K5

WEARABLE METABOLIC TECHNOLOGY

"Field ready... wear it!"

COSMED
The Metabolic Company

> *Introducing K5, the 4th generation of the most popular wearable metabolic system, a breakthrough in the field of exercise physiology and human performance assessment.*

1987 ... *introducing K2, the first compact Metabolic system (O_2 consumption) for field testing*

1994 ... *introducing K4, the first mobile metabolic system (both O2 and CO2) with patented dynamic mixing chamber*

1997 ... *introducing K4 b², the first "breath by breath" mobile metabolic system with integrated GPS*

2014 ... *K5 wear it!*

It has been almost 30 years since COSMED introduced the first generation of compact metabolic systems. During this time we have collected significant feedback and ideas directly from the most important institutions around the world.

The result of such an experience has been carefully implemented in a complete new piece of technology incorporating latest design and providing researchers, sport professionals and clinical users new ways to explore human exercise physiology.

COSMED is proud to introduce **K5**, the 4th generation of the most popular wearable metabolic system, a breakthrough in the field of exercise physiology and human performance assessment.

The K5 is the most innovative and versatile metabolic system ever created. K5 reaps the benefits of more than 25 years of experience with metabolic systems. K5 features a list of new and unique characteristics that expand the scope of metabolic testing from clinical exercise testing to performance assessment.

Accuracy & Reliability

K5 has been designed with a focus on accuracy and usability. With this new generation of metabolic system COSMED introduces new patented technologies for gas exchange measurements.

IntelliMET™ (Intelligent Dual Metabolic Sampling Technology - US Patent 9581539) sets a new standard in metabolic measurements by providing a dual gas sampling system able to provide both micro-dynamic mixing chamber and breath by breath gas exchange measurements. With IntelliMET (option) users can select between the mixing chamber and the breath

by breath mode depending on the protocol type, research or other factors.

K5 features proven and reliable, highly linear and rapid response O_2 (GFC) and CO_2 (NDIR) sensors. The O_2 sensor has an average lifespan of 12 months. Once exhausted, the O_2 cell is replaced by the user without the need of technical assistance.

K5 is also provided with a new function for a rapid automatic-verification ("Check") of the main hardware components (sensors status, response time, humidity, pneumatics etc.). With this, users can quickly perform a quality control of the whole system before starting or even while the test is running.

4,5" (114 mm)

2,5" (64 mm)

6,8" (174 mm)

Design

- Designed according to **IP54 standard**, K5 is a tough/rugged device. Rubber seals protect the body, connectors and ports against water, moisture and dust intrusion.
- Single-body device (battery inside), reduces weight (780 g), thus simplifying setup.
- 3,5" LCD (TFT transflective, LED-backlit). The resistive touch-screen allows full interaction with gloves or wet fingers.
- 4 keys waterproof keyboard for rapid access to frequent functions (On/Off and Rec buttons). Back/Check and Home/Marker keys.
- Li-ion "smart battery" (w/ microprocessor) with an LCD showing charge status. Battery life is a total of 4 hours. Batteries are easily replaceable.
- Two large compartments located on the top of K5 allow users to access the O_2 sensor (user replaceable), the battery and the SD-card slot (for extra storage capacity).
- Tripod mount (1/4"-20 UNC) located at the bottom of the unit allows mounting on several standard supports.

The 3,5" LCD is transflective with backlit TFT for optimal viewing in all lighting conditions

- Optional paediatric harness has the same features of the standard one and fits subjects with height range between 120 and 160 cm.
- The integrated tripod mount (1/4"-20 UNC) provides extreme versatility and acts as a safety support in case K5 is mounted on supports available for other wearable technology (i.e. for biking or other outdoor activities and sports) or when used in lab testing.

All plugs, connectors and caps are protected by seals and are water, moisture and dust resistant

User replaceable O_2 sensor and/or battery is an easy operation without any special tools

Accessing the SD-card slot is useful to simplify data sharing without connecting to the PC software

Wearable

Great attention has been paid to simplify subject setup and improve ergonomics. The preferred position of the device is mounted on the back of the subject.

