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; cgdcX]b`g\_]d`bg\_] [ fYb\_] `nfU\_Ug`df]g]bc`\_cbj Y\_W]c`nUc [ fYj Ub`Y`dfcglcfcj žn  
ja Ybg\_c`a c `c`Xc`j`\_`1 bc`+\$`\_K žVfYn`j Ybh]`Urcf`U`nU`n [ cfYj Ub]`nfU`\_]b#J]  
dfcXi`\_H`n [ cfYj Ub`U!`8 cdc`b]c`5 %

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 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

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

**Ta slovenski standard je istoveten z: EN 778:1998/A1:2001**

**ICS:**

97.100.20

**SIST EN 778:1999/A1:2002**

**en**

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English version

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This amendment A1 modifies the European Standard EN 778:1998; it was approved by CEN on 18 August 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for inclusion of this amendment into the relevant national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This amendment 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 Management Centre 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

Management Centre: rue de Stassart, 36 B-1050 Brussels

## Foreword

This Amendment EN 778:1998/A1:2001 to the EN 778:1998 has been prepared by Technical Committee CEN/TC 179 "Gas-fired air heaters", the secretariat of which is held by NEN.

This Amendment to the European Standard EN 778:1998 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by March 2002, and conflicting national standards shall be withdrawn at the latest by March 2002.

This Amendment to the European Standard EN 778:1998 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).

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.

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## 2 Normative references

Add:

"CR 1404 Determination of emissions from appliances burning gaseous fuels during type testing"

### 5.2.5.3 Other pollutants

Add subclause 5.2.5.3 with following text:

Under the test and calculation conditions of 6.3.5.5, the NO<sub>x</sub> concentration in the dry air-free products of combustion shall not exceed 260 mg/kWh or the manufacturer's declared maximum concentration, whichever is the lower. However, for appliances intended to use only third family gases, the limit NO<sub>x</sub> value is multiplied by a factor of 1,60. For appliances intended to use propane only, the limit NO<sub>x</sub> value is multiplied by a factor of 1,50.

### 6.3.5.5 Other pollutants

Add subclause 6.3.5.5 with following text:

#### 6.3.5.5.1 General

The appliance is installed as specified in 6.3.5.1.

For appliances intended to use second and third family gases, the tests are carried out with reference gas G 20. For appliances intended to use only G 25, the tests are carried out with reference gas G 25. For appliances intended to use only third family gases, the tests are carried out with reference gas G 30. For appliances intended to use propane only, the tests are carried out with reference gas G 31.

The appliance is adjusted to its nominal heat input and, where appropriate, to other heat inputs provided by the controls.

The NO<sub>x</sub> measurements are carried out when the appliance is at thermal equilibrium, conforming with details given in CR 1404.

The reference conditions for the combustion air are:

- temperature : 20 °C;
- humidity : 10 g H<sub>2</sub>O /kg air.

If the test conditions are different from these reference conditions, it will be necessary to correct the NO<sub>x</sub> values as specified below.

$$NO_{x,0} = NO_{x,m} + \frac{0,02 NO_{x,m} - 0,34}{1 - 0,02 (h_m - 10)} (h_m - 10) + 0,85 (20 - T_m)$$

Where

NO<sub>x,0</sub> is the value of NO<sub>x</sub> corrected to the reference conditions expressed in milligram per kilowatt hour (mg/kWh);

NO<sub>x,m</sub> is the NO<sub>x</sub> measured at  $h_m$  and  $T_m$  in milligram per kilowatt hour (mg/kWh) in the range 50 mg/kWh to 300 mg/kWh;

$h_m$  is humidity during the measurement of NO<sub>x,m</sub> in g/kg in the range 5 g/kg to 15 g/kg;

$T_m$  is the ambient temperature during the measurement of NO<sub>x,m</sub> in °C in the range 15 °C to 25 °C.

The measured NO<sub>x</sub> values are weighted in accordance with 6.3.5.5.2. It is checked that the weighted NO<sub>x</sub> value does not exceed the limit value stated in 5.2.5.3.

For the calculation of conversions of NO<sub>x</sub>, see Annex G.

#### 6.3.5.5.2 Weighting

The measured NO<sub>x</sub> values are weighted using the formulae below, which take into account the efficiency of the appliance, its heat capacity and its usage characteristics.

On/off appliances: 
$$E_{Q_n} \cdot \frac{9 \eta_{ref}}{10 \eta_{Q_n}}$$

High/low appliances: 
$$0,5 E_{Q_n} \cdot \frac{9 \eta_{ref}}{10 \eta_{Q_n}} + 0,5 E_{Q_{min}} \cdot \frac{9 \eta_{ref}}{10 \eta_{Q_{min}}}$$

Modulating appliances: 
$$0,2 E_{Q_n} \cdot \frac{9 \eta_{ref}}{10 \eta_{Q_n}} + 0,8 E_{Q_{min}} \cdot \frac{9 \eta_{ref}}{10 \eta_{Q_{min}}}$$

Where

$E_{Q_n}$  is the emission figure at nominal heat input;

$E_{Q_{min}}$  is the emission figure at minimum heat input;

$\eta_{ref}$  is the reference efficiency, i.e. the applicable efficiency requirement stated in 5.2;

$\eta_{Q_n}$  is the efficiency at nominal heat input;

$\eta_{Q_{min}}$  is the efficiency at minimum heat input.

NOTE: See also 5.3, where  $Q_{min}$  is understood to be any heat input lower than the nominal heat input, and for which both the efficiency and the NO<sub>x</sub> emission figure are measured.

### 7.3.7 Emissions

Add subclause 7.3.7 with following text:

The manufacturer may choose to declare the weighted NO<sub>x</sub> emission value or to express it by a class according to the following list:

- Class 1, for values not exceeding 250 mg/kWh;
- Class 2, for values not exceeding 200 mg/kWh;
- Class 3, for values not exceeding 150 mg/kWh;
- Class 4, for values not exceeding 100 mg/kWh;
- Class 5, for values not exceeding 50 mg/kWh.

The value or class may be marked on the appliance or contained in the technical data.

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## Annex G

(informative)

### Calculation of conversions of NO<sub>x</sub>

**Table G.1 - Conversion of the emission value of NO<sub>x</sub> for first family gases**

$1 \times 10^{-6} = 2,054 \text{ mg/m}^3$ $(1 \times 10^{-6} = 1 \text{ cm}^3/\text{m}^3)$		G 110	
		mg/kWh	mg/MJ
O <sub>2</sub> = 0 %	$1 \times 10^{-6} =$	1,714	0,476
	$1 \text{ mg/m}^3 =$	0,834	0,232
O <sub>2</sub> = 3 %	$1 \times 10^{-6} =$	2,000	0,556
	$1 \text{ mg/m}^3 =$	0,974	0,270

**Table G.2 - Conversion of the emission value of NO<sub>x</sub> for second family gases**

$1 \times 10^{-6} = 2,054 \text{ mg/m}^3$ $(1 \times 10^{-6} = 1 \text{ cm}^3/\text{m}^3)$		G 20		G 25	
		mg/kWh	mg/MJ	mg/kWh	mg/MJ
O <sub>2</sub> = 0 %	$1 \times 10^{-6} =$	1,764	0,490	1,797	0,499
	$1 \text{ mg/m}^3 =$	0,859	0,239	0,875	0,243
O <sub>2</sub> = 3 %	$1 \times 10^{-6} =$	2,059	0,572	2,098	0,583
	$1 \text{ mg/m}^3 =$	1,002	0,278	1,021	0,284

**Table G.3 - Conversion of the emission value of NO<sub>x</sub> for third family gases**

$1 \times 10^{-6} = 2,054 \text{ mg/m}^3$ $(1 \times 10^{-6} = 1 \text{ cm}^3/\text{m}^3)$		G 30		G 31	
		mg/kWh	mg/MJ	mg/kWh	mg/MJ
O <sub>2</sub> = 0 %	$1 \times 10^{-6} =$	1,792	0,498	1,778	0,494
	$1 \text{ mg/m}^3 =$	0,872	0,242	0,866	0,240
O <sub>2</sub> = 3 %	$1 \times 10^{-6} =$	2,091	0,581	2,075	0,576
	$1 \text{ mg/m}^3 =$	1,018	0,283	1,010	0,281

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