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Non-domestic gas-fired overhead luminous radiant heaters - Part 1: Safety

Hellstrahler mit einem Brenner ohne Gebläse für gewerbliche und industrielle Anwendung - Teil 1: Sicherheit

Appareils surélevés de chauffage à rayonnement lumineux au gaz, à usage non domestique - Partie 1: Sécurité

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Non-domestic gas-fired overhead luminous radiant heaters - Part 1: Safety

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Gasgeräte-Heizstrahler - Hellstrahler mit einem Brenner ohne Gebläse für gewerbliche und industrielle Anwendung - Teil 1: Sicherheit

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Foreword

This document (EN 419-1:2009) has been prepared by Technical Committee CEN/TC 180 “Domestic and non-domestic gas fired air heaters and non-domestic gas fired overhead radiant heaters”, 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of an identical text or by endorsement, at the latest by July 2009, and conflicting national standards shall be withdrawn at the latest by July 2009.

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 supersedes EN 419-1:1999.

In particular, it should be noted that this standard no longer includes requirements for Type B_1 appliances.

The test gases, test pressures and appliance categories given in this European Standard are in accordance with those specified in EN 437:2003.

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 Annex ZA which is an integral part of this document.

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, 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 the United Kingdom.

1 Scope

This European Standard specifies the requirements and test methods for the construction, safety, classification and marking of non-domestic gas-fired overhead luminous radiant heaters for environmental comfort, incorporating an atmospheric burner system referred to in the body of the text as "appliances".

This European Standard is applicable to Type A_1 appliances only (see 4.3).

This European Standard is not applicable to:

a) appliances designed for use in domestic dwellings;

b) outdoor appliances;

c) appliances of heat input in excess of 120 kW (based on the net calorific value of the appropriate reference gas);

d) appliances having fully pre-mixed gas and air burners in which:

1) either the gas and all the combustion air are brought together just before the level of the combustion zone; or

2) the pre-mixing of the gas and all combustion air is carried out in a part of the burner upstream of the combustion zone;

e) appliances in which the supply of combustion air and/or the removal of the products of combustion is achieved by integral mechanical means.

This standard is applicable to appliances which are intended to be type tested. Requirements for appliances which are not intended to be type tested would need to be subject to further consideration.

Requirements concerning the rational use of energy have not been included in this European Standard.

2 Normative references

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

EN 88-1:2007, *Pressure regulators and associated safety devices for gas appliances - Part 1: Pressure regulators for inlet pressures up to and including 500 mbar*

EN 125:1991, *Flame supervision devices for gas burning appliances – Thermo-electric flame supervision devices*

EN 126:2004, *Multifunctional controls for gas burning appliances*

EN 161:2007, *Automatic shut-off valves for gas burners and gas appliances*

EN 257:1992, *Mechanical thermostats for gas-burning appliances*

EN 298:2003, *Automatic gas burner control systems gas burners and gas burning appliances with or without fans*

EN 437:2003, *Test gases - Test pressures - Appliance categories*

EN 1057:2006, *Copper and copper alloys - Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 10226-1:2004, *Pipe threads where pressure-tight joints are made on the threads – Part 1: Taper external threads and parallel internal threads - Dimensions, tolerances and designation*

EN 10226-2:2005, *Pipe threads where pressure tight joints are made on the threads – Part 2: Taper external threads and taper internal threads. Dimensions, tolerances and designation*

EN 13410:2001, *Gas-fired overhead radiant heaters - Ventilation requirements for non-domestic premises*

EN 60335-1:2002, *Household and similar electrical appliances - Safety - Part 1: General requirements*

EN 60335-2-102:2006, *Household and similar electrical appliances - Safety - Part 2-102: Particular requirements for gas, oil and solid-fuel burning appliances having electrical connections*

EN 60529:1991, *Degrees of protection provided by enclosures (IP code)*

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)*

EN ISO 3166-1:2006, *Codes for the representation of names of countries and their subdivisions – Part 1: Country codes (ISO 3166-1:2006)*

EN ISO 6976:2005, *Natural gas - Calculation of the calorific value, density, relative density and Wobbe index from composition (ISO 6976:1995 including Corrigendum 1:1997, Corrigendum 2:1997 and Corrigendum 3:1999)*

ISO 7005-1:1992, *Metallic flanges - Part 1: Steel flanges*

ISO 7005-2:1988, *Metallic flanges - Part 2: Cast iron flanges*

ISO 7005-3:1988, *Metallic flanges - Part 3: Copper flanges and composite flanges*

CR 1404:1994, *Determination of emissions from appliances burning gaseous fuels during type testing*

3 Terms and definitions

For the purposes of this standard the following terms and definitions apply.

3.1 Appliance and its constituent parts

3.1.1
overhead luminous radiant heater
gas-fired appliance intended for installation at a height above head level, which is designed to heat the space beneath by radiation and in which the heat is produced by means of burning the fuel at or near the outer surface of a material such as a ceramic plaque or gauze, or by means of an atmospheric burner heating a gauze or similar material

3.1.2
atmospheric burner
aerated burner in which the air for combustion is entrained at atmospheric pressure

3.1.3
inlet connection
the part of the appliance intended to be connected to the gas supply

3.1.4
mechanical joint
means of ensuring the soundness of an assembly of several (generally metallic) parts without the use of liquids, pastes, tapes, etc.

NOTE For example the following:

a) metal to metal joints;

b) conical joints;

c) toroidal sealing rings (“O” rings);

d) flat joints.

3.1.5
gas circuit
part of the appliance that conveys or contains the gas between the appliance gas inlet connection and the burner(s)

3.1.6
restrictor
device with an orifice, which is placed in the gas circuit so as to create a pressure drop and thus reduce the gas pressure at the burner to a predetermined value for a given supply pressure and rate

3.1.7
gas rate adjuster
component allowing an authorized person to set the gas rate of the burner to a predetermined value according to the supply conditions

NOTE 1 Adjustment can be progressive (screw adjuster) or in discrete steps (by changing restrictors).

NOTE 2 The adjusting screw of an adjustable regulator is regarded as a gas rate adjuster.

NOTE 3 The action of adjusting this device is called “adjusting the gas rate”.

NOTE 4 A factory sealed gas rate adjuster is considered to be non-existent.

3.1.8
setting an adjuster
immobilizing a gas rate adjuster by such means as e.g. a screw, after the gas rate has been adjusted by the manufacturer or installer

3.1.9
sealing an adjuster
term applied to any arrangement in respect of the adjuster such that any attempt to change the adjustment breaks the sealing device or sealing material and makes this interference apparent

NOTE 1 A factory sealed adjuster is considered to be non-existent.

NOTE 2 A regulator is considered to be non-existent if it has been factory sealed in a position such that it is not operational in the range of supply pressures corresponding to the appliance category.

3.1.10
putting an adjuster or a control out of service
putting an adjuster or a control (of temperature, pressure, etc.) out of action and sealing it in this position.

NOTE The appliance functions as if the adjuster or control had been removed.

3.1.11
injector
component that admits the gas into a burner

3.1.12
main burner
burner that is intended to ensure the thermal function of the appliance and is generally called “the burner”

3.1.13
ignition burner
burner whose flame is intended to ignite another burner

3.1.14
ignition device
means (e.g. flame, electrical ignition device or other device) used to ignite the gas at the ignition burner or at the main burner

3.1.15
primary aeration adjuster
device enabling the primary air to be set at the necessary value according to the supply conditions

3.2 Adjusting, control and safety devices

3.2.1
automatic burner control system
system comprising at least a programming unit and all the elements of a flame detector device

The various functions of an automatic burner control system may be in one or more housings.

3.2.2
programming unit
device which reacts to signals from control and safety devices, gives 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 The programming unit follows a predetermined sequence of actions and always operates in conjunction with a flame detector

3.2.3
programme
sequence of control operations determined by the programming unit involving switching on, starting up, supervising and switching off the burner

3.2.4
flame detector
device by which the presence of a flame is detected and signalled

NOTE The flame detector 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, may be assembled in a single housing for use in conjunction with a programming unit.

