

Monitoring Quick Guide 1

Version 1.0

SM-QG-01 - Selecting Continuous Emission Monitoring systems (CEMs) and the validity of CEM unit's certificates

1. Scope

This note describes the requirements for selecting new Continuous Emission Monitoring (CEMs) systems for industrial installations regulated by the Scottish Environment Protection Agency.

2. Practical Guidance

2.1 Basic rules for selecting CEMs

The following guidelines apply when selecting CEMs:

Determinands	The CEM is to be certified for the determinands specified in the permit, where continuous monitoring is required. Certification must be in accordance with BS EN 15267-3 (see 2.4).
Ranges	The CEM is to be certified for a range that is suitable for the application.
Stack gas conditions	The operator should ensure that specific site conditions do not negate the performance of the CEM to below required standards.
Proven suitability	The operator is recommended to ensure that the intended CEM is proven on comparable installations.
Particulate monitors	Generally, particulate monitors may be sensitive to changes in flow rate, particle size distribution and changes in particle shape. Therefore the operator should determine whether specific stack conditions could potentially undermine the integrity of the monitoring data.

The reference materials used in the automatic or manual zero and span check procedures (as required for QAL3 in EN 14181) should be documented by the manufacturer and should have been assessed as part of the CEM certification process.

2.2 Suitable ranges

When CEMs have been tested and certified, the test certificate states the certified range. In some cases a CEM may have more than one range.

In general, the lower the certified range, the better the performance of the CEM is likely to be. This is because the majority of performance standards are expressed as a percentage of the certified range. For example, if the performance requirement for cross-sensitivity is $\pm 4\%$ of the range and a CEM has a certified range of 0 to 75 mg.m^{-3} , then the cross-sensitivity will not be more than $\pm 4\%$ of 75 mg.m^{-3} , which is 3 mg.m^{-3} . A CEM with a certified range of 0 to 200 mg.m^{-3} will have a maximum cross-sensitivity of $\pm 4\%$ of 200 mg.m^{-3} , or 8 mg.m^{-3} .

The main performance characteristic that is not range-dependent is linearity (or lack of fit). Therefore as an extra assurance, if a CEM is to be used for higher ranges than those certified, CEMs manufacturers should ideally have had the linearity evaluated over the higher ranges during type-testing. If this is not the case, then the linearity over the higher ranges should be evaluated either before installation or immediately afterwards.

The converse to the above may also be true i.e. CEMs are less likely to perform as well at ranges which are lower than those at which they have been certified. If there is any doubt, reference should be made to the CEM units certificate test results.

Key Point

- **Generally, CEMs with lower certified baseline ranges will perform satisfactorily at higher ranges, since the lower the certified range, the better the performance.**

Scottish Environment Protection Agency's approach to selecting suitable CEMs is to apply range multipliers, whereby the lowest certified value is not to be more than 1.5x the daily average (DA) ELV for waste incineration processes and 2.5x the DA ELV for large combustion plant and other types of process. As there is a linear relationship between certified ranges and uncertainties, these multipliers provide assurance that CEMs with appropriate ranges will meet the uncertainty requirements specified in the incineration and large combustion plant Directives. This approach is the same as that employed in England & Wales and Germany and is now within BS EN 15267-3.

Key Points

When selecting a new CEM operators should select a CEM with a certification range no more than:

- **1.5x the daily average ELV for waste incineration installations**
- **2.5x the daily average / 48h ELV for large combustion plant and other types of installations.**

2.3 Systems integration

Extractive CEMs comprise the analyser(s) and additional devices for obtaining a measurement result. As well as the analyser(s), this includes the sampling system. It is the complete system, including the sampling system that has been tested and certified.

There are several types of sampling system, such as:

- Simple heated lines coupled to heated analysers that measure gases in a hot, wet form.
- Heated lines and chiller-driers, delivering the sampled gases to the analyser in cooled, dry form.
- Heated lines and permeation-driers, delivering the sampled gases to the analyser in cooled, dry form.
- Stack-mounted probe coupled directly to a permeation drier, which then passes the cooled, dry sample gas via an unheated line to an analyser.

