Quark RMR

Metabolic Cart







The gold standard for metabolic measurements in applied human physiology

COSMED

The Metabolic Company

- **Measurement of Oxygen Consumption over the entire human physiological range**
- **Best in class 02/C02 gas analyzers (Paramagnetic, NDIR)**
- **Different flowmeters available for Resting and Exercise applications**
- **Gas Exchange measurements via Breath by Breath or optional Mixing Chamber**
- **Powered by OMNIA, the most comprehensive software platform in the industry**
- **Independently validated during rest and exercise protocols**



The Quark RMR is a state-of-the-art metabolic cart for gas exchange analysis (VO_2, VCO_2) either at rest or during exercise.

The available configurations make the Quark RMR the most versatile metabolic cart for applied research in human physiology.

Quark RMR's accuracy and reliability have been validated against Gold Standard methods either with spontaneously breathing subjects (at rest and during exercise) and mechanically ventilated patients.

- **Low running costs and easy maintenance.** The design architecture has been conceived to reduce ordinary maintenance and to easily and rapidly resolve most technical problems with the replacement of plug-and-play boards.
- **Powered by OMNIA software.** An innovative user interface, touch screen ready, easy-to-use and self-explanatory.
- **Calibrations and Verifications.** Several tasks are available to ensure that the primary components perform according to their specifications.
- **Independently validated.** Quark RMR is the only Metabolic cart in the market that has been validated with different gas exchange methods (breath by breath and mixing chamber) throughout the whole physiological range (rest to maximal intensity exercise).

Design

- **Unsurpassed reliability**. Fast-response, stable and durable paramagnetic O_2 sensor and rapid infrared CO_2 sensor ensure reliable data for a long time without requiring replacement.
- **Breath by Breath & Mixing Chamber.** Quark RMR is provided with Breath by Breath sampling technology. A Mixing Chamber (7 Liters) is available as an option.
- **Modular architecture.** Configure Quark RMR according to different testing requirements. This cost-effective solution gives the opportunity to scale at any time to a more complex configuration.

Quark RMR at a glance	
Resting Energy Expenditure (REE) with Canopy Hood	●
Resting Energy Expenditure (REE) with Mask	●
Resting Energy Expenditure (REE) with Ventilator (for mechanically ventilated subjects)	○
Cardio Pulmonary Exercise Testing (CPET), by "Breath by Breath"	○
Cardio Pulmonary Exercise Testing (CPET), by "Physical Mixing Chamber"	○
Spirometry (FVC, SVC, MVV etc.)	○
Advanced CPET data analysis (VO_2max, thresholds, steady state, 02 kinetics, etc.)	●
Diagnostic 12-leads Stress testing ECG	○
6MWT and walk tests	○
High/Low FiO_2 (altitude simulation)	○

● Standard ○ Optional

Resting Energy Expenditure (REE)

The Quark RMR in its standard configuration provides the following features:

- Breath by Breath gas exchange measurement of oxygen consumption (VO_2), carbon dioxide production (VCO_2) and related ventilatory and metabolic parameters.
- Quark RMR is optimized to measure Resting Energy at very low flows and make it the most versatile metabolic cart to cover the entire physiological range from resting to exercise.
- Provided with a Canopy or face masks for the assessment of spontaneously breathing patients.
- Available with "Low Flow" Turbine Flowmeter for canopy and mask tests
- Intended for testing subjects above 15kg of weight or 6 years of age.
- An option using a single-use pneumotach is available for testing mechanical ventilated subjects.

REE by Canopy Dilution

- Provided with an Adult canopy hood, a Pediatric version of canopy hood is available as an option.
- Canopy blower is integrated in the device and is easily controlled through the software.
- The software prompts an intuitive widget to help the operator in maintaining a stable CO_2 expired fraction ($FeCO_2$) during the test.
- The canopy veil is easy to mount and made of medical grade LDPE. It's a single-use item in order to avoid any possible cross-contamination between subjects.
- Cleaning the hood is easy and can be done with easily accessible solutions.



