



maxtec Handi+ N2 Instructions

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NOTE: The latest edition of this operating manual can be downloaded from our website at www.maxtec.com

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CLASSIFICATION

- **Protection against electric shock:** Internally powered equipment
- **Protection against water:** IPX4
- **Mode of Operation:** Continuous
- **Flammable anesthetic mixture:** Not suitable for use in presence of a flammable anesthetic mixture.

Product Disposal Instructions:



■ The sensor, batteries, and circuit board are not suitable for regular trash disposal. Return sensor to Maxtec for proper disposal or dispose according to local guidelines. Follow local guidelines for disposal of other components.





WARNINGS

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

- Never allow an excess length of tubing, or any accessory near a person's head or neck, which may result in strangulation.
- Before use, all individuals who will be using the N2 Analyzer must become thoroughly familiar with the information contained in this Operation Guide.
- Strict adherence to the operating instructions is necessary for safe, effective product performance. This product will perform only as designed if installed and operated in accordance with the manufacturer's operating


instructions.

- Use only genuine accessories and replacement parts. Failure to do so may seriously impair the analyzer's performance.
- Repair or alteration of the N2 Analyzer beyond the scope of the maintenance instructions, or by anyone other than an authorized service person, could cause the product to fail to perform as designed.
- Calibrate the N2 analyzer weekly when in operation, or if environmental conditions change significantly. (ie, Elevation, Temperature, Pressure, Humidity — refer to "Factors Influencing Accurate Readings").
- Use of the N2 analyzer near devices that generate electrical fields may cause erratic readings
- Ensure proper tire inflation pressure after use, if required.
- The oxygen sensor is a sealed device containing a mild acid electrolyte, lead (Pb), and lead acetate. Lead and lead acetate are hazardous waste constituents and should be disposed of properly, or returned for proper disposal or recovery.
- Dropping the device can adversely affect its performance
-  **DO NOT** immerse the device in any cleaning solution, autoclave or expose the sensor to high temperatures (> 70°C).
-  **DO NOT** over pressurize the sensor. Doing so may destroy the sensor and void the warranty. To avoid over pressurization only allow 3 psi (or 2 liters per minute) of gas to come in contact with the sensor membrane.



Indicates a potentially hazardous situation, if not avoided, could result in minor or moderate injury and property damage















- Read the manual in its entirety before attempting use.
- Always use protective eyewear and observe proper safety procedures when working with pressurized gases.
- Dispose of the N2 properly when it has expired.
- Ensure the protective freshness seal has been removed from the sensing port before use.
- Ensure the N2 has been properly calibrated before use.
- If the N2 display goes blank immediately after the on button is pushed, or the N2 will not properly calibrate, the unit has expired.

 **DO NOT** use, dispose of properly.

- The display is not valid when in Over Range Mode. Recalibrate the N2 and observe the proper operating procedure.
- Never immerse the N2 or expose it to high humidity or moisture. It is not watertight.
- Never expose the N2 to high temperatures.

SYMBOL GUIDE

The following symbols and safety labels are found on the Handi+:

-  ON/OFF Key
- Do not throw away. Follow local guidelines for disposal
-  Serial Number
-  Corrosive
-  DO NOT
-  Contains Lead
-  Caution
-  Ingress Protection Rating
-  CAL (Calibration Key)
-  Attention, consult accompanying documents
-  Catalog Number
-  Lot code/Batch code
-  Meets ETL standards
-  Manufacturer
-  Warning

INTRODUCTION

This manual describes the function; operation and maintenance of the N2 Analyzer. The intent of this manual is to describe the function of the N2 Analyzer only. The final assembly manufacturer should provide operating instructions for the completed assembly. The N2 analyzer is engineered for long life, maximum reliability and stable performance.

NOTE: In order to obtain optimum performance from your analyzer, all operation and maintenance must be performed in accordance with this manual. Please read the manual thoroughly before using the analyzer and do not attempt any repair or procedure that is not described herein. We cannot warranty any damage resulting from misuse, unauthorized repair or improper maintenance of the instrument.

COMPONENT IDENTIFICATION

LCD DISPLAY: A 3-digit display provides a direct readout of nitrogen concentration in the range of 0 – 99.9%. The display is blank when the N2 Analyzer enters its sleep (power off) mode. The N2 Analyzer will automatically enter the sleep mode after 2 minutes from the last time the unit was energized. You can manually turn off the analyzer by pressing the on/off switch.

ON BUTTON/AUTO OFF: Use this button to turn the N2 Analyzer on or off. When the N2 Analyzer is in the Sleep (power off) mode, the LCD display is blank. When the ON button is pressed once, the analyzer will display the nitrogen concentration for 2 minutes. Pressing the ON button during this 2 minute “window” will prolong the ON period to 2 minutes from the most recent time that the button was pushed.

OVER RANGE INDICATOR: The appearance of a decimal point after the first digit means that the N2 Analyzer is reading in excess of 99.9%.

Example: 0.0.0 = 100% 0.0.1 = 101% 0.0.2 = 102% (etc).



CALIBRATION KEY: This key is used to calibrate the device. Holding the key for more than three seconds will force the device to enter a calibration mode.

OXYGEN SENSOR: This is used to measure oxygen concentration in sample gas.

SAMPLE INLET CONNECTION: This is the port at which the device is connected to determine nitrogen concentration.

PRE-USE CHECKOUT/ CALIBRATION

Follow these steps before using the N2 Analyzer

1. Prior to turning on the unit, a protective film covering the threaded sensor face must be removed. After removing the film, wait approximately 20 minutes for the sensor to reach equilibrium.
2. Pre-assembly, if required.
 - Thread the barbed adapter onto the oxygen sensor.
 - Connect the clear tubing to the barbed adapter.
3. Using the “ON/OFF” key  , make sure the unit is in the power “ON” mode.
4. Press and hold the Calibration Key  for 3 seconds until the display reads “CAL”. This will calibrate the N2 Analyzer to room air. Thereafter, we recommend calibration on a weekly basis

A new calibration is required when:

- The measured N2 percentage in 79.1% N2 is above 80.1% N2
 - The measured N2 percentage in 79.1% N2 is below 78.1% N2
 - If you are unsure about the displayed N2 percentage. (see Factors influencing accurate readings.)
5. The N2 Analyzer is ready to use.

OPERATION PRINCIPALS

The instrument display corresponds directly to the oxygen sensor. The oxygen diffuses through the membrane and an electrical current is generated that is proportional to the partial pressure of oxygen in the gas sample. The oxygen percentage is subtracted from 100, with the remainder being displayed as percent nitrogen. The sensor has a minimal response to gases other than oxygen.

FACTORS INFLUENCING ACCURATE READINGS

Elevation Changes

- Changes in elevation result in a reading error of approximately 1% of reading per 250 feet.

- In general, calibration of the instrument should be performed when elevation at which the product is being used changes by more than 500 feet.

Temperature Effects

The N2 analyzer will hold calibration and read correctly within $\pm 3\%$ when in thermal equilibrium within the operating temperature range. The device must be thermally stable when calibrated and allowed to thermally stabilize after experiencing temperature changes before readings are accurate.

- For best results, perform the calibration procedure at a temperature close to the temperature where analysis will occur.
- Allow adequate time for the sensor to equilibrate to a new ambient temperature.

CAUTION: "CAL Err St" may result from a sensor that has not reached thermal equilibrium.

Pressure Effects

Readings from the N2 analyzer are proportional to the partial pressure of oxygen. The partial pressure is equal to the concentration times the absolute pressure. Thus, the readings are proportional to the concentration if the pressure is held constant. Therefore, the following are recommended:

- Calibrate the N2 analyzer at the same pressure as the sample gas.
- If sample gases flow through tubing, use the same apparatus and flow rates when calibrating as when measuring.
- The N2 analyzer oxygen sensor has been tested at pressures up to two atmospheres absolute. Calibration or operation above this pressure is beyond the intended use.

Humidity Effects

Humidity (non-condensing) has no effect on the performance of the N2 analyzer other than diluting the gas, as long as there is no condensation. Depending on the humidity, the gas may be diluted by as much as 4%, which proportionally reduces the oxygen concentration.

The device responds to the actual oxygen concentration rather than the dry concentration.


Environments where condensation may occur are to be avoided since moisture may obstruct passage of gas to the sensing surface, resulting in erroneous readings and slower response time. For this reason, the following is recommended:

- Avoid usage in environments greater than 95% relative humidity.

CALIBRATION ERRORS AND ERROR CODES

The N2 analyzers have a self test feature built into the software to detect faulty calibrations, oxygen sensor failures, and low operating voltage. These are listed below, and include possible actions to take, if an error code occurs.

E03: No valid calibration data available

Make sure unit has reached thermal equilibrium. Press and hold the Calibration Button  for three seconds to manually force a new calibration

E04: Battery below minimum operating voltage


Unit is at end of life, see page I for proper disposal.

