Tech Diving Limited

TDL TekCheck
Oxygen-Helium Analyzer

User's Guide

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ATTENTION! READ THIS MANUAL COMPLETELY PRIOR TO USE

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English Edition
Version 2.0

Owners Name:	
Serial Number:	
Date Purchased:	
Dealer:	

Important remarks concerning the manual

This manual makes use of the following icons to indicate especially important comments

Indicates information about details which are important to prevent a risky situation.

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

TDL TekCheck Oxygen-Helium Analyzer User's Guide Ver 2.0

By Joel D. Silverstein
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Notes

TDL TekCheck Oxygen Helium Analzyer

Warnings and Safety Considerations

Important Safety Considerations

■ If you are unsure about the displayed Oxygen or helium Percentage: Repeat the measurement or check the value with another system

■ Check the TDL TekCheck in air before each series of measurements. If necessary calibrate as indicated in Section 4.5

■ Using pure Oxygen or Oxygen enriched gases or any gas mixture that contains Oxygen needs special safety measures! Please consider the general safety considerations of using pure Oxygen or Oxygen enriched gases or gases that contain Oxygen!

■ If the display screens are blank, faded, or cannot be stabilized the display values can be wrong.

■ If the diver uses the wrong value of the gas mixture he / she or the dive computer could calculate insufficient decompression time (EAD, END, PO2, PN2) or oxygen toxicity (MOD, CNS, OTU etc.). Both situations could result in death or serious injury.

■ Avoid risky 

ions which ar 

rked in this manual with CAUTION and STOP

■ Do not use the TDL TekCheck in pressure chambers.

■ Do not submerge the TDL TekCheck in water.

■ The battery and the Oxygen sensor contain corrosive liquid. If the battery or Oxygen sensor should leak: Do not let the liquid come in contact with skin, eyes, or mouth. If it does flush the affected area with water for at least 15 minutes. Consult with a physician. Do not inhale vapor. Immediately clean the leakage from the instrument with a soft towel and dispose of the towel properly.

General Information

This user's guide is designed to help the **certified mixed gas diver or certified gas blending technician** better understand the need and application of conducting oxygen and helium content measurement of breathing mixtures prepared for technical divers. Non-certified users accept all risks of use.

This user's guide will also provide information as to the operational use of the TDL TekCheck Oxygen Helium Analyzer (Part # GA-TekCheck), and it's associated accessories.

The TDL TekCheck is a portable Oxygen / Helium analyzer for the trained and certified mixed gas diver, and gas mixing technician. The TDL TekCheck requires that the gas analyzed be presented to the TekCheck unit at a regulated flow rate, and that the oxygen display of the unit be calibrated prior to taking a gas sample. The display is not static once analysis is being performed. It is the **USER'S SOLE RESPONSIBLITY** to properly record the gas percentages displayed on the LCD read-out and lable the cylinder being analyzed appropriately WHILE THE CONTINUOUS SAMPLE IS BEING TAKEN. Turning off the flow prior to the user writing down the gas percentages may lead to improper information being used by the user.

ATTENTION This guide does not purport to be a complete study or presentation on scientific analysis of breathing gas. The TDL TekCheck Oxygen Helium Analyzer does not check the purity of the gas mixture. The TDL TekCheck Oxygen Helium Analyzer only presents the oxygen and helium content by percentage of the gas presented to it. Other tools should be used for that purpose. Users should seek out other additional information for those areas of expertise.

WARNING: USING OXYGEN MIXTURES CONTAINING 16% or LESS OXYGEN CONTENT AT THE SURFACE CAN CAUSE INJURY OR DEATH FROM HYPOXIA

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1.1 BREATHING GAS ANALYSIS OVERVIEW

Gas analysis is essential in mixed gas diving, mainly because of the very real hazards of both high and low oxygen; (hypoxia and oxygen toxicity) and from the hazards of nitrogen narcosis encountered with high partial pressure of nitrogen in a breathing gas mixture. Oxygen analysis is the most common but not the only type of analytical measurement performed in mixed gas diving. Helium analysis is critical as well to help the diver understand what levels of helium are in the mixture and the resultant balance nitrogen in the gas mixture which can contribute or not contribute to nitrogen narcosis at depth. This discussion here is primarily about analysis for the field of gas mixtures prepared for breathing while underwater utilizing scuba, rebreathers or surface supplied gas diving equipment.

There are other types of analysis tools used in the laboratory, such as the mass spectrometer or gas chromatograph; the latter are more complex, accurate, and expensive, but they can be used to measure a variety of gases, not just oxygen and helium. These other analysis tools are used to measure the purity of the gas mixture.

1.2 Analysis for gases other than oxygen and helium content.

Overwhelmingly, the need for sophisticated gas analysis for gases other than oxygen is for contaminants in compressed air. If analysis is needed for gas mixes purchased commercially in storage cylinders, the simplest approach is to get this from the compressed gas supplier. Active trace gases (as opposed to inert gases) can be analyzed with colorimetric tubes. Except for potential contaminants analysis for gas mixtures used by divers is normally limited to oxygen content and helium content.

1.3 Performing Gas Analysis

Gas analysis is one of the critical steps that ensures a diver's safety. All divers who use nitrox, heliox, or trimix need to know how properly to analyze the gas that they will be using. Before discussing the procedures of how to analyze gas, a short discussion of how analyzers work is in order.

