

## PROTOCOL 14-0022

### Oxygen Delivery Testing Panoramic Oxygen Mask Simulated Patient Conditions

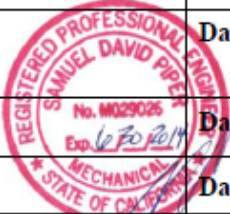
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**The POM Study – FiO2 Delivery**

**PIPER MEDICAL**

**Protocol 14-0022**

**PROTOCOL:** Oxygen Delivery Testing of the POM Panoramic Oxygen Mask Under Simulated Patient Conditions

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**1.0 Objective**

- 1.1 To measure the delivered FiO2 for the POM Panoramic Oxygen Mask under simulated patient conditions

**2.0 Reference**

- 2.1 DRAFT VERSION “REVIEWER GUIDANCE FOR PREMARKET NOTIFICATION SUBMISSIONS” November 1993.
- 2.2 GOOD LABORATORY PRACTICE REGULATIONS, USFDA (21 CFR PART 58)
- 2.3 PIPER MEDICAL SOP-E-131 – PRESSURE FLOW MEASUREMENT OPERATION
- 2.4 PIPER MEDICAL SOP-E-133 – OXYGEN SENSOR OPERATION

**3.0 Acceptance Criteria**

- 3.1 All equipment and laboratory processes used and specified will meet there pre-determined operation and calibration requirements before and after testing. All testing shall be performed per GLP.

PIPER MEDICAL

Protocol 14-0022

**PROTOCOL:** Oxygen Delivery Testing of the POM Panoramic Oxygen Mask Under Simulated Patient Conditions

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#### 4.0 Equipment List

- 4.1 POM Medical, LLC Panoramic Oxygen Mask with Medium and High concentration adapters, REF 1001 – Piper Sample ID 140317-1, 140317-2, and 140317-3
- 4.2 0-100 psig Pressure Gauge (E-008)
- 4.3 Gilmont glass float type Rotameter (E-015)
- 4.4 Low Flow Rotameter (E-082)
- 4.5 AccuLAB Standard Electronic Balance TS series (E-002)
- 4.6 Vacuum source (in-house)
- 4.7 Compressed gas source (in-house)
- 4.8 Oxygen source (in-house)
- 4.9 CO<sub>2</sub> source (in-house)
- 4.10 Velleman Digital Oscilloscope (E-154)
- 4.11 Ohmeda 5200 CO<sub>2</sub> Monitor (E-132)
- 4.12 Data Acquisition System
- 4.13 Humidity/Temperature Meter (E-100)
- 4.14 Oxygen Sensor (E-081)
- 4.15 Harvard Respiratory Pump (E-053)
- 4.16 Wright Respirometer (E-004)
- 4.17 Mannequin Head (0.875" ID oral cavity, head width = 6.0")

PIPER MEDICAL

Protocol 14-0022

**PROTOCOL:** Oxygen Delivery Testing of the POM Panoramic Oxygen Mask Under Simulated Patient Conditions

**Testing Procedure**

5.1 Set Up

- 5.1.1 Connect the Harvard Respirator pump as shown in figure 1. Run a line from the CO<sub>2</sub> source to the inhalation limb of the Harvard Pump on the piston side of the inhalation check valve as shown.
- 5.1.2 Use mannequin head for a simulated patient head.
- 5.1.3 Set the Harvard Pump and oxygen flow to the desired settings per table 1. Prior to placing each sample set the ETCO<sub>2</sub> level to 3%. Take FiO<sub>2</sub> measurements.

