

TABLE 1 OF § 1066.125—DATA RECORDING AND CONTROL MINIMUM FREQUENCIES—Continued

Applicable section	Measured values	Minimum command and control frequency ^a	Minimum recording frequency ^{b, c}
§ 1066.425	Continuous concentrations of raw or dilute analyzers.	.....	1 Hz.
§ 1066.425	Power analyzer .....	.....	1 Hz.
§ 1066.501			
§ 1066.425	Bag concentrations of raw or dilute analyzers .....	.....	1 mean value per test interval.
40 CFR 1065.545	Diluted exhaust flow rate from a CVS with a heat exchanger upstream of the flow measurement.	.....	1 Hz.
§ 1066.425			
40 CFR 1065.545	Diluted exhaust flow rate from a CVS without a heat exchanger upstream of the flow measurement.	5 Hz	1 Hz means.
§ 1066.425			
40 CFR 1065.545	Dilution air flow if actively controlled (for example, a partial-flow PM sampling system) ^d .	5 Hz	1 Hz means.
§ 1066.425			
40 CFR 1065.545	Sample flow from a CVS that has a heat exchanger	1 Hz	1 Hz.
§ 1066.425			
40 CFR 1065.545	Sample flow from a CVS that does not have a heat exchanger.	5 Hz	1 Hz means.
§ 1066.425			
§ 1066.420	Ambient temperature .....	.....	1 Hz. ^e
§ 1066.420	Ambient humidity .....	.....	1 Hz. ^e
§ 1066.420	Heated sample system temperatures, including PM filter face.	.....	1 Hz.

^aCFVs that are not using active control are exempt from meeting this requirement due to their operating principle.
^b1 Hz means are data reported from the instrument at a higher frequency, but recorded as a series of 1 s mean values at a rate of 1 Hz.
^cFor CFVs in a CVS, the minimum recording frequency is 1 Hz. For CFVs used to control sampling from a CFV CVS, the minimum recording frequency is not applicable.
^dThis is not applicable to CVS dilution air.
^eUnless specified elsewhere in this part or the standard-setting part. Note that this provision does not apply to soak periods where recording frequencies are not specified. For these instances, we recommend a recording frequency of ≥ 0.016 Hz.

§ 1066.130 Measurement instrument calibrations and verifications.

The measurement instrument calibration and verification requirements in 40 CFR part 1065, subpart D, apply with the following exceptions:

- (a) The calibration and verification provisions of 40 CFR 1065.303 do not apply for engine speed, torque, fuel rate, or intake air flow.
- (b) The linearity verification provisions of 40 CFR 1065.307 do not apply for engine speed, torque, fuel rate, or intake air flow. Section 1066.135 specifies additional linearity verification provisions that apply specifically for chassis testing.
- (c) The provisions of § 1066.220 apply instead 40 CFR 1065.310.

(d) The provisions of 40 CFR 1065.320, 1065.325, and 1065.395 do not apply.

(e) If you are measuring flow volumetrically (rather than measuring based on molar values), the provisions of § 1066.140 apply instead of 40 CFR 1065.340.

(f) The provisions of § 1066.150 apply instead 40 CFR 1065.350(c), 1065.355(c), 1065.370(c), and 1065.375(c).

(g) Table 1 of this section summarizes the required and recommended calibrations and verifications that are unique to testing under this part and indicates when these must be performed. Perform other required or recommended calibrations and verifications as described in 40 CFR 1065.303, with the exceptions noted in this section. Table 1 follows:

TABLE 1 OF § 1066.130—SUMMARY OF REQUIRED CALIBRATIONS AND VERIFICATIONS

Type of calibration or verification	Minimum frequency ^a
40 CFR 1065.307: Linearity verification.	The linearity verifications from 40 CFR part 1065 do not apply under this part for engine speed, torque, fuel rate, or intake air flow; the linearity verification described in § 1066.135 applies for the following measurements: Dynamometer speed: See § 1066.220. Dynamometer torque: See § 1066.220.
40 CFR 1065.310: Torque	This calibration does not apply for testing under this part; see § 1066.220.
40 CFR 1065.320: Fuel flow	This calibration does not apply for testing under this part.
40 CFR 1065.325: Intake flow	This calibration does not apply for testing under this part.

TABLE 1 OF § 1066.130—SUMMARY OF REQUIRED CALIBRATIONS AND VERIFICATIONS—Continued

Type of calibration or verification	Minimum frequency ^a
40 CFR 1065.340: CVS calibration.	This calibration does not apply for CVS flow meters calibrated volumetrically as described in § 1066.140.
40 CFR 1065.345: Vacuum leak.	Required upon initial installation of the sampling system; recommended within 35 days before the start of an emissions test and after maintenance such as pre-filter changes.
40 CFR 1065.350(c), 1065.355(c), 1065.370(c), and 1065.375(c).	These provisions do not apply for testing under this part; see § 1066.150.
40 CFR 1065.395: Inertial PM balance and weighing.	These verifications do not apply for testing under this part.

^a Perform calibrations and verifications more frequently if needed to conform to the measurement system manufacturer's instructions and good engineering judgment.

§ 1066.135 Linearity verification.

This section describes requirements for linearity verification that are unique to testing under this part. (Note: See the definition of “linearity” in 40 CFR 1065.1001, where we explain that linearity means the degree to which measured values agree with respective reference values and that the term “linearity” is not used to refer to the shape of a measurement instrument's unprocessed response curve.) Perform other required or recommended calibrations and verifications as described in 40 CFR 1065.307, with the exceptions noted in this section.

(a) For gas analyzer linearity, use one of the following options:

(1) Use instrument manufacturer recommendations and good engineering judgment to select at least ten reference values, y_{refi} , that cover the range of values that you expect during testing (to prevent extrapolation beyond the verified range during emission testing). We recommend selecting zero as one of your reference values. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2% or less of the value at each data point, concentration values may be calculated by use of a straight-line curve fit for that range. If the deviation exceeds 2% at any point, use the best-fit nonlinear equation that represents the data to within 2% of each test point to determine concentration. If you use a gas divider to blend calibration gases, verify that the calibration curve produced names a calibration gas within 2% of its certified concentration. Perform this verification between 15 and 50% of the full-scale analyzer range.

(2) Use the linearity requirements of 40 CFR 1065.307, except for CO₂ measurements used for determining fuel economy and GHG emissions for motor vehicles at or below 14,000 pounds GVWR. If you choose this linearity option, you must use the provisions of 40 CFR 1065.672 to check for drift and make appropriate drift corrections.

(b) For dilution air, diluted exhaust, and raw exhaust sample flow, use a reference flow meter with a blower or pump to simulate flow rates. Use a restrictor, diverter valve, variable-speed blower, or variable-speed pump to control the range of flow rates. Use the reference meter's response for the reference values.

(1) *Reference flow meters.* Because of the large range in flow requirements, we allow a variety of reference meters. For example, for diluted exhaust flow for a full-flow dilution system, we recommend a reference subsonic venturi flow meter with a restrictor valve and a blower to simulate flow rates. For dilution air, diluted exhaust for partial-flow dilution, and raw exhaust, we allow reference meters such as critical flow orifices, critical flow venturis, laminar flow elements, master mass flow standards, or Roots meters. Make sure the reference meter is calibrated and its calibration is NIST-traceable. If you use the difference of two flow measurements to determine a net flow rate, you may use one of the measurements as a reference for the other.

(2) *Reference flow values.* Because the reference flow is not absolutely constant, sample and record values of Q_{refi} for 30 seconds and use the arithmetic mean of the values, Q_{ref} , as the reference value. Refer to 40 CFR 1065.602