1.4 Oxygen Analyzers

Oxygen analyzers are available in different sizes and types; some have a digital display and others use an analog (needle) readout. Ideally, an analyzer must be able to read and show oxygen values down to a fraction of 0.001 or 0.1% (one-tenth of a percent). For example, the digital read out should be able to read 32.4% instead of 32% or 35.8% instead of 36%.

The heart of an oxygen analyzer is its detection method. There are two primary types of oxygen analyzer generally used for breathing gases; paramagnetic and electrochemical.

The paramagnetic analyzer takes advantage of the fact that oxygen is attracted to a magnetic field; these are primarily used in research laboratories and are accurate, stable, relatively expensive and somewhat delicate. Paramagnetic oxygen analyzers are for the most part not used in analyzing breathing gas for diving due to their inability to sustain the rough treatment they would receive in the field.

The other category of oxygen analyzer available in portable units comprises those that are electrochemical in function. The electrochemical cell breaks oxygen into ions and electrons and measures the current generated; this current is proportional to the partial pressure of oxygen to which the sensor is exposed. Electrochemical oxygen analyzers use two electrodes made of different metals; these are immersed in an electrolyte solution that is contained by a thin, oxygen-permeable membrane. Oxygen diffuses through the membrane to the cathode, where it is reduced, generating a very small current. This current is linearly proportional to the PO_2; it is measured by the unit's electronic circuit and the result displayed.

Electrochemical oxygen analyzers are relatively inexpensive, can be made portable and rugged, and show little interference from other gases. However, they require the user to calibrate on a known gas source prior to use and may need calibration during a given gas analysis session. This is especially true when measuring oxygen content that varies widely between samples. Calibration may also need to be done frequently when the cell

begins to age. Cell life depending on manufacturer, use, and exposure to the elements can be anywhere from 6 to 36 months.

1.4.1 The Oxygen Analysis Process

The process of analyzing the oxygen content of a cylinder of gas mix involves calibrating the analyzer with a "standard gas" or "calibrating gas," then repeating with the "unknown" or "sample" mix. Both calibrating gas and the sample mix should be passed through the analyzer at the same flow rate using a flow restrictor ranged for specific supply pressure, or a regulator that can deliver a consistent flow regardless of supply pressure. In either case it is important that the sample be drawn using the same flow rate the calibration was achieved with.

1.5 Helium Analyzers

Helium analyzers operate by comparing the thermal conductivity of the sample gas to the thermal conductivity of a reference gas housed in a sealed cell. This technique to determine helium was first reported in the scientific literature as far back as 1908 and is still readily used today.

Thermal conductivity gas analysis is remarkably sensitive and is often used to measure not only helium for diving purposes but, hydrogen, carbon dioxide and other gases. These gases are normally measured in a background of air, but the sensors operate just as well in a background of nitrogen or when monitoring two inert gases.

Thermal conductivity analyzers determine the helium composition by continuously comparing the sample gas to the reference gas. This comparison is performed in a two-cell explosion proof sensor housing. The reference gas is sealed into a closed cell and will not change. The sample gas flows through and across the other cell. A temperature-sensitive heated filament or a solid state rapid thermal device is mounted in each cell. When the sample gas composition changes, its thermal conductivity will also change. This means it will conduct a different amount of heat away from the filaments or RTD. Since the resistance of the filaments is a function of their temperature, their resistance changes when the sample gas composition changes such is the same concept with the RTD but at a much more rapid and consistent pace. Any such change creates an imbalance resulting in an electrical signal output proportional to the change. These technique allows thermal conductivity analyzers to provide an accurate measure of any change in sample gas composition.

1.6 Sampling Types

Helium analyzers sample gas in two distinct ways; Flow-Through or Discrete. The discrete method requires that the gas be captured and held in place while the sensor measures the thermal conductivity of the gas. This is normally needed for older technology filament type sensors. With the flow-through method the gas will pass through the sensing chamber. Once the gas mixture is inside the sensing chamber, the electronic circuit then measures the difference of the thermal conductivity between the gas mixture and the reference gas. The helium content is then calculated by the circuit and displayed.

The Analyzer measures the helium content based on the extinct high thermal conductivity of helium gas. A helium analyzer used for measuring the content of helium is specifically designed to measure helium in a gas mixture similar to normal air or nitrogen.

1.7 The Need for Calibration

No matter what the method or mechanism of an oxygen gas analyzer, the analysis is no better than the calibration of the analyzer. An electrochemical cell tends to be quite linear. Some types of analyzers are not linear, and these can be a great deal more trouble to use. Being linear, it need be calibrated in only two places to give reliable readings. This is called "zeroing" and "spanning." In effect this sets the slope and the intercept of the calibration curve. Usually an oxygen analyzer is "zeroed" with an inert gas such as argon, nitrogen, or helium; the gas type does not matter with this mechanism. Some analyzers rely on an electrical zero, but this may not be quite as reliable, since this method does not account for drift of the sensor cell especially as the sensor ages.

