Method Implementation Document for EN 13284-1:2017: Stationary source emissions – Determination of low range mass concentration of dust – Part 1: Manual gravimetric method

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 Monitoring stack emissions: techniques and standards for periodic monitoring - GOV.UK. MIDs provide details on how the preferred standards shall be used for regulatory monitoring.

Further information on MCERTS performance standards and guidance can be obtained from:

Monitoring emissions to air, land and water (MCERTS) - GOV.UK

Amendments

- Foreword – updated hyperlinks
- Section 8.3 – deleted pre-weighing as section applies to both pre and post weighing

Introduction

This document supplements EN 13284-1[1]. However, it does not re-state all the provisions of EN 13284-1 and organisations are reminded of the need to comply with the criteria detailed in EN 13284-1. The clause numbers in this document follow those of EN 13284-1, although the text from the standard is not repeated in this document. EN 13284-1 remains the authoritative document and in cases of dispute, the accreditation body will adjudicate on unresolved matters.

1 Scope

No additional requirements to BS EN 13284-1.

2 Normative references

No additional requirements to BS EN 13284-1.

3 Terms and Definitions

No additional requirements to BS EN 13284-1.

4 Symbols and abbreviations

No additional requirements to BS EN 13284-1.

5 Principle

No additional requirements to BS EN 13284-1.

6 Measurement planning and sampling strategy

6.1 Measurement planning

No additional requirements to BS EN 13284-1.

6.2 Sampling strategy

(a) The maximum (angle) of flow with regard to the stack axis shall be measured and recorded for each sample point. If the angle of flow at any of the sample points is greater than 15^{o} with regard to the stack axis, the flow criteria are not in compliance with the standard. In the absence of an alternative, compliant sampling location, the sample points at which the angle of flow is not compliant shall not be sampled. This sampling deviation shall be included in the sample report.

US EPA M2[2] provides details of how to carry out a swirl test using an S-type Pitot. The procedure is described below:

1) Level and zero the manometer

2) Connect an S Type Pitot tube to the manometer and leak-check the system

3) Position the S Type Pitot tube at each traverse point, in succession, so that the planes of the face openings of the Pitot tube are perpendicular to the stack cross-sectional plane (when the S Type Pitot tube is in this position, it is at 0° reference)

4) Note the differential pressure reading at each traverse point

5) If a null (zero) Pitot reading is obtained at 0° reference at a given traverse point, an acceptable flow condition exists at that point

6) If the Pitot reading is not zero at 0° reference, rotate the Pitot tube (up to ±90° yaw angle), until a null reading is obtained

7) Determine if the angle of rotation is less than 15° at each sample point

- A device, such as a port adaptor, can be marked to show if the angle of rotation is <15°. However, if the angle of rotation is measured to the nearest degree, it is necessary to use a device, such as an inclinometer.

- Measuring the angle of rotation to the nearest degree is considered good practice and under some circumstances may be requested by the regulatory authority.

8) Apply the swirl test to each sample point

9) If the value of rotation is less than 15° at each sample point, the overall flow condition in the stack is acceptable

(b) no additional requirements to EN 13284-1

(c) The standard states that the minimum velocity of the stack gas must generate a differential pressure larger than 5Pa if a Pitot tube is used to carry out the measurement. It is possible to carry out sampling at lower velocities, if an anemometer is used, provided that the velocity of the stack gas is above the limit of detection of the device and it has been calibrated within the region of the expected velocity.

(d) If local negative flow is present then the sampling location is not in compliance with the standard. If an alternative location cannot be found, then the sample point(s) in areas of negative flow shall not be sampled. This sampling deviation shall be included in the sampling report.

If requirements (a) – (d) of the standard regarding the angle of flow and velocity cannot be met the sampling location is not compliant with the standard. The client shall be informed that the location does not comply with the standard (see10.2 of the standard). An alternative compliant location shall be sought.

If, after consultation with the client, a suitable sampling location cannot be found then the number of sampling points on the sampling plane shall be doubled (up to a maximum of 20 sample points is normally sufficient). When the number of sample points is doubled a traverse shall be repeated to determine which ones are compliant. The sampling points, which have negative flow or the angle of flow is not less than 15° shall not be sampled. It must be stated in the monitoring report that the flow criteria are not in compliance with the standard.

If a suitable sample location cannot be found, the estimation of the uncertainty relating to the results of a specific stack emission measurement exercise is complicated and not possible to quantify. This means that the effect of the sample location on the measurement uncertainty shall not be taken into account when reporting the uncertainty. In these cases, qualifying remarks explaining the deviations from the standard shall be included in the monitoring report and it shall be stated clearly in the report that the sample location requirements were not met and, therefore, that the results were not produced in compliance with the standard.

7 Equipment and materials

No additional requirements to EN 13284-1.

8 Weighing procedure

8.1 General

No additional requirements to EN 13284-1.

8.2 Pre-sampling conditioning

No additional requirements to EN 13284-1.

8.3 Weighing

The standard specifies that 3 readings shall be taken at 1, 2 and 3 minutes as part of the weighing procedure. This procedure may be omitted if validation evidence is provided to demonstrate that the filter weight does not change by more than 0.01% over this time period. This validation must include information on the environmental conditions (humidity and temperature of the weighing room) and on the filter material.

8.4 Post-sampling treatment of weighed parts

No additional requirements to EN 13284-1.

8.5 Post-sampling treatment of the rinsing solutions

No additional requirements to EN 13284-1.

8.6 Improvement of the weighing procedure

No additional requirements to EN 13284-1.

9 Sampling procedure

There are 2 options to obtaining a water vapour concentration:

Option 1: The water vapour concentration is measured before particulate monitoring using EN 14790[(3)]. This concentration is used to determine the isokinetic rate during the test. It is also used when calculating the measurement result(s), provided the water vapour conditions are stable and well characterised.

Note 1: if the water vapour concentration is variable, there is a risk that the water vapour for the process being monitored may change. This may lead to the isokinetic rate during the test being incorrect, which may mean the result(s) does not comply with EN 13284-1.

Note 2: CEMS data may show that a process has stable water vapour conditions.

Option 2: The water vapour concentration is determined before the particulate test and also during the particulate test. The water vapour concentration determined before the test is used to estimate the isokinetic rate required during the particulate test. The water vapour concentration measured during the particulate test is used for determining the water vapour to be applied when calculating the measurement result(s).

When using option 2 is it important that the water vapour concentration used to calculate the isokinetic rate is reliable. This concentration can be obtained in the following ways:

- carry out sampling in accordance with EN 14790 (this approach shall be used on a stack where the water vapour concentration is unknown or where the water vapour concentration is variable);

- use an expected water vapour concentration based on previous monitoring campaigns or where it is known that the water vapour concentration is at ambient conditions (this shall only be done if the water vapour conditions are stable and well characterised).

Note 3: if the water vapour concentration is estimated before the particulate test using information from previous monitoring campaigns, there is a risk that the water vapour for the process being monitored may have changed. This may lead to the isokinetic rate during the test(s) not meeting the criteria specified in EN 13284-1.

For stable and well characterised stack gas emissions, where it is known that the water vapour concentration is at ambient conditions or has been previously confirmed to be less than 5% volume/volume concentration, it is not necessary to determine the water vapour concentration by measurement.

If droplets are present in stack gas emissions, Option 1 shall be followed, using Annex A of BS EN 14790 to determine the water vapour concentration.

Note 4: the approach used in Annex A is for the measurement of water vapour only. It does not include the droplets.

10 Calculation

No additional requirements to BS EN 13284-1.

11 Measurement report

No additional requirements to EN 13284-1.

Annexes A - H

No additional requirements to EN 13284-1.

Bibliography

(1) BS EN 13284-1:2017 - Determination of low range mass concentration of dust – Part 1: Manual gravimetric method

(2) US EPA Method 2 Determination of stack gas velocity and volumetric flow rate (Type S Pitot tube). Available from the US EPA website.

(3) BS EN 14790:2017 Stationary source emissions – determination of water vapour in ducts.