

BS EN 298:2012



BSI Standards Publication

# Automatic burner control systems for burners and appliances burning gaseous or liquid fuels

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### National foreword

This British standard is the UK implementation of EN 298:2012. It supersedes BS EN 230:2005 and BS EN 298:2003, which will be withdrawn on 01 May 2015.

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.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

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

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EUROPEAN STANDARD  
NORME EUROPÉENNE  
EUROPÄISCHE NORM

**EN 298**

May 2012

ICS 27.060.01

English Version

**Automatic burner control systems for burners and appliances  
burning gaseous or liquid fuels**

Systèmes automatiques de commande pour brûleurs et  
appareils utilisant des combustibles gazeux ou liquides

Feuerungsautomaten für Brenner und Brennstoffgeräte für  
gasförmige oder flüssige Brennstoffe

This European Standard was approved by CEN on 9 March 2012.

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.

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## Foreword

This document (EN 298:2012) 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 November 2012, and conflicting national standards shall be withdrawn at the latest by May 2015.

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

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For the relationship of this document with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

This document supersedes EN 230:2005 and EN 298:2003.

This document refers to clauses of EN 13611:2007+A2:2011 and adapts them, indicating the changes by stating “with the following modification”, “with the following addition”, “is replaced by the following” or “is not applicable”. It also adds clauses or sub-clauses to the structure of EN 13611:2007+A2:2011 which are particular to this standard (EN 298:2012). Additional sub-clauses or annexes are either numbered starting from 101 or are designated as Annex AA, BB, CC etc. It should be noted however that these clauses and sub-clauses are not indicated as additions in the text.

The following is a list of significant technical changes between this document and the previous editions:

- Alignment with EN 13611:2007+A2:2011;
- Integration of the requirements from EN 230 (EN 230 is merged into prEN 298);

NOTE If, due to the reference of EN 13611 the term “gas” will be part of a requirement or test, then the term “gas” shall be substituted by the term “fuel”

- Requirements from the flame supervision and the reactions in case of loss of flame have been adapted to modifications made in EN 267 and EN 676 and optimised for better understanding;
- Requirements and tests for “independent flame detectors” have been integrated;
- New requirements concerning “common cause” have been added;
- Requirements for the new function “remote reset from lock-out” have been added.

EN 298 compliance for burner control systems or flame detector devices cannot be claimed based upon SIL classification according to EN 61508.

SIL classification cannot be claimed based upon compliance with this standard only. A supplementary method for SIL determination is specified in EN 13611:2007+A2:2011, Annex J.

According to the CEN/CENELEC Internal Regulations, the national standards organizations 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, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

## 1 Scope

This European Standard specifies the safety, construction and performance requirements for automatic burner control systems, programming units and flame detector devices, intended for use with gas and oil burners and gas and oil burning appliances, with or without fans and similar use.

This European Standard is applicable to automatic burner control systems that include additional functions.

This European Standard does not cover automatic burner control systems utilizing thermo-electric flame supervision devices.

NOTE 1 European Standards for burners, appliances or processes which use automatic burner control systems, programming units or flame detectors can override the requirements of this standard.

NOTE 2 Provisions for production control are not part of this European Standard.

## 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 267:2009+A1:2011, *Automatic forced draught burners for liquid fuels*

EN 1643, *Valve proving systems for automatic shut-off valves for gas burners and gas appliances*

EN 13611:2007+A2:2011, *Safety and control devices for gas burners and gas burning appliances — General requirements*

EN 14459:2007, *Control functions in electronic systems for gas burners and gas burning appliances — Methods for classification and assessment*

EN 60730-1:2011, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:2010 (modified))*

EN 60730-2-5:2002+A1:2004+A11:2005+A2:2010, *Automatic electrical controls for household and similar use — Part 2-5: Particular requirements for automatic electrical burner control systems (IEC 60730-2-5:2000+Am1:2004+Am2:2008, (modified))*

EN 60947-5-1:2004, *Low-voltage switchgear and controlgear — Part 5-1: Control circuit devices and switching elements — Electromechanical control circuit devices (IEC 60947-5-1:2003)*

