



# Standards and Methods for Environmental monitoring in the UK

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Each year in the Annual Guide, we highlight what has taken place in the world of standards development. Standard reference methods are essential for the effective measurement and control of air pollution. Such standards are developed at National, European and worldwide 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.

Standards are developed in Europe by Comité European de Normalisation (CEN) and internationally by International Standardisation Organisation (ISO)

European Standards (ENs) are based on a consensus, which reflects the economic and social interests of 33 CEN Member countries channelled through their National Standardization Organizations. Most standards are initiated by industry. Other standardisation projects can come from consumers, Small and Medium-sized Enterprises (SMEs) or associations, or even European legislators.

ISO International Standards ensure that products and services are safe, reliable and of good quality. For business, they are strategic tools that reduce costs by minimising waste and errors

and increasing productivity. They help companies to access new markets, level the playing field for developing countries and facilitate free and fair global trade.

## Selection of standards for emission monitoring

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 EN15267 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 National, European and worldwide 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.

ISO standards are accepted on a case by case principle; it is not mandatory for a member country in the European Union (EU) to adopt a standard.

Member states of the EU must implement CEN standards. If a conflicting standard is in existence, then this must be withdrawn.

## Understanding how standards numbers work

Figure 1 shows how standards are adopted in the UK and published by the British Standards Institute (BSI).

1. Should a standard be developed, for example in the UK by BSI it will be prefixed by BS, e.g. BS 3841-1:1994 Determination of smoke emission from manufactured solid fuels for domestic use.

2. When a standard is developed and published by CEN, it is prefixed with EN, and when introduced in the UK it will become a BS EN document, e.g. BS EN 1911:2010 Stationary source emissions – Determination of mass concentration of gaseous chlorides expressed as HCl and as stated above any conflicting standard must be removed. CEN or ISO can develop a standard under a joint agreement, and then CEN and ISO publish it with a prefix EN ISO, and in the UK it then becomes a BS EN ISO prefix, e.g. BS EN ISO 23210:2009 Stationary source emissions – Determination of PM10/PM2.5 mass concentration in the flue gas. A national foreword is added to the standard to indicate its scope of applicability and to highlight any UK specific concerns.

3. When ISO develops a standard it is prefixed ISO and should this be adopted in the UK it becomes BS ISO, e.g. BS ISO 25597:2015 Stationary source emissions – Test method for determining PM10/PM2.5 mass in stack gases using cyclone samplers and sample dilution.

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 EU Directives, i.e. Industrial Emission Directive (IED), where, for example, the use of CEN standards is mandatory.

The following is a list of current standards for emission monitoring.

Standard No	Standard Title	Date	MIDS
BS ISO 14164:1999	Stationary source emissions. Determination of the volume flowrate of gas streams in ducts. Automated method	1999.08.15	
BS EN 13211:2001	Air quality. Stationary source emissions. Manual method of determination of the concentration of total mercury	2001.07.15	
BS ISO 12141:2002	Stationary source emissions. Determination of mass concentration of particulate matter (dust) at low concentrations. Manual gravimetric method	2002.11.26	
BS ISO 11338-1:2003	Stationary source emissions. Determination of gas and particle-phase polycyclic aromatic hydrocarbons. Sampling	2003.06.25	
BS ISO 11338-2:2003	Stationary source emissions. Determination of gas and particle-phase polycyclic aromatic hydrocarbons. Sample preparation, clean-up and determination	2003.11.27	
BS EN 14385:2004	Stationary source emissions. Determination of the total emission of As, Cd, Cr, Co, Cu, Mn, Ni, Pb, Sb, Tl and V	2004.03.22	MID14385

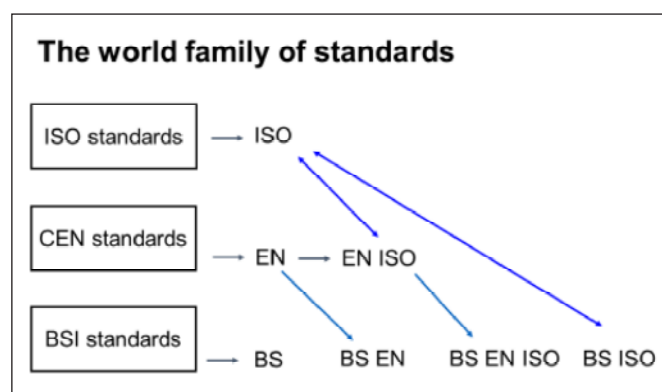


Figure 1. Diagram of the world family of standards

If mandatory requirements do not dictate the standard, then monitoring standards should be used in the following order of priority as given in the European IPPC Bureau's Reference Document (<http://eippcb.jrc.ec.europa.eu/>) on the General Principles of Monitoring:

1. EN standards
2. ISO standards, other international standards, national standards
3. Validated laboratory-developed and non-standard methods

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-rigorously validated standard method if the application is not one for which the CEN method was developed.

