611:2015, 4.4.

## **5 Test conditions and measurement tolerances**

Shall be according to EN 13611:2015, Clause 5.

## **6 Construction requirements**

### **6.1 General**

Shall be according to EN 13611:2015, 6.1.

### **6.2 Mechanical parts of the control**

EN 13611:2015, 6.2 is not applicable.

## **6.3 Materials**

EN 13611:2015, 6.3 is not applicable.

## **6.4 Gas Connections**

EN 13611:2015, 6.4 is not applicable.

## **6.5 Electrical parts of the control**

### **6.5.1 General**

Shall be according to EN 13611:2015, 6.5.1 with the following addition:

The switching actions and the reset as indicated in Figure 2 are an integral part of the TCF. For multifunctional controls, the TCF or parts of it can be physically integrated in other functional blocks (e.g. Automatic Burner Control).

### **6.5.2 Switching elements**

Shall be according to EN 13611:2015, 6.5.2.

### **6.5.3 Electrical components**

#### **6.5.3.1 Performance of electrical components**

Shall be according to EN 13611:2015, 6.5.3.1.

#### **6.5.3.2 Test**

Shall be according to EN 13611:2015, 6.5.3.2.

#### **6.5.3.3 Sensing element**

Shall be according to EN 13611:2015, 6.5.3.3 with the following addition:

To withstand temperature overshoot after a protective action, the sensing element, being in contact with this temperature, shall be able to withstand a maximum temperature as declared in 7.1. This is the maximum temperature that the sensor will face in its application for a short period of time. During the long-term performance tests of 7.10.101 b) and d) this extreme temperature shall be maintained for 10 min each for the last 10 cycles.

The sensing element of the TTB shall not be removable without tools. Incorrect refitting, after servicing shall be made difficult.

For TCF Appliance Control Functions, where the safety depends on the correct location of the sensing elements, these sensing elements shall not be removable without tools. Incorrect refitting, after servicing shall be made difficult.

For TTB and TCF based on sensors other than temperature sensors, equivalent requirements shall be applied.

#### **6.5.3.4 Gas controls employing electrical components in the gas way**

EN 13611:2015, 6.5.3.4 is not applicable.

## **6.6 Protection against internal faults for the purpose of functional safety**

### **6.6.1 Design and construction requirements**

#### **6.6.1.1 Fault avoidance and fault tolerance**

##### **6.6.1.1.1 General**

Shall be according to EN 13611:2015, 6.6.1.1.1 with the following addition:

- TCF shall be safety class C.

EN 13611:2015, 6.6.4.2 c) and 6.6.4.3 a), are not applicable.

The fault reaction time shall be stated in the installation and operating instructions.

- TTB as a class B function

The requirements for protection against internal faults for the purpose of functional safety as given in 6.6 of EN 13611:2015 shall apply, with the exception of EN 13611:2015, 6.6.3.2 c).

The fault reaction time shall be stated in the installation and operating instructions with a limit of 24 h.

- TTB as a class C function

Requirements for protection against internal faults for the purpose of functional safety as given in 6.6 of EN 13611:2015 shall apply, with the exception of EN 13611:2015, 6.6.4.2 c) and 6.6.4.3 a).

The fault reaction time shall be stated in the installation and operating instructions.

##### **6.6.1.1.2 System design**

Shall be according to EN 13611:2015, 6.6.1.1.2.

##### **6.6.1.2 Lock-out function**

Shall be according to EN 13611:2015, 6.6.1.2.

##### **6.6.1.3 Reset device**

Shall be according to EN 13611:2015, 6.6.1.3.

##### **6.6.1.4 Documentation**

Shall be according to EN 13611:2015, 6.6.1.4.

### **6.6.2 Class A**

Shall be according to EN 13611:2015, 6.6.2.

### **6.6.3 Class B**

#### **6.6.3.1 Design and construction requirements**

Shall be according to EN 13611:2015, 6.6.3.1.

##### **6.6.3.2 First fault**

Shall be according to EN 13611:2015, 6.6.3.2 with the following modification:

For TTB and TCF-subassemblies declared as class B, EN 13611:2015, 6.6.3.2 c) is not applicable.

### **6.6.3.3 Fault introduced during lock-out or safety-shut-down**

Shall be according to EN 13611:2015, 6.6.3.3.

### **6.6.4 Class C**

#### **6.6.4.1 Design and construction requirements**

Shall be according to EN 13611:2015, 6.6.4.1.

#### **6.6.4.2 First fault**

Shall be according to EN 13611:2015, 6.6.4.2 with the following modification:

For TCF and TTB, EN 13611:2015, 6.6.4.2 c) is not applicable.

#### **6.6.4.3 Second fault**

Shall be according to EN 13611:2015, 6.6.4.3 with the following modification:

For TCF and TTB, EN 13611:2015, 6.6.4.3 a) is not applicable.

#### **6.6.4.4 Faults during lock-out or safety- shut-down**

Shall be according to EN 13611:2015, 6.6.4.4.

### **6.6.5 Circuit and construction evaluation**

Shall be according to EN 13611:2015, 6.6.5.

## **6.101 TTB**

### **6.101.1 General**

The TTB shall not be adjustable. Protection against unintended or unauthorized access is considered to be non-adjustable.

If an unacceptable spillage is detected (threshold value reached), the TTB shall proceed to the safety shut-down or lock-out within a declared TTB reaction time.

The system shall only leave this safety shut-down or lock-out automatically after the declared minimum waiting time or without a waiting time initiated by manual reset action. The minimum waiting time shall be specified in the Installation and Operating instructions.

A continuous reset signal shall not lead to a restart.

### **6.101.2 Threshold value**

The significant physical threshold value and its tolerances to which the TTB responds shall be specified in the Installation and Operating instructions.

This should include:

- set point;
- tolerances on the set point of supplied TTB's;
- drift of the set point.

Information shall be supplied in the Installation and Operating instructions explaining the maximum deviation of the set point of the protective action, based on a calculation method using averaging with the mean square value.

When tested under conditions of 7.9 and Clause 9 as well as after the test of 7.10, the threshold value shall not be outside the specified tolerances.

### **6.102 TCF**

The temperature limiter set point of the TCF shall not be adjustable. Protection against unintended or unauthorized access is considered to be non-adjustable.

The TCF shall perform a safety shut-down in the case of exceeding the set point of the protective action. Unless otherwise specified, this safety shut-down shall be followed by a non-volatile lock-out.

A continuous reset signal shall not lead to a restart.

## **7 Performance**

### **7.1 General**

Shall be according to EN 13611:2015, 7.1 with the following addition:

TCF and TTB devices shall comply with the requirements of type 2 of EN 60730-2-9:2011, in which case the installation and operating instructions shall specify the following:

- set point (for TCF: temperature limiter set point; for TTB: the significant physical threshold value);
- tolerances on the set point;
- drift of the set point(s);
- temperature which the sensing element is able to withstand;
- reaction time (being the response time of the sensing element and the response time of the electronics).

The technical documentation shall contain an explanation for the maximum tolerance on the set point of the protective action, based on a calculation method using averaging with the root mean square value.

When tested under conditions of 7.9 and Clause 9 as well as after the test of 7.10 the set point shall not be outside the specified tolerances.

### **7.2 Leak-tightness**

EN 13611:2015, 7.2 is not applicable.

### **7.3 Test for leak-tightness**

EN 13611:2015, 7.2.2 is not applicable.

### **7.4 Torsion and bending**

EN 13611:2015, 7.3 is not applicable.

### **7.5 Torsion and bending tests**

EN 13611:2015, 7.3.2.2 is not applicable.

### **7.6 Rated flow rate**

EN 13611:2015, 7.4 is not applicable.

## **7.7 Test for rated flow rate**

EN 13611:2015, 7.4.2 is not applicable.

## **7.8 Durability**

### **7.8.1 Elastomers in contact with gas**

EN 13611:2015, 7.5.1 is not applicable.

### **7.8.2 Marking**

Shall be according to EN 13611:2015, 7.5.2.

### **7.8.3 Resistance to scratching**

EN 13611:2015, 7.5.3 is not applicable.

### **7.8.4 Resistance to humidity**

EN 13611:2015, 7.5.4 is not applicable.

## **7.9 Performance tests for electronic controls**

### **7.9.1 At ambient temperature**

Shall be according to EN 13611:2015, 7.6.1 with the following addition:

During exposure of the control to the different ambient temperature conditions of 7.9.1, 7.9.2 and 7.9.3 the set point shall not be outside the tolerances, specified in 7.1.

### **7.9.2 At minimum temperature**

Shall be according to EN 13611:2015, 7.6.2.

### **7.9.3 At maximum temperature**

Shall be according to EN 13611:2015, 7.6.3.

## **7.10 Long-term performance for electronic controls**

### **7.10.1 General**

Shall be according to EN 13611:2015, 7.7.1 with the following addition:

The performance as declared in 7.1 shall be verified after the long-term performance tests.

In this subclause, the tests for sensing element(s) assembly and control (see Figure 2) are described separately. As an alternative, both tests can be integrated in a system test of sensing element(s) assembly and control. If the control is integrated in other controls (e.g. the Automatic Burner Control), the long-term performance tests can be combined.

### **7.10.2 Stress test**

#### **7.10.2.1 Thermal stress test**

Shall be according to EN 13611:2015, 7.7.2.1 with the following modification:

The number of cycles as specified in EN 13611:2015, 7.7.2.1 d) shall be 1 000 cycles.

#### **7.10.2.2 Vibration test**

Shall be according to EN 13611:2015, 7.7.2.2.

### 7.10.3 Long term performance test

Shall be according to EN 13611:2015, 7.7.3.

