A Precision Peak Flow Meter

The new MicroPeak peak flow meter was designed to meet the new standards in performance and quality including a high visibility scale and built-in color-zone asthma management system.

The lightweight, portable and accurate MicroPeak, with it’s “one-size-fits-all” design, is a true advance in helping your patients' manage their asthma.

The durable MicroPeak incorporates an internal check valve to protect the integrity of the internal mechanism and reduce cross contamination concerns.

The MicroPeak is part of an extensive range of respiratory management devices marketed by Micro Direct and is offered as catalog No. MPE7200.

Specifications

- Range: 60 - 900 L/min
- Scale Increments: 10 L/min
- Accuracy: < +/- 10%
- Repeatability: < +/- 5%
- Calibration: 100% (individual unit)
- Materials: All Latex Free
- Standards: Meets ATS/NAEPP
- Warranty: One Year
- Built-in One-way Valve
A COPD Screening Device Reporting FEV₁ & ‘Lung Age’

Simple and easy to use, the spiro✓ offers a practical solution for COPD testing in adult smokers

A quick test using the spiro✓ measures and displays a patient’s FEV₁ and FEV₁ % predicted on its large LCD display; and is the ideal tool for monitoring the effectiveness of respiratory therapy treatments at the bedside in the hospital or emergency department setting.

The spiro✓ uses these results to calculate and display a ‘Lung Age’ estimation. The lung age can be used to show smokers the physical damage caused by smoking and is an essential tool for every successful smoking program.

Features

- Measures and displays FEV₁ and FEV₁ % Predicted
- ‘Lung Age’ estimation
- Simple to use
- Large, easy to read display
- Battery strength indicator
- Auto power off
- Easy to clean, detachable flow head
- Light, compact, attractive; makes it convenient to carry

Specifications

- **Product:**
  Spiro✓ Spirometer

- **Parameters Displayed:**
  FEV₁, FEV₁ % predicted, Lung Age

- **Predicted Values:**
  NHANES III

- **Accuracy:**
  Better than +/- 3% to ATS/ERS Standards

- **Volume Range:**
  0 - 9.99 Liters/Second (L/S) BTPS

- **Sensor:**
  Stator/Rotor

- **Flow Impedance:**
  Better than 0.15kPa/L/S at 14 L/S

- **Display:**
  Liquid Crystal Display (LCD)

- **Power Supply:**
  2 AAA Alkaline Batteries

- **Size:**
  4.5” x 2.5” x 2”

- **Weight:**
  Unit Only: 2.5 oz
  Packed: 4.5 oz

Catalog #MD02 Design and product specifications subject to change without notice.

Rev. 11/10
Affordable Spirometer For Home Use

The Micro Direct spiro✓ home spirometer was specifically designed for situations where low cost, easy to use, accurate spirometry is required.

The spiro✓ accurately measures, displays and stores the actual FEV₁, FEV₆ and the percent of Personal Best FEV₁. The personal best FEV₁ can be set by the clinician with future patient efforts compared to their personal best. The three color action zones are preset but can be customized by the clinician.

Features

- Measures FEV₁, FEV₆ and % of Personal Best FEV₁
- Simple to use
- Large, easy to read display
- Quality blow indicator
- FEV₁ zones can be personalized
- Stores 200 test sessions
- Easy to clean, detachable flow head
- Light, compact, attractive; makes it convenient to carry

Specifications

Product:
Spiro✓ Home Monitor

Parameters Displayed:
FEV₁, FEV₆ and % Personal Best FEV₁

Memory:
200 Test Sessions

Accuracy:
Better than +/- 3% to ATS/ERS Standards

Volume Range:
0 - 9.99 Liters/Second (L/S) BTPS

Sensor:
Stator/Rotor

Flow Impedance:
Better than 0.15kPa/L/S at 14 L/S

Display:
Liquid Crystal Display (LCD)

Power Supply:
2 AAA Alkaline Batteries

Size:
4.5” x 2.5” x 2”

Weight:
Unit Only: 2.5 oz
Packed: 4.5 oz

Catalog #MD01 Design and product specifications subject to change without notice.
The original pocket spirometers and still the best

The Micro Direct Micro and MicroPlus Spirometers are specifically designed for situations where low cost precision respiratory measurement is required. Selected for lung transplant programs world-wide as well as for major clinical trials, both spirometers have proven long term accuracy and reliability. The Micro and MicroPlus spirometers utilize our Gold Standard Transducer which insure precise measurement of low end-expiratory flow often seen in COPD patients. The Micro Spirometer measures and displays on it’s high visibility screen FVC and FEV\textsubscript{1}. The MicroPlus measures and displays FVC, FEV\textsubscript{1}, PEF, FEV\textsubscript{1}\% and can be connected to the optional Spida 5 spirometry programs, compatible with all the latest Windows operating systems. An alternative version of the MicroPlus which measures FEF\textsubscript{25-75} and FEV\textsubscript{6} (in place of FVC) is also offered.

Simple to use, lightweight and with over 50,000 units in daily use, the Micro and MicroPlus are the World’s No. 1 Spirometers for asthma and COPD testing.

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240
Telephone 800-588-3381
Fax 207-786-7280
www.micro-direct.com

Features

- Gold Standard Transducer
- Meets or exceeds all ATS accuracy standards
- Competitively priced
- Easy to use, clean and maintain
- Complete with sturdy carrying case and accessories
- Optional FEF\textsubscript{25-75}, FEV\textsubscript{6} (MicroPlus Only)
- Optional PC software (MicroPlus only)
- No user calibration adjustment required.

