(B) A NO₂ to NO converter. The NO₂ to NO converter efficiency must be at least 90 percent.

(C) For raw analysis, an ice bath or other cooling device located after the NOX converter (optional for dilute analysis).

(D) A chemiluminescent detector (CLD or HCLD).

(ii) The quench interference must be less than 3.0 percent as measured in §89.318.

(b) Other gas analyzers yielding equivalent results may be used with advance approval of the Administrator.

(c) The following requirements must be incorporated in each system used for testing under this subpart.

(1) Carbon monoxide and carbon dioxide measurements must be made on a dry basis (for raw exhaust measurement only). Specific requirements for the means of drying the sample can be found in §89.309(e).

(2) Calibration or span gases for the NOX measurement system must pass through the NO₂ to NO converter.

(d) The electromagnetic compatibility (EMC) of the equipment must be on a level as to minimize additional errors.

(e) Gas drying. Chemical dryers are not an acceptable method of removing water from the sample. Water removal by condensation is acceptable. A water trap performing this function and meeting the specifications in §89.308(b) is an acceptable method. Means other than condensation may be used only with prior approval from the Administrator.

§89.310 Analyzer accuracy and specifications.

(a) Measurement 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 3 in Appendix A of this subpart.

(1) Response time. As necessary, measure and account for the response time of the analyzer.

(2) Precision. The precision of the analyzer must be, at worst, ±2 percent of full-scale concentration for each range used at or above 100 ppm (or ppmC) or ±2 percent for each range used below 100 ppm (or ppmC). The precision is defined as 2.5 times the standard deviation(s) of 10 repetitive responses to a given calibration or span gas.

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

(4) Zero drift. The analyzer zero-response drift during a 1-hour period must be less than 2 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.

(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 span-response 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 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.
§ 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.

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.

5. Verify that all NDIR analyzers meet the water rejection ratio and the CO\textsubscript{2} rejection ratio as specified in §89.318.

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


§ 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 \text{C}, ≤ 1 ppm \text{CO}, ≤ 400 ppm \text{CO}_2, ≤ 0.1 ppm \text{NO})

2. [Reserved]

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