

## § 90.314

## 40 CFR Ch. I (7–1–11 Edition)

an acceptable method. Means other than condensation may be used only with prior approval from the Administrator.

### § 90.314 Analyzer accuracy and specifications.

(a) *Measurement and accuracy—general.* The analyzers must have a measuring range which allows them to measure the concentrations of the exhaust gas sample pollutants with the accuracies shown in Table 2 in Appendix A of this subpart.

(1) *Precision.* The precision of the analyzer must be, at worst, two percent of full-scale concentration for each range used. The precision is defined as 2.5 times the standard deviation(s) of 10 repetitive responses to a given calibration or span gas.

(2) *Noise.* The analyzer peak-to-peak response to zero and calibration or span gases over any 10-second period must not exceed two percent of full-scale chart deflection on all ranges used.

(3) *Zero drift.* The analyzer zero-response drift during a one-hour period must be less than two percent of full-scale chart deflection on the lowest range used. The zero-response is defined as the mean response including noise to a zero-gas during a 30-second time interval.

(4) *Span drift.* The analyzer span drift during a one-hour period must be less than two 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 or use good engineering practice. Adhere to the minimum requirements given in §§ 90.316 through 90.325 and § 90.409.

(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 are made to ensure the accuracy of the calibration curves. The following procedure for calibration below 15 percent of full scale may be used:

NOTE TO PARAGRAPH (c): If a gas divider is used, the gas divider must conform to the accuracy requirements as follows. 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  $\pm 1.5$  percent of NIST gas standards or other gas standards which have been approved by the Administrator. This accuracy implies that primary gases used for blending must be “named” to an accuracy of at least  $\pm$ one percent, traceable to NIST or other approved gas standards.

(i) Span the full analyzer range using a top range calibration gas. The span gases must be accurate to within  $\pm$ two percent of NIST gas standards or other gas standards which have been approved by the Administrator.

(ii) Generate a calibration curve according to, and meeting the requirements, of the sections describing analyzer calibrations which are found in §§ 90.316, 90.317, 90.318, and 90.320.

(iii) Select a calibration gas (a span gas may be used for calibrating the CO<sub>2</sub> analyzer) with a concentration between the two lowest non-zero gas divider increments. This gas must be “named” to an accuracy of  $\pm$ one percent of NIST gas standards or other standards approved by the Administrator.

(iv) Using the calibration curve fitted to the points generated in paragraphs (c)(2) (i) and (ii) of this section, check the concentration of the gas selected in paragraph (c)(2)(iii) of this section. The concentration derived from the curve must be within  $\pm 2.3$  percent ( $\pm 2.8$  percent for CO<sub>2</sub> span gas) of the gas's original named concentration.

(v) Provided the requirements of paragraph (c)(2)(iv) of this section are met, use the gas divider with the gas selected in paragraph (c)(2)(iii) of this section and determine the remainder of the calibration points. Fit a calibration curve per §§ 90.316, 90.317, 90.318,

## Environmental Protection Agency

## § 90.316

and 90.320 of this chapter for the entire analyzer range.

(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) The alternative in paragraph (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 (C) or less; or

(iii) The emissions from the engine are erratic and the integrated chart deflection value for the cycle is greater than 15 percent of full scale; or

(iv) The contribution of all data read below the 15 percent level is less than 10 percent by mass of the final test results.

### § 90.315 Analyzer initial calibration.

(a) *Warming-up time.* The warming-up time should be according to the recommendations of the manufacturer. If not specified, a minimum of two hours should be allowed for warming up the analyzers.

(b) *NDIR, FID, and HFID analyzer.* Tune and maintain the NDIR analyzer per the instrument manufacturer recommendations or specifications or using good engineering practice. The combustion flame of the FID or HFID analyzer must be optimized in order to meet the specifications in § 90.316(b).

(c) *Zero setting and calibration.* Using purified synthetic air (or nitrogen), set the CO, CO<sub>2</sub>, NO<sub>x</sub>, and HC analyzers at zero. Connect the appropriate calibrating gases to the analyzers and record the values. Use the same gas flow rates and pressure as when sampling exhaust.

(d) *Rechecking of zero setting.* Recheck the zero setting and, if necessary, re-

peat the procedure described in paragraph (c) of this section.

### § 90.316 Hydrocarbon analyzer calibration.

(a) Calibrate the FID and HFID hydrocarbon analyzer as described in this section. Operate the HFID to a set point  $\pm 5.5$  °C between 185 and 197 °C.

(b) *Initial and periodic optimization of detector response.* Prior to initial use and at least annually thereafter, adjust the FID and HFID hydrocarbon analyzer for optimum hydrocarbon response as specified in this paragraph. Alternative methods yielding equivalent results may be used, if approved in advance by the Administrator.

(1) Follow good engineering practices for initial instrument start-up and basic operating adjustment using the appropriate fuel (see § 90.312) and purified synthetic air or zero-grade nitrogen.

(2) Use of one of the following procedures is required for FID or HFID optimization:

(i) The procedure outlined in Society of Automotive Engineers (SAE) paper No. 770141, "Optimization of a Flame Ionization Detector for Determination of Hydrocarbon in Diluted Automotive Exhausts;" author, Glenn D. Reschke. This procedure has been incorporated by reference. See § 90.7.

(ii) The HFID optimization procedures outlined in 40 CFR part 1065, subpart D.

(iii) Alternative procedures may be used if approved in advance by the Administrator.

(3) After the optimum flow rates have been determined, record them for future reference.

(c) *Initial and periodic calibration.* Prior to initial use and monthly thereafter, or within one month prior to the certification test, the FID or HFID hydrocarbon analyzer must be calibrated on all normally used instrument ranges using the steps in this paragraph. Use the same flow rate and pressures as when analyzing samples. Introduce calibration gases directly at the analyzer. An optional method for dilute sampling described in 40 CFR part 1065, subpart F, may be used.

(1) Adjust analyzer to optimize performance.