AG2 Index of Preferred Methods

Version 2, September 2017

The index below is designed to guide all test houses / operators on which methods to select when carrying our emissions testing for compliance purposes. Each subsection has further information to guide the test house / operator if any deviations to the standard methods are allowable. Where a determinand is not listed, or a test house / operator would like to use an alternative method, permission in writing must be sought from the Irish EPA before any testing proceeds.

MIDs: UK Environment Agency Methods Implementation Documents (MIDs) are referenced alongside a number of determinands in this index. Standards may contain various options and approaches, as well as potential ambiguities. Method implementation documents (MIDs) have been produced for several standards to ensure they are applied consistently. MID's may be used by contractors who are ISO 17025 accredited for the required method(s), subject to compliance with AG2. When MID's are used they are referred to as a deviation from the relevant standard.

Certified analysers: References in the index to "certified analyser" means any analyser that has been certified in accordance with EN 15267-3.

European Standards: BS EN xxxxx standard method" is equivalent to "IS EN xxxxx standard method" and acceptable for use in Ireland.

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1. ALDEHYDES (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13649 (Non- Isokinetic sampling)	DNPH coated silica gel tube / Analysis by solvent desorption followed by GC-MS or GC-FID	± 25%	IS EN 13649 is not specific to Aldehydes but is a general method for the determination of the mass concentration of individual gaseous organic compounds by adsorption onto charcoal, DNPH coated silica gel is a better trapping agent and must therefore be used instead of charcoal. Ensure trapping efficiency is assessed (analyse front and back of tube) and meets the requirement in the Standard. The stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube to maintain the trapping ability. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Storage and transportation: Keep below 5°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. (as per NIOSH 2016) Analysis timescales: Analyse within 34 days of the sample being taken. (as per NIOSH 2016)
Based on US EPA M0011 (available here) (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	DNPH solution / Analysis by HPLC	± 25%	The DNPH solution is made using 4g DNPH crystals, 20ml Orthophosphoric Acid & made up to 1l with Acetonitrile. This is an adaptation of US EPA M316 which is specific to formaldehyde which requires the use of Reagent Grade Water as the sampling medium as opposed to DNPH solution. Storage and transportation: Standard requires them to be kept cool (Section 7.2.4), this will be taken as keeping below 8°C from sample birth to analysis. Analysis timescales: Analyse within 14 days from sample being taken. (as per US EPA M316, not stipulated in US EPA M0011)
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references.

2. AMINES & AMIDES (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13649 (Non- Isokinetic sampling)	Silica gel tube / Analysis by solvent desorption followed by GC-MS or GC-FID	± 25%	IS EN 13649 is not specific to Amines & Amides but is a general method for the determination of the mass concentration of individual gaseous organic compounds by adsorption onto charcoal. Silica gel is a better trapping agent and must therefore be used instead of charcoal. Ensure trapping efficiency is assessed (analyse front and back of tube) and meets the requirement in the Standard. The stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube to maintain the trapping ability. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Storage and transportation: Keep below 25°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references.

3. AMMONIA (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
Procedural requirements of IS EN 14791 (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	0.1N H_2SO_4 / Analysis by IC	± 30%	Measures total NH_3 and NH_4^+, therefore beware of interferences from NH_4^+ salts. Stainless steel is not a suitable probe or filter housing material. Compliant materials include titanium and PTFE. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references.

4. BIOAEROSOLS (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
VDI 4257 (Blatt 2) (Isokinetic sampling)	Saline / Analysis by serial dilution and cultivation onto agar plates followed by colony counting	See Further Information	The Standard stipulates the use of a single impinger. For wet processes an extra impinger may be added. It is permitted for the analysis laboratory to filter the rinse solution to obtain a lower limit of detection. The standard defines a number of different bank pass criteria. The field blank is acceptable if the blank agar plate value does not exceed 3 CFU/plate count. Storage and transportation: Maintain a temperature of 5ºC ±3 ºC immediately after sampling until analysis. Monitor temperature to ensure this temperature range not exceeded. Analysis timescales: Analyse immediately or at least within 24 hours of the sample being taken. The following uncertainties may be applied: - 30% for total bacteria cultured onto half strength nutrient agar - 30% for gram negative bacteria cultured onto MacConkey agar - 23% for Aspergillus fumigates cultured onto malt extract agar

5. CARBON DIOXIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS ISO 12039 (Instrumental Sampling)	NDIR analyser	± 25%	Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the ELV or 50 – 90% of the range to be used. The range selected must encompass at least 2 x the ELV, but may be set higher if expected emissions are likely to be higher than this.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references.

