

Method Implementation Document for EN 15259:2007: stationary source emissions – Requirements for the measurement sections and sites and for the measurement objective, plan and report

Foreword

The Environment Agency recognises that European and International standards may need supplementing by Method Implementation Documents (MIDs) to ensure they are being implemented consistently.

We have established our Monitoring Certification Scheme: MCERTS to ensure quality environmental measurements. Organisations wishing to include a standard in their schedule of MCERTS accreditation shall follow the requirements of the standard and, where available, the associated MID.

MIDs are not produced for every standard but where required they will be used to supplement standards called up by Technical Guidance Note (TGN) M2. MIDs provide details on how the preferred standards shall be used for regulatory monitoring.

Copies of MIDs and further information on MCERTS, including copies of performance standards and guidance can be obtained from our web-site at:

www.mcerts.net

Or from the STA web-site at:

www.S-T-A.org

Any comments or suggested improvements to this MID should be e-mailed to Rupert Standing at rupert.standing@environment-agency.gov.uk.

Record of amendments

Version 3, May 2019:

- Amended “less than 30% of the ELV” principle (section 8.3). New text added to section (e)
- Deleted references to Waste Incineration and Large Combustion Plant Directive (section 8.3).
- Revised text on the use of instrumental methods (section 8.3).
- Deleted table of Alternative for manual (non-instrumental) methods (section 8.3).
- Added: inconclusive results (“false fail”) principle for Sref (section 8.3).
- Added requirement to re-check inconclusive results (“false fail”) principle, if ELVs are reduced (section 8.3).
- Stated that calculations may require rechecking, if ELVs are lowered (section 8.3)

- Stated that flow criteria and homogeneity tests should be carried out during the commissioning of new plants (section 9).

Introduction

BS EN 15259 is important to plant designers, plant operators and organisations that measure stack emissions.

By meeting the MCERTS performance standard for organisations a stack emission monitoring organisation will meet the sample planning and reporting requirements of EN 15259.

In order to meet the sample strategy requirements it may be necessary to carry out a test for stack gas homogeneity. Section 8.3 of EN 15259 and this MID provide information on meeting the requirements of the homogeneity test.

This MID does not repeat text, tables or diagrams from BS EN 15259, instead it refers to the relevant sections of this standard. It is therefore essential that the reader has a copy of BS EN 15259.

1 Scope

No additional information

2 Normative references

No additional information

3 Definitions symbols and abbreviations

No additional information

4 Symbols and abbreviations

No additional information

5 Principles

No additional information

6 Measurement section and measurement site

No additional information

7 Measurement objective and measurement plan

No additional information

8 Sampling strategy

8.1 General

Monitoring organisations may use the results from a homogeneity test carried out by another monitoring organisation, provided the organisation that carried out the test has MCERTS accreditation for it.

Note: information on when a homogeneity test is repeated is given in section 8.3a.

8.2 Measurements of particulates and other components by grid measurement

Flow proportional sampling is not required when carrying out a grid measurement for gases.

8.3 Determination of homogeneity

a) Application of the homogeneity test

The homogeneity test is applicable to combustion processes.

Note 1: under some circumstances the Environment Agency may require a homogeneity test to be carried out on non-combustion processes.

The test is not usually required for stacks with sampling plane areas of $<1 \text{ m}^2$ (i.e. below 1.13 m in diameter for circular ducts).

Due to practical reasons the homogeneity test is carried out using instrumental measurement techniques. For determinands, where the CEN / ISO standard reference method is a manual (non-instrumental) method, an alternative instrument based method that is specified in TGN M2 (available from www.mcerts.net) may be used. If a suitable instrumental method is not available, the determinand may be excluded from the homogeneity test (other gases tested may be used as an alternative means of demonstrating homogeneity).

For determination of NO_x, if the NO₂ concentration is insignificant (less than 10% of the total NO_x), a homogeneity test for NO_x may be carried out by measuring NO only. If significant amounts of NO₂ are present (greater than 10% of the total NO_x), it is necessary to perform a total NO_x measurement.

Note 2: a converter may be used to convert NO₂ to NO. Total NO_x can then be measured directly.

It may not be necessary to carry out a homogeneity survey for TOC, if it is established that CO is a suitable proxy for TOC.

Note 3: if TOC is at low concentrations (i.e. less than 3 mg/m³) the variability in the readings may make it difficult to apply the homogeneity test.

The homogeneity test applies to O₂ because it is used to correct the final measurement result. However, the homogeneity tests are not corrected for O₂.

The homogeneity test may apply to H₂O, if it is used to correct the final measurement result. For processes without liquid based abatement systems, gases such as O₂ may be used as an alternative for H₂O.

O₂ is not a suitable alternative for non-combustion processes, as they have fixed ambient air O₂ concentrations.

SO₂ may be used as an alternative for HCl, HF and NH₃.

The homogeneity test is usually carried out at a measurement location once only. This shall be done at conditions that are representative of the normal operation of the process. However, it may have to be repeated if there is a significant operational change in the process, such as a long term change in load, fuel, abatement technology or ductwork.

If an operator does not have an ELV, a virtual ELV can be agreed with the Environment Agency.

b) Responsibility on MCERTS accredited monitoring organisations

MCERTS accredited stack emissions monitoring organisations shall have documented procedures to meet the requirements for the determination of homogeneity. This shall include having the required equipment and a method for calculation.

