



# **Performance standard for organisations carrying out manual stack emission monitoring**

**Environment Agency  
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Version 8**



## **Record of amendments**

### **Version 8    January 2019**

- Document reformatted and reordered to comply with changes to ISO 17025
- Introduction - Deleted reference to EN 15675:2007 – application of EN ISO/IEC 17025 to periodic measurements
- Updated references
- Clause 6.5.5 - Updated information on field blank procedure
- Clause 7.2.12 - Added note on accreditation requirements for the analysis of odour
- Annex B - Amended Annex B to take account of the revision of the MCERTS performance standard for CEMs and T-CEMs.
- Annex C - Added reference to emergency escape plans
- Annex D - Stated that the order of the section headings shall be followed. Stated that expected velocity and supporting measurements can be used.
- Annex E – added annex on participation in proficiency-testing schemes
- Annex F - Stated that the order of the section headings shall be followed. Deleted the requirement to list the substances to be monitored from the monitoring objective section.

### **Status of this document**

This standard may be subject to review and amendment following publication. The most recent version is available on our website at:

[www.mcerts.net](http://www.mcerts.net)

## Foreword

We set up our Monitoring Certification Scheme (MCERTS) to ensure good quality environmental measurements. The scheme is based on international standards and provides for the product certification of instruments, the competency certification of personnel and the accreditation of laboratories.

The standard we focus on in this document sets out what you must do if you want to get accreditation from us to monitor pollution released from chimney stacks.

You can apply to MCERTS as an individual or as an organisation. This document sets out the performance standard for organisations. You can get a separate document, which focuses on people, from the contact details at the end of this foreword.

Under MCERTS, organisations must be accredited by the United Kingdom Accreditation Service (UKAS) to show they have reached the standard set out in this document. The standard focuses on how you should plan, carry out and report on the monitoring you do.

Planning involves reviewing the site where you want to do the work. This review includes a risk assessment to make sure the work can be done safely.

Skilled people must carry out the work using internationally recognised methods.

You must report on the work you have done, using the format we ask you to.

### **The benefits of this MCERTS standard**

- The standard makes sure that information on pollution released from chimney stacks is reliable.
- Everybody in the competitive market of monitoring pollution from chimney stacks will be working towards the same standard.
- The standard sends a message that measuring pollution from chimney stacks is an important part of producing reliable information for regulatory purposes.
- By setting quality standards which everybody must work towards, the standard promotes and raises the professional reputation of people and organisations involved in monitoring pollution from chimney stacks.

If you have any questions regarding the accreditation process, or would like further information on how to apply, please contact:

UKAS  
2 Pine Trees  
Chertsey Lane  
Staines-upon-Thames  
TW18 3HR  
Telephone: 01784 429000  
Email: [info@ukas.com](mailto:info@ukas.com)

For more information on MCERTS and for copies of the performance standards and further guidance, see our web-site at: [www.mcerts.net](http://www.mcerts.net)

If you have any general questions about MCERTS, please contact our National Customer Contact Centre: [enquiries@environment-agency.gov.uk](mailto:enquiries@environment-agency.gov.uk)

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# Performance standard for organisations carrying out manual stack emission monitoring

## Introduction

Manual stack emission monitoring for regulatory purposes includes measurements for:

- determining compliance with numerical limits in permits
- the calibration of continuous emission monitoring systems (CEMs)
- field testing of CEMs for type approval
- acceptance trials on new pollution abatement plant or alternative fuel applications
- determining emission factors for use in emissions trading and inventory reporting

Note 1: Stack emission monitoring is a general term used to describe the preparation work prior to a measurement campaign, undertaking the site work, calculating the monitoring results and producing the final report for the client. In most cases the client is a process operator.

The extension of MCERTS to include manual stack emission monitoring is built on proven international standards to ensure good quality monitoring data. The scheme is split into three components that should be used in conjunction – the certification of personnel to the MCERTS personnel competency standard, the accreditation of stack emission monitoring organisations to the MCERTS performance standard for organisations and the accreditation of laboratories to the MCERTS performance standard for laboratories testing samples from stack emissions monitoring.

The general requirements for the competence of testing laboratories are described in the International Standard EN ISO/IEC 17025. This contains all the requirements laboratories have to meet if they wish to demonstrate that they operate a quality system, are technically competent, and are able to generate technically valid results.

Note 2: Laboratories are referred to as stack emission monitoring organisations (organisations) throughout this performance standard. This covers both independent monitoring organisations and those which have in-house monitoring teams.

This MCERTS performance standard provides criteria for the application of EN ISO/IEC 17025 in the specific field of monitoring of emissions from stationary sources.

The structure of this document follows the structure of EN ISO/IEC 17025. This standard does not re-state the provisions of EN ISO/IEC 17025. Monitoring organisations are reminded of the need to comply with all the relevant criteria detailed in EN ISO/IEC 17025.

## 1. Scope

The monitoring of stack emissions is often called measurement, testing or sampling. In this document, the term monitoring is used except where the specific meanings of the alternatives are more appropriate.

The manual monitoring of stack emissions can involve taking samples for laboratory analysis, the in-situ determination of flue gas physical parameters such as temperature, pressure and flow rate, and of particulate loadings by isokinetic sampling, and the in-situ periodic instrumental monitoring of pollutants. Its primary use is for regulatory purposes, including measurement for determining compliance with authorised numerical limits, calibrating continuous emission monitoring systems and acceptance trials on new pollution abatement plant.

The monitoring of emissions from stationary sources can be undertaken for a wide range of substances using various methods. Details of methods are provided in our Technical Guidance Note M2.

Accreditation of organisations to this performance standard will demonstrate that they meet our MCERTS requirements for regulatory monitoring of stack emissions from stationary sources.

The MCERTS standard contains both technical and health and safety requirements. Compliance with regulatory and safety requirements on the operation of laboratories is not covered by EN ISO/IEC 17025. However, carrying out stack emission monitoring is hazardous (for example, working at heights, lifting equipment, exposure to chemicals); and, if correct health and safety practices are not adhered to, the quality of the monitoring is often compromised.

