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Room sealed storage water heaters for the production of sanitary hot water using LPG for vehicles and boats

Raumluftunabhängige, flüssiggasbeheizte Vorrats-Wasserheizer für den sanitären Gebrauch für Fahrzeuge und Boote

Appareils de production d'eau chaude par accumulation a circuit étanche pour usages sanitaires utilisant les combustibles GPL pour les véhicules et bateaux

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Room sealed storage water heaters for the production of sanitary hot water using LPG for vehicles and boats

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This European Standard was approved by CEN on 18 September 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.

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

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Foreword

This document (EN 15033:2006) has been prepared by Technical Committee CEN/TC 181 “Dedicated liquefied petroleum gas appliances”, 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of an identical text or by endorsement, at the latest by May 2007, and conflicting national standards shall be withdrawn at the latest by May 2007.

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 EU Directive(s).

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

It was prepared to deal with particular aspects relating to :

— safety;

— rational use of energy.

In particular, matters which relate to quality assurance systems, production tests and certification of conformity of auxiliary devices are not dealt with by 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, 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 defines the specifications and test methods for the construction, safety, rational use of energy and fitness for purpose, environment, classification and marking of room sealed storage water heaters for the production of sanitary hot water using LPG for:

— vehicles as defined in article 1 of Directive 70/156/EEC (see 3.12);

— caravan holiday homes;

— agricultural, forestry and mobile machinery, and

— boats;

hereafter called "appliance".

This standard applies to appliances:

— type C_1, C_3 and C_5 (room sealed, see CEN/TR 1749) with combustion air intake and outlet for the products of combustion (combined or not) in the wall or roof;

— fitted with atmospheric burners;

— appliances fitted with or without a fan on the combustion circuit;

— using LPG at the pressure $I_{3B/P(30)}$ indicated in EN 437 (for caravan holiday homes and boats see Annex A);

— of nominal heat input not exceeding 7 kW (H_i);

— appliances whether connected to the water mains pressure or on board water supply;

— appliances using, where appropriate, 12 V or 24 V DC electrical supply (or appliances with an additional 230 V heating element).

This standard does not contain all the necessary requirements for:

— appliances which fulfil a dual purpose role of space heating and heating water for sanitary hot water use.

This standard covers type testing only.

NOTE 1 Alternatively appliances (storage water heaters) for caravan holiday homes may comply with EN 89.

NOTE 2 For space heating aspects see EN 624 "Specification for dedicated LPG appliances - Room sealed LPG space heating equipment for installation in vehicles and boats".

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 125, *Flame supervision devices for gas burning appliances — Thermo-electric flame supervision devices*

EN 126, *Multifunctional controls for gas burning appliances*

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

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

EN 437, *Test gases — Test pressures — Appliance categories*

EN 549, *Rubber materials for seals and diaphragms for gas appliances and gas equipment*

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

EN 1487, *Building valves — Hydraulic safety groups — Tests and requirements*

EN 1949, Specification for the installation of LPG systems for habitation purposes in leisure accommodation vehicles and in other road vehicles

EN 50165, *Electrical equipment of non-electric appliances for household and similar purposes — Safety requirements*

EN 60068-2-6, *Environmental testing — Part 2: Tests - Tests Fc: Vibration (sinusoidal) (IEC 60068-2-6:1995 + Corrigendum 1995)*

EN 60335-1, *Household and similar electrical appliances — Safety — Part 1: General requirements (IEC 60335-1:2001, modified)*

EN 60335-2-21, *Household and similar electrical appliances — Safety — Part 2- 21: Particular requirements for storage water heaters (IEC 60335-2-21:2002, modified)*

EN 60529, *Degrees of protection provided by enclosures (IP code) (IEC 60529:1989)*

EN 60730-2-9, *Automatic electrical controls for household and similar use — Part 2-9: Particular requirements for temperature sensing controls (IEC 60730-2-9:2000, modified)*

EN ISO 228-1, *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, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:1997)*

EN ISO 10239, *Small craft — Liquefied petroleum gas (LPG) systems (ISO 10239:2000)*

ISO 7-1, *Pipe threads where pressure-tight joints are made on the threads —- Part 1: Dimensions, tolerances and designation*

ISO 262, *ISO general-purpose metric screw threads — Selected sizes for screws, bolts and nuts*

ISO 301, *Zinc alloy ingots intended for castings*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1 Water heater

3.1.1
storage water heater
appliance which heats and stores a quantity of water contained in a vessel at a preset temperature and which has the heat source located inside or outside the vessel

3.1.2
fixed temperature storage water heater
appliance fitted with a non-adjustable thermostat which controls the water temperature to a given setting

3.1.3
adjustable temperature storage water heater
appliance fitted with a thermostat controlling the water temperature with the set point value of this device being adjustable

3.1.4
open storage water heater
appliance with a vent to the atmosphere

3.1.5
closed storage water heater
appliance which has no vent to the atmosphere

3.1.6
condensing storage water heater
appliance in which, under normal operating conditions and for certain operation temperatures, the water vapour of the combustion products is partially condensed in order to use the latent heat of this water vapour to produce heat

3.2 Characteristics of the gas and electrical supplies

3.2.1
reference conditions
dry gas at a temperature of 15 °C and an absolute pressure of 1013,25 mbar

3.2.2
test gases
gases intended for the verification of the operational characteristics of appliances using combustible gases. They consist of reference gases and limit gases

3.2.2.1
reference gases
test gases with which appliances operate in normal conditions, when they are supplied at the corresponding nominal pressure

3.2.2.2
limit gases
test gases representative of the extreme variations of the characteristics of the gases for the use of which the appliance has been designed

3.2.3
calorific value
quantity of heat produced by the complete combustion under reference conditions of unit volume or mass of gas at a constant pressure of 1013,25 mbar, the constituents of the combustible mixture being taken under reference conditions and the products of combustion being brought back to these same conditions

NOTE A distinction is made between two types of calorific value:

gross calorific value
water produced by combustion is assumed to be condensed

Symbol: H_s (kWh/kg),

net calorific value
water produced by combustion is assumed to be in the vapour state

Symbol: H_i. (kWh/kg)

3.2.4
limit pressures
pressures representative of the extreme variations in the appliance supply conditions

Symbols:

maximum pressure: p_{max} (mbar)

minimum pressure: p_{min} (mbar)

3.2.5
rated voltage
voltage or range of voltages specified by the manufacturer at which the appliance will operate normally

3.3
gas circuit
part of the appliance conveying or containing LPG

3.4 Control and safety devices

3.4.1
control knob
component intended to be operated manually in order to control an appliance, for example: tap or temperature selector

3.4.2
manual shut-off valve
valve that permits manual interruption of the gas rate to the burner and ignition burner (if any)

3.4.3
automatic shut-off valve
valve designed to open when energized by an electrical current and which closes automatically in the absence of the electrical current

3.4.4
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

3.4.5
multifunctional control
device having at least two functions, one of which is a shut-off function, integrated in one housing, whereby the functional parts cannot operate if separated

3.4.6
programming unit
device that reacts to impulses from control and safety systems, gives control commands, controls the start-up program, supervises the burner operation and causes controlled shutdown or safety shutdown if necessary

NOTE The programming unit follows a predetermined sequence of actions, in conjunction with the flame detector.

3.4.7
automatic burner control system
system that comprises at least a programming unit and all the elements that make up a flame supervision device

3.4.8
water overheat safety device
device which initiates a non-volatile lockout before the appliance can be damaged or the safety of the user being endangered

3.4.9
vent
orifice which permits atmospheric pressure to be maintained in a compartment of variable volume or content

3.4.10
device for monitoring air supply or evacuation of combustion products
device designed to automatically shut-down the appliance in the event of abnormal air intake or combustion products evacuation conditions

3.5 Stages of operational and safety sequence

3.5.1
program
sequence of the operations determined by the automatic burner control unit to assure the start-up, supervision and shutdown of the burner

3.5.2
spark restoration
automatic process by which, following disappearance of the flame signal, the ignition device is switched on again without the gas supply having been interrupted

3.5.3
recycling
automatic process by which, after loss of flame during operation, the gas supply is interrupted and the full start procedure is re-initiated automatically (normally after a minimum required waiting time, without a fan, or after prep urge time, with a fan)

3.5.4
controlled shutdown
process by which a control device (internal or external to the appliance) immediately cuts off the gas supply to the burner; the appliance returns to its off position

3.5.5
safety shutdown
process which is initiated immediately in response to the signal from a temperature limiting device or sensor and which causes the burner to shut down; the appliance returns to its start position

3.5.6
lock out
complete interruption of the gas supply

3.5.7
non-volatile lockout
situation such that a restart can only be accomplished by a manual reset

3.5.8
volatile lockout
situation such that a restart can be accomplished either by manual intervention or by restoration of the electrical supply after its loss

3.5.9
ignition lockout (thermoelectric device only)
device that prevents the ignition system from functioning when the main gas circuit is open

3.5.10
restart lockout (thermoelectric device only)
device that prevents restoration of the gas flow to the main burner or to the main burner and the ignition burner until the end of the extinction safety time

3.5.11
prepurging
operation consisting of introducing forced air into the combustion circuit in order to evacuate any remaining air/gas mixtures; this takes place between the start-up command and the activation of the ignition device

3.6 Burners and ignition devices

3.6.1
burner

component that provides the air-gas mixture and ensures the combustion of the gas

3.6.2
main burner
burner that is intended to assure the thermal function of the appliance by burning the main gas quantity

3.6.3
ignition device
any means (flame, electrical ignition device or other device) used to ignite the gas admitted to the ignition burner or the main burner

3.6.3.1
manual ignition device
device by means of which the burner is ignited following manual intervention

3.6.3.2
automatic ignition device
automatic device which ignites the ignition burner or the main burner directly

3.6.4
ignition burner
small burner intended to ignite a main burner

3.6.4.1
permanent ignition burner
ignition burner that is ignited before the main burner and extinguished when the appliance is shut down voluntarily or by the flame supervision device

3.6.4.2
alternating ignition burner
ignition burner that is extinguished as soon as ignition of the main burner has taken place and re-ignites at the main burner flame just before the latter extinguishes

3.6.4.3
interrupted ignition burner
ignition burner that operates only during the ignition sequence

3.7 Combustion

3.7.1 combustion circuit
circuit comprising the air supply circuit, combustion chamber, heat exchanger and combustion products circuit up to and including the ducts but not the flue outlet

3.7.2
combustion chamber
enclosure inside which combustion of the air-gas mixture takes place

3.7.3
ducts of the combustion circuit
combustion air intake and combustion products evacuation ducts (flue) used for transporting combustion air to and combustion products from the appliance to the terminal

NOTE ducts completely surrounded: the combustion products evacuation duct is surrounded by combustion air along its whole length.

3.7.4
separated ducts
the combustion products evacuation duct and the combustion air intake duct are neither concentric nor completely surrounded

3.7.5
terminal
device to which the combustion air intake ducts and / or the combustion products evacuation ducts (flue) are connected and which is intended to maintain the quality of combustion in the event of wind

3.7.5.1
flue terminal
part of the combustion circuit that is intended to be connected to the flue, evacuating the combustion products to the outside

3.7.6
wind protection device
cover over the combustion circuit openings on the outside of the vehicle (e.g. deflector plates, covering hoods), which protect the circuit from unacceptable effects in the event of wind and maintains the quality of combustion

3.7.7
condensate
liquid formed by the condensation of the combustion products water vapour

3.8 Water circuit

3.8.1
hydraulic safety group
group comprising all or a part of the following items (in accordance with EN 1487) in a single unit in the normal direction of the water flow such as a non return valve, an isolating valve (optional), a safety valve, a drain device and an air break to drain

3.8.2
combined temperature and pressure relief valve
device which automatically prevents the water in the appliance from exceeding a certain temperature and prevents the pressure from exceeding the maximum working pressure

3.8.3
water temperature thermostat
device allowing the water temperature to be maintained automatically at a pre-determined value

3.8.4
adjustable water temperature thermostat
water temperature thermostat that permits the user to adjust the set point temperatures between the maximum and minimum values

3.8.5
low inertia thermometer
measuring instrument with a response time such that 90 % of the final temperature rise, in the range 15 °C to 100 °C, is obtained within 5 s when the sensor is plunged into still water

3.8.6
water supply pressure
gauge pressure measured at the water inlet connection of the appliance

Symbol: *p*

Unit: bar

NOTE 1 bar = 10^5 Pa.

3.9 Soundness

3.9.1
external soundness
soundness, with respect to the atmosphere, of an enclosure containing gas

3.9.2
internal soundness
soundness of a closure member in the closed position and isolating an enclosure containing gas from another enclosure or from the outlet of the valve

3.10 Operation

3.10.1
gas rates

3.10.1.1
mass rate
mass of gas consumed by the appliance over time during continuous operation

Symbol: M

Unit: kilograms or grams per hour (kg/h)

3.10.1.2
volume rate
volume of gas consumed by the appliance over time during continuous operation

Symbol: V

Unit: cubic metres per hour (m^3/h)

3.10.2
heat inputs

3.10.2.1
heat input
product of the volumetric rate or the mass rate and the net calorific value of the gas referred to the same given conditions

Symbol: Q

Unit: kilowatt (kW)

3.10.2.2
nominal heat input
value of the heat input declared by the manufacturer

Symbol: Q_n

Unit: kilowatt (kW)

3.10.2.3
corrected heat input
heat input that would be obtained if the appliance were supplied with dry reference gas at the normal supply pressure and a temperature of 15 °C, with an atmospheric pressure of 1 013,25 mbar (see 6.4.2)

Symbol: Q_c

Unit: kilowatt (kW)

3.10.2.4
minimum heat input
minimum value of heat input declared by the manufacturer

Symbol: Q_m

Unit: kilowatt (kW)

3.10.2.5
heat output
quantity of energy transmitted to the water divided by time

Symbol: P

Unit: kilowatt (kW)