REE by dilution with canopy hood

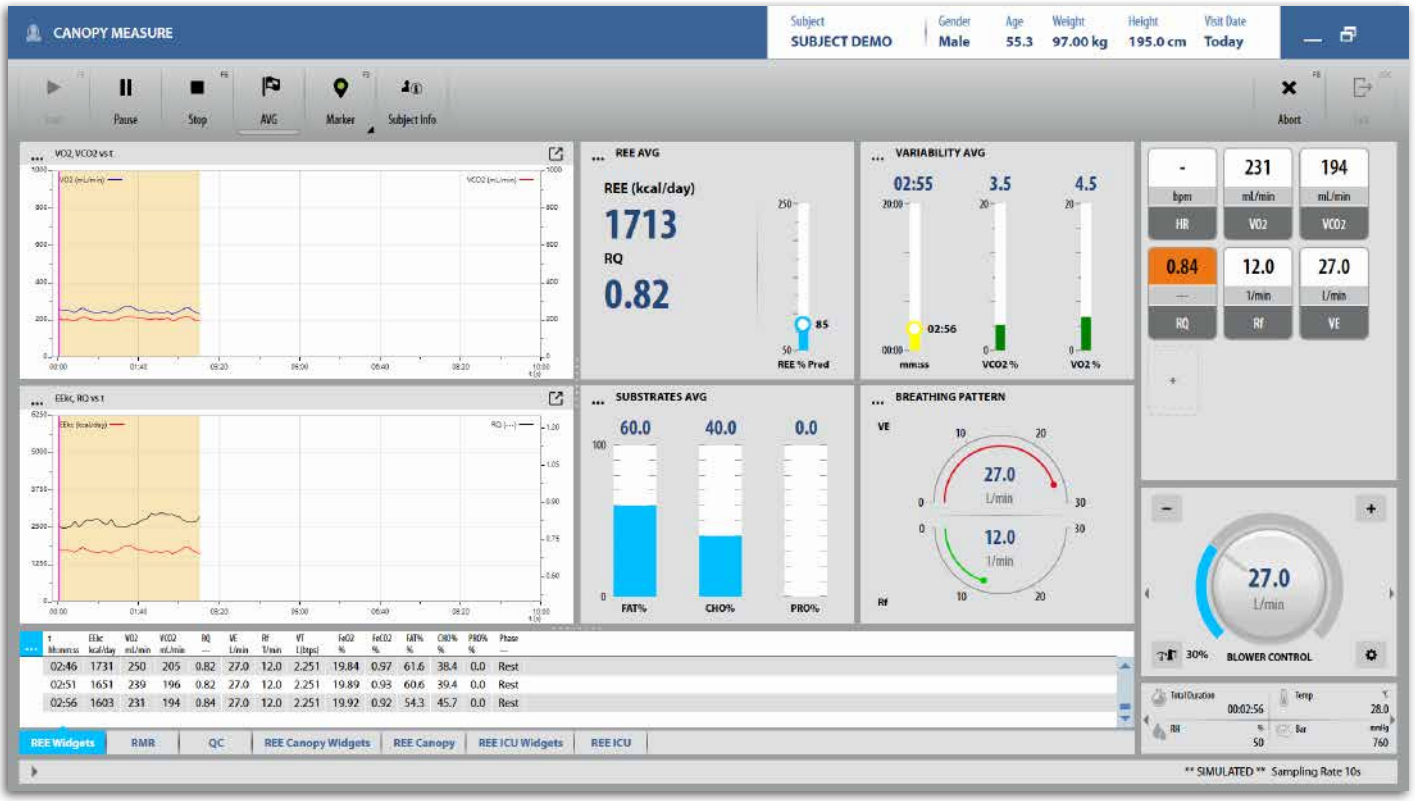
REE by Mask and Mouthpieces

- REE tests can also be done by wearing multi-use silicone oro-nasal face masks (available in 5 sizes: 3 adult, 2 pediatric).
- In addition to canopy and mask, users can also use mouthpiece with antibacterial filters, together with a nose clip.





REE breath by breath by face mask and with mouthpiece and AB filter



REE test real-time panel including graphs, tabular data and widgets for quick results interpretation

Cardio Pulmonary Exercise Testing

On top of the standard features, the optional module for Cardio Pulmonary Exercise Testing (CPET) extends the possibility to perform full exercise protocols during exercise efforts.

- Fast response analyzers provide accurate, reliable, breath-by-breath gas exchange data at any exercise intensity.
- CPET made easy thanks to OMNIA, the new generation of COSMED software. The intuitive, beautiful, and innovative user interface brings complex CPET procedures to a new simpler stage.