CAL Err St: O2 Sensor reading not stable


Wait for displayed oxygen reading to stabilize when calibrating the device at 100% oxygen.

Wait for unit to reach thermal equilibrium (Please note that this can take up to one half hour, if the device is stored in temperatures outside the specified operating temperature range).

CAL Err lo: Sensor voltage too low

Press and hold the Calibration Button  for three seconds to manually force a new calibration. If unit repeats this error more than three times, contact Maxtec Customer Service for possible sensor replacement.

CAL Err hi: Sensor voltage too high

Press and hold the Calibration Button  for three seconds to manually force a new calibration. If unit repeats this error more than three times, contact Maxtec Customer Service for possible sensor replacement.

CAL Err Bat: Battery voltage too low to recalibrate

Unit is at end of life, see page I for proper disposal.

CLEANING, MAINTENANCE, AND DISPOSAL

Store the N2 analyzer in a temperature similar to its ambient environment of daily use. The instructions given below describes the methods to clean the instrument, sensor and its accessories:

Instrument

- When cleaning or disinfecting the exterior of the N2 analyzer, take appropriate care to prevent any solution from entering the instrument.
- **DO NOT** immerse unit in fluids.

Oxygen Sensor

- Clean the sensor with a cloth moistened with a 65% alcohol / water solution.
- We do not recommend use of spray disinfectants because they can contain salt, which can accumulate in the sensor membrane and impair readings.
- DO NOT throw away. Dispose of properly in accordance with local regulations.

Accessory

- The threaded barbed adapter may be cleaned by washing it with a 65% alcohol/ water solution. The part must be thoroughly dry before it is re-used.

SPECIFICATIONS

- **Sensor Type:** Galvanic fuel cell
- **Measurement Range:** 0-99.9% Nitrogen
- **Resolution/Display:** 0.1%

- **The three digit LCD indicates values between 0.0 – 99.9% oxygen Over range indicated by one decimal point on display located after the first digit. Accuracy and Linearity:** $\pm 1\%$ of full scale at constant temperature, R.H. and @ 15°C – 40°C pressure when calibrated at full scale. $\pm 3\%$ actual oxygen level over full operating temperature.
 - **Response Time:** < 15 seconds for 90% step change. (at 25°C)
 - **Warm-up Time:** None required
 - **Operating Temperature:** 15°C – 40°C (59°F – 104°F)
 - **Storage Temperature:** -15°C – 50°C (5°F – 122°F)
 - **Operating Pressure:** Atmospheric pressure to 3psig.
 - **Environmental:** General purpose housing equivalent to NEMA 1.
The Handi+ is not waterproof. 0-95% RH, non-condensing.
 - **Warranty:** Twenty-four months in normal operating conditions.
 - **Power Requirements:** Powered by one internal, non-replaceable Lithium battery, CR2450.
Power on push button automatically shuts off after 80 seconds time-out.
Electronics rated general purpose; not for use in hazardous areas or for use with flammable gases.
 - **Weight:** Approx. 3 Ounces
 - **Battery Life:** Approx. 1850 hours (74,000 cycles)
 - **Sample Port:** M16 x1 Thread with barbed tubing adapter.
 - **Operating Pressure:** Atmospheric pressure to 3 psig
- Expected Storage Life :** Two months with freshness seal on sensor.

WARRANTY

The N2 analyzer is designed for oxygen delivery equipment and systems. Under normal operating conditions, we warrant the N2 analyzer to be free from defects of workmanship or materials for a period of 2- years from the date of shipment provided that the unit is properly operated and maintained in accordance with our operating instructions. Based on our product evaluation our sole obligation under the foregoing warranty is limited to making replacements, repairs, or issuing credit for equipment found to be defective. This warranty extends only to the buyer purchasing the equipment directly from us or through our designated distributors and agents as new equipment. Our warrants the oxygen sensor in the N2 analyzer to be free from defects in material and workmanship for a period of 2-years from the date of shipment in a N2 analyzer. Should a sensor fail prematurely, the replacement sensor is warranted for the remainder of the original sensor warranty period. Routine maintenance items, such as batteries, are excluded from warranty. We and any other subsidiaries shall not be liable to the purchaser or other persons for incidental or consequential damages or equipment that has been subject to abuse, misuse, misapplication, alteration, negligence or accident. THESE WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

Customer Support

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Documents / Resources

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References

- [Maxtec | The leader in oxygen analysis and delivery products](#)