

# K5

WEARABLE  
METABOLIC  
TECHNOLOGY



“field ready...  
wear it!”



**COSMED**  
The Metabolic Company

“Introducing K5, the 4<sup>th</sup> 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  $O_2$  and  $CO_2$ ) with patented dynamic mixing chamber
- 1997 ... introducing K4 b<sup>2</sup>, 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 4<sup>th</sup> 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.



## Design

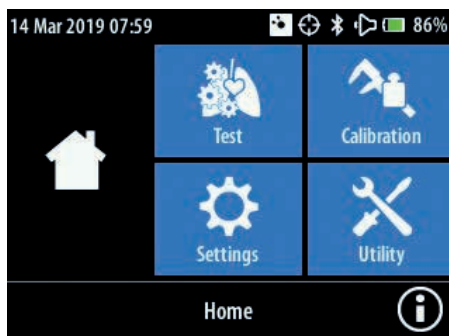
Designed according to **IP54 standard**, K5 is a tough/rugged device. Rubber seals protect the body, connectors and ports against water, moisture and dust intrusion.

Single-body device, reduces weight (900g including battery) and simplifies setup.

3.5" touch-screen LCD (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.

The integrated tripod mount (1/4"-20 UNC) located at the bottom of the unit allows the K5 to be mounted on several standard supports (i.e for biking, outdoor activities and sports or when used in lab testing) providing extreme versatility.



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

## User Interface

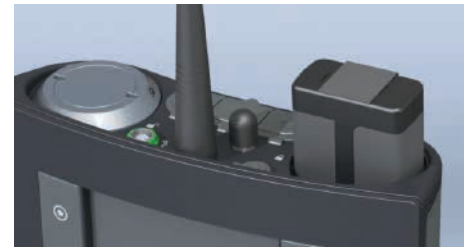
4 keys keyboard for rapid access to frequent functions (On/Off and Rec buttons, Back/Check and Home/Marker keys).

Two large compartments located on the top of K5 allow users to easily access the O<sub>2</sub> sensor, the battery and the SD-card slot.

Intuitive user interface allows simple navigation and quick access to all commands and features, with big easy-to-click icons

Status bar provides information regarding time, date, battery status, Bluetooth® (on/off), GPS and notification icons (for QC messages, warnings etc.).

Li-ion "smart battery" with an LCD showing charge status. Battery life is a total of 4 hours. Batteries are easily replaceable.



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



User replaceable O<sub>2</sub> 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



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

## 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 provides great comfort and ergonomics during dynamic field testing.

The 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 of breathable material, is detachable and washable, providing great comfort while walking or running.



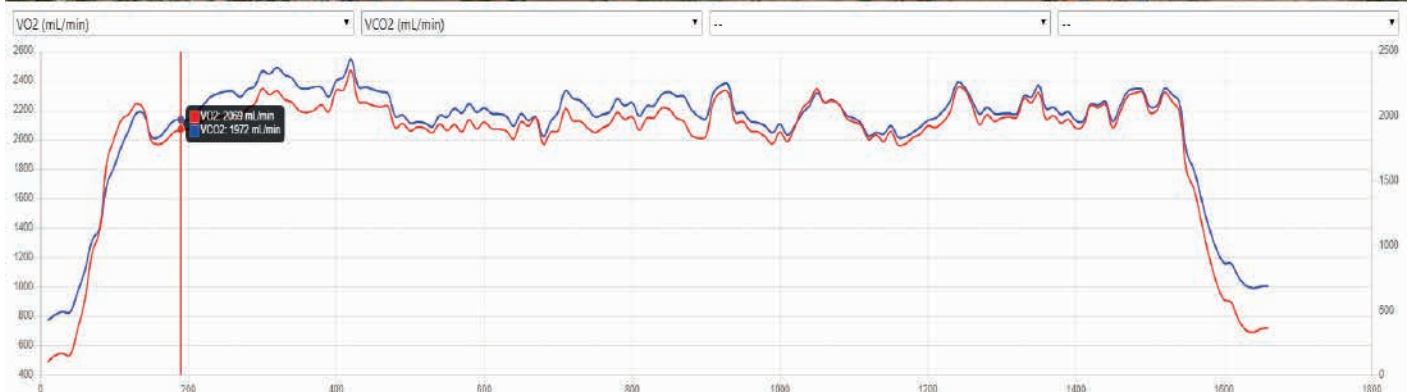
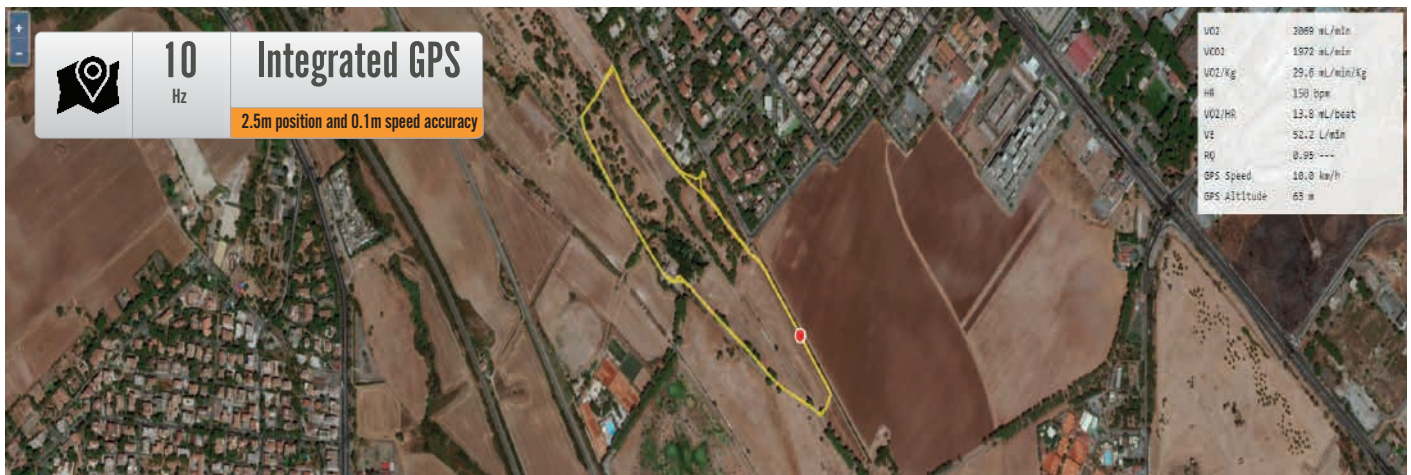
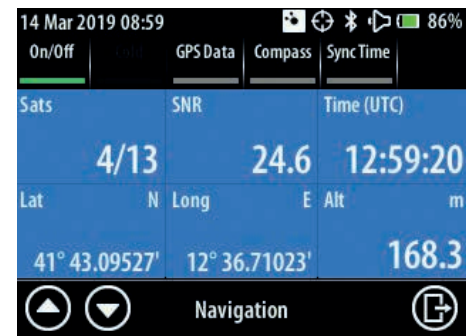
## Navigation