IEV 191, *International Electrotechnical Vocabulary — Chapter 191: Dependability and quality of service (Consolidated version included Amendment 1 and Amendment 2); Identical with IEC 60050-191:1990-12 (Consolidated with IEC 60050-191/A1:1993-03 and IEC 60050-191/A2:2002-01)*

### 3 Terms and definitions

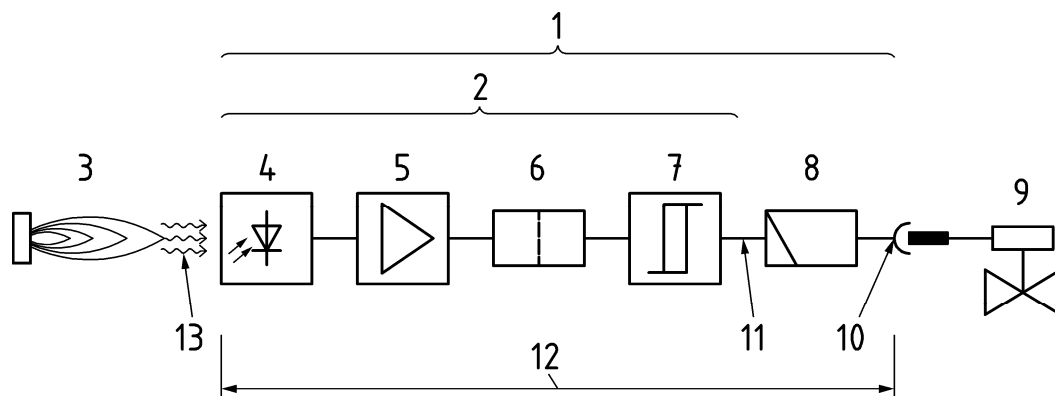
For the purposes of this document, the terms and definitions given in EN 13611:2007+A2:2011 and the following apply.

#### 3.101

##### flame detector device

device by which the presence of a flame is detected and signalled (see Figure 1)

Note 1 to entry: Flame detector devices can consist of a flame sensor, an amplifier and a relay for signal transmission. These parts, with the possible exception of the actual flame sensor, can be assembled in a single housing for use in conjunction with a programming unit.



#### Key

- |   |                                             |    |                                           |
|---|---------------------------------------------|----|-------------------------------------------|
| 1 | automatic burner control system (see 3.110) | 8  | programming unit (see 3.109)              |
| 2 | flame detector device (see 3.101)           | 9  | shut-off valve (see 3.104)                |
| 3 | flame                                       | 10 | shut-off valve terminal                   |
| 4 | flame sensor (see 3.103)                    | 11 | flame signal (see 3.107)                  |
| 5 | amplifier                                   | 12 | flame failure response time (see 3.105.1) |
| 6 | filter                                      | 13 | sensed flame (see 3.106)                  |
| 7 | threshold                                   |    |                                           |

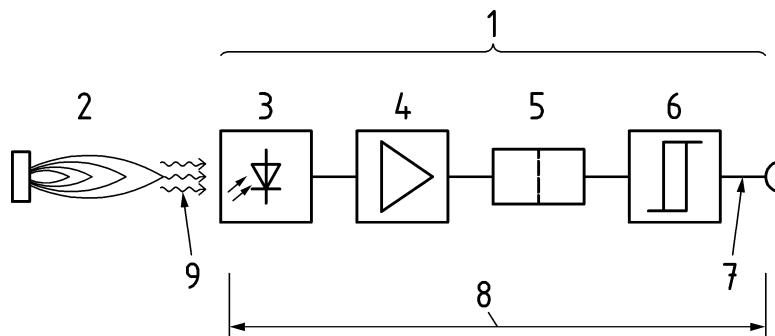
Figure 1 — Basic functional chain of a typical flame supervision

#### 3.102

##### independent flame detector device

flame detector device which operates independent of the programming unit to provide the class C control function (see Figure 2)

Note 1 to entry: Self-checking functions are incorporated in this type of flame detector device.



