Quick guide GD/ANALYTICAL/001–EN

ABB Measurement & Analytics
PS-18 and Procedure 6 for HCl CEMS

Performance specifications and test procedures for hydrogen chloride (HCl) continuous emission monitoring systems (CEMS)

Measurement made easy

Introduction

On July 7 2015, EPA published Performance Specification 18 and Procedure 6 for HCl CEMS in the Federal Register (https://federalregister.gov/a/2015-16385).

These performance specifications and test procedures for hydrogen chloride (HCl) continuous emission monitoring systems (CEMS) provide sources and regulatory agencies with criteria and test procedures for evaluating the acceptability of HCl CEMS. The final performance specification (PS-18) includes requirements for initial acceptance, including instrument accuracy and stability assessments. It also includes quality assurance (QA) procedures (Procedure 6) which specify the minimum requirements necessary for the control and assessment of the quality of CEMS data submitted to the EPA.

ABB have put together this quick reference guide on the final document to help you understand what it means for you.

ABB Measurement & Analytics

ABB is a pioneer in Continuous Emission Monitoring Systems (CEMS) going back more than 60 years to the first usable NDIR analyzer for combustion optimization. With over 50,000 analyzers installed worldwide, we are a partner you can trust to provide the highest quality measurement solutions, ensuring you remain fully compliant with environmental regulations.

Whether for coal / oil fired power (MATS), Portland cement (PC-MACT) or waste incineration (CISWI), ABB is the only supplier offering all three major measuring principles for the low concentration measurement of Hydrogen Chloride (HCl) emissions. Importantly for you, that enables ABB to provide an unbiased recommendation for your application, whether it be dilution compatible Off-Axis ICOS, hot / wet extractive FTIR or integrated path (IP) TDL technology.

General topics

Span values

EPA now offers additional flexibility by allowing rounding up of the span value to the nearest multiple of 5:

— Subpart UUUUU: MATS – 5 ppm span value
— Subpart LLL: PC-MACT – 10 ppm span value

Low level HCl emitters

EPA agreed that alternative relative accuracy (RA) specifications are needed when source HCl concentrations are much lower than the emission limit:

— EPA also recognized that requiring a dynamic spike audit (DSA) strictly on the basis that emissions are low presents a disincentive to maintaining low emissions and has removed this requirement for low emission sources.

Sampling point location

EPA agreed that HCl CEMS need not be installed at the same location as reference method sampling points and representative HCl emissions measurements can be demonstrated by passing a RATA.

Diluent analyzers

EPA recognized that diluent analyzer references may cause confusion as PS-18 applies only to HCl CEMS and all references are removed.

Moisture measurement

EPA stated that, although potentially advantageous, moisture measurement is not required to comply; site-specific default value(s) using Method 4 may be used in some cases.

NIST-traceable HCl gas cylinders

EPA continues to assert the availability of NIST-traceable HCl compressed gas cylinders and say they know that at least one gas vendor is producing commercially available cylinder gas standards.

— EPA clarified that either NIST-traceable reference gases or gas standards certified by gas vendors to within 5 % are allowed for ongoing daily Calibration Drift (CD) checks.
— However, NIST-certified or NIST-traceable and vendor certified (±5 %) HCl standards will still be required for PS-18 certification testing and Procedure 6 quarterly audits.

Liquid evaporative standards

Liquid evaporative standards in place of gas cylinders may be used but they must also be NIST-traceable.

Dilution of high concentration span gases

EPA agreed that higher concentration cylinder gases diluted by a quality controlled procedure should be allowed.

— The added uncertainty from dilutions using Method 205 are estimated to be approximately 0.5 %.
— However, there was no relaxation of the 5.0 % specification for calibration drift (CD) and measurement error (ME) tests.

Dynamic spiking (DS)

EPA concluded that dynamic spiking procedures should be optional for the following certification and QA procedures:

1. the upscale portion of the 7-day calibration drift (CD) test
2. the daily mid-level calibration drift (CD) checks
3. the quarterly Data Accuracy Assessments

However, the dynamic spiking procedure does not replace the 7-day or daily zero CD check, the initial measurement error test, or the RATA comparison with a reference method.

EPA agreed that requiring nine spikes is not necessary for dynamic spiking audits (DSA) and inserted text in each relevant section which, in general, specifies three replicate measurements of each audit gas.

For extractive HCl CEMS that cannot use tracers such as SF_6 or N_2O to determine the dilution ratio, the alternative is to do an absolute volume dilution determination, with additional error from a dilution following Method 205 estimated to be 3 %.

Optical path length measurement (IP-CEMS only)

EPA decided that optical path length cannot be determined from engineering drawings and that purge gas flow rate effect must be taken into consideration.

— A laser-based tape measure or mechanical tape measure are to be used to determine the true distance available.

Manufacturer's certification

EPA has allowed initial vendor or integrator evaluation of level of detection (LOD) and interference checks, although LOD must also be verified in the field using dynamic spiking (DS).

— EPA have also eliminated the direct requirement for evaluation of instrument linearity.
— Measurement error (ME), formerly calibration error (CE), must still be tested in the field.

Performance Specification (PS) and Quality Control (QC) Testing

Interference – PS testing only

Field test is not required – it can be performed in a controlled environment (for example, manufacturer certified).

The sum of the interference must be ≤2.5 % of span or ±3.0 % of equivalent HCl concentration used for the test.

Results are also acceptable if the sum of the interference is 6 x LOD or 0.5 ppmv for a calibration span of 5 to 10 ppm.

Beam intensity (IP-CEMS only) – PS & QC testing

EPA clarified that beam attenuation tests are to be conducted by the manufacturer.

— However, beam intensity tests, which are an integral part of IP-CEMS operation, must still be performed in the field.

The difference between the measured concentration with and without attenuation of the light source must not exceed ±3.0 %.

Temperature and pressure verification (IP-CEMS only) – PS & QC testing

EPA recognizes that temperature and pressure measurements of stack conditions are critical to ongoing quality of HCl measurements by IP-CEMS, therefore NIST-traceable devices must be used.

— Replacement or rotation of temperature or pressure measurement devices with NIST-traceable units is an acceptable alternative to in situ audits.

— EPA have eased the requirement for temperature and pressure device assessment to an annual basis.

The absolute relative difference between measured stack temperature and temperature reference must be ≤1.0 % (or ≤5.0 °F).

The absolute relative difference between measured stack pressure and pressure reference must be ≤5.0 % (or ≤0.5 in. WC).

Level of detection (LOD) – PS testing only

Initial LOD determination can be performed in a controlled environment (i.e. manufacturer certified)

— Published laboratory LOD determination for TDL technologies showed low (0.007 ppm) LOD, yet field installations demonstrated higher (0.1 to 0.3 ppm) detection capability.

— As a result, EPA also requires verification of LOD using a dynamic spiking procedure during initial startup and field certification.

You may not use a CEMS whose LOD is >20 % of the applicable regulatory limit.

Response time (RT) – PS testing only

EPA recognized that response time for various HCl CEMS technologies may vary with the technology or specific application.

— Three different types of response time measurement are required:

a. measurement error
b. level of detection
c. dynamic spiking

Determine the mean upscale and downtime RTs for each procedure, based on time required to reach 95 % of each change.

Measurement error (ME) (formerly calibration error [CE]) – PS testing only

To avoid confusion with Part 75, EPA has renamed Calibration Error (CE) as Measurement Error (ME).

— EPA emphasized that this is a critical field test that not only verifies linearity, but also accounts for the effect of site-specific sample matrix on sampling and analyzer system performance.

— ME testing is required at zero and three concentrations relative to span:

a. 20 to 30 %
b. 50 to 60 %
c. 80 to 100 %

The ME must be ≤5.0 % of the span at the low-, mid- and high-level reference gas concentrations.

Calibration drift (CD) – PS & QC testing

PS-18 calibration drift requirements have been revised to include only a mid-level check (50-60% of span).

EPA commented that some technologies may not meet the drift requirements in PS-18 and Procedure 6, but noted that the requirements are no more stringent than other existing performance specifications.

— In a hint to users to choose HCl CEMS carefully, EPA also noted that certain technologies have proven their ability to meet the requirements for calibration drift in PS-18 and Procedure 6.

— The lowest span envisaged in current rules is 5 ppm which would yield a 0.25 ppm drift allowance; other spans such as 10 ppm would increase the drift tolerance accordingly.

EPA acknowledged one concern that measuring zero gas drift for IP-CEMS should exclude the native measurement path concentration and referenced the following text in section 11.8.6.2:

"For IP-CEMS, you may exclude the in stack measurement path when determining zero gas concentration"

However, confusingly, the final PS-18 contained different text in section 11.8.6.2:

"For IP-CEMS, you must include the source measurement optical path while performing the upscale CD measurement; you **must** exclude the source measurement optical path when determining the zero gas concentration"

No reference to or justification for this change could be found in the 'Response to Comments' document.

The allowable drift for CEMS in PS-18 is ±5.0 % of span for 7 consecutive days during initial evaluation; whereas the allowable drift for CEMS in Procedure 6 for ongoing quality control is ±10.0 % of span.

Relative accuracy (RA) – PS & QC testing

EPA clarified that PS-18 provides only examples of reference methods.

— Allowable reference methods for specific source categories vary. For example, PC-MACT (Subpart LLL) allows only optical methods (e.g. Method 321), whereas MATS (Subpart UUUUU) lists both optical methods and Method 26A.

EPA responded to extensive commenting and agreed to remove the requirement for paired reference method 26A sampling trains during RATA tests.

EPA emphasized the importance of stratification testing but also recognized the need to provide one or more options (three offered) for RM sample point selection that do not require stratification testing.

— EPA also clarified that stratification testing must be conducted at the same location as the RM testing and should not be conducted during transient conditions.

— SO_2 is permitted as a surrogate for HCl in stratification testing.

Unless otherwise specified in an applicable regulation/permit, the RA must be ≤20.0 % of the reference method (RM) average.

If the average reference method (RM) emission level is less than 75 % of the HCl concentration equivalent to the emission standard, you may now substitute the HCl concentration equivalent to Equation 14 in place of RMavg.

Calibration range above span (CRAS)

EPA has removed this requirement but stated that it may be required under specific rules (e.g. Subpart LLL – PC-MACT); optional calibration procedure is provided.

Alternative performance specifications

EPA repeatedly mentioned the continued availability of PS-15 as an alternative performance specification for FTIR CEMS.

EPA encouraged alternative monitoring requests, referring interested parties to 60.8(b)(2), 61.13(h)(1)(ii), 63.7(e)(2)(ii) and Guideline 22 (GD-022).

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