3.2.5
flame signal
signal given by the flame detector, normally when the flame sensor senses a flame

3.2.6
flame supervision device
device that, in response to a signal from the flame detector, keeps the gas supply open and shuts it off in the absence of the supervised flame

3.2.7
flame simulation
condition which occurs when the flame signal indicates the presence of a flame when in reality no flame is present

3.2.8
pressure regulator [1)]
device which maintains the outlet pressure constant independent of the variations in inlet pressure within defined limits

3.2.9
adjustable pressure regulator
regulator provided with means for changing the outlet pressure setting

3.2.10
volume regulator[1)]
device which maintains the gas rate constant within a given tolerance, independent of the upstream pressure

3.2.11
range-rating device
component on the appliance intended to be used by the installer to adjust the heat input of the appliance within a range of heat inputs stated by the manufacturer, to suit the actual heat requirements of the installation

This adjustment may be progressive (e.g. by use of a screw adjuster) or in discrete steps (e.g. by changing restrictors).

3.2.12
automatic shut-off valve
valve designed to open when energized and to close automatically when de-energized

3.3 Operation of the appliance

3.3.1
heat input
Q
quantity of energy used in unit time corresponding to the volumetric and mass flow rates, the calorific value to be used being the net or gross calorific value

NOTE The heat input is expressed in kilowatts (kW) [EN 437:2003].

3.3.2
nominal heat input
Q_n
value of the heat input (kW) declared by the manufacturer

[1)] The term “regulator” is used in both cases.

3.3.3
volume flow rate
V
volume of gas consumed by the appliance in unit time during continuous operation

NOTE The volume flow rate is expressed in m^3/h, l/min, dm^3/h or dm^3/s [EN 437:2003].

3.3.4
mass flow rate
M
mass of gas consumed by the appliance in unit time during continuous operation

NOTE The mass flow rate is expressed in kg/h or g/h [EN 437:2003].

3.3.5
start gas
gas that is supplied at the start gas rate either at the main burner or at a separate ignition burner

3.3.6
start gas rate
restricted gas flow rate admitted either to a separate ignition burner or to the main burner during start up

3.3.7
start gas flame
flame established at the start gas rate either at the main burner or at a separate ignition burner

3.3.8
flame stability
characteristic of flames which remain on the burner ports or in the flame reception zone intended by the construction

3.3.9
flame lift
total or partial lifting of the base of the flame away from the burner port or the flame reception zone provided by the design

Flame lift may cause the flame to blow out, i.e. extinction of the air-gas mixture.

3.3.10
light-back
entry of a flame into the body of the burner

3.3.11
light-back at the injector
ignition of the gas at the injector, either as a result of light-back into the burner or by the propagation of the flame outside the burner

3.3.12
sooting
phenomenon appearing during incomplete combustion and characterized by deposits of soot on the surfaces or parts in contact with the combustion products or with the flame

3.3.13
first safety time [2)]
interval between the ignition burner valve, start gas valve or main gas valve, as applicable, being energized and the ignition burner valve, start gas valve or main gas valve, as applicable, being de-energized if the flame detector signals the absence of a flame at the end of this interval

3.3.14
second safety time
where there is a first safety time applicable to either an ignition burner or to a start gas flame only, the second safety time is the interval between the main gas valve being energized and the main gas valve being de-energized if the flame detector signals the absence of a flame at the end of this interval

3.3.15
running condition of the system
condition in which the burner is in normal operation under the supervision of the programming unit and its flame detector

3.3.16
controlled shut-down
process by which the power to the automatic shut-off valve(s) is removed immediately as a result of the action of a controlling function

3.3.17
safety shut-down
process which is effected immediately following the response of a safety control or sensor or the detection of a fault in the burner control system and which puts the burner out of operation by immediately removing the power from the automatic shut-off valve(s) and the ignition device

3.3.18
non-volatile lock-out
safety shut-down condition of the system such that a restart can only be accomplished by a manual reset of the system and by no other means

3.3.19
volatile lock-out
safety shut-down condition of the system such that a restart can only be accomplished by either the manual reset of the system, or an interruption of the mains electrical supply and its subsequent restoration

3.3.20
spark restoration
process by which, following loss of the flame signal, the ignition device will be switched on again without total interruption of the gas supply

NOTE This process ends with the restoration of the running condition or, if there is no flame signal at the end of the safety time, with volatile or non-volatile lock-out.