6. CARBON MONOXIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser	-	A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process.
IS EN 15058 Compliance Work (Instrumental Sampling)	NDIR analyser	± 6%	This is the Standard Reference Method for determination of CO. The calculated uncertainty must be < ± 6% of the Daily ELV. Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the ELV or 50 – 90% of the range to be used. The range selected must encompass at least 2 x the ELV, but may be set higher if expected emissions are likely to be higher than this. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Any NDIR analyser may be used so long all of the performance checks in the Standard Reference Method have been performed.
AM for IS EN 15058 Compliance Work (Instrumental Sampling)	Not NDIR or FTIR	± 6%	This is an Alternative Method for determination of CO. The calculated uncertainty must be < ± 6% of the Daily ELV. Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the ELV or 50 – 90% of the range to be used. The range selected must encompass at least 2 x the ELV, but may be set higher if expected emissions are likely to be higher than this. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – “Intralaboratory procedure for an alternative method compared to a reference method” to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.
TGN M22 (available here) Compliance Work (Instrumental sampling)	FTIR analyser	± 6%	This is an Alternative Method for determination of CO. The calculated uncertainty must be < ± 6% of the Daily ELV. Analysis must be performed using instrument specific or transportable references. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – “Intralaboratory procedure for an alternative method compared to a reference method” to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.

7. DIOXINS & FURANS (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 1948 Parts 1, 2 & 3 (Isokinetic sampling)	Filter, Rinse & XAD / Analysis by GC-HRMS	± 30%	Refer to Environment Agency MID 1948 for additional information / requirements. Storage and transportation: Keep below 25°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 21 days of the sample being taken.

8. FORMALDEHYDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA M316 (available here) (Isokinetic sampling)	Reagent Grade water / Analysis by spectrophotometry	± 25%	Storage and transportation: Keep below 8°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 14 days of sample being taken.
NCASI Method ISS-FP-A105.01 (available here) (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	BHA Solution / Analysis by GC/NPD	± 25%	This method requires the use of at least 3 impingers (midget / Greenburg Smith or other), each containing chilled BHA Solution (o-benzylhydroxylamine). In addition to the Formaldehyde - Methanol, Phenol, Acetaldehyde, Acrolein & Propionaldehyde are also absorbed. Methanol and Ketones can be analysed using GC-FID. Formaldehyde, Acetaldehyde, Acrolein & Propionaldehyde can be analysed using GC-FID. The NCASI Method has not gone through the US EPA Method 301 validation criteria, unlike the previous version of this Method. It is considered to be a self validating method. Storage and transportation: Keep below 8°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 14 days of sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references.

9. GAS VELOCITY & VOLUMETRIC FLOW RATE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 16911-1 and PD CEN/TR 17078 (Manual Method)	Pitot tube with pressure measurement device or anemometer, and temperature measurement device	± 10%	IS EN 16911-1 is a Standard specific to the measurement, and associated calculations, of velocity and volumetric flow rate in ducts. PD CEN/TR 17078:2017 was published as guidance on the application of EN ISO 16911-1.
IS EN 16911-1 (Manual Method)	Transit time tracer gas method		Complex sampling and analysis equipment required.

10.HALOGENS & HALIDES (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA Method 26 / 26A (available here) (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	Halides only: 0.05M H_2SO_4 Halides & Halogens: 0.05M H_2SO_4 & 0.1N NaOH / Analysis by IC	± 25%	**Not to be used for HCl, HF & HCN as these have specific CEN / ISO / US EPA Methods applicable to them.** Suitable for other hydrogen halides, HX (specifically HBr) and halogens, X_2 (specifically Cl_2, Br_2). Method 26 is for gas-phase halides only whereas Method 26A is for both aerosol and gas-phase halides. If used to measure halogens, the 0.05M H_2SO_4 impinger must be inserted before the NaOH impingers to knock out the halides that may be present. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references. Suitable for HBr only as FTIR is not able to detect diatomic molecules which is how the halogens exist (Cl_2, Br_2).

11.HEXAVALENT CHROMIUM (AKA Cr^{+6}) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA Method 0061 (available here) (Isokinetic sampling)	0.1 or 0.5M KOH solution / Analysis by IC/PCR or any other validated technique (e.g. Colorimetry)	± 25%	Re-circulating probe method which requires the impinger solution to be pumped up to the nozzle and down the probe to prevent Cr^{+6} from turning into Cr^{+3} in the sampling train. pH test required at the end of the test to ensure the pH in the impinger solution has not exceeded 8.5. Post test nitrogen purge of the impingers required for 30 minutes at 10l/min. Final post test requirement is to filter the samples to remove any particulate using a 0.45 micron acetate paper filter. Storage and transportation: Keep below 5°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 14 days of the sample being taken (as per US EPA Method 0061).