The health and safety requirements are set out to ensure that organisations have a health and safety management system and are following safe systems of work (for example, undertaking risk assessments). UKAS will audit whether these systems are in place – it is not auditing the adequacy of the systems. However, if UKAS assessors observe poor health and safety practice they will inform us.

We have an agreement with UKAS regarding the operation of MCERTS for manual stack emission monitoring. This agreement allows us to use information supplied by UKAS, as part of our regulatory duties.

We may carry out our own inspections and investigations and act upon their findings for organisations accredited to ISO/IEC17025 for the MCERTS performance standard.

## 2. References

- BS EN ISO 14956 Evaluation of the suitability of a measurement method by comparison with a stated measurement uncertainty
- EN ISO/IEC 17024 Conformity assessment - General requirements for bodies operating certification of persons
- EN ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories
- MCERTS Personnel Competency Standard, Environment Agency
- MCERTS Performance standard for laboratories testing samples from stack emissions monitoring, Environment Agency
- Technical Guidance Note M1, Sampling requirements for monitoring stack emissions to air, Environment Agency
- Technical Guidance Note M2, Monitoring of stack emissions to air, Environment Agency
- Risk assessment guide: industrial emission monitoring, Source Testing Association
- MCERTS Performance standards and test procedures for CEMs and T-CEMs, Environment Agency
- BS EN 14181 Quality assurance of automated measurement systems

## 3. Terms and definitions

**Alternative method** – a method that has been proved equivalent to a standard reference method.

**Competent authority** – organisation responsible for implementing environmental legislation (for example, in England and Wales the Environment Agency).

**Duct** – structure that conveys waste gas.

**Emission limit value** – the numerical limit on an emission, which may not be exceeded during one or more periods of time.

**Field blank** – a measurement sample taken at the plant site in an identical manner to the normal samples in the series, except that no gas is sampled.

**Job file** – file in which details of the stack emission measurement campaign for an individual site are recorded.

**Measurement campaign (measurement objective)** – scope of work required on a particular site for a specific time period.

**Measurement series** – one or several measurements of the same measurand carried out at the same sampling plane, and at the same process operating conditions.

**Method Implementation Document** – document published by the Environment Agency outlining its interpretation of a method.

**Periodic measurement (manual measurement)** – determination of a measurand at specified time intervals. The specified time intervals can be regular (e. g. once every month) or irregular. Measurands can include the amount, quantity or physical

property of an emission. Measurements are usually made using portable equipment for typically less than 24 hours.

**Reference method** – measurement method taken as a reference by convention, which gives, or is presumed to give, the accepted reference value of the measurand. These methods are listed in M2.

Note: The method is a standard reference method if it is prescribed by European legislation.

**Risk assessment** – an assessment of the health and safety hazards and associated risks involved in stack measurement at a specific work location.

**Sampling location** – a suitable position on the plant where representative samples can be obtained.

**Site specific protocol (Measurement plan)** – the installation specific application of an organisation's technical procedures. A protocol describes how the measurement method is employed in a given situation.

**Site record sheets** – sheet on which the laboratory's on-site measurement data and operations are recorded at the time they are made.

**Site review** – a visit conducted by the organisation before undertaking stack emission measurements to ensure the physical and logistical situation is fully understood before arriving on-site to conduct work. The review provides essential information for determining the site-specific protocol.

**Stack** – structure through which waste gas is released to atmosphere. Stacks are intended to be of sufficient height to adequately disperse emissions in the atmosphere. Measurement of emissions may be carried out in ducts and stacks.

**Stack emission monitoring organisations** – organisations that undertake the measurement of emissions to air from stationary sources. This can include work undertaken at the laboratory's permanent facilities, at sites away from their permanent facilities and in temporary or mobile laboratories.

**Standard reference method** – see reference method.

**Technical procedure (operating procedure)** – the organisation's detailed written procedures on how to perform a method in line with its quality system.

**Testing laboratory** – laboratory that performs tests. A testing laboratory may undertake work at permanent facilities, at sites away from their permanent facilities and in temporary or mobile laboratories. The sampling and analysis stages may occur at different locations.

**UKAS** – the United Kingdom Accreditation Service, the body appointed by the Government to assess and accredit organisations that provide testing services to international standards, for example EN ISO/IEC 17025.

## **4. General requirements**

### **4.1 Impartiality**

Stack emission monitoring shall be carried out by an organisation that is free from any commercial, financial and other pressures that might influence their technical judgement. Process operators using in-house monitoring teams shall have management structures that ensure this requirement is met.

### **4.2 Confidentiality**

No additional requirements to EN ISO/IEC 17025.

## **5. Structural requirements**

An organisation shall implement a health and safety policy addressing the hazards and associated risks to health and safety in the activities associated with stack emissions monitoring.

Accreditation is through a programme of laboratory and site based assessments carried out by UKAS.

Note: UKAS assessments will be complemented by a programme of Environment Agency audits.

Some laboratory and site based audits will be carried out on an “unannounced” basis. Stack emission monitoring organisations shall co-operate, when required, in planning these audits. For unannounced site based audits the organisations, when requested, shall provide information to UKAS, in advance, of the MCERTS accredited work they plan to carry out.

## **6. Resource requirements**

### **6.1 General**

No additional requirements to EN.ISO/IEC 17025.

### **6.2 Personnel**

6.2.1 Monitoring organisations shall use personnel with appropriate MCERTS certification to carry out stack emission measurements.

Note: The MCERTS personnel competency standard defines three levels - an entry level (trainee), Level 1 (technician) and Level 2 (team leader).

6.2.2 Trainees are permitted only to carry out stack emission monitoring under the *direct* supervision of a MCERTS Level 2 person.

6.2.3 Trainees shall not carry out or approve site reviews and risk assessments even under direct supervision.

Note: Site reviews, risk assessments, site specific protocols (SSP) and monitoring reports are defined in section 7.3.

6.2.4 Trainees shall not write or approve site specific protocols or monitoring reports.

6.2.5 Personnel who have obtained Level 1 shall carry out stack emission monitoring under the *general* supervision of a MCERTS Level 2 person. To provide general supervision the Level 2 must be actively involved in the

practical work of monitoring on site. However, they do not have to observe all the work carried out by the team they are supervising.

- 6.2.6 Level 1 personnel are permitted to carry out site reviews and risk assessments under the direct supervision of a MCERTS Level 2 person. Level 1 personnel are not permitted to approve site reviews, risk assessments, site specific protocols or monitoring reports. Direct supervision means that a Level 2 must accompany the Level 1 while carrying out risk assessments and site reviews. To authorise SSPs and reports produced by a Level 1 the Level 2 must check the completed documents in detail.
- 6.2.7 Personnel with Level 2 certification, shall lead a stack emission monitoring team, approve site reviews, risk assessments, site-specific protocols and monitoring reports.
- 6.2.8 Level 2 personnel are responsible for the direct supervision of trainees. Direct supervision of a Trainee requires the Level 2 to observe all the site work activities they carry out.
- 6.2.9 The Level 2 person shall be actively involved in the practical work of monitoring on site and is responsible for the work undertaken by the team.
- 6.2.10 Personnel with Level 2 certification shall be available on site throughout the monitoring campaign.
- 6.2.11 When there is more than one Level 2 person on site, the person taking overall responsibility for the work shall be clearly nominated.

Note: The SSP is used to record role responsibilities of personnel.

- 6.2.12 To lead on-site monitoring work and to approve site reviews, site specific protocols and reports the Level 2 certification shall include technical endorsements relevant to the substance(s) being measured.
- 6.2.13 A summary of the certification and supervision required to carry out different stack emission monitoring activities is provided in Annex A.

### **6.3 Facilities and environmental conditions**

- 6.3.1 Monitoring organisations shall, wherever possible, use sampling facilities/platforms that comply with the requirements of Environment Agency Technical Guidance Note: M1.
- 6.3.2 Any deviations from a method caused by stack sampling facilities not conforming to the method requirements (for example, access restricted to one port) shall be recorded.
- 6.3.3 Portable lighting shall be used when appropriate.
- 6.3.4 Lifts and hoists shall be used where appropriate.
- 6.3.5 Service requirements, such as electricity supply, shall be considered.
- 6.3.6 Stack emission monitoring has a high potential for contamination of samples. The organisation shall identify and assess the risk of contamination and a clean area shall be available for setting up equipment and samples, recovering samples, and storing equipment and samples.
- 6.3.7 Access to and use of areas affecting the quality of the monitoring shall be controlled. The area for equipment set up and the work area shall be cordoned off so that access to the sampling equipment and monitoring

operation is restricted. If necessary, a mobile laboratory shall be manned or otherwise secure so access is restricted at all times.

- 6.3.8 The work area shall be cleared of trip hazards and obstacles. Mobile laboratories and transport vehicles shall be kept clean and free from sources of contamination.

## **6.4 Equipment**

- 6.4.1 Procedures shall be in place to ensure that equipment is appropriate to the process-specific environment where it is to be used.
- 6.4.2 In methods where detailed material specifications are not given, the materials shall satisfy the following requirements:
- be non-reactive to the pollutant being measured
  - not cause any significant positive or negative interference to the measurement process
  - have sufficient strength to withstand the environmental conditions (e.g. vibration, heat, shear forces, flex, and abrasion) associated with the process being measured and the measurement environment
- 6.4.3 The identification of equipment shall be in an accessible location for viewing and it shall be etched, stamped, or otherwise permanently fixed to the component.
- 6.4.4 The history of equipment use shall be traceable, so that possible causes of problems can be determined.
- 6.4.5 A record sheet for equipment use, which enables potential problems, maintenance procedures and possible sources of contamination to be identified, shall be developed for use with methods.
- 6.4.6 Safe handling and transportation procedures shall be developed to ensure equipment that has been calibrated shall not be affected during transportation.
- 6.4.7 In methods where detailed leak check procedures are not given the leak flow shall be below 2 % of the normal flow rate during sampling.

Note: Stack sampling equipment generally comprises several pieces of apparatus (for example, probes, filters, traps, pumps, meters) connected together to form a 'sampling train'. The equipment is connected together on-site.

- 6.4.8 In methods where detailed procedures are not given for dealing with contamination the following practices shall be followed. Components and equipment exposed to the sample stream shall be thoroughly cleaned and dried, including the sample media area, prior to conducting sampling. If performing multiple runs with the same equipment, the sample train shall be cleaned between runs. Cleaning shall be performed using appropriate methods, tools and solvents to ensure that residue is removed and to prevent contaminating or otherwise affecting the sample. The organisation's technical procedure shall specify the cleaning procedure.

Note: Contamination of samples analysed in a laboratory is assessed by the field blank.

## 6.5 Metrological traceability

6.5.1 The laboratory shall identify the calibration aspects of its methods that can contribute significantly to the total uncertainty of the measurement result. Where appropriate the calibration of reference material and equipment (e.g. Pitot tubes) shall be traceable to a laboratory accredited under EN ISO/IEC 17025. If this is not possible, the testing laboratory shall satisfy itself of the quality of the reference material and equipment.

Note Such equipment include:

- instruments to measure physical parameters, such as temperature, pressure, flow, volume (e.g. dry-gas meters), weight (e.g. analytical balances)
- analysers to measure waste gas (e.g. chemiluminescence NO<sub>x</sub> analysers, FID analysers, paramagnetic oxygen analysers)

6.5.2 Some items of measurement equipment shall be calibrated periodically, such as Pitot probes, manometers, thermocouples and balances.

Note: This periodic calibration can vary from once a month to once a year. Other items of equipment, such as waste gas analysers require calibration as an integral part of each measurement.

6.5.3 Calibration gases shall be traceable, where possible, to EN ISO/IEC 17025 for calibration by third party accreditation from a nationally recognised accreditation body that is a member of the International Laboratory Accreditation Cooperation (ILAC). The calibration gases shall be labelled with the relevant accreditation logo and number.

Note 1: UKAS is an example of a nationally recognised accreditation body.

Note 2: It may not be possible to obtain ISO 17025 traceable gases for all calibration gases.

Note 3: The uncertainty budget for calibration gases are normally specified in individual monitoring standards, such as CEN reference methods.

