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Varnostne in nadzorne naprave za plinske gorilnike in plinske aparate - Splošne zahteve (vključno z dopolnili do A2)

Safety and control devices for gas burners and gas burning appliances - General requirements

Sicherheits-, Regel- und Steuereinrichtungen für Gasbrenner und Gasgeräte - Allgemeine Anforderungen

Équipements auxiliaires pour brûleurs à gaz et appareils à gaz - Exigences générales

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Safety and control devices for gas burners and gas burning appliances - General requirements

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This European Standard was approved by CEN on 7 October 2007 and includes Amendment 1 approved by CEN on 5 June 2011 and Amendment 2 approved by CEN on 29 July 2011.

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Foreword

This document (EN 13611:2007+A2:2011) has been prepared by Technical Committee CEN/TC 58 “Safety and control devices for gas-burners and gas-burning appliances”, 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of an identical text or by endorsement, at the latest by April 2012, and conflicting national standards shall be withdrawn at the latest by April 2012.

This document includes Amendment 1, approved by CEN on 2011-06-05 and Amendment 2, approved by CEN on 2011-07-29.

This document supersedes [A2] EN 13611:2007 [/A2].

The start and finish of text introduced or altered by amendment is indicated in the text by tags [A1] [/A1] and [A2] [/A2].

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 EC Directive(s).

For relationship with EC Directive(s), see informative Annexes ZA or B, which are an integral part of this document.

For additional requirements for safety accessories and pressure accessories as defined in EU-Directive 97/23/EC see normative Annex F.

For controls used in DC supplied gas burners and gas burning appliances see additional requirements in normative Annex I.

This European Standard covers type testing only.

Tests intended for production testing are not specifically included.

This standard recognizes the safety level specified by CEN/TC 58 and is regarded as a horizontal standard dealing with the safety, construction and performance of controls for gas burners and gas burning appliances and to their testing.

[A2] Primarily in industrial applications it is common practice to rate the safety of a plant based on values describing the likelihood of a dangerous failure. These values are being used to determine Safety Integrity Levels or Performance Levels when the system is being assessed in its entirety.

CEN/TC 58 standards for safety relevant controls do go beyond this approach, because for a certain life span for which the product is specified, designed and tested a dangerous failure is not allowed at all. Failure modes are described and assessed in greater detail. Measures to prevent from dangerous situations are defined. Field experience over many decades is reflected in the CEN/TC 58 standards. Requirements of these standards can be considered as proven in practice.

To be able to provide values for the parameters that are needed for Safety Integrity Level or Performance Level system assessment, the Annexes J and K of this document specifies a possible methodology to derive values for the relevant parameters from the requirements of this European Standard.

Only controls that comply with the relevant CEN/TC 58 control standard can be assessed for PL classification according to this amendment.

It cannot be presumed that any Safety Integrity Level or Performance Level assessment alone would imply that requirements of a CEN/TC 58 standard have been met.

For particularly slow and long term cycling controls the test method might result in testing durations which are not feasible. An interim appropriate solution would be to determine suitable service intervals (see also EN ISO 13849-1). The responsible working group of CEN/TC 58 aim to find more representative test methods in the short term for specific scenarios. A2

This European Standard should be used in conjunction with the specific standard for a specific type of control, (e. g. EN 88-1, EN 88-2, EN 125, EN 126, EN 161, EN 257, EN 298, EN 1106, EN 1643, EN 1854, EN 12067-1 and EN 12067-2, EN 12078) or for controls for specific applications. This standard may also be applied, so far as reasonable, to controls not mentioned in a specific standard and to controls designed on new principles, in which case additional requirements may be necessary.

Other control standards should make use of this standard by adapting this standard and stating "addition“, "modification“ or "replacement“ in their corresponding clauses.

This 2nd edition of EN 13611 includes EN 13611:2000/A1:2004 and new 6.5 Electric parts of the control and 6.6. Protection against internal faults for the purpose of functional safety. Annex G contains a list of materials which meet the essential requirements of Pressure Equipment Directive (PED).

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 and United Kingdom.

1 Scope

This European Standard specifies safety, construction, and performance requirements and testing of safety control or regulating devices and sub-assemblies or fittings (hereafter referred to as controls) for burners and gas burning appliances using fuel gases of the first, second or third families and to their testing.

Controls to which this European Standard applies include the following:

— automatic shut-off valves;

— automatic burner control systems;

— flame supervision devices;

— gas/air ratio controls;

— pressure regulators;

— manual taps;

— mechanical thermostats;

— multifunctional controls;

— pressure sensing devices;

— valve proving systems;

— zero pressure regulators.

The methods of test given in this standard are intended for product type testing.

For DC supplied controls Annex H applies.

NOTE 1 When no particular control standard exists, the control can be tested according to this standard and further tests taking into account the intended use.

