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Single burner gas-fired overhead radiant tube heaters for non-domestic use - Part 1:
Safety

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

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

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Single burner gas-fired overhead radiant tube heaters for non-domestic use - Part 1: Safety

Tubes radiants suspendus à monob brûleur 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 10 January 2009.

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Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Page

Foreword.....	6
1 Scope.....	7
2 Normative references	8
3 Definitions.....	9
3.1 Appliance and its constituent parts	9
3.2 Combustion circuit	10
3.3 Adjusting, control and safety devices	11
3.4 Operation of the appliance.....	12
3.5 Gases.....	15
3.6 Conditions of operation and measurement.....	16
3.7 Country of destination.....	17
4 Appliance classification	17
4.1 Classification according to the nature of the gases used (categories)	17
4.2 Classification according to the gases capable of being used	18
4.2.1 Category I.....	18
4.2.2 Category II.....	19
4.2.3 Category III.....	19
4.3 Classification according to the mode of evacuation of the combustion products.....	20
4.3.1 General.....	20
4.3.2 Type A	20
4.3.3 Type B	20
4.3.4 Type C	21
5 Constructional requirements.....	21
5.1 General.....	21
5.1.1 Conversion to different gases	21
5.1.2 Materials and method of construction.....	22
5.1.3 Accessibility for maintenance and use.....	23
5.1.4 Means of sealing	23
5.1.5 Supply of combustion air and evacuation of combustion products	24
5.1.6 Inlet connections.....	26
5.1.7 Confirmation of operation	26
5.1.8 Electrical equipment.....	27
5.1.9 Operational safety in the event of fluctuation, interruption and restoration of the auxiliary energy.....	27
5.1.10 Motors and fans	27
5.2 Requirements for adjusting, control and safety devices.....	27
5.2.1 General.....	27
5.2.2 Gas rate adjusters.....	28
5.2.3 Range-rating devices.....	28
5.2.4 Aeration adjusters.....	28
5.2.5 Controls and safety devices	28
5.2.6 Regulators	29
5.2.7 Multifunctional controls	29
5.2.8 Automatic shut-off valves	29
5.2.9 Gas strainers	30
5.2.10 Thermostats.....	30
5.2.11 Air proving device.....	30
5.2.12 Automatic burner control system	31
5.3 Ignition devices	32

5.3.1	General.....	32
5.3.2	Ignition device for the main burner.....	32
5.3.3	Ignition burners.....	33
5.4	Main burner.....	33
5.5	Pressure test points.....	33
5.6	Injectors	33
6	Operational requirements	33
6.1	Soundness	33
6.1.1	Soundness of the gas circuit.....	33
6.1.2	Soundness of the combustion circuit and correct evacuation of the combustion products.....	33
6.2	Heat inputs.....	34
6.2.1	Nominal heat input.....	34
6.2.2	Start gas heat input.....	34
6.2.3	Effectiveness of the range-rating device.....	34
6.3	Limiting temperatures	34
6.3.1	Wall and ceiling temperatures	34
6.3.2	Component temperatures	35
6.3.3	Fan motor temperatures.....	35
6.3.4	POCED (Type B ₄ , B ₅ , C ₁ and C ₃ appliances)	35
6.4	Ignition, cross-lighting and flame stability.....	35
6.4.1	All appliances (still air conditions).....	35
6.4.2	Supplementary tests for Type B ₁₂ , B ₁₃ , B ₄₂ and B ₄₃ appliances	35
6.4.3	Supplementary tests for Type C ₁ and C ₃ appliances	36
6.5	Pressure regulator	36
6.6	Combustion	36
6.6.1	All appliances (still air conditions).....	36
6.6.2	Supplementary tests under special conditions	36
6.7	Prolonged performance.....	37
6.8	Measurement of oxides of Nitrogen (NO _x).....	37
7	Test methods.....	38
7.1	General.....	38
7.1.1	Characteristics of test gases (Reference and limit gases).....	38
7.1.2	Conditions for preparation of the test gases	38
7.1.3	Practical application of test gases	41
7.1.4	Test pressures.....	42
7.1.5	Test procedures	43
7.1.6	General test conditions	44
7.2	Construction and design.....	45
7.2.1	Manually operated devices (automatic burner control systems)	45
7.2.2	Pre-purging	45
7.2.3	Safety time	45
7.2.4	Extinction time	45
7.3	Safety of operation.....	46
7.3.1	Soundness	46
7.3.2	Heat inputs.....	47
7.3.3	Limiting temperatures	50
7.3.4	Ignition, cross-lighting and flame stability.....	54
7.3.5	Pressure regulator	60
7.3.6	Combustion	60
7.3.7	Prolonged performance.....	64
7.4	Other pollutants	64
7.4.1	General.....	64
7.4.2	Weighting.....	65
8	Marking and instructions	68
8.1	Marking of the appliance and the packaging	68
8.1.1	Data plate	68
8.1.2	Other marking.....	69