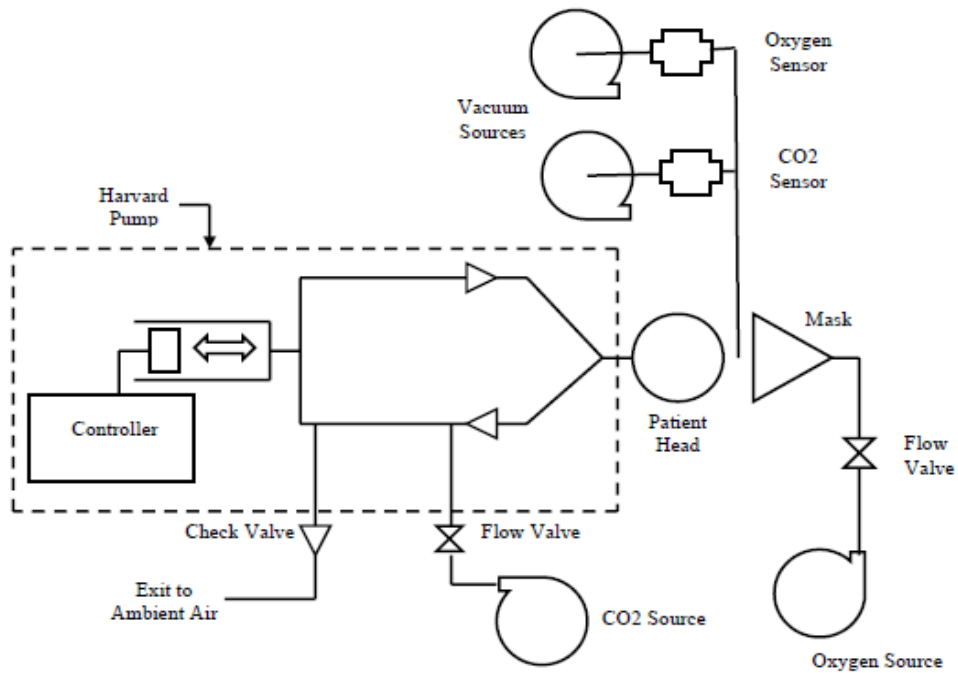


Figure 1 showing the patient simulation setup used for testing

**The POM Study – FiO2 Delivery**

**PIPER MEDICAL**

**Protocol 14-0022**

**PROTOCOL: Oxygen Delivery Testing of the POM Panoramic Oxygen Mask Under Simulated Patient Conditions**

	<u>Simulated Respiratory Settings</u>
Respiratory Rate	12 bpm
Tidal Volume	400 ml
I:E Ratio	1:1
End Tidal CO2	3%

Table 1 showing the respiratory settings used for testing.



Figure 2 showing a picture of the set ups used during testing. The medium concentration adapter configuration is showed on the left, the high concentration adapter configuration is showed on the right.

- 5.1.4 Attach a 0.125" OD sensing oxygen line to mannequin head and position the sensing end directly centered over the 0.875" ID simulated oral cavity of the mannequin head. Sample through the line to the oxygen and CO2 sensor (10 ml/min each) using a vacuum source. End tidal CO2 values shall be set with out the mask in place so as to simulate normal expected breathing.
- 5.1.5 Once CO2 flow has been set to the desired end tidal CO2 value, the mask will be adjusted to the desired oxygen flow rate and placed on mannequin head.
- 5.1.6 Two sets of measurements will be performed, one set will be with the sample masks equipped with a medium concentration adapter as described in the production instructions. The other identical set of tests will be performed on the same sample masks equipped with a high concentration adapter as described in the product instructions. Testing of the medium concentration adapter configuration will occur at 8, 10, and 12 l/min oxygen flow provided as described in product instructions. Testing of the high concentration adapter configuration will occur at 10, 12, and 15 l/min oxygen flow as described in the product instructions.
- 5.1.7 Each sample will be tested once in each configuration at each oxygen flow rate.

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Protocol 14-0022

**PROTOCOL:** Oxygen Delivery Testing of the POM Panoramic Oxygen  
Mask Under Simulated Patient Conditions

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5.2 Testing

- 5.2.1 Allow system to equilibrate for at least 3 minutes prior to taking each reading. Test each sample once for FiO<sub>2</sub>.
- 5.2.2 After allowing each setting 3 minutes to equilibrate obtaining an FiO<sub>2</sub> measurement.
- 5.2.3 Tabulate combined data and perform a comparison. Discuss results and reference results to acceptance criteria.