Specifications

- Measurements
  Micro - FVC and FEV\textsubscript{1}
  MicroPlus - FVC, FEV\textsubscript{1}, PEF and FEV\textsubscript{1}\%
- Volume Range
  0.1 to 9.99 Liters
- Flow Range
  0.2 to 15.00 Liters/Second
- Accuracy
  +/-3\% (ATS diagnostic standard)
- Dimensions
  6.5” x 2.5” x 2”
- Weight net
  8 ounces
- Power Supply
  Single 9 volt battery
- Interface
  RS232 (MicroPlus only)
- Catalog #
  MS01 - Micro Spirometer; MS03 - MicroPlus
The new generation of Micro Direct Micro Spirometers

The innovative Micro Direct MicroGP and MicroDL are new generation pocket spirometers offering exceptional features at exceptional prices. These spirometers feature the Micro Medical gold standard digital volume transducer with its proven accuracy, stability and reliability and are fully compliant with the 1994 ATS standards for diagnostic devices.

MicroGP

The inexpensive MicroGP is the device of choice for COPD and asthma screening offering a high degree of accuracy with simplicity of operation. Measuring and displaying FEV1/FVC/PEF with percent predicted as well as allowing a direct printout which includes the small airways flow indicators of F50/F25/MEF and the Flow/Volume and Volume/Time curves.

MicroDL

The MicroDL has the additional features of a large memory capacity allowing up to 500 data sets (including Flow/Volume and Volume/Time curves) to be recorded for either direct printing or uploading to the complimentary Spida 5 software.

Spida 5 PC Software

Available at an additional cost for the MicroGP but supplied complimentary with the MicroDL, the Spida 5 software is an easy to use spirometry data collection and database system that offers powerful comparative and long term trending facilities. Information can be easily downloaded from the MicroDL or can be used real-time with the MicroGP or MicroDL as a low cost PC-based system with minimum set-up and pre-defined reports.

MicroGP

- Inexpensive pocket Spirometer for COPD/asthma screening
- Full 8 1/2 x 11 direct printout with Flow/Volume and Volume/Time curves
- ATS/ERS compliance for diagnostic devices
- Displays actual and percent predicted
- Battery operated and ergonomically designed

MicroDL - as MicroGP plus

- ‘Traffic light’ patient alert system features
- 500 test memory including Flow/Volume and Volume/Time curves
- Ideal for clinical trials/patient home use
- Complimentary Spida 5 PC software

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240
Telephone 800-588-3381
Fax 207-786-7280
www.micro-direct.com
### Specifications

**Spirometry**

<table>
<thead>
<tr>
<th>Measurements</th>
<th>FEV&lt;sub&gt;1&lt;/sub&gt;, FVC, PEF, FEV/FVC, FEF&lt;sub&gt;50&lt;/sub&gt;, FEF&lt;sub&gt;25&lt;/sub&gt;, FEF&lt;sub&gt;25-75&lt;/sub&gt; and FET</th>
</tr>
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<tbody>
<tr>
<td>Storage</td>
<td>Up to 500 complete data sets including Flow/Volume and Volume/Time curve (MicroDL only)</td>
</tr>
<tr>
<td>Predicted Values</td>
<td>Knudson</td>
</tr>
<tr>
<td>Printer Output</td>
<td>Serial output for Hewlett Packard Printers (Cat. No. MLA450 required)</td>
</tr>
<tr>
<td>Display</td>
<td>3 1/2” Digit LCD with custom icons</td>
</tr>
<tr>
<td>Transducer</td>
<td>Gold Standard uni-directional digital volume transducer</td>
</tr>
<tr>
<td>Resolution</td>
<td>10 ml Volume, 0.30 L/S flow</td>
</tr>
<tr>
<td>Accuracy</td>
<td>To ATS 1994 standards for diagnostic devices</td>
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<tr>
<td>Interface</td>
<td>RS232 input/output</td>
</tr>
<tr>
<td>Software</td>
<td>Spida 5 PC software complimentary (MicroDL only)</td>
</tr>
<tr>
<td>Power Supply</td>
<td>9 volt Alkaline cell / Lithium back-up battery</td>
</tr>
<tr>
<td>Battery Life</td>
<td>Main battery approximately 24 hours continuous use</td>
</tr>
<tr>
<td></td>
<td>Backup Battery &gt; 10 years</td>
</tr>
<tr>
<td>Dimensions</td>
<td>6.5” x 2.5” x 2”</td>
</tr>
<tr>
<td>Unit Weight</td>
<td>8 ounces</td>
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<tr>
<td>Packed Weight</td>
<td>2.5 pounds</td>
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</table>

### Bibliography


Pulse Oximetry Module for the MicroLab and MicroLoop Spirometers

The pulse oximetry module combines a high quality oximeter/sensor combination in a single unit that plugs direct into the new MicroLab or MicroLoop diagnostic spirometers. The device will make quick assessments and continuous (up to 60 minutes) measurements of Oxygen Saturation (SpO2) and heard rate (bpm) which are displayed on a high resolution color touch-screen.

The pulse waveforms are continuously displayed in green, yellow or red. Textual and audible warnings are available to ensure that abnormal saturation, heart rates and pulse artifact are immediately indicated. Analysis of the results from a continuous test is also possible and printout formats, both internal and direct 8 1/2” x 11” are selectable.

The instrument makes pulse oximetry quick and simple in supporting other respiratory investigations, vital in the management of COPD and other cardio respiratory disease.

