

**Subpart F—Test Procedures**

**§ 1048.501 What procedures must I use to test my engines?**

(a) Use the equipment and procedures for spark-ignition engines in 40 CFR part 1065 to show your engines meet the duty-cycle emission standards in § 1048.101(a) and (b). Measure HC, NO<sub>x</sub>, CO, and CO<sub>2</sub> emissions using the full-flow dilute sampling procedures in 40 CFR part 1065. Use the applicable duty cycles in §§ 1048.505 and 1048.510.

(b) We describe in § 1048.515 the supplemental procedures for showing that your engines meet the field-testing emission standards in § 1048.101(c).

(c) Use the fuels specified in 40 CFR part 1065, subpart C, for all the testing we require in this part, except as noted in § 1048.515. Use these test fuels or any commercially available fuel for service accumulation.

(d) To test engines for evaporative emissions, use the equipment and procedures specified for testing diurnal emissions in 40 CFR 86.107–96 and 86.133–96 with fuel meeting the specifications in 40 CFR part 1065, subpart C. Measure emissions from a test engine

with a complete fuel system. Reported emission levels must be based on the highest emissions from three successive 24-hour periods of cycling temperatures. Note that you may not be required to test for evaporative emissions during certification if you certify by design, as specified in § 1048.245.

(e) You may use special or alternate procedures, as described in 40 CFR 1065.10.

(f) We may reject data you generate using alternate procedures if later testing with the procedures in 40 CFR part 1065 shows contradictory emission data.

**§ 1048.505 What steady-state duty cycles apply for laboratory testing?**

(a) Measure emissions by testing the engine on a dynamometer with one or more of the following sets of steady-state duty cycles to show that the engine meets the steady-state standards in § 1048.101(b):

(1) Use the 7-mode duty cycle described in the following table for engines from an engine family that will be used only in variable-speed applications:

TABLE 1 OF § 1048.505—7-MODE DUTY CYCLE <sup>1</sup>

Mode No.	Engine speed	Observed torque <sup>2</sup>	Minimum time in mode (minutes)	Weighting factors
1	Maximum test speed	25	3.0	0.06
2	Intermediate test speed	100	3.0	0.02
3	Intermediate test speed	75	3.0	0.05
4	Intermediate test speed	50	3.0	0.32
5	Intermediate test speed	25	3.0	0.30
6	Intermediate test speed	10	3.0	0.10
7	Idle	0	3.0	0.15

<sup>1</sup>This duty cycle is analogous to the C2 cycle specified in ISO 8178–4.

<sup>2</sup>The percent torque is relative to the maximum torque at the given engine speed.

(2) Use the 5-mode duty cycle described in the following table if you certify an engine family for operation only at a single, rated speed:

TABLE 2 OF § 1048.505—5-MODE DUTY CYCLE FOR CONSTANT-SPEED ENGINES <sup>1</sup>

Mode No.	Engine speed	Torque <sup>2</sup>	Minimum time in mode (minutes)	Weighting factors
1	Maximum test	100	3.0	0.05
2	Maximum test	75	3.0	0.25
3	Maximum test	50	3.0	0.30
4	Maximum test	25	3.0	0.30
5	Maximum test	10	3.0	0.10

<sup>1</sup>This duty cycle is analogous to the D2 cycle specified in ISO 8178–4.

<sup>2</sup>The percent torque is relative to the maximum torque at maximum test speed.