If the homogeneity test has not been carried out at a location, where it is applicable, the monitoring organisation shall inform the operator that the homogeneity test should be carried out to confirm that the sample location is suitable for measuring gases from a single

point. The SSP and monitoring report shall record if the homogeneity test has not been carried out.

c) Carrying out the test

The test is carried out using instrumental analysers. The analysers shall be verified for performance, such as by the annual systems check specified in reference methods (i.e. zero, span, linearity, response time compared to moving system etc.).

When measuring water soluble gases the full length of the probe shall be maintained at a temperature of 20K above the stack gas dew point, so that condensation of stack gas in the probe does not occur. Alternatively, a probe that has multiple extraction tubes at each sample point may be used, as this does not require heating.

When measuring insoluble gases, such as NO, CO or O₂, an unheated probe may be used.

The standard states that a permanently installed CEM may be used as the reference point, provided it is calibrated in accordance with BS EN 14181. It is therefore necessary to confirm that the CEM has a valid up to date Quality Assurance Level 2 / Annual Surveillance Test assessment and report.

Note 1: It is generally better to use the same type of reference method for both the grid and time dependant reference measurements, since the statistical tests defined in EN 15259 require a comparison of the standard deviations of the two sets of data.

A single instrument may be used to carry out the grid measurement and time dependent reference measurements. The time dependant reference measurements are taken for the same length of time as the grid measurements. It is important that the process is stable for both sets of measurements. This approach is acceptable if the combined uncertainty of the grid and time dependant reference measurements is less than the value specified in the standard. If this is not the case, then the measurements must be repeated with two instruments.

The standard deviation of S_{grid} is generally greater than S_{ref} because it includes additional uncertainty caused by spatial differences. If S_{ref} is less than S_{grid} , then the location is classed as being homogenous. However, it is important to check that the grid and reference measurements are compatible. For example, if S_{ref} is significantly lower than S_{grid} it could indicate a measurement error.

d) Default values in lieu of an ELV for O₂ and H₂O for calculation of U_{perm}

For O₂, a default value of 21% shall be used in lieu of an ELV. For H₂O a default value of 30% shall be used in lieu of an ELV (see Section 8.3, Note 10 of EN 15259). These default values are used in the absence of an ELV to calculate the U_{perm} value.

e) Exemption from applying test results when results are low

If the standardised measurement results are less than the maximum expanded measurement uncertainty allowed at the daily ELV for the method used, then the statistical tests to assess if the duct is homogenous do not need to be carried out. The measurement uncertainty limits are provided in TGN M2.

f) Using S_{grid} and S_{ref} values to exclude inconclusive results

Note 1: if the variation in the fixed point is small (i.e. low S_{ref}), it is possible that the duct will appear to be heterogeneous, even if the grid only shows a small variation (i.e. low S_{grid}). This could result in inconclusive results, which result in a "false fail" of the homogeneity test.

If the homogeneity check calculations in EN 15259 indicate that the duct is heterogeneous, the following additional checks can be applied to exclude inconclusive results (a “false fail”):

- If $S_{ref} = <2\%$ or $S_{grid} = <5\%$ of the ELV for gases except O_2 and H_2O , any sample point in the duct may be used because the duct is considered to be homogeneous (i.e. the standard deviation of the gas concentrations at the reference point is insignificant when compared to the ELV and the limit of quantification of the method).
- In the absence of an ELV for H_2O , a default value of 20% shall be used to determine if $S_{ref} = <5\%$ of the virtual ELV and a value of 30% shall be used for S_{grid} .
- If S_{ref} is $<0.2\%$ or S_{grid} is less than 0.3% for O_2 , any sample point in the duct may be used.

The above checks shall only be applied after completing the determination of homogeneity procedure specified in EN 15259.

Where values are based on ELVs, the calculations may require rechecking, if ELVs for the process are lowered.

Note 2: If there is a BAT-AEL range applicable to the process the lowest value of this range could be used to complete ELV based checks. This would demonstrate that the check would still be valid, if the lowest BAT-AEL was applied in the future.

8.4 Permanently installed AMS

Note: EN 15259 refers to CEMs as AMS.

If the procedure in Section 8.3 of EN 15259 demonstrates that the gas concentration(s) are homogeneously distributed across the sample plane, it means the CEM probe or measurement path may be located at any location on the sample plane. If they are not homogeneously distributed a representative point(s) or line must be found using the procedure given in Section 8.4.

Section 8.4 of EN 15259 refers to Annex E: Examples for determining homogeneity of waste gas profiles. Annex E gives example data from a homogeneity test. Example E.1 of the Annex is applicable to both periodic monitoring and CEMs. Example E.2 is for finding a single representative point for locating an extractive CEM.

It is recommended that example E.1 is followed because it allows the CEM probe or measurement path to be located anywhere in the sample plane, provided the gases are homogeneously distributed. If they are not homogeneously distributed example E.2 is applicable.

A homogeneity test is required when installing CEMs at a location that has not had a previous homogeneity test. If the CEMs are replaced, and the same location is used by the new CEMs, the test does not need repeating.

9 Measurement report

For new plants, it is recommended that a report containing details of the flow criteria and homogeneity test results is produced during the commissioning of the plant.

A determination of homogeneity report shall state whether homogeneous results were demonstrated by the procedure in EN 15259 only or whether the additional criteria for assessing inconclusive data specified by this MID was required.