

§ 1065.920 PEMS Calibrations and verifications.

(a) *Subsystem calibrations and verifications.* Use all the applicable calibrations and verifications in subpart D of this part, including the linearity verifications in §1065.307, to calibrate and verify PEMS. Note that a PEMS does not have to meet the system-response specifications of §1065.308 if it meets the overall verification described in paragraph (b) of this section.

(b) *Overall verification.* We require only that you maintain a record showing that the particular make, model, and configuration of your PEMS meets this verification. We recommend that you generate your own record to show that your specific PEMS meets this verification, but you may also rely on data and other information from the PEMS manufacturer. If you upgrade or change the configuration of your PEMS, your record must show that your new configuration meets this verification. The verification consists of operating an engine over a duty cycle in the laboratory and statistically comparing data generated and recorded by the PEMS with data simultaneously generated and recorded by laboratory equipment as follows:

(1) Mount an engine on a dynamometer for laboratory testing. Prepare the laboratory and PEMS for emission testing, as described in this part, to get simultaneous measurements. We recommend selecting an engine with emission levels close to the applicable duty-cycle standards, if possible.

(2) Select or create a duty cycle that has all the following characteristics:

(i) Engine operation that represents normal in-use speeds, loads, and degree of transient activity. Consider using data from previous field tests to generate a cycle.

(ii) A duration of (20 to 40) min.

(iii) At least 50% of engine operating time must include at least 10 valid test intervals for calculating emission levels for field testing. For example, for highway compression-ignition engines, select a duty cycle in which at least 50% of the engine operating time can be used to calculate valid NTE events.

(3) Starting with a warmed-up engine, run a valid emission test with the duty cycle from paragraph (b)(2) of this

section. The laboratory and PEMS must both meet applicable validation requirements, such as drift validation, hydrocarbon contamination validation, and proportional validation.

(4) Determine the brake-specific emissions for each test interval for both laboratory and the PEMS measurements, as follows:

(i) For both laboratory and PEMS measurements, use identical values to determine the beginning and end of each test interval.

(ii) For both laboratory and PEMS measurements, use identical values to determine total work over each test interval.

(iii) Apply any “measurement allowance” to the PEMS data. If the measurement allowance is normally added to the standard, subtract the measurement allowance from the PEMS brake-specific emission result.

(iv) Round results to the same number of significant digits as the standard.

(5) Repeat the engine duty cycle and calculations until you have at least 100 valid test intervals.

(6) For each test interval and emission, subtract the lab result from the PEMS result.

(7) If for each constituent, the PEMS passes this verification if any one of the following are true:

(i) 91% or more of the differences are zero or less than zero.

(ii) The entire set of test-interval results passes the 95% confidence alternate-procedure statistics for field testing (*t*-test and *F*-test) specified in subpart A of this part.

§ 1065.925 PEMS preparation for field testing.

Take the following steps to prepare PEMS for field testing:

(a) Verify that ambient conditions at the start of the test are within the limits specified in the standard-setting part. Continue to monitor these values to determine if ambient conditions exceed the limits during the test.

(b) Install a PEMS and any accessories needed to conduct a field test.

(c) Power the PEMS and allow pressures, temperatures, and flows to stabilize to their operating set points.