3.3.21
automatic recycling
process by which, after loss of flame during the running condition or accidental interruption of the operation of the appliance, the gas supply is interrupted and the complete start sequence is automatically re-initiated

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[2)] Where there is no second safety time, this is called the safety time.

NOTE This process ends with the restoration of the running condition or, if there is no flame signal at the end of the safety time, or if the cause of the accidental interruption has not disappeared, with volatile or non-volatile lock-out.

3.3.22
ignition opening time
time interval between ignition of the supervised flame and the moment when the valve is held open

3.3.23
extinction safety time
time which elapses between the moment when the supervised flame is extinguished and the moment when:

a) for an appliance without an automatic burner control system, the gas supply is shut-off:

1) to the main burner;

2) and/or to the ignition burner;

b) or for an appliance with an automatic burner control system, the control system initiates shut-down of the burner by removing power to the automatic gas shut-off valves

3.4 Gases

3.4.1
calorific value

quantity of heat produced by the complete combustion, at a constant pressure equal to 1 013,25 mbar, of unit volume or mass of gas, the constituents of the combustible mixture being taken at reference conditions and the products of combustion being brought back to the same conditions

A distinction is made between:

a) the gross calorific value H_s in which the water produced by combustion is assumed to be condensed;

b) the net calorific value H_i in which the water produced by combustion is assumed to be in the vapour state

NOTE The calorific value is expressed either in MJ/m^3 of dry gas at the reference conditions or in MJ/kg of dry gas [EN 437:2003].

3.4.2
relative density
d
ratio of the masses of equal volumes of dry gas and dry air measured under the same conditions of temperature and pressure

3.4.3
Wobbe index
gross Wobbe index: W_s and net Wobbe index: W_i.
ratio of the calorific value of a gas per unit volume and the square root of its relative density under the same reference conditions. The Wobbe index is said to be gross or net according to whether the calorific value used is the gross or net calorific value

NOTE The Wobbe index is expressed in MJ/m^3 of dry gas at the reference conditions or in MJ/kg of dry gas [EN437:2003].

3.4.4
test pressures
gas pressures used to verify the operational characteristics of appliances using combustible gases; they consist of normal and limit pressures

NOTE Test pressures are expressed in mbar; 1 mbar = 10^2 Pa [EN 437:2003].

3.4.5
normal pressure
***p*n**
pressure under which the appliances operate in nominal conditions when they are supplied with the corresponding reference gas

[EN 437:2003]

3.4.6
limit pressures
(maximum limit pressure p_{max} and minimum limit pressure p_{min})
pressures representative of the extreme variations in the appliance supply conditions

[EN 437:2003]

3.4.7
pressure couple
combination of two distinct gas distribution pressures applied by reason of the significant difference existing between the Wobbe indices within a single family or group in which:

a) the higher pressure corresponds only to gases of low Wobbe index;

b) the lower pressure corresponds to gases of high Wobbe index

[EN 437:2003]

3.5 Conditions of operation and measurement

3.5.1
reference conditions
in this standard the following reference conditions apply:

a) for calorific values, temperature 15 °C

b) for gas and air volumes, dry, brought to 15 °C and to an absolute pressure of 1 013,25 mbar

3.5.2
cold condition
condition of the appliance required for some tests and obtained by allowing the unlit appliance to attain thermal equilibrium at room temperature

3.5.3
hot condition
condition of the appliance required for some tests and obtained by heating to thermal equilibrium at the nominal heat input, any thermostat remaining fully open

3.5.4
thermal equilibrium
operating state of the appliance, corresponding to a particular setting of the input in which the flue gas temperature does not change by more than ± 2 % (in °C) over a period of 10 min