

## § 74.2

mine dust sampling devices for determining the concentrations of respirable dust in coal mine atmospheres; procedures for applying for such approval; test procedures; and labeling.

### § 74.2 Definitions.

(a) *Accuracy*: the ability of a continuous personal dust monitor (CPDM) to determine the “true” concentration of the environment sampled. Accuracy describes the closeness of a typical measurement to the quantity measured, although it is defined and expressed in terms of the relative discrepancy of a typical measurement from the quantity measured. The accuracy of a CPDM is the theoretical maximum error of measurement, expressed as the proportion or percentage of the amount being measured, without regard for the direction of the error, which is achieved with a 0.95 probability by the method.

(b) *Bias*: the uncorrectable relative discrepancy between the mean of the distribution of measurements from a CPDM and the true concentration being measured.

(c) *Coal mine dust personal sampler unit (CMDPSU)*: a personal device for measuring concentrations of respirable dust in coal mine atmospheres that meets the requirements specified under Subpart B of this part.

(d) *Continuous personal dust monitor (CPDM)*: a sampling device for continuously measuring concentrations of respirable dust in coal mine atmospheres that reports within-shift and end-of shift measurements of dust concentrations immediately upon the completion of the period of exposure that was monitored and that meets the requirements specified under Subpart C of this part.

(e) *ISO*: the International Organization for Standardization, an international standard-setting organization composed of representatives from various national standards-setting organizations. ISO produces industrial and commercial voluntary consensus standards used worldwide.

(f) *Precision*: the relative variability of measurements from a homogeneous atmosphere about the mean of the population of measurements, divided by the mean at a given concentration. It

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reflects the ability of a CPDM to replicate measurement results.

### Subpart B—Approval Requirements for Coal Mine Dust Personal Sampler Unit

#### § 74.3 Sampler unit.

A CMDPSU shall consist of:

- (a) A pump unit,
- (b) A sampling head assembly, and
- (c) If rechargeable batteries are used in the pump unit, a battery charger.

#### § 74.4 Specifications of sampler unit.

(a) *Pump unit*:

(1) *Dimensions*. The overall dimensions of the pump unit, hose connections, and valve or switch covers shall not exceed 4 inches (10 centimeters) in height, 4 inches (10 centimeters) in width, and 2 inches (5 centimeters) in thickness.

(2) *Weight*. The pump unit shall not weigh more than 20 ounces (567 grams).

(3) *Construction*. The case and all components of the pump unit shall be of sufficiently durable construction to endure the wear of use in a coal mine, shall be tight fitting to minimize the amount of dust entering the pump case, and shall be designed to protect against radio frequency interference and electromagnetic interference.

(4) *Exhaust*. The pump shall exhaust into the pump case, maintaining a slight positive pressure which will reduce the entry of dust into the pump case.

(5) *Switch*. The pump unit shall be equipped with an ON/OFF switch or equivalent device on the outside of the pump case. This switch shall be protected against accidental operation during use and protected to keep dust from entering the mechanisms.

(6) *Flow rate adjustment*. Except as provided in the last sentence of this paragraph, the pump unit shall be equipped with a suitable means of flow rate adjustment accessible from outside the case. The flow rate adjuster shall be recessed in the pump case and protected against accidental adjustment. If the pump is capable of maintaining the flow rate consistency required in this part without adjustment, an external flow rate adjuster is not required.

(7) *Battery.* The power supply for the pump shall be a suitable battery located in the pump case or in a separate case which attaches to the pump case by a permissible electrical connection.

(8) *Pulsation.* (i) The irregularity in flow rate due to pulsation shall have a fundamental frequency of not less than 20 Hz.

(ii) The quantity of respirable dust collected with a sampler unit shall be within  $\pm 5$  percent of that collected with a sampling head assembly operated with nonpulsating flow.

(9) *Belt clips.* The pump unit shall be provided with a belt clip which will hold the pump securely on a coal miner's belt.

(10) *Recharging connection.* A suitable connection shall be provided so that the battery may be recharged without removing the battery from the pump case or from the battery case if a separate battery case is used.

(11) *Flow rate indicator.* A visual indicator of flow rate shall be provided either as an integral part of the pump unit or of the sampling head assembly. The flow rate indicator shall be calibrated within  $\pm 5$  percent at 2.2, 2.0, and 1.7 liters per minute to indicate the rate of air passing through the accompanying sampling head assembly.

(12) *Flow rate range.* The pump shall be capable of operating within a range of from 1.5 to 2.5 liters per minute and shall be adjustable over this range.

(13) *Flow rate consistency.* The flow shall remain within  $\pm 0.1$  liters per minute over at least a 10-hour period when the pump is operated at 2 liters per minute with a standard sampling head assembly.

(14) *Flow restriction indicator.* The pump shall be capable of detecting restricted flow and providing a visual indication if it occurs. The flow restriction indicator shall remain activated until the cause is corrected. The pump shall shut down automatically if flow is restricted for one minute.

(15) *Duration of operation.* The pump with a fully charged battery pack shall be capable of operating for (i) not less than 8 hours at a flow rate of 2 liters per minute against a resistance of 25 inches (64 centimeters) of water measured at the inlet of the pump; and (ii) for not less than 10 hours at a flow rate

of 2 liters per minute against a resistance of 15 inches (38 centimeters) of water measured at the inlet of the pump.

(16) *Low battery indicator.* The pump unit shall be equipped with a visual indicator of low battery power.

(17) *Elapsed time indicator.* The pump unit shall be capable of displaying the actual pump run time in minutes (up to 999 minutes) and retaining the last reading after the pump is shut down due to either a flow restriction described in paragraph (a)(14) of this section or low battery power described in paragraph (a)(16) of this section or at the end of the sampling shift.

(b) *Sampling head assembly.* The sampling head assembly shall consist of a cyclone and a filter assembly as follows:

(1) *Cyclone.* The cyclone shall consist of a cyclone body with removable grit cap and a vortex finder and shall be constructed of nylon or a material equivalent in performance. The dimensions of the components, with the exception of the grit cap, shall be identical to those of a Dorr-Oliver 10 millimeter cyclone body, part No. 28541/4A or 01B11476-01 and vortex finder, part No. 28541/4B.

(2) *Filter assembly.* The filter assembly shall meet the following requirements:

(i) *Filter.* The filter shall be a membrane filter type with a nominal pore size not over 5 micrometers. It shall be nonhygroscopic and shall not dissolve or decompose when immersed in ethyl or isopropyl alcohol. The strength and surface characteristics of the filter shall be such that dust deposited on its surface may be removed by ultrasonic methods without tearing the filter. The filter resistance shall not exceed 2 inches (0.5 centimeters) of water at an airflow rate of 2 liters per minute.

(ii) *Capsule.* The capsule enclosing the filter shall not permit sample air to leak around the filter and shall prevent visual inspection of the filter surface or filter loading. The capsule shall be made of nonhygroscopic material. Its weight, including the enclosed filter, shall not exceed 5 grams and it shall be pre-weighed by the manufacturer with a precision of  $\pm 0.001$  milligrams. Impact to the capsule shall not dislodge any dust from the capsule,

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which might then be lost to the weight measurement.

(iii) *Cassette.* The cassette shall enclose the capsule so as to prevent contamination and intentional or inadvertent alteration of dust deposited on the filter. The cassette must be easily removable without causing a loss or gain of capsule weight. The cassette shall be designed to prevent contaminants from entering or dust from leaving the capsule when it is not in use, and to prevent the reversal of airflow through the capsule or other means of removing dust collected on the filter.

(3) *Arrangement of components.* The connections between the cyclone vortex finder and the capsule and between the capsule and the ¼-inch (0.64 centimeters) (inside diameter) hose mentioned in paragraph (b)(5) of this section shall be mechanically firm and shall not leak at a rate of more than 0.1 liters per hour under a vacuum of 4 inches (10 centimeters) of water.

(4) *Clamping of components.* The clamping and positioning of the cyclone body, vortex finder, and cassette shall be rigid, remain in alignment, be firmly in contact and airtight. The cyclone-cassette assembly shall be attached firmly to a backing plate or other means of holding the sampling head in position. The cyclone shall be held in position so that the inlet opening of the cyclone is pointing perpendicular to, and away from, the backing plate.

(5) *Hose.* A 3-foot (91 centimeter) long, ¼-inch (0.64 centimeters) (inside diameter) clear plastic hose shall be provided to form an airtight connection between the inlet of the sampler pump and the outlet of the filter assembly. A device, capable of sliding along the hose and attaching to the miner's outer garment, shall be provided.

(c) *Battery charger.*

(1) *Power supply.* The battery charger shall be operated from a 110 (VAC) (nominal), 60 Hz power line.

(2) *Connection.* The battery charger shall be provided with a cord and polarized connector so that it may be connected to the charge socket on the pump or battery case.

(3) *Protection.* The battery charger shall be fused, shall have a grounded

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power plug, and shall not be susceptible to damage by being operated without a battery on charge.

(4) *Charge rates.* The battery charger shall be capable of fully recharging the battery in the pump unit within 16 hours.

### § 74.5 Tests of coal mine dust personal sampler units.

(a) The National Institute for Occupational Safety and Health (NIOSH), Department of Health and Human Services, shall conduct tests to determine whether a CMDPSU that is submitted for approval under these regulations meets the requirements set forth in § 74.4.

(b) The Mine Safety and Health Administration (MSHA), Department of Labor, will conduct tests and evaluations to determine whether the pump unit of a CMDPSU that is submitted for approval under these regulations complies with the applicable permissibility provisions of 30 CFR 18.68.

### § 74.6 Quality control.

The applicant shall describe the way in which each lot of components will be sampled and tested to maintain its quality prior to assembly of each sampler unit. In order to assure that the quality of the CMDPSU will be maintained in production through adequate quality control procedures, MSHA and NIOSH reserve the right to have their qualified personnel inspect each applicant's control-test equipment procedures and records and to interview the employees who conduct the control tests. Two copies of the results of any tests made by the applicant on the CMDPSU or the pump unit thereof shall accompany an application provided under § 74.13 of this part.

## Subpart C—Requirements for Continuous Personal Dust Monitors

### § 74.7 Design and construction requirements.

(a) *General requirement.* Continuous Personal Dust Monitors (CPDMs) shall be designed and constructed for coal miners to wear and operate without impeding their ability to perform their work safely and effectively, and shall