

D`jbg_] [cgdX]b`g_] [fYb_] `nfU_ U`g`df]g]bc`_cbj Y_W]`c`nUc[fYj Ub`Y`dfcglcfcj `n
ja Ybg_c`a c `c`Xc`j`_`1 bc`+\$`_K `VfYn`j Yb]U`cf`U`nU`n[cfYj Ub]`nfU_`]b#U`]X]a bY
d`]bY

Domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 70 kW, without a fan to assist transportation of combustion air and/or combustion products

Gasbefeuerte Warmluftf rzeuger mit erzwungener Konvektion zum Beheizen von R umen f r den h uslichen Gebrauch mit einer Nennw rmebelastung nicht  ber 70 kW, ohne Gebl se zur Bef rderung der Verbrennungsluft und/oder der Abgase

G n rateurs d'air chaud a convection forc e utilisant les combustibles gazeux pour le chauffage de locaux a usage d'habitation de d bit calorifique sur Hi inf rieur ou  gal a 70 kW, sans ventilateur pour aider l'alimentation en air comburant et/ou l' vacuation des produits de combustion

Ta slovenski standard je istoveten z: EN 778:1998

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Descriptors: heaters, gas appliances, hot air generators, classifications, specifications, safety, equipment specification, performance evaluation, tests, marking, name plates, technical notices

English version

Domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 70 kW, without a fan to assist transportation of combustion air and/or combustion products

Générateurs d'air chaud à convection forcée utilisant les combustibles gazeux pour le chauffage de locaux à usage d'habitation de débit calorifique sur H_i inférieur ou égal à 70 kW, sans ventilateur pour aider l'alimentation en air comburant et/ou l'évacuation des produits de combustion

Gasbefeuerte Warmlufterzeuger mit erzwungener Konvektion zum Beheizen von Räumen für den häuslichen Gebrauch mit einer Nennwärmebelastung nicht über 70 kW, ohne Gebläse zur Beförderung der Verbrennungsluft und/oder der Abgase

This European Standard was approved by CEN on 9 August 1997.

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.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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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 179 "Gas-fired air heaters", the secretariat of which is held by NNI.

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 1998, and conflicting national standards shall be withdrawn at the latest by July 1998.

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 Annex ZA, which is an integral part of this standard.

This European Standard covers type-testing only.

The test gases, test pressures and appliance categories given in this standard are in accordance with those specified in EN 437:1993 "Test gases, test pressures and appliance categories".

NOTE: For countries requesting special categories (specified in EN 437:1993), the absence of specific information concerning A.3.3 and A.3.4 implies that the general requirements described in the body of the standard (clauses 4.1.1, 4.2.2, 4.2.3 and 4.2.5) also apply to these special categories.

Work is in progress to look for a device to detect failure of the heat exchanger. If successful, this could be an alternative to the "heat exchanger thermal cycle" requirement, 5.2.7.

Type B₁₁ appliances shall be fitted with an atmosphere sensing device or a combustion products discharge safety device in order to meet the Essential Requirement of 3.4.3 of the Directive 90/396/EEC. In this standard these appliances are designated as type B_{11AS} and B_{11BS}, according to the device. However, appliances intended to be installed in a space separated from living rooms and provided with appropriate ventilation directly to the outside, need not carry such a device, but in this case, appropriate warnings on the packaging and in the instructions shall clearly indicate the limit on the use on this type of appliance. In this standard these appliances are designated as type B₁₁.

Other European Standards covering gas-fired air heaters are as follows:

EN 525	Non-domestic direct gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW
EN 621	Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, without a fan to assist transportation of combustion air and/or combustion products
EN 1020	Non-domestic gas-fired forced convection air heaters for space heating not exceeding a net heat input of 300 kW, incorporating a fan to assist transportation of combustion air and/or combustion products
prEN 1196	Domestic and non-domestic gas-fired air heaters - Supplementary requirements for condensing air heaters
prEN 1319	Domestic gas-fired forced convection air heaters for space heating, with fan-assisted burners not exceeding a net heat input of 70 kW

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prEN 12669 Non-domestic gas-fired hot air blowers for agriculturalized and supplementary space heating including special requirements for use in greenhouses

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.

