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Non-domestic gas-fired overhead luminous radiant heaters - Part 2: Rational use of energy

Gasgeräte-Heizstrahler - Hellstrahler mit Brenner ohne Gebläse für gewerbliche und industrielle Anwendung - Teil 2: Rationelle Energienutzung

Appareils surélevés de chauffage a rayonnement lumineux au gaz, a usage non domestique - Partie 2 : Utilisation rationnelle de l'énergie

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English Version

Non-domestic gas-fired overhead luminous radiant heaters - Part 2: Rational use of energy

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This European Standard was approved by CEN on 16 March 2006.

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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.

CEN members are the national standards bodies of Austria, Belgium, 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.

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COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This European Standard (EN 419-2:2006) 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of an identical text or by endorsement, at the latest by December 2006, and conflicting national standards shall be withdrawn at the latest by December 2006.

This European Standard supersedes ENV 1259-1:1994, ENV 1259-2:1996 and ENV 1259-3:1996

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 European Standard.

This part of EN 419 complements EN 419-1: “Non-domestic gas-fired overhead luminous radiant heaters - Part 1: Safety”.

It is intended that this standard would be reviewed 3 years after publication.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, 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 the requirements and test methods for the rational use of energy 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) 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.

2 Normative references

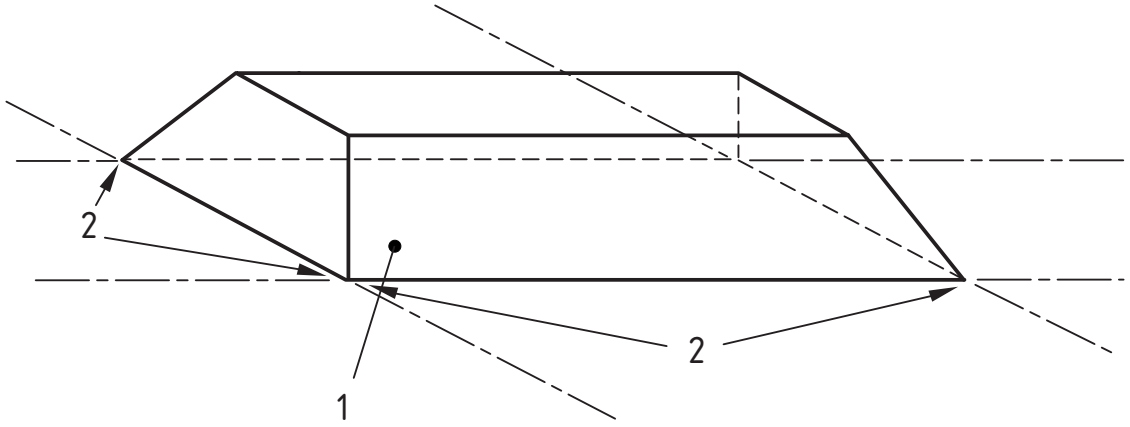
The following referenced documents are indispensable for the application of this European Standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 419-1: 1999, *Non-domestic gas-fired overhead luminous radiant heaters — Part 1: Safety*

3 Terms and definitions

For the purposes of this European Standard, the terms and definitions given in Clause 3 of EN 419-1: 1999 apply together with the following.

3.1
radiation reference plane
flat horizontal surface bound by the lower edge of the reflector or, in the case where radiant parts project below this lower edge of the reflector, the flat horizontal surface touching the lowest radiant part (see Figure 1)



Key

1 Reflector
2 Reference plane

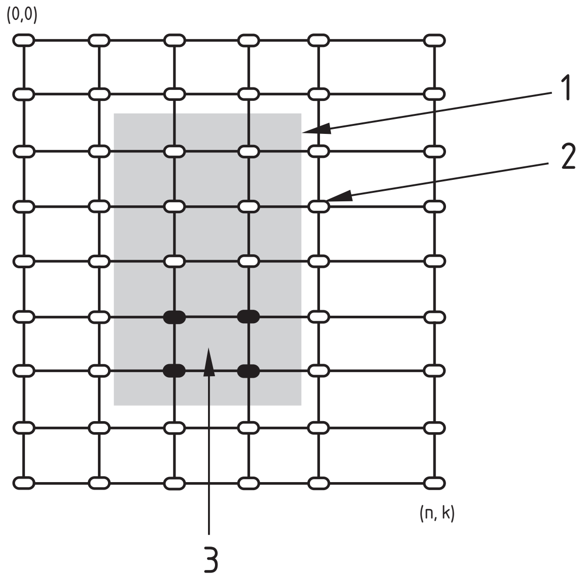
Figure 1 — Radiation reference plane

3.2
irradiance (*E*)
radiant power per unit area (W/m^2) incident upon a surface

3.3
radiant factor (R_f)
heat emitted by the appliance through the radiation reference plane divided by the net heat input of the test gas

3.4
measuring plane (Test method B only)
plane parallel to the radiation reference plane and 100 mm ± 3 mm below it

3.5
measuring grid (Test method B only)
regular arrangement in the measuring plane of straight lines running parallel and perpendicular to the longitudinal axis of the appliance with sufficient precision (± 1 mm). The nodal points of the measuring grid are located at the points of intersection of these lines (see Figure 2) such that the distance between all adjacent nodes points on these lines is 100 mm ± 2 mm



Key

1 Heater

2 Nodal point

3 Measuring cell F_{ij}

Figure 2 — Measuring grid (Test method B)

4 Classification of appliances

4.1 Classification according to the nature of the gases used

The requirements of 4.1 of EN 419-1:1999 apply.

4.2 Classification according to the gases capable of being used

The requirements of 4.2 of EN 419-1:1999 apply.

4.3 Classification according to the mode of evacuation of the combustion products

The requirements of 4.3 of EN 419-1:1999 apply.

5 Symbols

The symbols shown in Table 1 are used in this standard.

Table 1 — Symbols

Symbol	Title	Unit
α_{CO_2}	Coefficient in equation for k_{co2}	kPa^{-1} m^{-1}
α_{H_2O}	Coefficient in equation for k_{mo}	kPo m^{-1}
a	Reflector length	mm
A_{CO_2}	Absorption factor of carbon dioxide	—
A_{H_2O}	Absorption factor of water vapour	—

Symbol	Title	Unit
A_{TOT}	Radiant correction factor for water vapour and CO_2 in air (see Annex E)	—
b	Reflector width	mm
c	Distance between two nodal points parallel with the longitudinal axis	mm
$C\alpha\beta$	Surface area correction factor	—
D	Average thickness of radiating gas layer (from measurement point to radiation reference plane)	m
ε_{CO_2}	Emission factor of carbon dioxide	—
ε_{H_2O}	Emission factor of water vapour	—
E	Actual irradiance from overhead radiant heater	W/m^2
E_a	Actual irradiance output by appliance in air	W/m^2
E_{ij}	Irradiance of the appliance measured at the nodal points of the measurement	W/m^2
$\overline{E_{if}}$	Average irradiance over the measurement grid F_{ij}	W/m^2
F_w	Window correction factor	—
H_i	Net calorific value of the test gas (at 15 °C, 1013,25 mbar, dry gas)	Wh/m^3
k_{CO_2}	Coefficient in equation for emission factor of carbon dioxide	$kPa^{-1}\ m^{-1}$
k_{H_2O}	Coefficient in equation for emission factor of water vapour	$kPa^{-1}\ m^{-1}$
L	Length of reference surface cylinder	m
N	Number of arc positions along the half cylinder (see Figure 2)	—
n	Coefficient in equations for k_{CO_2} and k_{H_2O}	—
P_{CO_2}	Partial pressure of carbon dioxide in ambient air	kPa
P_{H_2O}	Partial pressure of water vapour in ambient air	kPa
$p_{max,H20}$	Saturated vapour pressure	mbar
p	Gas supply pressure	mbar
p_a	Atmospheric pressure	mbar
p_W	Saturation vapour pressure of fuel gas at temperature t_g	mbar
Q_m	Measured heat input based on the net calorific value of the test gas	W
$Q_{(R)C}$	Radiant output after correction for absorption of radiation in air	W
$Q_{(R)M}$	Measured radiant output	W
R	Radius to radiometer from centre of reference plane	m
R_f	Radiant factor	—
S	Radiometer sensitivity	$\mu V/(W/m^2)$
t_A	Ambient air temperature	°C
t_g	Gas temperature at measuring point	°C
t_s	Sensor temperature	°C
U	Sensor voltage	V
V	Gas volume input at test conditions	m^3/h
V_b	Sensor voltage recorded with radiation shield in place	µV
V_t	Sensor voltage recorded without radiation shield in place	µV
V_o	Gas volume rate under reference conditions (at 15 °C, 1013,25 mbar, dry gas)	m^3/h
ε_{H_2O}	Emissivity of water	—

6 Requirements for the rational use of energy

When mounted horizontally in accordance with the manufacturer's instructions and measured by one of the methods given in 7.2 the radiant factor of the appliance, adjusted to the nominal heat input, shall be in accordance with the values given in Table 2.

Table 2 — Radiant factor for appliances mounted horizontally

Class	Radiant Factor
1	> 0,4 to ≤ 0,5
2	> 0, 5

7 Test methods

7.1 General

The test shall be carried out with the appliance mounted horizontally in accordance with the manufacturer's instructions.

The requirements of 7.1 of EN 419-1: 1999 apply unless otherwise specified.

7.2 Radiant factor

7.2.1 General

7.2.1.1 Working area (requirements applicable to all methods of test)

The working area shall be of a size to allow installation of the appliance and shall:

a) provide sufficient ventilation to remove the combustion products and the heat generated by the appliance;

b) have an ambient air temperature of 20 °C ± 5 °C;

c) allow the sensors to be positioned free from draughts;

The sensor temperature shall be checked before and after measurements are taken and shall:

d) for air cooled sensors, be 20°C ± 5 °C;

e) for water cooled sensors, the temperature of the cooling water shall not change by more than ± 5 °C during the test.