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.

Data can be monitored real time on K5 display and, eventually, downloaded (together with K5 metabolic parameters) in a dedicated interactive browser or in mapping software such as Google Earth.

GPS data can be monitored real time or downloaded in a dedicated interactive mapping software.



## Wireless Connectivity

Great attention has been given to allow K5 more efficient wireless data transmission and seamless integration with other devices. Provided with wireless data transmission (standard and optional) K5 can be controlled via remote and integrated with Bluetooth® external peripherals.

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 (Bike Power & Torque, Bike Speed & Cadence, HR monitor, Muscle Oxygen Monitor, Stride Based Speed & Distance)<sup>1</sup>.

<sup>1</sup> More information at [www.thisisant.com/directory/k5](http://www.thisisant.com/directory/k5)



The real-time GUI of K5 allows users to switch views between different data sets.

	Heart Rate (HR)
  	Bike Speed (SPD) Bike Cadence (CAD) Bike Speed & Cadence (S&C)
 	Bike Power (PWR) Bike Crank Torque Frequency (CTF)
 	Foot Speed (SPD) Step Count (STP)
	Muscle Oxygen (MO <sub>2</sub> )





**5**  
Profiles

**ANT+ Compatible**  
Wireless integrated sport-sensor-devices

## Data Management & Software

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

OMNIA allows the user to operate complex equipment without requiring long learning paths.

Easy-to-use touch-screen graphic user interface with intuitive workflow and hierarchy.

Compatible with Windows 7, 8, 8.1, 10 (32 or 64 bit).

Multi-language environment: Italian, English, Spanish, French, German, Portuguese, Greek, Dutch, Turkish, Russian, Chinese (Trad and Simplified), Korean, Romanian, Czech, Norwegian, Hebrew (interpretation only).

SQL Database allowing virtually unlimited records and data safety.

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

User access by ID and password protected. Multi-users access rights management (Principal Investigator, Physician, Technician, Administrator...) with event logging.

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

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, Imbramed-Bike, Imbramed-TmillATL, Imbramed-Treadmill, Lodebike, Powerjog, RAM770, TechnogymRunRace, Tecmachine1800, TrackEmul, Woodway, Woodway Pro, Marquette T2100/T2000).



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.

## 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).

Power

USB

HR Aux (Polar/TTL)



## 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 easy data sharing without passing through PC software.



*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)*

## 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.

Rugged Peli™ carrying case .

OMNIA PC software.

## Optional modules

Long Distance Bluetooth Module.

IntelliMET™ w/ Micro Dynamic Mixing Chamber.

ANT+ Engine.

Wireless wrist-worn pulse oximeter, NONIN WristOx2 3150 (Ref A-661-600-018)

Aquatainer kit

3L Calibration syringe, gas & regulators.



*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

KS	Metabolic system (REF. C09090-01-99)
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, Back/Check)
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)	Breath by Breath
Gas Exchange (optional)	IntelliMET™ - Intelligent Dual Metabolic Sampling Technology (Breath by Breath & Micro Dynamic Mixing Chamber), US Patent 9581539
Flowmeter	Digital Turbine (Ventilation 0-300 l/min; accuracy <2% or 50ml/min)
O <sub>2</sub> sensor	GFC 0-100% range, lifespan 12 months (user replaceable), ±0.02% Vol. accuracy, ~120 ms Response Time
CO <sub>2</sub> sensor	Digital NDIR, 0-10% range, ±0.02% Vol. 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 data transfer/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
Device	Linux OS

### Safety & Quality Standards

MDD (93/42 /EEC); EN 60601-1 (safety) / EN 60601-1-2 (EMC)



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