There are also many variations of these basic forms and as analysers are typically designed for use with specific types of sampling system, testing and subsequent approvals will certify a CEM with a stated type of sampling system and this will be stated on the CEM unit's certificate.

As most industrial processes differ in their requirements, some pragmatic flexibility is allowed in the selection of the sampling system used with the certified CEM. However, any alternative sampling system must not deviate from the type of system specified on the CEM unit's certificate.

Allowable variations could include:

1. A different brand or model of sampling system of the same type, so long as there is evidence from third-party test laboratories that the alternative system works with similar types of CEM.
2. Additional manifolds and heated valves used to allow more than one analyser to share a sampling system.

Any installation using an alternative sampling system must show it meets the requirements of QAL2 and QAL3 of EN 14181.

Key Point

- **Evidence is required from third-party test laboratories that any alternative sampling system works with similar types of CEM. In addition, on installation the CEM and alternative sampling system must meet the requirements of QAL2 and QAL3 of EN 14181.**

2.4 CEM unit's certificates and validity

2.4.1 Certification schemes

Across Europe schemes have been set up to test and validate CEM unit's to ensure they meet the requirements of BS EN 15267-3 and therefore QAL1 of BS EN 14181. Such schemes include the Environment Agency of England & Wales Monitoring Certification scheme (MCERTS) and the German TUV/UBA certification scheme, although other schemes may be available. All European certification schemes to BS EN 15267-3 and QAL1 of BS EN 14181 are considered equivalent and a unit certified under one scheme may apply for certification to a different scheme without undergoing further assessment.

A CEM unit holding valid certification is deemed suitable for use under QAL1 of BS EN 14181. In Scotland units certified to the MCERTS scheme are common.

2.4.2 Expired certificates and installed measuring systems

Some of the certificates include a statement that the certification is only valid for CEMs manufactured before a specified date. For example, the statement for an MCERTS instrument could be:

'MCERTS certification only valid for products manufactured before 28 February 2008'

CEMs manufactured before the date stated would have been certified at the point of installation and can continue to be used. CEMs manufactured after that date would not be certified. Installed systems are not affected by certification expiry until they need to be replaced, at which point an instrument with valid certification must be installed.

2.4.3 The recertification process

Recertification must be to the latest version of the standard and it is the responsibility of the manufacturer, in consultation with the certification body, to determine and arrange any necessary testing to meet the current requirements. This would normally be a formality unless there have been significant changes to the performance standards or the certified system since the last certificate was issued.

2.4.3. Certificate validity during recertification

When the recertification process is underway the certificate validity is extended. Currently under the MCERTS scheme for example, the manufacturer has 12 months from the expiry date of the original certificate to complete the recertification¹. If recertification is successful, the certificate will be extended for five years² from the expiry date of the original certificate. Please note, if recertification is unsuccessful then the original expiry date of the certificate will apply.

Note 1: From 2014 onwards, when a product is due for recertification, manufacturers must meet the requirements of the latest MCERTS standard and complete the recertification before the expiry of the certificate. From 2014, no grace period will apply and the certification validity will lapse according to the expiry date on the certificate.

Note 2: If EN15267-3 has not changed, the certificate can be reissued for a further 5 years, which would be included in the annual audit fee. If EN15267-3 has changed, the manufacturer will need to meet the new requirements before a new certificate is issued.

3. Further information

3.1 Quick Guides

- SM-QG-02 – Continuous Monitoring Requirements – Waste Incineration Directive
- SM-QG-03 – Application of EN 14181

3.2 Environment Agency Technical Guidance Notes

- TGN M1 – Sampling requirements for monitoring stack emissions to air from industrial installations
- TGN M2 – Monitoring of stack emissions to air
- TGN M20 – Quality assurance of continuous emissions monitoring systems

4. Feedback

Any comments or suggested improvements to this note should be e-mailed to Duncan Stewart at duncan.stewart@sepa.org.uk.

5. Acknowledgments

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