Note 4: Examples of occasions when calibration gases are required are the annual calibration/functional checks carried out on portable monitoring instruments.

6.5.4 A stack emissions monitoring laboratory may use calibration gases to prove that “working” gases (i.e. those used on site for span check verification) meet the uncertainty budgets specified for span gases in the relevant standards. These working gases must be traceable, through the laboratories EN ISO/IEC 17025 accreditation, to the accredited calibration gases.

6.5.5 When monitoring is undertaken requiring analysis of samples, field blanks shall also be analysed and reported. A field blank shall be carried out in close proximity to the sample location, in an identical manner to the normal samples in the measurement series, except the sample probe does not have to be inserted in the stack and no gas is drawn through the sample equipment.

6.5.6 Where a method does not specify a minimum criteria for the field blank value, the field blank shall be less than 10% of the emission limit value.

Note: The field blank is expressed in the same units as the emission limit value (mg/m<sup>3</sup>). To calculate the field blank value the analytical

laboratory result (i.e. a mass) is divided by the typical volume sampled during the measurement campaign.

- 6.5.7 When measuring gas concentrations using a manual technique, an absorber efficiency check shall be carried out for at least one test at each stack location per sampling campaign. The absorber efficiency check is passed if less than 5% of the measured pollutant is in the last impinger of the sample train.

The absorber efficiency check becomes less effective as the concentration of the pollutant in a stack gas decreases. Therefore, passing the absorber efficiency test shall only be required if the final measurement result is greater than 30% of the emission limit value.

Note: The following recommendations help ensure the absorber efficiency is met:

- keep the absorbers below 20°C
- addition of an extra absorber containing absorber solution
- add an appropriate use before date to the absorber solution
- use a low flow rate (e.g. 2 – 3 l/min) to improve the absorption of the target measurand in the absorber solution

## **6.6 Externally provided products and services**

No additional requirements to EN.ISO/IEC 17025.

## **7 Process requirements**

### **7.1 Review of requests, tenders and contracts**

- 7.1.1 Organisations are permitted to subcontract monitoring activities to another organisation accredited under MCERTS for that work. It is the responsibility of the organisation to ensure that the subcontracted organisation is accredited under MCERTS for the scope of work. If analytical work is subcontracted, it shall be to an organisation that has accreditation to EN ISO/IEC 17025 and MCERTS for the scope of work.

Where individuals are employed on a subcontracted basis by an organisation, the organisation shall ensure that the individual is certified under the MCERTS personnel competency scheme to the required level.

### **7.2 Selection, verification and validation of methods**

#### **a) Selection of sampling methods**

- 7.2.1 Monitoring shall be carried out in accordance with monitoring methods selected from Environment Agency Technical Guidance Note: M2.
- 7.2.2 MCERTS accreditation is applicable to methods in TGN M2 only.

Note 1: Even though a measurand may not be listed specifically in TGN M2, it may fall under a general method, such as speciated VOCs. Under these circumstances MCERTS accreditation can be obtained because it falls under the procedural framework of a CEN standard.

Note 2: The methods in TGN M2 have been selected according to the following hierarchy:

- Comité European de Normalisation (CEN);
- International Standardisation Organisation (ISO).

If the substance cannot be monitored using methods covered by the above then a method from one of the following has been used in M2:

- British Standards Institution (BSI);
- United States Environmental Protection Agency (US EPA);
- Verein Deutscher Ingenieure (VDI).

7.2.3 M2 lists European reference methods (RMs), where available. It also lists techniques that could be used as an alternative method (AM) to the RM. Annex B of this document provides the framework for the use of instrumental based RMs and AMs.

7.2.4 The methods referred to in operators' permits are usually selected from M2. If an operator's permit refers to a method that is not in M2 the monitoring contractor shall bring this to the attention of the client before carrying out the monitoring work.

Note: If the method in the operator's permit is different to the one in M2, it is usually acceptable for the operator and us to update the permit by agreeing in writing that the method in M2 is used.

7.2.5 Environment Agency Method Implementation Documents (MIDs) provide details on how the preferred methods shall be used for regulatory monitoring.

7.2.6 The stack emission monitoring organisation shall use written technical procedures addressing the operation at the stack. The technical procedures shall meet the requirements of the method and the MID, where available.

7.2.7 The monitoring organisation shall obtain accreditation for each method they wish to use.

Note: UKAS will accredit organisations for the technical procedures to ensure they follow the standard methods, MIDs and the requirements of EN ISO/IEC 17025.

7.2.8 When supplementary parameters (i.e. physical ones, such as velocity, temperature and pressure or chemical ones, such as oxygen, carbon dioxide and water vapour) are used in the calculation of a measurement result, the measurement of these parameters shall be MCERTS accredited. If they are not MCERTS accredited, MCERTS accreditation cannot be claimed for the reported measurements.

7.2.9 The methods organisations are accredited to use shall be defined in the organisation's schedule of activities.

#### **b) Analysis methods**

7.2.10 If the method requires laboratory analysis of samples collected on-site, the monitoring organisation shall either be accredited for the analysis method to EN ISO/IEC 17025 for the MCERTS Performance standard for laboratories carrying out testing of samples from stack emissions monitoring or shall use another laboratory accredited to that standard.

7.2.11 If the analysis method is not accredited, the overall monitoring result is not MCERTS accredited. A statement explaining that the result is not accredited shall be included in the monitoring report.

7.2.12 A monitoring organisation with MCERTS accreditation for odour sampling, can claim MCERTS accreditation for the overall result of a measurement for odour, if the analysis is accredited to EN ISO/IEC 17025.

Note: Analysis of odour samples by olfactometry is not included in the MCERTS Performance standard for laboratories carrying out testing of samples from stack emissions monitoring.

### **c) Unusual measurands**

7.2.13 Occasionally a monitoring organisation may be required to measure an unusual measurand (i.e. one that is not listed in TGN M2 or covered by a general method in TGN M2).

To measure an unusual measurand the monitoring organisation may select a national method (e.g. US EPA). If a national method is not available they may adapt an occupational method, such as those produced by the following:

- Method for the Determination of Hazardous Substances (MDHS) series published by the Health and Safety Executive (HSE).
- National Institute of Occupational Safety and Health (NIOSH).
- Occupational Safety and Health Administration (OSHA).