#### Key

|   |                                               |   |                                            |
|---|-----------------------------------------------|---|--------------------------------------------|
| 1 | independent flame detector device (see 3.102) | 6 | threshold                                  |
| 2 | flame                                         | 7 | flame signal (see 3.107)                   |
| 3 | flame sensor (see 3.103)                      | 8 | flame failure detection time (see 3.105.2) |
| 4 | amplifier                                     | 9 | sensed flame (see 3.106)                   |
| 5 | filter                                        |   |                                            |

**Figure 2 — Basic functional chain of an independent flame detector device**

### 3.103

#### flame sensor

device which reacts to the presence of the flame by providing an output signal that is used for further signal processing

### 3.104

#### shut-off valve

safety device which releases the fuel flow when energized and stops the fuel flow automatically when de-energized

Note 1 to entry: For further information refer to EN 161 or EN 126 for gas and EN ISO 23553-1 for oil, or to other similar devices if mentioned in the relevant appliance standard.

### 3.105

#### time in case of flame failure

#### 3.105.1

##### flame failure response time

##### FFRT

response time between the loss of a sensed flame and the resulting de-energizing of the shut-off valve terminals

Note 1 to entry: FFRT may be referred to as “extinction safety time” in appliance standards.

#### 3.105.2

##### flame failure detection time

##### FFDT

response time of an independent flame detector device between the loss of a sensed flame and the flame signal indicating the absence of a flame

### 3.106

#### sensed flame

physical value monitored by the flame sensor

### 3.107

#### flame signal

signal given by the flame detector device in case of sensed flame

### 3.108

#### **flame simulation**

condition which occurs when the flame signal indicates the presence of a flame when in reality no flame is present

### 3.109

#### **programming unit**

unit which executes the program, reacts to signals from control and safety devices, gives the control commands, controls the start-up sequence, supervises the burner operation and causes controlled shut-down, and if necessary, safety-shut-down and lock-out

Note 1 to entry: The programming unit follows a predetermined sequence of actions and always operates in conjunction with a flame detector device.

### 3.110

#### **automatic burner control system**

system comprising at least a programming unit and all the elements of a flame detector device

Note 1 to entry: The various functions of an automatic burner control system can be in one or more housings.

### 3.111

#### **start position**

stage where the system is not in lock-out position and has not yet received the start signal but can proceed with the start-up sequence when required

Note 1 to entry: At this stage, the output terminals for any shut-off valve and ignition device are not energized.

### 3.112

#### **start signal**

signal (e.g. from a thermostat) which releases the system from its start position and commences the predetermined program

### 3.113

#### **purge**

forced introduction of air through the combustion chamber and flue passages in order to displace any remaining fuel/air mixture and/or products of combustion

### 3.114

#### **pre-purge**

purge which takes place between the start signal and the energization of the shut-off valve or, in the case of gas, the energization of the ignition device, if this comes first

### 3.115

#### **post-purge**

purge which takes place immediately following shut-down

### 3.116

#### **first safety time**

interval between the pilot shut-off valve, the start shut-off valve or the main shut-off valve, as applicable, being energized and the pilot shut-off valve, start shut-off valve or the main shut-off valve, as applicable, being de-energized if no flame signal is present

Note 1 to entry: Where there is no second safety time, this is called the safety time.

### 3.117

#### **second safety time**

where there is a first safety time applicable to either a pilot or start fuel flame only, the second safety time is the interval between the main shut-off valve being energized and the main shut-off valve being de-energized if no main flame signal is present

### **3.118**

#### **running position**

position of the system in which the burner is in normal operation under the supervision of the programming unit and its flame detector device

### **3.119**

#### **controlled shut-down**

process by which the power to the shut-off valve(s) is removed before any other action takes place as a result of the action of a controlling function

### **3.120**

#### **safety-shut-down**

process which is effected immediately following the response of a protection device or the detection of a fault in the automatic burner control system and puts the burner out of operation

Note 1 to entry: The resulting state of the system is defined by deactivated terminals for the shut-off valves and the ignition device.