EN 416-1:2009 (E)

8.1.3	Marking of the packaging containing the burner	69
8.1.4	Utilization of symbols on the appliance and packaging	69
8.2	Instructions	71
8.2.1	General	71
8.2.2	Technical instructions	72
8.2.3	Instructions for use and maintenance	74
8.3	Presentation	74
9	Evaluation of conformity of POCEs and their associated terminals	75
9.1	General	75
9.2	Type testing	75
9.2.1	Initial type testing	75
9.2.2	Further type testing	75
9.2.3	Sampling for type testing	75
9.3	Factory Production Control (FPC)	75
9.3.1	General	75
9.3.2	Equipment	77
9.3.3	Raw materials and components	77
9.3.4	Product testing and evaluation	77
9.3.5	Non-conforming products	77
Annex A	(informative) National situations	78
A.1	General	78
A.2	Categories listed in the body of the standard and marketed in different countries	78
A.3	Appliance supply pressures corresponding to the categories given in A.2	80
A.4	Special categories marketed nationally or locally	82
A.4.1	General	82
A.4.2	Definition of special categories	83
A.4.3	Gas rate adjusters, aeration adjusters and regulators	86
A.4.4	Conversion to different gases	86
A.5	Test gases corresponding to the special categories given in A.4	86
A.6	Gas connections in the various countries	87
A.7	Flue connections in the various countries	89
Annex B	(normative) Appliance (flue) types	90
B.1	Type B appliances with a fan in the combustion circuit	90
B.2	Type C appliances with a fan in the combustion circuit	94
Annex C	(informative) Equivalence rules	96
C.1	Conversion to categories within a restricted Wobbe Index range	96
C.2	Conversion to categories within an identical Wobbe Index range	96
C.3	Conversion to categories within a wider Wobbe Index range	97
Annex D	(informative) Calculation of flue gas mass flow rate	98
D.1	Flue gas mass flow rate	98
D.2	Quantity of air in the flue gas	98
D.3	Flue gas excess air ratio (λ)	99
D.4	Quantity of water vapour in the flue gas	99
D.5	Quantity of Nitrogen in the flue gas	99
D.6	Quantity of Oxygen in the flue gas	100
D.7	Dry quantity of flue gas	100
D.8	Quantity of carbon dioxide in the flue gas	100
Annex E	(informative) Identification of gas types in use in various countries	102
Annex F	(normative) Special national conditions	103
F.1	General	103
F.1.1	Belgium	103
F.1.2	Italy	103
Annex G	(informative) Calculation example of the weighting factors for an appliance with several rates	104
G.1	Appliance rates	104

G.2	Weighting of $Q_{pi, \%} = 20$	104
G.3	Weighting of $Q_{pi, \%} = 40$	104
G.4	Weighting of $Q_{pi, \%} = 60$	104
G.5	Weighting of $Q_{pi, \%} = 70$	105
G.6	Total weighting	105
Annex H (informative) NO_x conversion calculation		106
H.1	NO_x emission conversion factors	106
H.2	NO_x conversion calculation	107
Annex I (informative) National situations for countries whose national bodies are CEN Associate Members		109
Annex J (informative) An example of sampling plans		110
J.1	Sampling plans	110
J.1.1	Acceptable Quality Level (AQL)	110
J.1.2	The inspection level	110
J.1.3	Normal, tightened or reduced inspection	110
J.1.4	Single, double, multiple or sequential sampling	110
J.1.5	Batch quality	110
J.2	Inspection levels and procedures	111
J.2.1	Incoming material	111
J.2.2	In-process aspects	111
J.2.3	Finished goods checks	111
Annex K (informative)		112
K.1	General conditions of test	112
K.1.1	Principle of method	112
K.1.2	Test room	112
K.1.3	Preparation of appliance	112
K.2	Test conditions	112
K.3	Test procedure	113
K.4	Accuracy of measurement	117
K.5	Calculation of Flue Loss	117
Annex ZA (informative) Relationship between this European Standard and the Essential Requirements of EU Directive 90/396/EEC – The approximation of the laws of Member States concerning gas appliances		120
Annex ZB (informative) Clauses of this European Standard addressing the provisions of the EU Construction Products Directive		122
ZB.1	Scope and relevant characteristics	122
ZB.2	Procedure(s) for attestation of conformity of [construction products]	124
ZB.2.1	System(s) of attestation of conformity	124
ZB.2.2	EC Certificate and Declaration of conformity	125
ZB.3	CE marking and labelling	126
Bibliography		128

EN 416-1:2009 (E)**Foreword**

This document (EN 416-1:2009) 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 AFNOR.

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 September 2009, and conflicting national standards shall be withdrawn at the latest by September 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 416-1:1999.

This revision modifies EN 416-1:1999. It has been prepared to incorporate requirements for combustion products evacuation ducts, POCEDs, supplied as an integral part of the appliance to support EU Directive 89/106/EEC on construction products under Mandate M/105. To this end, it extends the scope of the standard to cover Type B₄ and B₅ appliances.

Furthermore, the opportunity presented by this amendment has been taken to update the standard in respect to 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 Annexes ZA and ZB, which are integral parts 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 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, B₂₃, B₄₂, B₄₃, B₅₂, B₅₃, C₁₂, C₁₃, C₃₂ and C₃₃ 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:

- a) appliances designed for use in domestic dwelling;
- b) outdoor appliances;
- c) appliances of heat input in excess of 120 kW (based on the net calorific value of the appropriate reference test 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 that are designed for continuous condensation within the flue system under normal operating conditions;
- f) appliances having combustion products evacuation ducts that are non-metallic.

This standard is applicable to appliances which are intended to be type tested. It also includes requirements concerning the evaluation of conformity, including factory production control, but these requirements only apply to POCEs and their associated terminals.

NOTE 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.

EN 416-1:2009 (E)**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 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 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 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, *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*

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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 60529:1992, *Degrees of protection provided by enclosures (IP Code)*

EN 60584-1:1995, *Thermocouples — Part 1: Reference tables*

EN 60584-2:1993, *Thermocouples — Part 2: Tolerances*

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 calorific values, density, relative density and Wobbe index from composition (ISO 6976:1995 including Corrigendum 1:1997, Corrigendum 2:1997 and Corrigendum 3:1999)*

ISO 274:1975, *Copper tubes of circular section — Dimensions*

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 alloy and composite flanges*

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

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

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

3.1.2

single burner systems

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

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 parts (e.g. metal to metal joints, conical joints, toroidal sealing rings ('O' rings), flat joints without the use of liquids (e.g. pastes and tapes)

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 authorised 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

EN 416-1:2009 (E)**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 pressure 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. The appliance then 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**premixed burner**

burner in which the gas and a quantity of air, at least equal to that theoretically necessary for complete combustion, are mixed before the flame port(s)

3.1.14**ignition burner**

burner whose flame is intended to ignite another burner

3.1.15**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

3.1.16**primary aeration adjuster**

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

3.2 Combustion circuit**3.2.1****combustion products circuit**

circuit including the combustion chamber, the radiant tube, the combustion products evacuation duct and either the fitting piece or the connection to the terminal, if any

3.2.2**air supply and combustion products evacuation ducts**

means for transporting combustion air to the burner and combustion products to the terminal or fitting piece

NOTE A fitting piece is not utilised by appliances of Type C₁ or of Type C₃. It is necessary to distinguish between:

- a) completely surrounded ducts where the combustion products evacuation duct is surrounded by combustion air throughout its length; and

- b) separate ducts where the combustion products evacuation duct and the combustion air supply duct are neither concentric nor completely surrounded ducts

3.2.3

combustion chamber

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

3.2.4

flue outlet

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

3.2.5

draught diverter

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

3.2.6

terminal

device(s) fitted to the outside of the building, which are connected to the air supply and combustion products evacuation ducts for Type C₁ and Type C₃ appliances (one or two devices)

3.2.7

terminal guard

device that protects the terminal from mechanical damage from outside influences

3.2.8

POCED

combustion products evacuation duct that is intended to be used only with a specific appliance/system; this duct being either supplied with the appliance/system or specified in the manufacturer's instructions

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3.3 Adjusting, control and safety devices

3.3.1

automatic burner control system

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

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

3.3.2

air proving device

device intended to cause safety shutdown in the event of abnormal conditions of air admission or of combustion products evacuation

3.3.3

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

3.3.4

programme

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

3.3.5

flame detector

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

EN 416-1:2009 (E)

It can consist of a flame sensor, an amplifier and a relay for signal transmission. These parts, with the possible exception of the flame sensor, may be assembled in a single housing for use in conjunction with a programming unit.

3.3.6**flame signal**

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

3.3.7**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

3.3.8**flame simulation**

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

3.3.9**pressure regulator**¹⁾

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

3.3.10**adjustable pressure regulator**

regulator provided with means for changing the outlet pressure setting

3.3.11**volume regulator**¹⁾

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

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3.3.12**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).

3.3.13**automatic shut-off valve**

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

3.4 Operation of the appliance**3.4.1****heat input****Q**

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

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

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

3.4.2**nominal heat input** Q_n

value of the heat input (kW) declared by the manufacturer

3.4.3**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 cubic metres per hour (m³/h), litres per minute (l/min), cubic decimetres per hour (dm³/h) or cubic decimetres per second (dm³/s) [EN 437:2003].

3.4.4**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 kilograms per hour (kg/h) or grams per hour (g/h) [EN 437:2003].

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**

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**

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

3.4.8**flame stability**

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

3.4.9**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).

3.4.10**light-back**

entry of a flame into the body of the burner

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**

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