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 It supersedes BS EN 230:2005 and BS EN 298:2003, which will be withdrawn on 01 May 2015.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.

Published by BSI Standards Limited 2012

ISBN 978 0 580 70697 4

ICS 27.060.01

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 31 July 2012.

Amendments issued since publication

Amd. No.	Date	Text affected

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.

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Ref. No. EN 298:2012: E

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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of an identical text or by endorsement, at the latest by November 2012, and conflicting national standards shall be withdrawn at the latest by May 2015.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)*

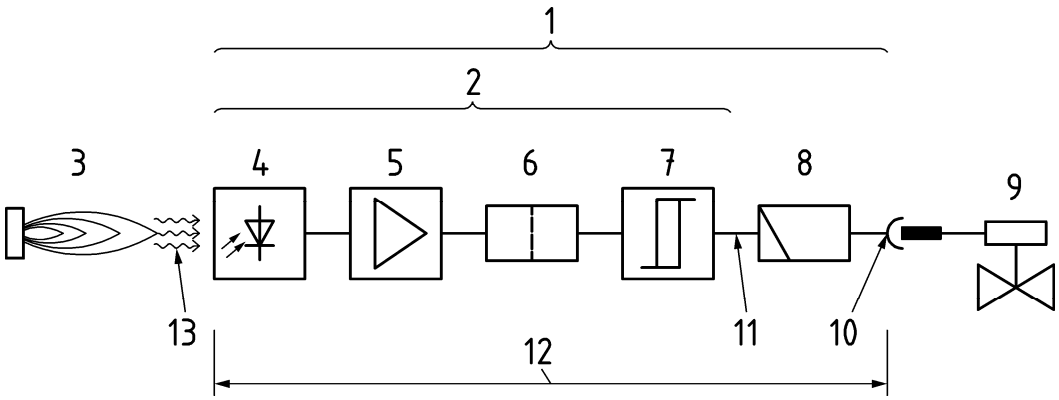
IEV 191, *International Electrotechnical Vocabulary — Chapter 191: Dependability and quality of service (Consolidated version included Amendment 1 and Amendment 2); Identical with IEC 60050-191:1990-12 (Consolidated with IEC 60050-191/A1:1993-03 and IEC 60050-191/A2:2002-01)*

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.

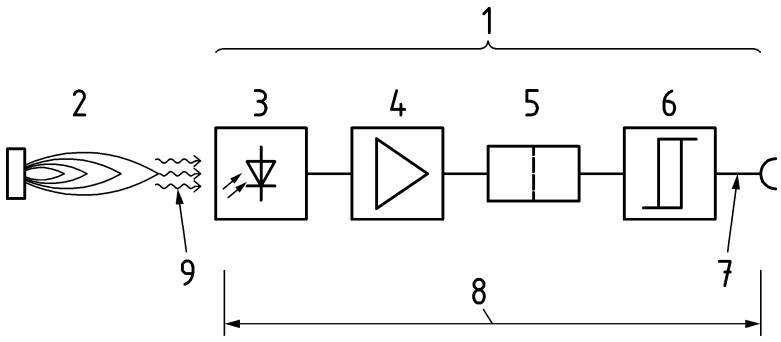


Key
1 automatic burner control system (see 3.110)
2 flame detector device (see 3.101)
3 flame
4 flame sensor (see 3.103)
5 amplifier
6 filter
7 threshold
8 programming unit (see 3.109)
9 shut-off valve (see 3.104)
10 shut-off valve terminal
11 flame signal (see 3.107)
12 flame failure response time (see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

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)
2 flame
3 flame sensor (see 3.103)
4 amplifier
5 filter
6 threshold
7 flame signal (see 3.107)
8 flame failure detection time (see 3.105.2)
9 sensed flame (see 3.106)

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.

7.7 Test for rated flow rate

EN 13611:2007+A2:2011, 7.7 is not applicable.

7.8 Durability

7.8.1 Elastomers in contact with gas

EN 13611:2007+A2:2011, 7.8.1 is not applicable.

7.8.2 Marking

Shall be according to EN 13611:2007+A2:2011, 7.8.2.

7.8.3 Tests for marking

Shall be according to EN 13611:2007+A2:2011, 7.8.3.

7.8.4 Resistance to scratching

EN 13611:2007+A2:2011, 7.8.4 is not applicable.

7.8.5 Scratch test

EN 13611:2007+A2:2011, 7.8.5 is not applicable.

7.8.6 Resistance to humidity

EN 13611:2007+A2:2011, 7.8.6 is not applicable.

7.8.7 Humidity test

EN 13611:2007+A2:2011, 7.8.7 is not applicable.

7.9 Performance tests for electronic controls

7.9.1 At ambient temperature

Shall be according to EN 13611:2007+A2:2011, 7.9.1 with the following addition:

If the physical characteristic of a sensed flame has an influence on the program time(s) of the flame detector device/burner control system (e.g. by saturation effects), that characteristic shall be considered during the assessment within the conditions specified by the manufacturer (refer to 9.2 i)).

If the physical effects that cause the influence on the program time(s) of the flame detector device/burner control system cannot be sufficiently described, the manufacturer of the flame detector device/burner control system shall define how compliance with the required program times is to be assessed after integration into the appliance.

The switching times and the program sequence recorded shall comply with the requirements of 7.101.2, 7.101.3 and 7.101.5.

7.9.2 At low temperature

Shall be according to EN 13611:2007+A2:2011, 7.9.2 with the following addition:

The switching times and the program sequence recorded shall comply with the requirements of 7.101.2, 7.101.3 and 7.101.5.

7.9.3 At high temperature

Shall be according to EN 13611:2007+A2:2011, 7.9.3 with the following addition:

The switching times and the program sequence recorded shall comply with the requirements of 7.101.2, 7.101.3 and 7.101.5.

7.10 Long-term performance for electronic controls

7.10.1 General

Shall be according to EN 13611:2007+A2:2011, 7.10.1.

7.10.2 Stress test (by the test laboratory)

7.10.2.1 Thermal stress test

Shall be according to EN 13611:2007+A2:2011, 7.10.2.1 with the following modification:

Replace paragraph d) by the following:

d) The system shall also be tested under the following conditions:

   1) 2 500 cycles without flame signal presence;

   2) 2 500 cycles with the flame signal disappearing during operation.

7.10.2.2 Vibration test

Shall be according to EN 13611:2007+A2:2011, 7.10.2.2 with the following modification:

Replace the 5th paragraph and its indents by the following:

The test is performed at least with the following severity conditions:

a) Frequency range: 10 Hz to 150 Hz;

b) Acceleration/Amplitude: 10 to 58 Hz: 0,075 mm or higher if declared by the manufacturer
58 to 150 Hz: 1,0 g or higher if declared by the manufacturer;

c) Sweep rate: 1 octave per minute;

d) Number of sweep cycles: 10;

e) Number of axes: 3, mutually perpendicular.

NOTE For mobile applications different/higher values may apply.

7.10.3 Long-term performance test (by the manufacturer)

Shall be according to EN 13611:2007+A2:2011, 7.10.3.

7.101 Functional requirements

7.101.1 General

If the functional behaviour deviates from this standard, the manufacturer shall declare this by giving detailed information and reasons for the deviation (see Clauses 4 and 9).

Adjustment of parameters, such as program timings and program sequences, is permitted. It shall only be possible however by providing protection against access by uninstructed persons; or it shall be declared as requiring such protection in the application.

If there are no particular requirements for oil burner control systems concerning the type of lock-out following safety-shut-down in the relevant appliance standard, a non-volatile lock-out is required.

7.101.2 Program

7.101.2.1 General

7.101.2.1.1 The program shall be in accordance with the details provided by the manufacturer's instructions.

7.101.2.1.2 The program shall be such that it is not possible to perform two or more actions which in combination could cause injury to persons or damage to property. The order of the actions shall be fixed in such a manner that it is not possible to change their order.

7.101.2.1.3 The shut-off valve(s) controlling the start fuel rate shall not normally be energized before the ignition device.

If for certain gas applications the shut-off valve(s) controlling the start gas rate are energized before the ignition device, this shall be declared by the manufacturer (see 9.2 e)).

For gas burner control systems, the ignition device shall be de-energized at or before the end of the first safety time.

In the case of hot surface igniters used with gas burner control systems, the shut-off valves shall not be energized before the ignition device has reached sufficient temperature to ignite the gas. If ignition temperature supervision is declared by the manufacturer or required by application standards, failure to detect sufficient temperature shall lead to at least safety-shut-down.

For oil burner control systems the shut-off valves shall not be energized before the ignition device.

7.101.2.1.4 When a system has a start flame proving period it shall be no less than that declared by the manufacturer.

NOTE In particular this applies to dual or multi fuel burners with pre-ignition in the oil mode.

