

§ 1065.202

40 CFR Ch. I (7–1–08 Edition)

(h), effective July 7, 2008. For the convenience of the user, the added and revised text is set forth as follows:

§ 1065.201 Overview and general provisions.

(a) *Scope.* This subpart specifies measurement instruments and associated system requirements related to emission testing in a laboratory or similar environment and in the field. This includes laboratory instruments and portable emission measurement systems (PEMS) for measuring engine parameters, ambient conditions, flow-related parameters, and emission concentrations.

(b) *Instrument types.* You may use any of the specified instruments as described in this subpart to perform emission tests. If you want to use one of these instruments in a way that is not specified in this subpart, or if you want to use a different instrument, you must first get us to approve your alternate procedure under §1065.10. Where we specify more than one instrument for a particular measurement, we may identify which instrument serves as the reference for comparing with an alternate procedure.

(h) *Recommended practices.* This subpart identifies a variety of recommended but not required practices for proper measurements. We believe in most cases it is necessary to follow these recommended practices for accurate and repeatable measurements and we intend to follow them as much as possible for our testing. However, we do not specifically require you to follow these recommended practices to perform a valid test, as long as you meet the required calibrations and verifications of measurement systems specified in subpart D of this part.

§ 1065.202 Data updating, recording, and control.

Your test system must be able to update data, record data and control systems related to operator demand, the dynamometer, sampling equipment, and measurement instruments. Use data acquisition and control systems that can record at the specified minimum frequencies, as follows:

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TABLE 1 OF § 1065.202—DATA RECORDING AND CONTROL MINIMUM FREQUENCIES

Applicable test protocol section	Measured values	Minimum command and control frequency	Minimum recording frequency
§ 1065.510 .....	Speed and torque during an engine step-map.	1 Hz .....	1 mean value per step.
§ 1065.510 .....	Speed and torque during an engine sweep-map.	5 Hz .....	1 Hz means.
§ 1065.514, § 1065.530 .....	Transient duty cycle reference and feedback speeds and torques.	5 Hz .....	1 Hz means.
§ 1065.514, § 1065.530 .....	Steady-state and ramped-modal duty cycle reference and feedback speeds and torques.	1 Hz .....	1 Hz.
§ 1065.520, § 1065.530, § 1065.550 .....	Continuous concentrations of raw or dilute analyzers.	N/A .....	1 Hz.
§ 1065.520, § 1065.530, § 1065.550 .....	Batch concentrations of raw or dilute analyzers.	N/A .....	1 mean value per test interval.
§ 1065.530, § 1065.545 .....	Diluted exhaust flow rate from a CVS with a heat exchanger upstream of the flow measurement.	N/A .....	1 Hz.
§ 1065.530, § 1065.545 .....	Diluted exhaust flow rate from a CVS without a heat exchanger upstream of the flow measurement.	5 Hz .....	1 Hz means.
§ 1065.530, § 1065.545 .....	Intake-air or raw-exhaust flow rate .....	N/A .....	1 Hz means.
§ 1065.530, § 1065.545 .....	Dilution air if actively controlled .....	5 Hz .....	1 Hz means.
§ 1065.530 .....	Sample flow from a CVS that has a heat exchanger.	1 Hz .....	1 Hz.
§ 1065.530, § 1065.545 .....	Sample flow from a CVS does not have a heat exchanger.	5 Hz .....	1 Hz mean.

§ 1065.205 Performance specifications for measurement instruments.

Your test system as a whole must meet all the applicable calibrations, verifications, and test-validation criteria specified in subparts D and F of

this part or subpart J of this part for using PEMS and for performing field testing. We recommend that your instruments meet the specifications in Table 1 of this section for all ranges

you use for testing. We also recommend that you keep any documentation you receive from instrument manufacturers showing that your instruments meet the specifications in Table 1 of this section.

