

Environmental Protection Agency

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data point. The calibration curve must fit the data points within 2 percent of point.

(6) Optional. A new calibration curve need not be generated if:

(i) A calibration curve conforming to paragraph (b)(5) of this section exists; or

(ii) The responses generated in paragraph (b)(4) of this section are within 1 percent of full scale or 2 percent of point, whichever is less, of the responses predicted by the calibration curve for the gases used in paragraph (b)(4) of this section.

(7) If multiple range analyzers are used, the lowest range used must meet the curve fit requirements below 15 percent of full scale.

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

§ 89.324 Calibration of other equipment.

(a) Other test equipment used for testing shall be calibrated as often as required by the instrument manufacturer or necessary according to good practice.

(b) If a methane analyzer is used, the methane analyzer shall be calibrated prior to introduction into service and monthly thereafter:

(1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance.

(2) Zero the methane analyzer with zero-grade air.

(3) Calibrate on each normally used operating range with CH₄ in air with nominal concentrations starting between 10 and 15 percent and increasing in at least six incremental steps to 90 percent (e.g., 15, 30, 45, 60, 75, and 90 percent) of that range. The incremental steps are to be spaced to represent good engineering practice. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each non-zero data point and within ±0.3 percent of full scale on the zero, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds these limits, the best-fit nonlinear equation which represents the

data to within these limits shall be used to determine concentration.

[63 FR 57013, Oct. 23, 1998]

§ 89.325 Engine intake air temperature measurement.

(a) Engine intake air temperature measurement must be made within 122 cm of the engine. The measurement location must be made either in the supply system or in the air stream entering the supply system.

(b) The temperature measurements shall be accurate to within ±2 °C.

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

§ 89.326 Engine intake air humidity measurement.

(a) *Humidity conditioned air supply.* Air that has had its absolute humidity altered is considered humidity-conditioned air. For this type of intake air supply, the humidity measurements must be made within the intake air supply system and after the humidity conditioning has taken place.

(b) *Nonconditioned air supply procedure.* Humidity measurements in non-conditioned intake air supply systems must be made in the intake air stream entering the supply system. Alternatively, the humidity measurements can be measured within the intake air supply stream.

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

§ 89.327 Charge cooling.

For engines with an air-to-air intercooler (or any other low temperature charge air cooling device) between the turbocharger compressor and the intake manifold, follow SAE J1937. This procedure has been incorporated by reference. See §89.6. The temperature of the cooling medium and the temperature of the charge air shall be monitored and recorded.

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

§ 89.328 Inlet and exhaust restrictions.

(a) The manufacturer is liable for emission compliance over the full range of restrictions that are specified by the manufacturer for that particular engine.

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(b) Perform testing at the following inlet and exhaust restriction settings.

(1) Equip the test engine with an air inlet system presenting an air inlet restriction within 5 percent of the upper limit at maximum air flow, as specified by the engine manufacturer for a clean air cleaner. A system representative of the installed engine may be used. In other cases a test shop system may be used.

(2) The exhaust backpressure must be within 5 percent of the upper limit at maximum declared power, as specified by the engine manufacturer. A system representative of the installed engine may be used. In other cases a test shop system may be used.

[59 FR 31335, June 17, 1994. Redesignated and amended at 63 FR 56995, 57013, Oct. 23, 1998]

§ 89.329 Engine cooling system.

An engine cooling system is required with sufficient capacity to maintain the engine at normal operating temperatures as prescribed by the engine manufacturer.

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

§ 89.330 Lubricating oil and test fuels.

(a) *Lubricating oil.* Use the engine lubricating oil for testing that meets the requirements as specified by the manufacturer for a particular engine and intended usage. Record the specifications of the lubricating oil used for the test.

(b) *Test fuels.* (1) Use diesel fuels for testing which are clean and bright, with pour and cloud points adequate for operability. The diesel fuel may contain nonmetallic additives as follows: Cetane improver, metal deactivator, antioxidant, dehazer, antirust, pour depressant, dye, dispersant, and biocide.

(2) Use petroleum fuel meeting the specifications in Table 4 in Appendix A of this subpart, or substantially equivalent specifications approved by the Administrator, for exhaust emission testing. The grade of diesel fuel used must be commercially designated as "Type 2-D" grade diesel fuel and recommended by the engine manufacturer.

(3) Testing of Tier 1 engines rated under 37 kW or Tier 2 engines rated at

or above 37 kW that is conducted by the Administrator shall be performed using test fuels that meet the specifications in Table 4 in Appendix A of this subpart and that have a sulfur content no higher than 0.20 weight percent.

(c) Other fuels may be used for testing provided they meet the following qualifications:

(1) They are commercially available;

(2) Information acceptable to the Administrator is provided to show that only the designated fuel would be used in customer service;

(3) Use of a fuel listed under paragraph (b) of this section would have a detrimental effect on emissions or durability; and

(4) Fuel specifications are approved in writing by the Administrator prior to the start of testing.

(d) Report the specification range of the fuel to be used under paragraphs (b)(2) and (c)(1) through (c)(4) of this section in the application for certification in accordance with § 89.115 (a)(8).

[59 FR 31335, June 17, 1994. Redesignated and amended at 63 FR 56995, 57013, Oct. 23, 1998]

§ 89.331 Test conditions.

(a) *General requirements.* Calculate all volumes and volumetric flow rates at standard conditions for temperature and pressure (0 °C and 101.3 kPa), and these conditions must be used consistently throughout all calculations.

(b) *Engine test conditions.* Measure the absolute temperature (designated as *T* and expressed in Kelvin) of the engine air at the inlet to the engine, and the dry atmospheric pressure (designated as *p* and expressed in kPa), and determine the parameter *f* according to the following provisions:

(1) Naturally aspirated and mechanically supercharged engines:

$$f = \frac{99}{p_s} \times \left(\frac{T}{298} \right)^{0.7}$$

(2) Turbocharged engine with or without cooling of inlet air:

$$f = \left(\frac{99}{p_s} \right)^{0.7} \times \left(\frac{T}{298} \right)^{1.5}$$