

CPDM shall also report end-of-shift results using computer software compatible with current, commonly used personal computer technology.

(2) The CPDM shall report results as cumulative mass concentration in units of mass per volume of air (mg/m^3) with two significant figures of accuracy rounded as customary.

(i) *Power requirements.* The power source of the CPDM shall have sufficient capacity to enable continuous sampling for 12 hours in a coal mine dust atmosphere of up to $4.0 \text{ mg}/\text{m}^3$. If the CPDM uses a rechargeable battery, the battery charger shall be operated from a 110 (VAC) (nominal), 60 Hz power line.

(j) *Flow stability and calibration of pump.* If a pump is used, the flow shall not vary more than ± 5 percent of the calibrated flow for 95 percent of samples taken for any continuous duration for up to 12 hours. The flow calibration maintenance interval to assure such performance shall be specified in the calibration instructions for the device.

(k) *Battery check.* If the CPDM uses a rechargeable battery, the CPDM shall have a feature to indicate to the user that the device is sufficiently charged to operate and provide accurate measurements for an entire shift of 12 hours under normal conditions of use.

(1) *Integration with other personal mining equipment.*

(1) If the CPDM is integrated or shares functions with any other devices used in mines, such as cap lights or power sources, then the applicant shall obtain approvals for such other devices, prior to receiving final certification of the CPDM under this section.

(2) A CPDM that is integrated with another device shall be tested, according to all the requirements under this part, with the other device coupled to the CPDM and operating.

(m) *Tampering safeguards or indicators.* The CPDM shall include a safeguard or indicator which either prevents intentional or inadvertent altering of the measuring or reporting functions or indicates that the measuring or reporting functions have been altered.

(n) *Maintenance features.* The CPDM shall be designed to assure that the device can be cleaned and maintained to

perform accurately and reliably for the duration of its service life.

§ 74.8 Measurement, accuracy, and reliability requirements.

(a) *Breathing zone measurement requirement.* The CPDM shall be capable of measuring respirable dust within the personal breathing zone of the miner whose exposure is being monitored.

(b) *Accuracy.* The ability of a CPDM to determine the true concentration of respirable coal mine dust at the end of a shift shall be established through testing that demonstrates the following:

(1) For full-shift measurements of 8 hours or more, a 95 percent confidence that the recorded measurements are within ± 25 percent of the true respirable dust concentration, as determined by CMDPSU reference measurements, over a concentration range from 0.2 to $4.0 \text{ mg}/\text{m}^3$; and

(2) For intra-shift measurements of less than 8 hours, a 95 percent confidence that the recorded measurements are within ± 25 percent of the true respirable dust concentration, as determined by CMDPSU reference measurements, over the concentration range equivalent to 0.2 to $4.0 \text{ mg}/\text{m}^3$ for an 8-hour period.¹

(c) *Reliability of measurements.* The CPDM shall meet the accuracy requirements under paragraph (b) of this section, regardless of the variation in density, composition, size distribution of respirable coal mine dust particles, and the presence of water spray mist in coal mines.

¹The equivalent dust concentration range to the 8-hour range of $0.2 - 4 \text{ mg}/\text{m}^3$ is calculated by multiplying this 8-hour range by the dividend of eight hours divided by the duration of the intrashift measurement specified in units of hours. For example, for a measurement taken at exactly one hour into the shift, the 8-hour equivalent dust concentration range would be a one-hour average concentration range of: $8 \text{ hours}/1 \text{ hour} \times (0.2 - 4 \text{ mg}/\text{m}^3) = 1.6 - 32 \text{ mg}/\text{m}^3$; for a two-hour measurement, the applicable concentration range would be calculated as: $8 \text{ hours}/2 \text{ hours} \times (0.2 - 4 \text{ mg}/\text{m}^3) = 0.8 - 16 \text{ mg}/\text{m}^3$; for a 4-hours measurement, the equivalent range would be: $0.4 - 8 \text{ mg}/\text{m}^3$; * * * etc. A CPDM must perform accurately, as specified, for intrashift measurements within such equivalent concentration ranges.

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(d) *Precision.* The precision of the CPDM shall be established through testing to determine the variability of multiple measurements of the same dust concentration, as defined by the relative standard deviation of the distribution of measurements. The relative standard deviation shall be less than 0.1275 without bias for both full-shift measurements of 8 hours or more, and for intra-shift measurements of less than 8 hours within the dust concentration range equivalent to 0.2 to 4.0 mg/m³ for an 8-hour period, as specified under paragraph (b)(2) of this section.

(e) *Bias.* The bias of the CPDM measurements shall be limited such that the uncorrectable discrepancy between the mean of the distribution of measurements and the true dust concentration being measured during testing shall be no greater than 10 percent. Bias must be constant over the range of dust concentration levels tested, 0.2 to 4.0 mg/m³ for an 8-hour sampling period.

(f) *Testing conditions.* Laboratory and mine testing of the CPDM for accuracy, precision, bias, and reliability under diverse environmental conditions (as defined under § 74.7(e) and (g)) shall be determined using the NIOSH testing procedure, "Continuous Personal Dust Monitor Accuracy Testing," June 23, 2008, available at: <http://www.cdc.gov/niosh/mining/pubs/pubreference/outputid3076.htm>. All testing results shall be submitted to NIOSH in writing on the application filed under § 74.11.

(1) Persons must proceed in accordance with NIOSH testing procedure "Continuous Personal Dust Monitor Accuracy Testing," June 23, 2008. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Persons may obtain a copy at the address below: NIOSH-Publications Dissemination, 4676 Columbia Parkway, Cincinnati, OH 45226. <http://www.cdc.gov/niosh/mining>.

(2) Persons may inspect a copy at MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Boulevard, Room 2350, Arlington, Virginia 22209-3939, (202) 693-9440, or at the National Archives and Records Administration (NARA). For information on

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the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

§ 74.9 Quality assurance.

(a) *General requirements.* The applicant shall establish and maintain a quality control system that assures that CPDM devices produced under the applicant's certificate of approval meet the required specifications and are reliable, safe, effective, and otherwise suitable for their intended use. To establish and to maintain an approval under this part, the applicant shall:

(1) Submit a copy of the most recent registration under ISO Q9001-2000, American National Standard, Quality Management Systems-Requirements, published by ISO:

(i) With the application for approval under § 74.13 of this part; and

(ii) Upon request by NIOSH, subsequent to the approval of a CPDM under this part.

(2) Persons must proceed in accordance with ISO Q9001-2000, American National Standard, Quality Management Systems-Requirements. The Director of the Federal Register approves this incorporation by reference in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. Persons may obtain a copy from the International Organization for Standardization at the address provided below.

International Organization for Standardization, ISO Central Secretariat, 1, ch. de la Voie-Creuse, Case Postale 56, CH-1211 GENEVA 20, Switzerland. <http://www.standardsinfo.net>.

(3) Persons may inspect a copy at MSHA, Office of Standards, Regulations, and Variances, 1100 Wilson Boulevard, Room 2350, Arlington, Virginia 22209-3939, (202) 693-9440, or at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030, or go to: http://www.archives.gov/federal_register/code_of_federal_regulations/ibr_locations.html.

(b) *Quality management audits.* Upon request, applicants or approval holders must allow NIOSH to inspect the quality management procedures and