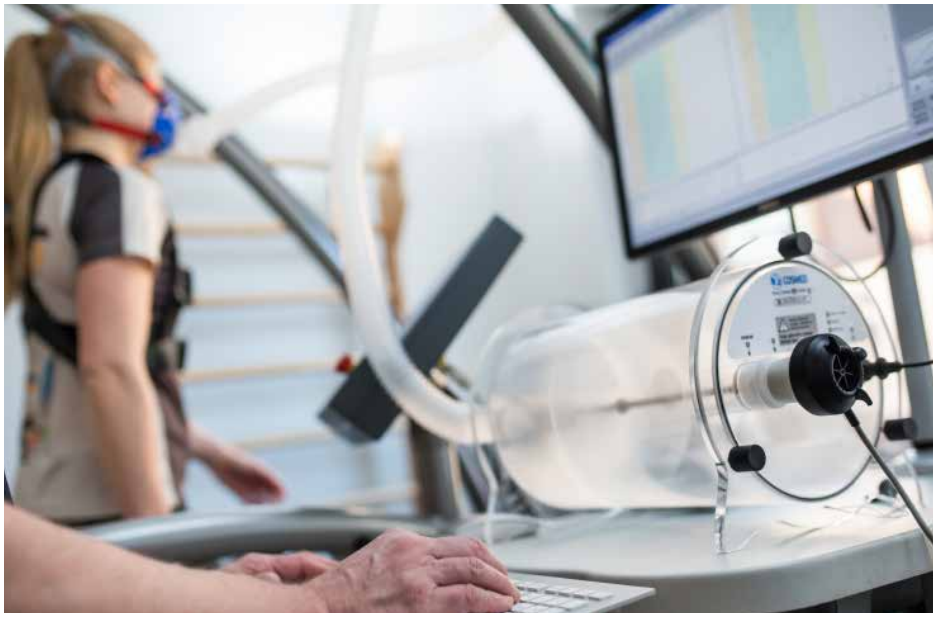
CPET by Breath by Breath

- Breath by Breath is the standard configuration of the CPET Module. It includes a "High-Flow Range" flow reader with 2 extra turbines.
- Tests are conducted using ergonomic multi-use silicone oro-nasal face masks (available in 5 sizes: 3 adult, 2 pediatric) for comfortable testing in any condition.
- Masks are also available with 2 inspiratory valves, to reduce resistance and prevent moisture accumulation especially at high intensity exercise.

CPET by Mixing Chamber

- This optional module includes a physical mixing chamber (7 liters) with 2-way valve and adapters.
- Ideal for gas exchange analysis when testing athletes ventilating at a frequency over 60 breaths per minute.
- Simplified subject set-up, with turbine flowmeter placed at the exhalation port of the mixing chamber, avoids the use of cumbersome conventional helmets.
- The software provides flowmeter calibration specific for Mixing Chamber test to linearize response at its best.







Powerful post editing tools for calculation of the main parameters including custom training zones.



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

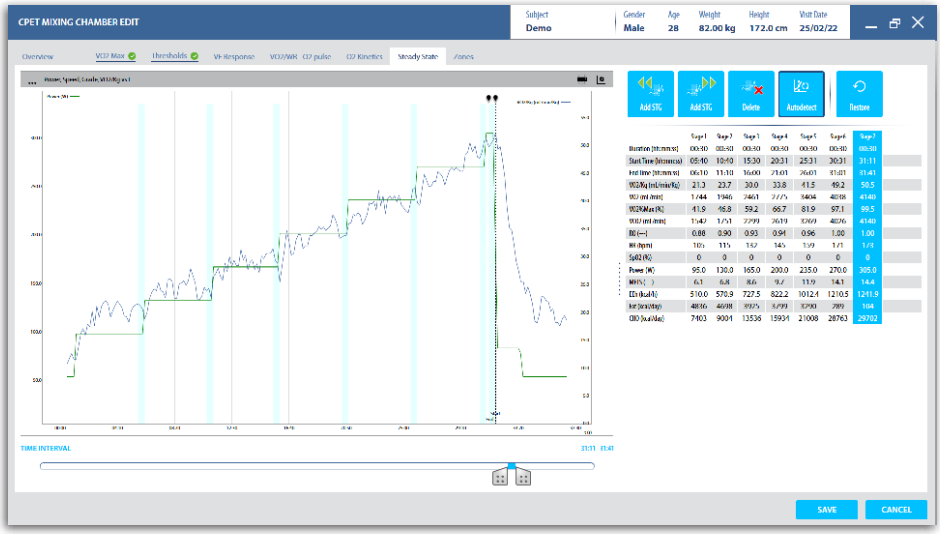
Spirometry

- Software module for performing FVC, SVC, MMV and Pre/Post Bronchial Provocation.
- Real time acquisition and capture of Exercise Flow Volume loops (EFVL) with resting FVC comparison for evaluating ventilatory limitation.
- Trial selection and Quality Control in compliance with ATS/ERS guidelines.
- Pediatric incentive with user-defined effort grade on both volume and flow.
- Full compliance with latest ATS/ERS guidelines (interpretation, QC, etc.).
- GOLD COPD Interpretation on FVC Post BD.
- Latest Global Lung Initiative (GLI) predicteds (including Z-score).

Data Management & Software

Quark RMR comes with **OMNIA Metabolic Module**, the new software designed by COSMED, compatible with the entire COSMED products range, OMNIA allows the user to operate different equipment in a single software environment.

- Easy-to-use touch-screen graphic user interface with intuitive workflow and hierarchy.
- Manage and display data and charts through standard (9 panel plot, etc.) or user defined Dashboards.
- Select and define charts, data and widgets to define your preferred working environment.
- Powerful chart creation (up to 4 Y axis and one X axis) with full control on settings.
- Easy, quick and fully assisted calibration for high accuracy measurements, both for flowmeters (calibration and linearity check) and for gas sensors (zero, gain and delay).



Automatic steady state identification

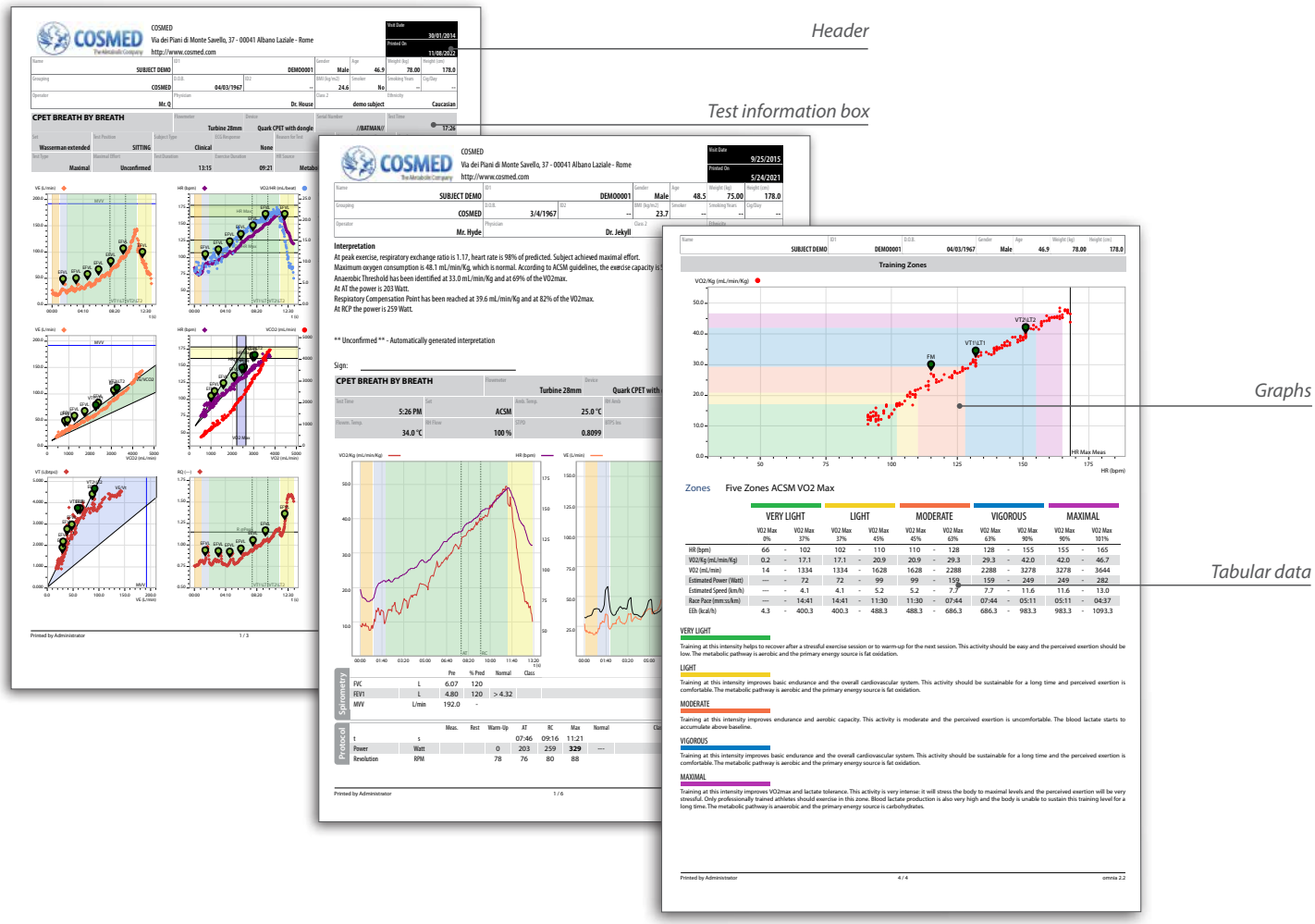
- Powerful post-test editing phase for data filtering, calculation of **thresholds** (VT1/LT1, VT2/LT2), VO_2max, EFVL, VE/VCO_2 slope, intercept and other parameters requested for interpretation.
- **Steady state** identification within multiple stages provides for more detailed analysis of the physiological response to the exercise.
- **Training zones** to personalise exercise prescription according to metabolic reference parameters including VO_2max, VO_2@VT1, VO_2@VT2 and VO_2 reserve.
- Advanced analysis tool to perform multiple regressions on REE and CPET data.
- Comprehensive tools automatically elaborate CPET tests results and provide **interpretation** including text strings and numerical data based on latest scientific guidelines.
- Built-in rest and exercise **Protocol editor** to design and save any type of protocol.
- Wide list of Ergometers can be automatically controlled: (COSMED Bike/Treadmill, Ergoline, HPCosmos®, Monark, Trackmaster) and with the optional Ergometer module (LODE, CSafe Treadmill, Cyclus 2, Technogym, Imbramed, Woodway® and many others).
- **Export data** in pdf, xml, and xls formats. Import data in xml format.
- **SQL Database** allowing virtually unlimited records and data safety.
- Custom user rights management (Physician, Technician, Administrator,...) with event logging.
- Compatible with Win 8 (32/64), 8.1 (32/64), 10 (32/64), 11 (64). Mac OS compatibility when installed in Virtual PC OS (Parallel, VMware).

Networking

OMNIA Network allows to share a single database in either a small network (LAN) or a large network (WAN) environment.

OMNIA Network is based on a Client-Server architecture and allows to run different COSMED devices through simultaneous access of data and run tests via a virtually unlimited number of COSMED products.

- Based on standard SQL database to store data securely.
- Access and security compliance according to international guidelines.
- Standard network license supports up to five clients and can be extended to unlimited clients.
- User management system allows to define users' profiles and rights to each software feature.
- With the optional OMNIA Connector module, OMNIA can exchange data with Hospital Information Systems (HIS) or Electronic Medical Records (EMR) via **HL7®** or **DICOM®** protocols. Shared data are managed through a dedicated worklist with visit status always updated.



Options and Accessories

- **Mixing chamber.** 7-Liters physical mixing chamber is the ideal solution for highly accurate measurements during exercise in research and sport applications.
- **Carts.** Full range of carts either medical-graded with isolation transformer (available either with 230 or 120 VAC) or non-electrified. All carts can accomodate multiple cylinder holders and up to 2 monitors.
- **High/Low FiO_2 option.** Exercise gas exchange measurements with enriched gas mixture.
- **COSMED Aquatrainer®.** Respiratory snorkel for real time gas analysis during swimming.
- **Metabolic simulator.** Periodic verification of metabolic systems performance by means of adjustable breathing pattern and gas exchanges.
- **Wide selection of ergometers.** Several COSMED and third-party modular ergometers available, including cycle ergometers, arm ergometers, recumbent bikes, reclining ergometers and treadmills.



COSMED Metabolic Simulator is an advanced verification tool to simulate human subject gas exchange and respiratory pattern for both clinical and research settings

Interfaced Devices

- **Diagnostic quality 12-lead Stress ECG.** Available either in wireless or patient cable configuration, with full disclosure and scroll back during test. High resolution ECG processing produces an exceptionally clear on-screen display and allows detailed, reliable analysis of ST segments and minimal arrhythmia changes. Available with Resting and Exercise ECG interpretation software.
- **SpO2.** Continuous SpO2 measurement during CPET through Nonin® Xpod oximeter (several probes available).
- **Walk test.** Nonin® WristOx 3150 for walking and titration tests.
- **Non- Invasive Blood Pressure monitor.** Suntech® Tango® M2 specifically designed to overcome noise, motion and physical difficulties associated with cardiac stress and exercise testing.
- **Cardiac Output.** PhysioFlow® Q-Link™ and PhysioFlow® Enduro™. Portable, battery powered, non-invasive hemodynamic monitor for reliable and repeated cardiac output measurements during exercise.
- **Philips Intellibridge™ compatibility.** It allows to transfer REE parameters during testing (VO_2, VCO_2, RQ, REE, VE, Rf) through Philips monitoring solution directly to the Hospital Information System or to Philips IntelliSpace Critical Care (ICCA) systems.



COSMED C12x/T12x ECGs (wireless or patient cable)



Pulse oximeter



Blood Pressure Monitor (Tango®)



Cardiac Output monitor (Physioflow®)

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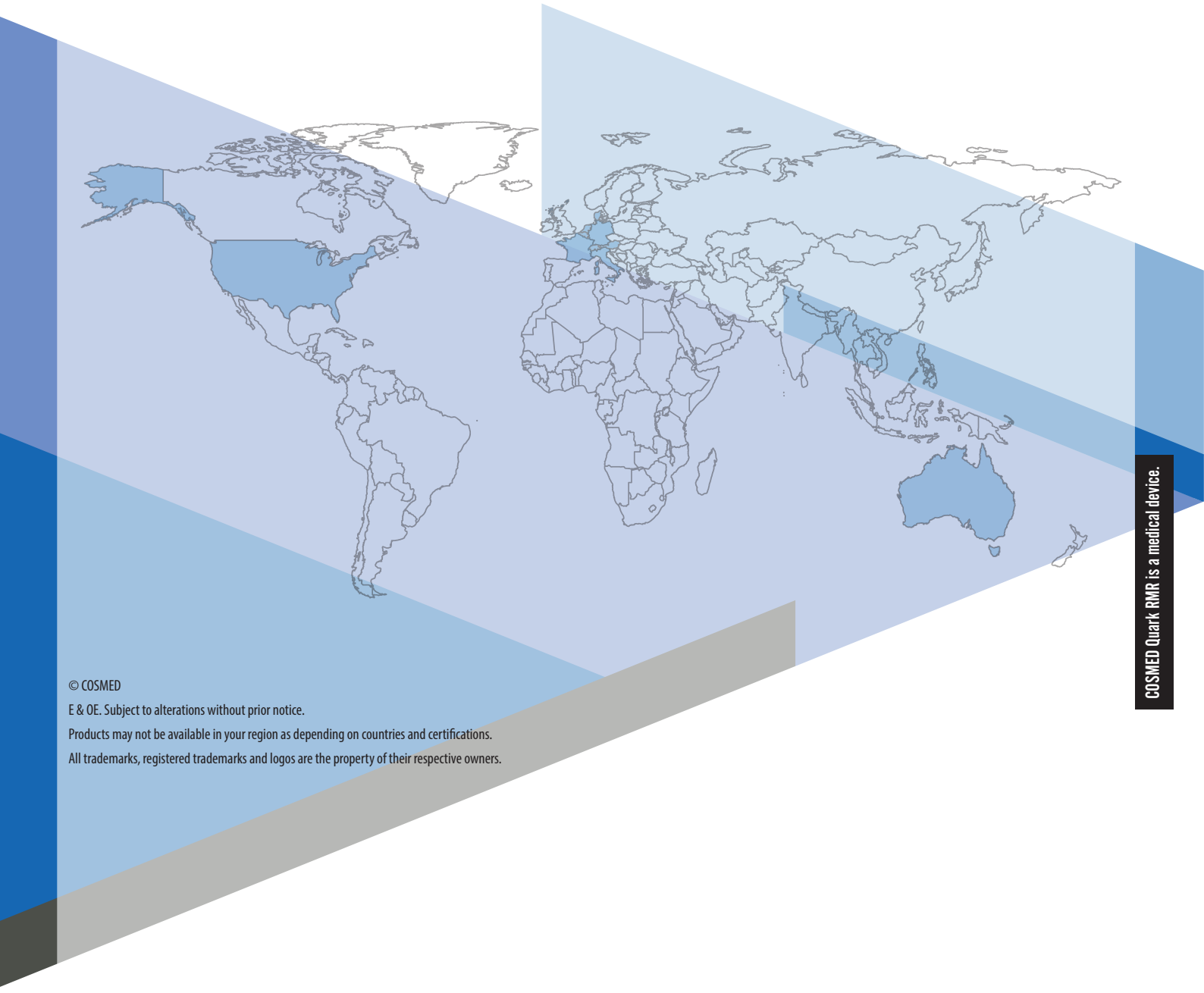
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