12.HOMOGENEITY TESTING (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 15259 (Instrumental sampling)	Any suitable analyser taking a grid measurement approach	N/A	Used to determine if a stack gas pollutant concentration is sufficiently homogenous at the sample plane location to enable it to be sampled from a single point. It usually requires the use of two instrumental analysers, which record gas concentration changes across the sample plane and over the time of the homogeneity test. Statistical analysis is used to show if the gas can be considered homogenous or in-homogenous. If the gas is in-homogenous an alternative location or a grid measurement approach should be used. The Standard can also be used to determine the location of CEMs. Recommended for combustion processes and stacks with an area ≥1.0m² (equivalent to ≥1.13m diameter for circular ducts). Refer to Environment Agency MID 15259 for additional information / requirements.

13.HYDROGEN BROMIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA Method 26 (available here)	Sulphuric acid and sodium hydroxide. Analysis by ion chromatography (IC)	-	Sources, such as those controlled by wet scrubbers, that emit acid particulate matter must be sampled isokinetically using Method 26A.

14.HYDROGEN CHLORIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser or IS EN 1911	-	A certified analyser at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants.
IS EN 1911 (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	Reagent grade water / Analysis by IC	± 30%	This is the Standard Reference Method for the measurement of Gaseous Inorganic Chlorides (expressed as HCl). It does not measure HCl, but measures total Cl^- reaching the impingers. Subject to interference from other chloride ions (e.g. ammonium chloride) as impossible to differentiate between them. Result valid so long as absorption efficiency requirements in the standard are met. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) Compliance Work (Instrumental sampling)	FTIR analyser	± 30%	This is an Alternative Method for determination of HCl. It measures gas-phase HCl directly as opposed to IS EN 1911 which measures Total Gaseous Inorganic Chlorides (expressed as HCl). Analysis must be performed using instrument specific or transportable references. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.

15.HYDROGEN CYANIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA OTM29 (available here) (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	≥ 1.0N NaOH / Analysis by IC	± 25%	Does not measure HCN, but measures total CN^- reaching the impingers. i.e. Total Gaseous Inorganic Cyanide (expressed as HCN). Requires pH of impingers to be checked at no more than 15 minute intervals during the sampling exercise. The pH must not drop below 12 in the final impinger. For highly acidic stack gases, a stronger NaOH solution may be used, alternatively a greater volume of impinger liquid may be used. The Method specifies the use of 6.0N NaOH impinger solution, however it is a dangerous substance to handle and its viscosity can lead to sampling issues, so a weaker concentration may be used so long as the pH of the final impinger remains above 12. As with the CEN methods, it is useful to perform an absorption efficiency test on the impingers to ensure that <5% of the recovered HCN appears in the final impinger. Acceptable changes to the Method which are not required in European or ISO Standards are: 1. It is not necessary to carry out a field blank spike. 2. It is not necessary to measure the Carbon Dioxide concentration in the stack for non-combustion sources. 3. A titanium probe and filter holder may be used instead of glass. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	It measures gas-phase HCN directly as opposed to US EPA OTM29 which measures Total Gaseous Inorganic Cyanide (expressed as HCN). Analysis must be performed using instrument specific or transportable references.

16.HYDROGEN FLUORIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS ISO 15713 (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	0.1N NaOH / Analysis by IC or ISE	± 25%	Does not measure HF, but measures total F^- reaching the impingers. i.e. Total Gaseous Inorganic Fluoride (expressed as HF). This method does not measure fluorocarbons. Where IC analysis is utilised, a caustic eluent must be used on a suitable OH^- tolerant IC column. IS ISO 15713 requires the use of Monel / PTFE / PE / PP / Quartz Glass for sampling train materials. Titanium and Borosilicate glass are not permitted. Refer to Environment Agency MID 15713 for additional information / requirements. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	It measures gas-phase HF directly as opposed to IS ISO 15713 which measures Total Gaseous Inorganic Fluoride (expressed as HF). Analysis must be performed using instrument specific or transportable references.

