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# Exhalometer™

OPERATING MANUAL &  
INSTRUCTIONS FOR USE

R501P01



# Exhalometer™

## Operating Manual & Instructions for Use

### ∴ Table of Contents

1. Introduction . . . . .	2
2. Principles of Operation . . . . .	3
3. Performance Characteristics and Specifications. . . . .	3
3.1 Displayed Parameters . . . . .	5
3.2 Accessories . . . . .	6
4. Operating Instructions. . . . .	7
4.1 Turning the instrument “ON”. . . . .	8
4.2 Ventilation Parameters . . . . .	8
4.3 Normal Operating Displays . . . . .	9
4.4 Turning the instrument “OFF”. . . . .	10
5. Cleaning and Disinfecting <b>Exhalometer™</b> for Reuse Service . . . . .	10
6. Calibration . . . . .	11
7. Trouble Shooting. . . . .	12
Error Code Descriptions – Table 1. . . . .	13
8. Warranty. . . . .	14

### ∴ Warranty

The **Exhalometer™** is warranted by Maxtec, Inc. against defects and workmanship for one year from the date of purchase. During the warranty period, Maxtec, Inc will repair or, at their option, replace at no charge, an instrument that proves to be defective provided the instrument is returned, shipping prepaid, to Maxtec, Inc. This warranty does not apply to instruments that were damaged by abuse or as a result of modification by someone other than Maxtec, Inc. No other warranty is given.

The repair or replacement of the instrument is your exclusive remedy. ANY OTHER IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS IS LIMITED TO THE ONE YEAR DURATION OF THIS WRITTEN WARRANTY. Some states, provinces or countries do not allow exclusion or limitation of incidental or consequential damage so the above limitations or exclusions may not apply to you.

IN NO EVENT SHALL MAXTEC BE LIABLE FOR CONSEQUENTIAL DAMAGES.

This warranty gives you specific legal rights and you may have other rights which vary from state to state, province to province and country to country.

This instrument is sold on the basis of specifications applicable at the time of manufacture. Maxtec, Inc. shall have no obligation to modify or update this instrument once sold.

### ∴ Principles of Operation

Because the **Exhalometer™** measures the amount of air exhaled by the patient, it gives a true indication of what the patient actually received.

The **Exhalometer™** determines air flow by measuring the pressure drop across a laminar flow restrictor, which combined with Bernoulli Effect pressure drop, gives the **Exhalometer™** exceptional accuracy and stability over a broad range of flow rates and temperatures.

### ∴ Performance Characteristics and Specifications

**Power:** Two AAA Alkaline Batteries, easily replaced without any special tools.

**Expected Battery Life:** > 50 hours total; 1 hour after low battery icon flashes.

**WARNING:** When voltage gets too low to perform reliably, the **Exhalometer™** will lock out. When new batteries are installed, the instrument unlocks.

**Operating temperature range:** -15°C to 50°C (5°F - 122°F)

**Storage Temperature:** -40°C to 60°C (-40°F - 140°F)

**Relative Humidity Range:** 0% - 100%

**Accuracy:** ± 20 ml or ± 10% of the displayed value.

**Connections:** Patient side 30mm ID;  
Exhaust side 30mm OD



4. Calibration is completed when **CAL** changes to 500 and the **STANDBY** icon turns off.
5. Proper calibration can be verified by repeating STEP 1.

### ⚡ Troubleshooting

1. The **Exhalometer™** is programmed to perform a continuous self check. If it detects a fault which would cause it to display erroneous data, it locks out the display, (except for an ERROR Code that identifies the source of the fault – See TABLE 1).
2. With the exception of the “Low Battery” display and calibration errors, these faults are not usually correctable by the user, and the instrument **should be returned for service**.

*(continued on next page)*

### ⚡ Displayed Parameters

- ① **Exhalation flow rate** – each box represents 12 LPM.
- ② **CAL Icon and Exhaled Tidal Volume** – displays up to 990 ml – flashes 990 if > 990 ml.\*
- ③ **Standby Icon**
- ④ **Error Icon**
- ⑤ **Battery Icon**
- ⑥ **Expiratory Minute Volume/Respirations per Minute and Error Codes** – in normal operation display alternates every 3 1/2 seconds.
- ⑦ **Respirations per Minute** – active when respirations per minute is displayed.
- ⑧ **Expiratory Minute Volume** – active when expiratory minute volume is displayed.\*
- ⑨ **On/Off Switch** – must be held for 3 seconds.
- ⑩ **Calibration Switch** – must be held for 3 seconds.

*\*Even though the tidal volume flashes 990 (should the exhaled tidal volume exceed 990 ml) the displayed minute volume is accurate, since it includes the actual volume of the exhalation.*

### ⚡ Turning the Instrument “OFF”

1. Press and hold the ON/OFF button until the display turns off.  
NOTE: To conserve power the **Exhalometer™** will turn off if no flow is detected for 8 minutes.
2. Discard the Filter Attachment after use.  
WARNING: Filter is for single patient use only.

### ⚡ Cleaning and Disinfecting Exhalometer™ for Reuse Service

1. After use clean and disinfect the flow tube with one spray of ALPET D2 \* sanitizer into each end of the flow tube. Allow to dry before using.
2. Clean and disinfect the outside surfaces by spraying with ALPET D2. Allow surfaces to dry.

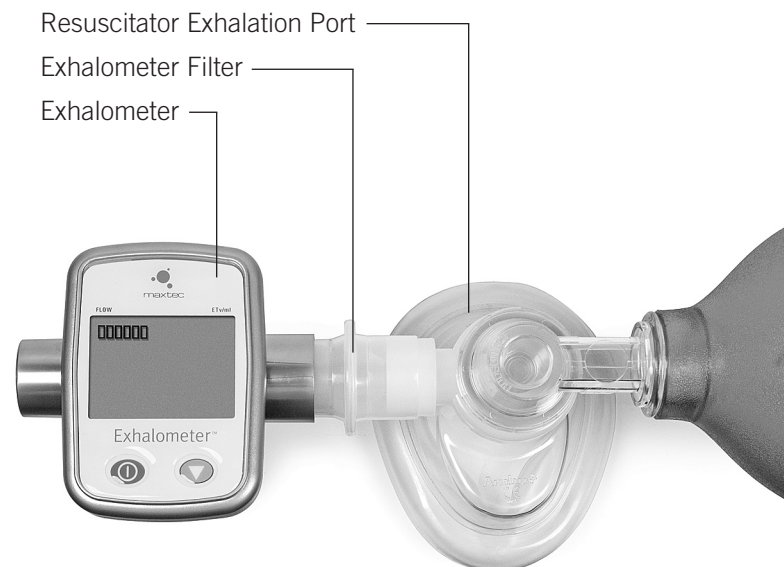
#### Available from:

Bestsanitizers Inc.  
P.O. Box 1360  
Penn Valley, CA 95946  
888-225-3767  
www.bestsanitizers.com

### ⚡ Operating Instructions

It is not necessary to attach the **Exhalometer™** until the resuscitator has been connected to the patient and resuscitation has been initiated. The **Exhalometer™** is suitable for use with patients down to 20 lbs.

#### Exhalometer™ Typical Setup:



## ⚙️ Accessories

**NOTE:** It is essential that a filter be used with the **Exhalometer™**. It not only protects the **Exhalometer™** from liquid and particulate contamination (e.g. vomitus) which would otherwise adversely affect the functionality of the instrument but also reduces possible bacterial and/or viral contamination from aerosols and particulates which may be present in the patient's exhale breath.

For short durations (< one half hour) use of the Ventlab filter is appropriate (3.1.1 or 3.1.2). For longer durations, or for use in cold ambient temperatures (< 50°F) the Caldyne filter, 3.1.3, should be used as it contains a desiccant to limit condensation within the **Exhalometer™**, which could adversely affect its accuracy and functionality.

**3.1.1 Filter** – Ventlab Guardian # BF102 (19mm – 30mm); for MRDs with 19mm expiratory ports

**3.1.2 Filter** – Ventlab Guardian # BF103 (30mm – 30mm); for MRDs with 30mm expiratory ports

**3.1.3 Filter** – Caldyne # 100-805 (30mm – 30mm); for MRDs with 30mm expiratory ports

**3.1.4 Calibration Syringe** (Part Number 100-813) – used to check device on a monthly basis.

## ⚙️ Calibration

The calibration setting of the **Exhalometer™** is inherently stable, however, it is recommended that it be checked on a monthly basis.

1. Determine if calibration is needed by turning on the **Exhalometer™** and pumping 10 full strokes (500 ml) from the calibration syringe (#100-813) through the instrument. If the RESP/MIN reads 10 and the EXP. MIN.VOL reads between 4.8 and 5.2, the instrument is accurate within  $\pm 4\%$  of actual flow and calibration is not required.

CAUTION (1): When pumping make sure that the indicated **FLOW** is between 2 and 5 boxes and that the piston travels a full stroke.

2. If calibration is required, turn the instrument on, then press and hold the **CAL** button until **CAL** appears in the upper right hand corner of the display. The **STANDBY** icon will flash for one minute.

CAUTION: If air flows through the instrument while the **STANDBY** icon is flashing, it can result in aborting the calibration and causing a **CAL** and **ERROR** message 22 to be displayed. If this error message is displayed, turn off the instrument and restart the calibration procedure.

3. When the **STANDBY** icon stops flashing (but remains on), pump one full stroke (500 ml) of air through the **Exhalometer™**. See cautionary note (1) above.

## ⚙️ Turning the Instrument “ON”

1. **REMOVE** a fresh Filter from its protective package and connect it to the expiratory port of the resuscitator.  
NOTE: It is required that a filter be used with each use of the **Exhalometer™**. (See 3.1 Accessories, for correct filter part number.)

2. **PRESS** and **HOLD** the ON/OFF button for 3 seconds until the display comes on. The display will then read “STANDBY,” while the instrument does a self check.  
CAUTION: If air flows through the **Exhalometer™** during the self check, the **ERROR** icon will be displayed. If this error message is displayed, turn off the instrument and restart the process.

3. When the **STANDBY** icon turns off, connect the **Exhalometer™** to the filter. NOTE: A PEEP valve may be installed on the 30 mm male exhaust port of the **Exhalometer™**.

## ⚙️ Ventilation Parameters

The correct ventilation parameters (tidal volume, respirations per minute and minute volume) should be determined by the clinician who provides judgment based on education, expert medical opinion and assessment of the patient's medical condition.

## ⚙️ Normal Operating Displays

1. In use, when the patient exhales, the boxes on the **FLOW** display fill in to give a visual indication of exhalation flow.
2. When flow stops the exhaled tidal volume (ETv) is displayed for a two second period.
3. The alternating information in the center of the display shows the total volume (liters) exhaled during the preceding minute (EXP. MIN. VOL) and the number of exhalations during the preceding minute (RESP./MIN.). These displays alternate every 3 1/2 seconds.

NOTE: The displayed values add up during the first minute. Thereafter the displayed parameters are the running values for the preceding minute.

