



cem solutions
CONTINUOUS EMISSIONS MONITORING

QAL3

An ongoing assurance of the quality of performance of a CEM system whilst it's in operation



By Mike Lloyd

What is a QAL3?

A QAL3 (Quality Assurance Level 3) is a continual assessment of the quality of performance of a CEM system whilst it's in operation.

Who should carry out a QAL3?

The Process Operator is required to apply and carry out a procedure for performing QAL3 checks, recording results and making these available for inspection / review as necessary.

If this isn't something the Process Operator wants to deal with, the CEMS supplier or service provider can support this activity, either in person on site or by remote connection.

How frequently should a QAL3 be carried out?

A new CEM system must have at least 3 months of QAL3 data to demonstrate the stability of the system before a QAL2 is carried out.

If using CUSUM charts as defined in the technical guidance, QAL 3s should be carried out weekly.

If using a Shewhart charts, as a minimum, the frequency needs to be in line with the maintenance interval of the device. Where that interval is 6 monthly, sites will typically choose to increase this frequency to obtain more data.

For either method, no adjustment of the zero and span figures should be made unless the device fails the check. In case of a failure, a calibration should not be made without first considering, investigating and rectifying the cause as required, after which the QAL3 should be repeated.



Many CEM systems have the ability to conduct QAL3 tests automatically which reduces the potential burden on the maintenance / engineering team. It also helps provide continuity of process.

The QAL3 requirements also apply for zero and span measurements for oxygen and moisture-monitoring systems.

How do I choose which QAL3 procedure to use?

The process operator can decide which type of control chart or procedure is to be used – CUSUM or Shewhart charts. Two points to consider are:

- The CEM must be able to indicate negative values.
- If using CUSUM charts, weekly zero and span checks will be required.





The majority of instruments use automatic self-checks - these tests can be conducted without additional work from site personnel although the operator must still interpret reports, annotate and take action as necessary. Records of reports should be readily available as well as details of the reference devices used.

How do I generate a QAL3 report?

Most sites opt to use specific software designed for logging and reporting QAL3 data.

Setting up of the relevant charts requires detailed data to calculate the acceptable tolerance on the measurement (sAMS). Warning and Limit levels can then be calculated to determine pass / fail criteria.

I need to interpret the results of the QAL3 – how do I know it's been successful?

Whilst an overview report may be generated by the QAL3 software, it is strongly advisable to review the relevant charts to assess if there is any change in response of the equipment.

Other considerations when implementing a QAL3 regime needs to include:

- Calibration gas concentrations
- Calibration gas certification / accuracy
- Changing of calibration gas
- Changing of CEM Hardware
- QAL2 auditing
- Content of QAL3 report, which should include the following:
 - CEM details – monitoring approach and technique, operating range, make and model.

- CEM changes – details of change in make, model and serial number through the year.
- Manufacturer's service visit records – routine maintenance.
- Manufacturer's call out records – corrective actions taken.
- Operator's routine maintenance and corrective actions.
- QAL3 baseline re-sets – summary.
- Zero and span drift plots.
- Zero and span drift tabulation

Where can I find the official guidance about what is expected of me with regard to QAL3s?

Technical Guidance note M20 – a 67-page document produced by the Environment Agency, its latest version being from April 21. If a Process Operator needs to know what is expected of them to carry out a QAL3 – measuring the drift and precision of the CEM system – this is the document to guide that practice. The document will be published as an online guide over the coming months.

