K4 b²

Cardio Pulmonary Exercise Testing


Why limit your studies to the length of the cable?

- Pulmonary Gas Exchange ($VO_2$, $VCO_2$)
- Breath by Breath Technology
- Telemetry Data Transmission up to 800m
- Indirect Calorimetry
- Integrated GPS System
- Integrated Oxygen Saturation ($SpO_2$)
- Integrated 12-lead Stress Testing ECG
- Powerful Windows™ Software for advanced data analysis

COSMED

Pulmonary Function Equipment

The K4 b² is the first COSMED portable system for intrapulmonary gas exchange analysis on true breath by breath basis. Its technology and dimensions allow to measure physiological response to exercise in the field without any limit.

## Applications

Sport Medicine, Research, Human Performance, Gait Lab, Occupational health, Cardiology, Cardiac Rehabilitation, Clinical Nutrition and any application that requires the measurement of the cardio-respiratory response either in the field or in the lab.

## Accurate & Reliable

COSMED is the only manufacturer having more than 20 years of experience in mobile metabolic testing.

The K4 b² has been designed to be accurate and reliable in any condition. It has been validated, used and mentioned in more than 300 publications worldwide in the most important scientific journals.

The fast $O_2$ and $CO_2$ analyzers are maintained at a constant temperature. Sampling flow and pressure are continuously monitored. A barometer along with a temperature and pressure sensor allow instantaneous correction for any change in the environmental conditions.

## True Mobility

The K4 b² is provided with all necessary hardware for testing in the field:

- Total weight of 800 g
- Integrated LCD for calibrating and showing data during field testing without the need of a PC.
- Powerful rechargeable batteries that can be exchanged during the test.

## 3 devices in 1!!!

The K4 b² is a versatile system. Whether in the lab or in the field, tests can be carried out in three different configurations:

### 1 - Holter Data Recorder

The main unit stores breath by breath data in its high capacity memory (16.000 breaths). When the test is completed all data may be downloaded to the PC for analysis and presentation. The versatility design of the unit allows for tests to be run in the field without the need for a PC or laptop.

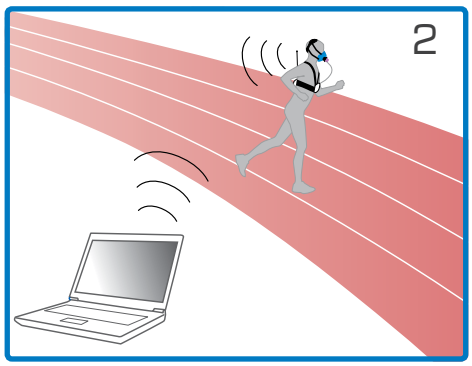
### 2 - Telemetry Transmission

The K4 b² utilizes digital telemetry transmission to send breath by breath data to the PC located away from the subject (up to 800 meters). During transmissions K4 b² stores data into its memory to avoid any possible data lost.

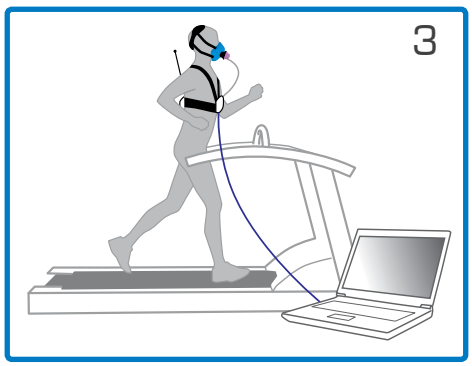
### 3 - Laboratory Station

Connect the RS-232 cable to a PC and turn your mobile K4 b² into a conventional Metabolic Cart. The K4 b² offers the same features of the best stand alone laboratory systems (accuracy, easy of use, ergometer control etc.).

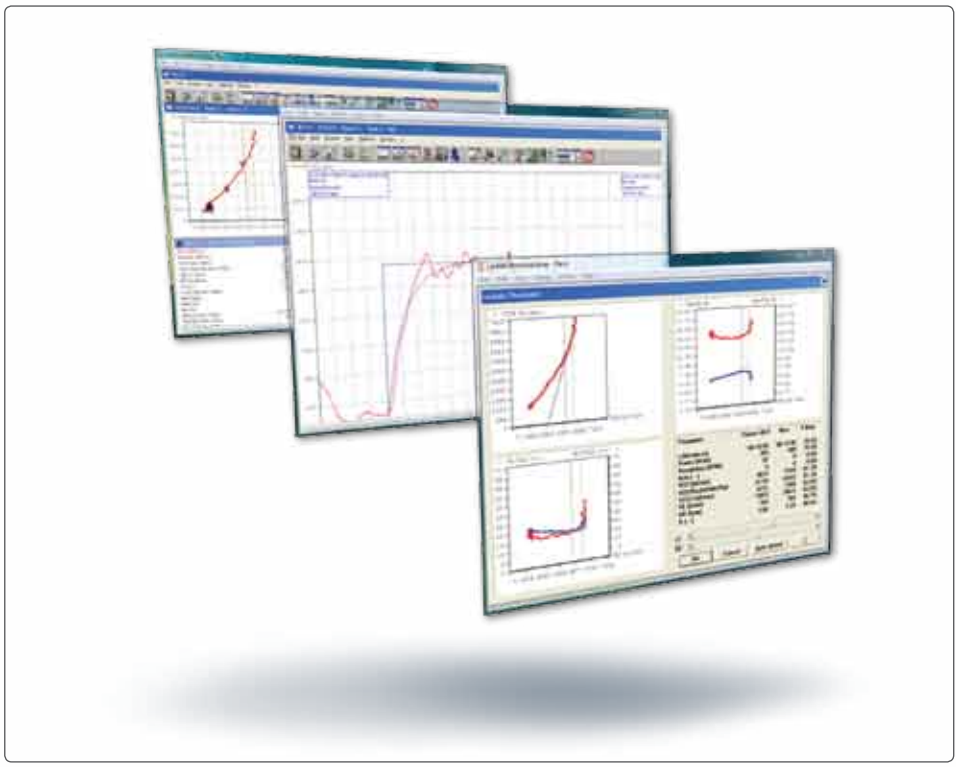

*Holter data recorder*




*Telemetry Transmission*



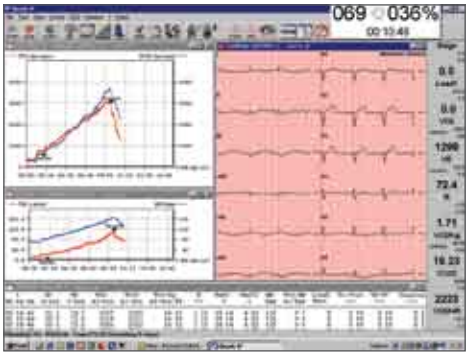

*Laboratory Station*



*PC software Windows VISTA compatible, offers familiar user interface and powerful data elaboration*

## Manage data completely

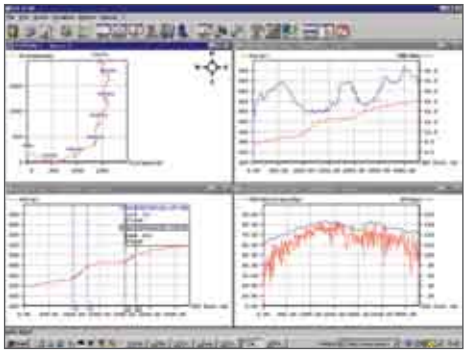
- Patient Database management.
- Selection of parameters and graphs for custom data presentation.
- Automatic and manual detection of anaerobic and RC threshold according to the modified V-slope method or user defined plots.
- Control of any ergometer provided with a RS-232 interface.
- Real time visualization of the $O_2$ and $CO_2$ waveforms during the test.
- File export in different formats (Lotus, Excel, ASCII).
- Advanced data elaboration (filtering, smoothing. averaging etc.).
- $O_2$ Kinetics tool ($O_2$ deficit, $O_2$ debt, time constant, etc.).
- Exercise Flow-Volume loops.
- Custom parameters and predicted equations.
- Custom fittings (linear and exponential).
- "Send to Excel" feature to easily export data on MS Excel.
- Speed and distance marking for easy calculation of $O_2$ cost of locomotion (Gait Lab applications).
- Non Invasive Cardiac Output during breath by breath analysis.



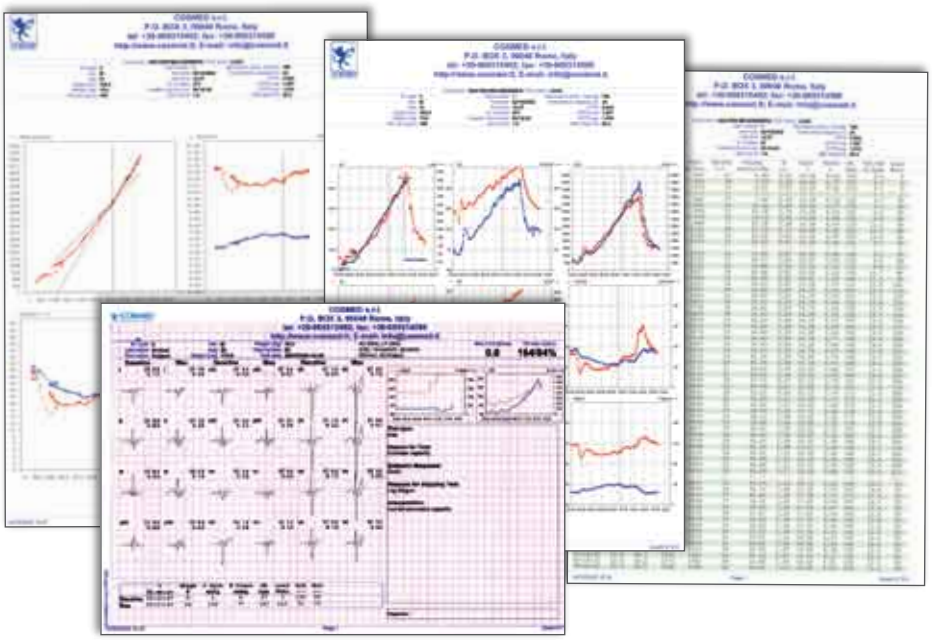
*Real time display of both gas exchange and ECG when integrating K4 b² with COSMED wireless or patient cable ECG*

## Integrated GPS and Enjoy Field Testing!!

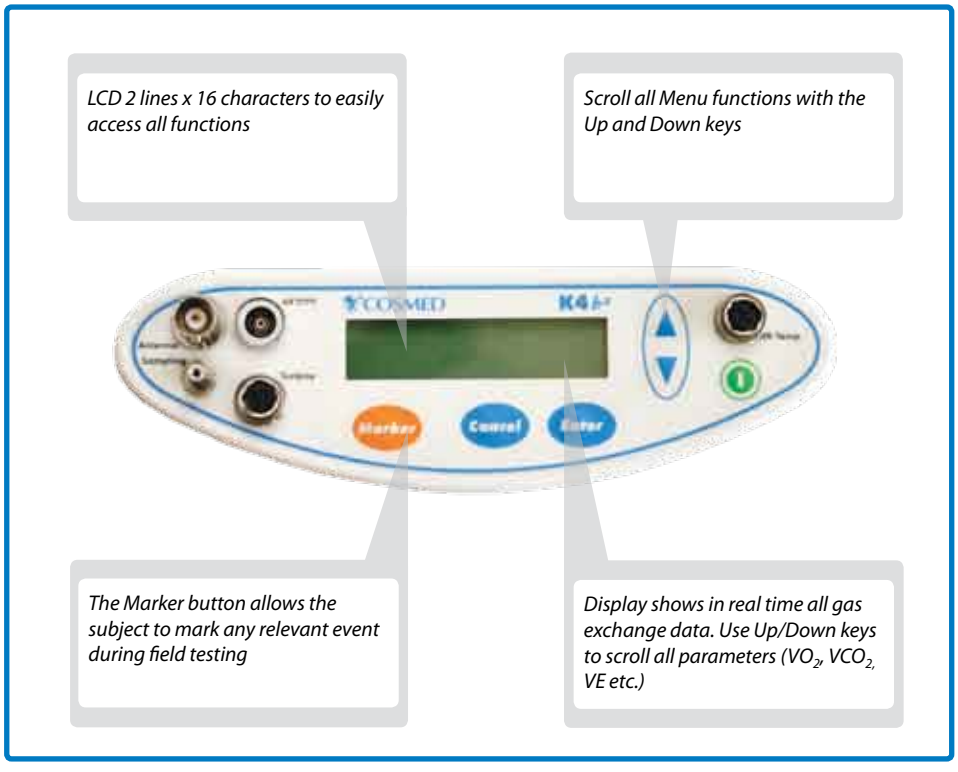
By connecting the GPS module you can measure speed, distance, altitude and geographical position of a subject running in an open field together with gas exchange data.



*Graphs showing the geographical data obtained from GPS and user selected gas exchange data ($VO_2$kg, Ventilation, HR etc.)*



*Explicative colour printout reports in different formats deliver clear information to user including: graphical test display, numerical data compared to predicted values and automatic interpretation of test results.*



- K4 b² unit
- Manual & Software
- Adult harness
- 3 Face Masks
- Antenna
- Adult Headcap
- 3 Rechargeable Batteries
- 2 Flowmeter
- Charge unit
- HR Polar® belt
- Telemetry unit
- Calibration unit

# Technical Specification

| Flowmeter | Bidirectional digital turbine Ø 28 mm |
|---|---|
| Flow range | 0.08-20 l/s |
| Ventilation Range | 0-300 l/min |
| Accuracy | ±2 % |
| Flow Resistance | <0.7 $cmH_2O/l/s$ @ 14 l/s |
| Resolution | 8 ml |

| Gas Analyzer | Oxygen ($O_2$) | Carbon Dioxide ($CO_2$) |
|---|---|---|
| Type | GFC | NDIR |
| Range | 7-24% $O_2$ | 0-8% $CO_2$ |
| Response time | 120 ms per 90% FS | 120 ms per 90% FS |
| Accuracy | ± 0.02% $O_2$ | ± 0.01% $CO_2$ |

| Gas Exchange Measurement | |
|---|---|
| Type | Breath by Breath |
| Expired gas drying | Nafion® tube |

| Hardware | Transmitter Unit | Receiver Unit |
|---|---|---|
| Memory | 16,000 breaths | |
| Display | LCD - 2 lines x 16 characters | |
| Keyboard | 6 keys | |
| Heart Rate Monitor | Wireless double electrode (Polar®) | |
| Serial port | RS 232 | |
| Thermometers (range) | 0-50°C | |
| Barometers (range) | 53-106 Kpa | |
| Battery type | Ni-MH | 4 x 1.5V AA |
| Battery autonomy | ~ 6 hours | |
| Dimensions (mm/in) | 170 x 55 x 100 / 6.7 x 2.2 x 3.9 | 170 x 48 x 90 /6.7 x 1.9 x 3.5 |
| Weight (g/lb) | 475 / 1.04 | 330 / 0.72 |
| Transmission distance | 800 m (US version only: FCC rules limit transmission up to 300 yards max) | |
| GPS Module (g/lb) | 80 / 0.17 | |

## Standard Packaging Includes

K4 b² TX Module, K4 b² RX Module, GPS Module, three (3) Rechargeable Batteries, Charge unit, two (2) flowmeters, Polar HR belt, three (3) faces masks (Adult S, M, L), Adult headcap, Adult Harness, Gas Calibration unit, PC software, Aluminium Carrying case, RS-232 cable, antenna, extra cabling for connections.

## Available languages

English, Italian, Spanish, French, German

## Electrical requirements

| | |
|---|---|
| Power supply | 100/240V, 50-60 Hz |
| Power consumption | 60 VA |
| Class | I type B |

## PC configuration required

Pentium or faster, Windows XP, VISTA 32, 128 Mb RAM or more, CD-Rom reader, 80 Mb on HD space available.

## Safety & Quality Standards

Equipment complies with MDD (93/42 EEC) and FDA 510(k) cleared.

CE 0476

*Distributed by:*

CERMET SISTEMA DI GESTIONE CERTIFICATO Reg.n. 387- M UNI EN ISO 13485:2003

CERMET SISTEMA DI GESTIONE CERTIFICATO Reg.n. 387- A UNI EN ISO 9001:2008

COSMED Pulmonary Function Equipment


**COSMED srl**
Via dei Piani di Monte Savello 37
Pavona di Albano - Rome
I - 00041 ITALY
Phone +39 (06) 931-5492
Fax +39 (06) 931-4580
info@cosmed.com
www.cosmed.com

**COSMED USA Inc.**
2211 N. Elston Avenue #305
Chicago, IL 60614
UNITED STATES
Phone +1 (773) 645-8113
Fax +1 (773) 645-8116
info@cosmedusa.com
www.cosmedusa.com

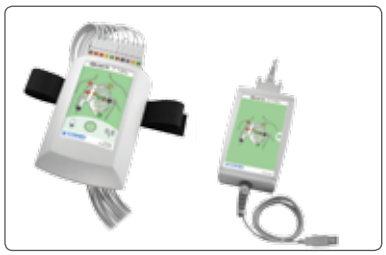
**COSMED China Office**
1st Floor, 215-1 QiYi Road
Guangzhou 510030
P. R. of CHINA
Phone +86 (20) 8332-4521
Fax +86 (20) 8332-0683
china@cosmed.com
www.cosmed.com

*Ideal for field testing, the new GPS kit brings Speed, Distance, Altitude, Longitude and Latitude measurements in real time together with Gas Exchange measurements. The GPS module is small, robust and water resistant.*

## Integrated GPS for Field Testing

*AquaTrainer is an innovative snorkel for measuring $VO_2$max on swimmers in their environment (flume or pool).*

## Gas Exchange in Swimming



*K4 $b^2$ can be completed with different configurations of 12 lead stress test ECG (wireless and patient cable) for a truly integrated cardiopulmonary exercise testing.*

## 12-lead Stress Testing ECG

*Add oximetry sensors (finger, ear-clip and reflectance) for a continuos monitoring of $SPO_2$ during exercise.*

## Integrated $SPO_2$ measurements

*The harness is designed to provide a perfect balance during any sport discipline*

*K4 b² used with Olympic level speed skater*

*For comfortable biking K4 b² can be placed on the back of the subject by adjusting harness*