Ideally it is best to calibrate or "span" an analyzer with a "standard" gas that is close in oxygen level to the sample. For analyzing oxygen levels in the range of 21% to 40% oxygen, it is satisfactory to calibrate with fresh outside air, using the value 20.95% oxygen. Since values above 20.9% are "extrapolations," if an analyzer is spanned but not zeroed properly it may be off by a percentage point or two at 40%. The best method is to "bracket" with calibration gases.

For meters that do not span, (usually units designed for diving gasses) using compressed air at a constant flow rate to calibrate the meter is best. This is typically done with a flow restrictor that is connected to a scuba regulator that can create a flow of 1-3 liters per minute. It can also be done with a hand loaded regulator that is dialed in to a specific flow rate. In any event a flow rate of 1/2-3 liters per minute is best. The calibration flow and the ultimate sampling flow should be the same.

Helium analyzers do not need to be "calibrated" or "spanned" in the field. Once calibrated at the manufacturing point the helium sensor should not need re-calibration. If however a known source gas shows erratic readings the unit should be returned to the manufacturer for re-calibration or replacement of the sensor.

1.8 The Need for Two analyzers

In some scientific diving organizations using two analyzers to sample the same gas is required. This is done for redundancy purposes only. However for general purposes one properly calibrated analyzer, used correctly, is adequate for checking scuba cylinders. Repeated analysis with the same unit properly calibrated helps build the confidence in the tool. The key to a proper analysis is in the calibration and flow rate.

1.9 Analyzing Gas

It is a standard and in most cases a mandatory operational procedure for the diver to analyze the gas before accepting or signing out cylinders for use. In addition the diver will want to analyze the gas again just before diving with it. The procedures for analysis are simple to follow, but must be done carefully to maintain the integrity of the resulting analysis. The diver will choose diving tables and oxygen limits based on this analysis. It is standard protocol and essential to check the analyzer's calibration with a known gas (such as air) before performing the analysis.

1.91 Calibrating gas

The best calibration gases are normally obtained from a commercial gas supplier, and should be in the range of or just a little higher than the sample to be analyzed. As an alternative, atmospheric air has a uniform composition everywhere, at a level of 20.95%, or 21% for practical purposes. Industrial "air" obtained in cylinders might vary from this value, so only compressed atmospheric breathing air should be used. The problem with setting an analyzer with air is that mixes in the high end of the oxygen enriched air range are then extrapolations, so calibration with air should be done carefully. With mixtures greater than 50% oxygen content 100% pure oxygen can be used for calibration.

1.92 Flow Rate

Proper analysis depends not only on the analyzer itself but on the flow rate of the gas passing in front of and through the sensor cells. **The sample should be read at the same flow rate as is used for the calibration.** A flowmeter or flow controller, or flow controlled device should be used. Different tools are available to regulate the gas flow for analyzing. One type uses a special regulator fitted with a flow valve capable of manually adjusting the flow rate from 0 to 10 liters per minute (the upper end of this regulator is much higher than needed). Ideally, the flow should be between one-half and 3 liters per minute, nominally 1 lpm. One type of special fitting is available that connects to the low pressure inflation hose of a scuba regulator and acts as a flow meter that is preset to not exceed 3 lpm. Although it is possible to analyze the gas without a flow meter, readings can be inaccurate and this is not a recommended practice.

1.93 Calibration

An oxygen analysis is only as good as its calibration. Before performing an analysis the analyzer should be calibrated to a known gas.

First check or set the zero, using a pure inert gas (nitrogen, argon, or helium) and the method described here, or use the analyzer's electronic zero. Generally the zero does not drift very much.

The flow rate regulator is attached to the source of calibrating gas or compressed atmospheric air. Turn on the analyzer, set the flow rate at (nominally) 1 liter per minute and let the gas flow through the sensor for approximately one minute or until the reading is stable. Once settled, make sure the oxygen reading is set to the value of the calibrating gas, or 20.9%, if air is used; adjust the calibration setting on the analyzer if necessary.

If adjustments are needed too often during re-calibration it may be time to replace the oxygen sensor.

1.94 Analyzing the cylinder

Once the analyzer has been calibrated, leave it turned on and move the sampling device onto the tank that needs analysis. Remember that the flow rate should be the **same** as that to which the unit was calibrated. Let the meter read the new gas for at least one minute or until stable. (Where the sampling hose between the cylinder and the analyzer is more than 24 inches in length let the flow continue for at least 2 minutes.) The resultant reading is the partial pressure of oxygen in the tank at ambient pressure and is the thermal conductive measurement of the helium. At sea

level this is equal to the oxygen and helium fraction, which can be converted to percentage by multiplying by 100. With the analyzer still attached and sampling the cylinder, transfer these numbers immediately to the cylinder contents label, fill out the rest of the data, and attach it to the cylinder and enter in log book.

