Operation Manual

O_2 Quickstick™

Oxygen Analyzer

If you have any questions on this equipment please contact Technical Support at:

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WARNING

This Operation Manual contains important safety information and should always be available to those personnel operating this equipment. Read, understand, and retain all instructions before operating this equipment to prevent injury or equipment damage.

Every effort was made to ensure the accuracy of the information contained within this manual; however, we retain the right to modify its contents without notice. If you have problems or questions after reading the manual, stop and call for information.

1. Introduction

This manual will assist you in the proper set-up, operation and maintenance of the O_2 Quickstick ™ Oxygen Analyzer. Be sure to read the entire manual.

Throughout this manual we will use certain words to call your attention to conditions, practices or techniques that may directly affect your safety. Pay particular attention to information introduced by the following signal words:

Indicates an imminently hazardous situation, which if not avoided, will result in serious personal injury or death.

Indicates a potentially hazardous situation, which if not avoided, could result in serious personal injury or death.

Indicates a potentially hazardous situation, which if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

Notifies people of installation, operation or maintenance information which is important but not hazard-related.

2. System Description

When using the Analyzer for diving applications with mixed gases other than air, you must first obtain proper instruction from a certified diving instructor with a nationally recognized training agency qualified in mixed gas diving. Improper use of this analyzer may result in incorrect gas analysis which can lead to serious personal injury or death.

Although the Analyzer is a rugged instrument, careless handling or abuse may result in damage to the Analyzer resulting in inaccurate gas analysis. Inaccurate gas analysis can lead to serious personal injury or death.

Breathing gas must always be analyzed by two separate Analyzers, with one used for gas production and one used for analysis after production. Never depend on a single Analyzer during both gas production and delivery. If the Analyzer readings do not agree, both units must be recalibrated. Inaccurate gas analysis can lead to serious personal injury or death.

The Nuvair O_2 Quickstick™ Oxygen Analyzer is designed to measure oxygen levels directly from high-pressure cylinders in the range 0.1-100.0% O_2. No sampling hoses or accessories are necessary. The O_2 Quickstick™ is designed as a quick check device to test and verify that previous readings with another analyzer are correct. It is a water-resistant, drop-resistant, self-contained unit designed specifically for the sport and technical diving industry.

The O_2 Quickstick™ uses a digital display with low power consumption, so no on-off switch is required. Power is provided by a standard alkaline 9-volt Battery. The Analyzer uses an electrochemical O_2 Sensor to measure O_2 content in gases. The Sensor is disposable and user-replaceable, with a life expectancy of up to 36 months depending on usage. The Battery and Sensor are both user replaceable.

2.1. Preparation for Use

To extend Sensor life, the Analyzer is supplied with the Sensor sealed in a bag. When first received, please verify that the bag is intact. If it is torn, contact your supplier for assistance. Prior to initial use, install the Sensor into the Analyzer in accordance with the Sensor Replacement procedure. It is not necessary to remove the Sensor between Analyzer uses.

Sensor Sealed in Bag

The Battery must also be installed prior to initial use in accordance with the Battery Replacement procedure. The Battery may be removed during extended periods of inactivity.

3. Calibration

WARNING

Oxygen Analyzers must be calibrated before each use. Improper calibration may result in the use of incorrect breathing gas mixtures, which may cause serious injury or death to the person using the gas mixture.

WARNING

Calibration or use of the Analyzer with a low battery may result in inaccurate readings. Inaccurate gas analysis can lead to serious personal injury or death.

NOTICE

If the Analyzer has been subjected to a recent change in ambient temperature, allow it to stabilize for one hour before calibration.

WARNING

When Analyzer calibration is performed at different atmospheric conditions than the gas being measured, a calibration correction value may be required. Improper calibration may result in the use of incorrect breathing gas mixtures, which may cause serious injury or death to the person using the gas mixture.

Calibration should always be performed at the same temperature and humidity conditions as the gas being measured. This is not always possible, for example, in a tropical environment where dry breathing gas from a high-pressure Scuba cylinder will be measured after Analyzer calibration has been performed in the warm, humid ambient air. Under these conditions a calibration correction value may be required, as detailed in the Appendix, or dry air must be used for calibration.

WARNING

Obtain proper training before attempting special calibration procedures. Improper calibration may result in the use of incorrect breathing gas mixtures, which may cause serious injury or death to the person using the gas mixture.

