SLOVENSKI STANDARD

SIST EN 777-1:1999/A1:2002

01-april-2002

Stropna cevna sevala z veļ plinskimi gorilniki za nestanovanjske prostore ï 1. del: Sistem D, varnost - Dopolnilo A1

Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use - Part 1: System D, safety

Gasgeräte-Heizstrahler - Dunkelstrahlersysteme mit mehreren Brennern mit Gebläse für gewerbliche und industrielle Anwendung - Teil 1: System D, Sicherheit

Tubes radiants suspendus a multi-bruleurs a usage non-domestique utilisant les combustibles gazeux - Partie 1: Systeme D, sécurité

Ta slovenski standard je istoveten z: **EN 777-1:1999/A1:2001**

ICS:

97.100.20

SIST EN 777-1:1999/A1:2002 **en**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 777-3:1999/A1

February 2001

ICS 97.100.20

English version

Multi-burner gas-fired overhead radiant tube heater systems for non-domestic use - Part 3: System F, safety

Tubes radiants suspendus à multi-brûleurs à usage non-domestique utilisant les combustibles gazeux - Partie 3: Système F, sécurité

Gasgeräte-Heizstrahler - Dunkelstrahlersysteme mit mehreren Brennern mit Gebläse für gewerbliche und industrielle Anwendung - Teil 3: System F, Sicherheit

This amendment A1 modifies the European Standard EN 777-3:1999; it was approved by CEN on 27 November 2000.

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.

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

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Ref. No. EN 777-3:1999/A1:2001 E

Foreword

This Amendment EN 777-3:1999/A1:2001 to EN 777-3:1999 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 Amendment to the European Standard EN 777-3:1999 shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by August 2001, and conflicting national standards shall be withdrawn at the latest by August 2001.

This Amendment to the European Standard EN 777-3:1999 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).

This Amendment modifies EN 777-3:1999. It has been prepared to incorporate requirements and test methods concerning NO_X emissions of non-domestic multi-burner gas-fired overhead radiant tube heater systems.

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.

Contents list

In the list, delete 'Annex H (informative) Bibliography' and insert the following:

'Annex H (informative) Example of calculation of the weighting factors for a system with several rates

Annex I (informative) Calculations of conversions of NO_x '

In the list, after 'Annex ZA (informative) Clauses of this European Standard addressing essential requirements or other provisions of EU Directives' insert the following:

'Bibliography'

2 Normative references

Add the following reference:

'CR 1404: 1994 Determination of emissions from appliances burning gaseous fuels during type-testing'

6 Operating Requirements

Add 6.8 as follows:

'6.8 Measurement of oxides of Nitrogen, NO_x

The manufacturer shall declare the NO_x class in Table **9** that is applicable to the system.

When measured in accordance with the method of test in 7.4.1, the NO_x concentration(s) in the dry, air free products of combustion shall be such that the weighted NO_x value, determined as appropriate in accordance with 7.4.2, does not exceed the maximum NO_x concentration of the NO_x class declared by the manufacturer.'

Table 9 - NO_x classes

NO_x Classes	Maximum NO_x concentration mg/kWh
1	260
2	200
3	150
4	100

7 Test Methods

Add 7.4 as follows:

'7.4 Other pollutants

7.4.1 General

The system is installed as specified in **7.1.6** and connected to a flue as described in **7.1.6.2.**

For systems intended to use second family gases, the tests are carried out using test gas G 20, if the system category is such that this test gas is used as a reference gas. If G 20 is not used as a reference gas, the tests are carried out using G 25 exclusively.

For systems intended to use all gases of the third family, the tests are carried out with reference gas G 30 and the maximum NO_x concentration (see Table 9) is multiplied by a factor of 1,30.

For systems intended to use propane only, the tests are carried out with reference gas G 31 and the maximum NO_x concentration is multiplied by a factor of 1,20.

The system is adjusted to its nominal heat input.

The NO_x measurements are carried out when the system is at thermal equilibrium, conforming to details given in CR 1404:1994.

No wet meters are used.

The reference conditions for the combustion air are:

- temperature: 20 °C;
- relative humidity H_o: 10 g(H_2O) /kg(air).

If the test conditions are different to these reference conditions, it is necessary to correct the NO_x values as specified below.

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

where:

$NO_{x,reference}$ is the value of NO_x corrected to the reference conditions expressed in milligram per kilowatthour (mg/kWh);

$NO_{x,m}$ is the NO_x measured at h_m and T_m expressed in milligram per kilowatthour (mg/kWh) in the range 50 mg/kWh to 300 mg/kWh;

NOTE. Where NO_x is measured in ppm, convert it to mg/kWh in accordance with Annex I.

h_m is the humidity during the measurement of $NO_{x,m}$ expressed in gram per kilogram (g/kg) in the range 5 g/kg to 15 g/kg;

T_m is the ambient temperature during the measurement of $NO_{x,m}$ expressed in degrees Celsius (°C) in the range 15 °C to 25 °C.

The measured NO_x values are weighted in accordance with 7.4.2.

It is checked that the weighted NO_x values comply with the values of Table 9, depending on the NO_x class chosen.

7.4.2 Weighting

7.4.2.1 General

The weighting of the NO_x measured values shall be as described in 7.4.2.2 to 7.4.2.5, on the basis of the values in Table 10.

Table 10 - Weighting factors

Partial heat input $Q_{pi,\%}$ as % of Q_n	70	60	40	20
Weighting factor F_{pi}	0,15	0,25	0,30	0,30

For range rated systems Q_n is replaced by Q_a, the arithmetic mean of the maximum and the minimum input of the range, as stated by the manufacturer.

7.4.2.2 On/off systems

The NO_x concentration is measured (and possibly corrected as specified in 7.4.1) at the nominal heat input, Q_n.

7.4.2.3 Systems with several rates

The NO_x concentration is measured (and possibly corrected as specified in 7.4.1) at the partial heat input corresponding to each of the rates and weighted in accordance with Table 10.

If necessary, the weighting factor specified in Table 10 is recalculated for each rate as specified below.

If the heat inputs of two rates are between the partial heat inputs specified in Table 10, it is necessary to apportion the weighting factor between the heat inputs of the higher and lower rates, as follows:

$$F_{\text{p,high rate}} = F_{\text{pi}} \bullet \frac{Q_{\text{pi,\%}} - Q_{\text{low rate,\%}}}{Q_{\text{high rate,\%}} - Q_{\text{low rate,\%}}} \bullet \frac{Q_{\text{high rate,\%}}}{Q_{\text{pi,\%}}}$$

$$F_{\text{p,low rate}} = F_{\text{pi}} - F_{\text{p,high rate}}$$

If the heat inputs of two rates cover more than one partial heat input specified in Table 10, then it is necessary to apportion each weighting factor between the heat inputs of the higher and lower rate as indicated above.

The weighting NO_x value, $NO_{x,pond}$, is then equal to the sum of the products of the measured NO_x values at the different rates, multiplied by their weighting factor, calculated as specified below:

$$\text{NO}_{\text{x,pond}} = \sum \left(\text{NO}_{\text{x,mes high}} \bullet F_{\text{p,high rate}} \right)$$

(See calculation example in Annex H and calculation of conversions of NO_x in Annex I.)

7.4.2.4 Modulating systems in which the minimum modulating heat input is no greater than 0,20 Q_n

The NO_x concentration is measured (and possibly corrected as specified in 7.4.1) at the partial heat inputs specified in Table10.

The weighted NO_x value, $NO_{x,pond}$, is determined as specified below:

$$\text{NO}_{\text{x,pond}} = 0{,}15 \times \text{NO}_{\text{x,mes(70)}} + 0{,}25 \times \text{NO}_{\text{x,mes(60)}} + 0{,}3 \times \text{NO}_{\text{x,mes(40)}} + 0{,}3 \times \text{NO}_{\text{x,mes(20)}}$$

7.4.2.5 Modulating systems in which the minimum modulating heat input is greater than 0,20 Q_n

The NO_x concentration is measured (and possibly corrected as specified in 7.4.1) at the minimum modulating rate and at the partial heat inputs $Q_{pi,\%}$, specified in Table 10, which are greater than the minimum modulation rate.

The weighting factors for the partial heat inputs in Table 10, which are no greater than the minimum modulation rate are added and multiplied by this heat input.

The weighted NO_x value, $NO_{x,pond}$, is therefore determined as specified below:

$$NO_{x,pond} = NO_{x,mes,Qmin} \bullet \sum F_{pi}(Q \le Q_{min}) + \sum (NO_{x,mes} \bullet F_{pi})$$

where:

Q_{min} is the minimum modulating heat input, expressed in kilowatt (kW);

Q_n is the nominal heat input, expressed in kilowatt (kW);

Q_a is the arithmetic mean heat input of Q_n and Q_{min}, expressed in kilowatt (kW);

$Q_{pi,\%}$ is the partial heat input for weighting, expressed in percent of Q_n;

F_{pi} is the weighting factor corresponding to the partial heat input $Q_{pi,\%}$;

$NO_{x,mes}$ is the measured (and possibly corrected) value, expressed in milligram per kilowatthour (mg/kWh):

- at the partial heat input : $NO_{x,mes\ (70)}$, $NO_{x,mes\ (60)}$, ... ;
- at the minimum heat input (modulating systems) : $NO_{x,mes,Qmin}$;
- at the heat input corresponding to a single rate : $NO_{x,mes(rate)}$;

$Q_{high\ rate,\%}$ is the heat input rate greater than $Q_{pi,\%}$;

$Q_{low\ rate,\%}$ is the heat input rate less than $Q_{pi,\%}$;

$F_{p,high\ rate}$ is the apportioned weighting factor, high rate;

$F_{p,low\ rate}$ is the apportioned weighting factor, low rate.'