#### 7.10.101 TCF Sensing element(s) assembly

The sensing element assembly shall be tested, using the temperature change method as described in EN 60730-2-9:2011, for:

- a) 245 000 cycles in the temperature range from 20 °C up to the maximum regulating temperature as stated in the installation and operating instructions,
- b) 5 000 cycles in a range from the maximum regulating temperature up to the temperature that the sensing element should be able to withstand, see 7.1,

or the sensing element assembly shall be tested, using the two baths method as described in EN 60730-2-9:2011, for:

- c) 100 000 cycles in a range from 20 °C up to the maximum regulating temperature as stated in the installation and operating instructions,
- d) 2 000 cycles in the temperature range from the maximum regulating temperature up to the temperature that the sensing element should be able to withstand, see 7.1.

NOTE Alternative test methods can be applied if comparable results will be achieved e.g. EN 60730-1:2011, Annex J for thermistors.

#### 7.10.102 TTB Sensing element(s) assembly

The sensing element assembly shall be tested, using the temperature change method as described in EN 60730-2-9:2011, for:

- a) 245 000 cycles from 20 °C up to the maximum operating temperature as stated in the installation and operating instructions;
- b) 1 000 cycles from the maximum operating temperature up to the temperature that the sensing element should be able to withstand, see 7.1;

Alternatively the two baths method as described in EN 60730-2-9:2011 may be used:

- c) 100 000 cycles from 20 °C up to the maximum operating temperature as stated in the installation and operating instructions;
- d) 400 cycles in the temperature range from the maximum operating temperature up to the temperature which the sensing element should be able to withstand, see 7.1.

NOTE Alternative test methods can be applied if comparable results will be achieved e.g. EN 60730-1:2011, Annex J for thermistors.

### 7.11 Data exchange

Shall be according to EN 13611:2015, 7.8.

## 8 Electrical requirements

Shall be according to EN 13611:2015, Clause 8.



## **9 Electromagnetic compatibility (EMC)**

Shall be according to EN 13611:2015, Clause 9.

## **10 Marking, installation and operating instructions**

### **10.1 Marking**

Shall be according to EN 13611:2015, 10.1.

### **10.2 Installation and operating instructions**

Shall be according to EN 13611:2015, 10.2 with the following addition:

For TCF control function, the following information shall be specified:

- set point of the temperature limiter;
- tolerances on the set point;
- drift of the set point(s);
- temperature that the sensing element is able to withstand;
- reaction time;
- fault reaction time.

For TTB control function, the following information shall be specified:

- safety class;
- set point for the significant physical threshold value;
- tolerances on the set point;
- drift of the set point(s);
- temperature that the sensing element is able to withstand;
- reaction time;
- minimum waiting time;
- fault reaction time.

### **10.3 Warning Notice**

Shall be according to EN 13611:2015, 10.3.

**Annex A**  
(informative)

**Abbreviations and Symbols**

Shall be according to EN 13611:2015, Annex A

**Annex B**  
(informative)

**Leak-tightness test for gas controls – volumetric method**

EN 13611:2015, Annex B is not applicable.

**Annex C**  
(informative)

**Leak-tightness test for gas controls – pressure loss method**

EN 13611:2015, Annex C is not applicable.

**Annex D**  
(normative)

**Conversion of pressure loss into leakage rate**

EN 13611:2015, Annex D is not applicable.

**Annex E**  
(normative)

**Electrical/electronic component fault modes**

Shall be according to EN 13611:2015, Annex E.

**Annex F**  
(normative)

**Additional requirements for safety accessories and pressure accessories as  
defined in EU Directive 97/23/EC**

EN 13611:2015, Annex F is not applicable.

**Annex G**  
(normative)

**Materials for pressurized parts**

EN 13611:2015, Annex G is not applicable.



**Annex H**  
(normative)

**Additional materials for pressurized parts**

EN 13611:2015, Annex H is not applicable.

**Annex I**  
(normative)

**Requirements for controls used in DC supplied burners and appliances  
burning gaseous or liquid fuels**

Shall be according to EN 13611:2015, Annex I.

**Annex J**  
(normative)

**Method for the determination of a Safety Integrity Level (SIL)**

Shall be according to EN 13611:2015, Annex J.

**Annex K**  
(normative)

**Method for the determination of a Performance Level (PL)**

EN 13611:2015, Annex K is not applicable.

**Annex L**  
(informative)

**Relationship between Safety Integrity Level (SIL) and Performance Level  
(PL)**

EN 13611:2015, Annex L is not applicable.

**Annex M**  
(normative)

**Reset functions**

Shall be according to EN 13611:2015, Annex M.

**Annex N**  
(informative)

**Guidance document on Environmental Aspects**

Shall be according to EN 13611:2015, Annex N.

**Annex 0**  
(normative)

**Seals of elastomer, cork and synthetic fibre mixtures**

EN 13611:2015, Annex 0 is not applicable.



## Bibliography

According to EN 13611:2015, Bibliography with the following addition:

- [1] EN 126:2012, *Multifunctional controls for gas burning appliances*
- [2] EN 126:2012/prA1:2014, *Multifunctional controls for gas burning appliances*
- [3] EN 15502-2-2:2014, *Gas-fired central heating boilers - Part 2-2: Specific standard for type B1 appliances*
- [4] EN 60730-1:2011, *Automatic electrical controls for household and similar use - Part 1: General requirements*





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