Calibration in air at sea level is suitable for many applications; however, the closer the oxygen content of the calibration gas is to the gas being tested, the more accurate the measurement results. The following special applications require calibration procedures beyond the scope of this manual:

- Analysis of gases containing greater than 50% oxygen requiring calibration with pure oxygen or certified calibration gas
- Analysis of gases at altitudes above sea level requiring correction for reduced atmospheric pressure

3.1. Air calibration is essential before every use and should be performed in the environment that the reading will be taken.
3.2. The calibration adjustment screw is the only user adjustable control on the O_2 Quickstick™. It is located in the recessed hole on the battery end of the Analyzer.
3.3. The Calibrator Trim Tool provided is used to calibrate the Analyzer. It uses a very small flat screwdriver blade to adjust the calibration screw.
3.4. Expose the analyzer to fresh air for two minutes or until the reading on the display has stabilized. Adjust the calibration screw with the calibrator trim tool until the display reads 20.9% (see Section 4).

4. Operation

4.1. Open the cylinder valve slowly until a slight hiss can be heard.

4.2. Hold the sensor end of O_2 Quickstick™ (the end without the lanyard) against the valve opening so that the Nitrox mixture passes over the oxygen sensor. Be careful not to block the exhaust ports on the side.

4.3. The reading should stabilize in 15 seconds or less and the display reading taken.

4.4. If you cannot obtain a stable reading, check that you still have a very gentle flow of gas and repeat. If you still cannot obtain a stable reading see Troubleshooting section or use another analyzer.

4.5. Note that after a few seconds of the gas flow being stopped the reading will begin to change towards the level in the surrounding air of 20.9% O_2.

WARNING

Never expose the Oxygen Sensor to pressures other than ambient or you may cause damage and/or false readings. Damaged Sensors will not provide accurate gas analysis. Inaccurate gas analysis can lead to serious personal injury or death when the gas mixture that was analyzed is used for breathing.

WARNING

Gas, even under moderate pressures, can cause extreme bodily harm. Never allow any gas stream to be directed at any part of your body.

5. Maintenance

5.1. During the first 12 months of the warranty period, the O_2 Quickstick™ should be returned to the dealer/manufacturer for repair. Your O_2 Quickstick™ should give you three years continuous operation with proper care before needing sensor replacement.

5.2. To clean the O_2 Quickstick™ use a damp soft cloth.

5.3. Although designed to be water-resistant the O_2 Quickstick™ should not be intentionally immersed in liquid or left outside unprotected.

5.4. The O_2 Quickstick™ is built to resist the effects of day to day shocks and drops but remember it is a precision oxygen analyzer and should be looked after carefully to give long trouble free service.

5.5. Protect the O_2 Quickstick™ from long periods of direct sunlight and do not subject it to high or low temperature extremes.

5.6. Battery Replacement – To replace the battery, gently push and remove the end cover with thumb (the side with the lanyard). See figures 1 & 2. Gently pull the battery out from the O_2 Quickstick™ housing. See figures 3 & 4. Replace with new battery and reassemble.

NOTICE

Be sure to dispose of spent, leaking, or damaged Batteries properly, according to local regulations.

5.7. Sensor Replacement - To replace the sensor, gently push and remove the end cover with thumb (the side without the lanyard). See Figures 1 and 2. Disconnect the 2-pin sensor plug/socket and unscrew the complete sensor unit in a counter-clockwise direction. See Figures 5 and 6. Replace with new sensor and reassemble unit.

Figure 1

Figure 2

Figure 3

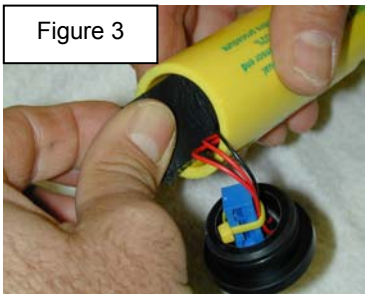


Figure 5

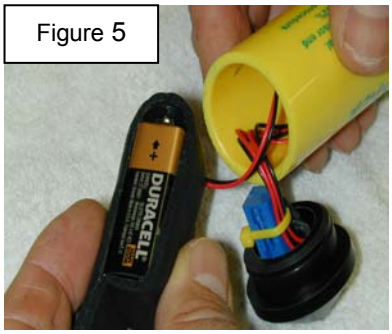
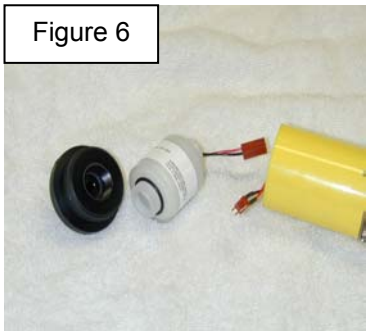


Figure 4

Figure 6



CAUTION

Be sure to dispose of spent, leaking, or damaged Oxygen Sensors properly, according to local regulations.