**The POM Study – FiO<sub>2</sub> Delivery**

PIPER MEDICAL

Protocol 14-0022

**PROTOCOL:** Oxygen Delivery Testing of the POM Panoramic Oxygen Mask Under Simulated Patient Conditions

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**6.0 RESULTS**

POM (Panoramic Oxygen Mask) FiO<sub>2</sub> Results  
Rate = 12 BPM, TV = 400 ml, I:E Ratio = 1:1, ETCO<sub>2</sub> % = 3%

	<b>Medium Oxygen Flow Adaptor</b>		
	<b>O<sub>2</sub> Flow = 8 l/min</b>	<b>O<sub>2</sub> Flow = 10 l/min</b>	<b>O<sub>2</sub> Flow = 12 l/min</b>
<b>1</b>	78.4%	84.4%	87.6%
<b>2</b>	76.8%	83.8%	88.1%
<b>3</b>	77.5%	82.0%	85.2%
<b>Mean</b>	77.6%	83.4%	87.0%
<b>Std Dev</b>	0.8%	1.2%	1.6%

	<b>High Oxygen Flow Adaptor</b>		
	<b>O<sub>2</sub> Flow = 10 l/min</b>	<b>O<sub>2</sub> Flow = 12 l/min</b>	<b>O<sub>2</sub> Flow = 15 l/min</b>
<b>1</b>	89.2%	91.6%	95.6%
<b>2</b>	88.4%	92.2%	97.1%
<b>3</b>	87.0%	90.1%	93.8%
<b>Mean</b>	88.2%	91.3%	95.5%
<b>Std Dev</b>	1.1%	1.1%	1.7%

Table 2 showing the oxygen (FiO<sub>2</sub>) delivery results for the two device configurations.

**PIPER MEDICAL**

**Protocol 14-0022**

**PROTOCOL:** Oxygen Delivery Testing of the POM Panoramic Oxygen Mask Under Simulated Patient Conditions

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## **7.0 DISCUSSION**

All equipment and laboratory processes met their specifications and requirements before and after testing. Oxygen measurements were calibrated at 21% and 100% before testing. After testing calibration curves were verified. The acceptance criteria of the test were met.



### **Conclusion of Piper Medical O<sub>2</sub> Delivery Study**

The overall results from the Piper Medical FiO<sub>2</sub> study, has exceeded POM Medical's expectations of the anticipated results. In a simulated (spontaneously) breathing patient, the medium concentration POM model was able to achieve up to 88.1% FiO<sub>2</sub> delivered to the patient.

Given the exact same protocol performed with the high concentration model, The POM was able to achieve an outstanding 97% FiO<sub>2</sub> delivered to the patient. These results greatly supersede the functionality of other traditional oxygen masks as well as nasal cannulas.

The POM can outperform most free flowing oxygen masks on the market. With The POM's ability to provide ultimate "panoramic access" to the patient's nose or mouth while monitoring end-tidal CO<sub>2</sub>, and also providing these high FiO<sub>2</sub> percentages, it can be easily concluded that the Panoramic Oxygen Mask will become the standard of care for all upper endoscopy procedures under conscious sedation.

Note: POM Medical was unable to find evidence of any free flowing oxygen mask on the market today that can claim a FiO<sub>2</sub> delivery of over 90% (oxymask).

It is our hope that you have found this study beneficial in examining the FiO<sub>2</sub> functionality of The Panoramic Oxygen Mask.

## Benefits of The Panoramic Oxygen Mask

- It is a much safer alternative device than the commonly used nasal cannula. It provides more than double the FiO<sub>2</sub> percentage to the patient during the procedure creating increased oxygen saturation.
- Complies with the ASA guidelines for end tidal CO<sub>2</sub> monitoring during.
- Facilitates deeper sedation eliminating interruptions during the procedure and decreases hypoxic events.
- It is disposable reducing cross contamination and sterilization cost.
- Cost effective. It uses a simple oxygen outlet reducing the need for a circuit and ventilator as well as the need for expensive positive pressure endoscopy masks.
- Doesn't change clinical practice. It is as simple to put on as its alternative and easy to use.
- The only mask available with two anatomically placed entry points or membranes. These two modifiable membranes allow for many different size scopes, tubes, or probes.
- It is extremely versatile for many types of procedures.
- Eliminates the cumbersome maintenance of positive ventilation equipment and procedures.
- Reusable on the same patient after procedure.