The standards bodies have various technical committees that are responsible for the development of the standards. For emission, to air, the CEN committee is CEN TC 264 and for ISO is ISO TC 146 SC.1.

Standard No	Standard Title	Date	MIDS
BS EN 14884:2005	Air quality. Stationary source emissions. Determination of total mercury: automated measuring systems	2006.01.26	
BS EN 1948-2:2006	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Extraction and clean-up of PCDDs/PCDFs	2006.03.24	MID1948
BS EN 1948-3:2006	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Identification and quantification of PCDDs/PCDFs	2006.03.24	
BS ISO 15713:2006	Stationary source emissions. Sampling and determination of gaseous fluoride content	2006.06.30	MID 15713
BS ISO 10396:2007	Stationary source emissions. Sampling for the automated determination of gas emission concentrations for permanently-installed monitoring systems	2007.02.28	
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	2007.10.31	MID 15259
DD CEN/TS 15674:2007	Air quality. Measurement of stationary source emissions. Guidelines for the elaboration of standardised methods	2007.11.30	
DD CEN/TS 15675:2007	Air quality. Measurement of stationary source emissions. Application of EN ISO/IEC 17025:2005 to periodic measurements	2007.11.30	
BS EN 15267-3:2007	Air quality. Certification of automated measuring systems. Performance criteria and test procedures for automated measuring systems for monitoring emissions from stationary sources	2008.03.31	
BS EN 15445:2008	Fugitive and diffuse emissions of common concern to industry sectors. Qualification of fugitive dust sources by reverse dispersion modelling	2008.09.30	
BS EN 15446:2008	Fugitive and diffuse emissions of common concern to industry sectors. Measurement of fugitive emission of vapours generating from equipment and piping leaks	2008.09.30	
BS EN 15267-1:2009	Air quality. Certification of automated measuring systems. General principles	2009.04.30	
BS EN 15267-2:2009	Air quality. Certification of automated measuring systems. Initial assessment of the AMS manufacturer's quality management system and post certification surveillance for the manufacturing process	2009.04.30	
BS 2742:2009	Use of the Ringelmann and miniature smoke charts	2009.05.31	
BS EN ISO 23210:2009	Stationary source emissions. Determination of PM10/PM2,5 mass concentration in flue gas. Measurement at low concentrations by use of impactors	2009.08.31	
BS EN 15859:2010	Air quality. Certification of automated dust arrestment plant monitors for use on stationary sources. Performance criteria and test procedures	2010.05.31	
BS EN ISO 21258:2010	Stationary source emissions. Determination of the mass concentration of dinitrogen monoxide (N2O). Reference method. Non-dispersive infrared method	2010.07.31	
BS EN 1911:2010	Stationary source emissions. Determination of mass concentration of gaseous chlorides expressed as HCl. Standard reference method	2010.08.31	
BS EN ISO 25140:2010	Stationary source emissions. Automatic method for the determination of the methane concentration using flame ionisation detection (FID)	2010.08.31	
BS EN ISO 25139:2011	Stationary source emissions. Manual method for the determination of the methane concentration using gas chromatography	2011.05.31	
BS ISO 11057:2011	Air quality. Test method for filtration characterization of cleanable filter media	2011.05.31	

Standard No	Standard Title	Date	MIDS
BS ISO 13271:2012	Stationary source emissions. Determination of PM <sub>10</sub> /PM <sub>2,5</sub> mass concentration in flue gas. Measurement at higher concentrations by use of virtual impactors	2012.07.31	
BS EN 12619:2013	Stationary source emissions. Determination of the mass concentration of total gaseous organic carbon. Continuous flame ionisation detector method	2013.01.31	
BS EN ISO 16911-1:2013	Stationary source emissions. Manual and automatic determination of velocity and volume flow rate in ducts. Manual reference method	2013.03.31	MID 16911-1
BS EN ISO 16911-2:2013	Stationary source emissions. Manual and automatic determination of velocity and volume flow rate in ducts. Automated measuring systems	2013.03.31	
BS EN ISO 13833:2013	Stationary source emissions. Determination of the ratio of biomass (biogenic) and fossil-derived carbon dioxide. Radiocarbon sampling and determination	2013.04.30	
PD CEN/TS 16429:2013	Stationary source emissions. Sampling and determination of hydrogen chloride content in ducts and stacks. Infrared analytical technique	2013.04.30	
BS EN 1948-4:2010+A1:2013	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Sampling and analysis of dioxin-like PCBs	2014.02.28	
BS ISO 14385-1:2014	Stationary source emissions. Greenhouse gases. Calibration of automated measuring systems	2014.07.31	
BS ISO 14385-2:2014	Stationary source emissions. Greenhouse gases. Ongoing quality control of automated measuring systems	2014.07.31	
BS EN 14181:2014	Stationary source emissions. Quality assurance of automated measuring systems	2014.11.30	TGN M20
PD CEN/TS 13649:2014	Stationary source emissions. Determination of the mass concentration of individual gaseous organic compounds. Sorptive sampling method followed by solvent extraction or thermal desorption	2014.12.31	
PD CEN/TS 1948-5:2015	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Long-term sampling of PCDDs/PCDFs and PCBs	2015.04.30	
BS EN ISO 13199:2012	Stationary source emissions. Determination of total volatile organic compounds (TVOCs) in waste gases from non-combustion processes. Non-dispersive infrared analyser equipped with catalytic converter	2015.09.30	
BS ISO 17211:2015	Stationary source emissions. Sampling and determination of selenium compounds in flue gas	2015.09.30	
BS ISO 25597:2013	Stationary source emissions. Test method for determining PM <sub>2.5</sub> and PM <sub>10</sub> mass in stack gases using cyclone samplers and sample dilution	2015.09.30	
BS ISO 17179:2016	Stationary source emissions. Determination of the mass concentration of ammonia in flue gas. Performance characteristics of automated measuring systems	2016.06.30	
BS EN 19694-1:2016	Stationary source emissions. Determination of greenhouse gas (GHG) emissions in energy-intensive industries. General aspects	2016.07.31	
BS EN 19694-2:2016	Stationary source emissions. Greenhouse Gas (GHG) emissions in energy-intensive industries. Iron and steel industry	2016.07.31	
BS EN 19694-3:2016	Stationary source emissions. Determination of greenhouse gas (GHG) emissions in energy-intensive industries. Cement industry	2016.07.31	
BS EN 19694-4:2016	Stationary source emissions. Determination of greenhouse gas (GHG) emissions in energy-intensive industries. Aluminium industry	2016.07.31	

Standard No	Standard Title	Date	MIDS
BS EN 19694-5:2016	Stationary source emissions. Determination of greenhouse gas (GHG) emissions in energy-intensive industries. Lime industry	2016.07.31	
BS EN 19694-6:2016	Stationary source emissions. Determination of greenhouse gas (GHG) emissions in energy-intensive industries. Ferroalloy industry	2016.07.31	
BS EN 14789:2017	Stationary source emissions. Determination of volume concentration of oxygen. Standard reference method: Paramagnetism	2017.01.31	
BS EN 14790:2017	Stationary source emissions. Determination of the water vapour in ducts. Standard reference method	2017.01.31	
BS EN 14792:2017	Stationary source emissions. Determination of mass concentration of nitrogen oxides. Standard reference method. Chemiluminescence	2017.01.31	
BS EN 14793:2017	Stationary source emissions. Demonstration of equivalence of an alternative method with a reference method	2017.01.31	
BS EN 15058:2017	Stationary source emissions. Determination of the mass concentration of carbon monoxide. Standard reference method: non-dispersive infrared spectrometry	2017.01.31	
BS EN 15267-4:2017	Air quality. Certification of automated measuring systems. Performance criteria and test procedures for automated measuring systems for periodic measurements of emissions from stationary sources	2017.01.31	
PD CEN/TS 17021:2017	Stationary source emissions. Determination of the mass concentration of sulphur dioxide by instrumental techniques	2017.01.31	
BS EN 14791:2017	Stationary source emissions. Determination of mass concentration of sulphur oxides. Standard reference method	2017.03.31	
BS ISO 18466:2016	Stationary source emissions. Determination of the biogenic fraction in C O <sub>2</sub> in stack gas using the balance method	2017.03.31	
PD CEN/TR 17078:2017	Stationary source emissions. Guidance on the application of EN ISO 16911-1	2017.04.30	
BS ISO 9096:2017	Stationary source emissions. Manual determination of mass concentration of particulate matter	2017.09.19	
BS EN 13284-1:2017	Stationary source emissions. Determination of low range mass concentration of dust. Manual gravimetric method	2017.11.29	MID13284-1
BS EN 13284-2:2017	Stationary source emissions. Determination of low range mass concentration of dust. Quality assurance of automated measuring systems	2017.12.06	TGN M20
PD CEN/TS 17198:2018	Stationary source emissions. Predictive Emission Monitoring Systems (PEMS). Applicability, execution and quality assurance	2018.08.23	
BS EN 1948-1:2006	Stationary source emissions. Determination of the mass concentration of PCDDs/PCDFs and dioxin-like PCBs. Sampling of PCDDs/PCDFs	2019.03.15	MID_1948

\* The Environment Agency recognises that European and International standards may need supplementing by Method Implementation Documents (MIDs) to ensure they are being implemented consistently. They have established the Monitoring Certification Scheme: MCERTS to deliver 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.

It may not be necessary to produce a MID for every standard, but where required they will be used to supplement standards called up by Technical Guidance Note M2. MIDs provide details on how the preferred standards shall be used for regulatory monitoring.

MIDs are produced in collaboration with the Source Testing Association (STA) and its members.

## Further guidance and advice

The STA guides its members and their clients. This includes methodology advice, guidance on equipment selection and training. Visit the STA web site for details [www.s-t-a.org](http://www.s-t-a.org) or any technical question contact [airanswers@s-t-a.org](mailto:airanswers@s-t-a.org) or telephone +44(0) 1462 457535.