17.HYDROGEN SULPHIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA M11 (available here) (Non-Isokinetic sampling)	Cadmium sulphate solution or zinc acetate solution / Analysis by iodometric titration or DIST-VAS	± 25%	No filter is required for this test. The US EPA Method states the use of cadmium sulphate solution, it is a highly harmful substance and is often replaced with zinc acetate in the UK. Midget impingers are specified in the method, however larger impingers may be used so long as an absorption efficiency tests proves that less than 5% is present in the final impinger. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 4 weeks of the sample being taken.
IS EN 13649 (Non- Isokinetic sampling)	Charcoal tube / Analysis by solvent desorption followed by GC-MS or GC-FID	± 25%	IS EN 13649 is not specific to hydrogen sulphide but is a general method for the determination of the mass concentration of individual gaseous organic compounds by adsorption onto charcoal. Ensure trapping efficiency is assessed (analyse front and back of tube) and meets the requirement in the Standard. The stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube to maintain the trapping ability. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Due to the nature of interferences on the tube, this method is suitable for non-combustion processes where no sulphur dioxide is present. IS EN 13649 will most likely give a better Limit of Detection (LOD) than the US EPA M11 test, however it is recommended to check with the analysis lab to confirm this. Storage and transportation: Keep below 25°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 4 weeks of the sample being taken.

18.ISOCYANATES (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA CTM 36 (available here) (Isokinetic sampling)	1-(2-pyridyl) piperazine coated filter / Analysis by HPLC	± 25%	The Standard refers specifically to TDI, MDI, HDI and IPDI, but may also be used for other isocyanates. The US EPA Method stipulates the use of glass, however a titanium probe and filter holder may be used as an alternative. The filter will normally be placed inside the stack during sampling. Where the stack temperature exceeds 105°C, out stack filtration will be employed with the out stack oven set to 105°C. This will also be the case if water droplets are present in the stack which prevent the use of in stack sampling. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 90 days of the sample being taken.

19.MERCURY (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13211 (Isokinetic sampling)	Potassium dichromate or potassium permanganate solution / Analysis by CV-AAS, ICP-MS or CV-AFS	± 15%	Refer to Environment Agency MID 14385 for additional information / requirements. The MID allows mercury to be measured off the back of a standard IS EN 14385 sampling train, so long as the filter and all of the impingers are analysed for particulate and gaseous phase mercury, respectively. Storage and transportation: Keep below 25°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 2 weeks of the sample being taken.

20.METALS (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14385 (Isokinetic sampling)	Nitric peroxide solution / Analysis by ICP-MS, ICP-OES or ICP-AAS	± 15%	IS EN 14385 specifically relates to the determination of total emissions of As, Cd, Cr, Co, Cu, Mn, Ni, Pb, Sb, Tl and V. Refer to Environment Agency MID 14385 for additional information / requirements. The MID allows IS EN 14385 to be extended to cover other metals, subject to the analysis lab confirming their abilities to perform the analysis on these other metals. Storage and transportation: Keep below 25°C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 2 weeks of the sample being taken.

21.NITRIC ACID VAPOUR (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA Method 7D (available here) (Non-Isokinetic sampling)	Potassium permanganate solution / Analysis by IC	± 25%	Measures NO, NO_2 & nitric acid vapour. Used on surface treatment of metals processes. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 4 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	It measures gas-phase HNO_3 directly as opposed to US EPA Method 7D which measures NO, NO_2 and nitric acid vapour. Analysis must be performed using instrument specific or transportable references.

22.NITROGEN OXIDES (NO & NO_2) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser	-	A certified analyser at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants .
IS EN 14792 Compliance Work (Instrumental sampling)	Chemiluminescence analyser	± 10%	This is the Standard Reference Method for determination of NO_x. Measures NO (and NO_2 via a NOx converter). The calculated uncertainty must be < ± 10% of the Daily ELV. Where a NO_x converter is utilised, the converter efficiency must be >95%. Water vapour must be removed before the analyser. Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the ELV or 50 – 90% of the range to be used. The range selected must encompass at least 2 x the ELV, but may be set higher if expected emissions are likely to be higher than this. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Any Chemiluminescence analyser may be used so long all of the performance checks in the Standard Reference Method have been performed. Refer to Environment Agency MID 14792 for additional information / requirements.
AM for IS EN 14792 Compliance Work (Instrumental Sampling)	Not Chemiluminescence or FTIR e.g. NDIR, NDUV	± 10%	This is an Alternative Method for determination of NO and NO_2. The calculated uncertainty must be < ± 10% of the Daily ELV. Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the ELV or 50 – 90% of the range to be used. The range selected must encompass at least 2 x the ELV, but may be set higher if expected emissions are likely to be higher than this. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.
TGN M22 (available here) Compliance Work (Instrumental sampling)	FTIR analyser	± 10%	This is an Alternative Method for determination of NO and NO_2. The calculated uncertainty must be < ± 10% of the Daily ELV. Analysis must be performed using instrument specific or transportable references. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.

23.NITROUS OXIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN ISO 21258 (Instrumental sampling)	NDIR analyser	± 25%	Interferences from CO and CO_2. (measure CO_2 to compensate). Water vapour must be removed before the analyser.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	This is an Alternative Method for determination of N_2O. Analysis must be performed using instrument specific or transportable references. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.

24.ODOUR (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13725 (Manual sampling)	Odour bag / Analysis by olfactometry and odour panel	Dependant on number of sample runs performed	The unit of measurement is European odour unit per cubic metre (ou_E/m^3). Important to prevent the formation of condensation in the bag. Where the stack is hot and wet, static dilution may be performed up to a ratio of 3:1 (3 parts dilution gas to 1 part stack gas). Where greater dilution is required, dynamic dilution must be employed. Dilution ratios can be measured using a direct reading analyser (CO_2 or O_2(and comparing the stack gas concentrations to the concentrations as measured in the odour bag. Where odour testing is performed as part of an odour dispersion modelling exercise, accurate stack gas velocity and volumetric flow rate will be required in order to calculate the odour emission rates. This should be done following the Gas Velocity & Volumetric Flow Rate section in this document. Refer to Environment Agency MID 13725 for additional information / requirements. Storage and transportation: Keep at ambient temperature (ensure this is above the dew point of the gas in the bag) and in the dark. No requirement to monitor temperature. Analysis timescales: Analyse within 24 – 30 hours of the sample being taken.

25.OIL MIST, TAR & BITUMEN FUME (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13284-1 for sampling (Isokinetic sampling)	Cyclohexane washed GF filter / Analysis by cyclohexane extraction followed by gravimetric analysis	± 25%	In-stack filtration is employed to reduce the chance of sticky particulates fouling the sampling equipment and thus leading to low recoveries. If out-stack is employed, the train must be heated to the stack temperature. The nozzle, gooseneck (and heated probe if used) must be rinsed with acetone and then analysed using a GC-MS screen to pick out oil mist / tar / bitumen fume components or gravimetrically after filtering out any particulate matter. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 4 weeks of the sample being taken.

26.OXYGEN (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser	-	The analyser must be certified at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants .
IS EN 14789 Compliance Work (Instrumental sampling)	Paramagnetic analyser	± 6%	This is the Standard Reference Method for determination of O_2. The calculated uncertainty must be < ± 6% of the measured concentration. Where stack Oxygen is > 15% v/v, analyser must be calibrated using dried air (21%) or calibration gas at ~21% traceable to Primary Standards. Where stack Oxygen is < 15% v/v, the analyser must be checked at the expected stack gas oxygen concentration using calibration gases traceable to Primary Standards. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Any Paramagnetic analyser may be used so long all of the performance checks in the Standard Reference Method have been performed.
AM for IS EN 14789 Compliance Work (Instrumental sampling)	Not Paramagnetic e.g. Zirconia Cell (wet and dry)	± 6%	This is an Alternative Method for determination of O_2. The calculated uncertainty must be < ± 6% of the measured concentration. Where stack Oxygen is > 15% v/v, analyser must be calibrated using dried air (21%) or calibration gas at ~21% traceable to Primary Standards. Where stack Oxygen is < 15% v/v, the analyser must be checked at the expected stack gas oxygen concentration using calibration gases traceable to Primary Standards. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – “Intralaboratory procedure for an alternative method compared to a reference method” to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.

27.PAHs (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS ISO 11338 Parts 1 & 2 (Isokinetic sampling)	Filter, Rinse & XAD / Analysis by GC-HRMS	± 25%	The regulatory authority will specify the set of PAH compounds that should be measured. The most common is known as the WID / IED list of PAHs, which comprises of 16 compounds: Anthanthrene; Benzo[a]anthracene; Benzo[b]fluoranthene; Benzo[k]fluoranthene; Benzo(b)naph(2,1-d)thiophene; Benzo(c)phenanthrene; Benzo[ghi]perylene; Benzo[a]pyrene; Cholanthrene; Chrysene; Cyclopenta(c,d)pyrene; Dibenzo[ah]anthracene; Dibenzo[a,i]pyrene; Fluoranthene; Indo[1,2,3-cd]pyrene; Napthalene. It is up to the monitoring organisation to ensure the laboratory analyses for the correct list of PAHs. Storage and transportation: Keep below 25^{o}C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 21 days of the sample being taken.