Table 1 of §1065.205—Recommended performance specifications for measurement instruments

Measurement Instrument	Measured quantity symbol	Complete System Rise time and fall time	Recording update frequency	Accuracy*	Repeatability*	Notes†
Engine speed transducer	$\omega$	1 s	1 Hz mean	2.0 % of pt. or 0.5 % of max.	1.0 % of pt. or 0.25 % of max.	0.05 % of max.
Engine torque transducer	$T$	1 s	1 Hz mean	2.0 % of pt. or 1.0 % of max.	1.0 % of pt. or 0.5 % of max.	0.05 % of max.
Electrical work (and/or power) meter	$W$	1 s	1 Hz mean	2.0 % of pt. or 0.5 % of max.	1.0 % of pt. or 0.25 % of max.	0.05 % of max.
General pressure transducer (not a part of another instrument)	$P$	5 s	1 Hz	2.0 % of pt. or 1.0 % of max.	1.0 % of pt. or 0.50 % of max.	0.1 % of max.
Atmospheric pressure meter used for PM-stabilization and balance measurements	$P_{amb}$	50 s	5 times per hour	50 Pa	25 Pa	5 Pa
Gases (except atmospheric pressure meter)	$P_{gas}$	50 s	5 times per hour	250 Pa	100 Pa	50 Pa
Temperature sensor for PM-stabilization and balance measurements	$T$	30 s	0.1 Hz	0.25 K	0.1 K	0.1 K
Other temperature sensor (not a part of another instrument)	$T$	30 s	0.5 Hz	0.4 % of pt. K or 0.2 % of max. K	0.2 % of pt. K or 0.1 % of max. K	0.1 % of max.
Dewpoint sensor for PM-stabilization and balance measurements	$T_{dew}$	30 s	0.1 Hz	0.25 K	0.1 K	0.02 K
Other dewpoint sensor	$T_{dew}$	30 s	0.1 Hz	1 K	0.5 K	0.1 K
Fuel flow meter	$\dot{m}$	5 s (N/A)	1 Hz (N/A)	2.0 % of pt. or 1.5 % of max.	1.0 % of pt. or 0.75 % of max.	0.5 % of max.
Total diluent exhaust meter (CVS) (With heat exchanger before meter)	$\dot{m}$	1 s (5 s)	1 Hz mean (1 Hz)	2.0 % of pt. or 1.5 % of max.	1.0 % of pt. or 0.75 % of max.	1.0 % of max.
Dilution air, inlet air, exhaust, and sample flow meters	$\dot{m}$	1 s	1 Hz mean of 3 Hz samples	2.5 % of pt. or 1.5 % of max.	1.25 % of pt. or 0.75 % of max.	1.0 % of max.
Continuous gas analyzer	$x$	5 s	1 Hz	2.0 % of pt. or 2.0 % of max.	1.0 % of pt. or 1.0 % of max.	1.0 % of max.
Batch gas analyzer	$x$	N/A	N/A	2.0 % of pt. or 2.0 % of max.	1.0 % of pt. or 1.0 % of max.	1.0 % of max.
Gravimetric PM balance	$m_{PM}$	N/A	N/A	See §1065.190	0.5 mg	N/A
Imperial PM balance	$m_{PM}$	5 s	1 Hz	2.0 % of pt. or 2.0 % of max.	1.0 % of pt. or 1.0 % of max.	0.2 % of max.

\* Accuracy, repeatability, and noise are all determined with the same collected data, as described in §1065.305, and based on absolute values. "pt." refers to the overall flow-weighted mean value reported at the standard. "max." refers to the peak value reported at the standard event (not test interval), not the maximum of the instrument's range. "mean" refers to the actual (flow-weighted) mean measured over any test interval.

MEASUREMENT OF ENGINE PARAMETERS AND AMBIENT CONDITIONS

§ 1065.210 Work input and output sensors.

(a) *Application.* Use instruments as specified in this section to measure work inputs and outputs during engine

operation. We recommend that you use sensors, transducers, and meters that meet the specifications in Table 1 of § 1065.205. Note that your overall systems for measuring work inputs and outputs must meet the linearity verifications in §1065.307. We recommend that you measure work inputs