1 SCOPE

This standard specifies the requirements and test methods for the safety and efficiency of domestic gas-fired air heaters with (an) atmospheric burner(s) and without a fan to assist the transportation of combustion air and/or flue gases, hereafter referred to as "appliances".

This standard applies to Type B₁₁, B_{11AS}, B_{11BS}, C₁₁, C₂₁, C₃₁ and C₄₁ appliances with an input not exceeding 70 kW (net cv-basis), intended primarily for use in single unit residential dwellings. Provision of the heated air may be by means of ducting.

This standard does not apply to:

- appliances of the condensing type;
- appliances for outdoor installation;
- dual purpose air conditioning appliances (heating and cooling);
- appliances where the air is heated by an intermediate fluid;
- appliances with forced draught burners;
- appliances fitted with a manual or automatic means of adjusting the combustion air supply or the combustion products evacuation (including flue dampers);
- portable or transportable forced convection appliances;
- appliances having multiple heating units with a single draught diverter;
- appliances fitted with more than one flue outlet;
- C₂₁ and C₄₁ appliances for 3rd family gases.

NOTE: For C₄₁ appliances: see all requirements and test methods that are valid for C₂₁ appliances, unless otherwise stated.

This European Standard covers type-testing only.

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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	Pressure governors for gas appliances for inlet pressures up to 200 mbar
EN 125:1991	Flame supervision devices for gas burning appliances - thermoelectric flame supervision devices
EN 126:1995	Multifunctional controls for gas burning appliances
EN 161:1992	Automatic shut-off valves for gas burners and gas burning appliances
EN 257:1992	Mechanical thermostats for gas burning appliances
EN 298:1993	Automatic gas burner control systems for gas burners and gas-burning appliances with or without fans
EN 437:1993	Test gases - Test pressures - Appliance categories
EN 23166:1993	Codes for the representation of names of countries (ISO 3166:1988)
prEN 50165:1993	Electrical equipment of non-electric heating appliances for household and similar purposes - Safety requirements
EN 60335-1:1988	Safety of household and similar electrical appliances - Part 1: General requirements
EN 60529:1991	Degrees of protection provided by enclosures
EN 60730-1:1991	Automatic electrical controls for household and similar general purposes - Part 1: General requirements
EN 60730-2-1:1992	Automatic electrical controls for household and similar use - Part 2: Particular requirements for electrical controls for electrical household appliances
EN 60730-2-9:1995	Automatic electrical controls for household and similar use - Part 2: Particular requirements for temperature-sensing controls
EN 61058-1:1992	Switches for appliances - Part 1: General requirements
IEC 479-1:1994	Effect of current passing through the human body - Part 1: General aspects
IEC 479-2:1987	Effect of current passing through the human body - Part 2: Special aspects
ISO 7-1:1994	Pipe threads where pressure-tight joints are made on the threads - Part 1: Dimensions, tolerances and designation
ISO 228-1:1994	Pipe threads where pressure-tight joints are not made on the threads - Part 1: Dimensions, tolerances and designation
ISO 1182:1990	Fire tests - Building materials - Non-combustibility test
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

3 DEFINITIONS

For the purpose of this standard, the following definitions apply:

3.1 Appliance and its constituent parts

3.1.1 domestic air heater: An appliance designed for the heating by means of warm air and possibly ventilation of a single unit residential dwelling.

3.1.2 forced convection air heater: An appliance designed to provide space heating from a central source by distributing heated air, by means of an air moving device, either through ducting or directly into the heated space.

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

3.1.4 mechanical joint; mechanical means of obtaining soundness: A means of assuring the soundness of an assembly of several (generally metallic) parts without the use of liquids, pastes, tapes, etc. There are, for example:

- 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 to set the gas rate of the burner to a predetermined value according to the supply conditions.

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

3.1.8 setting an adjuster: Immobilization of an adjuster by some means such as a screw after the manufacturer or installer has adjusted it. The adjuster is said to be "set" in this position.

3.1.9 sealing an adjuster: Setting of an adjuster using a material such that any attempt to change the adjustment breaks the sealing material and makes the interference with the adjuster apparent. The adjuster is said to be "sealed" in its adjustment position.

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 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. The appliance then functions as if the adjuster or control had 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 assure the thermal function of the appliance and is generally called the burner.

3.1.13 ignition device: Any means (flame, electrical ignition device or other device) used to ignite the gas at the ignition burner or at the main burner.

This device can operate intermittently or permanently.

3.1.14 ignition burner: A burner whose flame is intended to ignite another burner.

3.1.15 aeration adjuster: A device enabling the excess primary air to be set at the desired value according to the supply conditions.

The action of adjusting this device is called "adjusting the primary aeration".

3.1.16 combustion circuit: The combustion circuit comprises the air supply circuit, the combustion chamber, the heat exchanger and the combustion products evacuation circuit so far as this is part of the appliance.

3.1.17 combustion chamber: An enclosure inside which combustion of the air-gas mixture takes place.

3.1.18 flue outlet: The part of an appliance that connects with a flue to evacuate the products of combustion.

3.1.19 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.

3.2 Adjusting, control and safety devices

3.2.1 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).

3.2.2 automatic burner system: A burner system in which, when starting from the completely shut-down condition, the start-gas flame is detected and proved and the main gas valve(s) is(are) actuated without manual intervention.

3.2.3 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.

3.2.4 non-automatic burner system: A burner system with an ignition burner which is ignited manually.

3.2.5 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.

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

3.2.7 flame detector device: 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.

3.2.8 flame signal: The signal given by the flame detector device, normally when the flame sensor senses a flame.

3.2.9 flame simulation: A condition which occurs when the flame signal indicates the presence of a flame when in reality no flame is present.

3.2.10 pressure governor¹⁾: A device which maintains the outlet pressure constant independent of the variations in inlet pressure and/or flow rate within defined limits.

3.2.11 adjustable pressure governor: A governor provided with means for changing the outlet pressure setting.

3.2.12 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.

3.2.13 automatic shut-off valve: A valve designed to open when energized and to close automatically when de-energized.

¹⁾ The term "governor" is used in this case and for a volume governor.

3.2.14 room temperature control thermostat: A device controlling the operation of the appliance (by on/off, high/low or modulating control) and enabling the room temperature to be kept automatically, within a given tolerance, at a predetermined value.

3.2.15 overheat cut-off device: A device that shuts off and locks out the gas supply before the appliance is damaged and/or before safety is put into question, and that requires manual intervention to restore the gas supply.

3.2.16 temperature limiter: A device which is intended to keep a temperature below one particular value during normal operation conditions and which may have a provision for setting by the user.

3.2.17 overheat limit device: A device which is intended to keep a temperature below one particular value during abnormal operation conditions and which has either no provision for setting or is provided with a maximum temperature limit stop.

The overheat limit device may be of the automatic or the manual reset type.

3.2.18 fan control: A control that starts and/or stops the air delivery fan when the temperature of the delivered air reaches certain predetermined values.

3.2.19 temperature sensing element; temperature sensor: A component that detects the temperature of the environment to be supervised or controlled.

3.2.20 combustion products discharge safety system: A system that automatically shuts off the gas supply to the main burner, and perhaps to the ignition burner, when spillage of combustion products from the draught diverter is detected.

3.2.21 atmosphere sensing device: A device designed to shut off the gas supply before the concentration of combustion products of the surrounding atmosphere reaches a set value.

3.2.22 modulating control: An automatic control by which the heat input of the appliance can be varied in a continuous manner between the nominal heat input and a minimum value.

3.2.23 high/low control: An automatic control which permits an appliance to operate either at the nominal heat input or at a fixed reduced heat input.

3.2.24 closed position indicator switch: A switch fitted to an automatic shut-off valve which indicates when the closure member is in the closed position.

3.2.25 proof of closure switch: A switch within an automatic shut-off valve with mechanical overtravel which indicates when the closure member is in the closed position.

3.2.26 valve proving system: A system to check the effective closure of automatic shut-off valves.

3.3 Operation of the appliance

3.3.1 heat input: The 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.

Symbol: Q

Unit: kilowatts (kW)

3.3.2 nominal heat input: The value of the heat input declared by the manufacturer.

Symbol: Q_n

3.3.3 mass flow rate: The mass of gas consumed by the appliance in unit time during continuous operation.

Symbol: M

Units: kilograms per hour (kg/h), or grams per hour (g/h).

3.3.4 volumetric flow rate: The volume of gas consumed by the appliance in unit time during continuous operation.

Symbol: V

Units: cubic metres per hour (m^3/h), litres per minute (l/min), cubic decimetres per hour (dm^3/h), or cubic decimetres per second (dm^3/s).

3.3.5 flame stability: The characteristic of flames which remain on the burner ports or in the flame reception zone intended by the construction.

3.3.6 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.

3.3.7 light-back: The entry of a flame into the body of the burner.

3.3.8 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.

3.3.9 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.

3.3.10 yellow tipping: The yellowing of the tip of the blue cone of an aerated flame.

3.3.11 first safety time²⁾: The interval between the ignition burner gas valve, the start gas valve or main gas valve, as applicable, being energized and the ignition burner gas valve, the 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.

3.3.12 second safety time: 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. This only applies where there is a first safety time applicable to either an ignition burner or start gas flame.

3.3.13 waiting time: The time between safety shut-down and any (re)start attempt.

3.3.14 start gas: Gas that is supplied at the start gas rate to establish the start gas flame.

3.3.15 start gas rate: The restricted gas flow rate admitted either to a separate ignition burner or to the main burner during the first safety time.

3.3.16 start gas flame: A flame established at the start gas rate either at the main burner or at a separate ignition burner.

3.3.17 running condition of the system: The condition of the system in which the burner is in normal operation monitored by the flame supervision device and/or programming unit.

3.3.18 controlled shut-down: The process by which the power to the gas valve(s) is removed immediately. This is achieved by the opening of a control loop which includes an external control device. The unit returns to its start position.

3.3.19 safety shut-down: The process which is initiated in response to the signal from a limiting device or sensor and which causes the main burner to shut down the same way as for a controlled shut-down.

3.3.20 Lock-out

3.3.20.1 non-volatile lock-out: The 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.

3.3.20.2 volatile lock-out: The 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 main power and its subsequent restoration.

3.3.21 spark restoration: The process by which, after disappearance of the flame signal, the ignition device is energized again without the gas supply having been totally interrupted. 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.

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

3.3.22 automatic recycling: The process by which, following loss of flame signal 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. 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 lock-out or non-volatile lock-out.

3.3.23 ignition opening time: The time interval between ignition of the supervised flame and the moment when the valve is held open.

3.3.24 extinction safety time: The time interval between extinction of the supervised flame and the gas supply being shut off to the main burner and/or to the ignition burner.

3.4 Gases

3.4.1 test gases: Gases intended for the verification of the operational characteristics of appliances using combustible gases. They comprise the reference and the limit gases.

3.4.2 reference gases: Test gases on which appliances operate under nominal conditions, when they are supplied at the corresponding normal pressure.

3.4.3 limit gases: Test gases representative of the extreme variations in the characteristics of the gases for which appliances have been designed.

3.4.4 gas pressure: The static pressure, relative to the atmospheric pressure, measured at right angles to the direction of flow of the gas.

It is expressed in millibars (mbar) or in bars.

3.4.5 test pressures: Gas pressures used to verify the operational characteristics of appliances using combustible gases. They consist of normal and limit pressures.

They are expressed in millibars (mbar).

NOTE: 1 mbar = 10^2 Pa.

3.4.6 normal pressure: The pressure under which the appliances operate in nominal conditions, when they are supplied with the corresponding reference gas.

Symbol: p_n

3.4.7 limit pressures: Pressures representative of the extreme variations in the appliance supply conditions.

Symbols:

maximum pressure: p_{\max}

minimum pressure: p_{\min}

3.4.8 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

- the higher pressure corresponds only to gases of low Wobbe index; and
- the lower pressure corresponds to gases of high Wobbe index.

3.4.9 relative density: The ratio of the masses of equal volumes of dry gas and dry air under the same conditions of temperature and pressure.

Symbol: d

3.4.10 calorific value: The quantity of heat produced by the 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: