

*"Assess, Monitor, Evaluate
Exercise Capacity..."*

Quark CPET
Clinical Metabolic Cart



State-of-the-art metabolic cart for clinical
Cardio Pulmonary Exercise Testing



COSMED
The Metabolic Company

- **Breath by breath gas exchange analysis (VO_2 , VCO_2)**
- **Powerful software for data analysis (thresholds, slopes, 9-Panel Plots, Auto-interpretation etc.)**
- **Spirometry and Exercise Flow Volume Loops**
- **Optional Walk Test Module (6MWT, Shuttle, etc.)**
- **Integrated wireless or cable 12-lead Stress Testing ECG, and single-lead ECG chest-strap (option)**
- **Interface to HIS via HL7®, DICOM® or GDT protocols**



Quark CPET is a metabolic cart designed for clinical use across a wide range of patient populations. Engineered to meet the demands of modern clinical environments, Quark CPET delivers accurate measurements of oxygen uptake (VO_2), carbon dioxide output (VCO_2), and related variables to support diagnosis, risk stratification, and therapy monitoring.

At its core, Quark CPET features robust, fast-response gas analyzers — paramagnetic or GFC for O_2 , and infrared for CO_2 — ensuring fast, stable readings with minimal drift. In addition to its native breath-by-breath sampling technology, Quark CPET also offers an optional mixing chamber, providing clinicians with the flexibility to tailor protocols to different patient conditions and clinical needs.

Validated against gold-standard methodologies across the full physiological spectrum, Quark CPET supports clinical confidence in both submaximal and maximal assessments. It is compatible with multiple monitoring modules including pulse oximetry (SpO_2), automatic blood pressure, and arterial blood gas integration, expanding its diagnostic versatility.

Quark CPET is powered by OMNIA, COSMED's intuitive software platform that simplifies test execution and interpretation with guided workflows, real-time quality indicators, and customizable reporting.

Whether conducting routine pre-operative evaluations, rehabilitation assessments, or exercise intolerance investigations, OMNIA streamlines CPET delivery in clinical settings. Built-in quality control tools, customizable layouts, and compatibility with hospital information systems (HIS) ensure both clinical accuracy and operational efficiency.

The system's low maintenance design reduces operational downtime through modular, plug-and-play hardware archi-

ture, ensuring long-term reliability with minimal service requirements.

A wide selection of ergometers — including treadmills, cycle ergometers, arm ergometers, and recumbent bikes — is available directly from COSMED, offering tailored solutions for hospitals, rehabilitation clinics, and specialized diagnostic centers.

More than a metabolic cart, Quark CPET is a complete clinical platform for evidence-based cardiopulmonary assessment.

Metabolic Testing	
Cardio Pulmonary Exercise Testing (CPET) with Breath by Breath technology	●
Cardio Pulmonary Exercise Testing (CPET) with Adaptive Mixing Chamber technology	○
Resting Energy Expenditure (REE) with Mask	●
Exercise Flow Volume Loops	●
Advanced CPET data analysis ($\text{VO}_{2\text{max}}$, thresholds, slopes, steady state, O_2 kinetics, etc.)	●
Training Zones and FatMax	●
Diagnostic 12-leads Stress testing ECG	○
SpO_2 during exercise	○
High/Low FiO_2	○
Automatic blood pressure monitor	○
Aquatrain (gas exchange snorkel for swimming application)	○
Lung Function Testing	
Spirometry (FVC, SVC, MVV etc.)	○
Walk Test (6MWT, ISWT, custom protocol), Titration Tests, Overnight Pulse Oximetry	○

● Standard ○ Optional

Cardio Pulmonary Exercise Testing

Quark CPET offers a comprehensive suite of testing features designed to support high-precision cardiopulmonary evaluations in clinical settings. From basic functional capacity assessments to complex ventilatory efficiency evaluations, the system enables accurate, real-time analysis of gas exchange and related physiological parameters across the full spectrum of exercise intensity.

With flexible configuration options—including native breath-by-breath sampling and the optional Adaptive Mixing Chamber—Quark CPET allows clinicians to tailor protocols to individual patient needs, ensuring accurate diagnostics and informed clinical decision-making in cardiology, pulmonology, rehabilitation, and pre-operative evaluation.

CPET BY BREATH BY BREATH

In its standard configuration, Quark CPET uses a high-flow turbine flowmeter and fast-response gas analyzers to deliver true breath-by-breath gas exchange data. This allows clinicians to monitor rapid physiological changes during ramp, step, or interval-based protocols with precision.

Exams are typically conducted using reusable silicone masks (available in pediatric and adult sizes), or via mouthpiece with nose clip. For high-exertion tests, optional dual-valve masks are available to minimize inspiratory resistance and reduce condensation, ensuring comfort and accuracy during prolonged or intensive assessment.

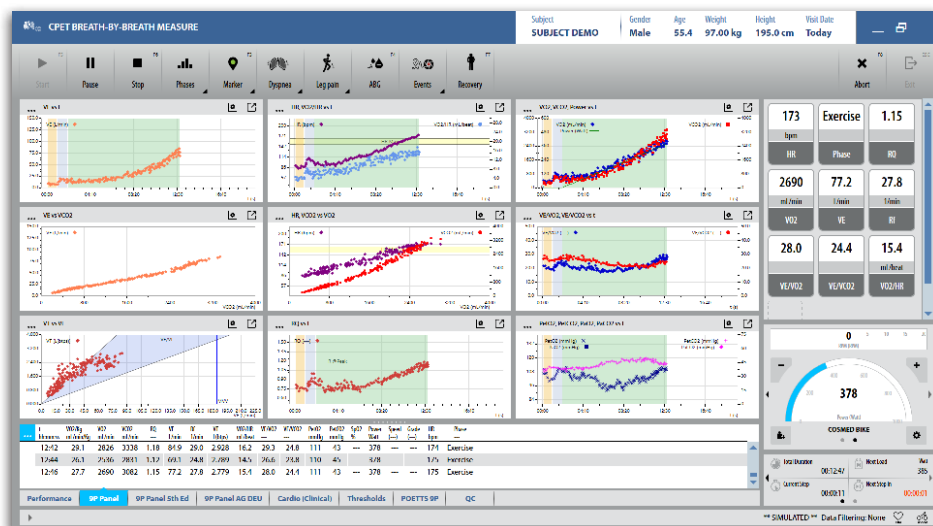
CPET BY ADAPTIVE MIXING CHAMBER

Quark CPET can be optionally equipped with COSMED's AMIS 24 Adaptive Mixing Chamber. Unlike fixed-volume systems, AMIS 24 dynamically adjusts its internal volume (4–15 L) in real time to match the patient's ventilation, providing stable and responsive washout times across a broad range of ventilatory demands (50–300 L/min).

The result is Douglas-bag-level accuracy with near breath-by-breath temporal resolution, ideal for patients with high ventilation rates or variable breathing patterns, such as those undergoing high-intensity testing or requiring detailed ventilatory kinetics analysis.

CLINICAL PROTOCOL FLEXIBILITY

OMNIA protocol editor allows full customization of testing procedures, whether replicating standard clinical protocols or adapting to patient-specific conditions. Ramp, stepwise, interval, or constant-load formats can be easily programmed and adjusted.



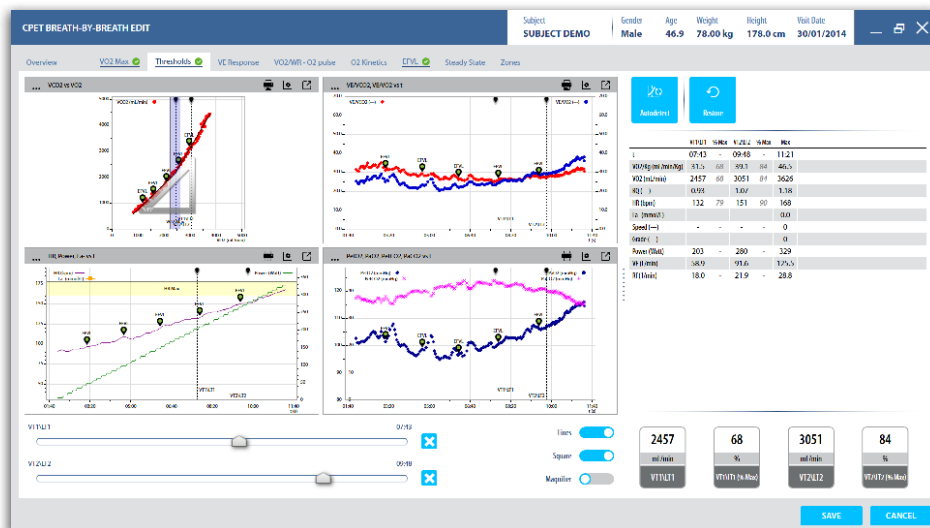
Possibility to manage/display real time data and plots via dashboards (default and user defined)



ADVANCED INTERPRETATION TOOLS

OMNIA equips clinicians with a full arsenal of advanced interpretation tools designed to enhance diagnostic precision and support clinical decision-making across a range of patient populations and care pathways.

- Configurable dashboards and layouts to monitor key CPET variables in real time according to clinical priorities. Standard formats such as the 9-Panel Plot and POETTS layouts are included, alongside fully customizable user-defined dashboards.
- Automated identification of first (VT1/LT1) and second (VT2/LT2) ventilatory or lactate thresholds using multiple validated algorithms. Visual markers and manual override functions support expert review and ensure confidence in threshold-based clinical interpretations.
- Automated identification of VO_2max with confirmation of peak effort achievement based on standard physiological criteria. This supports reliable assessment of cardiorespiratory fitness and treatment efficacy in both baseline and follow-up evaluations.
- Real-time assessment of ventilatory efficiency, crucial for identifying ventilatory abnormalities and stratifying risk in conditions such as heart failure, pulmonary hypertension, and unexplained dyspnea.
- Real-time display of flow-volume loops during exercise to help detect mechanical ventilatory constraints. Particularly valuable in evaluating dynamic hyperinflation or restrictive ventilatory patterns in patients with pulmonary disease.
- Identification of individualized training and rehabilitation zones based on key metabolic landmarks (VO_2max , VO_2 at VT1 and VT2, VO_2 reserve). These zones support precision-guided exercise therapy in cardiopulmonary rehab and clinical fitness programs.
- Detailed insights into submaximal metabolic kinetics and oxygen utilization across steady-state stages, ideal for rehabilitation monitoring, workload tolerance assessment, and endurance capacity evaluation.
- Advanced tools for data refinement and recalculation of key parameters such as ventilatory thresholds, VO_2max , VE/VCO_2 slopes, VO_2/WR (work rate), OUES (oxygen uptake efficiency slope), EFVL (expiratory flow-volume loops), and more.
- Detailed analysis of O_2 uptake kinetics by enabling unlimited selection of O_2 deficit and/or debt intervals. Ideal for evaluating metabolic efficiency, slow component kinetics, or delayed recovery in clinical populations.



Powerful post editing for calculation and reviewing of main parameters (edit Thresholds, EFVL, VE/VCO_2 , etc.)



Automatic steady state identification



OMNIA real time interface of a stress ECG Test with COSMED Q-12

OMNIA Software

OMNIA is COSMED's comprehensive software platform that powers the Quark CPET system, delivering a complete and clinically focused environment for managing cardiopulmonary and metabolic testing. Designed for ease of use in high-demand clinical settings, OMNIA supports the entire workflow — from calibration to data interpretation and reporting — within a secure and flexible framework optimized for patient care.

INTUITIVE & OPERATOR-FRIENDLY

OMNIA's clean, task-oriented interface simplifies complex test procedures, helping clinical staff work efficiently and with confidence. Guided, automated calibration routines cover all necessary checks (gas sensors, flowmeter, mixing chamber) and minimize preparation time. During tests, real-time quality indicators, alerts, and coaching prompts help ensure consistent data collection, even with challenging patient populations.

INTERPRETATION & DECISION SUPPORT

Built-in analytical tools enable fast, reliable clinical interpretation of data. OMNIA automatically calculates physiological parameters and markers. Test results are presented with automatic text-based interpretations, numerical summaries, and threshold zones to support diagnostic assessment and individualized therapy planning. Data smoothing, artifact removal, and segment-specific averaging options enhance report accuracy, even in complex cases.

CLINICIAN-TAILORED REPORTING

OMNIA's flexible reporting feature allows clinicians to generate reports that reflect the specific needs of their patient population or department. Choose from predefined templates or create custom reports including trend analysis, gauges, tables, graphs, and interpretation aids. Whether for a single test, longitudinal patient tracking, or outcome-based reporting, outputs can be exported in PDF, XML, or XLS formats, and seamlessly integrated into electronic medical records.

SECURE DATA MANAGEMENT

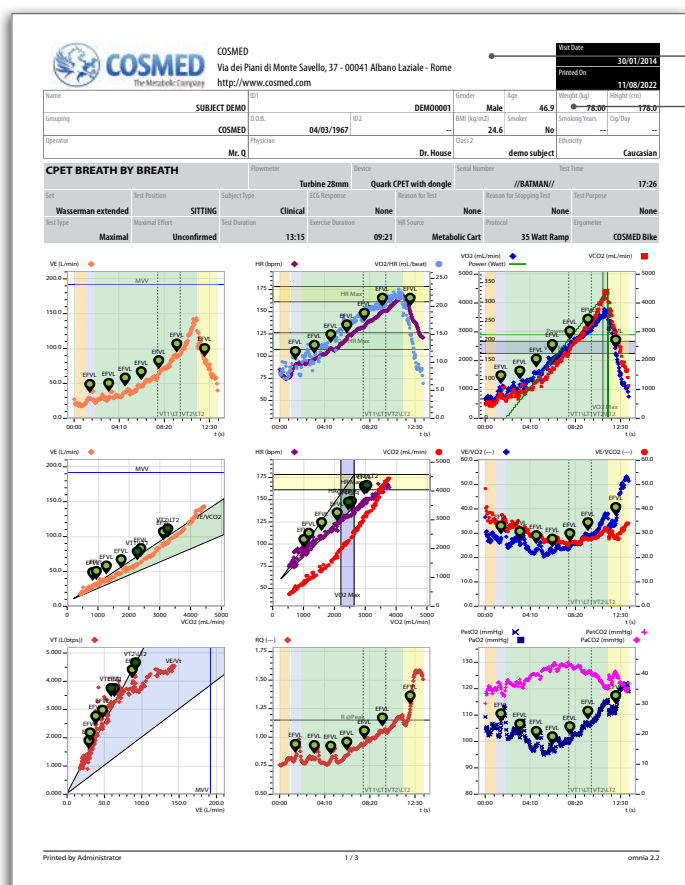
OMNIA employs a robust SQL-based data infrastructure designed to support high-volume clinical environments. Role-based user permissions (Administrator, Physician, Technician), audit trails, and encryption protocols ensure secure, compliant data handling. OMNIA is fully aligned with GDPR and HIPAA standards, featuring automated backups and secure archiving to protect patient data and maintain long-term test records.

FULL INTEROPERABILITY

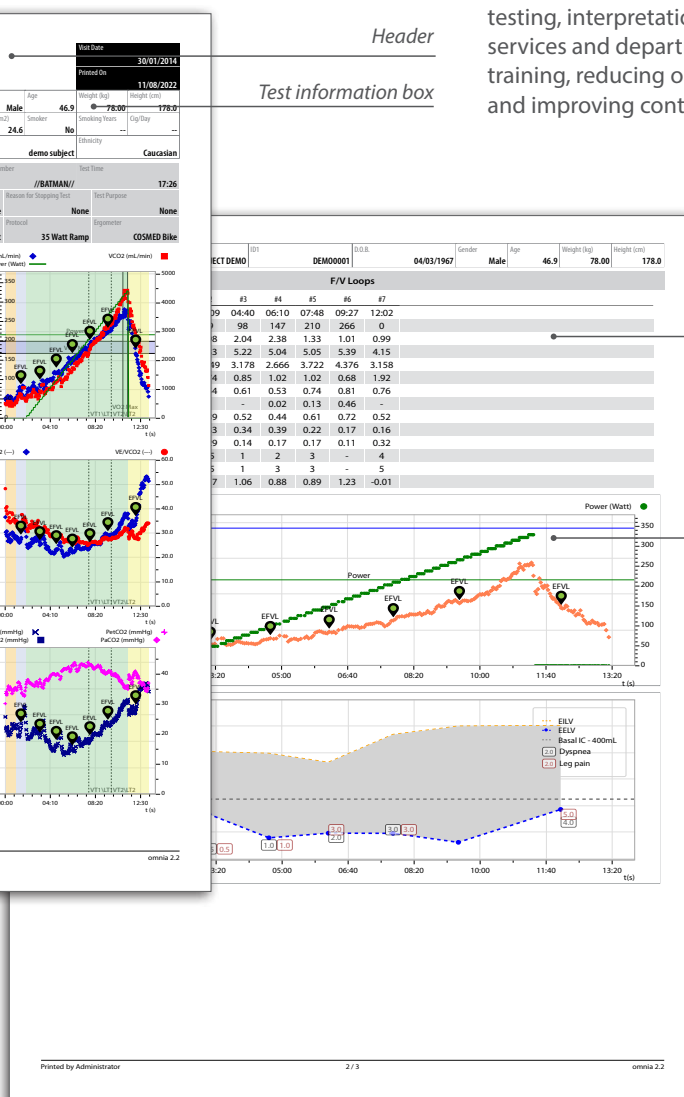
OMNIA is ready for hospital and clinic integration, with native support for HL7, DICOM, and GDT protocols. Whether installed on a single workstation or across a networked multi-lab setup, the client-server architecture enables centralized data access, multi-station coordination, and seamless interoperability with hospital information systems (HIS/EMR).

UNIFIED CLINICAL ECOSYSTEM

OMNIA supports all COSMED diagnostic platforms under a single software environment. This unification ensures consistency in testing, interpretation, and reporting across services and departments, simplifying staff training, reducing operational complexity, and improving continuity of care.



Custom printout reporting with gauges, comprehensive interpretation statements, editable charts and tabular data



Integrated ECG Solutions

Quark CPET is compatible with a comprehensive range of ECG solutions tailored to meet the diverse needs of cardiopulmonary exercise testing.

Whether you require high-end diagnostic capabilities or a streamlined, cost-effective setup, all options are designed to integrate smoothly into your workflow and testing protocols.

The **Q-12** is a fully integrated **12-lead ECG** system designed for real-time acquisition, high signal fidelity, and advanced post-test interpretation.

Operating in both wireless and wired configurations, Q-12 delivers diagnostic-grade performance with complete synchronization inside the OMNIA software platform, ensuring a unified experience during complex cardiopulmonary assessments. High-resolution ECG processing produces an exceptionally clear display and allows for detailed on-screen analysis.

OMNIA offers a comprehensive set of review and editing tools, including adaptive waveform measurement, overlay features for precise interval comparisons, and automated interpretation functions such as arrhythmia detection, ST segment analysis, and QT correction using selectable formulas.



OMNIA real-time interface of a CPET test with integrated single-lead strip displaying ECG signal from Q-Beat.

For a simpler yet effective solution, the **Q-Beat** offers a **single-lead ECG** integrated directly into OMNIA.

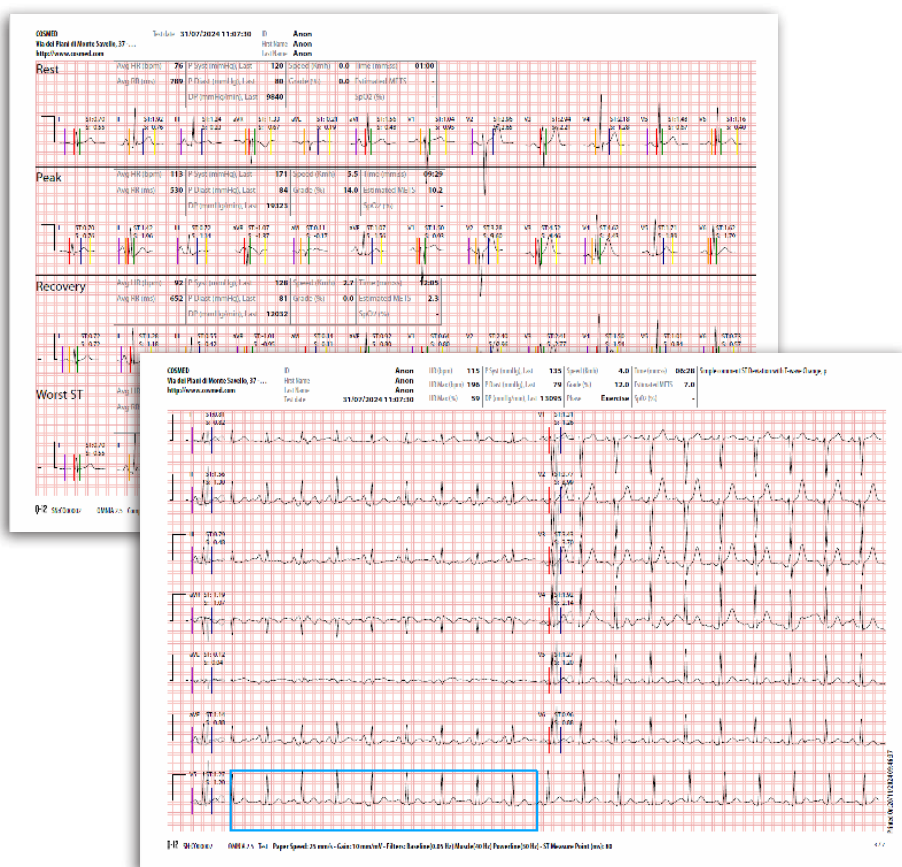
Worn as a comfortable, adjustable chest strap, Q-Beat communicates wirelessly with OMNIA via Bluetooth Low Energy (BLE), providing continuous, real-time heart rate monitoring throughout the test.

It represents a compact, cost-efficient option ideal for routine CPET procedures where reliable heart rate monitoring is

essential, but full 12-lead ECG data is not required.

Quark CPET is also compatible with the 12-lead Quark C12X and T12X ECG systems, which operate through an external software that communicates with OMNIA for synchronized testing and centralized data management.

In addition, OMNIA supports integration with selected third-party ECG solutions, providing added flexibility for facilities using existing platforms.



COSMED Q-Beat – Single-lead ECG with chest strap



COSMED Q-12 – 12-Lead ECG device

Easy-to-read, detailed ECG report with clear overlays highlighting key events for quick, accurate interpretation.

Options and Accessories

The Quark CPET system, combined with OMNIA Software, offers seamless integration with a broad range of medical-grade accessories and devices, enhancing its clinical utility across diverse patient populations and test environments.

ADAPTIVE MIXING CHAMBER AMIS 24

AMIS 24 is specifically designed to accommodate a wide range of ventilation rates (up to 300 L/min). Its variable internal volume (4–15 L) adjusts in real-time to the patient's ventilatory output, ensuring rapid washout and reliable gas exchange measurements.

COMPATIBLE ERGOMETERS

The system integrates natively with COSMED-branded and third-party ergometers, including upright and recumbent cycle ergometers, arm ergometers, reclining ergometers, and treadmills. Optional accessories — emergency stop buttons, safety harnesses, wheelchair ramps — enhance safety and accessibility for diverse clinical populations.

BLOOD PRESSURE MONITORING

The Suntech® Tango® M2 is purpose-built for exercise and stress testing environments. Its design minimizes errors associated with movement, ambient noise, and muscular tension, allowing accurate non-invasive blood pressure (NIBP) monitoring during incremental and high-intensity protocols.

INTEGRATED OXIMETRY

SpO₂ is continuously monitored during exercise using the Nonin® Xpod pulse oximeter, with multiple probe types available for adult and pediatric applications. The Nonin® WristOx 3150 offers accurate oximetry ideal for walk tests, oxygen titration studies, and overnight monitoring, with full data integration into the OMNIA platform.

BLOOD GAS MONITORING

OMNIA interfaces with advanced transcutaneous monitoring systems, such as SenTec® Digital Monitoring System and Radiometer® TCM5, allowing for continuous, non-invasive measurement of pO₂ and pCO₂ during exercise.

CARDIAC OUTPUT MONITORING

The PhysioFlow® Q-Link™ and Enduro™ systems offer non-invasive cardiac output measurement during exercise testing.

HIGH/LOW FIO₂ KIT

The FiO₂ kit enables testing under modified oxygen conditions, supporting both high and low inspired oxygen concentrations. It is ideal for protocols such as eucapnic voluntary hyperventilation (EVH), commonly used to assess bronchial hyperresponsiveness. Integration is smooth and monitored through OMNIA, ensuring safety and measurement consistency.

MY NRG APP

My NRG is COSMED's app that allows patients to retrieve metabolic test data (from CPET or REE) using a simple QR code scan. Results can be stored in a personal digital database or synced with health tracking platforms such as Apple HealthKit® and Google Fit™, supporting personalized follow-up and long-term engagement in rehabilitation or weight management programs.



COSMED My NRG App



Tango® blood pressure monitor



Nonin® WristOx 3150 pulse oximeter



A model from the extensive COSMED ergometer range



One of the many COSMED treadmills available

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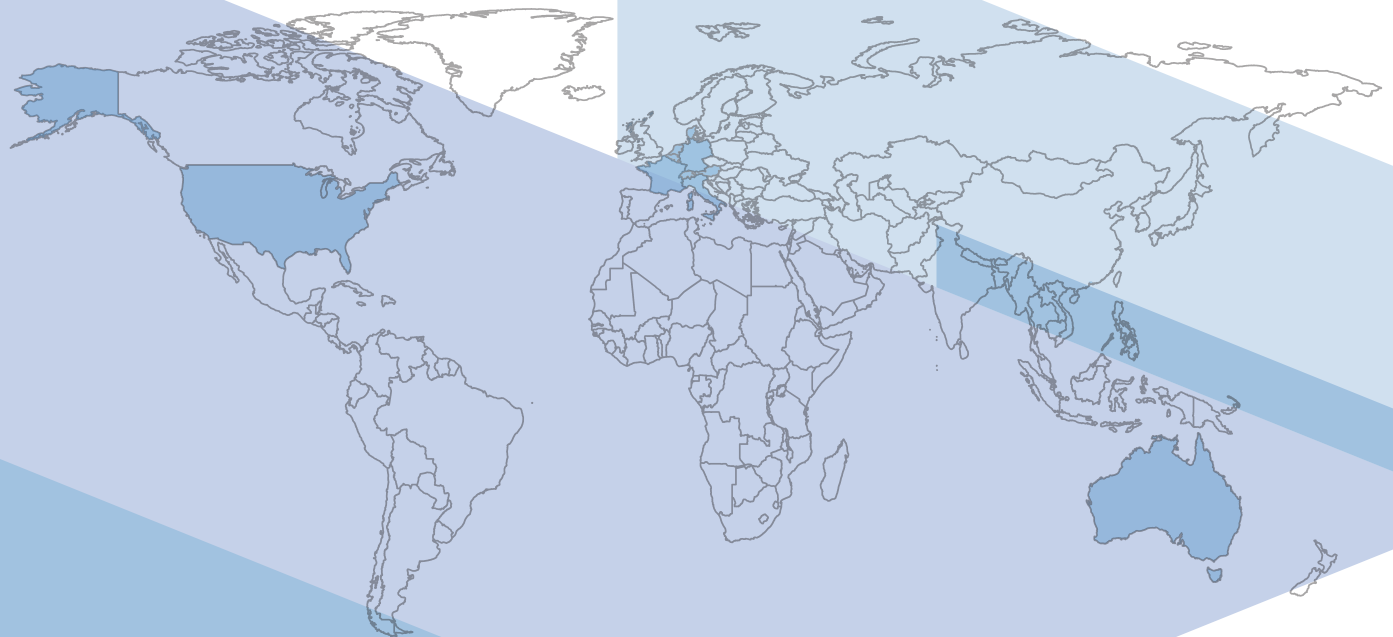
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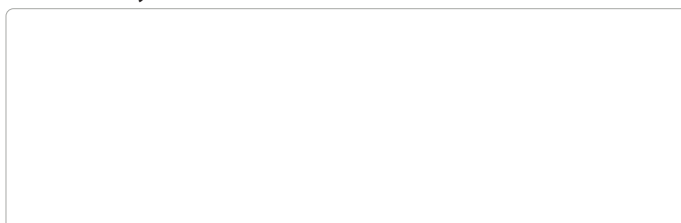


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To know more:



COSMED Quark CPET is a medical device.

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