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Single burner gas-fired overhead radiant-tube heaters - Part 1: Safety

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

Tubes radiants suspendus a monobruleur a usage non domestique utilisant les combustibles gazeux - Partie 1: Sécurité

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Single burner gas-fired overhead radiant-tube heaters - Part 1: Safety

Tubes radiants suspendus à monobûleur à usage non
domestique utilisant les combustibles gazeux - Partie 1:
Sécurité

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

This European Standard was approved by CEN on 9 May 1999.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Central Secretariat: rue de Stassart, 36 B-1050 Brussels

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Foreword

This European Standard has been prepared by Technical Committee CEN/TC 180 "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of an identical text or by endorsement, at the latest by December 1999, and conflicting national standards shall be withdrawn at the latest by December 1999.

This European Standard 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 relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this standard.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Test methods for rational use of energy are dealt with in European pre-standards ENV 1259-1, ENV 1259-2 and ENV 1259-3.

The test gases, test pressures and appliances categories given in this European Standard are in accordance with those specified in EN 437:1993 "Test gases — Test pressures — Appliance categories".

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1 Scope

This European Standard specifies the requirements and test methods for the construction, safety, classification and marking of non-domestic gas fired overhead radiant tube heaters incorporating a single burner system under the control of an automatic burner control system, referred to in the body of the text as 'appliances'.

This standard is applicable to Type A₂, A₃, B₁₂, B₁₃, B₂₂ and B₂₃ appliances intended for use in other than domestic dwellings, in which the supply of combustion air and/or the evacuation of the products of combustion is achieved by mechanical means located upstream of the draught diverter, if provided.

This standard is not applicable to:

- appliances designed for use in domestic dwelling;
- outdoor appliances;
- appliances of heat input in excess of 120 kW (based on the net calorific value of the appropriate reference test gas);
- appliances having fully pre-mixed gas and air burners in which:
 - either the gas and all the combustion air are brought together just before the level of the combustion zone;
 - or the pre-mixing of the gas and all combustion air is carried out in a part of the burner upstream of the combustion zone.

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

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 88:1991	<i>Pressure governors for gas appliances for inlet pressures up to 200 mbar</i>
EN 126:1995	<i>Multifunctional controls for gas burning appliances</i>
EN 161:1991	<i>Automatic shut-off valves for gas burners and gas appliances</i>
EN 257:1992	<i>Mechanical thermostats for gas-burning appliances</i>

EN 298:1993	<i>Automatic gas burner control systems for gas burners and gas burning appliances with or without fans</i>
EN 437:1993	<i>Test gases - Test pressures - Appliance categories</i>
EN 23166:1993	<i>Codes for the representation of names of countries (ISO 3166:1993)</i>
EN 60335-1:1988	<i>Safety of household and similar electrical appliances — Part 1: General requirements</i>
EN 60529:1991	<i>Degrees of protection provided by enclosures (IP Code)</i>
EN 60584-1:1995	<i>Thermocouples — Part 1: Reference tables</i>
EN 60584-2:1993	<i>Thermocouples — Part 2: Tolerances</i>
EN 60730-1:1995	<i>Automatic electrical controls for household and similar general purposes — Part 1: General requirements</i>
EN 61058-1:1992	<i>Switches for appliances — Part 1: General requirements</i>
ISO 7-1:1994	<i>Pipe threads where pressure-tight joints are made on the threads — Part 1: Designation, dimensions and tolerances</i>
ISO 228-1:1994	<i>Pipe threads where pressure-tight joints are not made on the threads — Part 1: Designation, dimensions and tolerances</i>
ISO 274:1975	<i>Copper tubes of circular section — Dimensions</i>
ISO 6976:1995	<i>Natural gas — Calculation of the calorific values, density, relative density and Wobbe index from composition</i>
ISO 7005-2:1988	<i>Metallic flanges — Part 2: Cast iron flanges</i>
ISO 7005-3:1988	<i>Metallic flanges — Part 3: Copper flanges and composite flanges</i>
prEN 50165:1995	<i>Electrical equipment of non-electrical heating appliances for household and similar purposes. Safety requirements</i>
IEC 479	<i>Effects of current on human beings and livestock</i>
IEC 479-1:1994	<i>Part 1: General aspects.</i>
IEC 479-2:1987	<i>Part 2: Special aspects</i>

3 Definitions

For the purposes of this standard the following definitions apply:

3.1 Appliance and its constituent parts

3.1.1

overhead radiant tube heater

a gas fired appliance intended for installation above head level which is designed to heat the space beneath by radiation by means of a tube or tubes, heated by the internal passage of combustion products

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3.1.2

single burner systems

those radiant tube heaters which employ a single combustion system incorporating independent flame monitoring and combustion air fan

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3.1.3

inlet connection

the part of the appliance intended to be connected to the gas supply

3.1.4

mechanical joint

a 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:

- metal to metal joints;
- conical joints;
- toroidal sealing rings ('O' rings);
- flat joints.

3.1.5

gas circuit

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

3.1.6

restrictor

a 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

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

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

The adjusting screw of an adjustable governor is regarded as a gas rate adjuster.

The action of adjusting this device is called 'adjusting the gas rate'.

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

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3.1.8

setting an adjuster

immobilizing a gas rate adjuster by such means as a screw, etc., after the gas rate has been adjusted by the manufacturer or installer

3.1.9

sealing an adjuster

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

A governor 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 pressure corresponding to the appliance category.

3.1.10

putting an adjuster or a control out of service

an adjuster or a control (of temperature, pressure, etc.) is said to be 'put out of service' if it is put out of action and sealed in this position. The appliance then functions as if this device has been removed

3.1.11

injector

a component that admits the gas into a burner

3.1.12

main burner

a burner that is intended to ensure the thermal function of the appliance and is generally called the burner

3.1.13

ignition burner

a burner whose flame is intended to ignite another burner

3.1.14

ignition device

a means (flame, electrical ignition device or other device) used to ignite the gas at the ignition burner or at the main burner

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3.1.15

primary aeration adjuster

a device enabling the primary air to be set at the necessary value according to the supply conditions

3.2 Combustion products circuit

3.2.1

combustion chamber

an enclosure inside which combustion of the air-gas mixture takes place

3.2.2

flue outlet

the part of a type B appliance that connects with a flue to evacuate the products of combustion

3.2.3

draught diverter

a device placed in the combustion products circuit to reduce the influence of flue-pull and that of down-draught on the burner performance and combustion

3.3 Adjusting, control and safety devices

3.3.1

automatic burner control system

a 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.

3.3.2

programming unit

a 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; the programming unit follows a predetermined sequence of actions and always operates in conjunction with a flame detector device.

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3.3.3

programme

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

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Control operations determined by the programming unit

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3.3.4

flame detector

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

It 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.

3.3.5

flame signal

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

3.3.6

flame supervision device

a 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

3.3.7

flame simulation

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

3.3.8

pressure governor¹⁾

a device which maintains the outlet pressure constant independent of the variations in inlet pressure within defined limits

3.3.9

adjustable pressure governor

A governor provided with means for changing the outlet pressure setting

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3.3.10

volume governor¹⁾

a device which maintains the gas rate constant within a given tolerance, independent of the upstream pressure

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¹ The term 'governor' is used in both cases.

3.3.11

range-rating device

a 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).

3.3.12

automatic shut-off valve

a valve designed to open when energized and to close automatically when de-energized

3.4 Operation of the appliance

3.4.1

heat input

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

Symbol: Q

Unit: Kilowatt (kW).

[EN 437: 1993]

3.4.2

nominal heat input

the value of the heat input declared by the manufacturer

Symbol: Q_n

Unit: Kilowatt (kW).

[EN 437: 1993]

3.4.3

volumetric flow rate

the volume of gas consumed by the appliance in unit time during continuous operation

Symbol: V

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Unit: Cubic metre per hour (m^3/h)

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[EN 437: 1993]

3.4.4

mass flow rate

the mass of gas consumed by the appliance in unit time during continuous operation

Symbol: *M*

Unit: Kilogram per hour (kg/h), or gram per hour (g/h).

[EN 437: 1993]

3.4.5

start gas

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

3.4.6

start gas rate

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

3.4.7

start gas flame

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

3.4.8

flame stability

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

3.4.9

flame lift

the 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.

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3.4.10

light-back

the entry of a flame into the body of the burner

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3.4.11

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 a flame outside the burner

3.4.12

sooting

a 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

3.4.13

yellow tipping

the yellowing of the tip of the blue cone of an aerated flame

3.4.14

purge

the 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

- **pre-purge:** The purge which takes place between the start signal and energising of the ignition device;
- **post-purge:** The purge which takes place immediately following shut-down.

3.4.15

first safety time ²⁾

the interval between the ignition burner valve, start gas valve or main gas valve, as applicable, being energised 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

3.4.16

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

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3.4.17

running condition of the system

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

3.4.18

controlled shut-down

the process by which the power to the gas shut-off valve(s) is removed immediately, e.g. as a result of the action of a controlling function

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