

## 1.0 PURPOSE

The purpose of this document is to provide a procedure to be used by the Electrical Safety Division to determine if any gas detector that has oxygen detection capability meets the requirements of 30 CFR 75.320 as well as the manufacturer's accuracy specifications.

## 2.0 SCOPE

This STP applies to oxygen detectors/multi-gas detectors submitted for approval under either 30 CFR Part 18 or 22.

## 3.0 REFERENCES

- 3.1. 30 CFR Part 18 "Electric Motor-Driven Mine Equipment and Accessories"
- 3.2. 30 CFR Part 22 "Portable Methane Detectors"
- 3.3. 30 CFR Part 75.320 "Air quality detectors and measurement devices"

## 4.0 DEFINITIONS

- 4.1. Oxygen detector - a portable hand-held instrument capable of indicating the percentage of oxygen in the ambient atmosphere.
- 4.2. Multi-gas detector - a portable hand-held instrument fitted with multiple sensors capable of detecting more than one type of gas in the ambient atmosphere.
- 4.3. Final reading - display reading on the instrument after the test gas has been applied to the detector for at least two minutes.

## 5.0 TEST EQUIPMENT

- 5.1. Standard oxygen-in-nitrogen gas mixtures, with controllable regulators, of the following concentrations: 20.9%, 19.0%, 17.0%, 15.0%, and 13.0% volume with an accuracy of  $\pm 0.2\%$ .
- 5.2. Hose(s) and connectors, as needed.
- 5.3. Digital Thermometer. Minimum resolution of 0.20 degree Celsius and minimum range from 0 to 40 degrees Celsius (Fluke 2170A).

## 6.0 TEST SAMPLES

- 6.1. Four representative samples of the portable oxygen detector/multi-gas detector of a quality design and construction consistent with that of the final manufactured product. If the detector includes an optional sampling pump, two of the samples should include the pump.
- 6.2. For pump or aspirated detectors, a sampling tube of the maximum length and maximum inside diameter specified for use with the detector.
- 6.3. The manufacturer's calibration kit (including calibration adapter, calibration procedures, instruction manual, probes, and sampling lines).

## 7.0 PROCEDURES

- 7.1. Two separate Oxygen Deficiency Accuracy Tests are to be performed on oxygen detectors and multi-gas detectors. One before the drop test and another after the drop test. Multi-gas detectors having the capability of also detecting methane will be subjected to one "Oxygen Deficiency Accuracy Test" before the detector is subjected to the "Drop Test of Methane-Indicating Detectors (ASTP2209)" and another after the detector is subjected to the "Drop Test of Methane-Indicating Detectors". Oxygen detectors and multi-gas detectors that do not detect methane will be subjected to one "Oxygen Deficiency Accuracy Test" before the detector is subjected to the "Drop Test for Portable Intrinsically Safe Apparatus (ASTP2226)" and another after the detector is subjected to the "Drop Test for Portable Intrinsically Safe Apparatus".
- 7.2. Conduct the test in an ambient temperature of 25 ( $\pm$  10) °C. Record the ambient temperature on the test sheet.
- 7.3. Charge the detectors according to the manufacturer's instructions or install fresh batteries.
- 7.4. Calibrate the instruments according to the manufacturer's instructions. If the manufacturer specifies calibrating the detector in "Fresh Air", use the 20.9% standard oxygen cylinder, at the manufacturer's specified flow rate, and the calibration adapter for the "Fresh Air" calibration. Note: Do not recalibrate the detectors during the test.

Note: Follow Section 7.5 through 7.9 for diffusion test samples and Section 7.10 through 7.15 for samples with pumps.

- 7.5. **Diffusion Sample:** Apply the 20.9% ( $\pm 0.2\%$ ) oxygen thru calibration adapter at the specified flow rate to the instrument. Note final reading and alarm(s) status.
- 7.6. Apply the 19.0% ( $\pm 0.2\%$ ) oxygen thru calibration adapter at the specified flow rate to the instrument. Note final reading and alarm(s) status.
- 7.7. Apply the 17.0% ( $\pm 0.2\%$ ) oxygen thru calibration adapter at the specified flow rate to the instrument. Note final reading and alarm(s) status.
- 7.8. Apply the 15.0% ( $\pm 0.2\%$ ) oxygen thru calibration adapter at the specified flow rate to the instrument. Note final reading and alarm(s) status.
- 7.9. Apply the 13.0% ( $\pm 0.2\%$ ) oxygen thru calibration adapter at the specified flow rate to the instrument. Note final reading and alarm(s) status.
- 7.10. **Pump Sample:** Connect one end of a tube from the output of the regulator on the test oxygen cylinder. Connect the other end to a tubing "T" connector. Connect the opposite end of the "T" connector to the laboratory vent. Connect the remaining "T" connector to the instrument's pump input.
- 7.11. Apply the 20.9% ( $\pm 0.2\%$ ) oxygen thru the "T" connector at a flow rate greater than the flow rate of the sampling pump. Note final reading and alarm(s) status.
- 7.12. Apply the 19.0% ( $\pm 0.2\%$ ) oxygen thru the "T" connector at a flow rate greater than the flow rate of the sampling pump. Note final reading and alarm(s) status.
- 7.13. Apply the 17.0% ( $\pm 0.2\%$ ) oxygen thru the "T" connector at a flow rate greater than the flow rate of the sampling pump. Note final reading and alarm(s) status.
- 7.14. Apply the 15.0% ( $\pm 0.2\%$ ) oxygen thru the "T" connector at a flow rate greater than the flow rate of the sampling pump. Note final reading and alarm(s) status.
- 7.15. Apply the 13.0% ( $\pm 0.2\%$ ) oxygen thru the "T" connector at a flow rate greater than the flow rate of the sampling pump. Note final reading and alarm(s) status.

## 8.0 TEST DATA

- 8.1. Final reading of the detector when the various concentrations of oxygen were applied.
- 8.2. The manufacturer, model number, and serial number of each detector.
- 8.3. Model/part number and flow rate of the pump, if applicable.
- 8.4. Length and inside diameter of sampling tubing, if applicable.
- 8.5. Alarm(s) status
- 8.6. Ambient temperature.
- 8.7. Test equipment identification (e.g. model number, part number, serial number(s)).
- 8.8. Flow rate applied to the calibration adapter during testing.

#### 9.0 PASS/FAIL CRITERIA

- 9.1. The detector fails if the instrument does not meet the accuracy requirements of 30 CFR 75.320 (b) ("...that can detect 19.5 percent oxygen with an accuracy of  $\pm 0.5$  percent). This is judged based on the performance of the detector at 20.9 and 19.0 %.
- 9.2. The detector fails if any of the readings are not within the tolerance(s) specified by the detector manufacturer.