Swedish Environmental Protection Agency's Statutes

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The Swedish Environmental Protection Agency's regulations on measuring equipment for determining environmental charge on emissions of nitrogen oxides in energy production;

adopted 8 December 2016.

The Swedish Environmental Protection Agency stipulates the following based on section 2 of the Environmental Charge on Emissions of Nitrogen Oxides in Energy Production Ordinance (1991:339)[1].

Scope of the regulations

Section 1 These regulations apply to combustion plants covered by the Environmental Charge on Emissions of Nitrogen Oxides in Energy Production Act (1990:613).

The regulations include requirements for measuring equipment used for continuous measurement and recording of nitrogen oxide emissions according to section 5, paragraph 2 of the same act.

Definitions

Section 2 Unless otherwise specifically stated in these regulations, formulations in the regulations have the same meaning as in the Environmental Charge on Emissions of Nitrogen Oxides in Energy Production Act (1991:613) and in the Environmental Charge on Emissions of Nitrogen Oxides in Energy Production Ordinance (1990:339)

These regulations use the following terms with provided definitions.

[1] See Directive (EU) 2015/1535 of the European Parliament and of the Council of 9 September 2015 laying down a procedure for the provision of information in the field of technical regulations and of rules on Information Society services.

Term	Definition
Accredited laboratory	The laboratories that meet the requirements in section 17.
Subject to charge	The operator subject to the charge, as defined in section 4 of the Environmental Charge on Emissions of Nitrogen Oxides in Energy Production Act (1990:613).
Calculating flue gas flow	Determining flue gas flow by a calculation based on measured or calculated amount of added fuel, fuel data and continuously measured O_2 or CO_2 content in the flue gas.
Fuel data	Values for a fuel's calorific value, moisture content, ash content and content of carbon, hydrogen, oxygen, nitrogen and sulphur.
Fuel index	A ratio used to calculate flue gas flow. This ratio is calculated from an equation with dry stoichiometric flue gas flow (g_{0t}), divided by the effective dry calorific value of the fuel, or in another equivalent way.
CO_2	Carbon dioxide
Fixed measuring equipment	The entire measurement system used to report the NO_x emissions from the production unit. Fixed measuring equipment refers to both measurement of the gas content in the flue gas and determination of the flue gas flow, including power meters and temperature sensors. Fixed measuring equipment includes the entire chain from the sampling point with measurement instruments and calculations to reporting of measurement values and measurement results digitally or in another form.
Gas content	Content of NO_x, NO, NO_2, O_2 or CO_2.
Valid measured values	Measured values recorded with fixed measuring equipment that meets the requirements of these regulations.

Calibration function	Linear relationship between the values from the control measuring system and the fixed measuring system which is produced according to the SS-EN 14181 standard at QAL2. The fixed measuring system is calibrated for NO_x even if it only measures NO.
Control measuring equipment	The entire measurement system of the accredited laboratory. This measuring equipment includes the entire chain from the sampling point with measurement instruments and calculations to reporting of measurement values.
Converter	Equipment that converts NO_2 to NO in the sample gas before determining the NO_x content in measuring equipment.
Conversion rate	The percentage of the NO_2 in the flue gas converted to NO when a converter is used.
Continuous control	Regular quality assurance with comparison against reference material.
Measuring of flue gas flow	Determination of flue gas flow based on direct measurements of physical quantities in a flue gas duct.
Lower detection limit	The concentration of a substance that causes a measurement signal significantly different from the background signal, i.e. lowest measurable concentration.
NO	Nitrogen monoxide
Zero point	Expected measurement result when the reference material does not contain the substance to be measured (i.e. zero).
Zero point deviation	The absolute value of the difference between the zero point and instrument reading when reference material for the zero point is used.
NO_x	Nitrogen oxides, the sum of NO and NO_2, expressed as NO_2.
NO_2	Nitrogen dioxide
O_2	Oxygen (or oxygen gas)

Production unit	The production unit as defined in section 2 of the Environmental Charge on Emissions of Nitrogen Oxides in Energy Production Act (1990:613).
Sample gas	A partial gas flow extracted from the flue gas duct for analysis in measuring equipment.
Reference material	Gas or equivalent material where the composition and content have been sufficiently well determined to use for zero or reference point determination.
Reference point	Expected measurement result when the measuring instrument is checked with reference material for the upper concentration range of the measuring instrument. The upper concentration range refers to expected measurement values during normal operation of the production unit.
Reference point deviation	The absolute value of the difference between the reference point and the instrument reading when reference material is used for the reference point.
Procedure	Defined way of performing an activity or process, including instructions on how to prevent unwanted events and how to respond to them properly if they do occur. A procedure is documented, known to the relevant personnel and followed. Deviations from a procedure are documented.
Trace element method	Standardised method for determining flue gas flow by measuring the velocity or concentration of a trace element in the flue gas duct.
Response time	The time that the measuring instrument needs to go from the zero point to 90 percent of the instrument reading at the reference point.
Alternating measurements	When a single measuring equipment is used for alternating measurements in more than one flue gas duct, alternatively for several points in the same flue gas duct.

