

slope, intercept, standard error, and coefficient of determination meet the

criteria in the following tables (you may delete individual points from the

regression analyses, consistent with good engineering judgment):

TABLE 1 OF § 1065.530.—STATISTICAL CRITERIA FOR VALIDATING TEST CYCLES FOR SPARK-IGNITION ENGINES

	Speed	Torque	Power
1. Slope of the regression line (m)	0.950 to 1.030	0.830 to 1.030	0.880 to 1.030.
2. Y intercept of the regression line (b).	$ b \leq 50$ rpm	$ b \leq 5.0$ percent of maximum torque from power map.	$ b \leq 3.0$ percent of maximum torque from power map.
3. Standard error of the estimate of Y on X (SE).	100 rpm	15 percent of maximum torque from power map.	10 percent of maximum power from power map.
4. Coefficient of determination (r^2)	$r^2 \geq 0.970$	$r^2 \geq 0.880$	$r^2 \geq 0.900$.

TABLE 2 OF § 1065.530.—STATISTICAL CRITERIA FOR VALIDATING TEST CYCLES FOR COMPRESSION-IGNITION ENGINES

	Speed	Torque	Power
1. Slope of the regression line (m)	0.950 to 1.030	0.830 to 1.030 (hot); 0.77 to 1.03 (cold).	0.890 to 1.030 (hot); 0.870 to 1.030 (cold).
2. Y intercept of the regression line (b).	$ b \leq 50$ rpm	$ b \leq 20$ Nm or $ b \leq 2.0$ percent of maximum torque from power map, whichever is greater.	$ b \leq 40$ kW or $ b \leq 3.0$ percent of maximum torque from power map, whichever is greater.
3. Standard error of the estimate of Y on X (SE).	100 rpm	13 percent of maximum torque from power map.	8 percent of maximum power from power map.
4. Coefficient of determination (r^2)	$r^2 \geq 0.970$	$r^2 \geq 0.880$ (hot); $r^2 \geq 0.850$ (cold)	$r^2 \geq 0.910$ (hot); $r^2 \geq 0.850$ (cold).

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(d) *Transient testing with constant-speed engines.* For constant-speed engines with installed governor operating over a transient duty cycle, the test cycle validation criteria in this section apply to engine-torque values but not engine-speed values.

73. Section 1065.615 is amended by revising paragraphs (c) and (d) to read as follows:

§ 1065.615 Bag sample calculations.

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(c) Calculate total brake work (kW-hr) done during the emissions sampling period of each segment or mode and then weight it by the applicable test cycle weighting factors.

(d) Calculate emissions in g/kW-hr by dividing the total weighted mass emission rate (g/test) by the total cycle-weighted brake work for the test.

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74. Section 1065.620 is added to read as follows:

§ 1065.620 Continuous sample analysis and calculations.

Use the sample analysis procedures and calculations of 40 CFR subpart N for continuous samples.

75. Section 1065.701 is added to read as follows:

§ 1065.701 Particulate measurements.

Use the particulate sampling system and procedures specified in 40 CFR part 86 subpart N to measure particulate emissions from compression-ignition nonroad engines.

76. Section 1065.910 is revised to read as follows:

§ 1065.910 Measurement accuracy and precision.

Measurement systems used for field testing have accuracy and precision comparable to those of dynamometer testing. Measurement systems that conform to the provisions of §§ 1065.915 through 1065.950 are deemed to be in compliance with the accuracy and precision requirements of paragraph of this section. If you use other field testing measurement systems you need to have documentation indicating that it is comparable to a dynamometer system.

(a) The two systems must be calibrated independently to NIST traceable standards or equivalent national standards for this comparison. We may approve the use of other standards. Calculations of emissions results for this test should be consistent with the field testing data reduction scheme for both the in-use equipment and the dynamometer equipment, and each complete test cycle will be considered one "summing interval", Si as defined in the field-testing data reduction scheme.

(b) While other statistical analyses may be acceptable, we recommend that the comparison be based on a minimum of seven (7) repeats of colocated and simultaneous tests. Perform this comparison over the applicable steady-state and transient test cycles using an engine that is fully warmed up such that its coolant temperature is thermostatically controlled. If there is no applicable transient test cycle, use the applicable steady-state cycle. Anyone who intends to submit an

alternative comparison is encouraged to first contact EPA Office of Transportation and Air Quality, Assessment and Standards Division to discuss the applicant's intended statistical analysis. The Division may provide further guidance specific to the appropriate statistical analysis for the respective application.

(c) The following statistical tests are suggested. If the comparison is paired, it must demonstrate that the alternate system passes a two-sided, paired t-test. If the test is unpaired, it must demonstrate that the alternate system passes a two-sided, unpaired t-test. The average of these tests for the reference system must return results less than or equal to the applicable emissions standard. The t-test is performed as follows, where "n" equals the number of tests:

(1) Calculate the average of the in-use system results; this is Iavg .

(2) Calculate the average of the results of the system to which the in-use system was Referenced; this is Ravg .

(3) Calculate the " $n - 1$ " standard deviations for the in-use and reference averages; these are Isd and Rsd respectively. Form the F ratio: $F = (\text{Isd} / \text{Rsd})^2$. F must be less than the critical F value, F_{crit} at a 95% confidence interval for " $n - 1$ " degrees of freedom. Table 1 of this section lists 95% confidence interval F_{crit} values for $n - 1$ degrees of freedom. Note that n_A represents the number of alternate system samples, while n_R represents the number of reference system samples.

(4) For an unpaired comparison, calculate the t-value: