O_2 Conserver Checker ✓

DESCRIPTION

The O_2 Conserver Checker can easily be used to test several key performance functions of supplemental oxygen systems. It can check that pulse type devices deliver a pulse with each breath, while also measuring the amount of oxygen delivered in the pulse. The volume of oxygen delivered can be compared to manufacturer specifications for the device to see if it is providing the proper oxygen dose with each breath. When used with portable concentrators, the model with the oxygen sensor can measure the oxygen concentration. The trigger pressure is also important to check because this gives an indication of how sensitive the device is and if it will detect shallow breathing or a cannula that is not well placed. Many conserver type devices also have a continuous flow mode and the O_2 Conserver Checker can measure the delivered oxygen flow rate in the continuous mode. This can also be used to check the oxygen flow rate of basic continuous flow systems like stationary concentrators or standard flow meters.

This table shows the measurements that can be performed on various supplemental oxygen devices.

Tests	Stationary Concentrator	Portable Concentrator	Gas or Liquid Conserver	Continuous Flow Regulator
Breath Triggering		✓	✓	
Trigger Pressure		✓	✓	
Pulse Volume		✓	✓	
Steady Flow	✓	✓	✓	✓
Oxygen Concentration	✓	✓		

SPECIFICATIONS

Power:	5 volts DC, 300 ma
Breath Rate:	10 to 40 BPM, 1 BPM increments
Trigger Pressure:	-0.025 to -0.80 cmH_2O (-2.45 Pa to -78.4 Pa)
Steady Flow:	0.5 to 17 LPM, ±5% or 0.1 LPM whichever is greater, resolution 0.1 LPM
Volume:	±5% of measured value or 1 ml whichever is greater
Oxygen Concentration:	20% to 96%, ±1.5%, resolution 0.1%, Part Number 100029 only
Operating Temperature:	15 °C to 37 °C (59 °F to 99 °F)
Warmup Time:	20 seconds for startup with O_2 sensor. Full accuracy of O_2 sensor may require 5 minutes warmup.
Dimensions and weight:	7” x 4.5” x 2.5” (117mm x 115mm x 63mm), 1 lb. (454 g)

The system meets the requirements for use in an oxygen rich environment however it is not labeled as such because the intended use does not include oxygen rich environments.

Specifications are subject to change without notice.

Manufactured by Dirks Instruments LLC, Stilwell KS, USA

Recommendation for Disposal

Treat as conventional solid waste in accordance with local and federal regulations.

WARNINGS

 Do not connect to any power source other than a 5 volt USB power supply.

 Do not connect anything to the oxygen flow port during the startup and zero function.

 Do not put your finger over the small hole next to the power inlet jack.

 The oxygen concentration value will not be correct if used with oxygen from sources other than a concentrator. 100% oxygen will read around 90%.

 To be used only for checking the function of supplemental oxygen systems. Not for calibration purposes or use on human or animal subjects.

INTENDED USE

The intended use of the O_2 Conserver Checker is the validation of oxygen regulators up to 15 LPM flow rates, oxygen conserving devices, stationary and portable oxygen concentrators.

INCLUDED IN THE BOX

- O_2 Checker
- USB power supply
- USB to DC power jack cable
- 7 ft oxygen tubing
- Operating Instructions
- Calibration certificate

OPERATION

Startup

Do not connect anything to the oxygen inlet port before the unit powers up. Also make sure that your finger is not on the small hole next to the power jack. Connect the provided USB to DC power connector cable to the power jack on the side of the tester and to a USB power source such as a typical USB charger or a USB battery. Once power is applied the display should turn on and show a welcome message and then after a few seconds it will begin to operate. The model with the oxygen sensor will run the fan for 20 seconds to purge the system with air and then set the oxygen concentration. When it starts up the sensors are zeroed and this must be done with nothing attached.

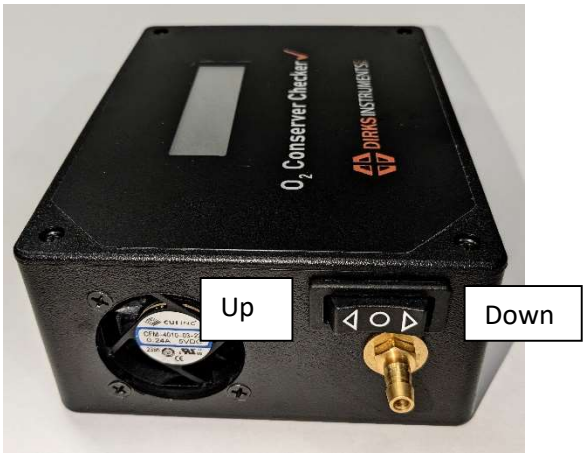
Testing

Connect an oxygen tube to the outlet of the device to be tested and connect the other end to the barb port on the O_2 Conserver Checker. Turn on the device to be tested and put it in the pulse mode or continuous flow mode. The O_2 Conserver Checker fan should begin to run for a short time every 3 seconds. This generates a simulated breath at 20 breaths per minute. If the device is in the pulse mode it should deliver a pulse of oxygen each time the fan starts to run. When a pulse is detected, the fan will shut off and after the pulse is complete the trigger pressure and oxygen volume will be displayed on the LCD display. The model with the oxygen sensor will also display the oxygen concentration reading. In the example to the right the trigger pressure was recorded as -0.156 cmH_2O and the pulse volume was 17.0 ml of oxygen. The oxygen concentration is shown as 90.2%.

When the device being tested is put in the continuous flow mode the tester will automatically detect that the flow is continuous and switch to the continuous flow display. The display will then show the measured flow rate in liters per minute (LPM). If the continuous flow ends the tester will automatically switch back to the pulse test mode and begin to deliver simulated breaths.

Setting the Test Breath Rate

When the O_2 Conserver Checker is powered up the breath rate will be 20 breaths per minute. This is a typical breath rate for testing but on many devices it is important to test at different breath rates. To change the simulated breath rate, press the button on the left side of the tester for a short time. There are two directions to toggle the button. Press the up button to increase the breath rate one breath per minute and the down button to decrease the breath rate one breath per minute. The current breath rate setting will be displayed momentarily in the lower right where the oxygen display is normally located. Press again to increase or decrease the breath rate setting. The breath rate can be adjusted from 10 to 40 breaths per minute.



Measured Values

The trigger pressure is always a negative value because this signifies a vacuum which is generated to simulate a breath. The pressure is displayed in cmH_2O. 1 cmH_2O is equivalent to 98 pascals so to convert to pascals you can basically shift the decimal point two positions to the right. The volume is always shown in ml (milliliters) which is the same as cc (cubic centimeters). This is the unit of volume generally used to measure small volumes such as this. The steady flow values are given in liters per minute (LPM).

To properly determine if a unit is performing to specification, it is best to compare the measurements to published values provided by the manufacturer. Manufacturers should be able to provide nominal values for the oxygen delivered at each pulse setting. This may vary depending on the breath rate so it will be important to properly set the test breath rate when comparing measured values to manufacturers specifications. Most manufacturers do not publish the breath trigger pressure so it may be difficult to get specifications from a manufacturer for this value. There is a significant variation in pulse volumes delivered by different units that are on the market so a specific target volume for a particular setting is not given in any standard at this time. The information given below is a normal range for pulse volumes at a given equivalent continuous flow setting. These values are only a general range and are not specific to any device but they can give you an idea what to expect. If you are seeing values that are outside of this range check with the manufacturer of the device to see what the nominal value should be. Most units tend to be around the middle of these ranges.

Setting	Pulse Volume Range (ml)
1	9 to 16
2	18 to 32
3	27 to 48
4	36 to 64
5	45 to 80

The trigger pressure is an indication of how sensitive the device is to breathing. Some devices have complex triggering methods that vary the trigger pressure based on several factors so a specific value cannot be given however there are some general ranges that can be helpful in determining if a device is performing well. Shallow breathing or breathing through the mouth will provide a very small pressure signal to the oxygen delivery device. In cases like this a device may not trigger on every breath because the pressure signal is too small. This can also be the case if a cannula is not well positioned on the nose. Devices that have a very sensitive trigger pressure may be able to detect this type of breathing and trigger properly. Breathing like this may generate a trigger pressure of only -0.1 or -0.2 cmH_2O. Normal breathing on a well-placed cannula will generate a pressure of -0.50 to -0.80 cmH_2O or more. Typical trigger pressures will be between -0.10 and -0.40 cmH_2O. The tester will generate a trigger pressure of up to -0.8 cmH_2O or more. If this is not enough to reliably trigger a device then there may be a problem with the sensitivity of the device.

Oxygen Concentration Sensor

The model with the oxygen concentration sensor will run the fan for 20 seconds during the power up function to purge the system with air and then it will set the oxygen concentration using air as a reference. The oxygen sensor will continue to warm up and stabilize for about 5 minutes after powering up. For best accuracy it is best to unplug the power after a few minutes of operation and then reconnect power to start the system with the sensor warm. This should provide the best oxygen reading. For normal operation restarting the device is not needed but if there is some question about the accuracy of the reading then perform this restart. When the device is starting up the input connection must be open to air and disconnected from any tubing or device.

The oxygen sensor will read oxygen concentration from concentrators up to 96% which is higher than a concentrator will normally generate. If you use the O_2 Conserver Checker to test devices that operate from a bottle or other 100% oxygen source the oxygen concentration reading will not be correct. The oxygen sensor will normally read between 90 and 92% when operated on 100% oxygen. This is because the system is assuming the presence of argon and some other gasses that are present in the output of an oxygen concentrator. When checking a concentrator in continuous flow mode it may take 3 or 4 minutes to get the most accurate oxygen concentration reading.

Sleep Mode

If the unit does not see oxygen flow for 5 minutes it will enter a sleep mode and display a message that it is in Sleep Mode. Press either the up or down button to exit the sleep mode and go back to normal operation.

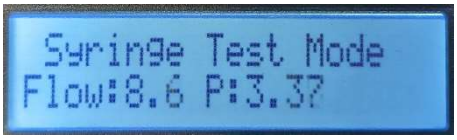
CALIBRATION CHECK MODES

There are two calibration check functions that can be used to check the calibration of the system if the proper equipment is available for the check. One mode can be used to check the flow calibration using a calibration syringe and air. This will verify the flow and volume measurement. Another mode will check the pressure calibration for the sensitivity test.

Flow and Volume Calibration Check

Equipment needed: 100 ml Volume Calibration Syringe Assembly, Hans Rudolph Inc. part number 113636-5510, contact Hans Rudolph Inc. at hri@rudolphkc.com. Other syringes can be used but it is important to be able to provide a steady flow and an accurate volume.

The volume test mode is activated by holding the up button during the initial power up message. A message will be displayed that will read Syringe Test Mode. After the initial message is displayed the flow and pressure sensor will be zeroed before performing the test. When the flow and pressure measurement is displayed both should be reading 0. This mode uses room air. Do not use oxygen or other gasses. A steady flow of air can be injected if you wish to measure a steady flow or if you are using a calibration syringe you can inject a known volume of air. During the test the flow and pressure will be displayed. The flow should be maintained between 0 and 17 LPM. The pressure should remain at 14 or below. When the flow ends the total accumulated volume will be displayed. If you are using a volume calibration syringe this volume should be close to the volume that was injected using the syringe. In the picture shown a 100 ml syringe was used to inject air into the device. The volume measured was quite close to the 100 ml expected. Volume measurements should be within 5% of the actual volume. Accurate readings require that the flow be within the measurement range of 0.8 to 17 LPM during the test and the known volume of the syringe being used must be accurate to less than 1%. It is recommended that this test be performed at different flow rates so that the accuracy at different flows can be checked.



To exit this test press either the up or down button. The display ask if you want to exit this mode. The Up button is used to exit and the Down button will zero the sensor and go back to the test mode.

Pressure Calibration Check

Equipment Required: Very low pressure gauge that can read a negative pressure. The pressure range should be 2 inches of water (500 Pa) or less.

To enter the pressure calibration check mode, hold the down button during the power up message. This will cause the unit to go to the pressure check mode. In this mode the pressure will be displayed and the fan will run to generate a small vacuum pressure. Connect the flow port to the pressure gauge to measure the pressure. The pressure gauge should measure close to the same pressure as is displayed on the device display. Press the up or down button to exit this test mode.

Oxygen Concentration Test

The oxygen sensor is designed and calibrated to measure oxygen coming from a concentrator. This gas has a mixture of oxygen, argon and some small amounts of other gasses. If you connect the flow port to a source of 100% oxygen and set the flow rate of the oxygen between 1 and 2 LPM the oxygen concentration in the normal mode of operation should read 91.8% ± 1%.