7.101.2.1.5 In case of spark supervision, this function shall be performed prior to the release of fuel.

7.101.2.2 Safety actions

The required checks in the program shall lead to the following safety actions:

a) If no flame signal is sensed at the end of the first or second safety time, the system shall proceed to lock-out or recycle, if applicable, in accordance with the relevant appliance standard;

b) Operation of an external protection device shall lead at least to safety-shut-down;

c) If a spark supervision device is utilized, failure to detect a spark during the manufacturer's declared spark supervision period shall lead at least to safety-shut-down before fuel is released;

d) If any air flow supervision device indicates an inadequate air supply in the running position, the system shall proceed at least to safety-shut-down;

e) Additionally for gas burner control systems the following applies:

    1) The supervision of the (proven) pre-purge time, as well as of the combustion air flow for burners with fan(s), shall be achieved in such a manner and by using such devices as are prescribed in the

relevant burner and/or appliance standards. If any air flow supervision device indicates an inadequate air supply during pre-purge, the system shall proceed at least to safety-shut-down before fuel is released.

2) If during the start-up sequence the no air check (in order to detect air flow simulation) fails, the system shall proceed at least to safety-shut-down.

f) Additionally for oil burner control systems the following applies:

1) If an air flow supervision device is indicating an inadequate air supply during the period between pre-purge time and running position, the system shall immediately proceed at least to safety-shut-down before fuel is released.

7.101.2.3 Flame failure

Depending on the design of the system, one of the following actions shall occur after the loss of sensed flame during the running position:

a) ignition restoration (see 7.101.2.5);

b) safety-shut-down;

c) recycling (see 7.101.2.4);

d) lock-out (see 7.101.3.6).

For oil burner control systems designed to control oil burners with a maximum throughput of > 30 kg/h, any ignition restoration is not allowed.

7.101.2.4 Recycling

Systems with recycling shall be designed such that they meet the requirement of 7.101.3.7. The subsequent start-up sequence shall be that which is normally performed by the system. For burner control systems for non-permanent operations where the fan remains switched on after flame failure, the air flow simulation check may be excluded.

Following this action, the flame signal shall be present by the end of the first safety time of the last permitted recycle attempt; if not, the system shall proceed to lock-out.

7.101.2.5 Ignition restoration

Systems with ignition restoration shall be designed such that, following the loss of the sensed flame, the ignition device shall be energized within 1 s, unless otherwise specified by the appliance standard.

Following this action, the flame signal shall be present before the end of a time span equal to the first safety time; if not, the system shall perform a recycling attempt or proceed to lock-out.

The restoration of the ignition source shall be considered to be the first ignition attempt.

7.101.2.6 Supervision of other external devices during the start-up sequence

If the system controls and/or supervises external devices (e.g. air damper actuators, auxiliary contacts of fuel valves, automatic valve proving systems, or other devices) which shall be position-checked prior to or during each start-up sequence, the start-up sequence shall continue only after these external devices have been successfully checked.

7.101.2.7 Start following safety-shut-down

Start-up sequence may occur when the cause of the safety-shut-down conditions disappears.

For oil burner control systems which are not provided with a pre-purge function, the interval between safety-shut-down and the next start attempt shall be more than 30 s.

7.101.2.8 Inter-purge and inter-waiting time

For systems that give more than one ignition attempt, an inter-purge or inter-waiting time prior to recycling (see 7.101.2.4) shall be provided after an unsuccessful ignition attempt.

These timings shall be not less than the timings declared in 9.2 e).

7.101.2.9 Safety against flame simulation and extraneous light signals

During each start-up sequence, the burner control system shall check for a flame signal before the shut-off valves are energized. This checking operation shall take place before any shut-off valve is energized and shall be of sufficient duration to ensure a safe and reliable check.

If a flame signal is present during the start-up sequence, safety shall be provided as follows:

a) Gas burner control systems shall either not initiate the next step in the start-up sequence, or proceed at least to safety-shut-down;

b) Oil burner control systems for oil burners with a maximum throughput $\leq$ 30 kg/h shall proceed to safety-shut-down. The following are exempt:

   1) oil burners without pre-purge;

   2) oil burners in which the fuel pressure during pre-purge at the main shut-off valve is less than 20 % of the atomising pressure.

In both cases, the oil burner control system shall not initiate the next step in the start-up sequence.

c) Oil burner control systems for oil burners with a maximum throughput > 30 kg/h shall always proceed to safety-shut-down.

These requirements are checked with static radiation and with flickering radiation at a frequency within the frequency response of the flame detector device.

7.101.2.10 Burner control systems for air heaters (WLE)

In addition to the requirements of this standard, burner control systems for air heaters shall comply with the following requirements:

a) They shall comply with the requirements of this document at an ambient temperature of -20 °C;

b) Any ignition restoration is not allowed;

c) For oil burner control systems used on air heaters with a maximum throughput $\leq$ 30 kg/h the requirements for oil burners with a maximum throughput > 30 kg/h shall apply;

d) They shall be marked with "WLE" (air heater; see 9.1).

7.101.3 Timing and operational sequences

7.101.3.1 General

Adjustment of pre-purge, post-purge, waiting and safety times is permitted. However, it shall only be made possible by the means of tools, and it shall be impossible from outside the enclosure in which the component is housed (see 7.101.1). Where these times can be adjusted using an existing scale on the component, the scale shall be accurate to ± 10 % of the indicated value. The means of adjustment shall be readily identifiable (e.g. colour-coded).

The nominal values and, if necessary, the limits of the timings shall be declared by the manufacturer (see 9.2 e)).

NOTE These times are dependent on the application.

7.101.3.2 Purge and waiting times for gas burner control systems

Shortening of these times shall not take place due to internal failures such as wear and tear, drop in accuracy of adjustments, and similar causes.

These times shall be not less than the values indicated by the manufacturer. If systems have adjustable times, these times shall be not less than the values initially measured at test conditions (see 5.4).

7.101.3.3 Pre-purge time for oil burner control systems

The requirements of EN 267:2009+A1:2011, 4.6.1.3, shall apply.

The electric ignition device shall be energized from the start of pre-purge period. This requirement is not applicable to oil burners

a) fitted with a device which during the pre-purge period prevents the operation of the ignition means when the fuel pressure upstream of the shut-off valve does not exceed 20 % of the atomising pressure; or

b) fitted with two shut-off valves in a series; or

c) mounted on heat generators which are subject to special requirements, such as ovens, kilns, air heaters, steam boilers or used in multi burner installations.

The ignition device for gas-fired pilot burners shall not be energized during pre-purge. For dual fuel or multi fuel burners, the ignition device shall not be energized during pre-purge.

7.101.3.4 Special requirements for the operational sequences of pilot burners

7.101.3.4.1 General

If not otherwise required by a specific application standard, the following applies for the operational sequences of pilot burners.

NOTE For oil burner control systems refer to the operating examples in Annex CC.

7.101.3.4.2 Ignition by non-supervised gas-fired pilot burner

If an ignition system incorporating a non-supervised gas-fired pilot burner is used, the period during which the shut-off valves for the pilot burner are energized shall not exceed 5 s. This period is limited by the signal to energize the shut-off valves for the pilot burner and the main burner. In addition, the electrical ignition device of the pilot burner shall not assist in the ignition of the main burner.

7.101.3.4.3 Ignition by supervised gas-fired pilot burner

If an ignition system incorporating a supervised pilot burner is used, the safety time of the pilot burner (first safety time) shall not exceed 5 s. The flame failure response time for the pilot burner shall not exceed 5 s.

7.101.3.4.4 Ignition by oil-fired pilot burner

The requirements of 7.101.3.4.2 and 7.101.3.4.3 also apply to oil-fired pilot burners, except for the safety times where 7.101.3.6 applies.

7.101.3.5 Post-ignition on oil burners

It is permitted to keep the ignition device energized into the running position during the declared post-ignition time if there is no flame simulation caused by the ignition system.

7.101.3.6 Safety times

For gas burner control systems the following applies:

a) Lengthening of safety times shall not take place due to internal failures such as wear and tear, a drop of accuracy in adjustment devices, and similar causes;

b) Safety times shall be not greater than the values declared by the manufacturer;

c) If systems have adjustable safety times, these shall be not greater than the values initially measured at test conditions (see 5.4).

For oil-burner control systems the safety times as given in EN 267:2009+A1:2011, 4.6.3 are applicable.

NOTE For programming units not having a safety time, these requirements do not apply.

7.101.3.7 Flame failure response time

When ignition restoration is not performed, the flame failure response time shall not exceed 1 s unless otherwise accepted by a specific application standard.

7.101.3.8 Reaction time to achieve safety-shut-down

The time to achieve safety-shut-down, whenever this is required, shall not exceed 1 s unless otherwise accepted by a specific application standard.

7.101.3.9 Reaction time to achieve lock-out

Whenever lock-out is required, it shall be achieved within 30 s after safety-shut-down.

7.101.3.10 Flame failure detection time

For independent flame detector devices the flame failure detection time shall not exceed 1 s unless otherwise accepted by a specific application standard. The maximum flame failure detection time shall be declared by the manufacturer (see 9.2 t)).

7.101.4 Flame detector device

7.101.4.1 General

7.101.4.1.1 Spark supervision by the flame detector device is allowed as part of the program.

The minimum and maximum value of the sensed flame shall be declared by the manufacturer (see 9.2 i)).

7.101.4.1.2 For systems designed for permanent operation, the flame detector device shall be provided with a self-checking function that operates at least once in every hour when the system is in the running position. The test shall be performed in accordance with 6.6.4.

7.101.4.1.3 Ionization flame detector devices shall only make use of the rectification property of the flame.

7.101.4.1.4 Flame detector devices using infra-red sensors shall only react to the flicker property of the flame.

7.101.4.1.5 For flame detector devices using discharge tubes, the program shall include a check for the ageing of the tube, i.e. striking without flame presence. Examples of suitable techniques are:

a) periodic, automatically executed supervision of the sensor function;

b) application of a voltage prior to fuel release which is at least 15 % higher than the voltage applied to the tube during the remainder of the sequence;

c) a check that there is no flame signal with the flame amplifier continually powered after each controlled shut-down.

7.101.4.1.6 Open circuiting of the flame sensor or its connecting cable shall cause loss of the flame signal.

7.101.4.2 Special requirements for flame detector devices used on gas burners

7.101.4.2.1 Flame detector devices sensitive to visible radiation shall only react to the flicker property of the flame. These devices shall not be sensitive to mains frequency or harmonics of that frequency up to 400 Hz. A tolerance of ± 3 Hz shall be taken into account.

Flame detector devices sensitive to visible radiation shall not indicate the presence of the flame when the sensor is illuminated by static light with 10 lx or less at a colour temperature of 2 856 K, and with the visible part of the spectrum being cut off below the wavelength of 400 nm and above the wavelength of 800 nm by the means of filters.

7.101.4.2.2 For flame detector devices using infra-red sensors, the mounting fixture of the flame sensor shall contain a form of switching such that the flame signal is switched off when the device is removed from its mounting position. This mounting fixture shall be designed so that it prevents the unintended loosening of the flame sensor. This requirement can be disregarded if the flame detector device is not sensitive to mains frequency or harmonics of that frequency up to 400 Hz. A tolerance of ± 3 Hz shall be taken into account. These requirements are not applicable if the flame sensor can only be removed from the mounting fixture by use of a special tool.

7.101.4.2.3 Flame detector devices using UV sensors shall not react to static infra-red light. The flame detector device shall not indicate the presence of the flame when the sensor is illuminated with 10 lx or less at a colour temperature of 2 856 K and with the spectrum being cut off below the wavelength of 400 nm by means of a filter.

7.101.4.3 Special requirements for flame detector devices used on oil burners

7.101.4.3.1 Flame sensors for in-visible radiation

a) Flame detector devices using infra-red sensors shall have the maximum sensitivity at a wavelength larger than 800 nm.

b) Flame detector devices using UV sensors shall have the maximum sensitivity at a wavelength less than 400 nm and shall not react to infrared light. If flame detector devices using UV sensors have a partial sensitivity in the visible range of radiation, the requirements of 7.101.4.3.2 a), b) and c) shall be fulfilled.

7.101.4.3.2 Flame sensors for visible radiation

The following requirements apply to the mean values of the appliances or sensors to be tested.

If the illumination intensity of the burner flame is < 0,5 lx during running position, flame sensors for visible radiation shall not be used.

Flame detector devices using flame sensors which have their maximum sensitivity at a wavelength larger than 400 nm and less than 800 nm shall fulfil the requirements as detailed in a) to c):

a) For an illumination intensity of the sensed flame during running position of less than 3 lx at 2856 K (measured at the flame sensor) the requirements shown in Figure 3 a) shall be met.

   The threshold 'B' to indicate a flame signal prior to the release of fuel shall be at a lower level of illumination than the threshold 'A' to indicate the loss of the sensed flame during running position resulting in a loss of the flame signal (negative switching differential). The threshold ratio B/A shall not exceed 0,7.

   The logic or circuit for the negative switching differential shall be a class B control function.

   Such flame detector devices shall be tested together with the burner to which they are fitted. The flame detector device shall not indicate a flame signal when the burner is illuminated externally with an intensity of 20 000 lx at 2 856 K during assessment.

b) In case of an illumination intensity of the sensed flame during running position of less than 7 lx at 2856 K (measured at the flame sensor) the requirements shown in Figure 3 b) shall be met.

   The threshold 'B' to indicate a flame signal prior to the release of fuel shall be at a lower level of illumination than the threshold 'A' to indicate the loss of the sensed flame during running position resulting in a loss of the flame signal (negative switching differential). The threshold ratio B/A shall not exceed 0,7.

The logic or circuit for the negative switching differential shall be a class B control function.

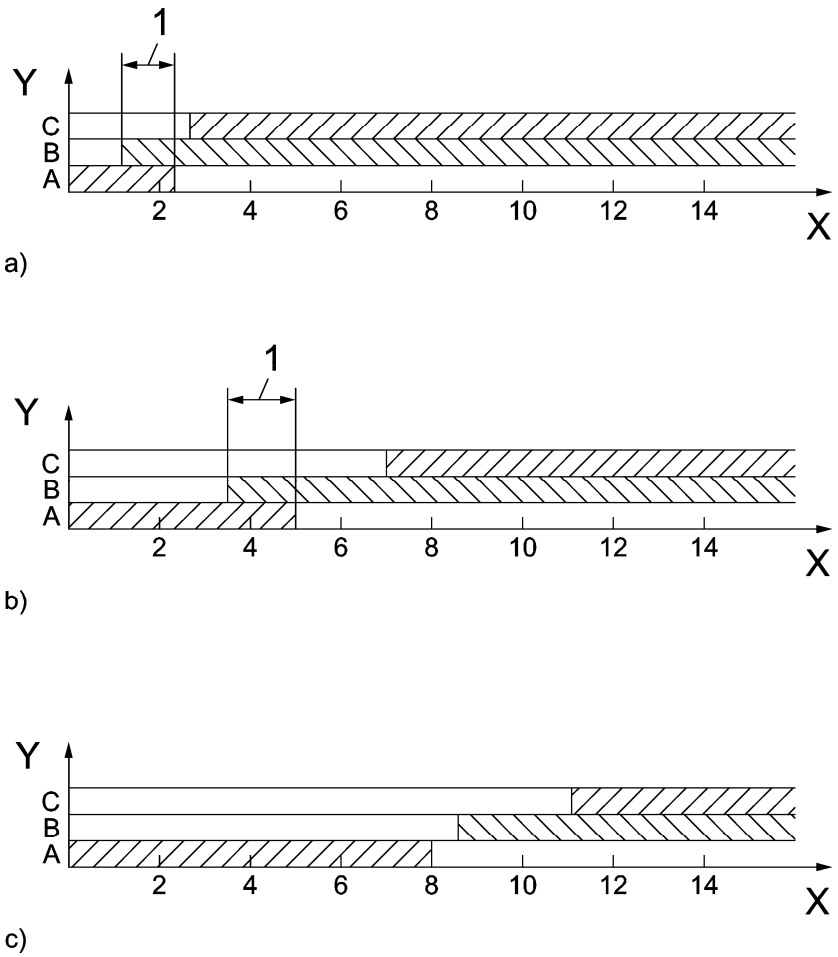
c) For an illumination intensity of the sensed flame during running position in excess of 7 lx at 2856 K (measured at the flame sensor) the requirements shown in Figure 3 c) shall be met.

   The threshold 'B' to indicate a flame signal prior to the release of fuel may be at a higher level of illumination than the threshold 'A' to indicate the loss of the sensed flame during running position resulting in a loss of the flame signal (switching differential). The threshold ratio B/A shall not exceed 1,1.

   The logic or circuit for the switching differential shall be a class B control function.

   Operations as detailed under a) and b) are also permissible.

The requirements for the threshold ratio B/A include also variations of the supply voltage for the flame detector device in the range + 10 % to - 15 %.



no flame signal is given

or flame signal is given (provided the same conditions are met)

Key

X illumination intensity in lx

Y flame signal

a) $C \geq 0{,}5$ lx; $B/A \leq 0{,}7$

b) $C \geq 3$ lx; $B/A \leq 0{,}7$

c) $C \geq 7$ lx; $B/A \leq 1{,}1$ in the range 0,85 – 1,1 U_N

1 negative switching differential

A loss of sensed flame

B presence of extraneous light

C presence of flame

Figure 3 — Flame sensors for visible light

7.101.4.3.3 Acoustic flame supervision

Flame detectors used for detecting the noise of the flame may not be affected by other noise sources in such a way that they will simulate a flame. This requirement is considered to be complied with when the following criteria are satisfied:

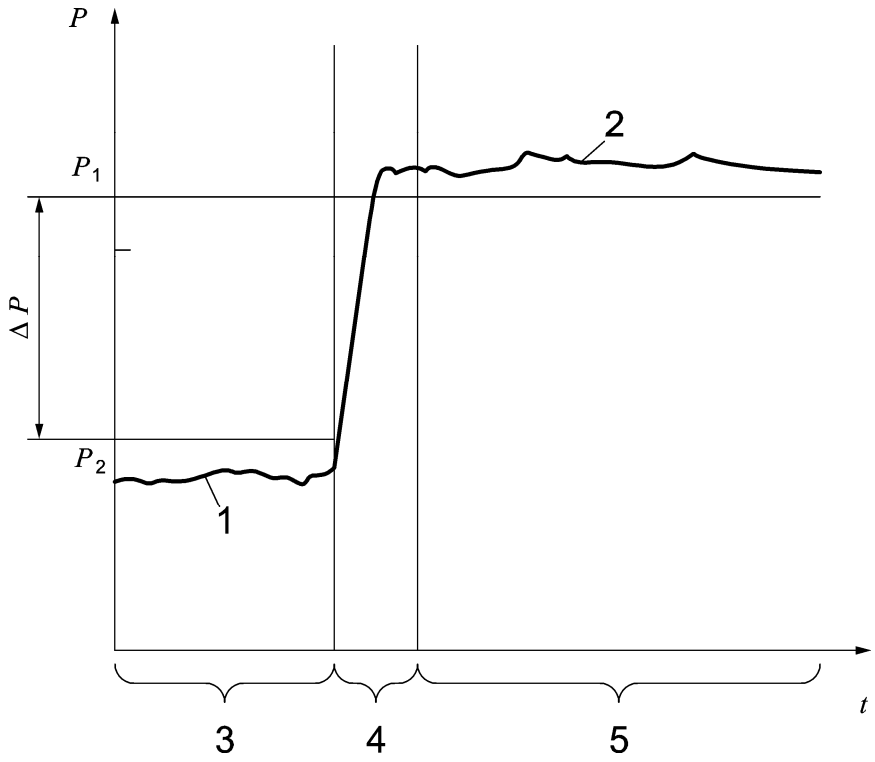
a) noise sensors may only be used in combination with burners where each heat source uses only one burner and where each flue gas system is connected to only one heat source;

b) noise sensors used for the detection of flames shall have a maximum upper limit of 40 Hz while observing a filter slope of at least 18 dB per octave, thus enabling the sensor to respond selectively to the noise generated by the flame;

c) the lower response threshold of the noise shall be higher than a sound pressure level of 80 dB (linear) in the range between 10 Hz and 40 Hz;

d) the supplier of the noise sensor shall specify an adequate minimum sound pressure differential between pre-purging status P2 (see Figure 4) and the flame off switching threshold P1 (see Figure 4). The manufacturer of the appliance (e.g. burner/boiler combination) shall ensure that the sound pressure differential of the application is larger or equal to the specified sound pressure differential (ΔP) in every operational status of the burner;

e) for all running positions after loss of flame, the noise shall be below P2 (see Figure 4), which shall be proved in the appliance (e.g. burner/boiler combination).



Key

1 sound pressure level during pre-purge
2 sound pressure level during running position
3 pre-purge
4 safety time
5 running position
P_1 switching threshold of the flame amplifier at the end of safety time (4) and during running position (5)
P_2 switching threshold of the flame amplifier during pre-purge (3)
ΔP Sound pressure differential

Figure 4 — Acoustic flame sensor

7.101.5 Lock-out function

The lock-out function shall be checked for proper operation during each start-up sequence.

The capability of the burner control system to store the non-volatile lock-out status shall be checked at least during each main power restoration.

The failure modes as described in Annex E shall be taken into consideration during the analysis of the electronic circuit.

In the case of a mechanical actuator, a test up to but not including the switching contacts is sufficient.

If the test of the lock-out function fails, the system shall proceed to safety-shut-down.

NOTE Internal faults on components of the checking circuit are not taken into account.

8 EMC/Electrical requirements

8.1 Protection against environmental influences

EN 13611:2007+A2:2011, 8.1 is replaced by the following:

NOTE EN 13611:2007+A2:2011, 8.1 states that the “specific control standard” specifies the applicable assessment criterion I and II. The specific assessment criteria I and II for this European Standard (i.e. EN 298) are listed below.

Any components specifically intended for protection against EMC disturbances that fail during any of these tests, will lead to non-compliance with this standard.

As a minimum for the tests given in 8.2 to 8.10, the tests shall be performed in the following operating phases:

For burner control systems:

a) start position

b) running position

c) lock-out position.

For independent flame detector devices:

d) flame off condition

e) flame on condition

f) lock-out (if applicable).

Additional operating phases in which the tests shall be performed may be given in the individual sub-clauses.

The following assessment criteria I and II are applicable for 8.2 to 8.10 unless specified otherwise:

Assessment Criterion I:

When tested at the severity levels according to 8.2 to 8.10, the burner control system shall continue to function in accordance with the requirements of this standard. It shall neither proceed to safety-shut-down nor lock-out, nor shall it reset from lock-out.

When tested at the severity levels according to 8.2 to 8.10, the Independent flame detector device shall continue to function in accordance with the requirements of this standard. It shall neither provide a flame signal while no sensed flame is present, nor interrupt a flame signal if a sensed flame is present, nor proceed to lock-out, nor shall it reset from lock-out.

Assessment Criterion II:

When tested at the severity levels according to 8.2 to 8.10, the burner control system shall

a) either perform as Assessment Criterion I or it may proceed to safety-shut-down which may be followed by an automatic restart, or if in volatile lock-out it may proceed to an automatic restart. If in non-volatile lock-out it shall remain in that condition or

b) where severity level 4 testing is required in addition to level 3, either it shall perform as above or the control shall become inoperative with all safety related output terminals de-energized or assuming a status in which they ensure a safe situation, complying with 6.6.5.2.

When tested at the severity levels according to 8.2 to 8.10, the Independent flame detector device shall

c) either perform as Assessment Criterion I or it may interrupt the flame signal while sensed flame is present or it may proceed to lock-out. It shall not provide a flame signal while no sensed flame is present. If in non-volatile lock-out it shall remain in that condition, or if in volatile lock-out it may proceed to reset from that condition or

d) where severity level 4 testing is required in addition to level 3, either it shall perform as above or it shall become inoperative assuming a status in which it ensures a safe situation, complying with 6.6.5.2.

NOTE In the basic EMC publications EN 61000-4 series "control" is commonly referred to EUT (Equipment under test).

8.2 Supply voltage variations below 85 % of rated voltage

Shall be according to EN 13611:2007+A2:2011, 8.2 with the following modification

Modification:

Assessment criteria II is replaced by the following:

Assessment criteria II:

The burner control system shall either perform as in criteria I or it may proceed to safety-shut-down followed by an automatic restart, or if in volatile lock-out it may proceed to an automatic restart. If in non-volatile lock-out it shall remain in that condition.

The Independent flame detector device shall either perform as Assessment Criterion I or it may interrupt the flame signal while sensed flame is present. It shall not provide a flame signal while no sensed flame is present. If in non-volatile lock-out it shall remain in that condition, or if in volatile lock-out it may proceed to reset from that condition.

8.3 Short-term voltage interruptions and decreases

Shall be according to EN 13611:2007+A2:2011, 8.3 with the following modification:

Replace the last two paragraphs in EN 13611:2007+A2:2011, 8.3 with the following:

For interruptions or decreases up to and including 1 period, the control shall conform to the Assessment Criterion I as specified in 8.1 of this European Standard (i.e. EN 298).

For interruptions or decreases exceeding 1 period the control shall conform to Assessment Criterion II.

Assessment Criterion II:

The system shall conform to Assessment Criterion I or it may proceed to safety-shut-down which may be followed by an automatic restart, or if in volatile lock-out it may proceed to an automatic restart. If in non-volatile lock-out it shall remain in that condition.

Assessment criterion II can be ignored, provided that the power failure occurs during the start-up sequence and is shorter than 60 s. At the restoration of power, the program may be continued from the point at which it was interrupted.

When the power supply is restored, the automatic restart shall comply with the requirements for a normal start-up sequence.

A shortened start-up sequence, e.g. a start-up sequence without pre-purge or waiting time, is allowed, provided that the power failure occurs within 60 s and after the end of the start-up sequence and is shorter than 60 s.

8.4 Supply frequency variations

8.4.1 General

Shall be according to EN 13611:2007+A2:2011, 8.4.1 with the following addition:

NOTE The requirements may be used for nominal frequencies other than 50 Hz.

8.4.2 Variations of up to 2 %

Shall be according to EN 13611:2007+A2:2011, 8.4.2 with the following modification:

Add the following paragraphs after the first paragraph of EN 13611:2007+A2:2011, 8.4.2: The following test conditions apply:

Vary the mains supply frequency about the nominal frequency f within the range – 2 % to + 2 %. Sequence the system through its complete start-up, running position and shut-down program a minimum of three times at each of the following supply frequencies: 0,98 f , 0,99 f , 1,01 f , 1,02 f.

Replace the second paragraph in EN 13611:2007+A2:2011, 8.4.2 with the following:

During the tests the control shall conform to Assessment *Criterion* I as specified in 8.1 of this European Standard (i.e. EN 298).

The operating phases given in 8.1 do not apply for this test.

8.4.3 Variations of between 2 % and 5 %

EN 13611:2007+A2:2011, 8.4.3 is replaced by the following:

Vary the mains supply frequency about the nominal frequency f within the ranges – 5 % to – 2 % and + 2 % to + 5 %. Sequence the system through its complete start-up and shut-down program a minimum of three times at each of the following supply frequencies: 0,95 f , 0,96 f , 0,97 f ,1,03 f , 1,04 f, 1,05 f.

During the tests the control shall conform to Assessment *Criterion* II as specified in 8.1 of this European Standard (i.e. EN 298).

8.5 Surge immunity test

Shall be according to EN 13611:2007+A2:2011, 8.5 with the following addition:

The following test conditions apply:

Five pulses of each polarity (+, –) and each phase angle are delivered in the following order for

a) Burner control systems:

1) 2 pulses with the system in the lock-out position;

2) 1 pulse with the system in the running position;

3) 2 pulses randomly applied during the start-up sequence.

b) Independent flame detector devices:

1) 2 pulses while no sensed flame is present;

2) 2 pulses while sensed flame is present;

3) 1 pulse while in the lock-out position (if applicable).

The intervals between the pulses shall not be less than 60 s. Nevertheless, shorter intervals are allowed if specified by the manufacturer.

The assessment criteria I and II as specified in 8.1 of this European Standard (i.e. EN 298) are applicable.

8.6 Electrical fast transient/burst

Shall be according to EN 13611:2007+A2:2011, 8.6 with the following addition:

If the test at the highest severity level complies with the assessment criterion I, tests at lower severity levels need not be performed.

The following test conditions apply:

The test shall be performed for 5 cycles with the system after having reached the running position, and remaining in the running position for a minimum of 30 s within each cycle. The test shall also be performed for a minimum of 1 min with the system in the lock-out position and with the system in the start position.

Independent flame detector devices are tested for a minimum of 1 min in each operating phase according to 8.1.

The assessment criteria I and II as specified in 8.1 of this European Standard (i.e. EN 298) are applicable.

8.7 Immunity to conducted disturbances

Shall be according to EN 13611:2007+A2:2011, 8.7 with the following addition:

If the test at the highest severity level complies with the assessment criterion I, tests at lower severity levels need not be performed.

The following test conditions apply:

The system has to be swept through the complete frequency range at least once with the system in each of the operating phases according to 8.1.

The assessment criteria I and II as specified in 8.1 of this European Standard (i.e. EN 298) are applicable.

8.8 Immunity to radiated fields

Shall be according to EN 13611:2007+A2:2011, 8.8 with the following addition:

If the test at the highest severity level complies with the assessment criterion I, tests at lower severity levels need not be performed.

The following test conditions apply:

The system has to be swept through the complete frequency range at least once with the system in each of the positions according to 8.1.

The assessment criteria I and II as specified in 8.1 of this European Standard (i.e. EN 298) are applicable.

8.9 Electrostatic discharge immunity test

Shall be according to EN 13611:2007+A2:2011, 8.9 with the following addition:

If the test at the highest severity level complies with the assessment criterion I, tests at lower severity levels need not be performed.

The following test conditions apply:

The system shall be tested in each of the operating phases according to 8.1.

The assessment criteria I and II as specified in 8.1 of this European Standard (i.e. EN 298) are applicable.

8.10 Power frequency magnetic field immunity test

Shall be according to EN 13611:2007+A2:2011, 8.10 with the following addition:

If the test at the highest severity level complies with the assessment criterion I, tests at lower severity levels need not be performed.

The following test conditions apply:

The system shall be tested in each of the positions according to 8.1.

The assessment criteria I and II as specified in 8.1 of this European Standard (i.e. EN 298) are applicable.

8.11 Electrical requirements

Shall be according to EN 13611:2007+A2:2011, 8.11 with the following modification:

Replace the first paragraph of EN 13611:2007+A2:2011, 8.11 with the following:

The electrical equipment shall comply with the relevant requirements of

a) EN 60730-2-5:2002+A1:2004+A11:2005+A2:2010, Clauses 8, 9, 10, 11, 12, 13, 14, 18, 19, 21, 22 and 24, except 11.3.4, 11.3.105 to 11.3.108, 11.3.110 to 11.3.113, 11.4.101 to 11.4.107, 11.101 and 12.1.1 which are covered by this standard,

b) EN 60730-1:2011, Clause 20.

The burner control system shall either comply with the requirements of EN 60730-2-5:2002+A1:2004+ A11:2005+A2:2010, Clause 23, or the manufacturer shall provide a clear indication to the customer that EMC emission requirements shall be tested after the incorporation of the burner control system into the equipment.

9 Marking, installation and operating instructions

9.1 Marking

Shall be according to EN 13611:2007+A2:2011, 9.1 with the following addition:

The system and/or its components shall be marked in clear and indelible characters with:

a) the value of the replaceable fuse(s) and its characteristics (if applicable) on or near each fuse holder;

b) marks, e.g. reference numbers on or near the terminals of the system;

c) first and/or second safety time for oil burner control systems;

d) the rated voltage(s) or rated voltage range and frequency (if applicable) for systems with its own housing (see 3.110);

e) "WLE" for systems designed for air heaters (see 7101.2.10).

9.2 Installation and operating instructions

Shall be according to EN 13611:2007+A2:2011, 9.2 with the following addition:

These instructions shall include the data required for the proper location, mounting, connection, operation and maintenance of the system.

These instructions shall at least include:

a) the supply voltage(s) and frequency;

b) the maximum and minimum ambient temperature(s);

c) an indication of the degree of protection (see 6.5.2);

d) clear indications for the connection in different supply voltage circuits (it shall, for instance, be clearly indicated that an isolating transformer which is earthed at one side shall be used if connection is to be made to a supply without an earth-bonded conductor or to a supply between the phases);

e) a listing and a diagram of the limits of the program times and details of their adjustment range(s) if any;

f) the maximum current rating of the output terminals;

g) the position(s) in which the system can be mounted;

h) the voltage and the frequency of the automatic burner control systems circuit(s);

i) the type of flame sensor(s) which can be applied. If the adjustment of the flame sensor sensitivity can cause an unsafe situation, the means of adjustment shall be suitably protected by the system installer. The minimum and the maximum sensed flame value shall be declared;

j) the type reference of the corresponding optical flame sensor(s) and the temperature range they can withstand;

k) the length and the type of cable for the connection of the flame sensor and other external components (see also 8.5, 8.6 and 8.7);

l) a typical external wiring diagram;

m) the rated input in W of the system itself, if higher than 25 W;

n) information for each terminal of the burner control system or independent flame detector device to indicate if a class I, II or III isolation type is required. This information shall indicate if circuits incorporate SELV, PELV or protective impedance;

o) an indication that the switching action of a thermostat or a similar device can reset the burner control system from volatile lock-out;

p) declaration of the time to achieve safety -shut-down if it (see 7.101.3.8) exceeds 1 s, as well as the applied standard on which this time is based;

q) declaration of the resistance to vibration by the manufacturer if the system is intended to be used in DC supplied mobile applications (see Annex I) or if required by any other application;

r) external measures to avoid un-authorized replacement of the fuse (see Table E.1 h));

s) clear indication if EMC emission requirements shall be tested after the incorporation of the burner control system into the equipment;

t) maximum value of “Flame failure response time” or, for independent flame detector devices, the maximum value of the “Flame failure detection time”.

NOTE The following data provided by the manufacturer can be of use to the test laboratory:

a) Operational specification (a minimum operating temperature range of 0 °C to 60 °C is required, see 7.9).

b) Declarations as required by EN 60730-2-5:2002+A1:2004+A11:2005+A2:2010, Table 7.2.

c) Operational life (normally number of cycles; a minimum life of 250 000 is required, see 7.10).

d) Minimum cycling time from start to start for continued satisfactory operation.

e) A complete fault analysis covering the characteristic failure modes of all components (see Annex E) and the effect of such failures on other components and the operation of the system.

f) The procedure for fault finding to be adopted while servicing the system.

g) Sufficient design details to enable assessment of the safety functions. This should include the manufacturer's design calculation on the effect of tolerance on critical circuit components.

h) Installation, servicing and maintenance instructions and details of replacement parts.

i) Manufacturer's test schedules and relevant supplementary information.

j) Circuit diagram complete with component list with circuit reference, electrical ratings, relevant operating stresses and tolerances.

k) Software documentation (where applicable), see EN 60730-1:2011.

l) Component specifications including:

1) type;

2) values;

3) tolerances;

4) ratings;

5) operating values;

6) component manufacturer/supplier;

m) The applications for which the system is intended and, where applicable, the type of pilot system for which the system is suitable.

9.3 Warning Notice

Shall be according to EN 13611:2007+A2:2011, 9.3.

Annex A
(informative)

Gas connections in common use in the various countries

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

Annex B
(informative)

Leak-tightness test − Volumetric method

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

Annex C
(informative)

Leak-tightness − Pressure loss method

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

Annex D
(normative)

Conversion of pressure loss into leakage rate

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

Annex E
(normative)

Electrical/electronic component fault modes

Shall be according to EN 13611:2007+A2:2011, Annex E with the following additions and modifications:

Modification:

The footnotes g), h) and m) of EN 13611:2007+A2:2011, Table E.1 are replaced by the footnotes g), h) and m) of Table E.1, below.

Addition:

EN 13611:2007+A2:2011, Table E.1 is applicable with the following modification and the addition of footnotes aa) and bb).

Table E.1 — Electrical/electronic component faults modes

Component type	Short	Open	Remarks
Relays			
- Coils	X	X	If the relay complies with EN 61810-1 the failure mode short-circuit need not be considered.
- Contacts	X [g, h, aa]	X	
Reed-relays	X	X	Contacts only
Printed circuit board conductors	X [m]	X [l]	
Electromechanical lockout elements			
- Coils	X	X	
- Contacts	X [bb]	X	
Flame sensor	X [cc]	X [cc]	See [cc]

Table E.1 *(continued)*

Component type	Short	Open	Remarks

[g] The failure modes "short-circuit" and "mechanical break-down" need not to be considered when the system – including the relay – has successfully completed the long-term performance tests of 7.10 (under nominal load of relay contacts) and if the relay is successfully tested for 3 million cycles under no load condition in compliance with EN 60947-5-1:2004, C.2, declared by the manufacturer and if special precautions have been taken to prevent welding of contacts (see 6.5.1). All of the following special precautions shall be fulfilled:

1. Measures to avoid welding:

1.1 Contacts closing on short-circuit:

Rating of the fuse: (I_N) < 0,6 * (I_e).

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

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

1.2 Lifetime/load cycle rating: proof that the contact does not weld after 1 000 000 cycles (4-fold safety) on maximum rated contact load, as specified by the controls manufacturer based on a test of 3 samples.

2. Measures to avoid microwelding:

2.1 Proof that the permissible (maximum) capacitance loads have been part of the lifetime-test according to 1.2.

2.2 Proof that no mains synchronous switching occurs, or the mains synchronous switching has not resulted in non-compliance with the lifetime test according to 1.2 (see also 7.10.1).

Spontaneous closing of a relay contact without energy is not considered if the relay is designed for the mechanical stress and the rating of the relay is appropriate to avoid mechanical breakdown.

[h] If a fuse is used to protect against the hazard of relay contact welding, either the fuse shall not be replaceable, or external measures are necessary to avoid un-authorized replacement. These measures shall be included in the instruction manual (see 9.2 "Installation and operating instructions").

[l] The open circuit failure mode, i. e. interruption of a conductor, is excluded if the thickness of the conductor is equal to or greater than 35 µm and the breadth of the conductor is equal to or greater than 0,3 mm or the conductor has an additional precaution against interruption, e. g. roll-tinned, etc. If a short-circuit at the output terminals causes the opening of a printed circuit board conductor, that conductor shall be subject to an open circuit fault analysis.

[m] The short-circuit failure mode is excluded if the requirements of EN 60730-1:2011, Clause 20 are met. For the assessment according to 6.6 the short-circuit failure mode is excluded if the requirements of EN 60730-1:2011 Clause 20 for overvoltage category III are met.

[aa] If no measures to avoid contact welding according to g) are taken, the fault mode “short” shall be considered to occur both in the instance of closing of the contact and when the contact is already closed.

[bb] 1) The electromechanical lock-out element shall withstand 60 000 cycles without load.

2) The contacts of the electromechanical lock-out element shall be protected against welding by a fuse dimensioned according to footnote g) 1.1.

3) The contacts of the electromechanical lock-out element shall withstand 20 000 cycles according to footnote g) 1.2.

4) Footnotes g) 2.1 and 2.2 shall be fulfilled accordingly.

5) In the operating position the contacts of the electromechanical lock-out element shall withstand 1 000 000 cycles of maximum load current in the closed position without contact welding.

6) All load conditions shall consider inductive and/or capacitive loads, "cos phi".

[cc] The fault modes of the flame sensor and of the flame sensor assembly shall be assessed. The assessment shall include the wiring, open and short, and depending on the technology used, the following failure modes shall be considered:

The characteristic sensor changes in principle or by an offset.

Specific fault modes related to the sensor technology.

Specific fault modes in the optical path (e.g. filter characteristics).

Examples are given in Annex BB.

Annex F
(normative)

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

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

This annex applies if the burner control system is used as part of safety accessories as defined by EU Directive 97/23/EC.

Annex G
(normative)

Materials for pressurized parts

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

Annex H
(informative)

Additional materials for pressurized parts

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

Annex I
(normative)

Requirements for controls used in DC supplied fuel burners and fuel burning appliances

I.1 Scope

Shall be according to Clause 1 and to EN 13611:2007+A2:2011, Annex I.

I.2 Thermal stress test

Shall be according to 7.10.2.1 with the following modifications:

Replace "85 % of the minimum declared rated voltage" *with* "80 % of the minimum declared DC voltage".

Replace "110 % of the maximum declared rated voltage" *with* "120 % of the maximum declared DC voltage".

I.3 Long-term performance test [by the manufacturer]

Shall be according to 7.10.3 with the following modifications:

Replace "85 % of the minimum declared rated voltage" *with* "80 % of the minimum declared DC voltage".

Replace "110 % of the maximum declared rated voltage" *with* "120 % of the maximum declared DC voltage".

I.4 At ambient temperature

Shall be according to 7.9.1 with the following modifications:

Replace "85 % of the minimum declared rated voltage" *with* "80 % of the minimum declared DC voltage".

Replace "110 % of the maximum declared rated voltage" *with* "120 % of the maximum declared DC voltage".

I.5 Supply voltage variations below 85 % of rated voltage

Shall be according to 8.2 with the following modifications:

Replace "85 % of the minimum declared rated voltage" *with* "80 % of the minimum declared DC voltage".

I.6 Short-term voltage interruptions and decreases

Shall be according to EN 13611:2007+A2:2011, I.6 with the following modifications:

The assessment criteria given in 8.1 and in 8.3 respectively apply.

The tests shall be performed in the operating phases as given in the relevant clauses of 8.3.

I.7 Supply frequency, surge immunity, electrical fast transient/burst, electromagnetic conducted disturbances, power frequency magnetic field immunity test

Shall be according to EN 13611:2007+A2:2011, I.7 with the following modifications:

The assessment criteria given in 8.1 and in 8.4 to 8.10 respectively apply.

The tests shall be performed in the operating phases as given in the relevant clauses of 8.4 to 8.10.

I.8 Electrical transient conduction immunity for type B only

Shall be according to EN 13611:2007+A2:2011, I.8 with the following modifications:

The assessment criteria given in 8.1 and in 8.4 to 8.10 respectively apply.

The tests shall be performed in the operating phases as given in the relevant clauses of 8.4 to 8.10.

Annex AA
(informative)

Functional characteristics of burner control systems, to be given by the appliance standard

Table AA.1 — Functional characteristics of gas burner control systems, to be given by the appliance standard

Clause(s)	Item	Remarks
3.116, 3.117, 7.101.3.1, 7.101.3.6	Safety times	Maximum time
3.124, 7.101.2.9, 7.101.2.2, 7.101.3.2	Purge or waiting times	Minimum time
3.105, 7.101.3.7	Flame failure response time	Normally 1 s, unless otherwise specified.
3.121, 7.101.1, 8.1	Volatile or non-volatile lock-out	Both are allowed unless otherwise specified.
3.122, 7.101.2.5	Ignition restoration	Specify if applicable
3.123, 7.101.2.4	Recycling	Specify if applicable
3.126, 6.6.4, 7.101.4.1.2	Permanent operation	Specify if applicable
3.130, 7.101.2.1.5, 7.101.2.2	Spark supervision	
3.131, 7.101.2.1.4	Pilot or start flame proving period	Minimum time if applicable

Table AA.2 — Functional characteristics of oil burner control systems, to be given by the appliance standard

Clause(s)	Item	Remarks
3.124, 7.101.3.3	Purge or waiting times	Minimum time
3.121, 7.101.1, 8.1	Volatile or non-volatile lock-out	As specified
3.122, 7.101.2.5	Ignition restoration	Specify if applicable
3.123, 7.101.2.4	Recycling	Specify if applicable
3.126, 6.6.4, 7.101.4.1.2	Permanent operation	Specify if applicable
3.130, 7.101.2.1.5, 7.101.2.2	Spark supervision	
3.131, 7.101.2.1.4	Pilot or start flame proving period	Minimum time, if applicable

Annex BB
(informative)