### **3.121**

#### **lock-out**

Note 1 to entry: Lock-out can mean non-volatile lock-out or volatile lock-out.

#### **3.121.1**

##### **non-volatile lock-out**

safety-shut-down condition of the system, where a restart can only be accomplished by the manual reset of the system and by no other means

#### **3.121.2**

##### **volatile lock-out**

safety-shut-down condition of the system, where a restart can only be accomplished by either the manual reset of the system, or an interruption of the main power and its subsequent restoration

### **3.122**

#### **Ignition restoration**

spark restoration

process by which, following loss of flame signal, the ignition device is switched on again without total interruption of the fuel supply

### **3.123**

#### **recycling**

process by which, after a safety-shut-down, a full start-up sequence is automatically repeated

### **3.124**

#### **timings**

#### **3.124.1**

##### **waiting time**

<gas> for burners without fans, interval between the start signal being given and the energization of the ignition device or shut-off valves, whichever comes first

Note 1 to entry: During this time natural ventilation of the combustion chamber and the flue passages can take place.

#### **3.124.2**

##### **waiting time**

<oil> interval between the start signal being given (and air registers in purge position, if applicable) and the energization of the ignition device

Note 1 to entry: During this time natural ventilation of the combustion chamber and the flue passages takes place.

### **3.124.3**

#### **pre-purge time**

<gas> period during which purging takes place at the proven air rate prior to the energization of the ignition device or shut-off valves, whichever comes first

### **3.124.4**

#### **pre-purge time**

<oil> period preceding the signal to open the shut-off valve during which the combustion chamber is compulsorily ventilated

### **3.124.5**

#### **post-purge time**

<gas> period during which purging takes place at the proven air rate between any shut-down and the moment the fan is switched off

### **3.124.6**

#### **post-purge time**

<oil> period following the signal to close the shut-off valve during which the combustion chamber is compulsorily ventilated

### **3.124.7**

#### **inter-purge time**

period during which purging of the combustion chamber takes place at the proven air rate after unsuccessful ignition and prior to the next recycle attempt

### **3.124.8**

#### **inter-waiting time**

period during which natural ventilation of the combustion chamber takes place after unsuccessful ignition and prior to the next recycle attempt

### **3.125**

#### **sequences**

### **3.125.1**

#### **start-up sequence**

sequence of actions executed by the system which brings the burner from the start position to the running position

### **3.125.2**

#### **first stage**

part of the start-up sequence which allows the release of start fuel into the combustion chamber

### **3.125.3**

#### **second stage**

part of the start-up sequence which allows the release of further fuel into the combustion chamber

### **3.126**

#### **system for permanent operation**

system that is designed to remain in the running position for longer than 24 h without interruption

### **3.127**

#### **system for non-permanent operation**

system that is designed to remain in the running position for less than 24 h

**3.128**

**self-checking function of the flame detector device**

automatic internal function of the system which checks the operation of the flame detector device

**3.129**

**air flow simulation**

condition which occurs when the air flow sensor indicates the presence of air flow when in reality no air flow is present

**3.130**

**spark supervision**

process of monitoring the ignition spark

**3.131**

**pilot or start fuel flame proving period**

interval between the end of the first safety time and the beginning of the second safety time which is used to prove that the pilot or start fuel flame is stable

**3.132**

**intermittent first stage**

first stage that is ignited prior to ignition of the main flame and is shut off simultaneously with the main flame

**3.133**

**interrupted first stage**

first stage that is ignited each time the burner is started up and which is extinguished at the end of the second safety time

**3.134**

**burner ignition systems**

**3.134.1**

**ignition by supervised gas-fired pilot burner**

system which releases the main fuel when the ignition burner flame is present

**3.134.2**

**ignition by non-supervised gas-fired pilot burner**

system in which the release of the main fuel is not prevented by the absence of the flame of the pilot burner

**3.135**

**ignition timings**

**3.135.1**

**total ignition time**

period during which the ignition device is energized

Note 1 to entry: This time includes pre-ignition, ignition and post-ignition times.

