



# SLOVENSKI STANDARD

## SIST EN 1196:2012

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### Plinski grelniki zraka - Dodatne zahteve za kondenzacijske grelnike

Domestic and non-domestic gas-fired air heaters - Supplementary requirements for condensing air heaters

Gasbefeuerte Warmlufterzeuger für den häuslichen und den nicht-häuslichen Gebrauch - Zusätzliche Anforderungen an kondensierende Warmlufterzeuger

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Générateurs d'air chaud à usages domestique et non domestique utilisant les combustibles gazeux - Exigences complémentaires pour les générateurs d'air chaud à condensation

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EUROPEAN STANDARD

EN 1196

NORME EUROPÉENNE

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## Domestic and non-domestic gas-fired air heaters - Supplementary requirements for condensing air heaters

Générateurs d'air chaud à usages domestique et non domestique utilisant les combustibles gazeux - Exigences complémentaires pour les générateurs d'air chaud à condensation

Gasbefeuerte Warmluftterzeuger für den häuslichen und den nicht-häuslichen Gebrauch - Zusätzliche Anforderungen an kondensierende Warmluftterzeuger

This European Standard was approved by CEN on 14 July 2011.

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 CEN-CENELEC Management Centre or to any CEN member.

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

Management Centre: Avenue Marnix 17, B-1000 Brussels

## EN 1196:2011 (E)

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## Foreword

This document (EN 1196:2011) has been prepared by Technical Committee CEN/TC 180 "Decentralized gas heating", 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of an identical text or by endorsement, at the latest by February 2012, and conflicting national standards shall be withdrawn at the latest by February 2012.

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 1196:1998.

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 document.

Compared to the former edition, attention is drawn to the amendment of Annex A and to the expansion of Annex B which reflects the increase in the number of CEN Member States.

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, Croatia, 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.

**EN 1196:2011 (E)****1 Scope**

This European Standard specifies the additional requirements and test methods for gas-fired air heaters which are designed so that water vapour condenses from combustion products. On this subject, it extends the European Standards EN 778 and EN 1319 for domestic air heaters, and EN 1020 for non-domestic air heaters.

This European Standard applies to gas-fired air heaters with or without a fan in the combustion circuit in one of the following constructional types:

- an integral air heater with at least one condensing heat exchanger;
- a non-condensing air heater with an integrated additional condensing heat exchanger;
- a non-condensing air heater, with an integrated additional condensing heat exchanger for the recovery of heat from combustion products and from ventilation air if appropriate.

This European Standard covers type-testing only.

**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 778, *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*

EN 1020, *Non-domestic forced convection gas-fired air heaters for space heating not exceeding a net heat input of 300 kW incorporating a fan to assist transportation of combustion air or combustion products*

EN 1319, *Domestic gas-fired forced convection air heaters for space heating, with fan-assisted burners not exceeding a net heat input of 70 kW*

**3 Terms and definitions**

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

NOTE They supplement the definitions in the aforementioned air heater standards.

**3.1****condensing air heater**

air heater in which, under normal operating conditions, the water vapour in the combustion products is totally or partially condensed in order to make use of the latent heat in this water vapour for heating purposes

**3.2****condensate**

liquid formed from the combustion products during the condensation process

### 3.3

#### **condensate collecting device**

part of the appliance designed to collect the condensate in order that it can be drained

## **4 Constructional and design requirements**

### **4.1 General**

All parts of the heat exchanger(s) and other parts of the appliance likely to come into contact with condensate under normal operating conditions at thermal equilibrium, shall be constructed from sufficiently corrosion resistant material or shall be sufficiently protected against corrosion, in order to ensure a reasonable life for an appliance that is installed, used and maintained in accordance with the manufacturer's instructions.

Connections at points where condensation can occur or condensate can be present, shall not give rise to corrosion.

The manufacturer shall provide evidence of evaluation, tests undertaken and/or experience gained to support the claim that the materials used and the construction methods adopted are suitable for the purpose intended.

### **4.2 Materials**

Copper and copper based alloys shall not be used for condensate carrying components.

### **4.3 Access, assembly and disassembly of condensate carrying parts**

A condensate collecting device or other means provided for condensate formed during normal operation to be continuously drained, shall be constructed in such a way that it can be cleaned in accordance with the manufacturer's instructions.

### **4.4 Condensate discharge**

The appliance shall be equipped with one or more condensate drains. Drains within the appliance shall have an internal diameter of at least 13 mm. The main drain for connection to the external drain shall have an internal diameter of at least 18 mm.

Condensate drains shall be so designed and arranged that combustion products do not escape via the drains.

If the appliance is equipped with a sealed combustion chamber, the condensate formed both in the appliance and in the flue system shall be discharged through one or more condensate drains. The drains for the flue system may be the same as the drains for the appliance. Condensate formed in the flue system shall drain to a purposely-designed drain.

Drains for removal of condensate shall be provided with a means, e.g. a water trap or siphon, to prevent leakage of combustion products or combustion air.

If the air heater's condensate outlet is blocked or if a pump for the discharge of condensate fails to operate, the construction shall be such that no hazardous situation can arise when the appliance is operating.

### **4.5 Condensate neutralization system**

If the air heater is fitted with a condensate neutralization system, this system shall be designed in such a way that the reagents can be exchanged without dismantling any part of the appliance.

**EN 1196:2011 (E)****4.6 Limitation of the combustion products temperature**

If the combustion products circuit contains materials that are likely to be affected by heat, the appliance shall incorporate a device to prevent the combustion products temperature from exceeding the maximum permissible temperature for the materials as declared by the manufacturer.

The device for limiting the combustion products temperature shall be fail-safe in operation, non-adjustable and shall not be accessible without the use of tools.

**5 Operational requirements****5.1 General**

The following requirements complete or replace the requirements given in the air heater standards mentioned in Clause 1.

**5.2 Draining of condensate**

When the appliance is installed in accordance with the test conditions of 6.2, condensate shall only form at the points intended for this purpose and shall be readily drained.

Condensate shall not run into parts of the appliance which are not designed for collection and discharge of condensate, neither shall the condensate interfere with the normal operation of the appliance.

**5.3 Soundness of the condensate-carrying parts**

Condensate shall not leak from the appliance condensate circuit.

**5.4 Composition of the condensate**

If the manufacturer states the chemical composition of the condensate, the measured composition shall be in accordance with the manufacturer's declaration.

**5.5 Condensate neutralization system**

If the air heater is fitted with a condensate neutralization system, the pH value of the neutralized condensate shall not be lower than six.

**5.6 Condensate discharge system****5.6.1 Capacity**

The dimensions of the condensate discharge system or the capacity of a pump for the discharge of condensate shall be such that the maximum amount of condensate that may be formed under extreme conditions, as simulated in 6.6.1, can be drained.

**5.6.2 Behaviour in the event of blockage or pump failure**

Blockage of the condensate drain(s) or switching off the pump for the discharge of the condensate shall not lead to concentrations of CO in the combustion products higher than 0,1 %, and spillage of condensate shall not occur before safety shut-down or lock-out occurs.



### 5.6.3 Soundness of the combustion circuit

Under the conditions of 6.6.3, a water trap or siphon shall have a water seal of at least 25 mm.

### 5.6.4 Limitation of combustion products temperature

If a device for limiting the combustion products temperature is provided as specified in 4.6, the temperature of the combustion products measured according to 6.7 shall not exceed the maximum allowable working temperature for the materials of the combustion circuit and the flue materials, specified by the appliance manufacturer.

Operation of this device shall cause a non-volatile lock-out.

## 5.7 Efficiency

Under the test conditions of 6.8, the appliance shall have an efficiency not lower than 90 % (on net calorific value).

## 6 Test methods

### 6.1 General

Unless otherwise stated, the tests are carried out under the general conditions of test as described by the appropriate standards for domestic and non-domestic air heaters specified in Clause 1. Special set up conditions required for condensing air heaters are specified below.

The reference conditions for the combustion air apply, with a relative humidity of 50 %.

Unless otherwise stated, the appliance is fitted with the minimum flue length as stated by the manufacturer.

The temperature of both the air to be heated and the combustion air at the inlet of the appliance shall be maintained at  $(20 \pm 5)$  °C.

### 6.2 Draining of condensate

The appliance is operated continuously for 4 h in a condensing mode at nominal heat input.

During and after this running condition, it is checked if the requirements of 4.4 and 5.2 are fulfilled.

### 6.3 Soundness of the condensate-carrying parts

After the test according to 6.2 it is checked whether the requirement of 5.3 is met.

### 6.4 Composition of the condensate

If required according to 5.4, during the last period of the test according to 6.2, a sufficient quantity of condensate is collected in a suitable (e.g. glass) vessel from the outlet of the appliance, whether or not it is fitted with a neutralization system. The collected condensate is analyzed for the concentrations of the constituents specified by the manufacturer.

It is checked whether the requirement of 5.4 is met.

**EN 1196:2011 (E)****6.5 Condensate neutralization system**

If the air heater is fitted with a condensate neutralization system, during the last period of the test according to 6.2, a sufficient quantity of condensate is collected in a suitable (e.g. glass) vessel from the outlet of the appliance. This may be the condensate collected according to 6.4.

The pH value of this condensate is measured and it is checked that the requirement of 5.5 is met.

**6.6 Condensate discharge system****6.6.1 Capacity**

The sizing of the condensate draining system or the capacity of a pump is checked by the introduction of the following equivalent rates of water into the draining system:

- for natural gas: 2 l/h water per m<sup>3</sup>/h of natural gas;
- for propane: 3 l/h water per m<sup>3</sup>/h of propane;
- for butane: 4 l/h water per m<sup>3</sup>/h of butane.

The minimum volume of water used for this test is 2 l. If the condensate drain is a combined drain for the combustion circuit and the flue, then the volumes stated above are increased by a factor of 2.

NOTE The volumes above take into account the possibility of the penetration of rain or snow into the flue system as designed by some manufacturers.

It is checked if the requirement of 5.6.1 is met.

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**6.6.2 Behaviour in the event of blockage or pump failure**

The appliance is operated continuously in a condensing mode at nominal heat input. With the condensate drain blocked or with a pump for the discharge of condensate put out of operation, it is checked if the requirement of 5.6.2 is met.

In order to accelerate the test, water may be added to the condensation circuit.

**6.6.3 Soundness of the combustion circuit**

The appliance is installed with the maximum flue length specified by the manufacturer, and operated with the maximum pressure in the combustion chamber. It is checked that the requirement of 5.6.3 is met.

**6.7 Limitation of combustion products temperature**

The appliance is installed as given in 6.1 and according to the manufacturer's instructions and operated at nominal heat input. The appliance is supplied with one of the corresponding reference gases for the appliance category.

After reaching thermal equilibrium, the appliance overheat cut-off device or air temperature limiter is rendered inoperative and the air delivery fan is put out of action. The temperature of the combustion products is measured until the appliance is switched off by the device for limiting the combustion products temperature.

It is checked that the requirement of 5.7 is met.

## 6.8 Efficiency

### 6.8.1 General

The appliance is installed according to the manufacturer's instructions. The air heater is supplied with one of the corresponding reference gases for the appliance category.

The efficiency (on net calorific value),  $\eta_i$ , expressed as a percentage, of the appliance is determined at each heat input specified by the manufacturer, using the indirect method based on the following equation:

$$\eta_i = \frac{H_i - (q_1 + q_2) + S}{H_i} - 100 \quad (1)$$

where

$H_i$  is the net calorific value in megajoules per cubic metre (MJ/m<sup>3</sup>) at 15 °C, 1 013,25 mbar, dry;

$S$  is the condensing correction (MJ/m<sup>3</sup> gas); this factor  $S$  is determined according to the procedure given in Annex A;

$q_1$  is the heat of the dry products of combustion divided by the heat input based on the net calorific value in per cent (%);

$q_2$  is the heat of the water vapour contained in the products of combustion divided by the heat input based on the net calorific value in per cent (%).

### 6.8.2 Efficiency at nominal heat input SIST EN 1196:2012

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The appliance is operated at nominal heat input. The flow rate of the air to be heated is controlled so as to be equal to the minimum stated by the manufacturer.

Under these conditions it is checked if the requirement of 5.7 is met.

### 6.8.3 Efficiency at minimum heat input

The appliance is operated at minimum heat input. The flow rate of the air to be heated is controlled so as to be equal to the minimum stated by the manufacturer.

Under these conditions it is checked if the requirement of 5.7 is met.

## 7 Marking and instructions

### 7.1 Marking

In addition to the marking as required in the associated appliance standard, i.e. EN 778, EN 1020 or EN 1319, the following applies:

- on the appliance and also the packaging it shall be clearly stated that it is a condensing appliance and that local regulations may apply with respect to the discharge of condensate as effluent;
- type C<sub>6</sub> appliances shall carry a firmly attached label indicating limitations of materials suitable for use with the appliance including the maximum operating temperature that the flue shall be capable of withstanding during use. The label shall draw the attention to the installation instructions on this subject, and shall be located near the flue gas outlet.