Quark CPET
Cardio Pulmonary Exercise Testing

Research grade stationary system for accurate and reliable metabolic measurements

"Assess, Measure, Improve my Performance"

Quark CPET
Cardio Pulmonary Exercise Testing

COSMED
The Metabolic Company

Designed to be used for any kind of cardio pulmonary exercise testing including exercise physiology, sports science and clinical exercise testing

- ▮ **State-of-the-art breath by breath gas exchange data analysis (VO$_2$, VCO$_2$)**
- ▮ **Fast response paramagnetic O$_2$ sensor**
- ▮ **Optional 7-liter mixing chamber (either for low or high ventilation ranges)**
- ▮ **Fully integrated 12-lead ECG for Stress Testing (option)**
- ▮ **Nutritional assessment with face mask or optional canopy hood**
- ▮ **Full spirometry and optional exercise SpO$_2$ monitoring**
- ▮ **Validated technology**

The Quark CPET is a state-of-the-art metabolic cart for gas exchange analysis (VO$_2$, VCO$_2$) either during exercise testing or resting protocols. Its high quality components and super-fast analyzers assure unsurpassed accuracy, reliability, and real breath-by-breath analysis of pulmonary gas exchange, even at high intensity exercises.

The Quark CPET is a unique system with both breath-by-breath and, optionally, mixing chamber sampling technology. The system has been scientifically validated for both gas sampling technique and in a wide range of exercise intensities.

Calibration and test execution can be easily performed thanks to the intuitive software interface.

The Quark CPET is fully modular and can be integrated with additional modules including fully integrated 12-lead ECG Stress testing, canopy hood for REE measurements, pulse-oximetry and many more.

Design

- ▪ **Latest technology in gas analyzers:** stable and durable paramagnetic technology for the O$_2$, rapid infrared for the CO$_2$. Both analyzers are reliable and do not need maintenance for long periods.

- ▪ **Breath by Breath (BBB)** sampling technique (with Face Mask) either during exercise or at rest
- ▪ Ergonomic multi-use silicone **Face Masks** (available in 5 sizes: 3 adult, 2 pediatric) for comfortable testing in any conditions
- ▪ **Ergometer Control**, via RS-232 interface, allows user easy protocol setup and dynamic changes
- ▪ **Low running costs** The design architecture has been made to eliminate the procedure of ordinary maintenance and to easily and rapidly solve any technical problem by replacing a board.
- ▪ **Comprehensive calibration** (easy, quick and fully software assisted) for high accuracy measurements either for flowmeters (calibration and linearity check), gas sensors (zero, gain and delay).
- ▪ **Superior hardware** specifications and quality design assure many years of accurate data
- ▪ **Independently validated technology** on a wide range of test modes (BBB and Mixing Chamber) and exercise intensities

Breath by breath (BxB) mode: Subject wears a multi-use silicone face mask incorporating the flowmeter

MIxing Chamber (optional) mode: Subject wears an headgear attached to a two-way nonrebreathing valve connected to the mixing chamber

Data Management & Software

OMNIA PC software provides a user friendly, fully-customisable interface together with powerful data elaboration
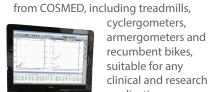
- Automatic and manual detection of anaerobic threshold according to the modified V-Slope method (Wasserman)
- Access data in a spreadsheet format for advanced data elaboration (filtering, smoothing, etc.)
- Standard and custom exercise protocols design
- O_2 Kinetics feature automatically provides O_2 debt, O_2 deficit and tau values during any constant stage
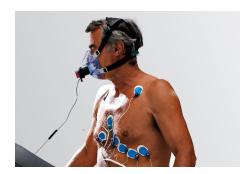- Indirect Cardiac Output by "Wassermann Algorithm"

Options & Accessories

The system can be implemented with a broad range of options/accessories that allow to configure a fully integrated Cardio Pulmonary Exercise Testing (CPET) system with 12-lead stress test PC ECG or to perform Gold Standard indirect calorimetry tests.

- Integrated diagnostic quality 12-lead Stress ECG, either in wireless or patient cable configurations
- 7L Mixing Chamber for gas exchange analysis of low and high ventilation ranges
- Canopy Hood for Gold Standard Resting Energy Expenditure (REE) measurements on spontaneously breathing subjects by means of a ventilated canopy hood
- High FiO2 kit for gas exchange measurements using hypoxic and hyperoxic gas mixtures.
- Wide selection of ergometers, available from COSMED, including treadmills, cyclergometers, armergometers and recumbent bikes, suitable for any clinical and research application.

Quark CPET performs during exercise pulmonary gas exchange analysis together with an integrated ECG

12-lead stress test ECG available in both wireless and Patient-cable configurations

MIxing Chamber

Cardio Pulmonary Exercise Test (CPET) real-time dashboard 9 Panel plot

Nutritional Assessment with canopy hood (option)

Bibliography

- Gullstrand L., et al. Validation of the Quark CPET Respiratory gas analyser in the BBB mode. 2013; Elite Sport Centre, Bosön
- Gullstrand L., et al. Validation of the Quark CPET Respiratory gas analyser (Mixing Chamber). 2013; Elite Sport Centre, Bosön
- Nieman DC, et al. Validity of COSMED's Quark CPET mixing chamber system in evaluating energy metabolism during aerobic exercise in healthy male adults. Res Sports Med. 2013;21(2):136-45
- more scientific studies on www.cosmed.com/bibliography

Technical Specifications

Product	Description	REF
Quark CPET	Stationary metabolic cart	C09061-01-99
Standard packaging	VO_2max flowmeter w/ sampling line, HR Belt (Ant+), Face Masks (3 sizes S, M, L), 2 Adult Head caps , Calibration Syringe (3 Liters), OMNIA PC software, cables, probes and user manual	

Gas Analyzers	Oxygen (O_2)	Carbon Dioxide (CO_2)
Type	Paramagnetic	NDIR
Range	0-25%	0-10%
Response time t90	120 ms	100 ms
Accuracy	±0.02%	±0.02%
Warm-up time	5 min	10 min

Flowmeter	VO_2max	RMR/REE (optional)
Type	Bidirectional Digital Turbine (Ø 28 mm)	Bidirectional Digital Turbine (Ø 18 mm)
Flow Range	0-16 l/s	0-8 l/s
Accuracy	± 2% or 20 ml/s (flow) ± 2% or 200 ml/min (ventilation)	± 2% or 20 ml/s (flow) ± 2% or 100 ml/min (ventilation)
Resistance	<0.6 cmH_2O /l/s @ 14l/s	<0.7 cmH_2Ol/s @ 3l/s
Ventilation range	0-300 l/min	0-50 l/min

Hardware		
Dimensions & Weight	17 x 30 x 45 cm / 6 Kg	
Interface ports	USB A-B, RS-232, HR-TTL, SPO2	

Software	OMNIA 1.3 - Metabolic Module	
Available languages	English, Italian, French, German, Spanish, Dutch, Russian, Chinese, Portuguese	
Required PC Configuration	1.4 GHz or faster processor speed. Compatible with Vista (32/64), Windows 7 (32/64), Windows 8 (32/64). RAM 4GB (8GB recommended). 500 MB of free disk space plus 100 MB for .NET framework plus 512 MB for SQLServer 2008 R2 SP1 Express	

Accessories & Options	Description	REF
Gas Calibration Kit	Gas cyclinder required for O_2/CO_2 calibration (16% O_2, 5% CO_2, N_2 bal) and a pressure regulator	A-860-000-004 (Gas) A-870-150-005 (Regulator)
Mixing Chamber	7 liters Mixing Chamber (physical)	C03261-01-11
RMR/REE Flowmeter	Extra Flowmeter, smaller size (ID 18) for more accurate readings at very low flow. Recommended for research on Metabolism	C02500-02-04
Ethanol Burning Kit module	Quality control test for routine calibration by burning a known quantity of Ethanol	C03471-01-11
Small Medical Grade Cart (either 120V or 240V)	1 cylinder holder	C03550-0*-04
Large Medical Grade Cart (either 120V or 240V)	3 cylinder holder	C02900-0*-04
Aquatrainer	Snorkel for enhanced Breath-by-Breath Gas Analysis during Swimming	C03870-01-11
High/Low FiO_2Kit	Kit for metabolic measurements using hypoxic and hyperoxic gas mixtures	C03471-01-11
REE with Canopy Hood	Kit including transparent canopy hood and blower for "gold standard2 indirect calorimetry measurements at rest	C03253-01-11
Quark C12x with TTL	Diagnostic quality 12 lead stress test ECG with patient cable	C09080-01-99
Quark T12x with TTL	Diagnostic quality wireless 12 lead stress test ECG	C09081-01-99
Oximeter (Xpod)	Nonin Oximeter integrated in the cable and attachable to different sensors (finger, earlobe and forehead)	C02600-01-05
Oximeter ipod	Nonin Oximeter with integrated finger probe	C02390-01-05

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