NOTE 2 This European Standard should be used in conjunction with the specific control standard (see Bibliography).

2 Normative references

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

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

EN 10028-2:2003, *Flat products made of steels for pressure purposes — Part 2: Non-alloy and alloy steels with specified elevated temperature properties*

EN 10028-3:2003, *Flat products made of steels for pressure purposes — Part 3: Weldable fine grain steels, normalized*

EN 10028-4:2003, *Flat products made of steels for pressure purposes — Part 4: Nickel alloy steels with specified low temperature properties*

EN 10028-5:2003, *Flat products made of steels for pressure purposes — Part 5: Weldable fine grain steels, thermomechanically rolled*

EN 10028-6:2003, *Flat products made of steels for pressure purposes — Part 6: Weldable fine grain steels, quenched and tempered*

EN 10028-7:2007, *Flat products made of steels for pressure purposes — Part 7: Stainless steels*

EN 10213-3:1995, *Technical delivery conditions for steel castings for pressure purposes — Part 3: Steel grades for use at low temperatures*

EN 10222-1:1998, *Steel forgings for pressure purposes — Part 1: General requirements for open die forgings*

EN 10222-5:1999, *Steel forgings for pressure purposes — Part 5: Martensitic, austenitic and austenitic-ferritic stainless steels*

EN 10272:2000, *Stainless steel bars for pressure purposes*

EN 13906-1, *Cylindrical helical springs made from round wire and bar — Calculation and design — Part 1: Compression springs*

EN 13906-2, *Cylindrical helical springs made from round wire and bar — Calculation and design — Part 2: Extension springs*

EN 60068-2-6, *Environmental testing — Part 2: Tests — Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + Corrigendum 1995)*

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

EN 60335-1:2002, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2001, modified)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60730-1:2000, *Automatic electrical controls for household and similar use — Part 1: General requirements (IEC 60730-1:1999, 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)*

EN 61000-4-2, *Electromagnetic compatibility (EMC) — Part 4: Testing and measurement techniques — Section 2: Electrostatic discharge immunity test — Basic EMC publication (IEC 61000-4-2:1995)*

EN 61000-4-3, *Electromagnetic compatibility (EMC) — Part 4-3: Testing and measurement techniques — Radiated, radio-frequency, electromagnetic field immunity test (IEC 61000-4-3:2006)*

EN 61000-4-4, *Electromagnetic compatibility (EMC) — Part 4-4: Testing and measurement techniques — Electrical fast transient/burst immunity test (IEC 61000-4-4:2004)*

EN 61000-4-5, *Electromagnetic compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test (IEC 61000-4-5:2005)*

EN 61000-4-6, *Electromagnetic compatibility (EMC) — Part 4-6: Testing and measurement techniques — Immunity to conducted disturbances, induced by radio-frequency fields (IEC 61000-4-6:2003 + A1:2004 + A2:2006)*

EN 61000-4-8, *Electromagnetic compatibility (EMC); part 4: testing and measurement techniques; section 8: power frequency magnetic field immunity test; basic EMC publication (IEC 61000-4-8:1993)*

EN 61000-4-11, *Electromagnetic compatibility (EMC) — Part 4-11: Testing and measurement techniques — Voltage dips, short interruptions and voltage variations immunity tests (IEC 61000-4-11:2004)*

EN 61000-4-29*, Electromagnetic Compatibility (EMC) — Part 4-29: Testing and measurement techniques; Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests (IEC 61000-4-29:2000)*

EN 61558-2-6, *Safety of power transformers, power supply units and similar — Part 2-6: Particular requirements for safety isolating transformers for general use (IEC 61558-2- 6:1997)*

EN 61558-2-17*, Safety of power transformers, power supply units and similar — Part 2-17: Particular requirements for transformers for switch mode power supplies (IEC 61558- 2-17:1997)*

EN ISO 228-1:2003, *Pipe threads where pressure-tight joints are not made on the threads — Part 1: Dimensions, tolerances and designation (ISO 228-1:2000)*

ISO 7-1:1994, *Pipe threads where pressure-tight joints are made on the threads — Part 1: Dimensions, tolerances and designation*

ISO 65, *Carbon steel tubes suitable for screwing in accordance with ISO 7-1*

ISO 262, *ISO general purpose metric screw threads — Selected sizes for screws, bolts and nuts*

ISO 301, *Zinc alloy ingots intended for casting*

ISO 7005 (all parts), *Metallic flanges*

ISO 7637-2, *Road vehicles — Electrical disturbances from conduction and coupling — Part 2: Electrical transient conduction along supply lines only*

ISO 7637-3, *Road vehicles — Electrical disturbance by conduction and coupling — Part 3: Vehicles with nominal 12 V or 24 V supply voltage — Electrical transient transmission by capacitive and inductive coupling via lines other than supply lines*

IEC 61643-1*, Low-voltage surge protective devices — Part 1: Surge protective devices connected to low-voltage power distribution systems — Requirements and tests*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
control
device which directly or indirectly controls the gas flow and/or provides a safety function within a gas burner or gas-burning appliance

3.2
control function
function providing safe operation of gas burners and gas burning appliances

3.3
closure member
movable part of the control which shuts off the gas flow

3.4
external leak-tightness
leak-tightness of a gas-carrying compartment with respect to atmosphere

3.5
internal leak-tightness
leak-tightness of the closure member (in the closed position) sealing a gas-carrying compartment with respect to another compartment or to the outlet of the control

3.6
inlet pressure
pressure at the inlet of the control

3.7
outlet pressure
pressure at the outlet of the control

3.8
pressure difference
difference between the inlet and outlet pressures

3.9
maximum inlet pressure
highest inlet pressure declared by the manufacturer at which the control may be operated

3.10
minimum inlet pressure
lowest inlet pressure declared by the manufacturer at which the control may be operated

3.11
flow rate
volume flowing through the control in unit time

3.12
rated flow rate
air flow rate at a specified pressure difference declared by the manufacturer, corrected to standard conditions

3.13
maximum ambient temperature
highest temperature of the surrounding air declared by the manufacturer at which the control may be operated

3.14
minimum ambient temperature
lowest temperature of the surrounding air declared by the manufacturer at which the control may be operated

3.15
mounting position
position declared by the manufacturer for mounting the control

3.16
nominal size
DN
numerical designation of size, for reference purposes, loosely related to manufacturing dimensions, common to all components in a piping system

[ISO 6708:1995]

3.17
apparatus
single piece of equipment with (a) direct function(s) intended for final use

3.18
system
combination of apparatus and/or active components constituting a single functional unit and intended to be installed and operated to perform (a) specific task(s)

3.19
installation
combination of apparatuses, components and systems assembled and/or erected (individually) in a given area

NOTE For physical reasons (e. g. long distances between individual items) it is in many cases not possible to test an installation as a unit.

3.20
fault tolerating time
time between the occurrence of a fault and the shut down of the burner, which is tolerated by the application without creating a hazardous situation

NOTE Actions other than shut down of a burner are possible if they can show prevention of hazardous situations.

3.21
fault reaction time
time for a control function, within the fault tolerating time, to react on a fault and initiate a shut down

3.22
normal operation
use of the control or its associated equipment for the purpose for which it was made and in the manner intended by the manufacturer under the conditions as specified

3.23
defined state
state of a control with the following characterisation:

a) control passively assumes a state in which the output terminals ensure a safe situation under all circumstances. When the cause of the transition to defined state is lifted the application starts up only in accordance with the appropriate requirements or

b) control actively executes a protective action, within the time as specified for the specific control standard, causing it to shut down and/or lock-out or

c) control remains in operation, continuing to satisfy all safety related functional requirements.

3.24
complex electronics
denote assemblies which use electronic components with the following characteristics:

a) Component provides more than one functional output.

b) It is impractical or impossible to represent the failure mode of such a component by stuck-at and cross-links at the pins or by other failure modes which are described in Annex E.

3.25
reset
action which provides reset from lock-out to allow the system to attempt a restart

3.26
failure
termination of the ability of an item to perform a required function

[191-14-01 of IEC 60050-191:1990]

3.27
degradation
undesired departure in the operational performance of any device, equipment or system from its intended performance

[161-11-19 of IEC 60050-161:1990]

NOTE The term "degradation" can apply to temporary or permanent failure.

3.28
fault
state of an item characterised by its inability to perform a required function, excluding the inability during preventive maintenance or other planned actions, or due to lack of external resources

NOTE 1 „Failure“ is an event, as distinguished from „fault“, which is a state.

NOTE 2 After failure the item has a fault.

NOTE 3 This concept as defined does not apply to items consisting of software only.

NOTE 4 A fault is often the result of a failure of the item itself, but may exist without prior failure.

[IEC 60191-1]

3.29
harm
physical injury and/or damage to health or property

[ISO/IEC Guide 51:1999]

3.30
hazard
potential source of harm

[ISO/IEC Guide 51:1999]

3.31
risk
probable rate of occurrence of a hazard causing harm and the degree of severity of the harm

[ISO/IEC Guide 51:1999]

3.32
functional safety
safety related to the application which depends on the correct functioning of the safety-related control

3.33
program
sequence of control operations

NOTE It may consist of switching on, starting up, supervising and switching off, safety shut down or lock out.

3.34
breather hole
orifice which allows atmospheric pressure to be maintained within a compartment of variable volume

4 Classification

4.1 Classes of control

Where appropriate, controls are classified by application (e. g. sealing force, performance characteristics, number of operations during their working life). For classification of controls, see also the specific control standard.

4.2 Groups of control

Controls are grouped according to the bending stresses which they are required to withstand (see Table 4).

Group 1 controls

— Controls for use in an appliance or installation where they are not subjected to bending stresses imposed by installation pipework (e. g. by the use of rigid adjacent supports).

Group 2 controls

— Controls for use in any situation, either internal or external to the appliance, typically without support.

NOTE Controls which meet the requirements of a group 2 control also meet the requirements of a group 1 control.

4.3 Classes of control functions

For the evaluation of protective measures for fault tolerance and avoidance of hazards it is necessary to classify control functions with regard to their fault behaviour.

At the classification of control functions their integration into the complete safety concept of the appliance shall be taken into account.

For the purpose of evaluating the design of a control function, present requirements recognise three distinct classes:

Class A: Control functions which are not intended to be relied upon for the safety of the application,

NOTE Examples are: room thermostats, temperature control.

Class B: Control functions which are intended to prevent an unsafe state of the appliance. Failure of the control function will not lead directly to a hazardous situation,

NOTE Examples are: thermal limiter, pressure limiter.

Class C: Control functions which are intended to prevent special hazards such as explosion or whose failure could directly cause a hazard in the appliance.

NOTE Examples are: burner control systems, thermal cut-outs for closed water systems (without vent protection).

5 Units of measurement and test conditions

5.1 Dimensions

Dimensions are given in millimetres.

5.2 Pressures

Pressures are static pressures relative to atmospheric pressure and are given in Pa or kPa (millibars or bars)[1)].

5.3 Bending moments and torques

Bending moments and torques are given in Newton metres.

5.4 Test conditions and measurement tolerances

Tests are carried out with air at (20 ± 5) °C.

All measured values are corrected to the standard conditions:

15 °C, 101,325 kPa (1013,25 mbar) dry.

Controls which can be converted to another gas family by exchanging components are additionally tested with the conversion components.

Tests are carried out in the mounting position declared by the manufacturer. Where there are several mounting positions, tests are carried out in the least favourable position.

Where possible those tests already covered by other standards (e. g. EN 60730-series) shall be combined.

Further test conditions are:

— rated voltage or rated voltage range;

— rated frequency;

— ambient temperature at (20 ± 5) °C.

The error of measurement shall not exceed:

— for time measurements: ± 0,1 s;

— for temperature measurements: ± 1 K;

— for supply frequency measurements: ± 0,1 Hz;

— for electrical supply measurements: ± 0,5 %.

All measurements shall be made after stable temperature conditions have been achieved.

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1) 1 mbar = 100 N/m^2 = 100 Pa

6 Construction requirements

6.1 General

Controls shall be designed, manufactured, and assembled so that the various functions operate correctly when installed and used according to the manufacturer's instructions.

All pressurized parts of a control shall withstand the mechanical and thermal stresses to which it is subjected without any deformation affecting safety.

In general conformity with the requirements given in this standard is verified by the methods of test given in this standard or the specific control standard.

6.2 Mechanical parts of the control

6.2.1 Appearance

Controls shall be free from sharp edges and corners which could cause damage, injury or incorrect operation. All parts shall be clean internally and externally.

6.2.2 Holes

Holes for screws, pins, etc., used for the assembly of parts of the control or for mounting, shall not penetrate gas ways. The wall thickness between these holes and gas ways shall be at least 1 mm.

Holes necessary for manufacture which connect gas ways to atmosphere but which do not affect the operation of the control shall be permanently sealed by metallic means. Suitable jointing compounds may additionally be used.

6.2.3 Breather holes

Breather holes in controls with diaphragms, which are not provided with a connection for a vent pipe, shall be designed in such a way that when the diaphragm is damaged, air does not escape at a rate of more than 70 dm³/h at the maximum inlet pressure.

Conformity shall be verified by the method given in 6.2.4

For maximum inlet pressures below 3 kPa (30 mbar), this requirement is deemed to be met if the diameter of the breather hole does not exceed 0,7 mm.

If a leakage rate limiter is used, it shall be able to withstand three times the maximum inlet pressure. If a safety diaphragm is used as a leakage rate limiter, it shall not take the place of the working diaphragm if there is a fault.

Breather holes shall be protected against blockage or they shall be located such that they do not easily become blocked. They shall be positioned in such a way that the diaphragm cannot be damaged by a sharp device inserted through the breather hole.

6.2.4 Test for leakage of breather holes

Rupture the dynamic part of the working diaphragm. Ensure all closure members of the control, if any, are in the open position. Pressurize all gas-carrying compartments to the maximum inlet pressure and measure the leakage rate.