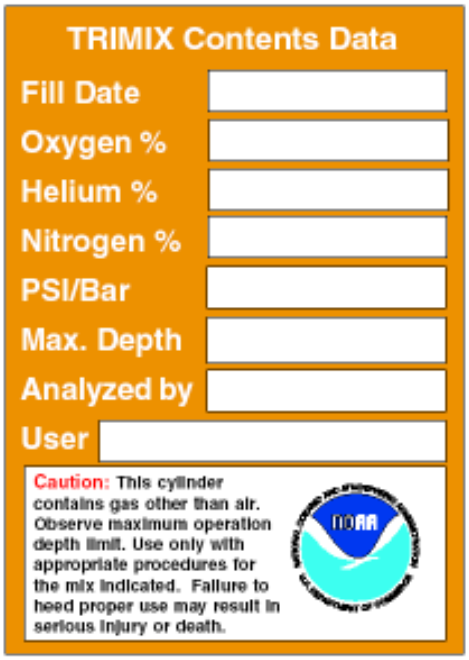
1.95 Cylinder Labeling

Every cylinder or cylinder set that contains a gas mixture other than air must be properly labeled as to its contents and fill data. In some cases, once an cylinder has been analyzed at the fill station it is likely that it will not be analyzed again. Unless analyzed again immediately before use the cylinder contents label is the *only* way to know what gas is in the tank before diving. The data includes fill date, tank pressure, oxygen percentage, maximum operating depth, the name or identification of the person who filled it out, and the users initials verifying that it was analyzed. The contents label or tag should be firmly attached to the cylinder or valve. Plastic reusable content tags can be written on in pencil and erased for the next use. Nonreusable labels should be written on with a permanent marker, never with a grease pencil (which may come off), and should only be removed by a gas blending technician before the next fill. Cylinder content labels are available commercially through the various technical diving training agencies, scuba accessory companies, and through select technical diving equipment companies.

Proper labeling is critical. Should a diver use a mixed gas cylinder without knowing it's content the diver could become seriously injured which can result in death. It is the user's responsibility to properly and conspicuously label a cylinder.

1.96 Fill station log

Once a cylinder or cylinder set has been filled and analyzed a permanent record should be kept at the filling center in a *Fill Station Log.* In the log the diver prints name, the date, tank serial number, tank pressure, oxygen percentage, maximum operating depth, and signs the log. The tank log is used to help keep track of cylinders and helps ensure that a technician can verify the last fill in the tank should a contents tag or label somehow get removed from the tank. The log also verifies, by the diver's signature, that the diver has personally analyzed the cylinder.



Sample Cylinder Contents Label

1.97 Acceptable range of mixes

It is generally accepted practice that a mix within ±1% of the desired oxygen content is acceptable. The NOAA nitrox tables for example take the ±1% range into effect, thus the NN32 can be 31-33% oxygen content, and the NN36 can be 35-37% oxygen content. If however the mix is off by more than 1% in either direction of the desired mix, the mixture will need to be adjusted or totally re-mixed. If time is a factor on a diving operation the mix may be used as long as its MOD is not exceeded and EAD procedures applied.

Once an analysis is obtained users should go back to their intended dive plan and confirm that their planned breathing gas matches their analyzed breathing gas and/or make appropriate changes to decompression schedules, maximum operating depth and contingency planning for the intended dive. Today's modern decompression planning software and variable mix decompression computers allow the user to program into them the exact gas mixtures contained in the cylinders that will be used. User's should take advantage of this technology and plan dive's accordingly.

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TDL TekCheck Analyzer

2.0 Product Information

The TDL TekCheck Oxygen - Helium Analyzer is designed to measure oxygen content levels in the 0.1 to 100.0% range and for measuring Helium content in the 0.1 to 100% range in a gas mixture, and is specifically designed to confirm the Helium content in a gas mixture similar to normal air or nitrogen.

The unit can be used to measure the oxygen and helium content for mixes used in recreational diving, technical diving, commercial diving, hyperbaric chamber monitoring, as medical instrumentation and in select industrial applications. The TDL TekCheck is designed to be able to verify oxygen and helium concentration in static supply cylinders as well as in dynamic continuous flow delivery systems.

The TDL TekCheck comes inside its own watertight, pressure protected case. When you open the box you will find inside a protective foam insert in the top of the box. When you pull that aside you will find underneath the TDL TekCheck Instructions. These instructions must not be removed from the box.

2.1 Unpacking and Inspection

Your TDL TekCheck Oxygen / Helium Analyzer is a robust and sophisticated electronic device. While we make every effort to properly package the product the user should always inspect the shipping package for damage and completeness. If there is damage evident, please save the package and notify the shipping company immediately. Then contact TDL Dive Systems and obtain an RMA # to return the item for inspection. If any items are missing contact TDL Dive Systems.