**3.135.2**

**pre-ignition time**

period between the energization of the ignition device and the start of the safety time

**3.135.3**

**ignition time**

period between the start of the safety time and the first detection of a flame signal

Note 1 to entry: The maximum ignition time ends prior to or simultaneous with the safety time when no flame signal has been detected.

### **3.135.4**

#### **post-ignition time**

period between the first detection of the flame signal and the de-energization of the ignition device

### **3.136**

#### **maximum throughput**

mass of oil consumed during one hour at the highest throughput stated by the manufacturer

Note 1 to entry: Maximum throughput is expressed in kilograms per hour (kg/h).

[SOURCE: EN 267:2009+A1:2011, 3.2.1.1]

### **3.137**

#### **common cause failures**

failures of different items, resulting from a single event, where these failures are not consequences of each other

Note 1 to entry: Common cause failures should not be confused with common mode failures.

[SOURCE: IEV 191-04-23]

## **4 Classification**

### **4.1 Classes of control**

Classification is not given for burner control systems or for flame detector devices.

### **4.2 Groups of control**

EN 13611:2007+A2:2011, 4.2 is not applicable.

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

Shall be according to EN 13611:2007+A2:2011, 4.3 with the following addition:

- The burner control system is a class C control function;
- The flame detector device, if independent from the programming unit, is a class C control function.

## **5 Units of measurement and test conditions**

### **5.1 Dimensions**

Shall be according to EN 13611:2007+A2:2011, 5.1.

### **5.2 Pressures**

Shall be according to EN 13611:2007+A2:2011, 5.2.

### **5.3 Bending moments and torques**

EN 13611:2007+A2:2011, 5.3 is not applicable.

### **5.4 Test conditions and measurement tolerances**

Shall be according to EN 13611:2007+A2:2011, 5.4 with the following modifications:

Replace the first 4 paragraphs by the following:

Where possible those tests already covered by EN 60730-2-5 shall be combined.

Add the following paragraph at the end of the clause:

All tests are performed in the order written in this European Standard (i.e. EN 298) except for that of 7.10 and 6.6.

## **6 Constructional requirements**

### **6.1 General**

EN 13611:2007+A2:2011, 6.1 is not applicable.

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

EN 13611:2007+A2:2011, 6.2 is not applicable.

### **6.3 Materials**

EN 13611:2007+A2:2011, 6.3 is not applicable.

### **6.4 Gas connections**

EN 13611:2007+A2:2011, 6.4 is not applicable.

### **6.5 Electronic parts of the control**

#### **6.5.1 General**

Shall be according to EN 13611:2007+A2:2011, 6.5.1 with the following addition:

NOTE 1 The requirement to include at least two operating elements does not apply to flame detector devices which are not intended to energize shut-off valves directly.

The requirement for two independent operating elements can be replaced by a requirement for one operating element for each shut-off valve (two operating elements in total), under the following conditions which guarantee the same overall safety level:

- an integrated solution consisting of a Burner control function and a Valve Proving System according to EN 1643 and
- the valve proving system checking the leakage during each burner cycle.

NOTE 2 The above requirement does not supersede the other requirements of this document e.g. fault assessment.

The construction of any additional functions included in the automatic burner control system, programming unit or flame detector device for which no provisions exist in this standard, shall be such that they do not degrade the safe and correct operation of the automatic burner control system, programming unit or flame detector device.

Measures shall be taken to protect against the failure of two (or more) switching elements, due to a common cause, by an external short-circuit that would prevent the burner control system from performing a safety shutdown.

Acceptable methods are current limitation, overcurrent protection device or internal fault detecting functions.

The suitability of measures to maintain the capability to interrupt the energization of the shut-off valve terminals by means of at least one switching element, or by interrupting a non-replaceable overcurrent protection device, shall be verified by the following test.

The shut-off valve terminals of the burner control system are connected to a switch that is intended to switch the short-circuit current. With this switch opened, the burner control system is connected as described in EN 60730-1:2011, H.27.1.1.2 with the outputs energized to simulate normal operation (with the contacts of the internal switching elements closed).