If a relevant method cannot be found, the monitoring organisation may adapt general monitoring principles based on the chemical and physical characteristics of the measurand.

MCERTS accreditation cannot be granted for these methods. However, the inclusion of quality assurance and quality control procedures helps ensure the methods are being employed properly.

7.2.14 In some circumstances it is not possible to precisely follow the requirements of isokinetic methods (i.e. those which require sampling at multiple points in a stack) due to the following factors related to the sample location:

- limited access to the required number of sample lines
- limited access to sample points, which may restrict the number of points that can be used
- poor positioning of the sample plane, which may result in the flow criteria not being met

In these circumstances the estimation of the uncertainty relating to the results of a specific stack emission measurement exercise are complicated and not possible to quantify. The affect of the sample location on the measurement uncertainty shall not be taken into account when reporting the uncertainty. Qualifying remarks explaining the deviations from the standard shall be included in the monitoring report.

Note: EN ISO 14956 provide generic guidance on how to estimate the uncertainty of measurements. For periodic measurements of emissions this guidance can be applied using the following approaches, depending on the situation to estimate the measurement uncertainty:

- repeat measurements on reference materials
- experimental work, for example, repeatability experiments, paired comparisons and inter-laboratory comparisons
- estimations based on previous results/data e.g. instrument specifications

7.2.15 Where a method is used, which does not have a stated uncertainty, the laboratory shall estimate the uncertainty of the measurement using the approach specified in EN ISO 14956.

### **7.3 Sampling**

#### **a) Site review**

7.3.1 A site review is an on site visit that shall be carried out prior to producing a site specific protocol (SSP). The review is carried out so that the stack emissions monitoring personnel understand the physical and logistical situation on-site. The site review would normally be carried out once only. However, if the monitoring regime at the site changes significantly it may need repeating. The review provides essential information for determining a SSP.

Note: provided the site has a MCERTS compliant SSP available, this can be used by a monitoring organisation, which is new to the site, to develop their own SSP. Under these circumstances it may not be necessary to carry out another site review.

7.3.2 A person certified to MCERTS Level 2 with the appropriate technical endorsements shall be responsible for carrying out the site review. This person, however, need not be a member of the monitoring team that carries out the actual stack emissions monitoring.

Note: A person certified to MCERTS Level 1 is permitted to conduct a site review but only under the direct supervision of a Level 2 person (see MCERTS personnel competency standard).

7.3.3 The site review is carried out at an earlier date to the sampling, so that there is time to prepare the SSP and for any remedial actions to be carried out by the monitoring organisation and/or the client commissioning the monitoring.

7.3.4 Site reviews shall be documented.

#### **b) Risk assessment**

7.3.5 An assessment of the hazards and associated risks involved in stack emission monitoring shall be undertaken and documented during a site review and before every measurement campaign. The risk assessment shall be reviewed before starting work each day.

7.3.6 The risk assessment shall contain, as a minimum, the information included in Annex C.

#### **c) Site-specific protocol (measurement plan)**

7.3.7 Following a site review a site specific protocol (SSP) shall be produced to detail the application of the technical procedures to a specific site. The SSP shall be documented.

Note 1: The SSP is kept by the operator as a record of how monitoring is carried out on their site.

Note 2: A copy of the SSP may be requested by the regulator.

- 7.3.8 Information from previous SSPs shall be used by a monitoring contractor when developing a new SSP. Agreement shall be sought from the client if technical changes are made to a previous SSP.

Note: Reviewing previous SSPs ensures that the monitoring is carried out consistently, even if the monitoring organisation changes.

- 7.3.9 A person certified to MCERTS Level 2 with the appropriate technical endorsements shall approve the SSP.

Note: A person certified to MCERTS Level 1 is permitted to produce an SSP but only under the direct supervision of a Level 2 person (see MCERTS personnel competency standard).

- 7.3.10 Agreement shall be sought from the client if a standard method in an organisation's technical procedure requires modifying due to site specific conditions.

- 7.3.11 The monitoring organisation should ensure the client agrees to the SSP prior to commencement of the measurement. Sufficient time shall be allowed, between the submission of the SSP to the client and the commencement of the measurement campaign, to enable the client to understand the SSP and to put in place any recommendations or changes required by the SSP. The laboratory shall retain documentary evidence that the client has agreed to the SSP.

- 7.3.12 The stack emission monitoring organisation shall, where available, use the operator's permit in order to prepare the SSP.

Note 1: Most monitoring for environmental compliance is carried out to meet requirements specified in an operator's permit.

Note 2: The operator is expected to provide the permit to the monitoring organisation in order for them to prepare the SSP.

- 7.3.13 The SSP shall contain, as a minimum, the information included in Annex D.

- 7.3.14 The SSP shall be updated, when required.

Note: It may be necessary to update the SSP following changes to the operator's permit or to the monitoring contractor's procedures. For example, the monitoring contractor's procedures may change due to the publication of a new monitoring standard. Depending on the significance of these changes it may be necessary to repeat a site review before updating the SSP.

#### **d) Job file**

- 7.3.15 A file shall be used to record details of the stack emission measurement campaign.

7.3.16 A file shall contain, as a minimum, the following:

- site-specific protocol;
- risk assessment;
- list of equipment used;
- reference to equipment history for the measurement campaign;
- reagents and sample media used;
- record of deviations from site-specific protocol;
- measurement record sheets;

**e) Site record sheets**

7.3.17 The organisation shall have procedures for recording monitoring data and operations relating to stack emission monitoring. Site record sheets shall be used to record this information.

7.3.18 Site record sheets shall include, as a minimum, the following:

- date
- name of the monitoring team members making the records
- measurement procedure used
- identification of the equipment
- sampling location (including diagrams as necessary)
- environmental conditions, for example, atmospheric pressure
- details of measurement start and finish times
- for manual methods, details of sampling, for example, dry gas metre readings, solution volumes, pressure and temperature readings
- for instrumental methods, the output or indicated readings of the analyser
- for manual methods, the sample details, for example, sample bottle or sorbent tube identification label

**7.4 Handling of test or calibration items**

7.4.1 A chain of custody record shall be maintained from the collection of samples, to sample storage, to sample analysis. The record should detail the person who has possession of the samples and the location of the item.

7.4.2 The stack shall be identifiable by a specific reference number or description.

**7.5 Technical records**

No additional requirements to EN ISO/IEC 17025.

**7.6 Evaluation of measurement uncertainty**

7.6.1 The organisation shall have procedures in place for providing an estimate of the uncertainties relating to results.

7.6.2 Where a RM has a stated uncertainty this can only be achieved if the requirements of the method are complied with in full. Where a RM is not complied with in full the laboratory shall estimate the uncertainty of the measurement.

## **7.7 Ensuring the validity of results**

### **7.7.1 Internal Quality Control**

No additional requirements to EN ISO/IEC 17025.

### **7.7.2 Participation in interlaboratory comparison or proficiency-testing programmes**

Information on participation in proficiency testing is provided in Annex E.

### **7.7.3** No additional requirements to EN ISO/IEC 17025.

## **7.8 Reporting of results**

### **7.8.1** A standard report format shall be used.

Note: The standardised report provides sufficient detail to allow an audit trail to the on-site measurement and process plant operating conditions.

### **7.8.2** The results of all monitoring shall be reported by the monitoring organisations to their clients. This requirement includes results showing non-compliance as well as compliance with emission-limit values.

### **7.8.3** Any deviations from the site specific protocol or the monitoring method /technical procedure(s) used shall be included in the report.

### **7.8.4** The report shall contain, as a minimum, the information included in Annex F. The report shall also contain information specified in individual monitoring methods.

Note: Monitoring methods may specify information related to both sampling and analysis.

### **7.8.5** Reports detailing results of regulatory compliance monitoring shall not contain opinions or interpretations:

- about the effect monitoring deviations have on the application of the method
- on whether the results demonstrate compliance or not with emission limit values

Note: The competent authority assesses the significance of monitoring deviations and whether results are compliant or not.

### **7.8.6** If requested, a copy of the report shall be provided to the competent authority. The report shall be available in an electronic format.

## **7.9 Complaints**

No additional requirements to EN ISO/IEC 17025.

## **7.10 Nonconforming work**

No additional requirements to EN ISO/IEC 17025.

## **7.11 Control of data and information management**

No additional requirements to EN ISO/IEC 17025.

# **8 Management system requirements**

No additional requirements to EN ISO/IEC 17025.

## **Annex A – Certification and supervision**

The certification and supervision requirements to carry out different stack emission monitoring activities under MCERTS accreditation are detailed below.

### **MCERTS trainee**

Can carry out site work under the **direct** supervision of a Level 2.

Note 1: Direct supervision of a Trainee requires the Level 2 to observe all the site work activities they carry out.

### **MCERTS level 1**

- Carry out risk assessments under **direct** supervision of a Level 2.
- Carry out site reviews under **direct** supervision of a Level 2.
- Produce SSPs but a Level 2 must authorise the SSP.
- Carry out site work under general supervision of a Level 2.
- Produce monitoring reports but a Level 2 must authorise the monitoring report.

### **MCERTS level 2**

The following activities may be carried out, no supervision required, but they must comply with MCERTS accreditation.

- Carry out and approve risk assessments
- Carry out and approve site reviews
- Produce and approve SSPs
- Carry out site work
- Supervise site work
- Produce and approve monitoring reports

Note 2: Direct supervision means that a Level 2 must accompany the Level 1 while carrying out risk assessments and site reviews.

Note 3: General supervision means the Level 2 must be actively involved in the practical work of monitoring on site. However, they do not have to observe all the work carried out by the team they are supervising.

The Level 2 must hold Technical Endorsements relevant to the monitoring required (this applies to carrying out the risk assessment, planning the work, carrying out the site work and producing the report).

To authorise SSPs and reports produced by a Level 1 the Level 2 must check the completed documents in detail.

## **Annex B – Use of portable instruments in stack emissions monitoring**

### **B.1 Use of instruments for EN 14181 calibration (QAL2 and AST)**

Instrumental measurement systems used to carry out QAL2 and AST parallel reference measurements shall be MCERTS certified as a transportable-CEM (T-CEM) for the appropriate measurand and certification range for the application (an instrument is considered to have a suitable certified range when the certified range is not more than 1.5x the daily average ELV for incineration processes and not more than 2.5x the daily average ELV for large combustion plant and other types of process).

### **B.2 Use of instruments for compliance monitoring**

#### **1) Use of MCERTS certified T-CEMs**

An instrument that is MCERTS certified as a T-CEM for the appropriate measurand and certification range (see B.1 for information on certification ranges) is suitable for compliance monitoring.

If an MCERTS certified instrument does not have a suitably low certification range for use at a particular application, it is acceptable to lower the certified range by proving the instrument meets the performance criteria, specified in the RM, over the lower range. This shall be done using an ISO 17025 accredited laboratory that has demonstrated to UKAS that it has suitable procedures in place to do this type of work.

The laboratory performance tests only need to be carried out on one instrument, as the MCERTS product certification verifies that each instrument is manufactured to the same standard.

#### **2) Use of instruments that are not MCERTS certified**

An instrument that is not MCERTS certified as a T-CEM may be used, provided it is proven to meet the performance criteria of the RM. This shall be done using an ISO 17025 accredited laboratory that has demonstrated to UKAS that it has suitable procedures in place to do this type of work. The user shall also demonstrate that the instrument works on the intended process application. This shall be achieved in one of the following ways:

- carrying out field tests, under ISO 17025 accreditation, to compare the instrument against the reference method
- carrying out tests, using an appropriate stack simulator test rig, under ISO 17025 accreditation, to compare the instrument against the reference method

As a minimum the test rig / field tests shall meet the requirements of CEN TS 14793.

The accredited method shall specify the types of process the instrument may be used on.

Once the test rig / field tests have been completed satisfactorily they can be applied to all instruments of the specific model tested.

Once the technique has been proven in the field the stack emission monitoring organisation shall demonstrate that **each** instrument they use meets the laboratory performance criteria specified by the RM.