2.2 Inside the Box

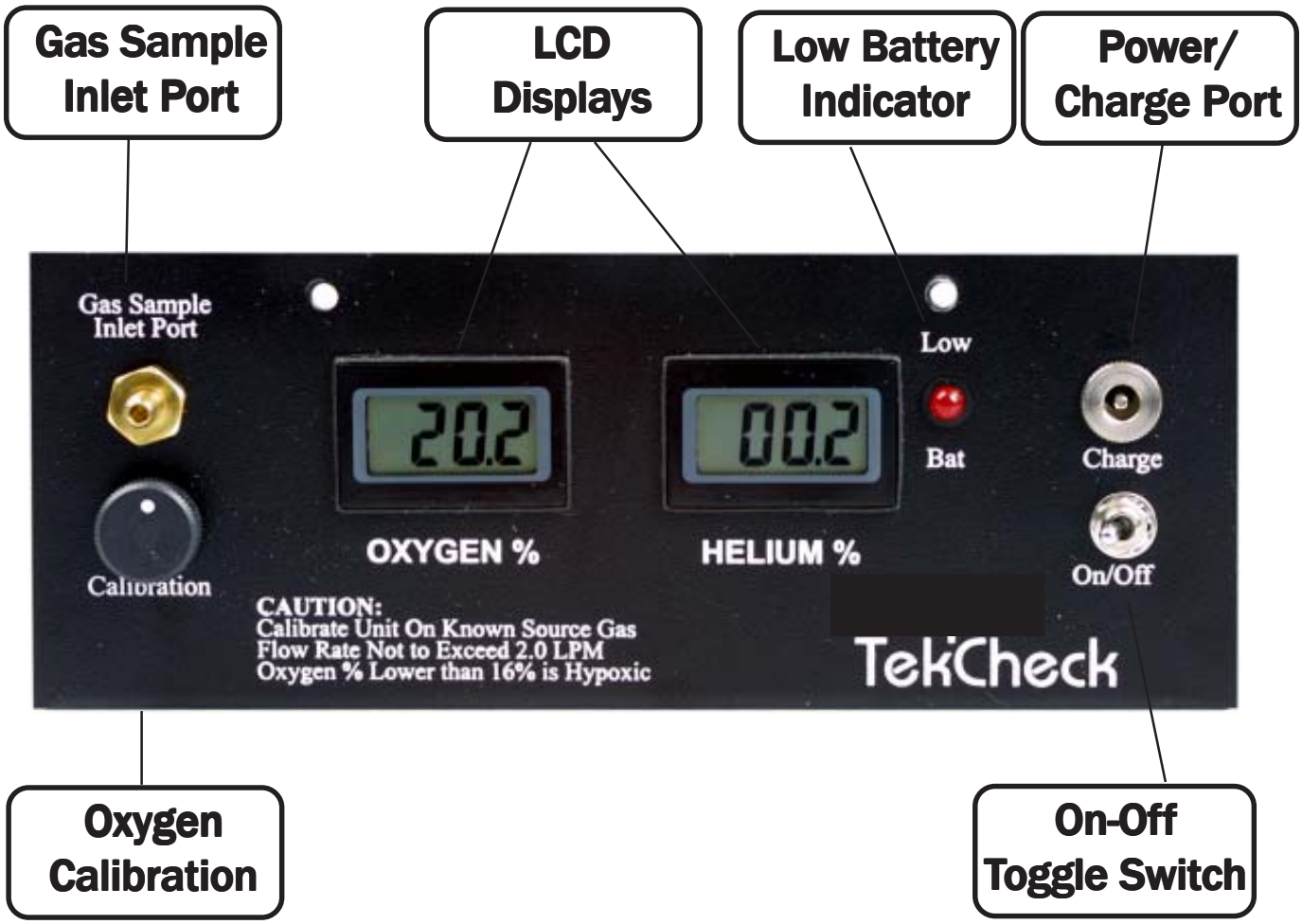
What's Included Inside the TDL TekCheck Box:

- ☐ TDL TekCheck Oxygen Helium Analyzer
- ☐ 110 Volt Class 2 Power Supply / Charger
- ☐ 16 inch latex 1/4" ID sampling tube
- ☐ TDL GA-BC Flow Device

If you ordered additional items they will be packed separately:

- ☐ 220 Volt Class 2 International Power Supply Charger
- ☐ GA-DIN Flow - 300 Bar Threaded Flow Device
- ☐ GA-TekCheck-02-Sensor

2.3 Panel Display Description



The TDL TekCheck is mounted into the protective case with two screws at the top of the panel. These screws should only be removed to replace the oxygen sensor when necessary. The Helium Sensor is a Factory Replacement item only. Do not tamper with the electronic boards, flow tubes or any other item under the panel face. Doing so can cause the unit to work improperly, thereby giving improper readings.

Do not connect a gas supply to the Gas Sample Port that has a flow rate higher than 3 LPM or contains any liquid. Doing so will damage unit and void warranty.

Do not connect any power supply to the Power Charge Port unless it has been supplied by TDL Dive Systems. Doing so will damage the unit and void warranty.

3.0 Product Specifications

The TDL TekCheck Oxygen helium analyser is an integrated unit combining two distinct measuring devices, utilizing the same power supply and gas flow path.

4.0 Using the TDL TekCheck

4.1 Charge the Unit

Prior to using the new TDL TekCheck the unit should be charged.

To charge the batteries first ensure that the charger you will be using matches your supply voltage.

The SUPPLIED CHARGER is designed for use in 110 volt AC current as is found in the United States. For areas where voltage is 220v use only the optional TDL TekCheck-220volt charger.

GA-Tek-110 volt charger

GA-Tek-220 volt charger

(Requires international PC Plug)

Once the correct charger has been selected, connect the small end of the charger to the Power / Charge Port on the TDL TekCheck Unit. Once connected, proceed with connecting the power pack to the electrical outlet.

Make sure that the unit is sitting on a stable surface, away from water, solvents, fuels or other combustible items.

The TDL TekCheck will be fully charged after 2 hours of charging time. The unit can also be run while connected to the charger as well. It can be in continuous use in this mode for up to four hours.

Once charging is complete disconnect the powerpack from the electricity source, then disconnect the cable from the TDL TekCheck and return the charger to a safe place.

Periodically inspect the charger for any cracks or damage to the charger case or cable. If any damage appears, DO NOT USE the charger again. Return it to TDL Dive Systems for inspection and replacement.

4.2 Turn the Unit On

To turn the TDL TekCheck on simply flip the Toggle switch to the on position. Once on the LCD screens will appear and the numbers will start to change. This is due to the existing gas in the flow tube being analyzed. The unit does not require any "warm-up" time. It is ready to use once powered up.

4.3 Calibrate the Unit

The TDL TekCheck requires that the Oxygen side be calibrated on a known gas source prior to taking a gas sample. The Helium side does not require calibration to provide analysis. While it is possible to calibrate the oxygen side of the unit on atmospheric room air this may provide an improper result when pressurized gas is presented.

When calibrating the unit chose a sample or calibration gas closest to the range you will be analyzing. In simple terms, for gas mixtures with an oxygen content lower than 50% calibration can be done with flow controlled compressed air. For gas mixtures that will have an oxygen content greater than 50% it is recommended that the unit be calibrated using 100% pure medical oxygen.

Failure to Calibrate may result in an inaccurate analysis reading which when the gas is used can cause injury or death.

4.4 Connecting the Sampling Device

Connect one end of the Gas Sampling Tube to the Gas Sample Inlet Port and the other end to either the TDL BC-Flow Connector or the TDL DIN Flow Adapter
.

GA-BC-Flow

If you will use the BC-Flow adapter this item is connected to a low pressure BC hose which is connected to a scuba regulator.

If you will be using the scuba regulator with the BC-Flow adapter to sample gas that will have greater than 40% oxygen content or will be in contact with 100% pure oxygen the sampling regulator must be cleaned and prepared for oxygen service prior to use.

GA-DIN-Flow

If you will use the DIN-Flow adapter this item is connected directly to the Scuba Cylinder and then connected to the TDL TekCheck with a piece of flexible tubing.

WARNING: The DIN portion of the GA-DIN-FLOW MUST be threaded completely into and be completely seated into the DIN scuba valve or the DIN Scuba Valve adapter before pressurizing the cylinder. Failure to do so can cause overpressurization between the scuba valve and the GA-DIN-FLOW causing it to act as a projectile which may result in damage, injury or death.

WARNING: Both the GA-DIN-FLOW and the GA-BC-Flow get connected to the TDL TekCheck with a length of flexible tubing. This tubing slides onto the "barb" on both units. DO NOT permanently attach this tube to either device with any securing device. Should pressure build up in the tubing due to some obstruction the tubing could burst which may result in damage, injury or death.

4.5 Calibrating TDL TekCheck

If using the GA-BC-Flow

Connect the scuba regulator to a scuba cylinder that has been filled with clean, dry, compressed air that meets CGA Grade E purity or better. Once connected slowly turn on the valve on the cylinder. With the BC-Flow connected to the TDL TekCheck with the flexible tubing, gas will begin to flow. You may hear a slight hiss coming from the TekCheck box. While the air is flowing watch the Oxygen LCD screen. After the flow has continued for 60-90 seconds or more adjust the CALIBRATION knob carefully to meet the known quantified gas oxygen percentage. Normal air will read on the Oxygen LCD screen 20.9%. Note that the Helium LCD should not change and will normally read about 00.2% when air is being passed through it.

Once calibration is completed turn off the scuba valve and press the purge button on the regulator until all pressure has been depleted from the hoses and the regulator itself. The regulator can now be removed and transferred to the scuba cylinder or cylinder set that is to be analyzed.

Read the instruction manual that came with the scuba regulator that may be used with the GA-BC-Flow to understand how that particular regulator is to be attached and removed from a scuba cylinder. This is the responsibility of the user.

If using the GA-DIN-Flow

Connect the GA-DIN-Flow adapter to a scuba cylinder that has been filled with clean, dry, compressed air that meets CGA Grade E purity or better. Once connected and fully seated slowly turn on the valve on the cylinder. With the DIN-Flow connected to the TDL TekCheck with the flexible tubing gas will begin to flow. You may hear a slight hiss coming from the TekCheck box. While the air is flowing watch the Oxygen LCD screen. After the flow has continued for 30-90 seconds or more adjust the CALIBRATION knob carefully to meet the known quantified gas oxygen percentage. Normal air will read on the Oxygen LCD screen 20.9%. Note that the Helium LCD should not change and will normally read about 00.2% when air is being passed through it.

Once calibration is completed turn off the scuba valve and wait until the DIN-Flow adapter has depressurized on its own. This may take approximately 2 minutes for the pressurized gas to flow out. Once the pressure has been depleted the DIN-Flow can be removed and transferred to the scuba cylinder or cylinder set that is to be analyzed.

4.6 Analyzing the Cylinder

Once the TDL TekCheck has been properly calibrated, move the sampling device over to the cylinder or cylinder set that is to be analyzed. Be sure not to move the Calibration knob at this time.

Connect the sampling device, (GA-BC-Flow or GA-DIN-Flow) to the cylinder as described in section 4.4 (Connecting the Sampling Device).

Next connect the flexible sampling hose to the sampling device and then to the Gas Sample Inlet Port on the TDL TekCheck Oxygen Helium Analyzer.

With both ends of the flexible tubing connected slowly turn on the cylinder valve. The sample gas will now begin to flow through the sampling device and into the TDL TekCheck. Depending on the length of the flexible tubing it can take from several seconds to several minutes for the gas to flow to the TDL TekCheck. Watch the displays as they will begin to change almost immediately upon receipt of the new gas sample. If helium is present the Helium LCD will increase in value. The Oxygen LCD will normally rise in value if the expected mix has an oxygen content greater than 21% and will decrease in value if the expected mix has an oxygen content lower than 21%.

It is necessary to allow the gas to flow into the TDL TekCheck for 2 continuous minutes to allow for a full and complete analysis of the sample gas. This is important to allow the reading to stabilize and to get an accurate analysis.

Once the reading has stabilized it is the user's responsibility to record (write down) the Oxygen Percentage and the Helium Percentage of the cylinder just analyzed on a CYLINDER CONTENT LABEL (section 2.1) and to enter those values into the FILL STATION LOG (section 2.2).

Once the cylinder content has been recorded and affixed to the cylinder the cylinder valve may be turned off and the sampling process terminated. Allow the sampling device to depressurize before removing it from either the BC hose or the cylinder valve to avoid injury. If no other cylinders will be analyzed at this time turn off the TDL TekCheck and store appropriately.

If gas sampling will continue there is no need to recalibrate if this will be done immediately. Transfer the sampling device to the next cylinder or cylinder set and repeat the analysis process as described above.

5.0 Troubleshooting

Problem	Reason	Solution
No Display	A. Switch Off B. Low Power	A. Turn On B. Recharge
0 Oxygen Reading	A. Sensor Disconnected B. Old Sensor	A. Connect Sensor B. Replace Sensor
0 Helium Reading	A. No Helium in Mixture B. Sensor Damaged	A. Analyze another tank with helium B. Return to Abyss for inspection / replacement
Unable to Calibrate	A. Damaged or Old Sensor B. Improper Flow Rate	A. Replace Sensor B. Use GA-BC-Flow or GA-DIN-Flow adapters to regulate flow
Faded Display	Low Power	Recharge batteries or run on A/C.
Erratic Display		Return for service
Redout Drift	A. Gas Still Sampling B. Rapid Temperature Change	A. Allow gas to flow for 2 minutes to stabilize. B. Allow unit to acclimatize to ambient temperature. Recalibrate, and resample.

In the event there are issues that arrive regarding the TDL TekCheck Oxygen Helium Analyzer that are not resolved by the above chart contact TDL Dive Systems for instructions on how to return the unit for service.

WARNING: USING THE UNIT IF THERE IS A KNOWN PROBLEM COULD RESULT IN IMPROPER GAS ANALYSIS WHICH IF USED COULD RESULT IN DAMAGE, INJURY, or DEATH.

6.0 Oxygen Sensors

Oxygen sensors have, like batteries, a certain lifetime. From the first time that a sensor contacts oxygen it starts to be used up. The Oxygen Sensor in the TDL TekCheck Oxygen Helium Analyzer has an expected useful life of approximately two years. This lifetime will depend on many factors, including, use, temperature, humidity, care, and handling.

Heavy use will cause the oxygen sensor to be used up more rapidly. Below are some situations in which the sensor will NOT last for up to 2 years.

1. Use. continuous daily use of approximately 100 samplings will result in short life time, approximately six months.

2. High Humidity areas will deteriorate the sensor quickly.

3. Exposure to gas samples that have high moisture content will deteriorate the sensor rapidly.

4. Subjecting the unit to heat above 120 degrees F. will deteriorate the sensor rapidly.

5. Dropping or damaging the unit, may cause the sensor to become damaged.

6.01 Replacing the Oxygen Sensor

Replacing the Oxygen Sensor in the TDL TekCheck Oxygen Helium analyzer should only be done by professionals at an TDL Dive Systems dealer, at the factory, or by those fully familiar with mechanical and electrical devises. To replace the sensor the following tools will be needed.

1. Clean work area.
2. Bright work light.
3. Small phillips head screw driver
4. TDL TekCheck Oxygen Sensor

While facing the TDL TekCheck carefully remove the two phillips head screws at the top of the pane. Then gently slide the panel face back until it comes free of the mounting rail.

Take the panel assembly out of the box and place the flat side (no switches) on a solid clean surface. Looking at the interior of the unit the "green" sensor is the oxygen sensor. This is connected to the unit with a small yellow and orange wire and "molex" connector. Carefully disconnect the molex connector. and gently pull the wire that is connected to the sensor free from obstruction.

Next, remove the oxygen sensor by gently grasping it with thumb and forefinger and rotating the entire sensor body COUNTERCLOCKWISE. Continue rotating the sensor in this manner until it is completely released from the sampling body.

Once the sensor is removed do not touch the face of the sensor, just discard it appropriately.

Once the old sensor is removed, take a new sensor from its packaging and remove the protective cover. Screw the new sensor into the TDL TekCheck unit in a clockwise motion using thumb and forefinger. Continue to screw sensor in until it seats at the bottom of the sample holder. DO NOT OVERTIGHTEN. Next, connect the molex connector from the sensor to the molex connector coming from the circuit board.

Let the sensor acclimatize to ambient temperature for 30 minutes. Then, turn on the TDL TekCheck to verify that the sensor is working properly. If so, turn off the unit and reassemble. Take care to not overtighten the panel screws.