Where overcurrent protection devices are used as the protective measure, the power supply to the burner control system shall have the capability of supplying an inrush current of at least 500 A. When current limitation techniques are used, the power supply to the burner control system shall not limit the current.

A short-circuit is applied between the shut-off valve terminals of the burner control system by closing the switch.

The test is terminated if there is no current flow through the switch, or after one hour.

If an overcurrent protection device is replaceable and has operated during the test, it shall be replaced and the test repeated two more times by attempting to restart the burner control system while keeping the switch closed.

A second test procedure is conducted in the same way with the switch closed prior to the first start-up sequence. A second test sample can be used for this second test procedure.

If an internal fault detecting function of the burner control system either opens the switching elements or initiates a safety-shut-down, the test is repeated two times while maintaining the external short-circuit by attempting to restart the burner control system.

Compliance is checked in accordance with EN 60730-1:2011, H.27.1.1.3 and Clause 15.

After the test, at least one switching element of the burner control system shall be able to de-energize the shut-off valve terminals, or a non-replaceable overcurrent protection device has permanently interrupted the supply to the shut-off valve terminals.

In some designs, at least two relays are used as switching elements with independent contacts and in a series with a non-replaceable fuse (see Table E.1, h) with  $I_N < 0,6 * I_e$ . Such designs are considered to comply with the requirements for prevention of common cause failure, without further testing.

NOTE 1  $I_N$ : values for the fuse (see EN 60127-1:2006, 3.16).

NOTE 2  $I_e$ : rated operational current of the contact (see EN 60947-1:2007; 4.3.2.3).

## **6.5.2 Protection provided by the enclosure**

Shall be according to EN 13611:2007+A2:2011, 6.5.2.

## **6.5.3 Electrical components**

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

Shall be according to EN 13611:2007+A2:2011, 6.5.3.1.

### **6.5.3.2 Test**

Shall be according to EN 13611:2007+A2:2011, 6.5.3.2.

### **6.5.3.3 Sensing element**

EN 13611:2007+A2:2011, 6.5.3.3 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**

Shall be according to EN 13611:2007+A2:2011, 6.6.1.1.

#### **6.6.1.2 Reset device**

Shall be according to EN 13611:2007+A2:2011, 6.6.1.2 with the following modification:

The last paragraph shall be substituted by:

The switching action of a thermostat or similar devices can result in a reset from volatile lock-out (see 9.2 o)).

For remote reset functions EN 14459:2007 Annex J applies.

#### **6.6.1.3 Documentation**

Shall be according to EN 13611:2007+A2:2011, 6.6.1.3.

### **6.6.2 Class A**

EN 13611:2007+A2:2011, 6.6.2 is not applicable.

### **6.6.3 Class B**

EN 13611:2007+A2:2011, 6.6.3 is not applicable.

### **6.6.4 Class C**

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

Shall be according to EN 13611:2007+A2:2011, 6.6.4.1 with the following modification:

Replace the second and third paragraph by the following:

Software shall conform to software class C of EN 60730-1:2011.

The automatic burner control system shall be fail-safe. Systems which meet the requirements of this clause and, if applicable, 6.6.1.1, are considered to be inherently fail-safe.

The circuitry and the construction of the system shall be such that they meet the requirements of 7.101. They shall be appraised according to the requirements to 6.6.4.2, 6.6.4.3 and 6.6.4.4 and tested under the test conditions and criteria of 6.6.5.

Components shall be dimensioned on the basis of the worst-case conditions which can arise in the system, as stated by the manufacturer.

Internal faults of the checking circuit for discharge tubes used in flame detector devices for non-permanent operation (see 7.101.4.1.5) shall not be considered.

