

# A new approach to human performance assessment through $VO_2$ max and resting metabolism

“ Assess, Measure, Improve my Performance ”



“  
*Fitmate™ is a small, inexpensive, userfriendly, lightweight, battery-powered unit, facilitating accurate metabolic measurements in both the field and in the lab<sup>(1)</sup>*  
 ”

- **VO<sub>2</sub>max, sub-max VO<sub>2</sub> and Anaerobic Threshold (AT)**
- **Nutritional assessment (REE, RMR)**
- **Fitness assessment and risk analysis**
- **Body composition & comprehensive weight management**
- **Colour LCD display and embedded high speed thermal printer**
- **Software for data management, exercise prescription and HR-VO<sub>2</sub> training zones**
- **Accurate, affordable and easy-to-use**



Comfortable silicone masks (5 sizes, both adult and pediatric) are available for exercise testing and for resting measurements



Easy to replace, the O<sub>2</sub> cell comes in a sealed bag, Lifespan is 12-18 months and it is indicated by the device.

The Fitmate PRO is a desktop metabolic monitor designed to break the mould of traditional Cardio Pulmonary Exercise Testing and proposes a new approach for the measurement of oxygen consumption during exercise testing or at rest. Fitmate PRO measures VO<sub>2</sub>max, either directly or through a sub-maximal protocol, and provides additional features like the calculation of the Anaerobic Threshold (AT) and the definition of heart rate training zones.

Fitmate PRO is a compact desktop device with internal rechargeable battery, a large LCD screen and in-built printer that allow testing without a computer or mains power lead. Fitmate PRO processes test results and stores all information inside its internal memory, ready for upload to PC software (included).

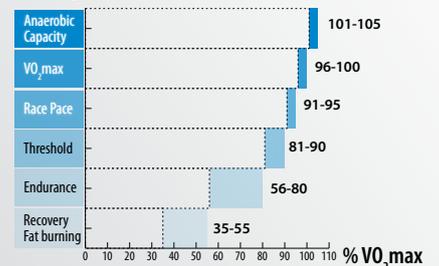
Fitmate PRO has been validated for measuring VO<sub>2</sub>max and for predicting maximal oxygen consumption with a sub-maximal protocol.

### Cardio Respiratory Fitness (VO<sub>2</sub>max)

The Fitmate technology allows to execute the VO<sub>2</sub>max and sub max test with most of cycle ergometers and treadmills available in the market (h/p/cosmos, Ergoline, Trackmaster, Technogym, Monark etc.).

- VO<sub>2</sub>, ventilation, heart rate and related parameters with a 15 seconds sampling rate
- Pre-defined VO<sub>2</sub>max and Sub-max exercise protocols and user defined protocols
- Pre-defined or custom exercise protocols (Bruce, cycle, ramp etc.)
- Automatic and adjustable Anaerobic Threshold detection
- Automatic RQ compensation during resting and graded exercise
- Automatic (protocol) or manual ergometer control
- Heart rate measurement with wireless belt (included) or TTL from ECG (optional)
- Calculation of Training Zones based on relationship between VO<sub>2</sub> and HR (both sub max and VO<sub>2</sub>max testing)
- Warnings and quality control messages (mask leaks, breathing pattern etc.) are displayed during test.

### Training Intensity



Training Zones based on the relationship between VO<sub>2</sub> and HR

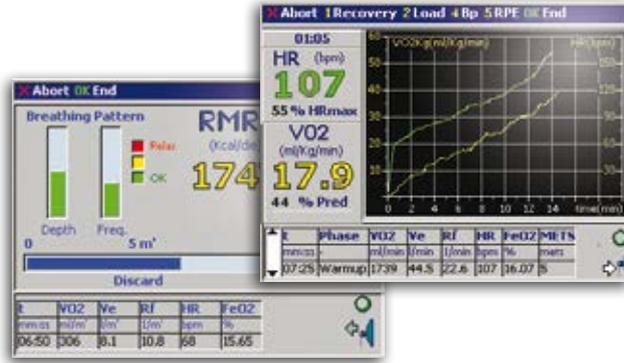
### Fitness Assessment

- Muscular fitness, resistance & flexibility
- Body Composition
- Standard Measurements (WHR, blood pressure etc.)
- Comprehensive Exercise Prescription report based on ACSM guidelines with a database of exercises and pictures for didactic purposes
- Cardiovascular Risk Analysis (PC software only)

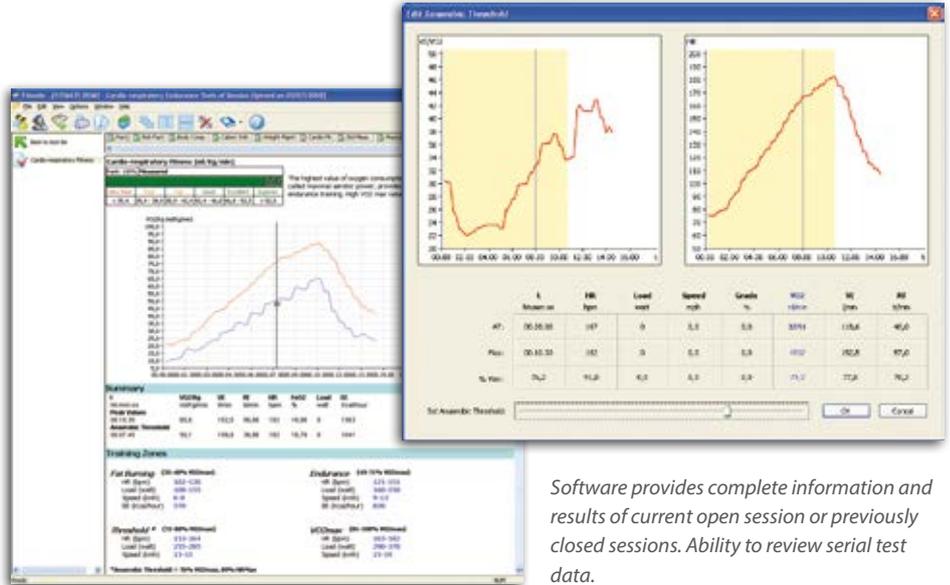
(1) Nieman DC, et al. Validation of Cosmed's FitMate in measuring exercise metabolism. *Appalachian State University, Boone, North Carolina, USA. Res Sports Med.* 2007 Jan-Mar;15(1):67-75

# Nutritional Assessment

- Fitmate measures accurate oxygen consumption at rest (REE, RMR), comparable with conventional metabolic carts. Tests can be executed either with face masks (multi-use), with mouthpiece and antibacterial filter or, optionally, with an integrated canopy hood
- Individual weight management programs based on Energy Balance equation
- Weekly Dietary plan and software (w/ USDA Database);
- Complete Lifestyle and Physical activity monitoring up to 60 days (with optional monitor, Lifecorder)



Real-time screenshot of  $VO_{2max}$  and RMR tests as shown on Fitmate PRO LCD display



Software provides complete information and results of current open session or previously closed sessions. Ability to review serial test data.

**COSMED**  
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I-00041 Rome ITALY (www.cosmed.com)

Last Name: DEMO  
First Name: FITMATE  
ID: 00001 Date(dd-mm-yyyy): 28/04/2009  
Test conducted by: Gender: Male  
Height(cm): 157 Weight(Kg): 86.5  
Age: 33 BMI(Kg/m<sup>2</sup>): 35.0

**Cardio Respiratory Fitness**

Test type: Submaximal  
Ergometer: Other-not interfaced  
Exercise protocol: Bike-Ramp 25W/min  
HRmax (bpm): 187

The Graph shows  $VO_{2/Kg}$ , Heart Rate

t	VO2Kg	Ve	Rf	HR	FeO2	Load	EE
mm:ss	ml/Kg/min	l/min	l/min	bpm	%	Watt	kcal/h
06:30	34.2	80.8	33.0	140	16.14	111	887

Peak value

$VO_{2}$  (ml/Kg/min)  
Rank: 91%

Very Poor	Poor	Fair	Good	Excellent	Superior
<35.3	35.3-38.9	38.9-42.4	42.4-46.8	46.8-52.5	>52.5

Functional Capacity (METS): 14

**TRAINING ZONES (HR)**

HR (bpm)	Fat Burn	Endurance	Thresh.	Race Pace	$VO_{2max}$	Supramax
100 - 132	134 - 162	164 - 174	176 - 180	182 - 187		
Load (W)	100-175	180-265	270-305	310-320	325-340	345-360
% $VO_{2}$	35-55	56-80	81-90	91-95	96-100	101-105
EE(Kcal/h)	640	920				

Individual HR Training Zones based on calculated Anaerobic Threshold

Subject data & Test Information

The Graph shows  $VO_{2/Kg}$ , Heart Rate

Gas Exchange Data ( $VO_{2}$ ,  $VE$ ,  $HR$  etc.) at peak, average, or each 15 secs interval

Individual HR Training Zones based on calculated Anaerobic Threshold

**Fitmate Wellness Technology**

Last Name: BONO Age: 41 Membership #: 25/02/2009  
First Name: James Height (cm): 190.00 Report Date: Personal Trainer:  
Gender: Male Weight (kg): 80.8

**Exercise Prescription**

Dear James, I would like to thank you for participating in our recent fitness screening. The results of your assessment based upon norms for your age and sex are attached. Following a thorough review of your health risk appraisal and fitness assessment we identified **no cardiovascular risk factors** based upon criteria from the American College of Sports Medicine. Based upon your age, family history and exercise program, we recommend the following:

In order to control/reduce fat, it is important that you follow your exercise prescription as follows:

- Initial conditioning stage
- Improved conditioning
- A maintenance condition

In each of these phases, the training and flexibility device is to create a strong foundation to increase in training to maintain a lifestyle of health. Your exercise prescription is as follows:

**Frequency of exercise:** Your exercise prescription is Frequency (4 per week)

**Warm-up:** 5 min

**Cardiovascular Training**

One or a combination of modalities which involves the use of large muscle groups such as walking, running, cycling, swimming, aerobic dancing, rowing etc.). If you choose to participate in more than one cardiovascular activity, a minimum of 10 minutes should be dedicated to each one. Varying of activities is recommended as this will stress different muscle groups, keep your exercise program interesting, and assist in the prevention of overuse/abuse injuries. There is no one best cardiovascular activity. You will achieve cardiovascular benefits from participation on any one of these activities. The one best exercise is the one you like. Recent studies have demonstrated that long term success and adherence to an exercise program is contingent upon your selection of activities you enjoy.

**Duration:** 20 minutes  
**Intensity:** 107 bpm

The intensity of exercise should be beneficial, you should work at the specified Program Goal set in the program.

**Cool Down:** This is one of the most important risk for muscle soreness, injury, Down accident! lie strongly rest with the next phase.

**Muscular Training**

Your muscular training program needs. Some exercises are designed for some muscle groups. The resistance for each exercise should be set by some type of starting weight gain repetition. If you are able to do the resistance by no more than decrease the resistance by 10%.

**Flexibility Development**

Do exercises involving the lower back, hip/ groin. Hold each repeat 3/4 times with intervals.

**Number of exercises:** 6 to 10  
**Intensity/Duration:** 10 to 15  
**Repetitions:** 3 to 4

**Muscular Training Program**

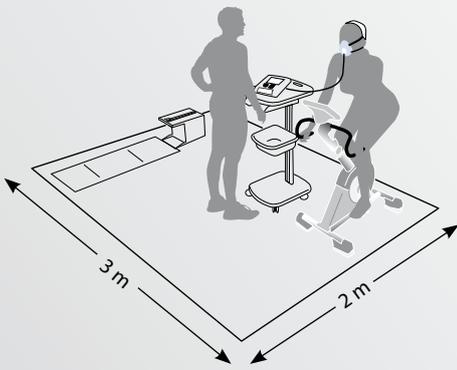
Exercise	Repetitions
Leg press Cal Extension	3 sets of 10 repetitions each with weight = 100
Log curl	3 sets of 10 repetitions each with weight = 50
Pectorial Fly	3 sets of 10 repetitions each with weight = 30
Biceps Curl	3 sets of 10 repetitions each with weight = 30
Triceps Press	3 sets of 10 repetitions each with weight = 30
Chest Press	3 sets of 10 repetitions each with weight = 30
Abdominal	3 sets of 10 repetitions each with weight = 25

Thermal printout sample (original size 110mm wide): Sub-Maximal Exercise Test

Software printout sample (available in A4 or Letter size): ACSM Exercise Rx

## Validation articles

- Vandarakis D, et al. A comparison of COSMED metabolic systems for the determination of RMR. *Res Sports Med* 2013;21(2):187
- Lee J et al. Validation Of The Cosmed Fitmate For Predicting Maximal Oxygen Consumption Medicine & Science in Sports & Exercise: May 2009 - Volume 41 - Issue 5 - p 260
- Nieman DC, et al. Validation of Cosmed's FitMate in measuring exercise metabolism. *Appalachian State University, Boone, North Carolina, USA. Res Sports Med* 2007 Jan-Mar;15(1):67-75
- Nieman DC, et al. Validation of Cosmed's FitMate in measuring oxygen consumption and estimating resting metabolic rate. *Appalachian State University, Boone, North Carolina, USA. Res Sports Med* 2006 Apr-Jun;14(2):89-96
- More scientific studies on [www.cosmed.com/bibliography](http://www.cosmed.com/bibliography)



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## Technical Specifications

Product	Description	REF
Fitmate PRO	Desktop metabolic monitor	C09066-02-99
Standard packaging	Unit, Carrying Case, PC Software, Battery Charger, USB Cable, Oxygen Sensor, Roll of thermal paper, Measuring Tape, RMR Flowmeter ID18, VO <sub>2</sub> Flowmeter ID28, Reusable V2 mask (Medium size), HR probe and belt, Head cap for V2 mask, Antibacterial filters (15 pcs).	
<b>Standard Tests</b>		
Cardio Pulmonary Exercise Test (CPET)	VO <sub>2</sub> max, Sub-max VO <sub>2</sub> , Thresholds (AT, RCP), Heart Rate with HR belt	
Nutritional Assessment	Resting Energy Expenditure (REE, RMR). Indirect Calorimetry (w/ Face Mask or w/ mouthpieces-antibacterial filter), Weight Management Program (Energy Balance), Diet Planner, Standardized Measurements (WHR, BP, RHR, etc), Body composition by Skinfold	
Fitness Assessment	Muscular Endurance/Strength/Flexibility, Standardized Measurements (WHR, BP, RHR, etc), Body composition by Skinfold	
Exercise Prescription	ACSM Exercise Prescription, VO <sub>2</sub> /HR Training Zones (based on AT)	
<b>Flowmeter</b>	<b>VO<sub>2</sub>max (Turbine Ø-28mm)</b>	<b>RMR/REE (Turbine Ø-18mm)</b>
Type	Bidirectional Digital Turbine	Bidirectional Digital Turbine
Flow Range	0-16 l/s	0-8 l/s
Accuracy	± 2% or 20 ml/s (flow) ± 2% or 200 ml/min (ventil.)	± 2% or 20 ml/s (flow) ± 2% or 100 ml/min (ventil.)
Resistance	<0.6 cmH <sub>2</sub> O /l/s @ 14l/s	<0.7 cmH <sub>2</sub> O/l/s @ 3l/s
Ventilation range	0-300 l/min	0-50 l/min
<b>Gas Analyzers</b>	<b>O<sub>2</sub></b>	
Type	GFC	
Range	0-25%	
Accuracy	±2% (REE) ±0.02% (O <sub>2</sub> )	
Warm-up time	10 seconds	
<b>Hardware</b>		
Dimensions & Weight	24 x 20 x 8 cm / 1.5kg	
Interface ports	USB A-B, RS-232, HR-TTL, Flowmeter	
Display	Colour LCD 320 x 240 pixel	
Printer	High speed thermal printer 12 cm	
Battery	Rechargeable Li-ion batteries (autonomy 6h; charging time 2h10)	
Electrical Requirements	220V ± 10 %;50/60Hz 110V ± 10%; 50/60Hz	
<b>Firmware</b>		
Available languages	Italian, English, Spanish, French, German, Portuguese, Greek, Dutch, Turkish, Chinese, Korean, Japanese, Finnish, Polish, Russian, Slovenian	
<b>Software</b>		
Available languages	Italian, English, Spanish, French, German, Portuguese, Greek, Dutch, Chinese, Finnish, Russian, Slovenian	
PC Configuration	Pentium or faster, Windows XP, VISTA (32/64 bit), Windows 7 (32/64 bit) 128 Mb RAM or more, USB, CD-Rom reader, 80 Mb on HD space available.	
<b>Accessories &amp; Options</b>	<b>Description</b>	<b>REF</b>
REE with Canopy Hood	Kit including transparent canopy hood and blower for "gold standard" indirect calorimetry measurements at rest	C03950-01-11
Fitmate cart	Fits Fitmate unit, printer, masks, printouts, carrying case	C02950-01-11
Calibration syringe	3L syringe for accuracy check of flow volume measurements	C00600-01-11
O <sub>2</sub> sensor replacement kit	Includes GFC sensor, sampling line and mounting key	C02748-01-11
Activity Monitor Fitmate Lifecorder PLUS	Integrated one-axial, solid state accelerometer.	C03580-01-04
Flexibility tester Sit & Reach box	Box for the indirect measurement of lower back and hamstring flexibility	A-662-160-001
<b>Safety &amp; Quality Standards</b>		
MDD (93/42 EEC); FDA 510(k); EN 60601-1 (safety) / EN 60601-1-2 (EMC)		



To know more:

