

## ANNEX V

## Technical provisions relating to combustion plants

## PART 1

**Emission limit values for combustion plants referred to in Article 30(2)**

1. All emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O<sub>2</sub> content of 6 % for solid fuels, 3 % for combustion plants, other than gas turbines and gas engines using liquid and gaseous fuels and 15 % for gas turbines and gas engines.
2. Emission limit values (mg/Nm<sup>3</sup>) for SO<sub>2</sub> for combustion plants using solid or liquid fuels with the exception of gas turbines and gas engines

<b>Total rated thermal input (MW)</b>	<b>Coal and lignite and other solid fuels</b>	<b>Biomass</b>	<b>Peat</b>	<b>Liquid fuels</b>
50-100	400	200	300	350
100-300	250	200	300	250
> 300	200	200	200	200

Combustion plants, using solid fuels which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, and which do not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, shall be subject to an emission limit value for SO<sub>2</sub> of 800 mg/Nm<sup>3</sup>.

Combustion plants using liquid fuels, which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, and which do not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, shall be subject to an emission limit value for SO<sub>2</sub> of 850 mg/Nm<sup>3</sup> in case of plants with a total rated thermal input not exceeding 300 MW and of 400 mg/Nm<sup>3</sup> in case of plants with a total rated thermal input greater than 300 MW.

A part of a combustion plant discharging its waste gases through one or more separate flues within a common stack, and which does not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, may be subject to the emission limit values set out in the preceding two paragraphs in relation to the total rated thermal input of the entire combustion plant. In such cases the emissions through each of those flues shall be monitored separately.

3. Emission limit values (mg/Nm<sup>3</sup>) for SO<sub>2</sub> for combustion plants using gaseous fuels with the exception of gas turbines and gas engines

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In general	35
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Liquefied gas	5
Low calorific gases from coke oven	400
Low calorific gases from blast furnace	200

Combustion plants, firing low calorific gases from gasification of refinery residues, which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, shall be subject to an emission limit value for SO<sub>2</sub> of 800 mg/Nm<sup>3</sup>.

4. Emission limit values (mg/Nm<sup>3</sup>) for NO<sub>x</sub> for combustion plants using solid or liquid fuels with the exception of gas turbines and gas engines

Total rated thermal input (MW)	Coal and lignite and other solid fuels	Biomass and peat	Liquid fuels
50-100	300 450 in case of pulverised lignite combustion	300	450
100-300	200	250	200 <sup>a</sup>
> 300	200	200	150 <sup>a</sup>

<sup>a</sup> The emission limit value is 450 mg/Nm<sup>3</sup> for the firing of distillation and conversion residues from the refining of crude-oil for own consumption in combustion plants with a total rated thermal input not exceeding 500 MW which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003.

Combustion plants in chemical installations using liquid production residues as non-commercial fuel for own consumption with a total rated thermal input not exceeding 500 MW which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, shall be subject to an emission limit value for NO<sub>x</sub> of 450 mg/Nm<sup>3</sup>.

Combustion plants using solid or liquid fuels with a total rated thermal input not exceeding 500 MW which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, and which do not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, shall be subject to an emission limit value for NO<sub>x</sub> of 450 mg/Nm<sup>3</sup>.

Combustion plants using solid fuels with a total rated thermal input greater than 500 MW, which were granted a permit before 1 July 1987 and which do not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, shall be subject to an emission limit value for NO<sub>x</sub> of 450 mg/Nm<sup>3</sup>.

Combustion plants using liquid fuels, with a total rated thermal input greater than 500 MW which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, and which do not operate more than 1 500 operating hours

per year as a rolling average over a period of 5 years, shall be subject to an emission limit value for NO<sub>x</sub> of 400 mg/Nm<sup>3</sup>.

A part of a combustion plant discharging its waste gases through one or more separate flues within a common stack, and which does not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, may be subject to the emission limit values set out in the preceding three paragraphs in relation to the total rated thermal input of the entire combustion plant. In such cases the emissions through each of those flues shall be monitored separately.

5. Gas turbines (including combined cycle gas turbines (CCGT)) using light and middle distillates as liquid fuels shall be subject to an emission limit value for NO<sub>x</sub> of 90 mg/Nm<sup>3</sup> and for CO of 100 mg/Nm<sup>3</sup>.

Gas turbines for emergency use that operate less than 500 operating hours per year are not covered by the emission limit values set out in this point. The operator of such plants shall record the used operating hours.

6. Emission limit values (mg/Nm<sup>3</sup>) for NO<sub>x</sub> and CO for gas fired combustion plants

	NO <sub>x</sub>	CO
Combustion plants firing natural gas with the exception of gas turbines and gas engines	100	100
Combustion plants firing blast furnace gas, coke oven gas or low calorific gases from gasification of refinery residues, with the exception of gas turbines and gas engines	200 <sup>d</sup>	—
Combustion plants firing other gases, with the exception of gas turbines and gas engines	200 <sup>d</sup>	—
Gas turbines (including CCGT), using natural gas <sup>a</sup> as fuel	50 <sup>bc</sup>	100
Gas turbines (including CCGT), using other gases as fuel	120	—
Gas engines	100	100

**a** Natural gas is naturally occurring methane with not more than 20 % (by volume) of inerts and other constituents.

**b** 75 mg/Nm<sup>3</sup> in the following cases, where the efficiency of the gas turbine is determined at ISO base load conditions:

- (i) gas turbines, used in combined heat and power systems having an overall efficiency greater than 75 %;
  - (ii) gas turbines used in combined cycle plants having an annual average overall electrical efficiency greater than 55 %;
  - (iii) gas turbines for mechanical drives.
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- c For single cycle gas turbines not falling into any of the categories mentioned under note (2), but having an efficiency greater than 35 % – determined at ISO base load conditions – the emission limit value for NO<sub>x</sub> shall be 50η/35 where η is the gas turbine efficiency at ISO base load conditions expressed as a percentage.
- d 300 mg/Nm<sup>3</sup> for such combustion plants with a total rated thermal input not exceeding 500 MW which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003.

For gas turbines (including CCGT), the NO<sub>x</sub> and CO emission limit values set out in the table contained in this point apply only above 70 % load.

For gas turbines (including CCGT) which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003, and which do not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, the emission limit value for NO<sub>x</sub> is 150 mg/Nm<sup>3</sup> when firing natural gas and 200 mg/Nm<sup>3</sup> when firing other gases or liquid fuels.

A part of a combustion plant discharging its waste gases through one or more separate flues within a common stack, and which does not operate more than 1 500 operating hours per year as a rolling average over a period of 5 years, may be subject to the emission limit values set out in the preceding paragraph in relation to the total rated thermal input of the entire combustion plant. In such cases the emissions through each of those flues shall be monitored separately.

Gas turbines and gas engines for emergency use that operate less than 500 operating hours per year are not covered by the emission limit values set out in this point. The operator of such plants shall record the used operating hours.

7. Emission limit values (mg/Nm<sup>3</sup>) for dust for combustion plants using solid or liquid fuels with the exception of gas turbines and gas engines

Total rated thermal input (MW)	Coal and lignite and other solid fuels	Biomass and peat	Liquid fuels <sup>a</sup>
50-100	30	30	30
100-300	25	20	25
> 300	20	20	20

- <sup>a</sup> The emission limit value is 50 mg/Nm<sup>3</sup> for the firing of distillation and conversion residues from the refining of crude oil for own consumption in combustion plants which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003.

8. Emission limit values (mg/Nm<sup>3</sup>) for dust for combustion plants using gaseous fuels with the exception of gas turbines and gas engines

In general	5
Blast furnace gas	10
Gases produced by the steel industry which can be used elsewhere	30

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## PART 2

### Emission limit values for combustion plants referred to in Article 30(3)

- All emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O<sub>2</sub> content of 6 % for solid fuels, 3 % for combustion plants other than gas turbines and gas engines using liquid and gaseous fuels and 15 % for gas turbines and gas engines.

In case of combined cycle gas turbines with supplementary firing, the standardised O<sub>2</sub> content may be defined by the competent authority, taking into account the specific characteristics of the installation concerned.

- Emission limit values (mg/Nm<sup>3</sup>) for SO<sub>2</sub> for combustion plants using solid or liquid fuels with the exception of gas turbines and gas engines

Total rated thermal input (MW)	Coal and lignite and other solid fuels	Biomass	Peat	Liquid fuels
50-100	400	200	300	350
100-300	200	200	300 250 in case of fluidised bed combustion	200
> 300	150 200 in case of circulating or pressurised fluidised bed combustion	150	150 200 in case of fluidised bed combustion	150

- Emission limit values (mg/Nm<sup>3</sup>) for SO<sub>2</sub> for combustion plants using gaseous fuels with the exception of gas turbines and gas engines

In general	35
Liquefied gas	5
Low calorific gases from coke oven	400
Low calorific gases from blast furnace	200

- Emission limit values (mg/Nm<sup>3</sup>) for NO<sub>x</sub> for combustion plants using solid or liquid fuels with the exception of gas turbines and gas engines

Total rated thermal input (MW)	Coal and lignite and other solid fuels	Biomass and peat	Liquid fuels
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50-100	300 400 in case of pulverised lignite combustion	250	300
100-300	200	200	150
> 300	150 200 in case of pulverised lignite combustion	150	100

5. Gas turbines (including CCGT) using light and middle distillates as liquid fuels shall be subject to an emission limit value for NO<sub>x</sub> of 50 mg/Nm<sup>3</sup> and for CO of 100 mg/Nm<sup>3</sup>

Gas turbines for emergency use that operate less than 500 operating hours per year are not covered by the emission limit values set out in this point. The operator of such plants shall record the used operating hours.

6. Emission limit values (mg/Nm<sup>3</sup>) for NO<sub>x</sub> and CO for gas fired combustion plants

	NO <sub>x</sub>	CO
Combustion plants other than gas turbines and gas engines	100	100
Gas turbines (including CCGT)	50 <sup>a</sup>	100
Gas engines	75	100

<sup>a</sup> For single cycle gas turbines having an efficiency greater than 35 % – determined at ISO base load conditions – the emission limit value for NO<sub>x</sub> shall be  $50 \times \eta / 35$  where  $\eta$  is the gas turbine efficiency at ISO base load conditions expressed as a percentage.

For gas turbines (including CCGT), the NO<sub>x</sub> and CO emission limit values set out in this point apply only above 70 % load.

Gas turbines and gas engines for emergency use that operate less than 500 operating hours per year are not covered by the emission limit values set out in this point. The operator of such plants shall record the used operating hours.

7. Emission limit values (mg/Nm<sup>3</sup>) for dust for combustion plants using solid or liquid fuels with the exception of gas turbines and gas engines

Total rated thermal input (MW)	
50-300	20
> 300	10 20 for biomass and peat

8. Emission limit values (mg/Nm<sup>3</sup>) for dust for combustion plants using gaseous fuels with the exception of gas turbines and gas engines

In general	5
Blast furnace gas	10
Gases produced by the steel industry which can be used elsewhere	30

### PART 3

#### Emission monitoring

1. The concentrations of SO<sub>2</sub>, NO<sub>x</sub> and dust in waste gases from each combustion plant with a total rated thermal input of 100 MW or more shall be measured continuously.

The concentration of CO in waste gases from each combustion plant firing gaseous fuels with a total rated thermal input of 100 MW or more shall be measured continuously.

2. The competent authority may decide not to require the continuous measurements referred to in point 1 in the following cases:
  - (a) for combustion plants with a life span of less than 10 000 operational hours;
  - (b) for SO<sub>2</sub> and dust from combustion plants firing natural gas;
  - (c) for SO<sub>2</sub> from combustion plants firing oil with known sulphur content in cases where there is no waste gas desulphurisation equipment;
  - (d) for SO<sub>2</sub> from combustion plants firing biomass if the operator can prove that the SO<sub>2</sub> emissions can under no circumstances be higher than the prescribed emission limit values.
3. Where continuous measurements are not required, measurements of SO<sub>2</sub>, NO<sub>x</sub>, dust and, for gas fired plants, also of CO shall be required at least once every 6 months.
4. For combustion plants firing coal or lignite, the emissions of total mercury shall be measured at least once per year.
5. As an alternative to the measurements of SO<sub>2</sub> and NO<sub>x</sub> referred to in point 3, other procedures, verified and approved by the competent authority, may be used to determine the SO<sub>2</sub> and NO<sub>x</sub> emissions. Such procedures shall use relevant CEN standards or, if CEN standards are not available, ISO, national or other international standards which ensure the provision of data of an equivalent scientific quality.
6. The competent authority shall be informed of significant changes in the type of fuel used or in the mode of operation of the plant. The competent authority shall decide whether the monitoring requirements laid down in points 1 to 4 are still adequate or require adaptation.
7. The continuous measurements carried out in accordance with point 1 shall include the measurement of the oxygen content, temperature, pressure and water vapour content of the waste gases. The continuous measurement of the water vapour content of the waste gases shall not be necessary, provided that the sampled waste gas is dried before the emissions are analysed.
8. Sampling and analysis of relevant polluting substances and measurements of process parameters as well as the quality assurance of automated measuring systems and the

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reference measurement methods to calibrate those systems shall be carried out in accordance with CEN standards. If CEN standards are not available, ISO, national or other international standards which ensure the provision of data of an equivalent scientific quality shall apply.

The automated measuring systems shall be subject to control by means of parallel measurements with the reference methods at least once per year.

The operator shall inform the competent authority about the results of the checking of the automated measuring systems.

9. At the emission limit value level, the values of the 95 % confidence intervals of a single measured result shall not exceed the following percentages of the emission limit values:

Carbon monoxide	10 %
Sulphur dioxide	20 %
Nitrogen oxides	20 %
Dust	30 %

10. The validated hourly and daily average values shall be determined from the measured valid hourly average values after having subtracted the value of the confidence interval specified in point 9.

Any day in which more than three hourly average values are invalid due to malfunction or maintenance of the automated measuring system shall be invalidated. If more than 10 days over a year are invalidated for such situations the competent authority shall require the operator to take adequate measures to improve the reliability of the automated measuring system.

11. In the case of plants which must comply with the rates of desulphurisation referred to in Article 31, the sulphur content of the fuel which is fired in the combustion plant shall also be regularly monitored. The competent authorities shall be informed of substantial changes in the type of fuel used.

## PART 4

### Assessment of compliance with emission limit values

1. In the case of continuous measurements, the emission limit values set out in Parts 1 and 2 shall be regarded as having been complied with if the evaluation of the measurement results indicates, for operating hours within a calendar year, that all of the following conditions have been met:
  - (a) no validated monthly average value exceeds the relevant emission limit values set out in Parts 1 and 2;
  - (b) no validated daily average value exceeds 110 % of the relevant emission limit values set out in Parts 1 and 2;
  - (c) in cases of combustion plants composed only of boilers using coal with a total rated thermal input below 50 MW, no validated daily average value exceeds 150 % of the relevant emission limit values set out in Parts 1 and 2,



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- (d) 95 % of all the validated hourly average values over the year do not exceed 200 % of the relevant emission limit values set out in Parts 1 and 2.

The validated average values are determined as set out in point 10 of Part 3.

For the purpose of the calculation of the average emission values, the values measured during the periods referred to in Article 30(5) and (6) and Article 37 as well as during the start-up and shut-down periods shall be disregarded.

2. Where continuous measurements are not required, the emission limit values set out in Parts 1 and 2 shall be regarded as having been complied with if the results of each of the series of measurements or of the other procedures defined and determined according to the rules laid down by the competent authorities do not exceed the emission limit values.

## PART 5

### Minimum rate of desulphurisation

1. Minimum rate of desulphurisation for combustion plants referred to in Article 30(2)

Total rated thermal input (MW)	Minimum rate of desulphurisation	
	Plants which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003	Other plants
50-100	80 %	92 %
100-300	90 %	92 %
> 300	96 % <sup>a</sup>	96 %

<sup>a</sup> For combustion plants firing oil shale, the minimum rate of desulphurisation is 95 %.

2. Minimum rate of desulphurisation for combustion plants referred to in Article 30(3)

Total rated thermal input (MW)	Minimum rate of desulphurisation
50-100	93 %
100-300	93 %
> 300	97 %

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## PART 6

### **Compliance with rate of desulphurisation**

The minimum rates of desulphurisation set out in Part 5 of this Annex shall apply as a monthly average limit value.

## PART 7

### **Average emission limit values for multi-fuel firing combustion plants within a refinery**

Average emission limit values (mg/Nm<sup>3</sup>) for SO<sub>2</sub> for multi-fuel firing combustion plants within a refinery, with the exception of gas turbines and gas engines, which use the distillation and conversion residues from the refining of crude-oil for own consumption, alone or with other fuels:

- (a) for combustion plants which were granted a permit before 27 November 2002 or the operators of which had submitted a complete application for a permit before that date, provided that the plant was put into operation no later than 27 November 2003: 1 000 mg/Nm<sup>3</sup>;
- (b) for other combustion plants: 600 mg/Nm<sup>3</sup>.

These emission limit values shall be calculated at a temperature of 273,15 K, a pressure of 101,3 kPa and after correction for the water vapour content of the waste gases and at a standardised O<sub>2</sub> content of 6 % for solid fuels and 3 % for liquid and gaseous fuels.