- New harness design (2 sizes) provides great comfort and ergonomics during dynamic field testing.
- The "standard" harness consists in 2 pieces; the "skeleton" is a robust/rigid/rugged part adjustable in length (fits height ranges from 160 to 200 cm circa). The soft piece is made in neoprene, detachable and washable, providing great comfort while walking or running.

"
K5 complies with IP54 standard, it has been specifically designed for outdoor use and provides protection against heavy water (rain, sweat) or dust.
"

Device User Interface

- 3.5" touch-screen LCD display (320 x 240) with LED-back-lit TFT for optimal viewing in all lighting conditions.
- Resistive touch-screen technology allows use in outdoor conditions with either gloves or wet fingers.
- 4 Keys for on/off and Start Recording data plus multi-function quick access keys for Home/Marker and Back/Check commands.
- Intuitive user interface allows simple navigation and quick access to all commands and features.
- Big easy-to-click icons for navigating across all functions.
- Status bar provides information regarding time, date, battery status, Bluetooth (on/off), GPS and notification icons (for QC messages, warnings etc.).
- During real time the firmware provides a menu/icon bar for switching between different views (data, graphs etc.), GPS data and/or connected devices (ANT+ profiles).

Navigation

The K5 features a standard integrated 10Hz GPS/QZSS receiver, with an accuracy of 2.5m in position and 0.1m/s in speed. K5 accurately measures both altitude and grade by using the internal barometric pressure sensor coupled with GPS readings.

GPS data can be monitored real time on K5 display and, eventually, downloaded (together with K5 metabolic parameters) in mapping software like Google Earth or Cesium

Wireless Connectivity

Great attention has been given to allow K5 more efficient wireless data transmission and seamless integration with other devices. Provided with both standard and optional wireless data transmission K5 is also compatible with Bluetooth 4.0 technology enabling integration with external peripherals such as ECG, SpO$_2$ monitors etc.

K5 is also fully compatible with ANT+ technology. ANT+ is a wireless technology that allows monitoring devices to communicate each other and integrating and synchronizing data in a single source.

- **Standard Bluetooth 2.1 + EDR** with data transmission range **10m** in line-of-sight (standard).

- **Long Range Bluetooth 2.1 + EDR** with data transmission range **up to 1000 m** in line-of-sight (option).

- **ANT+ engine** for integration with external devices (SRM, CycleOps, Garmin etc.) up to 8 channels simultaneously and compatible with 5 profiles[1] (Bike Power & Torque, Bike Speed & Cadence, Blood Pressure, HR monitor, Muscle Oxygen Monitor, Stride Based Speed & Distance, Weight Scale).

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1 More profiles coming soon

>1000 meters — **Bluetooth LR** — Long Range Wireless Data Transmission

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...Test in progress

VE	L/min	HR	bpm	VO2	ml/min
128.3		141		1875	
R	%	FeO2	%	CO2	
0.91		16.42		4.87	

Data | Raw | Graph | GPS | ANT+ | Control

🔍 Search... ⊗
👤 Francesco Lopez Guitierrez   ID 34   16/03/74

The real-time GUI of K5 allows users to switch views between different data sets, graphs and GPS information.

Icon	Description
♡ HR	Heart Rate (HR)
CAD SPD B&C	Bike Speed (SPD) / Bike Cadence (CAD) / Bike Speed & Cadence (S&C)
PWR CTF	Bicycle Power (PWR) / Crank Torque Frequency (CTF)
SPD STP	Foot Speed (SPD) / Distance (STP)
MO₂	Muscle Oxygen Monitor (MO$_2$)

K5 - Metabolic data
Power - Torque
Speed - Cadence
Bike Power Meter

ANT+ — **5** Profiles — **ANT+ Compatible** — Wireless integrated sport-sensor-devices

Example on how the ANT+ bike power profile works with K5

Data Management & Software

Every K5 comes with the Metabolic Module of OMNIA, the new modular software suite from COSMED with an intuitive and innovative user interface.

Compatible with the entire COSMED product range, OMNIA allows the user to operate complex equipment without requiring long learning paths. OMNIA is compatible with latest Windows OS (Win 10).

- Easy-to-use touch-screen graphic user interface with intuitive workflow and hierarchy. Designed to work with both standard PC and tablets.

- Compatible with Windows 7, 8, 8.1, 10 (32 or 64 bit). Mac OS compatibility when installed in Virtual PC OS (Parallels, VMware).

- Multi-language environment - Italian, English, Spanish, French, German, Portuguese, Greek, Dutch, Turkish, Russian, Chinese (Trad), Chinese (Simplified), Korean, Romanian, Czech, Norwegian[2].

- SQL Database allowing virtually unlimited records and data safety.

- Full Network Database Management (optional). OMNIA allows installations in complex Client/Server environments.

- User access by ID and password protected. Create roles and users by the built-in "user management" tool.

- Security Data solutions (according to US HipAA, ISO 27799:2008, EU 95/46/CE and 2002/58/CE).

- Multi-users access rights management (Principal Investigator, Physician, Technician, Administrator…) with event logging.

- Allows easy data and graphs display through either pre-defined dashboards (9 panel plot, etc.) or user defined templates.

- Real time acquisition and capture of Exercise Flow-Volume loops (EFVL) for the evaluation of ventilatory limitation.

- Multi-layers environment allows multiple views easy to access either by a click of the mouse or simply sliding the finger on a touch-screen device.

- Built-in Protocol editor (graphical) to design any type of exercise protocol (for both bikes and treadmills).

- Comprehensive interpretation tool with a powerful algorithm automatically elaborating results and providing interpretation text strings including numerical results.

- Ergometer control: standard (COSMED Bike, COSMED Treadmill, Ergoline, HPCosmos, Monark, Trackmaster) and optional (Archimed, BCube, BikeMax, Bosh 601, CatEye, clubLine, CSafe Treadmill, CT100-ErgocardII, Cyclus 2, ErgoFit Bike, Excalib.Sport, Excalibur, Excite-Bike, Excite-Treadmill, ImbramedBike, Imbramed-Treadmill, Lodebike, Powerjog, RAM770, TechnogymRunRace, Tecmachine1800, TrackEmul, Woodway).

2   More languages coming soon

OMNIA allows to print fully customisable reports that may include also interpretation, graphical and tabular data

OMNIA, the PC software provided with K5, offers an innovative and intuitive user interface touch-screen and tablet ready

Ports

- K5 comes standard with USB port for real-time communication with PC or for data download. Connecting K5 to a USB port turns the device into a conventional metabolic cart (PC controlled via software only).
- Medical grade AC/DC Power Plug for supplying direct current from the mains power (international plugs provided).
- HR Aux (auxiliary Heart Rate port) for reading HR obtained from an ECG (by TTL) or a Polar® belt (by plugging a Polar® HR receiver).

CPU & Data Storage

- 456 MHz CPU with 128 MB RAM.
- 512 MB internal flash memory for data storage and OS. Up to 2.048.000 breaths recordable.
- 32 GB SD-Card slot (HC type) user accessible for extra storage capacity and easy data sharing without passing through PC software.

Standard equipment

- K5 Wearable Metabolic System.
- 2 rechargeable Li-ion "smart" batteries.
- Dual bay battery charger adapter.
- AC/DC adapter 100-240V w/ INTL plugs for direct supply from the main power.
- 3 face masks w/ inspiratory valves (extra-small, small, medium) and 2 headgears (M, XS).
- 2 turbine flowmeters and one reader.
- 1 nafion line.
- HR monitor belt (COSMED ANT+).
- 1 harness (Adult size).
- Rugged Peli™ carrying case .
- OMNIA PC software.

Optional modules

- Long Distance Bluetooth Module.
- IntelliMET® w/ breath by breath Module.
- ANT+ Engine.
- Wireless wrist-worn pulse oximeter, NONIN WristOx2 3150 (Ref A-661-600-018)
- 3L Calibration syringe, gas & regulators.

Headphone

Turbine

Power

USB

HR Aux (Polar/TTL)

4 Hours Capacity

Smart Battery
Li-ion Fast-charge w/LCD status

The replaceable battery has an LCD showing status of the charge

The K5 face masks are provided with inspiratory valves that can reduce inspiratory resistance while breathing (available in Large, Medium and Small sizes, adult only)

K5 is supplied with a new rugged-waterproof professional case. The case has two compartments for separating wet items from the electrical parts

Technical Specifications

Physical Design
Design	Single body
IP (Protection Standard)	IP54 standard (Rugged design, weather sealed, waterproof and dust-proof)
Dimensions	174 x 111 x 64 mm (6.8 x 4.4 x 2.5 in)
Weight	750 g (1.7 lb) (900 g including battery)
Keyboard	4 keys waterproof (on/off, Rec, Home/Marker, Check/Back)
Harness	Multi-size ergonomic harness, adjustable
Mounts	Camera mount screw thread standard 1/4" 20 UNC for mounting on several physical supports

Gas & Flow Measurements
Gas Exchange (standard)	Micro Dynamic Mixing Chamber
Gas Exchange (optional)	IntelliMET™ - Intelligent Dual Metabolic Sampling Technology (Mixing Chamber & Breath by breath) US Patent 9581539
Flowmeter	Digital Turbine, 0.08-16 l/s Flow Range, ± 2% or 50 ml/s Accuracy, <0.6 cmH$_2$O s/l @ 14 l/s Resistance
O$_2$ sensor	GFC 0-100% range, lifespan 12 months (user replaceable), ±0.02% Accuracy, ~120 ms response time
CO$_2$ sensor	Digital NDIR, 0-10% range, ±0.02% Accuracy, ~100 ms response time

Wireless Connectivity
Telemetry (standard)	Bluetooth 2.1 + EDR Class II (Range 10 m line-of-sight)
Telemetry (optional)	Long range Bluetooth 2.1 + EDR Class I (Up to 1000 m line-of-sight)
ANT+ Module (optional)	ANT+ engine (master/slave) for integrating ANT+ profiles up to 8 channels

Navigation & Motion Sensors
GPS	10Hz GPS/QZSS receiver - position accuracy 2.5 m, speed accuracy 0.1 m/s
Altimeter	Barometric +GPS offset (altitude and grade)

Display
LCD	3,5" LCD Transflective (320x240) 65K colors - high visibility with LED-backlit TFT
Touch-screen	Resistive technology, allows gloves and wet fingers

Power
Mains	100-240 AC/DC Adapter, medical grade (complies with IEC 60601-1, class II) for direct power supply and battery charging
Battery	Rechargeable Li-ion 7,2V DC "Smart battery" w/ LCD charge status - 4 hours life and user replaceable
Battery Chargers	100-240VAC, both integrated and external (2 slots)
Backup battery	Embedded (Li-polymer)
Other	12V DC vehicle charger adapter (optional)

Environmental
Pressure Sensors	2 sensors, integrated barometer (-600 to +5500m) and continuous monitoring of analysers pressure
Temp. & Humidity sensors	4 sensors Integrated (internal and external)

CPU & data storage
CPU	456 MHz w/ 128MB RAM
Storage	512 MB Flash (data storage and OS), up to 2.048.000 breaths
Additional Memory	SD-HC Card 32GB/Fat32 - internal slot user accessible (for additional data storage/FW upgrade)

Ports
USB	USB - Device (2,5 KV galvanic-isolated)
Heart Rate (AUX)	Polar® HR receiver, ECG TTL port

OS & Software
PC Software	COSMED OMNIA (multi-language), WIN 10 compatible - Touch Screen interface, tablet ready
Device	Linux OS

Safety & Quality Standards
MDD (93/42 /EEC); FDA 510(k) pending; EN 60601-1 (safety) / EN 60601-1-2 (EMC)

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To know more: