

Standards and methods for monitoring in the UK

The verification of emissions monitoring data depends on standard reference methods, which are developed at a national, European or global level

With the increasing requirement for the installation of continuous emission monitoring systems (CEMS) it is important that capital investment is protected and that instrumentation gives reliable, meaningful and repeatable data. Fitting MCERTS-approved equipment is one element but it is extremely important that the system is verified. The verification process requires the use of standard reference methods to underpin the data.

Standard reference methods are essential for the effective measurement and control of air pollution. Such standards are developed at a national, European and global level. The robustness and fitness for purpose of these standards is a function of the accumulated expertise and experience of the people who work together in committee to produce them. Where internationally-derived standards are binding on the UK, as European (CEN) standards are, it is particularly important that they should recognise UK interests and sensitivities. BSI manages the UK input to new standards via its technical committees and the UK experts that they nominate to CEN and ISO working groups.

ISO standards are accepted on a case by case principle, it is not mandatory for a member country to adopt a standard.

CEN standards are mandatory and must be adopted by member states of the European Union. If a conflicting standard is in existence then this must be withdrawn.

BSI technical committee EH/2 is responsible for air quality issues. The sub group EH/2/1 is specifically charged with stationary source emission measurement standardisation. BSI EH/2/1 nominates experts to the technical committees of CEN/TC 264 (air quality) and ISO TC 146 (air quality). BSI EH/2/1 also oversees a portfolio of existing BSI, CEN and ISO standards to ensure that they are regularly reviewed for technical relevance and continued suitability for purpose. In order that existing and developing standards reflect the full range of UK interests, it is imperative that BSI EH/2/1, like other BSI committees, reflects the widest possible range of users.

Standards developed and published by CEN are generally accepted as being the most robust. However, other standards are still important, as there are substances that are not, as yet, covered by CEN Standards. The choice of the method is often dictated by the requirements of a relevant EU Directive, where, for example, the use of CEN standards is mandatory. If the standard is not dictated by mandatory requirements then monitoring standards should be used in the following order of priority as given in the European IPPC Bureau's Reference Document on the General Principles of Monitoring:

- Comité Européen de Normalisation (CEN)
- International Standardisation Organisation (ISO)

If the substance cannot be monitored using standards covered by the above then a method can be selected from any one of the following:

- American Society for Testing and Materials (ASTM)
- Association Française de Normalisation (AFNOR)



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- British Standards Institution (BSI)
- Deutsches Institute für Normung (DIN)
- United States Environmental Protection Agency (US EPA)
- Verein Deutscher Ingenieure (VDI)

If the substance cannot be monitored using standards covered by the above then the following occupational methods may be developed, following the requirements of ISO 17025, for stack-emission monitoring:

- 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)

The intended application of the standard method must always be taken into account. For example, a CEN method may be less suitable than another less-rig-

orously validated standard method if the application is not one for which the CEN method was developed. The Environment Agency produces, wherever required, Method Implementation Documents (MIDs) which detail the applicability of methods. The methods detailed in Environment Agency Technical Guidance Note (Monitoring) M2 'Monitoring of Stack Emissions to Air' should be used unless it can be demonstrated that they are not fit for purpose for a particular application.

Further guidance and advice

The Source Testing Association provides guidance to its membership and their clients. This includes methodology advice, guidance on equipment selection and training. Visit the STA website for details www.s-t-a.org or for any technical question contact airanswers@s-t-a.org or telephone +44(0) 1462 457535.

Selection of standards for emission monitoring:

COMPOUND	STANDARD NUMBER	DESCRIPTION	MID NUMBER
Alternate reference method procedure	DD CEN/TS 14793:2005	Intralaboratory validation procedure for an alternative method compared to a reference method	
Asbestos	BS 6069-4.2:1991	Method for the determination of asbestos plant emissions by fibre count measurement	
Calibration of CEMS	BS EN 14181:2004	Quality assurance of an AMS	14181
Carbon monoxide (CO)	BS EN 15058:2006	Determination of the mass concentration of carbon monoxide (CO). Reference method: non-dispersive infrared spectrometry	
CEMS sampling	BS ISO 10396:2007	Sampling for the automated determination of gas emission concentrations for permanently-installed monitoring systems	
Dioxin 1 sampling	BS EN 1948-1:2006	Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Sampling of PCDDs/PCDFs	1948
Dioxin 2 extraction	BS EN 1948-2:2006	Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Extraction and clean-up of PCDDs/PCDFs	1948
Dioxin 3 quantification	BS EN 1948-3:2006	Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Identification and quantification of PCDDs/PCDFs	1948
Dioxin 4 PCB sampling and analysis	DD CEN/TS 1948-4:2007	Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Sampling and analysis of dioxin-like PCBs	
Flow automatic	BS ISO 14164:1999	Determination of the volume flow rate of gas streams in ducts. Automated method	
HCl 1 sampling	BS EN 1911-1:1998	Manual method of determination of HCl. Sampling of gases	
HCl 2 absorption	BS EN 1911-2:1998	Manual method of determination of HCl. Gaseous compounds absorption	
HCl 3 analysis	BS EN 1911-3:1998	Manual method of determination of HCl. Absorption solutions analysis and calculation	
Hydrogen Fluoride	BS ISO 15713:2006	Sampling and determination of gaseous fluoride content	15713
Instrument certification	BS EN 15267-3:2007	Air quality – Certification of automated measuring systems – Part 3: Performance specifications and test procedures for automated measuring systems for monitoring emissions from stationary sources	
ISO 17025 elaboration	DD CEN/TS 15675- 2007	Elaboration of ISO17025 for stack emission monitoring	
Mercury	BS EN 13211:2001	Manual method of determination of the concentration of total mercury	
Mercury calibration	BS EN 14884:2005	Determination of total mercury: automated measuring systems	
Metals	BS EN 14385:2004	Determination of the total emission of As, Cd, Cr, Co, Cu, Mn, Ni, Pb, Sb, Ti and V	14385
Moisture / water vapour	BS EN 14790:2005	Determination of the water vapour in ducts	
Nitrogen Oxide (NOx)	BS EN 14792:2005	Determination of mass concentration of nitrogen oxides (NOx). Reference method: Chemiluminescence	
Odour	BS EN 13725:2003	Determination of odour concentration by dynamic olfactometry	
Oxygen	BS EN 14789:2005	Determination of volume concentration of oxygen (O2). Reference method. Paramagnetism	
PAH analysis	BS ISO 11338-2:2003	Determination of gas and particle-phase polycyclic aromatic hydrocarbons. Sample preparation, clean-up and determination	
PAH sampling	BS ISO 11338-1:2003	Determination of gas and particle-phase polycyclic aromatic hydrocarbons. Sampling	
Particulate	BS ISO 12141:2002	Determination of mass concentration of particulate matter (dust) at low concentrations. Manual gravimetric method	
Particulate / Dust	BS EN 13284-1:2002	Determination of low range mass concentration of dust. Manual gravimetric method	13284
Particulate calibration	BS ISO 10155:1995	Automated monitoring of mass concentrations of particles. Performance characteristics, test methods and specifications	
Particulate calibration	BS EN 13284-2:2004	Determination of low range mass concentration of dust. Automated measuring systems	
Particulate high range	BS ISO 9096:2003	Manual determination of mass concentration of particulate matter	
Planning	BS EN 15259:2007	Air Quality – Measurement of stationary source emissions – Requirements for measurement sections and sites and for the measurement objective, plan and report	
Smoke	BS 2742:1969	Notes on the use of the Ringelmann and miniature smoke charts	
Sulphur Dioxide (SO2)	BS EN 14791:2005	Determination of mass concentration of sulphur dioxide. Reference method	
TOC high range	BS EN 13526:2002	Determination of the mass concentration of total gaseous organic carbon in flue gases from solvent using processes. Continuous flame ionisation detector method	
TOC low range	BS EN 12619:1999	Determination of the mass concentration of total gaseous organic carbon at low concentrations in flue gases. Continuous flame ionisation detector method	
VOC speciation	BS EN 13649:2002	Determination of the mass concentration of individual gaseous organic compounds. Activated carbon and solvent desorption method	