

## General Description

This dilution tube (P/N 813514) has a 1:1 dilution ratio and is for use with the following MSA gas detectors only:

- Passport® Personal Alarm with electric pump module or aspirator assembly
- Passport FiveStar® Personal Alarm with electric pump module or aspirator assembly
- Microgard® Portable Alarm with 0.25 LPM electric pump
- Orion® Multigas Detector with electric pump
- Solaris® Multigas Detector with electric pump module or aspirator assembly
- Sirius® Gas Detector with adapter (P/N 10049059)
- Altair® 5/5X Multigas Detector with adapter(s) (P/N 10049059 and/or 10049060)

It can be used to help estimate concentrations of combustibles when the sampled atmosphere is oxygen-deficient (less than 10% oxygen).

### ⚠ WARNING

Dilution tubes must be used only in Fresh Air, and by users who have read these instructions and understand how to interpret instrument readings with dilution tubes installed. Use dilution tubes only when nitrogen is the inert background gas. Other inert gases such as helium, etc. cause erroneous readings as they have a strong thermal conductivity effect on the combustible sensor.

Dilution tubes must be removed after use to prevent erroneous interpretation of instrument readings. The sample must be drawn from a non-pressurized area only. Pressure (or vacuum) on the sample side or dilution side causes major disruptions of flow balance in the dilution tube, resulting in inaccurate readings, possible injury or death.

## Operating Instructions

1. Using a calibrated instrument unit without the dilution tube, take and record an oxygen reading from the inert area (FIGURES 1 and 2).
2. Attach the dilution tube to the sample inlet of the instrument pump module/aspirator bulb and attach the sampling line to the dilution tube. The dilution tube has been tested with 5-, 10- and 15- foot sample lines only; do not use other sample line lengths as their response characteristics are unknown.
  - The WaterStop® sample probe (P/N 800332 or 803333) with Teflon (Trademark of Du Pont) filter in place must be used to provide a balanced flow.

- The instrument and the dilution tube must be in fresh air (an area known to be free of combustible gases and containing 20.8% oxygen).

### 3. Sample the inert area again.

- The oxygen reading should be the average of 20.8 (ambient air), and the previously recorded reading from step 1.

For example: In an inert atmosphere with 2.0% oxygen, the reading should be 11.4% oxygen.  $(2.0 + 20.8) \div 2 = 11.4$  (FIGURE 3)

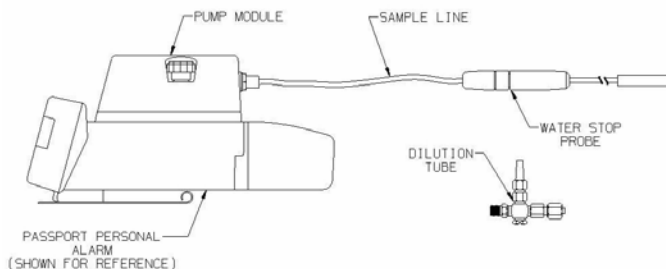


Figure 1. Passport Unit with Pump, Water Stop Probe and Sample Lines

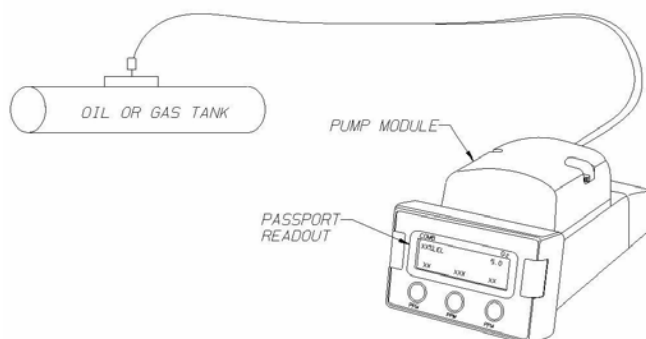


Figure 2. Taking an Oxygen Reading with Probe

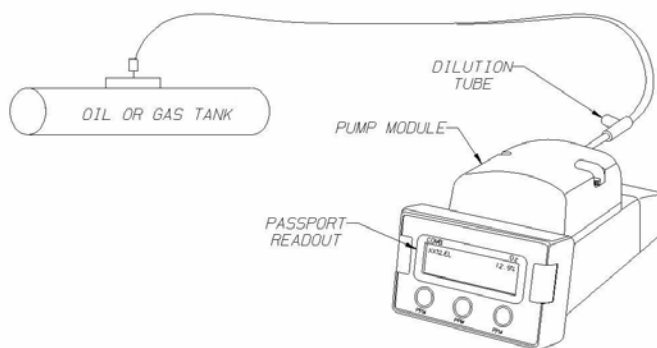


Figure 3. Taking an Oxygen Reading with Installed Dilution Tube

- If the reading is higher than your calculation, too much air is entering the fresh air side of the dilution tube; check the sample line for obstructions.
  - If the reading is lower than your calculation, not enough air is entering the fresh air side of the dilution tube; check the fritted dilution inlet for obstruction.
  - Do not use the instrument unit unless the oxygen reading equals your calculation  $\pm 2$  (using the example calculation of 11.4, allowable readings range from 9.4 to 13.4).
4. If the oxygen reading is acceptable, you may proceed to monitor for combustible gases in nitrogen. Multiply the instrument combustible reading by two for the correct reading. The results will be within  $\pm 20\%$  of the readings you would get if 20.8% oxygen were present.
  5. Remove the dilution tube immediately after sampling from the inert area to prevent unintentional use of the dilution tube.

## Using Two Dilution Tubes

Using two dilution tubes (P/N 813514) results in a 3:1 dilution ratio. If erroneous readings are caused by thermal conductivity effects, the use of two dilution tubes can further reduce thermal conductivity effects on the combustible sensor.

1. Using a calibrated instrument unit without the dilution tube, take and record an oxygen reading from the inert area (FIGURES 1 and 2).
2. Attach two dilution tubes to the sample inlet of the instrument pump module and attach the sampling line to the dilution tube. The two dilution tubes have been tested with 10-foot sample line only; do not use other sample line lengths as their response characteristics are unknown.
  - The WaterStop® sample probe (P/N 800332, 803333 or 10042621) with filter in place must be used to provide a balanced flow.
  - The instrument and the dilution tubes must be in fresh air (an area known to be free of combustible gases and containing 20.8% oxygen).

3. Sample the inert area again.
  - The oxygen reading should be the weighted average of 20.8 (ambient air), and the previously recorded reading from step 1.

For example: In an inert atmosphere with 2.0% oxygen, the reading should be 16.1% oxygen.  $(2.0 + 20.8 * 3) \div 4 = 16.1$  (FIGURE 4)

- If the reading is higher than your calculation, too much air is entering the fresh air side of the dilution tube; check the sample line for obstructions.
  - If the reading is lower than your calculation, not enough air is entering the fresh air side of the dilution tube; check the fritted dilution inlet for obstruction.
  - Do not use the instrument unit unless the oxygen reading equals your calculation  $\pm 1$  (using the example calculation of 16.1; allowable readings range from 15.1 to 17.1).
4. If the oxygen reading is acceptable, you may proceed to monitor for combustible gases in nitrogen. Multiply the instrument combustible reading by four for the correct reading. The results will be within  $\pm 40\%$  of the readings you would get if 20.8% oxygen were present.
  5. Remove the dilution tube immediately after sampling from the inert area to prevent unintentional use of the dilution tube.

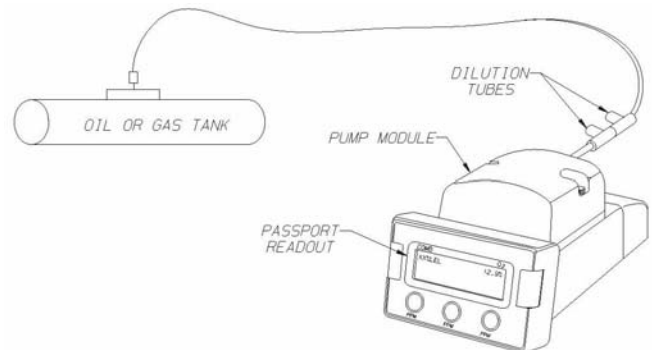


Figure 4. Taking an Oxygen Reading with Two Installed Dilution Tubes