Fault modes of flame sensors

Table BB.1 — Fault modes of flame sensors

	Methods for selectivity	Effects which may simulate a flame by external influences	Sensor fault model/ Long-term behaviour
Ionization	Rectifying effect of the flame	Creepage currents, Influences by the ignition device. DC Leakage current	Defined so far: short-circuit, open circuit. To be considered: creepage current caused by loss of insulation; increased surface resistance of the flame rod by pollution; influence on the signal by pollution: e.g. rectifying property of electrolytic fluids
IR	Selective wave length + flame flicker, FFT, rectified alternating signal; constructive requirements	Illumination from external light sources; radiation of red-hot surfaces within the combustion chamber; radiation of adjacent burners; interference with line frequency.	Defined so far: short-circuit, open circuit. To be considered: drift, deviation from the response curve
UV	Selective wave length, FFT	Illumination from external light sources; radiation of adjacent burners; ignition sparks; radioactive radiation; interference with line frequency.	UV Tube Type: Defined so far: short-circuit, open circuit, “excessive dark current” of UV tubes. To be considered: drift, deviation from the response curve UV Semi conductor
Visible light	Amplitude + constructive requirements, or flame flicker / FFT	Illumination from external light sources; radiation of red-hot surfaces within the combustion chamber; radiation of adjacent burners; ignition sparks; interference with line frequency.	Defined so far: short-circuit, open circuit. To be considered: drift, deviation from the response curve,
Acoustic	Frequency + amplitude + (constructive requirements to the appliance, number of heat generators) or FFT	External noise; ignition noise; burner fan noise; noise of other heat generators coupled acoustically, e.g. through the flue gas system	Defined so far: short-circuit, open circuit. To be considered: drift, deviation from the response curve

Table BB.1 *(continued)*

	Methods for selectivity	**Effects which may simulate a flame by external influences**	**Sensor fault model / Long-term behaviour**
Temperature	Amplitude and constructive requirement	Radiation of red-hot surfaces within the combustion chamber; radiation of adjacent burners; ambient temperature	Defined so far: short-circuit, open circuit. To be considered: drift, deviation from the response curve (refer to EN 14459)

Annex CC
(informative)

Functional diagrams of oil burner control systems

CC.1 Symbols

Table CC.1 — Symbols

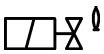
Symbol	Clause	Description
A	3.111	Start position
C	3.118	Running position
E	3.119	Controlled shut-down
X	7.101.2.9	Loss of sensed flame
Y	3.121	Lock-out
Z	3.121.1	Manual reset
b	3.125.1	Start-up sequence
d	3.118	Running position
f	3.115	Post-purge
t_1	3.124.4	Pre-purge time
t_2	3.135.2	Pre-ignition time (electric)
t_2'	3.131	Pilot or start fuel flame proving period
t_3	3.135.3	Ignition time (electric)
t_3'	3.135.3	Ignition time (gas) (oil)
t_4	3.135.4	Post-ignition time (electric)
t_4'	3.135.4	Post-ignition time (gas) (oil)
t_5	3.116	1st safety time
t_6	3.117	2nd safety time
t_7	3.105	Flame failure response time
t_8	3.124.6	Post-purge time
t_{10}	7.101.3.4.2	Maximum permissible period between release of fuel for a non-supervised pilot and re-lease of fuel for the main burner

CC.2 Explanations

Fan motor

Ignition (electric)

Oil shut-off valve



Pilot gas shut-off valve

Pilot flame signal

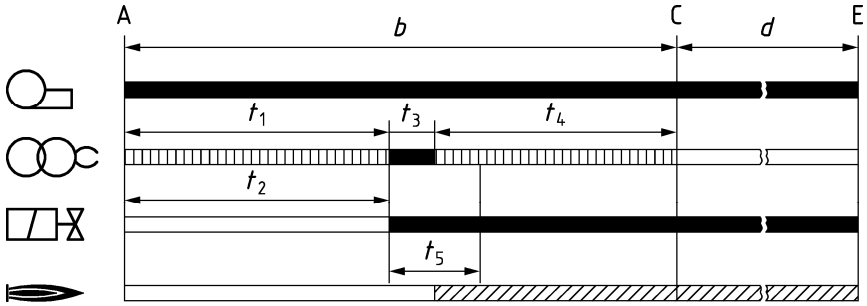
Main flame signal

Flame signal, gen.

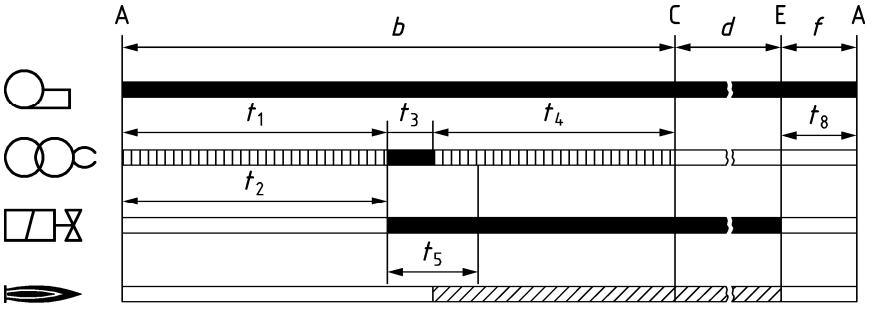
Failure signal

Air damper

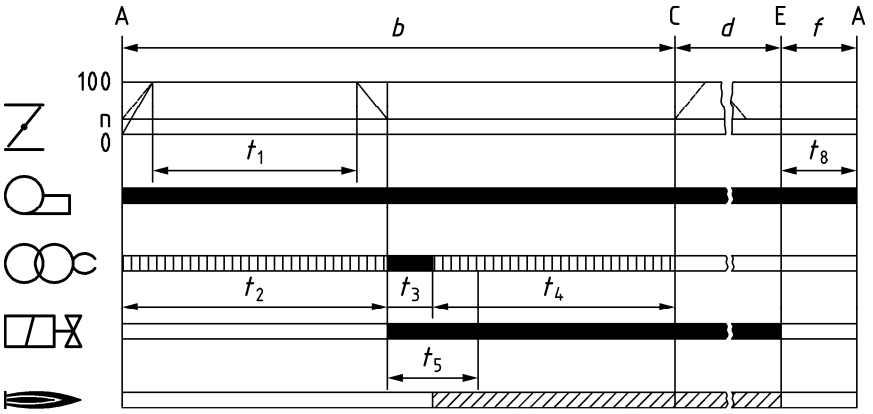
CC.3 Functional diagrams – Normal operation



a) Operation without post-purge

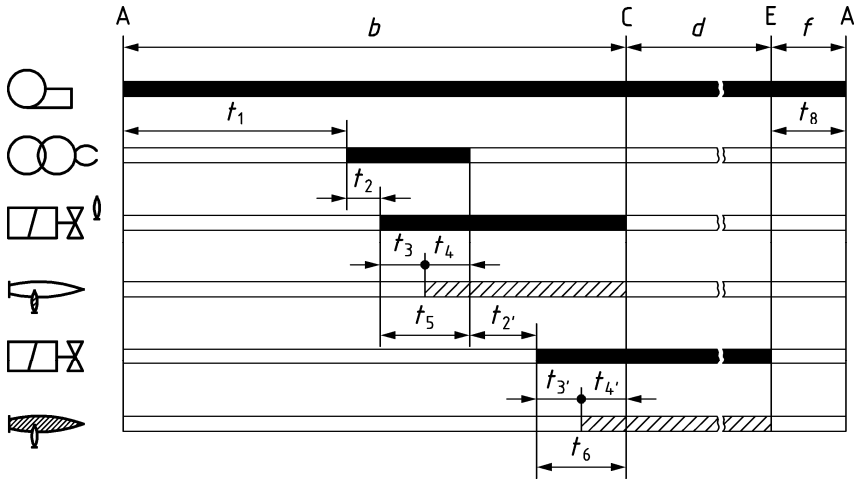


b) Operation with post-purge

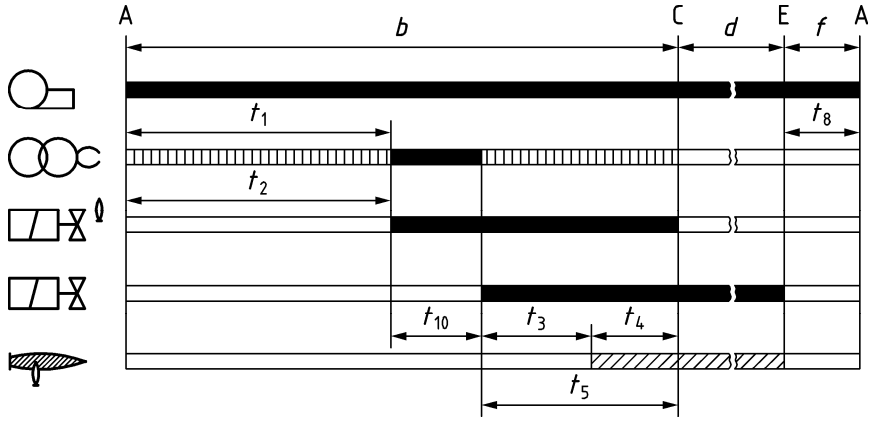


c) Supervised air damper operation, operation with post-purge

Figure CC.1 — Burner without pilot



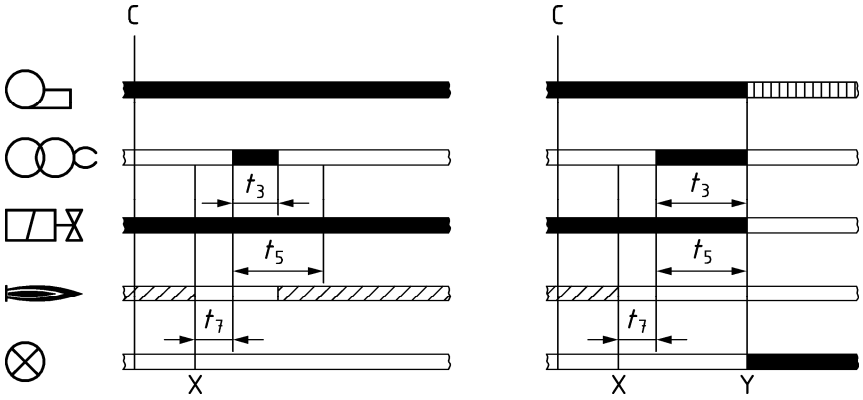
a) Pilot supervised, operation with post-purge two main shut-off valves in series or see EN 267



b) Pilot not supervised, operation with post-purge

Figure CC.2 — Burners with pilot which operates only during the ignition time

CC.4 Functional diagrams – protective response in case of abnormal operation in the application



a) Ignition restoration with flame re-establishment

b) Lock-out due to non-establishment of the flame

Figure CC.3 — Ignition restoration after loss of sensed flame during running position

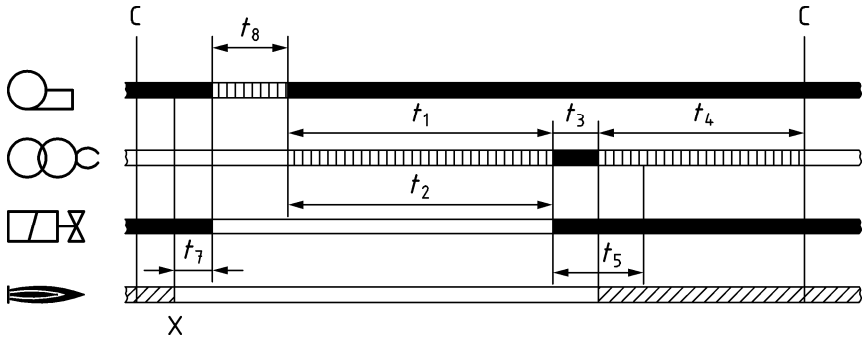


Figure CC.4 — Recycling after loss of sensed flame during running position

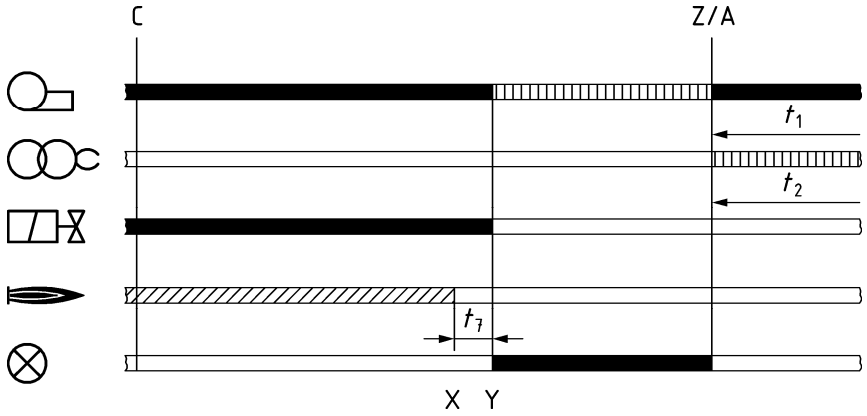


Figure CC.5 — Lock-out after loss of sensed flame during running position

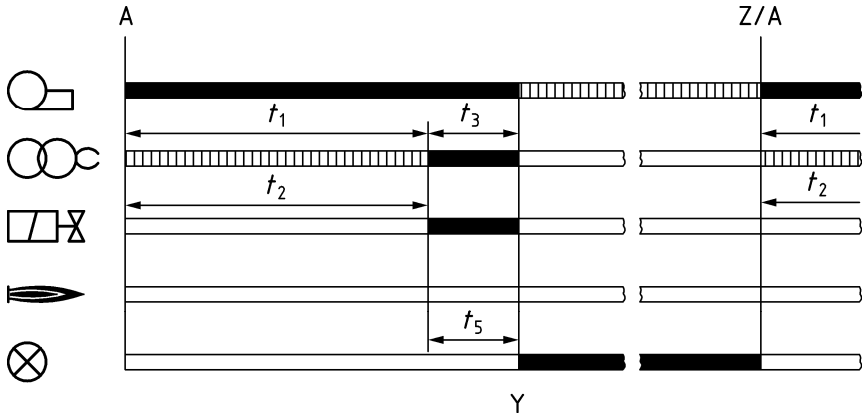


Figure CC.6 — Lock-out for the non-establishment of the flame signal (during safety time t_5)

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2009/142/EC relating to appliances burning gaseous fuels

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2009/142/EC relating to appliances burning gaseous fuels.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the clauses of this standard given in Table ZA confers, within the limits of the scope of this standard, a presumption of conformity with the corresponding Essential Requirements of that Directive and associated EFTA regulations.

Table ZA.1 — Correspondence between this European Standard and Directive 2009/142/EC relating to appliances burning gaseous fuels

N/A = Not applicable

Essential requirement (ERs) of Directive 2009/142/EC		Clause(s)/subclause(s) of this European Standard
1	**GENERAL CONDITIONS**	
1.1	Safety of operation	Complete standard
1.2	Installation instructions User instructions Warning notices Official language of instructions	9 N/A 9 9
1.2.1	Installation instructions	9
1.2.2	User instructions	N/A
1.2.3	Warning notices	9
1.3	Correct operation	7, 9
2	**MATERIALS**	
2.1, 2.2	Suitability for safety and intended purpose	6
3	**DESIGN AND CONSTRUCTION**	
3.1	General	
3.1.1	Mechanical stability	6
3.1.2	Condensation	N/A
3.1.3	Risk of explosion	N/A
3.1.4	Water penetration	N/A
3.1.5	Normal fluctuation of auxiliary energy	7.9

Table ZA.1 *(continued)*

Essential requirement (ERs) of Directive 2009/142/EC		Clause(s)/subclause (s) of this European Standard
3.1.6	Abnormal fluctuation of auxiliary energy	8
3.1.7	Hazards of electrical origin	8.11
3.1.8	Pressurized parts	N/A
3.1.9	Failure of safety, controlling and regulating devices	6.6, 7.101, 8.11,
3.1.10	Safety/adjustment	6.5.1, 7.101.1
3.1.11	Protection of parts set by the manufacturer	7.101.3.1
3.1.12	Controlling and setting devices	9
3.2	Unburned gas release	6.6, 7.101
3.2.1	Gas leakage	N/A
3.2.2, 3.2.3	Gas accumulation	N/A
3.3	Ignition	N/A
3.4	Combustion	N/A
3.5	Rational use of energy	N/A
3.6	Temperatures	7.9, 8.11
3.7	Foodstuffs and water used for sanitary purposes	N/A
ANNEX II		
	Certification procedures	N/A
ANNEX III		
	CE conformity mark and inscriptions	
1	Mark	N/A
2	Data plate	9

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

Shall be according to EN 13611:2007+A2:2011, Bibliography with the following additions:

[1] EN 126, *Multifunctional controls for gas burning appliances*

[2] EN 161, *Automatic shut-off valves for gas burners and gas appliances*

[3] EN 60127-1:2006, *Miniature fuses — Part 1: Definitions for miniature fuses and general requirements for miniature fuse-links (IEC 60127-1:2006)*

[4] EN 60947-1:2007, *Low-voltage switchgear and controlgear — Part 1: General rules (IEC 60947-1:2007)*

[5] EN 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4-2: Testing and measurement techniques — Electrostatic discharge immunity test (IEC 61000-4-2)*

[6] EN 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3)*

[7] EN 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test (IEC 61000-4-4)*

[8] EN 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test (IEC 61000-4-5)*

[9] EN 61000-4-6, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6)*

[10] EN 61000-4-8, *Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques — Power frequency magnetic field immunity test (IEC 61000-4-8)*

[11] EN 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests (IEC 61000-4-11)*

[12] EN ISO 23553-1, *Safety and control devices for oil burners and oil-burning appliances — Particular requirements — Part 1: Shut-off devices for oil burners (ISO 23553-1)*

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