

Environmental Protection Agency

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zero-gas during a 30-second time interval.

(5) *Span drift.* The analyzer span drift during a 1-hour period must be less than 2 percent of full-scale chart deflection on the lowest range used. The analyzer span is defined as the difference between the span-response and the zero-response. The span-response is defined as the mean response including noise to a span gas during a 30-second time interval.

(b) *Operating procedure for analyzers and sampling system.* Follow the start-up and operating instructions of the instrument manufacturer. Adhere to the minimum requirements given in § 89.314 to § 89.323.

(c) *Emission measurement accuracy—Bag sampling.* (1) Good engineering practice dictates that exhaust emission sample analyzer readings below 15 percent of full-scale chart deflection should generally not be used.

(2) Some high resolution read-out systems, such as computers, data loggers, and so forth, can provide sufficient accuracy and resolution below 15 percent of full scale. Such systems may be used provided that additional calibrations of at least 4 non-zero nominally equally spaced points, using good engineering judgement, below 15 percent of full scale are made to ensure the accuracy of the calibration curves. If a gas divider is used, the gas divider must conform to the accuracy requirements specified in § 89.312(c). The procedure in paragraph (c)(3) of this section may be used for calibration below 15 percent of full scale.

(3) The following procedure shall be followed:

(i) Span the analyzer using a calibration gas meeting the accuracy requirements of § 89.312(c), within the operating range of the analyzer, and at least 90% of full scale.

(ii) Generate a calibration over the full concentration range at a minimum of 6, approximately equally spaced, points (e.g. 15, 30, 45, 60, 75, and 90 percent of the range of concentrations provided by the gas divider). If a gas divider or blender is being used to calibrate the analyzer and the requirements of paragraph (c)(2) of this section are met, verify that a second calibration gas between 10 and 20 percent

of full scale can be named within 2 percent of its certified concentration.

(iii) If a gas divider or blender is being used to calibrate the analyzer, input the value of a second calibration gas (a span gas may be used for the CO₂ analyzer) having a named concentration between 10 and 20 percent of full scale. This gas shall be included on the calibration curve. Continue adding calibration points by dividing this gas until the requirements of paragraph (c)(2) of this section are met.

(iv) Fit a calibration curve per § 89.319 through § 89.322 for the full scale range of the analyzer using the calibration data obtained with both calibration gases.

(d) *Emission measurement accuracy—continuous sampling.* Analyzers used for continuous analysis must be operated such that the measured concentration falls between 15 and 100 percent of full-scale chart deflection. Exceptions to these limits are:

(1) The analyzer's response may be less than 15 percent or more than 100 percent of full scale if automatic range change circuitry is used and the limits for range changes are between 15 and 100 percent of full-scale chart deflection;

(2) The analyzer's response may be less than 15 percent of full scale if:

(i) Alternative (c)(2) of this section is used to ensure that the accuracy of the calibration curve is maintained below 15 percent; or

(ii) The full-scale value of the range is 155 ppm (or ppmC) or less.

[59 FR 31335, June 17, 1994. Redesignated and amended at 63 FR 56995, 57010, Oct. 23, 1998]

§ 89.311 Analyzer calibration frequency.

(a) Prior to initial use and after major repairs, bench check each analyzer (see § 89.315).

(b) Calibrations are performed as specified in §§ 89.319 through 89.324.

(c) At least monthly, or after any maintenance which could alter calibration, the following calibrations and checks are performed.

(1) Leak check the vacuum side of the system (see § 89.316).

(2) Check that the analysis system response time has been measured and accounted for.

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(3) Verify that the automatic data collection system (if used) meets the requirements found in Table 3 in appendix A of this subpart.

(4) Check the fuel flow measurement instrument to insure that the specifications in Table 3 in appendix A of this subpart are met.

(d) Verify that all NDIR analyzers meet the water rejection ratio and the CO₂ rejection ratio as specified in § 89.318.

(e) Verify that the dynamometer test stand and power output instrumentation meet the specifications in Table 3 in appendix A of this subpart.

[59 FR 31335, June 17, 1994. Redesignated at 63 FR 56995, Oct. 23, 1998]

§ 89.312 Analytical gases.

(a) The shelf life of all calibration gases must not be exceeded. The expiration date of the calibration gases stated by the gas manufacturer shall be recorded.

(b) *Pure gases.* The required purity of the gases is defined by the contamination limits given below. The following gases must be available for operation:

(1) Purified nitrogen (Contamination ≤ 1 ppm C, ≤ 1 ppm CO, ≤ 400 ppm CO₂, ≤ 0.1 ppm NO)

(2) [Reserved]

(3) Hydrogen-helium mixture (40 ± 2 percent hydrogen, balance helium) (Contamination ≤ 31 ppm C, ≤ 400 ppm CO)

(4) Purified synthetic air (Contamination ≤ 1 ppm C, ≤ 1 ppm CO, ≤ 400 ppm CO₂, ≤ 0.1 ppm NO) (Oxygen content between 18-21 percent vol.)

(c) *Calibration and span gases.* (1) Calibration gas values are to be derived from NIST Standard Reference Materials (SRM's) or other standardized gas samples and are to be single blends as listed in the following paragraph.

(2) Mixtures of gases having the following chemical compositions shall be available:

(i) C₃H₈ and purified synthetic air ;

(ii) C₃H₈ and purified nitrogen (optional for raw measurements);

(iii) CO and purified nitrogen;

(iv) NO_x and purified nitrogen (the amount of NO₂ contained in this calibration gas must not exceed 5 percent of the NO content);

(v) CO₂ and purified nitrogen.

(3) The true concentration of a span gas must be within ±2 percent of the NIST gas standard. The true concentration of a calibration gas must be within ±1 percent of the NIST gas standard. The use of precision blending devices (gas dividers) to obtain the required calibration gas concentrations is acceptable, provided that the blended gases are accurate to within ±1.5 percent of NIST gas standards, or other gas standards which have been approved by the Administrator. This accuracy implies that primary gases used (or blending) must be "named" to an accuracy of at least ±1 percent, traceable to NIST or other approved gas standards. All concentrations of calibration gas shall be given on a volume basis (volume percent or volume ppm).

(4) The gas concentrations used for calibration and span may also be obtained by means of a gas divider, either diluting with purified N₂ or diluting with purified synthetic air. The accuracy of the mixing device must be such that the concentration of the diluted gases may be determined to within ±2 percent.

(d) Oxygen interference check gases shall contain propane with 350 ppmC ±75 ppmC hydrocarbon. The three oxygen interference gases shall contain 21% ± 1% O₂, 10% ± 1% O₂, and 5% ± 1% O₂. The concentration value shall be determined to calibration gas tolerances by chromatographic analysis of total hydrocarbons plus impurities or by dynamic blending. Nitrogen shall be the predominant diluent with the balance oxygen.

(e) Fuel for the FID shall be a blend of 40 percent ±2 percent hydrogen with the balance being helium. The mixture shall contain less than 1 ppm equivalent carbon response; 98 to 100 percent hydrogen fuel may be used with advance approval of the Administrator.

(f) Hydrocarbon analyzer burner air. The concentration of oxygen for raw sampling must be within 1 mole percent of the oxygen concentration of the burner air used in the latest oxygen interference check (%O₂I). If the difference in oxygen concentration is greater than 1 mole percent, then the oxygen interference must be checked and, if necessary, the analyzer adjusted to meet the %O₂I requirements. The