DANGER

Do not swallow (ingest) either the electrolyte from the Oxygen Sensor or the Sensor itself. The Potassium Hydroxide chemical contained in the Sensor can cause severe injury or death. If electrolyte or the Sensor is swallowed, seek medical attention immediately.

WARNING

If after handling the Oxygen Analyzer or Sensor, you find that your fingers or other parts of your body feel "slippery" or the skin or eyes sting, immediately flush affected area with clean, fresh water for at least 15 minutes. The stinging or slippery sensation is an indication of a leaking Sensor. The Potassium Hydroxide chemical contained in the Sensor can cause severe injury or death. Seek immediate medical attention if eye contact is made or skin stinging persists.

Handling Sensors

Replacement Sensors are supplied in sealed bags. Normally Sensors do not present a health hazard. Before opening the bag, check that the electrolyte has not leaked. However, if electrolyte leakage has occurred, do not open bag. Dispose of Sensor properly or return for replacement.

If electrolyte leakage occurs while the Sensor is in service, use rubber gloves and chemical splash goggles for handling. Rinse contaminated surfaces thoroughly with water.

Electrolyte First Aid Procedures

- Ingestion - Drink a large volume of fresh water. Do not induce vomiting. Get immediate medical attention.
- Eye Contact - Flush eyes with clean, fresh water for at least 15 minutes and get medical help immediately.
- Skin Contact - Flush the affected area with clean, fresh water for at least 15 minutes and removed contaminated clothing. If stinging persists get medical attention.

6. Spares

Order replacement Sensor Part No. R-33D1.

7. Troubleshooting

SYMPTOM	REASON	SOLUTION
Battery symbol	Low Battery	Change the battery
No display	Switched off Bad connection	Switch on Check display connection Check battery connection
Zero reading	Sensor disconnected Sensor expired	Check connection Change sensor
Reading erratic	Pressure on sensor Radio transmission Sensor old or faulty Condensation on sensor.	Check flow Move unit away Change sensor Dry in air
Reading does not change when calibration knob is turned	Faulty connections Sensor failure	Check connections Change sensor
Display segments missing	Display faulty	Return to dealer
Will not calibrate	Sensor faulty Sensor not in air High altitude	Change sensor Check flow adapter Use altitude calibration procedure
Reading drifts	Rapid temperature change	Stabilize temperature & recalibrate

Appendix

Calibration Correction Values for Temperature and Humidity

Oxygen Analyzer calibration should always be performed at the same temperature and humidity conditions as the gas being measured. Where this is not possible, a calibration correction value may be required. A common example is a tropical environment where dry breathing gas from a high-pressure Scuba cylinder will be measured after Analyzer calibration has been performed in the warm, humid ambient air.

To determine if a calibration correction value is required, you must first know the temperature and relative humidity of the air in which calibration will be performed. Using the chart below, find the atmospheric oxygen percent value corresponding to these values. If the oxygen percent value falls in the shaded portion of the chart, calibrate the Analyzer to the corrected chart value. To use the correction value, follow the standard Calibration procedure except as follows:

OXYGEN COMPENSATION CHART FOR MOISTURE IN THE ATMOSPHERE

ATMOSPHERE OXYGEN PERCENT IN RELATION TO TEMPERATURE AND RELATIVE HUMIDITY										
TEMPERATURE (°F) -->	32	40	50	60	70	80	90	100	110	120
TEMPERATURE (°C) -->	0	4	10	16	21	27	32	38	43	49
RELATIVE HUMIDITY (%)	ATMOSPHERIC OXYGEN PERCENT (% O2)									
10	20.9	20.9	20.9	20.9	20.8	20.8	20.8	20.8	20.7	20.7
20	20.9	20.9	20.8	20.8	20.8	20.8	20.7	20.6	20.5	20.4
30	20.9	20.8	20.8	20.8	20.7	20.7	20.6	20.5	20.4	20.2
40	20.8	20.8	20.8	20.7	20.7	20.6	20.5	20.4	20.2	19.9
50	20.8	20.8	20.8	20.7	20.6	20.5	20.4	20.2	20.0	19.7
60	20.8	20.8	20.7	20.7	20.6	20.5	20.3	20.1	19.8	19.5
70	20.8	20.8	20.7	20.6	20.5	20.4	20.2	19.9	19.6	19.2
80	20.8	20.8	20.7	20.6	20.5	20.3	20.1	19.8	19.5	19.0
90	20.8	20.7	20.7	20.6	20.4	20.3	20.0	19.7	19.3	18.7
100	20.8	20.7	20.6	20.5	20.4	20.2	19.9	19.5	19.1	18.5
H20 at 100% RH	0.6	0.8	1.2	1.8	2.5	3.4	4.7	6.5	8.6	11.5

If the Temperature and Relative Humidity axis meet in the shaded part of the chart, calibrate to the chart O2 level or with dry air to maintain 0.5% O2 accuracy in NITROX.

- Make sure Oxygen Sensor is exposed to the ambient temperature and humidity corresponding to the correction value.
- Adjust the Calibration Adjustment Screw to achieve a Display reading equal to the correction value.
- Once you have calibrated the Analyzer for temperature and humidity using the, your readings for gas analysis should be correct with no further adjustment.
- Re-calibrate Analyzer for any changes in temperature or humidity of the ambient environment or the gas being analyzed.

Note that the calibration correction value is never used when the temperature and humidity conditions of the gas being measured are the same as the conditions during calibration.

Specifications

Range:	0.1-100.0% Oxygen (0-1 ATA PPO_2)
Display Accuracy:	+/- 0.1%
Sensor Type:	Electrochemical
Expected Sensor Life, Room Air:	36 Months
Power:	9V Alkaline Battery
Response Time:	Less Than 6 Seconds to 90% of Final Value
Operating Temperature:	32-104°F (0-40°C)
Storage Temperature:	32-122°F (0-50°C)
Pressure:	Sensitive to Partial Pressure
Humidity:	0-99% RH (Non-Condensing)

Note: All specifications are at ambient / sea level, 25°C

NUVAIR O_2 Quickstick ™ Warranty

NUVAIR extends a limited warranty, which warrants the O_2 Quickstick to be free from defects in materials and workmanship under normal use and service for a limited period. The O_2 Quickstick is warranted according to the pro-rated terms as set forth below. This warranty is not transferable.

NUVAIR will, at it's discretion and according to the terms as set forth within, replace or repair any materials which fail under normal use and service and do not exhibit any signs of improper maintenance, misuse, accident, alteration, weather damage, tampering, or use for any other than the intended purpose. Determination of failure is the responsibility of NUVAIR, which will work together with the customer to adequately address warranty issues. When any materials are repaired or replaced during the warranty period, they are warranted only for the remainder of the original warranty period. This warranty shall be void and NUVAIR shall have no responsibility to repair or replace damaged materials resulting directly or indirectly from the use of repair or replacement parts not approved by NUVAIR.

Pro-Rated Terms:
NUVAIR warrants the O_2 Quickstick to be free from defects in material and workmanship for a period of thirty-six (36) months from date of purchase. The warranty covers parts and labor and is prorated as follows:

- 0 – 12 Months Repair or replacement free of charge
- 13 – 18 Months Warranty allowance of 75% of purchase price
- 19 – 24 Months Warranty allowance of 50% of purchase price
- 25 – 36 Months Warranty allowance of 25% of purchase price

A warranty registration card, supplied with system documentation, must be filled out and submitted to NUVAIR for the warranty to be registered. If the warranty registration card is not received within ten (10) days of purchase, the warranty will begin with the date of manufacture by NUVAIR.

Maintenance Items:
Any materials which are consumed, or otherwise rendered not warrantable due to processes applied to them, are considered expendable and are not covered under the terms of this policy. This includes the 9-volt battery used in the O_2 Quickstick.

Return Policy:
Application for warranty service can be made by contacting NUVAIR during regular business hours and requesting a Return Material Authorization number. Materials that are found to be defective must be shipped, freight pre-paid, to the NUVAIR office in Oxnard, California. Upon inspection and determination of failure, NUVAIR shall exercise its options under the terms of this policy. Warranty serviced materials will be returned to the customer via NUVAIR's preferred shipping method, at NUVAIR's expense. Any expedited return shipping arrangements to be made at customer's expense must be specified in advance.

Limitation of Warranty and Liability:
Repair, replacement or refund in the manner and within the time provided shall constitute NUVAIR'S sole liability and the Purchaser's exclusive remedy resulting from any nonconformity or defect. NUVAIR shall not in any event be liable for any damages, whether based on contract, warranty, negligence, strict liability or otherwise, including without limitation any consequential, incidental or special damages, arising with respect to the equipment or its failure to operate, even if NUVAIR has been advised of the possibility thereof. NUVAIR makes no other warranty or representation of any kind, except that of title, and all other warranties, express or implied, including warranties of merchantability and fitness for a particular purpose, are hereby expressly disclaimed. No salesman or other representative of NUVAIR has authority to make any warranties.

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