28.PARTICULATE MATTER (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13284-1 (Isokinetic sampling)	Filter & rinse / Gravimetric analysis	± 15%	Applicable to both low and high range concentrations. Sampling times from 30 to 120 minutes depending on expected particulate loading. In or out-stack sampling may be utilised, however in-stack should always be selected unless the stack temperature is too hot to permit this configuration (i.e. seals would be melted) or water droplets are present. In this instance the probe and filter oven must be heated to a temperature of 160°C. A 5 figure balance (resolution 0.01mg) must be used for analysis. Laboratories wishing to weigh particulate samples must hold ISO 17025 accreditation for the weighing and regularly take part, successfully, in proficiency testing schemes to show its ongoing ability to obtain accurate results. Refer to Environment Agency MID 13284-1 for additional information / requirements.

29.PARTICULATE MATTER SIZE FRACTIONATION (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN ISO 23210 (Isokinetic sampling)	Impaction on a 2-stage cascade impactor / Gravimetric analysis	± 25%	Applicable for emissions of Total Particulate Matter (at **actual** conditions, not referenced) with a concentration of 1 – 50 mg/m^3. Allows measurement of PM10 and PM2.5. Not suitable to sum all parts to report total particulate matter result. Not suitable for stacks where water droplets are present. Single point sampling is acceptable at a “representative” sample point. Refer to Environment Agency TGN M15 for additional information.
IS EN 25597 (Isokinetic sampling	1 or 2-stage cyclone / Gravimetric analysis	± 25%	Applicable for emissions of Total Particulate Matter (at **actual** conditions, not referenced) with a concentration of >50 mg/m^3. Allows measurement of PM10 and PM2.5. Not suitable to sum all parts to report total particulate matter result. Not suitable for stacks where water droplets are present. Multiple point sampling as per the sample points in ISO 9096.

30.PCBs (DIOXIN LIKE) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 1948 Part 4 (Isokinetic sampling)	Filter, Rinse & XAD / Analysis by GC-HRMS	± 30%	Permissible to sample for PCBs on the same trap as for Dioxins & Furans. All site sampling and sample recovery procedures are identical. Refer to Environment Agency MID 1948 for additional information / requirements. Storage and transportation: Keep below 25^{o}C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 21 days of the sample being taken.

31.PHENOLS & CRESOLS (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13649 (sampling) (Non- Isokinetic sampling, no water droplets present) OSHA 32 or NIOSH 2546 (analysis)	XAD7 tube / Analysis by solvent desorption followed by GC-MS or GC-FID	± 25%	IS EN 13649 is not specific to phenols and cresols but is a general method for the determination of the mass concentration of individual gaseous organic compounds by adsorption onto charcoal, XAD7 is a better trapping agent and must therefore be used instead of charcoal. Ensure trapping efficiency is assessed (analyse front and back of tube) and meets the requirement in the Standard. The stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube to maintain the trapping ability. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Storage and transportation: Keep below 25^{o}C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 6 weeks of the sample being taken.
Based on IS EN 1911 (sampling) (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	Reagent grade water / Analysis by Colorimetry, HPLC or GC	± 25%	As phenols and cresols exhibit high hydrophilic behaviour, it means they can be trapped in impinger solutions. Suitable for hot / very wet stacks where dynamic dilution for tubes may prove to be unsuitable due to the elevated water vapour content in the stack gas. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.

32.SULPHUR DIOXIDE (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser or IS EN 14791	-	A certified analyser at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants .
IS EN 14791 (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	0.3 or 3% H_2O_2 / Analysis by IC	± 20%	This is the Standard Reference Method for the measurement of SO_2. The Standard recommends the use of 0.3% H_2O_2 where concentrations are expected to be <1000 mg/m^3 . For those expected to be >1000 mg/m^3 it is recommended to use 3% H_2O_2. Result valid so long as absorption efficiency requirements in the standard are met. The calculated uncertainty must be < ± 20% of the Daily ELV. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M21 (available here) Compliance Work (Instrumental sampling) NOTE: Valid until 31 December 2018, to be replaced by CEN TS 17021 after that date.	Not specific technique prescribed. Instrumental techniques available include non-dispersive infrared analysis (NDIR), electrochemical cells, UV-absorption analysis, and Fourier-Transform Infrared (FTIR) analysis	± 20%	This is an Alternative Method for determination of SO_2. Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the ELV or 50 – 90% of the range to be used. The range selected must encompass at least 2 x the ELV, but may be set higher if expected emissions are likely to be higher than this. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method. *Important note: Some NDIR analysers exhibit a large interference to Methane, and therefore may not be suitable for use when measuring emissions from landfill gas engines and biowaste plants. In these cases, an alternative method (or the Standard Reference Method) must be used.*
PD CEN/TS 17021 Determination of the mass concentration of SO_2 by instrumental techniques	Not specific technique prescribed. Instrumental techniques available include infrared (IR) absorption, ultraviolet (UV) absorption, UV fluorescence and electrochemical cells	± 15%	This is an Alternative Method for determination of SO_2. The calculated uncertainty must be < ± 15% of the Daily ELV. If there are droplets present in the stack gas it should be discussed with the local competent authority if this method is appropriate. Analyser must be calibrated using calibration gases traceable to Primary Standards at a concentration at either the half hourly ELV or 50 – 90% of the range to be used. The measurement range shall be adapted to the measuring objective. Generally, this means that the measurement range is high enough to cover the peak emission and at least 150 % of the half hourly ELV. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method. *Important note: Some NDIR analysers exhibit a large interference to Methane, and therefore may not be suitable for use when measuring emissions from landfill gas engines and biowaste plants. In these cases, an alternative method (or the Standard Reference Method) must be used.*

TGN M22 (available here) Compliance Work (Instrumental sampling)	FTIR analyser	± 20%	This is an Alternative Method for determination of SO_2. Analysis must be performed using instrument specific or transportable references. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.

33.SULPHURIC ACID MIST (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
US EPA Method 8 (available here) (Isokinetic sampling)	Isopropanol / Analysis by IC	± 25%	Measures H_2SO_4 and SO_3. A combined result is obtained because it is not possible to analyse H_2SO_4 and SO_3 separately.

34.TOTAL ACIDS (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
Based on IS EN 1911 (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	Reagent grade water / Analysis by potentiometric titration or IC	± 25%	Sampling is as per IS EN 1911. Analysis can be performed in one of 2 ways: **1. Potentiometric titration** This is the preferred method of analysis. The impinger solution is titrated with dilute sodium hydroxide to neutrality. The molarity of the impinger is calculated and then expressed as the equivalent mass of HCl. To maximise accuracy, the titrations must be carried out using an automated potentiometric titrator. **2. IC** This is an alternative method of analysis. This involves the summation of the eluted ions as HCl equivalents based on molecular weight. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.

35.VOCS (CONDENSABLE) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
Based on IS EN 14791 (Isokinetic sampling where water droplets are present, otherwise Non-Isokinetic sampling)	Reagent grade water / Analysis by OX / IR	± 25%	This method is a wet chemistry method whereby the analysis looks for Total Organic Carbon. Using 4 impingers in series, an efficiency of >75% should be achievable for Condensable VOC concentrations of >10 mg/m^3. Permitted sampling train materials are Glass / PTFE / Titanium & Viton. Where water droplets are present, out-stack filtration shall be employed, with the probe and oven set to 120°C or 20K above the stack (acid) dew point. Storage and transportation: Keep at ambient temperature. No requirement to monitor temperature. Analysis timescales: Analyse within 6 weeks of the sample being taken.

36.VOCS (NON METHANE) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13649 (Non- Isokinetic sampling)	Charcoal tube / Analysis by solvent desorption followed by GC-MS or GC-FID	± 25%	Ensure trapping efficiency is assessed (analyse front and back of tube) and meets the requirement in the Standard. The stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube to maintain the trapping ability. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Analysis is performed using a general semi-quantitative screen which is then summed to give a total for Non-Methane VOCs. Storage and transportation: Keep below 25^{o}C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 6 weeks of the sample being taken.

37.VOCS (SPECIATED) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 13649 (Non- Isokinetic sampling)	Charcoal tube / Analysis by solvent desorption followed by GC-MS or GC-FID	± 25%	IS EN 13649 is a general method for the determination of the mass concentration of individual gaseous organic compounds by adsorption onto charcoal. Consult the analysis laboratory to ensure that the best type of absorption medium is being used as charcoal may not always be the best material available. Ensure trapping efficiency is assessed (analyse front and back of tube) and meets the requirement in the Standard. The stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube to maintain the trapping ability. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Analysis may be performed using a general semi-quantitative screen, or specific VOCs can be targeted using a fully qualitative analysis. Storage and transportation: Keep below 25^{o}C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 6 weeks of the sample being taken.
IS EN 13649 (Non- Isokinetic sampling)	Atomic thermal desorption (ATD) tube / Analysis by solvent desorption followed by ATD-GC-MS	± 25%	IS EN 13649 is a general method for the determination of the mass concentration of individual gaseous organic compounds by adsorption onto charcoal. For improved Limits of Detection (and therefore for expected low speciated VOC concentrations), the use of ATD tubes is recommended over other materials such as charcoal. The ATD tube can be packed with a number of different absorption media (e.g. molecular sieve, sulfinert, mixed bed for example Tenax/Carbopack) to trap different pollutants. Consult the analysis laboratory to help decide which is the best type of packing media for the particular application. ATD tubes are highly sensitive to water, therefore the tube must be kept dry. If the tube gets wet, the analysis will fail and cannot be repeated. The analysis lab will normally perform a nitrogen purge before performing analysis, however to be on the safe side, the stack gas must have a water vapour content of no more than 2% v/v when it passes through the tube. Dynamic sample dilution will be required for hot / wet stacks with a water vapour content of > 2% v/v. Analysis may be performed using a general semi-quantitative screen, or specific VOCs can be targeted using a fully qualitative analysis. Storage and transportation: Keep below 25^{o}C from sample birth to analysis. Monitor temperature to ensure this temperature is not exceeded. Analysis timescales: Analyse within 6 weeks of the sample being taken.
TGN M22 (available here) (Instrumental sampling)	FTIR analyser	± 25%	Analysis must be performed using instrument specific or transportable references. This method has the ability to measure many individual organic compounds simultaneously. It is critical the stack gas matrix is well characterised to enable the FTIR to identify the concentrations of the known pollutants in the stack. Where the stack gas matrix is unknown, it is recommended to perform a charcoal screening run to help identify the components to enable the FTIR software to resolve as many pollutants in the stack gas matrix as possible, Where unknowns are present, and are not resolved, it will more than likely mean that other known components will not be quantified due to the interference of these unknowns. FTIR is a hugely powerful tool, but only in the hands of experienced operatives and where the stack gas matrix is well characterised already, or can be characterised by IS EN 13649 testing.

38.VOCS (TOTAL) (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser	-	The analyser must be certified at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants.
IS EN 12619 Compliance Work (Instrumental)	FID analyser	± 15%	Suitable for the measurement of both low and high level volatile organic compounds, expressed as carbon. Zero gas must be carbon free air (from a cylinder or scrubbed) so long as the oxygen synergy effects are tested and are found to meet the requirements of the Standard. If not, a mixture of air and nitrogen blended to the expected concentration of Oxygen in the stack will need to be used. Instrument calibrated on propane in air. Fuel is a hydrogen or a hydrogen / helium mix.

39.WATER VAPOUR (GOTO CONTENTS)

Allowable Standard/s	Sampling Medium / Analysis Technique	Standard Uncertainty	Further Information
IS EN 14181 Work	Any certified analyser or IS EN 14790	-	The analyser must be certified at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants.
IS EN 14790 Compliance Work (Non-Isokinetic sampling	Water / Gravimetric analysis	± 10%	This method is applicable to the measurement of water vapour (i.e. not including water droplets). For saturated stack gases, default to the theoretical water vapour tables in Annex A of IS EN 14790, tying to apply the result from an IS EN 14790 test to a saturated stack gas will most likely end up with an overestimate of the water vapour concentration (as water droplets may have been pulled into the sampling train and then weighed). Analysis must be made gravimetrically (not volumetrically) using a balance with a resolution of at least 0.01g. Minimum sampling time is 30 minutes and a minimum sample gas volume is 50l, higher sample rates are recommended to ensure a good Limit of Detection.
TGN M22 (available here) Compliance Work (Instrumental sampling)	FTIR analyser	± 10%	This is an Alternative Method for determination of H_2O. Analysis must be performed using instrument specific or transportable references. In order to use this, either use: 1. A certified analyser [see SIRA Website (CEMS / Transportables)] at a range of a maximum of 1.5 x ELV for Incinerators and a maximum of 2.5 x ELV for Large Combustion Plants and any other process. 2. Performance checks in the Standard Reference Method must have been performed. Additionally, demonstration of equivalence to CEN/TS 14793 – "Intralaboratory procedure for an alternative method compared to a reference method" to the satisfaction of INAB / the regulator will be required. This will include process and range specific field test comparisons with a reference method.