Sampling point

Section 3 Sampling point for extracting sample gas and for direct measurements of gas contents and flue gas flow must be located in the flue gas duct after any possible purification equipment for the emission being measured. The sampling point must be chosen to obtain representative measurement values.

Determining gas content

Section 4 NO_x is to be determined according to any of the following options:

1. NO and NO_2 are separately measured continuously and are registered as NO and NO_2 or as the total of NO_x.
2. NO and NO_2 are measured and registered continuously as NO_x using a NO analysis instrument equipped with a converter.
3. NO is measured and recorded continuously with a fixed percentage markup of 2.0 percent NO_2 if the portion of NO_2 is equal to or less than 2.0 percent.
4. NO is measured and recorded continuously with a fixed percentage markup of the portion of NO_2. If the portion of NO_2 is greater than 2.0 percent, the actual percentage that has been determined is to be used.
5. NO is measured and recorded continuously with a fixed percentage markup of 10 percent NO_2 if the portion of NO_2 has not been determined during the reporting period.
6. Using the calibration function for NO_x according to QAL2 and AST in SS-EN 14181.

In items 3 and 4, the proportion of NO_2 of the NO_x content must be determined under representative operating conditions at least once per calendar year and after such changes in the combustion plant that may change the emission conditions.

For production units using alternatives 3 or 4 and that have less than 2,000 operating hours annually, the proportion of NO_2 only needs to be determined at least once every three years a charge is due.

Section 5 When a converter is used, the conversion rate must be at least 90 percent. Procedures for control and maintenance must be in place to ensure that the converter meets this requirement. Converter control is to be conducted in accordance with applicable standards.

Section 6 Fixed measuring equipment and measuring range for determining gas contents shall be adapted to the normally occurring operating conditions.

The measuring instrument must show good linearity. The linearity is to be confirmed at least every three calendar years. No point may deviate more than 4 percent from the ideal line.

The deviation is calculated as a percentage of the value of the reference point.

Response time may be a maximum of 200 seconds.

The lower detection limit is to be established at least once per calendar year.

Procedures are to be in place for care, control and maintenance of measuring equipment. Actions during care, control and maintenance are to be documented.

All known faults with the fixed measuring equipment must be rectified even if the equipment meets the requirements in these regulations.

Section 7 The following applies during continuous control:

1. Measuring equipment for determining the gas contents used for reporting NO_x emissions must be controlled at least once per calendar month. The control is to establish and document zero point deviation and reference point deviation.
2. The defined uncertainty in the value of the reference material may not exceed ± 2 percent. Reference material for O_2 may consist of air.
3. Measuring equipment is to be adjusted at the latest when one of the below limits for deviation is exceeded.

   Zero point deviation > 4.0 percent
   Reference point deviation > 4.0 percent

   However, the deviation limits for NO_x, NO and NO_2 are not exceeded as long as the deviation is less than 2.0 ppm. The deviation limits in percentage refer to the percentage of the reference point's content.

   Adjustment of measuring equipment is to be documented.
4. If any of the limits for zero point deviation or reference point deviation are exceeded, measured values from the period after the last approved control are not valid.

Determining flue gas flow

Section 8 Flue gas flow can be determined through measurement or calculation. A method that gives representative results must be used.

Procedures are to be in place for care, control and maintenance of measuring equipment for measurement and calculation of flue gas flow. Measuring equipment must be maintained in accordance with the manufacturer's or supplier's recommendations. Actions during care, control and maintenance are to be documented.

Measuring of flue gas flow

Section 9 If the flue gas flow is determined by measurement, equipment is to be chosen that is adapted to the conditions in the flue gas duct.

Calculating flue gas flow

Section 10 The following applies if the flue gas flow is calculated:

1. It must be possible to verify calculation formulas, fuel data and constants.
2. The moisture content in fuel must be verified at least once per calendar month and updated when changes occur. Other fuel data parameters are to be updated when necessary but at least once per calendar year.
3. Procedures for updating calculation formulas, fuel data and other constants must be in place. The procedures are to be updated as needed.
4. Fuel analyses are to be performed according to applicable standards.
5. Fixed fuel indices preapproved by the Swedish Environmental Protection Agency may be used.

Registration and processing of measurement data

Section 11 When determining NO_x emissions with fixed measuring equipment that does not use alternating measurement, 30-minute or 60-minute average values are to be calculated. These averages are to be calculated from valid measurements evenly distributed over at least two-thirds of the averaging period, i.e. twenty minutes per half hour and forty minutes per hour, respectively.

Section 12 When determining NO_x emissions with fixed measuring equipment that uses alternating measurement, 30-minute or 60-minute average values are to be calculated from at least five measurement periods evenly distributed over the averaging period. The total measurement time during the averaging period is to be at least five minutes per measurement point and parameter.

Section 13 The amount of NO_x per averaging period is to be calculated by multiplying the average values for concentration and flue gas flow. Average values below the lower detection limit are to be given the gas content that constitutes the lower detection limit.

The amount of NO_x per day, month and year is to be calculated by adding together the amounts for the averaging periods.

The amount of NO_x is to be stated in kilograms.

Section 14 The formulas, constants and measurement values used to determine NO_x emissions are to be saved digitally, on printouts or in another suitable way and must be able to be linked to the respective average values.

Section 15 During periods when the fixed measuring equipment has not registered valid values, measured values for up to 37 hours per calendar month may be estimated using measured values from comparable operating conditions.

Section 16 Periods without valid measured values are to be documented.

Comparative measurements

Section 17 The operator subject to the charge is to ensure a comparative measurement as defined in sections 18–29 is conducted by a laboratory accredited for the task, in accordance with Regulation (EC) No 765/2008 of the European Parliament and of the Council of 9 July 2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products and repealing Regulation (EEC) No 339/93[2].

Comparative measurements according to sections 18–29 may also be conducted by a laboratory from another member state within the European Union, Turkey or the European Economic Area if the laboratory otherwise offers equivalent guarantees in terms of technical and professional competence and guarantees of independence.

The Accreditation and Conformity Assessment Act (2011:791) defines provisions for the accreditation specified in paragraph 1 that are conducted by the Swedish Board of Accreditation and Conformity Assessment (Swedac).

Section 18 Comparative measurements are to be conducted at least once per calendar year.

For the production units with less than 2,000 operating hours annually, this control is to take place at least once every third year subject to charges.

Scope

Section 19 The following is to be included for comparative measurements:

1. The entire fixed measuring equipment used for determining gas contents used to determine NO_x emissions.
2. Determination of percentage of NO_2, if this is used to determine gas content in accordance with section 4, items 3 or 4.
3. The entire fixed measuring equipment used for determining flue gas flow.
4. The measuring equipment for flue gas temperature, if the operator subject to the charge uses the flue gas temperature as an input parameter when calculating the flue gas flow.

During comparative measurements, the accredited laboratory must primarily measure the flue gas flow. If measurement in the flue gas duct is not practically feasible or does not produce representative measurement results, the flue gas flow shall be determined by calculation.

[2] OJ L 218, 13.8.2008, p. 30 (Celex 32008R0765).

Comparative measurements must be evaluated in the state (wet or dry) that the fixed measuring equipment uses in the final calculation of the mass flow of NO_x.

Sampling point

Section 20 Sampling point for the control measuring equipment must be positioned as defined by the requirements in section 3.

Measured value pairs and measurement time

Section 21 For the parameters defined in section 19 as requiring comparative measurements, pairs of related measured values from fixed measuring equipment and control measuring equipment must be produced using representative measured values determined during the same period. If the fixed measuring equipment continuously measures NO and NO_2 separately or uses a converter, pairs of measurement values must be produced for NO_x. If only NO is measured, pairs of measurement values must be produced for NO. There are to be at least ten pair of measurement values. The reported values are to be indicated to at least two significant figures.

Section 22 For each pair of measurement values, the measurement time must be at least 60 minutes and coincide with the period that the facility's calculation software uses to calculate hourly average values or two half-hourly average values.

If any of the following circumstances apply, shorter measurement time than specified in paragraph 1 may be used:

1. The fixed measuring equipment uses alternating measurement between production units with the same fuel. In this case, the measurement time for each pair of measurement values for at least one of the production units must be at least 60 minutes and for the other production units at least 20 minutes.
2. The fuel is gas or oil. In this case, the measurement time for each pair of measurement values is to be at least 20 minutes per production unit.
3. The trace element method is used.

Section 23 The difference between the pairs of measured values are to be calculated for each parameter included in the comparative measurement. The mean value and standard deviation are to be calculated for each series of such differences. It is to be determined whether the difference is systematic.

Gas contents

Section 24 For NO and NO_x respectively, the absolute value of a difference that is systematic may be at most 10 percent of the average value

of the fixed measuring equipment or at most 5.0 ppm if the average value of the fixed measuring equipment is less than 50 ppm.

For these parameters, the standard deviation may be at most 5.0 percent of the fixed measuring equipment's average value or at most 2.5 ppm if the average value of the fixed measuring equipment is less than 50 ppm.

For O_2 and CO_2, the absolute value of a difference that is systematic may be at most 0.50 percent by volume and the standard deviation at most 0.25 percent by volume.

Flue gas flow

Section 25 When comparative measurement of flue gas flow is performed by calculation, the flue gas flow can be calculated from two alternatives called *Calculation A* and *Calculation B*.

The calculations are made as described below.

1. If the operator subject to the charge measures the flue gas flow, the accredited laboratory must perform *Calculation A*.
2. If the operator subject to the charge calculates the flue gas flow, the accredited laboratory must perform *Calculation A* and *Calculation B*.

In *Calculation A* and *Calculation B*, the calculation formulas and constants used must be relevant to the production unit. Measured parameters and fuel data are to follow what is defined in sections 26 and 27. In other respects, the calculations must comply with section 10, items 1 and 4.

Section 26 In *Calculation A*, values for fuel data and measurement values for continuously measured parameters are to be determined and obtained as follows:

1. If the accredited laboratory uses measured boiler output, fuel flow or combustion air flow, measured values for these parameters may be taken from the measurement made by the operator subject to the charge.
2. If the operator subject to the charge calculates the flue gas flow and for this purpose measures flue gas temperature, content of O_2 or content of CO_2, measured values for these parameters must be taken from the measurements made by the operator subject to the charge.
3. For other measured parameters, the accredited laboratory must use measurement values from its own continuous measurements.
4. If the operator subject to the charge burns fossil oil, natural gas or LPG and has access to current fuel data from the fuel supplier or analysis protocol, the accredited laboratory may use this fuel data. Otherwise, the accredited laboratory is to use fuel data from the analysis of fuel samples taken during the comparative measurement and that are representative of the fuel burned during the comparative measurement of flue gas flow.

Section 27 In *Calculation B*, all values for fuel data and measurement values for continuously measured parameters are taken from the fixed measurement equipment. Calculation B is a formula check.

Section 28 The following table shows the maximum permitted deviations for comparative measurement of flue gas flow, as a percentage of the average value of the fixed measuring equipment:

Fixed measuring equipment	**Control measuring equipment**	**Systematic deviation (absolute value)**	**Standard deviation**
Measurement	Measurement	15	5.0
Measurement	Calculation A	10	5.0
Calculation	Measurement	15	5.0
Calculation	Calculation A	5.0	2.5
Calculation	Calculation B	3.0	1.5

Flue gas temperature

Section 29 If the accredited laboratory is to conduct a comparative measurement of the flue gas temperature measuring equipment operated by the operator subject to the charge, as defined in section 19, the difference between the fixed measuring equipment's average value and the control measuring equipment's average value must not exceed 10 °C.

Obligations to investigate and take action

Section 30 If the requirements in Section 24, 28 or 29 cannot be met during the comparative measurement, the operator subject to the charge is to investigate the cause. This investigation is to be conducted within 10 weeks, starting from the time when the comparative measurement was performed. If the cause can be determined, corrective action must be taken without delay. If corrective measures are taken without delay, the relevant requirements are considered fulfilled.

Exemptions

Section 31 The Swedish Environmental Protection Agency can, in individual cases, decide on exemptions from the provisions of these regulations if special circumstances call for such exemption. Application for an exemption is made in writing to the Swedish Environmental Protection Agency. The application must specify which provision the exemption applies

to and the reasons for applying for the exemption. The application should be submitted as soon as the circumstance related to the application became known to the operator subject to the charge. The Swedish Environmental Protection Agency is to have received the application no later than 25 January of the year following the reporting year.

Review initiated by the Swedish Environmental Protection Agency

Section 32 The Swedish Environmental Protection Agency may initiate a review of whether the operator continuously measuring and recording emissions using measuring equipment meets the special requirements referred to in section 5 of the Environmental Charge for Emissions of Nitrogen Oxides from Energy Production Act (1990:613), even though not all requirements in these regulations are met. Only a minor deficiency may exist for the special requirements to be considered fulfilled.

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Entry into force provisions

These regulations are valid from 1 July 2017, when the Swedish Environmental Protection Agency's Regulations on Measuring Equipment for Determining Environmental Charge on Emissions of Nitrogen Oxides in Energy Production (NFS 2004:6) expire. At the same time, the Swedish Environmental Protection Agency's general recommendations on the regulations cease to apply.

Swedish Environmental Protection Agency

KERSTIN CEDERLÖF

Anna Helena Lindahl
(Acting department)