## Annex C – Health and safety

1. Relevant safety guidance includes Environment Agency Technical Guidance Note: M1 and the Source Testing Association *Risk assessment guide: industrial emission monitoring*.
2. The monitoring organisation shall implement procedures to minimise health and safety risks during site work. The procedures shall include:
  - using a risk-management approach to site work
  - compliance with care of substances Control of Substances Hazardous to Health (COSHH)
  - site-safety induction training
  - safe systems for lone and remote working
3. Equipment used on-site by the organisation shall meet all the necessary safety standards required. Monitoring personnel shall use appropriate lifting equipment. As a minimum personnel shall wear safety glasses and steel toe-capped footwear conforming to appropriate standards while undertaking stack emission monitoring.

Note Equipment used on-site by the monitoring organisation also includes any of the operator's equipment they may use (for example, lifting equipment).
4. Appropriate control measures (for example, safe working procedures, local exhaust ventilation and personal protective equipment) shall be detailed in the organisation's technical procedure for the relevant methods.
5. The monitoring organisation shall undertake and document a risk assessment specific to the required work and sampling location. This shall be undertaken in three stages:
  - as part of a site review
  - before pre-sampling preparation in the laboratory
  - before on-site monitoring
6. The site review risk assessment shall include a section that shall be completed before entering the area of work. This shall be used by the monitoring organisation to find out standard site safety information such as fire alarms and procedures, chemical hazard alarms and procedures, intrinsically safe working areas, hygiene regulations, emergency rescue plans. This information may be covered in a formal site induction or a permit to work system. On sites where these are not available, it is the responsibility of the person certified to MCERTS Level 2 (team leader) to obtain the information.
7. The monitoring organisation's risk assessment shall confirm that the site/process operator has the following elements in place before undertaking stack emission work:
  - a safety policy covering work on site in accordance with the requirements of the Management of Health and Safety at Work Regulations
  - a safe sample platform and work area

8. Monitoring personnel visiting or working on a site for the first time shall attend a site induction if provided by the site operator. Attendance at an induction shall be recorded on the risk assessment for each member of the monitoring team.
9. The risk assessment shall include an assessment of the level of risk from each of the various hazards present and as a minimum shall include:
  - general site hazards – site traffic, fire and emergency, mechanical operations, chemical operations
  - physical hazards at the stack – lifting, falling, burns, electricity, compressed gases
  - chemical hazards at the stack – exposure to substances from flue gases, exposure to substances used in monitoring tests
  - weather and environment – temperature extremes, wind, rain, lightning, snow and ice, sunburn
  - chemical hazards at the laboratory – exposure to chemicals used for equipment and sample preparation
10. The risk assessment shall also include:
  - a COSHH assessment of exposure to workplace substances (both laboratory and on-site)
  - information on the composition and pressure of the gas in the stack to be monitored and the process characteristics
  - identification of the control measures are required to reduce exposure to an acceptable level
11. Organisations that undertake lone working on-site shall incorporate safety procedures into the risk assessment (for example, use of personal alarm, regular contact with site personnel).
12. The risk assessment shall clearly show the hazards for each working area (for example monitoring position, stack and the like).
13. The risk assessment shall quantify the risk. The level of risk shall be that recorded at the time of assessment, not the level that would be the case if control measures were put in place.
14. The operator shall be shown the risk assessment and be given the opportunity to comment on it. For in-house teams, a representative of the operator not directly involved in the work shall be shown the risk assessment. Typically, this could be the environmental manager or safety manager.
15. Work shall not commence until the organisation's risk assessment confirms that the risks are acceptable, or control measures have been put into place (including those that are the responsibility of the operator) to reduce the risk to an acceptable level.
16. Before work commences, the risk assessment shall be communicated by the Level 2 person (team leader) to other members of the monitoring team. All team members sign the risk assessment to confirm they have seen and understood its content.

## **Annex D – Site specific protocol**

A site-specific protocol (SSP) shall contain the following in the same section order specified below:

### **Part 1**

#### **Contact details, monitoring dates and personnel**

- operator name
- operators address and contact information
- permit number (including permit variation number, if applicable)
- installation name
- name of operator's contact
- date and report number of previous monitoring campaign
- planned date of monitoring campaign
- name and address of the monitoring organisation
- name, role during monitoring campaign, MCERTS registration number, certification level and technical endorsements held of the persons who will be involved in the monitoring campaign (the date when the certificates expire is to be included)

Note 1: Part 1 is updated before each monitoring visit

### **Part 2**

#### **Monitoring objectives**

- the overall aim of the monitoring campaign
- the substances to be monitored at each emission point:
  - emission limit value
  - reference conditions at which the results are expressed
  - details of monitoring method(s) to be used for each substance
- the overall uncertainty of the method(s)

#### **Process conditions**

- the type of process
- a description of the process
- if batch process whether the whole of the batch is to be sampled or the details of the part of the batch sampled
- the fuel type and feedstock
- the normal load, throughput or continuous rating of the plant
- any unusual occurrences that take place during the process
- what type of abatement system is fitted (if applicable)
- what type of CEM system is installed and details of the data information system (if applicable)
- the process details that need to be collected over the monitoring period

## Sample location

- dimensions of the stack(s) and monitoring facilities
- a description of the location of the sampling plane for each release point
- for each sampling plane, a description of the type of sampling port (accessibility, correct size, sufficient number, properly located)
- for each sampling plane, a summary of the number, arrangement and orientation of the sample line(s), and the number of sampling points per line
- access to the stack
- adequate work area at the sampling positions
- availability of required utilities (electrical, lighting, water)
- expected velocity profile\*
- expected temperature and moisture of the stack gas\*
- homogeneity test (where required)\*
- restrictions on using equipment, e.g. intrinsically safe areas
- physical restrictions to using required apparatus
- appropriate measurement equipment for the application
- for each sampling location, a summary of compliance with BS EN 15259 / EA TGN M1 (e.g. flow criteria, homogeneity, access to sample line(s) and sample point(s))

\*Note 2. Historical information from previous measurement reports may be used. A note of the reports date and ID number shall be included in the site review.