**Features**

- Oxygen Saturation (SpO2) 0% to 100%
- Heart Rate (bpm) 18 - 300
- Quick assessment and continuous measurements
- Colored textual, pulse quality warnings
- Audible warning of abnormal saturation levels and heart rates
- Internal and external direct, result and trend printouts
- Accuracy: Blood Oxygen Saturation 70-100% +/- 2 digits (SpO2) (+/- 1 S.D)
- Test recording time: 20 seconds to 60 minutes

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Results Screen

Testing Mode

---

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240
Telephone  800-588-3381
Fax    207-786-7280
www.micro-direct.com

Catalog #SPO6000   Design and product specifications subject to change without notice.
Affordable Handheld Pulse Oximeter

The Micro Direct MD300HH offers the features of a conventional oximeter in a compact, user-friendly handheld configuration. The MD3300HH accurately measures blood oxygen saturation levels and heart pulse rate. Readings are displayed and stored (up to 18 hours) in a sleek handheld unit.

Simple to use, this unique device delivers near immediate results; just place the probe on your finger and within seconds, the MD300HH will display accurate readings of your SPO2 and heart pulse rate. Ideal for all medical (hospital, clinics, EMS) and homecare related applications where fast measurement of vital signs is required.

Features

- Display SpO2, PR, SpO2 waveform (pleth or line)
- Pulse Rate tone modulation function
- Display signal strength
- 10 patients ID setup and 1 second interval
- Transmit data to a PC
- Three display modes
- Alarm information: probe off, finger out, low power
- Up to 24 hours continuous operation
- Light, compact, attractive makes it convenient to carry
- Automatic power-off design
- Low voltage indicator, low power consumption
- 2 AA alkaline or rechargeable batteries

Specifications

- **SpO2**
  - Range: 0 - 100%
  - Resolution: 1%
  - Accuracy: 80 - 99%: +/- 2%
    70 - 80%: +/- 3%
    0 - 69%: unspecified

- **Heart (Pulse) Rate**
  - Range: 30 - 254 bpm
  - Resolution: 1 bpm
  - Accuracy: +/- 2 bpm or +/- 2%

- **Alarm**
  - Alarm Modes: Probe off, Finger out, Low power
  - Visual information

- **Display**
  - Type: LCD
  - Parameters: SpO2, PR, Pleth waveform, Pleth bar
  - Mode: 3 display modes

- **Record**
  - Patient ID: 10 patients
  - Data Record: Up to 18 hours
  - Interval: 1 second

- **Data Transmission**
  - Transmission Method: Data cable
  - Interface: Oximeter side: DB9
    PC Side: USB

- **Environmental**
  - Operating Temperature: 32° - 122° F
  - Storage Temperature: 14° - 140° F
  - Operating Humidity: 15% RH - 95% RH
  - Storage Humidity: 10% RH - 95% RH

- **Classification**
  - Type of Protection: Internally powered equipment
  - Safety: IEC standard 61601-1-1

- **Mechanical**
  - Size: 5.12” x 1.57” x 1.06”
  - Weight: 4.23 ounces (including 2 batteries)

- **Power**
  - Type: 2 AA Alkaline or Rechargeable batteries
  - Operation Time: Approximately 24 hours for normal operation

Catalog #MD300HH  Design and product specifications subject to change without notice.
### Affordable Digital Finger Pulse Oximeter

The Micro Direct PulseOx 5500 digital finger pulse oximeter offers the features of a conventional oximeter in a compact, user-friendly, portable configuration. The PulseOx 5500 accurately measures blood oxygen saturation levels and heart pulse rate and displays the results on an easy-to-read liquid crystal display. Simple to use, this unique device delivers near-immediate results; just place the unit on your finger and press the ‘on’ button; within seconds, the PulseOx 5500 will display accurate readings of your SPO2 and heart pulse rate. Ideal for all medical and home-care related applications where fast measurement of vital signs is required.

The PulseOx 500 is based on SPO Medical’s uniquely patented algorithms that use pulse reflectance technology for the accurate measurement of blood oxygen saturation levels and heart pulse rate, non-invasively. It also addresses problems typically associated with motion artifacts, ensuring accurate and reliable reading. The PulseOx is designed to utilize very low power for extended usage, eliminating the need for frequent battery replacement and can be used outdoors in many conditions, including high altitudes, at high and low temperatures and even in the dark.

**Features**

- Easy to use
- “All-in-one” integrated finger device
- Very low power consumption
- Minimal maintenance costs
- Single button operation
- Robust and attractive design

**Specifications**

**Effective measuring range**
- Saturation: 40 to 99%
- Heart pulse rate: 40 to 250 bpm
- Resolution: 1 digit

**Accuracy (including motion artifacts and low profusion)**
- Saturation: +/-2% or +/- 2 digits
- Heart pulse rate: +/-3% or +/- 3 digits

**Display**
- Saturation: 2 characters
- Heart pulse rate: 3 characters
- Signal indications: ‘Sensor Off’ and ‘Weak Signal’
- Battery indication: Full power, 1/3 and near empty

**Mechanical**
- Dimensions: 2.91” x 1.57” x 1.61”
- Weight: 1.8 ounces including battery

**Environmental**
- Battery Life: 1,000 hours (40 days) continuous use
- Operating temperature: 39 to 107 degrees Fahrenheit
- Humidity: Up to 95% noncondensing
Affordable Digital Finger Pulse Oximeter

The Micro Direct MD300FT digital finger pulse oximeter offers the features of a conventional oximeter in a compact, user-friendly, portable configuration. The MD300FT accurately measures blood oxygen saturation levels (SpO2) and heart pulse rate (PR) along with a SpO2 waveform on an easy-to-read organic light-emitting diode (OLED) display.

Simple to use, this unique device delivers near immediate results; just place the unit on your finger and within seconds, the MD300FT will display accurate readings of your SpO2 and heart pulse rate. Ideal for all medical (hospital, clinics, EMS) and homecare related applications where fast measurement of vital signs is required.

Features

- Two colors OLED display; Adjustable brightness
- Displays SpO2, PR, SpO2 waveform (pleth or line)
- Displays signal strength
- Six display modes, convenience to overview the data
- Low voltage indicator, Low power consumption
- 2 AAA alkaline or rechargeable batteries
- Automatic power-off design
- Light, compact, attractive makes it convenient to carry

Specifications

**Patient Range**
Adult, Pediatric

**SpO2**
- Range: 35 - 99%
- Resolution: 1%
- Accuracy: 70 - 100%: +/- 2%
- 0 - 69%: unspecified
- Method: Dual wavelength LED

**Heart (Pulse) Rate**
- Range: 30 - 254 bpm
- Resolution: 1 bpm
- Accuracy: +/- 2 bpm or +/- 2%

**Display**
- Type: Color OLED display (Multi-display modes)
- Parameters: SpO2, PR, waveform (pleth or line)
- Information: Low battery indicator

**Environmental**
- Operating Temperature: 41° - 104° F
- Storage Temperature: 14° - 104° F
- Operating Humidity: 15% RH - 95% RH
- Storage Humidity: 10% RH - 95% RH

**Classification**
- Type of Protection: Internally powered equipment
- Safety: IEC standard 61601-1-1

**Mechanical**
- Size: 2.28" x 1.26" x 1.33"
- Weight: 1.76 ounces (including 2 batteries)

**Battery**
- Type: 2 AAA 1.5V Alkaline batteries or 2 AAA 1.5V rechargeable batteries
- Operation Time: Minimum 30 hours for normal operation

Catalog #MD300FT  Design and product specifications subject to change without notice.
Simple tests for respiratory muscle strength

The MicroRPM (Respiratory Pressure Meter) brings together the measurements of Maximum Inspiratory and Expiratory Mouth Pressures (MIP/MEP) with Sniff Nasal Inspiratory Pressure (SNIP) in one instrument.

These simple non-invasive tests of respiratory muscle strength are essential in monitoring patients with COPD who are undergoing a program of lung rehabilitation and are also valuable in the detection of other diseases affecting the function of the respiratory muscles.

Simple and easy to use, the pocket sized, battery operated MicroRPM features a clear digital display of the results in cmH$_2$O and comes complete with all accessories in a sturdy carrying case.

Also offered, is the optional PUMA PC software. PUMA is a comprehensive analysis and database software package.

**Features**

- Combined, mouth and nasal pressure measurements
- Clear digital display of the results
- Small, portable and lightweight
- Latest piezo resistive pressure sensing technology
- Optional Puma, PC software package
- Battery operated and complete with all accessories in a sturdy carrying case
- Easy to use and competitively priced

**Specifications**

- **Measurements**
  - Maximum Expiratory Pressure (MEP)
  - Maximum Inspiratory Pressure (MIP)
  - Sniff Nasal Inspiratory Pressure (SNIP)
- **Operating Pressure** $\pm$300 cmH$_2$O ($\pm$5PSID)
- **Burst Pressure** $\pm$700 cmH$_2$O ($\pm$20PSID)
- **Resolution** 1 cmH$_2$O
- **Accuracy** $\pm$ 3%
- **Power Supply** Single 9 volt battery
- **Dimensions** 6.5” x 2.5” x 1”
- **Weight** 6.20 oz (unit)/26.5 oz (complete)
- **Operating Temperature** 32 - 104 degrees Fahrenheit
- **Operating Humidity** 30% - 90% RH
- **Storage Temperature** -4 - 158 degrees Fahrenheit
- **Storage Humidity** 10% - 90% RH

MicroRPM, Part #RPM01. Micro Direct, Inc. pursues a policy of continuing improvements in design production and performance of its products. The right is therefore reserved to vary at any time and without notice.

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240
Telephone 800-588-3381
Fax 207-786-7280
www.micro-direct.com
Smoking and Pregnancy . . .
Helping to Break the Link

It is never too late to stop smoking. Every cigarette you decide not to smoke will help you and your baby’s health. A baby in the womb receives everything from its mother. Nutrients and oxygen come via the placenta and umbilical cord. Smoking not only exposes the fetus to toxins in tobacco smoke, but also damages placental function.

When a person smokes, some of the oxygen in their blood is replaced by carbon monoxide. If a pregnant woman smokes, her blood and therefore her child’s blood will contain less oxygen than normal. This can cause the fetal heart rate to rise as the baby struggles to get enough oxygen.

As well as displaying the mother’s CO level in parts per million (ppm) and the %COHb, the BabyCO will immediately display the carbon monoxide levels in (%FCOHb) of the unborn fetus.

The BabyCO is the gold standard in CO breath testing and the most advanced system currently available today. Some of its many features include fast response time, 1 ppm resolution, immediate display of CO levels in ppm, %COHb and %FCOHb, three color light indicators and is capable of interfacing with COBRA, a windows based software package for performing, printing and storing real time breath tests on your PC.

Babies born to mothers who smoke:

- Are more likely to be born premature and with a low birth weight (below 5 pounds 8 ounces)\(^1\)
- Have a birth weight on average (7 ounces) less than those born to non-smokers. This effect increases proportionally—the more the mother smokes, the less the child weighs\(^2\)
- Have organs that are smaller on average than babies born to non-smokers\(^3\)
- Have poorer lung function and increased prevalence of asthma\(^4\)
- Are twice as likely to die from SIDS\(^5\)

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240
Telephone  800-588-3381
Fax  207-786-7280
www.micro-direct.com
Customer Benefits and Features

The Baby CO is the gold standard in CO breath testing and is the most advanced system currently available today. A single breath from the mother will immediately show the percentage of carbon monoxide attached to the baby’s red blood cells (%FCOHb).

Ease of Use

Measurements are easily obtained from a single expiration and are aided by an auto-zero function when the unit is turned on. These results are then instantly displayed on the large liquid crystal display.

Design Innovation

An ergonomically designed unit of distinctive appearance, the textured handgrip encourages easy and reassuring use. The Baby CO is small, lightweight and is molded from high impact ABS plastic for durability.

Calibration Gases

In order to keep your Baby CO in pristine working condition and always have reproducible results at your disposal, we recommend calibration every six months. Calibration can be easily and safely carried out by the end user with our calibration cylinder. Alternatively, a calibration service is available by returning your Baby CO monitor to Micro Direct.

Part Number and Accessories

The Baby CO Carbon Monoxide Monitor and accessories are part of an extensive range of respiratory measurement devices offered by Micro Direct, Inc.

<table>
<thead>
<tr>
<th>Product</th>
<th>Catalog Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>BabyCO</td>
<td>BC01</td>
</tr>
<tr>
<td>BabyCO Calibration Kit</td>
<td>MC15</td>
</tr>
<tr>
<td>BabyCO Calibration Gas</td>
<td>MC10</td>
</tr>
<tr>
<td>Mouthpiece Adapter with one-way valve</td>
<td>PSA2000</td>
</tr>
<tr>
<td>Disposable cardboard Mouthpieces (bag of 100)</td>
<td>3301</td>
</tr>
<tr>
<td>COBRA software package Including interface cable</td>
<td>CB1000</td>
</tr>
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</table>

Baby CO Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas detected</td>
<td>Carbon Monoxide</td>
</tr>
<tr>
<td>Concentration range</td>
<td>0 - 500 ppm</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Operating range</td>
<td>0 - 104 degrees Fahrenheit</td>
</tr>
<tr>
<td>Sensor life</td>
<td>2 - 5 years</td>
</tr>
<tr>
<td>Sensor drift</td>
<td>&lt;5% per month</td>
</tr>
<tr>
<td>Display</td>
<td>3 1/2 Digit Custom LCD</td>
</tr>
<tr>
<td>Power supply</td>
<td>Single 9 volt battery</td>
</tr>
<tr>
<td>Weight (Net)</td>
<td>5.6 ounces</td>
</tr>
<tr>
<td>Weight (Packed)</td>
<td>2.2 pounds</td>
</tr>
<tr>
<td>Dimensions</td>
<td>6.5” x 2.5” x 1”</td>
</tr>
<tr>
<td>Indicator levels</td>
<td>green - 0 to 6 ppm; amber - 7 to 10 ppm; red - 11 to 20 ppm; flashing red and audio alarm 20 ppm and over</td>
</tr>
</tbody>
</table>

Bibliography


Essential Tool for Smoking Cessation and Carbon Monoxide monitoring

As someone who is involved in the field of smoking cessation, you are only too well aware of the dangers caused by smoking. What you need is a means of quickly and effectively monitoring your patient’s carbon monoxide levels—and then convincingly persuading them of the risks they bring upon themselves by smoking.

Micro Direct offers two models of carbon monoxide monitors specifically designed for your needs.

MicroCO

The MicroCO is the gold standard in CO breath testing and is the most advanced system currently available today. Some of its many features include fast response time, 1 ppm resolution, immediate display of CO levels in PPM and %COHb, color light indicators, capable of interfacing with COBRA, a windows based software package for performing and storing real time breath tests on your PC.

SmokeCheck

The SmokeCheck is designed as a simple screening test for cigarette consumption. Displaying an instant indication of CO levels in PPM and backed up with color light indicators, the SmokeCheck is the most cost effective CO monitor available today. Conversion of PPM results to %COHb is easily obtained using the SmokeCheck’s smoking cessation guide chart.

COBRA Software

COBRA offers a unique opportunity for performing and storing carbon monoxide breath tests. Based on a MicroSoft Word document, the CO report can easily be customized with logos, headings and other information. A single icon click launches a CO test allowing real-time control and display once connected to the MicroCO.

Features

- Small, lightweight and portable
- Zero warm-up time
- Easy to use, clean and maintain
- Simple calibration routine
- Single switch operation
- Auto-zero facility
- Color light indicators
- Audible warning tone for high CO levels
- Supplied with all accessories in a sturdy carrycase
- Breath-hold countdown timer (MicroCO only)
- Cobra PC software (MicroCO only)
- RS232 output (MicroCO only)

Carbon Monoxide testing is third party reimbursable using CPT code #94250
Customer Benefits and Features

The MicroCO is a powerful diagnostic tool for measuring alveolar Carbon Monoxide in parts per million (ppm) concentrations and percentage Carboxyhemoglobin (%COHb). Operating from a single 9 volt battery for approximately 8000 tests, the MicroCO combines accuracy and simplicity making it the preferred choice for all types of health professionals worldwide.

The SmokeCheck is the most cost effective CO monitor available today. Four ranges of CO levels are featured on the custom LCD. 0 to 6 ppm and green light will indicate a non smoker. 7 to 10 ppm and amber light will indicate a light smoker. 11 to 20 ppm and red light will indicate a smoker and 20+ and red flashing light with audible alarm will indicate a heavy smoker.

Ease of Use

Measurements are easily obtained from a single expiration and are aided by an auto-zero function at turn on, combined with a breath hold countdown timer. These results are then instantly displayed on the large, easy to read liquid crystal display and are visually represented by the appropriate color light indicator.

Design Innovation

An ergonomically designed unit of distinctive appearance, the textured handgrip encourages easy and reassuring use. Both the MicroCO and SmokeCheck are small, lightweight and are molded from high impact ABS plastic for durability.

Calibration Gases

In order to keep your carbon monoxide monitor in proper working condition and always have reproducible results at your disposal, we recommend calibration every six months. Calibration can be easily and safely carried out by the end user with our calibration cylinder. Alternatively, a calibration service is available by returning your carbon monoxide monitor to Micro Direct.

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MicroCO (#MC02) Specifications

<table>
<thead>
<tr>
<th>Gas detected</th>
<th>Carbon Monoxide</th>
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<tbody>
<tr>
<td>Concentration range</td>
<td>0 - 500 ppm</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Operating range</td>
<td>0 - 104 degrees Fahrenheit</td>
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<tr>
<td>Operating pressure</td>
<td>Atmospheric +/- 10%</td>
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<tr>
<td>Hydrogen cross-sensitivity</td>
<td>&lt;3%</td>
</tr>
<tr>
<td>Sensor life</td>
<td>2 - 5 years</td>
</tr>
<tr>
<td>Sensor drift</td>
<td>&lt;2% per month</td>
</tr>
<tr>
<td>Display</td>
<td>3 1/2 digit custom LCD</td>
</tr>
<tr>
<td>Power supply</td>
<td>Single 9 volt battery</td>
</tr>
<tr>
<td>Weight (Net)</td>
<td>8 ounces</td>
</tr>
<tr>
<td>Weight (Packed)</td>
<td>2.5 pounds</td>
</tr>
<tr>
<td>Dimensions</td>
<td>6.5” x 2.5” x 1”</td>
</tr>
<tr>
<td>Indicator levels</td>
<td>green - 0 to 6 ppm; amber - 7 to 10 ppm; red - 11+ ppm; poison audio alarm - 72 ppm</td>
</tr>
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</table>

SmokeCheck (#SC01) Specifications

<table>
<thead>
<tr>
<th>Gas detected</th>
<th>Carbon Monoxide</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentration range</td>
<td>0 - 500 ppm</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>1 ppm</td>
</tr>
<tr>
<td>Operating range</td>
<td>0 - 104 degrees Fahrenheit</td>
</tr>
<tr>
<td>Sensor life</td>
<td>2 - 5 years</td>
</tr>
<tr>
<td>Sensor drift</td>
<td>&lt;2% per month</td>
</tr>
<tr>
<td>Display</td>
<td>Custom LCD</td>
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<tr>
<td>Power supply</td>
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<tr>
<td>Weight (Net)</td>
<td>4.6 ounces</td>
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<tr>
<td>Weight (Packed)</td>
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<td>Dimensions</td>
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<tr>
<td>Indicator levels</td>
<td>green - 0 to 6 ppm; amber - 7 to 10 ppm; red - 11 to 20 ppm; flashing red and audio alarm 20 ppm and over</td>
</tr>
</tbody>
</table>

Micro Direct, Inc.
803 Webster Street
Lewiston, ME 04240
Telephone 800-588-381
Fax 207-786-7280

www.breathcotest.com
### Spirometry Solutions from Micro Direct

**Your Spirometry Specialist**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>Options</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MicroLab</strong></td>
<td>(ML3500-S) Desktop</td>
<td>Digital Volume Transducer, Touch Screen Color Display, Real Time FV Loop or VT Curve, Child Incentive, Internal or 8 1/2” x 11” Printout, 2,000 Patient Test Memory, Pre/Post Bronchodilator Comparison, Choice of Predicted Values, On-Screen Help Menu, Lung Age Estimation, Spida 5 PC Software Included, ATS Quality Checks, Meets ATS/ERS Standards, 2-Year Warranty</td>
<td>$2,395</td>
</tr>
<tr>
<td><strong>MicroLoop</strong></td>
<td>(ML3535-S) Hand Held</td>
<td>Digital Volume Transducer, Touch Screen Color Display, Real Time FV Loop or VT Curve, Child Incentive, 8 1/2” x 11” Printout (PC or Direct), 44 Test Parameters Available, 2,000 Patient Test Memory, Pre/Post Bronchodilator Comparison, Diagnostic Interpretation, Choice of Predicted Values, On-Screen Help Menu, Lung Age Estimation, Spida 5 PC Software Included, ATS Quality Checks, Meets ATS/ERS Standards, 2-Year Warranty</td>
<td>$1,995</td>
</tr>
<tr>
<td><strong>Alpha</strong></td>
<td>(MD6500) Desktop</td>
<td>Accurate Fleisch Pneumotach, Color High Resolution Display, Real Time FV Loop or VT Curve, No Child Incentive, Internal or 8 1/2” x 11” Printout, 13 Test Parameters, 9 Patient Test Memory, Pre/Post Bronchodilator Comparison, Diagnostic Interpretation, Predicted Values: NHANES III, On-Screen Help Menu, Lung Age Estimation, PDF Report Software Included, On-Screen Test Quality Prompts, Meets ATS/ERS Standards, 1-Year Warranty, 5-Year Optional</td>
<td>$1,850</td>
</tr>
<tr>
<td><strong>In2itive</strong></td>
<td>(MD7900) Hand Held</td>
<td>Accurate Fleisch Pneumotach, Touch Screen Color Display, Real Time FV Loop or VT Curve, Child Incentive, 8 1/2” x 11” Printout (PC), 52 Test Parameters Available, 10,000 Patient Test Memory, Pre/Post Bronchodilator Comparison, Diagnostic Interpretation, Predicted Values: NHANES III, On-Screen Help Menu, Lung Age Estimation, Spirotrac V PC Software Included, On-Screen Test Quality Prompts, Meets ATS/ERS Standards, 1-Year Warranty, 5-Year Optional</td>
<td>$1,750</td>
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<tr>
<td><strong>SpiroUSB</strong></td>
<td>(ML2525) PC-Based</td>
<td>Digital Volume Transducer, Computer Screen Display, Real Time FV Loop or VT Curve, Child Incentive (4 available), 8 1/2” x 11” Printout, 44 Test Parameters Available, Memory (PC Capacity Dependent), Pre/Post Bronchodilator Comparison, Diagnostic Interpretation, Choice of Predicted Values, On-Screen Help Menu, Lung Age Estimation, Spiida 5 PC Software Included, ATS Quality Checks, Meets ATS/ERS Standards, 2-Year Warranty</td>
<td>$1,595</td>
</tr>
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**Micro Direct, Inc. • 803 Webster Street, Lewiston ME 04240**

Telephone 207-786-7808 • 1-800-588-3381 • Fax 207-786-7280 • www.micro-direct.com • e-mail: sales@micro-direct.com
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Micro Direct also offers a complete line of filter adapters that fit every competitor’s spirometer.

From the low cost standard cardboard mouthpiece to the high efficiency, yet affordable SpiroSafe filter, Micro Direct has the spirometer disposables you need.

Call 1-800-588-3381 to place an order and cut your disposable costs today.
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Since early detection and treatment of COPD can positively influence the disease course, it is important to screen those patients at risk. The Microlife is the ideal tool to use as a quick check of lung function to highlight signs of disease as early as possible.

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Features

- Measures and displays PEF and FEV1
- Digital Diary stores 240 measurements with date and time.
- Quick and Easy to use
- Large graphical display
- Suitable for Children and adults
- Meets ATS accuracy standards
- Deluxe storage case
- Includes 3 reusable mouthpieces
- Optional PC software available
- 2-Year Parts and Labor Warranty
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## Your Spirometry Specialist

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<td>1-Year Warranty, 5-Year Optional</td>
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<td>2-Year Warranty</td>
</tr>
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BACTERIAL FILTRATION EFFICIENCY (BFE)/
DIFFERENTIAL PRESSURE (ΔP)

LABORATORY NUMBER: 58735
PROCEDURE NUMBER: SOP/ARO/007C
SAMPLE SOURCE: Enhanced Filter Co.
SAMPLE IDENTIFICATION: T-150
P.O. #809772
TEST REQUESTED: Bacterial Filtration Efficiency
Differential Pressure
DELTA P MANOMETER NUMBER: 486
DELTA P FLOWMETER NUMBER: 482
START DATE: 26 Jan 94
COMPLETION DATE: 28 Jan 94
REPORT DATE: 31 Jan 94

TEST PROCEDURE:

The procedure used for these tests is described in Nelson Laboratories' Procedure No. ARO/007C in accordance with MIL Spec MIL-M-36954C, 4.4.1.1.1 and 4.4.1.2.

A culture of Staphylococcus aureus was diluted in 1.5% peptone water to a precise concentration. The culture suspension was pumped through a 'Chicago' nebulizer at a controlled flow rate and fixed air pressure. The constant challenge delivery at a fixed air pressure formed aerosol droplets with a mean particle size (MPS) of approximately 3.0 μm. The aerosol droplets were generated in a glass aerosol chamber and drawn through a six-stage, viable particle, Andersen sampler. The collection flow rate through the test sample and Andersen sampler was maintained at 28.3 LPM (1 CFM). Test controls and test samples were challenged for a 2 minute interval.
The delivery rate of the challenge also produced a consistent level of 2200 ± 500 colony forming units (CFU) on the test control plates. A test control (no filter medium in the airstream) and reference material are included after every 7-10 test samples. The standard reference material used at Nelson Laboratories has consistently resulted in filtration efficiencies of 97.5% ± 1.0% for the past few years.

The Andersen sampler, a sieve sampler, impinged the aerosol droplets onto the six agar plates based on the size of each droplet. The agar medium used was soybean casein digest agar (SCDA). The agar plates were incubated at 37°C ± 2°C for 48 hours and the colonies formed by each bacteria laden aerosol droplet counted and converted to 'probable hit' values using the hole conversion chart provided by Andersen. These converted counts were used to determine the challenge level delivered to the test samples. The distribution ratio of colonies for each of the six agar plates were used to calculate the mean particle size (MPS) of the challenge aerosol.

RESULTS:

The filtration efficiencies were calculated as a percent difference between test sample runs and the control average using the following equation:

$$BFE \% = \frac{C - T}{C} \times 100$$

Where:  
C = Average of control values.  
T = Count total for test material.

This test procedure produces a more severe challenge to most filtration devices than would be experienced in use. Our purpose with this procedure is not to optimize the filtration efficiency, but to consistently measure, as accurately as possible, the differences between materials, or differences in the same material over time, thereby alerting the manufacturer to significant trends or changes which can then be dealt with promptly.
Several Quality Control steps have been taken to insure and monitor our own ability to consistently perform the Bacterial Filtration efficiency procedure:

1 - The test control average, determined from control runs where no filter medium is in the airstream, must be maintained at 2200 ± 500 CFU for the test to be valid, unless sponsor approves another control average.

2 - We include at least one reference material with every 7-10 samples tested. Statistical evaluation of these reference material data are recorded on Quality Control charts. The filtration efficiency of the reference material must be within ± 3 standard deviations of the average filtration efficiency of the reference material tested from the previous months.

3 - The test sample results are statistically analyzed to alert us to unusual variations which may indicate a need for retest before data are reported.

Reproducibility of the BFE procedure varies directly with test material efficiency. Therefore, our test reports express results below 90% to the nearest whole percent, between 90 to 99 to the nearest 0.1% and above 99 to the nearest 0.01%.

The Differential Pressure or Delta P test simply measured the differential air pressure on either side of the test sample using an incline or "U" tube manometer. Air flow through the test sample was maintained at 8 LPM (corrected for atmospheric pressure at sea level). The Delta P values were reported in mm water/cm² of test area and calculated using the following equation:

\[
\text{DELTA } P \ (\Delta P) = \frac{\bar{M}}{\text{TEST AREA}}
\]

Where: \( \bar{M} \) = Average mm water/cm² of test area of all determinations for each sample.
The sample holder used in the Delta P test has a test area of 5.06 cm².

At least one reference material is included with each set of test samples. The differential pressure values for the reference material are also recorded on Quality Control charts. The individual differential pressure values must be within ±3 standard deviation of the previous months' average to be valid.

Jeff Hills, B.S. RM(AAM)
Study Director

Dennis K. Ransom M.S. SM(AAM)
Associate Laboratory Director
### TABLE OF RESULTS

<table>
<thead>
<tr>
<th>UNIT NUMBER</th>
<th>SAMPLE IDENTIFICATION</th>
<th>DELTA P</th>
<th>PERCENT BFE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>T-150 #1</td>
<td>0.33</td>
<td>99.72</td>
</tr>
<tr>
<td>2</td>
<td>T-150 #2</td>
<td>0.37</td>
<td>99.95</td>
</tr>
<tr>
<td>3</td>
<td>T-150 #3</td>
<td>0.35</td>
<td>99.85</td>
</tr>
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</table>

CONTROL AVERAGE: 2171

MEAN PARTICLE SIZE: 2.9 Microns
VIRUS FILTRATION EFFICIENCY

LABORATORY NUMBER: 69422
PROTOCOL NUMBER: 943146-1
SAMPLE SOURCE: Enhanced Filter Company
SAMPLE IDENTIFICATION: E-150
P.O. #3098
START DATE: 10 Nov 94
COMPLETION DATE: 30 Nov 94
ISSUE DATE: 30 Nov 94

INTRODUCTION:

This report describes the procedure and results of the virus filtration efficiency (VFE) testing. This procedure was performed to determine the filtration efficiency of the test materials using a ratio of the challenge to effluent to determine efficiency. This procedure allowed a reproducible aerosol challenge to be delivered to each of the test materials. This test procedure was modified from Nelson Laboratories, Inc., standard VFE test and employed a more severe challenge (greater than 10^7 plaque forming units) than normally used in the standard VFE procedure.

JUSTIFICATION:

This VFE test provides a number of advantages over other filtration efficiency tests. The use of all glass impingers (AGIs) in the collection process allowed a high concentration of challenge to be delivered to each test material. The aerosol challenge particle size can be tightly controlled by monitoring the airflow and challenge flow through the nebulizer. The aerosol particles can be sized using a six-stage viable particle Andersen sampler.
All aerosols were contained so that there were no biosafety problems. The φX174 bacteriophage has a diameter of 27 nm (0.027 μm) and, therefore, provides a considerable margin of safety over the human pathogens of HBV and HIV.

CHALLENGE PREPARATION:

A 100 mL aliquot of tryptone broth was inoculated with E. coli C and incubated overnight at 37°C ± 2°C with shaking. The
The AGI fluid was assayed by placing aliquots of each sample into tubes containing 2.5 mL of top agar and 1-2 drops of E. coli C. The contents were mixed and poured over the surface of the bottom agar plates. All plates were incubated at 37°C ± 0°C for 18-24 hours.

The filtration efficiencies were calculated using the following equation:

\[ VFE \% = \frac{\text{Plaques without filter} - \text{Plaques with filter}}{\text{Plaques without filter (Control)}} \times 100 \]

RESULTS:

All control runs produced challenge levels of \(>1 \times 10^7\) PFU. The mean particle size (MPS) of the challenge aerosol was also determined using a six-stage Andersen sampler and calculated to be 2.5 \(\mu\)m.

The filtration efficiency of the E-150 #1 was 99.9846\%, E-150 #2 was 99.9933\% and E-150 #3 was 99.9960\%. Refer to Table 1 for summary of these results.

Jeff Hills, B.S. RM(AAM)
Study Director

Jerry R. Nelson, Ph.D. SM(AAM)
Laboratory Director

nhb
Table 1. VFE Results

<table>
<thead>
<tr>
<th>FILTER ID</th>
<th>CHALLENGE LEVEL (PFU)</th>
<th>TOTAL CFU RECOVERED</th>
<th>FILTRATION EFFICIENCY</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-150 #1</td>
<td>$1.12 \times 10^8$</td>
<td>$1.73 \times 10^4$</td>
<td>99.9846%</td>
</tr>
<tr>
<td>E-150 #2</td>
<td>$1.12 \times 10^8$</td>
<td>$7.56 \times 10^3$</td>
<td>99.9933%</td>
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<tr>
<td>E-150 #3</td>
<td>$1.12 \times 10^8$</td>
<td>$4.44 \times 10^3$</td>
<td>99.9960%</td>
</tr>
</tbody>
</table>
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Digital Peak Flow Meter for Spirometry

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