#### 6.6.4.2 First fault

EN 13611:2007+A2:2011, 6.6.4.2 is replaced by the following:

Any first fault (see Annex E) in any one component, or any one fault together with any other fault arising from that first fault, shall result in either:

- a) The system becoming inoperative with all shut-off valve terminals de-energized (For independent flame detector devices the de-energization of the flame signal output resulting in a “flame off” signal is equivalent.);
- b) The system proceeding to safety-shut-down within 3 s, or to lock-out, provided that subsequent reset from the lock-out condition under the same fault condition results in the system returning to the lock-out condition; continue with fault assessment during lock-out or safety-shut-down according to 6.6.4.4.3;
- c) The system continuing to operate, the fault being identified during the next start-up sequence and the result being either a) or b);
- d) The system remaining operational in accordance with all other functional requirements of this standard (see 7.101.2 to 7.101.5).

For automatic burner control systems designed for non-permanent operation, list item c) is applicable. List item c) is not applicable for automatic burner control systems designed for permanent operation.

#### 6.6.4.3 Second fault

Shall be according to EN 13611:2007+A2:2011, 6.6.4.3 with the following addition:

For automatic burner control systems designed for non-permanent operation EN 13611:2007+A2:2011, 6.6.4.3 a) is applicable. EN 13611:2007+A2:2011, 6.6.4.3 Clause b) is applicable for automatic burner control systems designed for permanent operation.

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

##### 6.6.4.4.1 General

Shall be according to EN 13611:2007+A2:2011, 6.6.4.4.1.

##### 6.6.4.4.2 First fault introduced during lock-out or safety-shut-down

EN 13611:2007+A2:2011, 6.6.4.4.2 is replaced by the following:

During assessment, the first fault shall not be reckoned to occur within 24 h after lock-out or safety-shut-down is reached, without an internal fault.

Any first fault (together with any other fault arising from that fault) in any one component (see Annex E) induced while the burner control system is in the safety-shut-down or lock-out position, shall result in either:

- a) the system remaining in safety-shut-down or lock-out, with the shut-off valves remaining de-energized;
- b) the system becoming inoperative with the shut-off valves remaining de-energized; or
- c) the system coming into operation again resulting in a) or b) as mentioned in this clause under the condition that the shut-off valve terminals are energized not longer than the safety time. If the cause of the original safety-shut-down or lock-out condition is no longer present and the burner control system resumes operation, it shall operate in accordance with the safety-related functional requirements of this standard, and the second fault assessment shall be carried out in accordance with 6.6.4.3.

**NOTE** While conducting this test, the fault can be applied at any time during the lock-out or safety-shut-down condition. It is not necessary to wait 24 h before applying the fault. If the fault was applied before 24 h and unacceptable results were obtained, the fault should be applied 24 h after reaching lock-out or safety-shut-down.

For independent flame detector devices the de-energization of the flame signal output resulting in a “flame off” signal is equivalent to the de-energization of the shut-off valve terminals.

#### **6.6.4.4.3 Second fault introduced during lock-out or safety-shut-down**

Shall be according to EN 13611:2007+A2:2011, 6.6.4.4.3 with the following addition:

**NOTE** While conducting this test, the second fault can be applied at any time during the lock-out or safety-shut-down condition. It is not necessary to wait 24 h before applying the second fault. If the second fault was applied before 24 h and unacceptable results were obtained, the initial fault should be applied and then 24 h should pass before the second fault is applied.

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

#### **6.6.5.1 Test conditions**

Shall be according to EN 13611:2007+A2:2011, 6.6.5.1.

#### **6.6.5.2 Test criteria**

Shall be according to EN 13611:2007+A2:2011, 6.6.5.2.

#### **6.6.5.3 Assessment**

Shall be according to EN 13611:2007+A2:2011, 6.6.5.3.

## **7 Performance**

### **7.1 General**

EN 13611:2007+A2:2011, 7.1 is not applicable.

### **7.2 Leak-tightness**

EN 13611:2007+A2:2011, 7.2 is not applicable.

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

EN 13611:2007+A2:2011, 7.3 is not applicable.

### **7.4 Torsion and bending**

EN 13611:2007+A2:2011, 7.4 is not applicable.

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

EN 13611:2007+A2:2011, 7.5 is not applicable.

### **7.6 Rated flow rate**

EN 13611:2007+A2:2011, 7.6 is not applicable.