## Details of monitoring

- expected emission values
- the equipment used for each substance monitored
- the sampling duration and number of samples for each measurement, including blanks
- for manual methods, the proposed sample flow-rate, volume and minimum sampling times
- for instrumental methods, the proposed span-gas concentration
- the measurement concentration range and lower detection limit
- for manual methods requiring a separate chemical analysis stage, details of the analytical method, the laboratory carrying out the analysis
- any modifications to the technical procedure, with justifications
- an explanation why any substance(s) in the monitoring objectives will not be monitored
- an explanation why any substance(s) will not be monitored in accordance with the monitoring method

Note 3: Part 2 is updated when there are changes to the monitoring. It may be necessary to update the SSP following changes to the operator's permit or to the monitoring contractor's procedures. For example, the monitoring contractor's procedures may change due to the publication of a new monitoring standard. Depending on the significance of these changes it may be necessary to repeat a site review before updating the SSP.

## **Annex E - Participation in proficiency-testing**

1. Proficiency-testing (PT) shall be used, where available and appropriate.
2. Monitoring organisations shall take part in PT that is accredited to ISO/IEC 17043 for determinands that are appropriate to the monitoring organisation's scope of accreditation and scope of work.
3. Where available and appropriate to the monitoring organisation's schedule of accreditation and scope of work, an appropriate, accredited PT scheme based on the use of a stack gas simulator or a real stack facility, shall be participated in. The participation rate shall be at least once in every 4 year accreditation cycle, for each permanent location that carries out accredited stack emissions monitoring activities.

Note: The National Physical Laboratory run a PT scheme that is based on the use of a stack gas simulator facility. Terms of references have been agreed between NPL and the Environment Agency to ensure that this is an effective means of assessing the performance of MCERTS accredited stack emissions monitoring organisations.

4. Where available and appropriate to the monitoring organisation's schedule of accreditation, appropriate accredited PT schemes, which are run by sending artefacts (for example a gas cylinder delivery programme) to a permanent location, shall be participated in, each year that a permanent location does not take part in a PT scheme based on the use of a stack gas simulator or real stack facility.
5. Each monitoring organisation shall have a proficiency testing plan, which shall document the proposed participation of Level 2 personnel and monitoring equipment/instruments from each occasion to the next, to prevent, where possible, duplication of participation of personnel and equipment/instruments.
6. For monitoring organisations with multiple locations, attendance of a PT scheme, which is based on a stack gas simulator or real stack facility, shall be spread evenly across a 4 year accreditation cycle. This shall be included in their PT plan.

## **Annex F – Stack emission monitoring report**

A stack emission monitoring report shall include the following information on each page:

- a unique reference in the following format:
  - permit number (including permit variation number, if applicable)
  - operator and installation name
  - year of the monitoring visit
  - sequential numbering system, if applicable (e.g. biannual, quarterly)
- a version number
- a page number, which shall be written as “page x of y”

The report shall contain the following information in the same section order specified below:

### **Part 1: Executive Summary**

#### **Cover sheet**

- MCERTS logo, UKAS accreditation symbol and registration number of the monitoring organisation
- title
- permit number (including permit variation number, if applicable)
- operator name
- installation name
- dates of the monitoring visit
- contract number or reference
- name and address of the client organisation (if applicable)
- name and address of the monitoring organisation
- date of the report
- name, MCERTS registration number, certification level and technical endorsements held of the person approving the report for the monitoring organisation and
- the signature of the person approving the report

#### **Contents**

The content sheet shall describe the contents of both parts of the report.

#### **Monitoring objectives**

- the overall aim of the monitoring campaign
- the substances to be monitored at each emission point and
- any special requirements

#### **Monitoring results**

- emission point
- substances to be monitored
- emission limit value expressed in the terms and units defined in the permit
- periodic monitoring result in the same terms as the emission limit value

- uncertainty associated with the result at a 95% confidence level
- units for the emission limit value, the periodic monitoring result and the uncertainty
- reference conditions at which the results are expressed
- date of monitoring
- start and end times for the monitoring
- name and reference number of monitoring method used
- accreditation for use of the method, such as MCERTS, UKAS
- process status at the time of monitoring, such as load and feedstock

### **Operating information**

- whether process was continuous or batch process
- whether the whole of the batch was sampled or the details of the part of the batch sampled (if applicable)
- what fuel was used during monitoring (if applicable)
- what feedstock used during monitoring (if applicable)
- the normal load, throughput or continuous rating of the plant
- what type of abatement system and whether operating
- the periodic monitoring results and the results obtained for the corresponding period by the operator's CEMS

### **Monitoring deviations**

- an explanation why any substance(s) in the monitoring objectives was not monitored
- an explanation why any substance(s) were not monitored in accordance with the monitoring method
- any other issues relevant to the monitoring results

## **Part 2: Supporting information**

### **Appendix 1**

- name, role during monitoring campaign, MCERTS registration number, certification level and technical endorsements held of the persons who carried out the monitoring campaign
- the substance(s) monitored, the reference number of the standard method used and the reference to the Technical Procedure used by the monitoring organisation
- a reference to the equipment check lists used on the monitoring campaign

### **Further appendices (for each emission point)**

- diagrams showing the dimensions of the stack and the monitoring facilities
- flow criteria measurements, such as measurements for temperature, pressure and stack gas velocity
- gas homogeneity test results
- gas measurements, such as oxygen and carbon dioxide
- water vapour measurements

- sampling measurements, such as stack gas temperature and velocity during sampling
- instrumental gas analyser site calibration measurements including zero and span gas concentrations
- instrumental gas analyser results
- information on sample analysis, including the name of the analytical laboratory, the accreditation for the use of the analytical method, the date of the analysis and any specific analytical requirements specified by the reference method
- the manual monitoring method results calculations, including concentrations and mass emissions (if required)
- uncertainty calculations for each reported result, including:
  - a list of parameters that affect the measurement uncertainty
  - uncertainty sources (in order of significance)
  - combined uncertainty for sources
  - expanded total uncertainty as a percentage of the total measurement
  - expanded total uncertainty in units of measurement
  - expanded total uncertainty as a percentage of the ELV (expressed at a 95% confidence interval)

## **LIT 5901**