7.2.1.2 Choice of test method

The radiant factor of the appliance may be determined by the method described in 7.2.2 or the method described in 7.2.3.

7.2.2 Method A

7.2.2.1 Installation and adjustment of the appliance

The appliance shall be installed at a height of between 2 m and 2,5 m and initially adjusted in accordance with the requirements of 7.1.

The test shall be carried out with the appliance adjusted to its nominal heat input or, in the case of a range-rated appliance, to its minimum and maximum nominal heat inputs[1] (see 7.1.3.2.3 of EN 419-1:

[1] A test at the maximum nominal heat input need not be applied if it is known that the lowest radiant output is achieved at the minimum nominal heat input.

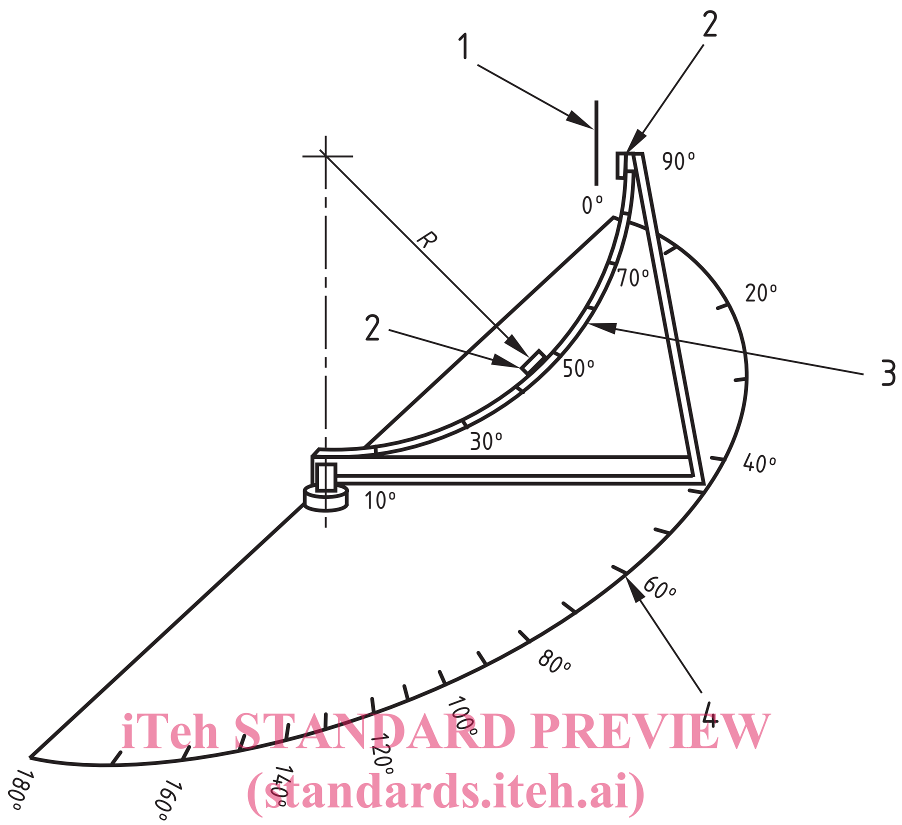
1999) and supplied with one of the reference gases for the category to which the appliance belongs (see 7.1.1 of EN 419-1: 1999).

7.2.2.2 Apparatus

7.2.2.2.1 Mechanical apparatus

In order to move the sensor positions in an imaginary envelope around the appliance a mobile, rigid test rig having a graduated, circular metal arc, with sensors attached, pivoted on its vertical axis is required. The radius of the metal arc shall be within the range given in Figure 3.

NOTE It is important to check that the maximum irradiance does not exceed the maximum value allowed for the instrument.



Key

1	Removable radiation shield
2	Radiometer
3	Parallel
4	Meridian
R	The radius measured from the arc centre to the surface of the radiometer. The radius shall be in the range 1,54 m to 1,88 m. For any one measurement, the radius shall not vary by more than ± 20 mm

Figure 3 — Test rig (Test method A)

Test equipment shall:

a) for an appliance with a length of more than 1,3 m, have sufficient adjustment to allow the arc centre to coincide with either end of the reference plane;

b) for an appliance with a length of 1,3 m or less, the arc centre shall coincide with the centre of the reference plane (see Figure 1).

c) be installed in a test area with sufficient floor area to allow marking on the floor for measurement positions;

d) have a detachable or retractable radiation shield in front of each sensor to mask it from the appliance. The radiation shield shall be designed and arranged so that the surface of the shield facing the sensor is at thermal equilibrium under the ambient conditions of the working area (see 7.2.1.1). The general arrangement and construction of the radiation shields is given in Figure 4;