Once reassembled the TDL TekCheck is ready to use.

Should there be any difficulty in dissassembly or reassembly, contact TDL Dive Systems for assistance.

6.02 Replacing the Helium Sensor

The helium sensor in the TDL TekCheck is a sophisticated factory calibrated device with an extremly long lifetime. This patented sensor has an expected lifetime of 60 continuous months of service. Meaning that the sensor is designed to take a continuous flow of gas and power for 60 continuous months without interuption.

However, should at any time the sensor not perform properly return the ENTIRE TDL TekCheck unit to TDL Dive Systems for inspection and sensor replacement.

DO NOT REMOVE THE HELIUM SENSOR FROM THE TDL TEKCHECK UNIT. DOING SO WILL VOID THE WARRANTY.

7.0 Maintenance and Storage

- Protect the unit from impact and intensive sun and heat.
- Store the unit in a cool, not too dry place. This helps to preserve the oxygen sensor life.
- Ideal storage temperature: 41 F up to 59 F.
- Do not leave the TDL TekCheck in an oxygen enriched atmosphere except when it is necessary.
- Disconnecting the Oxygen or Helium sensors from their sockets DOES NOT EXTEND their life and can void the warranty.
- Replace the oxygen sensor when calibration cannot be obtained.
- Charge batteries upon the BAT icon appearing on the LCD screen or when the LOW BAT indicator light appears.
- Do not clean the unit with any solvent.
- Clean the TDL TekCheck with a damp soft cloth.
- Dry the instrument with a soft towel.
- Do not scratch the display windows.

8.0 Limited Warranty

Please pay attention to the following remarks on warranty claims.

Recognition of Warranty

The limited warranty only covers units which were purchased from an authorized dealer.

Scope of Warranty

The manufacturer will repair all defects which are due to faulty materials or workmanship. The warranty covers the repair of the unit, free of charge. This includes the repair or replacement of the faulty part or the replacement of the entire TDL TekCheck. The Oxygen sensor, the helium sensor, the batteries and the rubber rings are excluded from the warranty. The manufacturer reserves the right to determine the merits of the warranty claim and to determine whether the unit will be repaired or replaced.

Excluded are Faults or Defects Due To:

- Improper operation or Stress
- Exterior influences, shipping damage, damage due to bumping, hitting, or dropping the unit.
- Water Damage
- Influences of weather or other phenomena.
- Repairs performed or attempted by unauthorized persons.
- Pressure chamber tests.

Warranty Period and Claim:
The warranty is given for a period of two years after the original purchase date, provided that the owner has properly executed and returned to TDL Dive Systems the PRODUCT WARRANTY/REGISTRATION, USER AGREEMENT & LIABILTY RELEASE, which is included with this product.

Failure to return a properly executed and signed form VOIDS ALL WARRANTY AND CLAIMS from use of this product.

Repairs or replacement during the warranty period do not extend the warranty period. In order to submit a warranty claim, deliver the unit, along with proof of purchase, to TDL Dive Systems at the address indicated on the cover of this manual. Prior to sending the unit back to the manufactured please contact TDL Dive Systems to obtain a Return Merchandise Authorization number (RMA#). Units returned without an RMA # will be returned to the sender.

Confirmation of Warranty:

Please confirm that you have read and fully understand all sections of this User's Manual.

DATE:_____

SIGNATURE:_____

9.0 Resources

As mentioned in the introduction. This manual is not a complete study of the intricacies of analyzing gas for scuba diving or underwater uses. The user should seek out additional information and additional training from recognized authorities in Mixed Gas diving and Gas Mixing procedures. Below are some resources readily known for additional information.

Tech Diving Limited
2959 Kiowa Blvd North
Lake Havasu City, AZ 86404
928-855-9400
info@techdivinglimited.com
www.techdivinglimited.com

Airspeed Press
Vance Harlow's
Oxygen Hackers Guide
79 Old Denny Hill road
Warner, NH 03278
airspd@conknet.com
www.conknet.com/~g_packard/oxyhacker.html

Best Publishing Company
2355 N. Steves Boulevard • PO Box 30100
Flagstaff, AZ 86003-0100 USA
800-468-1055
divebooks@bestpublcom
www.bestpub.com

American Nitrox Divers International
74 Woodcleft Avenue
Freeport NY, USA 11520-3342
Phone 516 546 2026
Fax 516 546 6010
www.andihq.com

International Association of Nitrox and Technical Divers.

9628 NE 2nd Avenue, Suite D
Miami Shores, FL 33138-2767
Phone: (305) 751-4873
Fax: (305) 751-3958
www.iantd.com

Technical Diving International
18 Elm Street
Topsham, ME 04086
Phone: 207-729-4201
Fax: 207-729-4453
www.tdisdi.com

Professional Association of Diving Instructors
30151 Tomas Street
Rancho Santa Margarita, CA 92688-2125
Phone: (800) 729-7234
Fax: (949) 858 7264
www.padi.com

National Association of Underwater Instructors
1232 Tech Blvd
Tampa, FL 33619-7832
Phone: (800) 553-6284
Fax: (813) 628-8253
www.naui.org

Notes

Tech Diving Limited

Tech Diving Limited
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